SKAGIT COUNTY PARKS & RECREATION
SKAGIT COUNTY FAIRGROUNDS
RESTROOM REPLACEMENT

SEC. 30, TWP. 34N., RGE. 04 E., W.M. CITY OF MOUNT VERNON,SKAGIT COUNTY, WASHINGTON

SHEET INDEX

CALL BEFORE YOU DIG
FOR BURIED UTILITY LOCATIONS
1-800-424-5555

LEGEND

- = TEMPORARY BENCH MARK
- = FOUND ALUMINUM CAP MON
- = FOUND CONC MON
- = EXISTING STORM DRAIN CATCH BASIN (TYPE 1)
- = EXISTING STORM DRAIN CATCH BASIN (TYPE 2)
- = EXISTING SANITARY SEWER MANHOLE
- = EXISTING SANITARY SEWER CLEANOUT
- = PROPOSED SEWER CLEANOUT
- = PROPOSED SEWER MANHOLE
- = EXISTING WATER METER BOX
- = EXISTING FIRE HYDRANT
- = EXISTING WATER VALVE
- = PROPOSED WATER VALVE
- = EXISTING POWER/AND OR UTILITY POLE
- = EXISTING GUY WIRE
- = EXISTING POWER STRUCTURE
- = EXISTING SIGN
- = EXISTING FLAG POLE
- = EXISTING LANDSCAPING
- = EXISTING GAS METER
- = DETAIL CALLOUT

- = EXISTING OVERHEAD ELECTRIC LINES
- = EXISTING FIBER OPTIC LINE
- = EXISTING UNDERGROUND POWER
- = EXISTING OVERHEAD PHONE
- = EXISTING UNDERGROUND PHONE
- = EXISTING OVERHEAD UTILITES (UNKNOWN)
- = EXISTING UNDERGROUND TV CABLE
- = EXISTING GAS MAIN
- = EXISTING WATER LINE
- = EXISTING SANITARY SEWER LINE
- = PROPOSED SANITARY SEWER LINE
- = PROPOSED WATER LINE
- = EXISTING FLOW LINE & DIRECTION
- = EXISTING STORM DRAIN LINE
- = EXISTING CHAIN LINK FENCE
- = EXISTING CONTOUR (INDEX)
- = EXISTING CONTOUR (NORMAL)
- = PROPOSED CONTOUR (INDEX)
- = PROPOSED CONTOUR (NORMAL)
- = PROPOSED ASPHALT PAVEMENT
- = ASPHALT PAVEMENT TO BE REMOVED
- = CONCRETE PAVEMENT TO BE REMOVED
- = RESTORE W/ TOPSOIL & GRASS SEED

SURVEY NOTE

DIGITAL COPIES OF THE CIVIL SITE PLANS WILL BE PROVIDED TO THE CONTRACTOR FOR REFERENCE. ALL UTILITY STRUCTURES, SAWCUTS AND OTHER COMPONENTS NECESSARY FOR CONSTRUCTION SHALL BE STAKED BY A LICENSED SURVEYOR PRIOR TO CONSTRUCTION AT THE CONTRACTOR'S EXPENSE. CONTRACTOR TO PROVIDE AS-BUILT SURVEY TO ENGINEER AT COMPLETION OF PROJECT. AS-BUILT SURVEY TO BE PERFORMED BY LICENSED SURVEYOR FOR ALL SEWER STRUCTURES AND CLEANOUT LOCATIONS, INCLUDE PIPE INVERT ELEVATIONS.

PROJECT INFORMATION

OWNER
SKAGIT VALLEY COLLEGE/SKAGIT COUNTY PARKS & REC
BRIAN ADAMS, DIRECTOR
JOSEPH SHEA, OPERATIONS AND LAND MANAGER
1730 CONTINENTAL PLACE
MOUNT VERNON, WA 98273
(360) 416-1356
jashea@co.skagit.wa.us

CIVIL ENGINEER
FREELAND & ASSOCIATES, INC.
MILES MCEATHRON, PE
2500 ELM STREET, SUITE 1
BELLINGHAM, WASHINGTON 98225
(360) 650-1408
mmceathron@freelandengineering.com

SURVEYOR
JEPSON & ASSOCIATES, PS
STEFAN LAUFER, PLS
222 GRAND AVENUE, SUITE C
BELLINGHAM, WASHINGTON 98225
(360) 733-5760
stefan@jepsonengineering.com

TAX PARCEL #
P29163

FIBER OPTIC
GARY VERVALIN
WAVE BROADBAND
PHONE: (425) 896-1958
MOB:(360) 630-8499
gvervalin@wavebroadband.com

CASCADE NATURAL GAS
JIM HOBBS
1520 SOUTH 2ND
MOUNT VERNON, WA 98273
(360) 336-6155
james.hobbs@cngc.com

PUGET SOUND ENERGY (POTELCO)
MICHAEL JUDY
1660 PARK LANE
BURLINGTON, WA 98233
TEL: (360) 766-5686
mike.judy@pse.com

FRONTIER
CHRIS PARMETER
595 PEASE ROAD
BURLINGTON, WA 98233
TEL: (360) 707-0641
FAX: (360) 757-4338
CONTACT: chris.parmeter@ftr.com

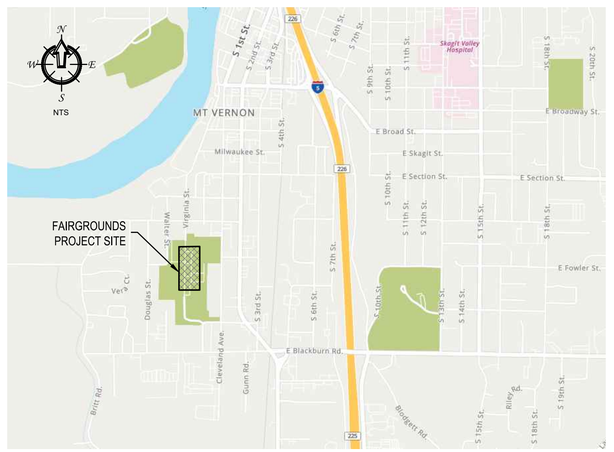
COMCAST
CASEY JONES
400 SEQUOIA DRIVE
BELLINGHAM, WA 98225
TEL: (360) 527-8243
FAX: (360) 527-8302
casey_jones@cable.comcast.com

WATER PURVEYOR
SKAGIT PUD #1
MIKE DEMERS
P.O. BOX 1436
MOUNT VERNON, WA 98273
TEL: (360) 242-7104
demers@skagitpud.com

CITY ENGINEERING INSPECTION
INSPECTION REQUESTS TO BE SCHEDULED USING PERMIT PORTAL AT:
https://ci-mountvernon-wa.smartgovcommunity.com/Application/ApplicationInspectionRequest

DEVELOPMENT SERVICES ENGINEERING MANAGER
ALAN DANFORTH
TEL: (360) 336-6214
alandf@mountvernonwa.gov

VICINITY MAP



CLIENT:
SKAGIT COUNTY PARKS & RECREATION
1730 CONTINENTAL PLACE
MOUNT VERNON, WA 98273

CALL BEFORE YOU DIG
FOR BURIED UTILITY LOCATIONS
1-800-424-5555

PROJECT LOCATION:
SKAGIT COUNTY FAIRGROUNDS
RESTROOM REPLACEMENT
VIRGINIA STREET & 2700 MARTIN RD
MOUNT VERNON, WA 98273

DRAWING #: 23057SPSB.DWG
DRAWN BY: MPM
CHECKED BY: MDB
DESIGNED BY: MPM

SHEET CONTENTS:
COVER SHEET

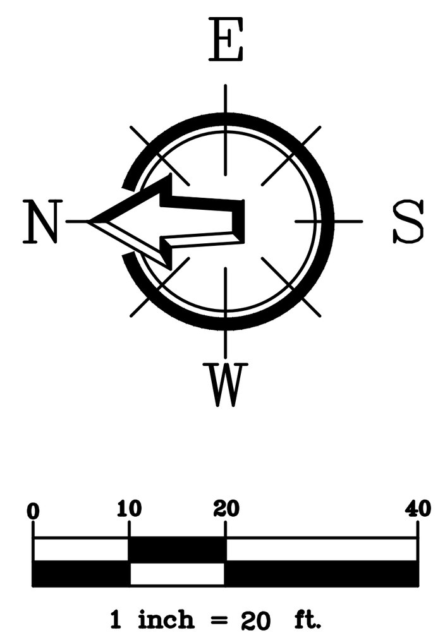
MILES PATRICK MCEATHRON
STATE OF WASHINGTON
49494
REGISTERED
PROFESSIONAL ENGINEER
03/17/2025

JOB #: 23057
DATE: 03-17-2025
SHEET: C1

REV: | DATE: | DESCRIPTION: | BY:

2500 Elm Street, Suite 1
Bellingham, WA 98225
t: 360.650.1408
f: 360.650.1401
FREELAND & ASSOCIATES

TOPOGRAPHIC SURVEY COMPLETED BY JEPSON & ASSOICATES, DATED FEBRUARY 2, 2024.
BOUNDARY SURVEY COMPLETED BY SEMRAU ENGINEERING & SURVEYING.



CONTROL NOTES (JEPSON):

HORIZONTAL DATUM & BASIS OF BEARINGS:
NAD 83/09 (USFT) WASHINGTON STATE PLANE, NORTH ZONE

BASIS OF COORDINATES & REFERENCE BENCHMARK:
MAG NAIL (#900)
COORDINATES DERIVED FROM TOPOGRAPHIC SURVEY FOR THE SKAGIT FAIRGROUNDS PAVING PROJECT No. 6006 DATED 02/14/2022.
NORTHING: 518293.97'
EASTING: 1,274,213.74'
ELEVATION: 20.85 (USFt) NAVD88

LEGAL DESCRIPTION:

P29184, SKAGIT COUNTY:
PORTION OF THE NORTH 1/2 OF THE NORTHEAST 1/4 OF SECTION 30, TOWNSHIP 34 NORTH, RANGE 4 EAST W.M., DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF VACATED LOT 11, BLOCK 20, "PLAT OF THE SOUTHERN ADDITION TO MT. VERNON", ACCORDING TO THE RECORDED PLAT THEREOF IN THE OFFICE OF THE AUDITOR OF SKAGIT COUNTY, WASHINGTON, IN VOLUME 2 OF PLATS, PAGE 110;
THENCE WEST ALONG THE SOUTH LINE OF SAID BLOCK TO THE SOUTHWEST CORNER OF LOT 10 IN SAID BLOCK;
THENCE SOUTH ALONG THE EAST LINE OF VIRGINIA STREET, PRODUCED TO THE SOUTH LINE OF THE NORTH 1/2 OF THE NORTHEAST 1/4 OF SAID SECTION;
THENCE EAST ALONG THE SOUTH LINE OF THE SAID NORTH 1/2 OF THE NORTHEAST 1/4 TO THE EAST LINE OF THE ALLEY IN SAID BLOCK 20 PRODUCED SOUTH;
THENCE NORTH TO THE POINT OF BEGINNING.

EXCEPT THAT PORTION DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF VACATED LOT 11, BLOCK 20, "PLAT OF THE SOUTHERN ADDITION TO MT. VERNON", ACCORDING TO THE RECORDED PLAT THEREOF IN THE OFFICE OF THE AUDITOR OF SKAGIT COUNTY, WASHINGTON, IN VOLUME 2 OF PLATS, PAGE 110;
THENCE SOUTH 1°52'01 WEST A DISTANCE OF 233.87 FEET ALONG THE EAST LINE OF THE ALLEY IN BLOCK 20, PRODUCED SOUTH;
THENCE NORTH 38°17'00 WEST A DISTANCE OF 17.20 FEET;
THENCE NORTH 1°45'59 EAST A DISTANCE OF 210.73 FEET MORE OR LESS TO THE SOUTH LINE OF BLOCK 20 OF SAID PLAT;
THENCE SOUTH 88°06'17 EAST ALONG SAID SOUTH LINE 11.46 FEET TO THE POINT OF BEGINNING.

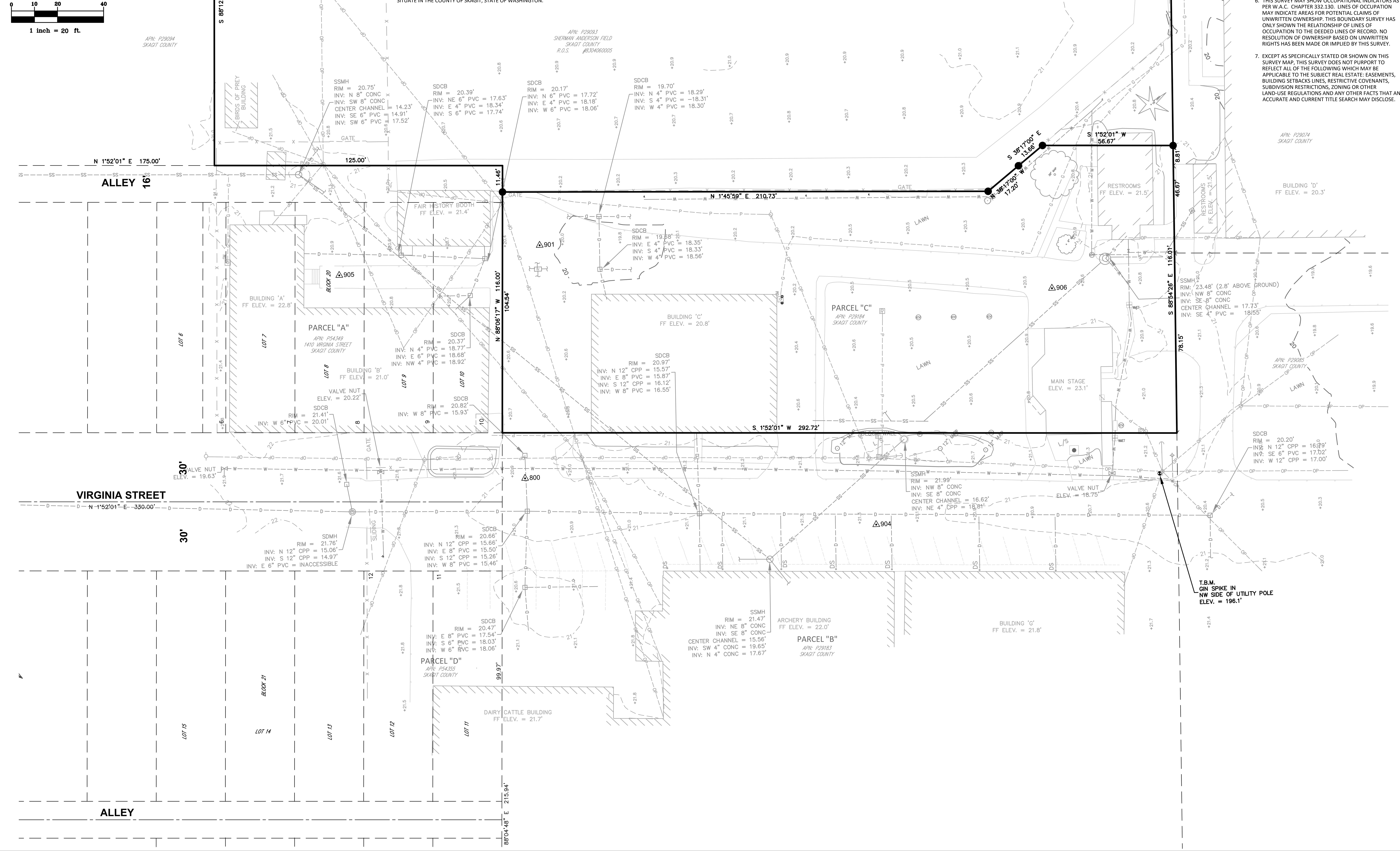
SITUATE IN THE COUNTY OF SKAGIT, STATE OF WASHINGTON.

SURVEYOR'S NOTES: (JEPSON)

1. THIS TOPOGRAPHIC SURVEY WAS PERFORMED IN NOVEMBER OF 2023. ALL MONUMENTS SHOWN HEREON WERE VISITED DURING THE COURSE OF THIS SURVEY, UNLESS OTHERWISE NOTED.
3. ANGULAR AND LINEAR MEASUREMENTS WERE MADE USING A COMBINATION OF CONVENTIONAL AND GNSS METHODS. PRIMARY CONTROL AND TOPOGRAPHIC DATA WERE OBSERVED USING A SURVEY GRADE CARLSON BRx7 GPS RECEIVERS ON WSRN NETWORK AND A GEOMAX CR2+ 2 SECOND ROBOTIC TOTAL STATION CALIBRATED WITHIN THE LAST YEAR. SUPPLEMENTAL TOPOGRAPHIC DATA WAS COLLECTED WITH A TRIMBLE X7 TERRESTRIAL SCANNER.
4. PROCEDURES USED IN THIS SURVEY MEET OR EXCEED STANDARDS SET FORTH BY WAC 332-130-090.
5. THIS SURVEY WAS COMPLETED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT AND DOES NOT PURPORT TO SHOW ANY OR ALL EASEMENTS THAT A CURRENT TITLE REPORT MIGHT REVEAL.
6. THE PURPOSE OF THIS TOPOGRAPHIC SURVEY IS TO PROVIDE AN EXISTING CONDITIONS BASE MAP FOR CIVIL ENGINEERING DESIGN OR PLANNING.
7. BASIS OF ELEVATIONS: ELEVATION VALUES AND CONTOURS DEPICTED ARE BASED UPON PRIMARY BENCHMARK REFERENCED IN CONTROL NOTES HEREON.
8. SOURCE OF CONTOURS: THE CONTOURS DEPICTED ARE GENERATED FROM DIRECT OBSERVATIONS IN THE FIELD AND ARE DEPICTED AT 1-FOOT INTERVALS.
9. ELEVATION AND/OR CONTOURS ACCURACY: THIS SURVEY COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS.
10. SOURCE OF DEPICTED UTILITY INFORMATION: UNDERGROUND UTILITIES DEPICTED ARE BASED UPON FIELD MEASUREMENTS OF ABOVE GROUND APPURTENANCES AND PAINT MARKS BY APS LOCATES INC..

SURVEYOR'S NOTES: (SEMRAU)

1. THE DESCRIPTIONS FOR THIS SURVEY IS FROM STATUTORY QUIT CLAIM DEED AND STATUTORY WARRANTY DEED RECORDED UNDER AUDITOR'S FILE NOS. 332392 AND 539341, RECORDS OF SKAGIT COUNTY, WASHINGTON, PROVIDED IN SUBDIVISION GUARANTEE ORDER NUMBER 213910-LT PREPARED BY LAND TITLE AND ESCROW COMPANY AND FIRST AMERICAN TITLE INSURANCE COMPANY.
2. BASIS OF BEARING: WASHINGTON PLANE COORDINATE SYSTEM, NORTH ZONE NO. 4601, NAD 83/2009, FROM REAL TIME KINEMATIC GPS OBSERVATIONS ON AUGUST 31, 2020. EXISTING MONUMENTS FOUND IN HAZEL STREET AT THE INTERSECTIONS OF VIRGINIA STREET AND CLEVELAND STREET, BEARING: S 88°06'17" E.
3. ALL DISTANCES ARE GROUND AND SHOWN IN FEET.
4. INSTRUMENTATION: LEICA MS50 THEODOLITE DISTANCE METER.
5. SURVEY PROCEDURE: STANDARD FIELD TRAVERSE.
6. THIS SURVEY MAY SHOW OCCUPATIONAL INDICATORS AS PER W.A.C. CHAPTER 332.130. LINES OF OCCUPATION MAY INDICATE AREAS FOR POTENTIAL CLAIMS OF UNWRITTEN OWNERSHIP. THIS BOUNDARY SURVEY HAS ONLY SHOWN THE RELATIONSHIP OF LINES OF OCCUPATION TO THE DEEDED LINES OF RECORD. NO RESOLUTION OF OWNERSHIP BASED ON UNWRITTEN RIGHTS HAS BEEN MADE OR IMPLIED BY THIS SURVEY.
7. EXCEPT AS SPECIFICALLY STATED OR SHOWN ON THIS SURVEY MAP, THIS SURVEY DOES NOT PURPORT TO REFLECT ALL OF THE FOLLOWING WHICH MAY BE APPLICABLE TO THE SUBJECT REAL ESTATE: EASEMENTS, BUILDING SETBACKS LINES, RESTRICTIVE COVENANTS, SUBDIVISION RESTRICTIONS, ZONING OR OTHER LAND-USE REGULATIONS AND ANY OTHER FACTS THAT AN ACCURATE AND CURRENT TITLE SEARCH MAY DISCLOSE.



CLIENT:
SKAGIT COUNTY PARKS & RECREATION
1730 CONTINENTAL PLACE
MOUNT VERNON, WA 98273

CALL BEFORE YOU DIG FOR BURIED UTILITY LOCATIONS 1-800-424-5555

PROJECT LOCATION:
SKAGIT COUNTY FAIRGROUNDS RESTROOM REPLACEMENT
VIRGINIA STREET & 2700 MARTIN RD
MOUNT VERNON, WA 98273

DRAWING #: 23057SP8.DWG	DRAWN BY: MPM
DESIGNED BY: MPM	CHECKED BY: MDB

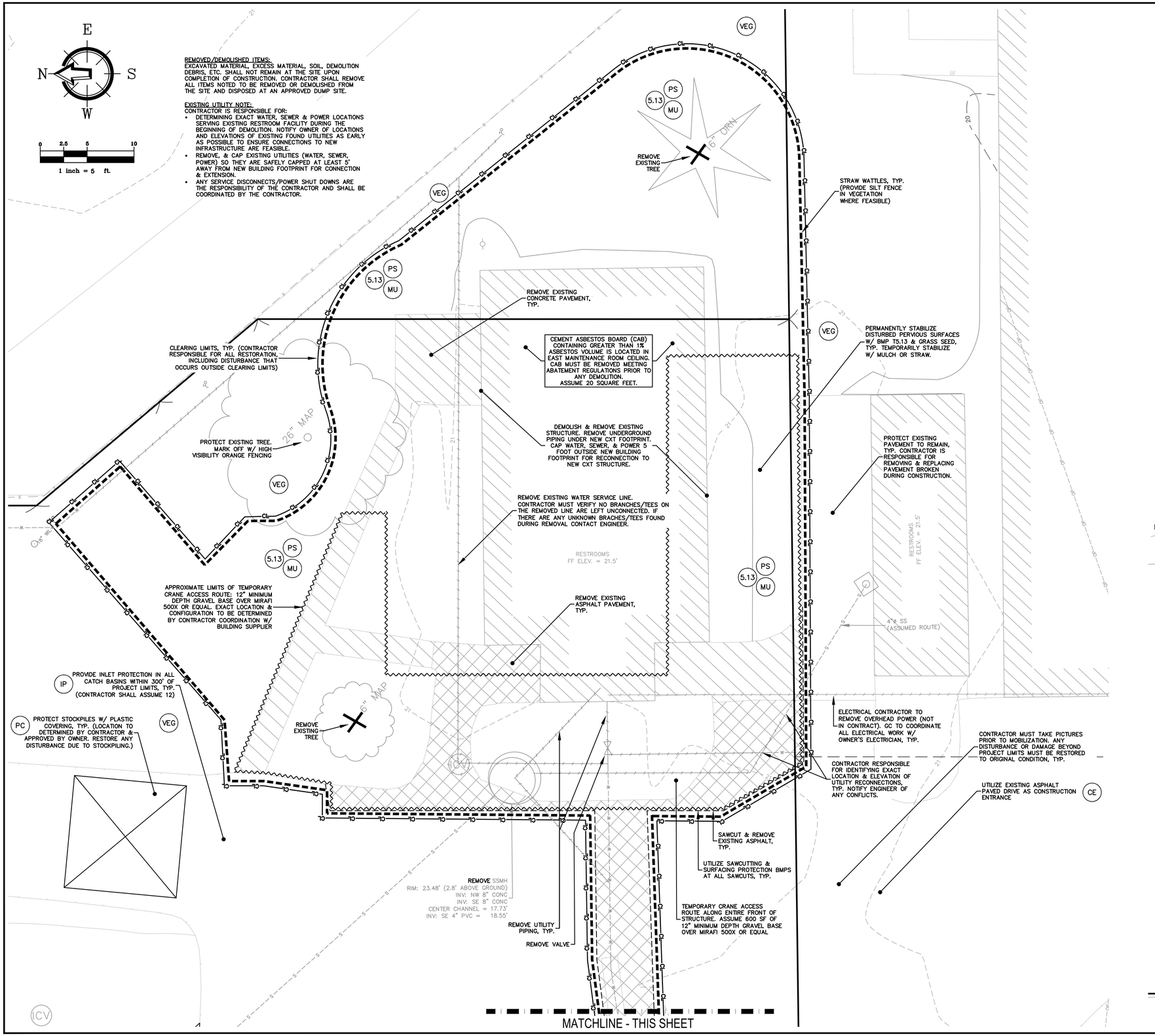
REV:	DATE:	DESCRIPTION:	BY:

SHEET CONTENTS:
EXISTING CONDITIONS

MILES PATRICK MCEATHRON
STATE OF WASHINGTON
49494
REGISTERED PROFESSIONAL ENGINEER
03/17/2025

JOB #: 23057
DATE: 03-17-2025
SHEET: C2

2500 Elm Street, Suite 1
Bellingham, WA 98225
t: 360.650.1408
f: 360.650.1401
FREELAND & ASSOCIATES



TESC LEGEND

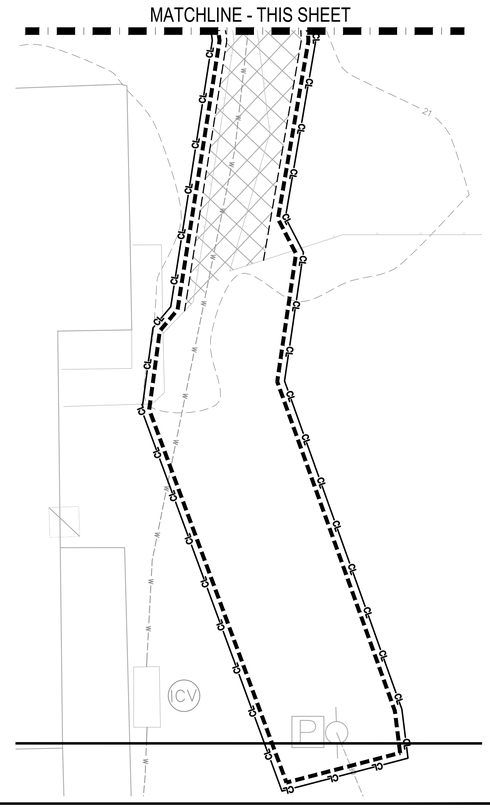
- VEG — WSDOE BMP C101 PRESERVING NATURAL VEGETATION
- CE — WSDOE BMP C105 STABILIZED CONSTRUCTION EXIT
- PK — WSDOE BMP C107 PARKING AREA STABILIZATION
- PS — WSDOE BMP C120 TEMPORARY AND PERMANENT SEEDING
- MU — WSDOE BMP C121 MULCHING
- PC — WSDOE BMP C123 PLASTIC COVERING (C / C7)
- 5.13 — WSDOE BMP T5.13 SOIL AMENDMENT (B / C7)
- IP — WSDOE BMP C220 STORM DRAIN INLET PROTECTION
- CL — CL — WSDOE BMP C103 OR BMP C104 CLEARING LIMITS
- SAWCUT LINE
- STRAW WATTLE

CONSTRUCTION SCHEDULING NOTE

1. CONTRACTOR SHALL MONITOR WEATHER CONDITIONS AND FORECASTS DURING CONSTRUCTION. THE AMOUNT OF SOIL THAT MAY BE EXPOSED AT ANY TIME DEPENDS ON THE CONTRACTOR'S AVAILABLE CREW, MATERIALS, AND EQUIPMENT. CONTRACTOR SHALL SCHEDULE WORK SO THAT ALL EXPOSED SOIL (INCLUDING TRENCHES AND STOCKPILES) CAN BE COMPLETELY COVERED AND STABILIZED PRIOR TO ANY SIGNIFICANT RAINFALL EVENT ON SITE.
2. THIS TEMPORARY EROSION AND SEDIMENT CONTROL PLAN IS THE CONSIDERED THE MINIMUM TO SUCCESSFULLY MAINTAIN THE SITE DURING IDEAL CONDITIONS. IT IS THE CONTRACTOR AND CESCL'S RESPONSIBILITY TO AMEND THIS PLAN AS NECESSARY TO ENSURE COMPLIANCE WITH COUNTY AND STATE REQUIREMENTS. THIS INCLUDES, BUT IT NOT LIMITED TO, ADDITION OF SETTLING PONDS, BAKER TANKS, ETC.

TESC CONTRACTOR RESPONSIBILITY

1. TEMPORARY EROSION CONTROL BMPs SHOWN IN THESE PLANS ARE THE MINIMUM NECESSARY FOR PERMIT APPROVALS. ADDITIONAL BMPs MAY BE REQUIRED DURING THE COURSE OF CONSTRUCTION. NO ADDITIONAL COMPENSATION WILL BE PROVIDED FOR ADDITIONAL BMPs OR BMP MAINTENANCE THAT MAY BE REQUIRED DURING CONSTRUCTION.
2. THE CONTRACTOR SHALL COMPLY WITH ALL REQUIREMENTS IN THE CITY PERMIT. NO ADDITIONAL COMPENSATION WILL BE MADE FOR BMP MAINTENANCE OR REPAIRS THAT RESULT FROM COMPLIANCE WITH THE PERMITS. LIKEWISE, ANY ADDITIONAL BMPs THAT MAY BE REQUIRED FOR COMPLIANCE DURING CONSTRUCTION SHALL BE IMPLEMENTED AT THE CONTRACTOR'S EXPENSE.



2500 Elm Street, Suite 1
Bellingham, WA 98225
t: 360.650.1408
f: 360.650.1401
FREELAND & ASSOCIATES

REV:	DATE:	DESCRIPTION:	BY:

CLIENT: SKAGIT COUNTY PARKS & RECREATION
1730 CONTINENTAL PLACE
MOUNT VERNON, WA 98273

CALL BEFORE YOU DIG FOR BURIED UTILITY LOCATIONS 1-800-424-5555

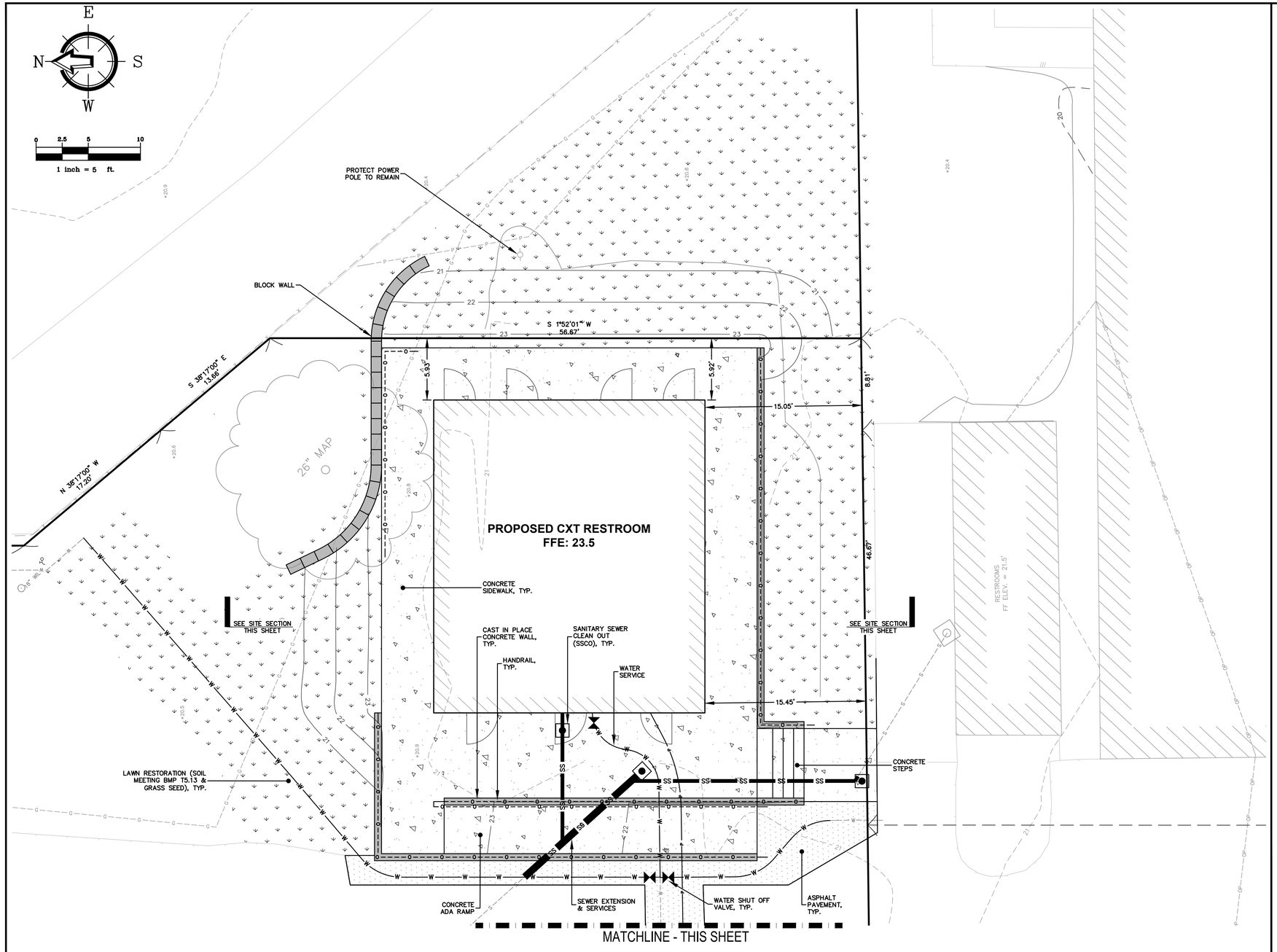
PROJECT LOCATION: SKAGIT COUNTY FAIRGROUNDS RESTROOM REPLACEMENT
VIRGINIA STREET & 2700 MARTIN RD
MOUNT VERNON, WA 98273

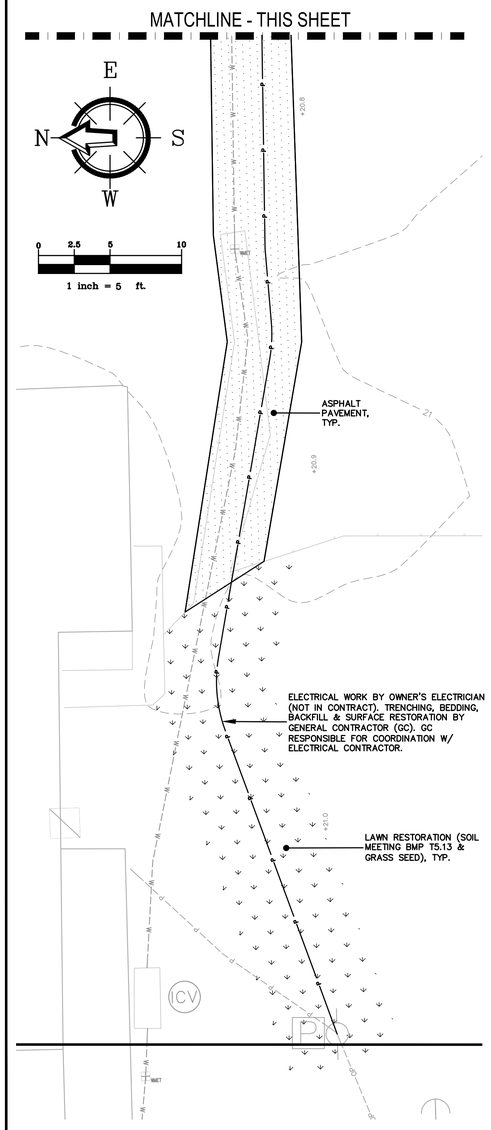
DRAWING #: 23057SP&D.DWG
DRAWN BY: MPM
CHECKED BY: MDB
DESIGNED BY: MPM

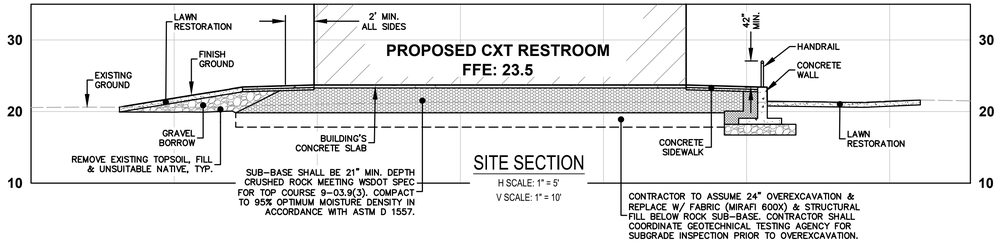
SHEET CONTENTS: DEMOLITION & EROSION CONTROL PLAN

MILES PATRICK MCCAMMON — STATE OF WASHINGTON — 49494 — REGISTERED PROFESSIONAL ENGINEER — 03/17/2025

JOB #: 23057
DATE: 03-17-2025
SHEET: C3







SITE SECTION

H SCALE: 1" = 5'

V SCALE: 1" = 10'

2500 Elm Street, Suite 1
Bellingham, WA 98225
t: 360.650.1408
f: 360.650.1401
FREELAND & ASSOCIATES

REV:	DATE:	DESCRIPTION:	BY:

CLIENT:
SKAGIT COUNTY PARKS & RECREATION
1730 CONTINENTAL PLACE
MOUNT VERNON, WA 98273

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RESTROOM REPLACEMENT
VIRGINIA STREET & 2700 MARTIN RD
MOUNT VERNON, WA 98273

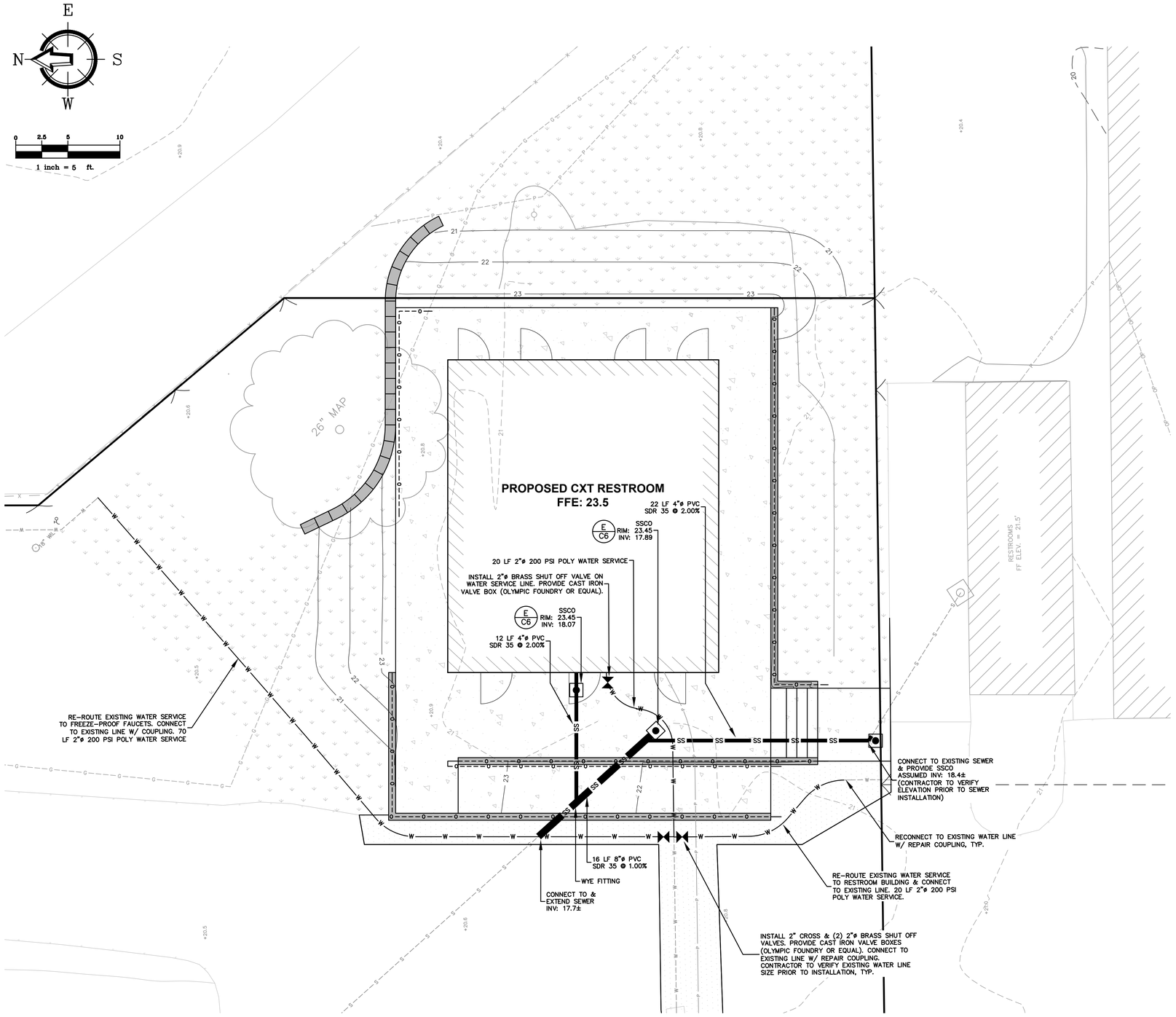
DRAWING #: 23057SP&D.DWG
DRAWN BY: MPM
CHECKED BY: MDB
DESIGNED BY: MPM

SHEET CONTENTS:
SITE PLAN

JAMES PATRICK MCCAMMON
STATE OF WASHINGTON
49494
REGISTERED PROFESSIONAL ENGINEER
04/17/2025

JOB #: 23057
DATE: 03-17-2025

SHEET:
C4



2500 Elm Street, Suite 1
Bellingham, WA 98225
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FREELAND & ASSOCIATES

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SKAGIT COUNTY PARKS & RECREATION
1730 CONTINENTAL PLACE
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VIRGINIA STREET & 2700 MARTIN RD
MOUNT VERNON, WA 98273

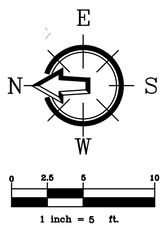
DRAWING #: 23057SPSD.DWG
DRAWN BY: MPM
CHECKED BY: MDB
DESIGNED BY: MPM

SHEET CONTENTS:
WATER & SEWER PLAN

JAMES PATRICK MCFARLAND
STATE OF WASHINGTON
49494
REGISTERED PROFESSIONAL ENGINEER
03/17/2025

JOB #: 23057
DATE: 03-17-2025

SHEET:
C5



PROPOSED UTILITY NOTE:
CONTRACTOR IS RESPONSIBLE FOR:

- CONNECT TO EXISTING UTILITIES & EXTEND SERVICE TO APPROPRIATE STUB UP LOCATION (WATER & SEWER). CONTRACTOR IS RESPONSIBLE FOR REFERRING TO CXT DRAWINGS & PROVIDING ALL WORK NOT PERFORMED BY BUILDING SUPPLIER (INCLUDING BUT NOT LIMITED TO FLOOR DRAINS, WASTE LINES, VENT PIPING, SHUT OFF VALVES, WATER SERVICE LINE, ETC.)
- CONTRACTOR SHALL PERFORM FINAL UTILITY HOOKUPS & COORDINATION W/ CXT.
- ELECTRICAL WORK IS NOT IN CONTRACT AS NOTED ON PLAN. ELECTRICAL STUB UPS AND FINAL HOOKUP NOT IN CONTRACT, BUT MUST BE COORDINATED BY GENERAL CONTRACTOR (GC) WITH ELECTRICAL CONTRACTOR. GC TO COORDINATE ANY SERVICE DISCONNECTS/POWER SHUT DOWNS WITH ELECTRICAL CONTRACTOR. ELECTRICAL CONTRACTOR RESPONSIBLE FOR L&I PERMIT & INSPECTIONS. GC RESPONSIBLE FOR ENSURING ELECTRICAL CONTRACTOR HAS PERMITS & INSPECTIONS.

CXT RESTROOM NOTE:
SKAGIT COUNTY PARKS & RECREATION HAS PURCHASED THE CXT STRUCTURE AND DELIVERY. CONTRACTOR SHALL COORDINATE W/ SUPPLIER FOR DELIVERY.

HANDRAIL NOTE:
ALL HANDRAILS TO INCLUDE FALL PROTECTION (3"ø @ 4.5" O.C.) EXCEPT HANDRAIL ON EAST SIDE IN ADA RAMP.

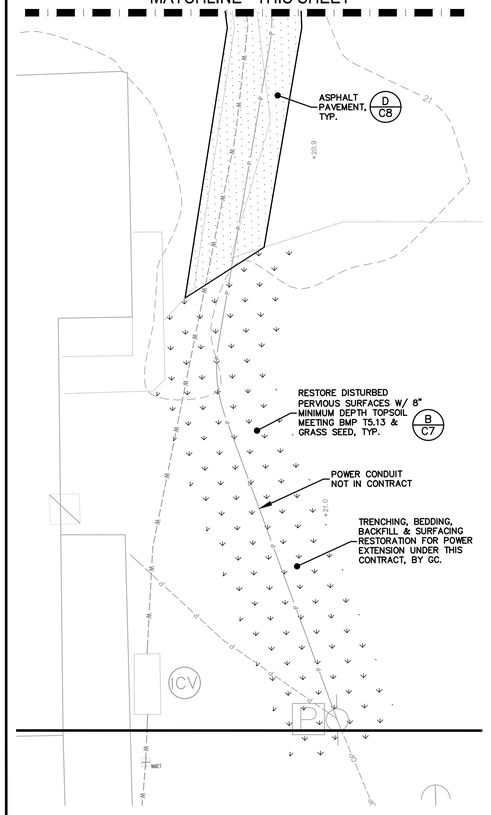
GENERAL REQUIREMENTS

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING SUB-SURFACE CONDITIONS AND SOIL TYPE DISCREPANCIES THAT CONTRADICT THE PLANS.
2. THE CONTRACTOR SHALL LAY OUT AND SET ANY CONSTRUCTION STAKES AND MARKS NEEDED TO ESTABLISH THE LINES, GRADES, SLOPES OR CROSS-SECTIONS AS SHOWN ON THE PLANS OR AS STAKED BY THE ENGINEER.
3. THROUGHOUT THE WORK, THE CONTRACTOR SHALL COMPLY WITH ALL PERMITS.
4. THE CONTRACTOR SHALL PROTECT ALL PRIVATE AND PUBLIC UTILITIES FROM DAMAGE RESULTING FROM THE WORK.
5. WHEN THE CONTRACTOR CONSIDERS THE WORK PHYSICALLY COMPLETE AND READY FOR FINAL INSPECTION, THE CONTRACTOR SHALL REQUEST THAT CITY INSPECTOR SCHEDULE A FINAL INSPECTION. THE INSPECTOR WILL MAKE A FINAL INSPECTION AND NOTIFY THE CONTRACTOR IN WRITING OF ALL PARTICULARS IN WHICH THE FINAL INSPECTION REVEALS THE WORK INCOMPLETE OR UNACCEPTABLE. THE CONTRACTOR SHALL IMMEDIATELY TAKE SUCH CORRECTIVE MEASURES AS ARE NECESSARY TO REMEDY THE LISTED DEFICIENCIES.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23-PUBLIC CONVENIENCE AND SAFETY, SHALL APPLY.
7. ALL WORK SHALL BE INSPECTED BY A REPRESENTATIVE OF CITY OF MOUNT VERNON, AND 24 HOURS NOTICE SHALL BE GIVEN PRIOR TO STARTING WORK OR TO SCHEDULE INSPECTIONS.
8. REDLINE AS-BUILT PLAN NOTING ANY CHANGES FROM THE PLANS SHALL BE PREPARED BY THE CONTRACTOR AND PROVIDED TO THE ENGINEER FOLLOWING COMPLETION OF CONSTRUCTION.

TESTING REQUIREMENTS

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ALL TESTING W/ SKAGIT COUNTY PARKS REPRESENTATIVE. TESTING AGENCY WILL BE UNDER CONTRACT W/ SKAGIT COUNTY PARKS. TESTING MUST MEET ALL CITY AND WSDOT STANDARDS.
2. GEOTECHNICAL TESTING CONSULTANT MUST OBSERVE NATIVE SUBGRADE CONDITION AT BASE OF ALL EXCAVATIONS INCLUDING PAVEMENT, RETAINING WALLS, UTILITY TRENCHES AND BUILDING.
3. PROJECT DOCUMENTS ASSUME 18" OVEREXCAVATION, FABRIC, AND REPLACEMENT W/ GRAVEL BORROW UNDER RETAINING WALLS, STAIR BASE, AND UTILITY TRENCHES. 24" OVEREXCAVATION ASSUMED UNDER NEW BUILDING.
4. PRIOR TO OVEREXCAVATION, TESTING AGENCY MUST OBSERVE SOIL CONDITION.
5. SLUMP SAMPLES SHALL BE TAKEN BY THE CONTRACTOR FROM EACH BATCH OR READY-MIX TRUCK LOAD AS SOON AS POSSIBLE AFTER MIXING AND SHALL BE TESTED UNDER DIRECTION OF THE OWNER'S TESTING AGENCY IN ACCORDANCE WITH ASTM C-143. CONCRETE NOT PASSING SLUMP TEST SHALL BE REMOVED FROM SITE.
6. CONTRACTOR SHALL TAKE ONE SAMPLE FROM EACH 50 CUBIC YARDS OF PLACED CONCRETE FOR COMPRESSIVE TESTING IN ACCORDANCE WITH ASTM C31 AND C39. COMPRESSIVE TESTS WILL BE PERFORMED BY OWNER'S TESTING AGENCY. CONCRETE THAT FAILS THE COMPRESSIVE TEST SHALL BE REMOVED FROM THE SITE.

MATCHLINE - THIS SHEET



2500 Elm Street, Suite 1
Bellingham, WA 98225
t: 360.650.1408
f: 360.650.1401
FREELAND & ASSOCIATES

REV:	DATE:	DESCRIPTION:	BY:

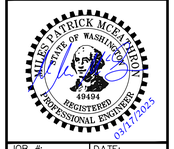
CLIENT:
SKAGIT COUNTY PARKS & RECREATION
1730 CONTINENTAL PLACE
MOUNT VERNON, WA 98273

CALL BEFORE YOU DIG
FOR BURIED UTILITY LOCATIONS
1-800-424-5555

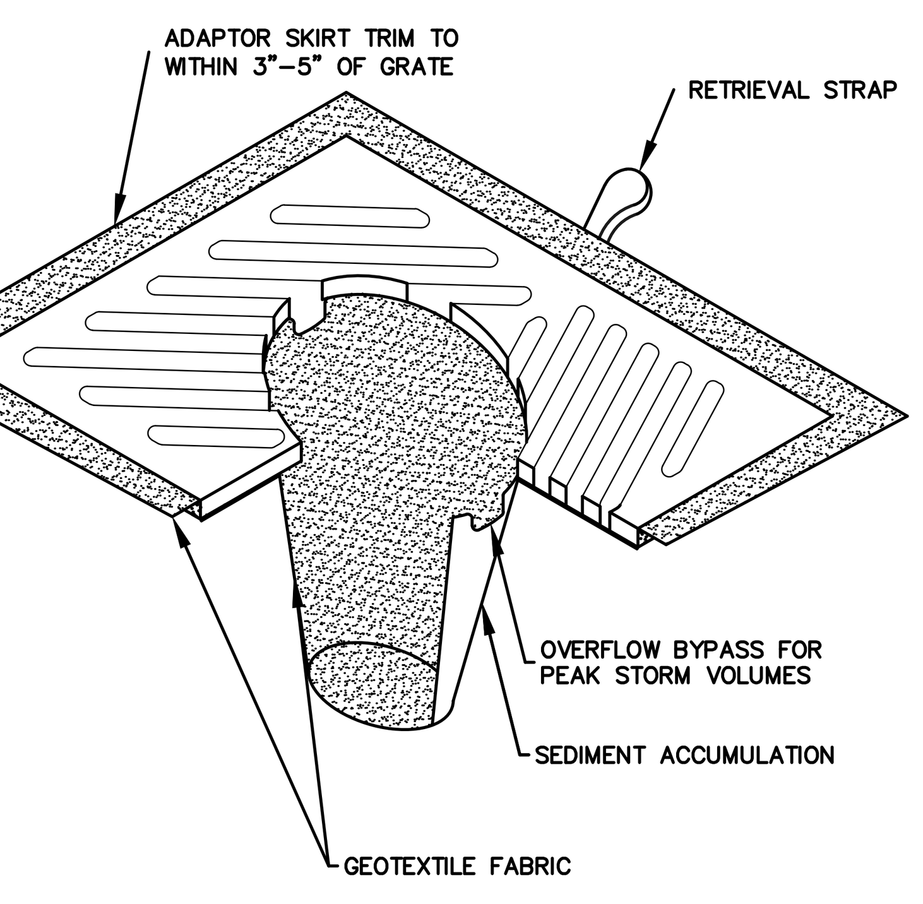
PROJECT LOCATION:
SKAGIT COUNTY FAIRGROUNDS
RESTROOM REPLACEMENT
VIRGINIA STREET & 2700 MARTIN RD
MOUNT VERNON, WA 98273

DRAWING #: 23057SP8.DWG
DRAWN BY: MPM
CHECKED BY: MDB
DESIGNED BY: MPM

SHEET CONTENTS:
GRADING & PAVING PLAN



JOB #: 23057
DATE: 03-17-2025
SHEET: C6



NOTES:

1. INSERT SHALL BE INSTALLED PRIOR TO CLEARING AND GRADING ACTIVITY, OR UPON PLACEMENT OF A NEW CATCH BASIN.
2. SEDIMENT SHALL BE REMOVED FROM THE UNIT WHEN IT BECOMES HALF FULL .
3. SEDIMENT REMOVAL SHALL BE ACCOMPLISHED BY REMOVING THE INSERT, EMPTYING, AND RE-INSERTING IT INTO THE CATCH BASIN.

(A) INLET PROTECTION
nts

1. CONTRACTOR SHALL BE RESPONSIBLE FOR FAMILIARITY WITH ALL UNDERGROUND UTILITIES, PIPES AND STRUCTURES. CONTRACTOR SHALL TAKE SOLE RESPONSIBILITY FOR ANY COST INCURRED DUE TO DAMAGE OF SAID UTILITIES. VERIFY ALL UTILITY LOCATIONS, PADS, AND APPURTENANCES PRIOR TO SUBGRADE PREPARATION ACTIVITIES. DO NOT BLOCK ACCESS TO UTILITY STRUCTURES. IDENTIFY DISCREPANCIES IMMEDIATELY TO OWNER.
2. ESTABLISH SUB-GRADE ELEVATIONS THAT WILL ACCOMMODATE FULL SOIL DEPTHS AS SPECIFIED IN BMP T5.13, ACCOMMODATE DEPTHS TO ALLOW FOR COMPOST ADDED FOR SUBGRADE PREPARATION AND SUBGRADE OPERATIONS.
3. SUB-GRADE PREPARATION FOR SEEDED AREAS SHALL BE AS FOLLOWS:
   - RIP/LOOSEN SUB-GRADE TO A DEPTH OF 4".
   - REMOVE COBBLES, ROCKS, CONCRETE, ASPHALT AND OTHER DEBRIS OVER 1/2" IN DIAMETER.
   - INCORPORATE/TILL FIRST LIFT OF TOPSOIL "A", OR SOIL AMENDMENT MEDIUM (ORGANIC COMPOST) INTO THE SUB-GRADE. TILLING THE COMPOST INTO THE SOIL SHALL BE ACCOMPLISHED BY TILLING IT TWICE, THE SECOND TIME PERPENDICULAR TO THE FIRST.
4. TOPSOIL SHALL BE PLACED IN TWO EQUAL LIFTS. THE FIRST LIFT SHALL BE INCORPORATED/ROTOTILLED INTO PREPARED SUBGRADE TO A MINIMUM 4" DEPTH. ALL AREAS SHALL BE FINAL GRADED TO AVOID HIGH OR LOW SPOTS, AND PROVIDE POSITIVE DRAINAGE.
5. TOPSOIL "A" (IMPORTED TOPSOIL) SHALL BE APPLIED IN LANDSCAPE AREAS. TOPSOIL "C"/AMENDED SOIL AREAS CONSIST OF LANDSCAPE/GRASS AREAS WHERE CONSTRUCTION ACTIVITIES CAUSED DISTURBANCE TO SOIL AND RESTORATION OF GRASS AND TOPSOIL IS REQUIRED.
6. FINISH GRADE OF TURF SHALL BE 1" BELOW FINISHED SURFACE OF ADJACENT WALK OR PAVED AREAS TO ENSURE POSITIVE DRAINAGE INTO LANDSCAPE AREA. LAWN/GRASS AREAS NEAR PAVED/HARD SURFACES SHALL BE AT 1" BELOW ADJACENT SURFACES.
7. ALL AREAS OF BARE SOIL, OR AREAS IMPACTED BY VEHICULAR USE OF ANY KIND, OR STORAGE OF MATERIALS INSIDE AND OUTSIDE OF THE CLEARING LIMITS SHALL RECEIVE FULL SUBGRADE PREPARATION, INCLUDING COMPOST AMENDMENTS AND SHALL BE RE-ESTABLISHED TO FINISH GRADE, PRE-EXISTING CONDITION AND SHALL BE AT CONTRACTOR'S COST.
8. ESTABLISHMENT/MAINTENANCE PROCEDURES SHALL INCLUDE WATERING, PROTECTION FROM INSECTS OR DISEASE, WEEDING, PRUNING, MOWING, AND OTHER ACTIVITIES AS MAY BE REQUIRED.
9. STANDARD COMMERCIAL GRADE FERTILIZERS AND HERBICIDES SHALL NOT BE APPLIED UNLESS THE CONTRACTOR HAS DEEMED IT NECESSARY TO PROMOTE HEALTHY AND SUSTAINABLE GROWTH. THE CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FROM THE OWNER BEFORE APPLYING FERTILIZERS AND HERBICIDES.
10. IRRIGATION SHALL BE ACHIEVED BY TRUCKED IN WATER. THE WATERING SYSTEM SHALL DELIVER UNIFORM DISTRIBUTION OF ADEQUATE WATER TO ESTABLISH ALL GRASS.
11. DISTURBED LAWN AREAS SHALL BE RE-VEGETATED AS GRASS/LAWN. WATER AS NECESSARY TO GERMINATE AND ESTABLISH ROOTS. FENCE OR TAPE-OFF LAWN AREAS TO PREVENT FOOT TRAFFIC FROM ENTERING THE SEEDED AREAS. THE FENCE OR SIMILAR BARRIER SHALL BE REMOVED AFTER LAWN ESTABLISHMENT AT OWNER'S DIRECTION.
12. UPON PROJECT CLOSE-OUT, THE OWNER WILL TAKE OVER MAINTENANCE RESPONSIBILITY OF THE LAWN AREAS. UNTIL THAT POINT, THE CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE SUCH AS PROTECTION FROM FOOT AND VEHICLE TRAFFIC, AND WATERING.

BMP T5.13 GENERAL NOTES

ESTABLISHING A MINIMUM SOIL QUALITY AND DEPTH IS NOT THE SAME AS PRESERVATION OF NATURALLY OCCURRING SOIL AND VEGETATION. HOWEVER, ESTABLISHING A MINIMUM SOIL QUALITY AND DEPTH WILL PROVIDE IMPROVED ON-SITE MANAGEMENT OF STORMWATER FLOW AND WATER QUALITY. SOIL ORGANIC MATTER CAN BE ATTAINED THROUGH NUMEROUS MATERIALS SUCH AS COMPOST, COMPOSTED WOODY MATERIAL, BIOSOLIDS, AND FOREST PRODUCT RESIDUALS. IT IS IMPORTANT THAT THE MATERIALS USED TO MEET THE SOIL QUALITY AND DEPTH BMP BE APPROPRIATE AND BENEFICIAL TO THE PLANT COVER TO BE ESTABLISHED. LIKEWISE, IT IS IMPORTANT THAT IMPORTED TOPSOILS IMPROVE SOIL CONDITIONS AND DO NOT HAVE AN EXCESSIVE PERCENT OF CLAY FINES. THIS BMP CAN BE CONSIDERED INFEASIBLE ON TILL SOIL SLOPES GREATER THAN 33 PERCENT.

DESIGN GUIDELINES

SOIL RETENTION: RETAIN, IN AN UNDISTURBED STATE, THE DUFF LAYER AND NATIVE TOPSOIL TO THE MAXIMUM EXTENT PRACTICABLE. IN ANY AREAS REQUIRING GRADING REMOVE AND STOCKPILE THE DUFF LAYER AND TOPSOIL ON SITE IN A DESIGNATED, CONTROLLED AREA, NOT ADJACENT TO PUBLIC RESOURCES AND CRITICAL AREAS, TO BE REAPPLIED TO OTHER PORTIONS OF THE SITE WHERE FEASIBLE.

SOIL QUALITY: ALL AREAS SUBJECT TO CLEARING AND GRADING THAT HAVE NOT BEEN COVERED BY IMPERVIOUS SURFACE, INCORPORATED INTO A DRAINAGE FACILITY OR ENGINEERED AS STRUCTURAL FILL OR SLOPE SHALL, AT PROJECT COMPLETION, DEMONSTRATE THE FOLLOWING:

1. A TOPSOIL LAYER WITH A MINIMUM ORGANIC MATTER CONTENT OF 10% DRY WEIGHT IN PLANTING BEDS, AND 5% ORGANIC MATTER CONTENT IN TURF AREAS, AND A PH FROM 6.0 TO 8.0 OR MATCHING THE PH OF THE UNDISTURBED SOIL. THE TOPSOIL LAYER SHALL HAVE A MINIMUM DEPTH OF EIGHT INCHES EXCEPT WHERE TREE ROOTS LIMIT THE DEPTH OF INCORPORATION OF AMENDMENTS NEEDED TO MEET THE CRITERIA. SUBSOILS BELOW THE TOPSOIL LAYER SHOULD BE SCARIFIED AT LEAST 4 INCHES WITH SOME INCORPORATION OF THE UPPER MATERIAL TO AVOID STRATIFIED LAYERS, WHERE FEASIBLE.
2. MULCH PLANTING BEDS WITH 2 INCHES OF ORGANIC MATERIAL
3. USE COMPOST AND OTHER MATERIALS THAT MEET THESE ORGANIC CONTENT REQUIREMENTS:
   a. THE ORGANIC CONTENT FOR "PRE-APPROVED" AMENDMENT RATES CAN BE MET ONLY USING COMPOST MEETING THE COMPOST SPECIFICATION FOR BIORETENTION (BMP T7.30), WITH THE EXCEPTION THAT THE COMPOST MAY HAVE UP TO 35% BIOSOLIDS OR MANURE. THE COMPOST MUST ALSO HAVE AN ORGANIC MATTER CONTENT OF 40% TO 65%, AND A CARBON TO NITROGEN RATION BELOW 25:1. THE CARBON TO NITROGEN RATION MAY BE AS HIGH 35:1 FOR PLANTINGS COMPOSED ENTIRELY OF PLANTS NATIVE TO THE PUGET SOUND LOWLANDS REGION.
   b. CALCULATED AMENDMENT RATES MAY BE MET THROUGH USE OF COMPOSTED MATERIALS MEETING (A.) ABOVE; OR OTHER ORGANIC MATERIALS AMENDED TO MEET THE CARBON TO NITROGEN RATIO REQUIREMENTS, AND MEETING THE CONTAMINANT STANDARDS OF GRADE A COMPOST.

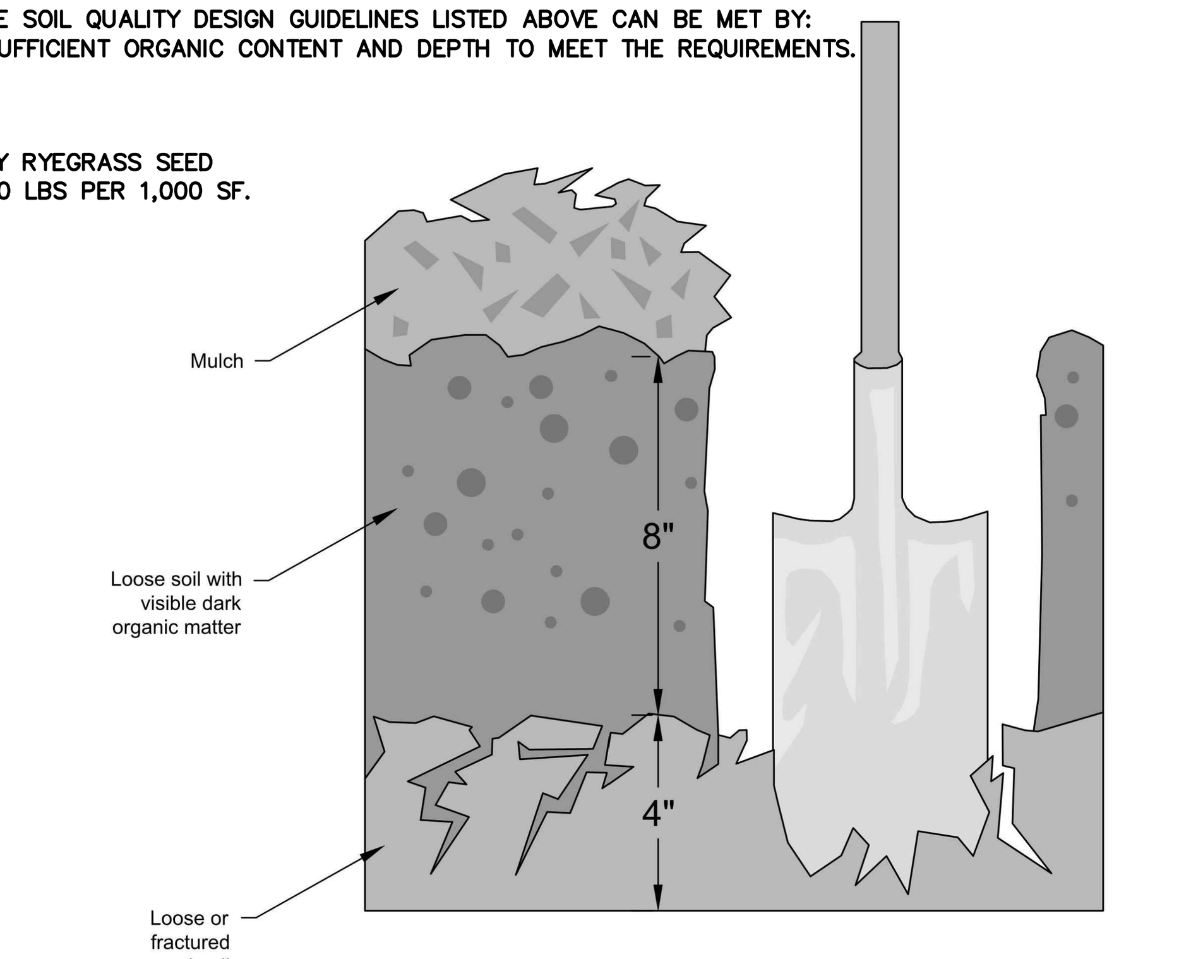
THE RESULTING SOIL SHOULD BE CONDUCIVE TO THE TYPE OF VEGETATION TO BE ESTABLISHED.

IMPLEMENTATION OPTIONS: THE SOIL QUALITY DESIGN GUIDELINES LISTED ABOVE CAN BE MET BY:

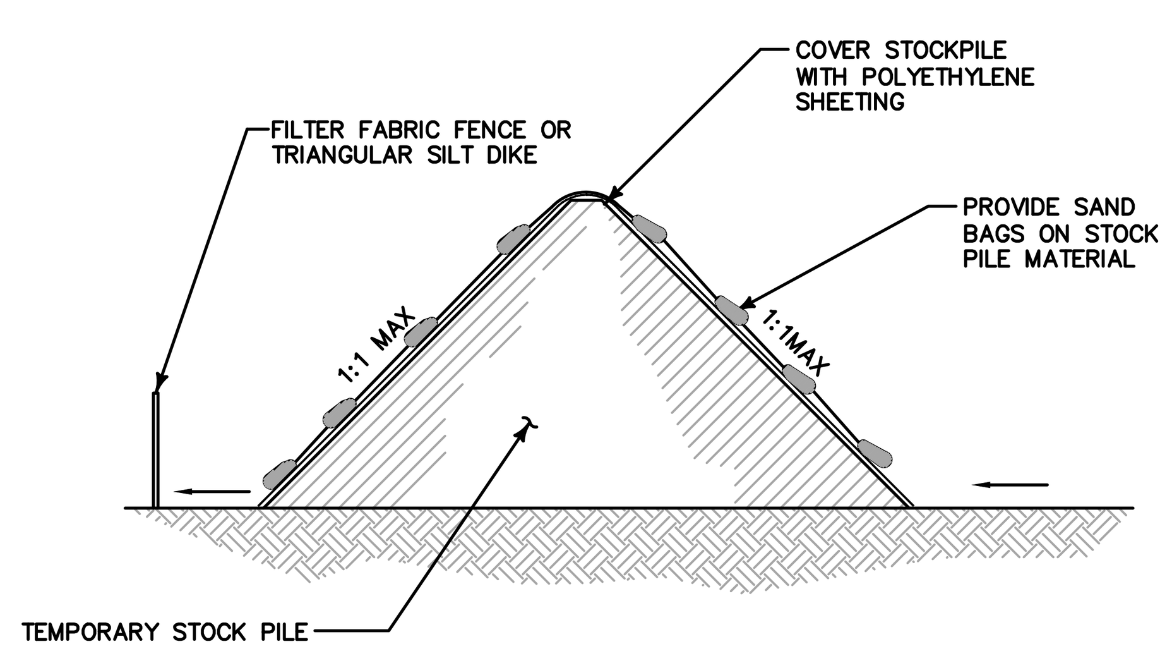
1. IMPORT TOPSOIL MIX OF SUFFICIENT ORGANIC CONTENT AND DEPTH TO MEET THE REQUIREMENTS.

GRASS SEED MIX

GRASS SEED SHALL BE 3-WAY RYEGRASS SEED MIX OR EQUAL W/ RATE OF 10 LBS PER 1,000 SF.



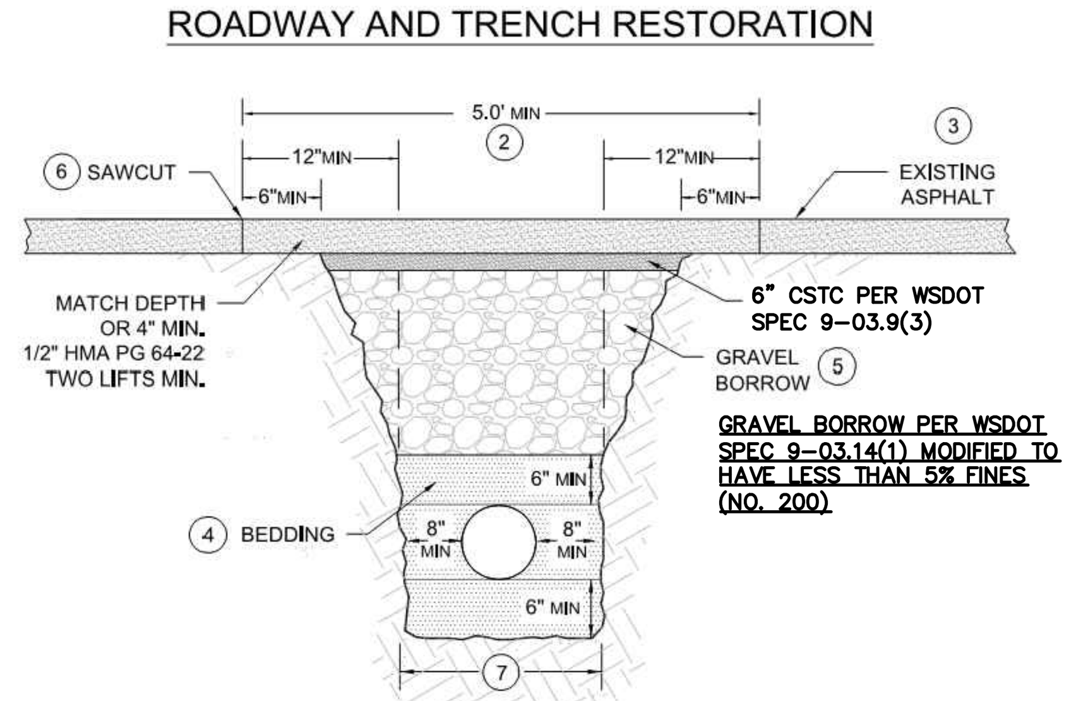
(B) LAWN RESTORATION (TOPSOIL & GRASS SEED MIX)



NOTES:
COMPACT STOCK PILE MATERIAL PER GEOTECHNICAL RECOMENDATIONS

(C) STOCKPILE PROTECTION
nts

ROADWAY AND TRENCH RESTORATION



NOTES:

1. ALL TRENCH CUTS AND REPAIR SHALL CONFORM WITH THE CITY OF MOUNT VERNON TRENCH RESTORATION AND STREET REPAIR STANDARDS.
2. THE RESTORATION WIDTH AS PER CITY ENGINEERING STANDARDS CHAPTER 3, SECTION 3-24. A MINIMUM OF 1 FOOT WIDER, ON EACH SIDE, THAN THE PROPOSED TRENCH. THE MINIMUM RESTORATION SHALL BE 5 FEET.
3. ASPHALT STRIP BETWEEN TRENCH RESTORATION AND EDGE OF EXISTING CURB AND GUTTER OR EDGE OF EXISTING PAVEMENT MAY BE REMOVED AND REPLACED WITH 1/2" HMA PG 64-22 OF EQUIVALENT DEPTH AT THE DIRECTION OF THE PUBLIC WORKS DIRECTOR.
4. GRANULAR MATERIAL 100% PASSING A 5/8" SCREEN, OR 5/8" CLEAR CRUSHED (NOT 5/8" MINUS) HAND COMPACTED. NO MORE THAN 3% BY WEIGHT PASSING A #200 SIEVE.
5. GRAVEL BORROW PLACED IN LOOSE LIFTS NOT EXCEEDING 8" IN DEPTH AND COMPACTED TO A MINIMUM OF 95% DENSITY. CONTROL DENSITY BACKFILL (CDF) MAY BE USED IN LIEU OF GRAVEL BORROW.
6. SAWCUT AND SEAL FINISHED JOINT WITH AR 4000.
7. TRENCH LIMITS PER SECTION 2-09.4 OF WSDOT STANDARD SPECIFICATIONS.
8. TRENCH REPAIR IN CONCRETE STREETS MAY DIFFER FROM THESE STANDARDS.
9. WIDTHS INDICATED ARE MINIMUMS. TRENCH RESTORATION WIDTHS SHALL BE INCREASED TO PROHIBIT CONSTRUCTING A PATCH WITHIN A PATCH. THIS MAY REQUIRE REMOVING AND RECONSTRUCTING EXISTING PATCHES THAT ARE ADJACENT TO OR CONTIGUOUS TO THE PROPOSED TRENCH. TRENCH RESTORATION WIDTHS SHALL ALSO BE INCREASED TO PREVENT THE CREATION OF ISOLATED SECTIONS OF PAVEMENT
10. TRENCH LIMITS AND STREET CUT RESTORATION WIDTH MAY BE REDUCED FOR UTILITY SIDE SERVICE LINE INSTALLATION AND REPAIR, WITH CITY APPROVAL.

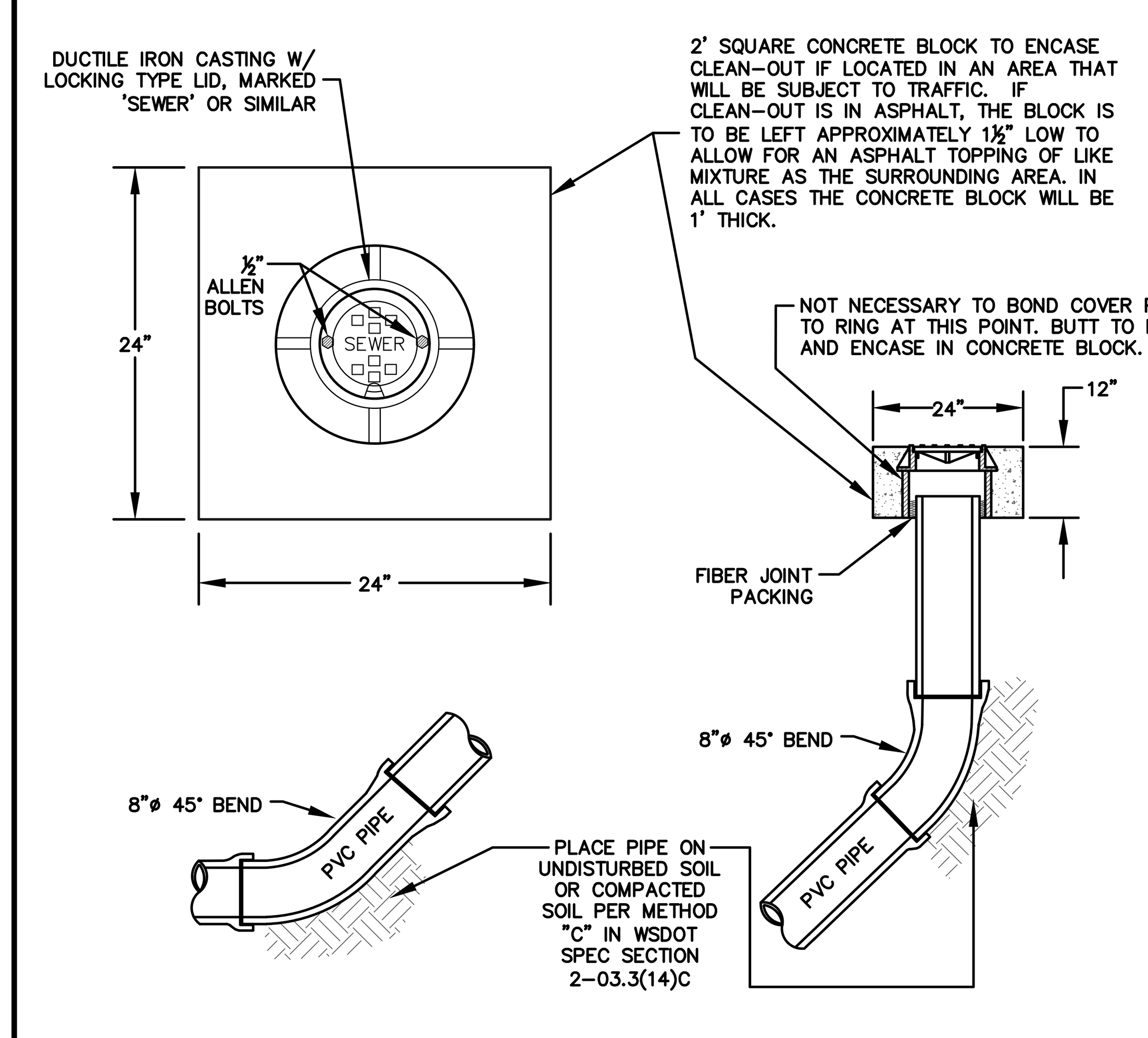
SUBGRADE & OVEREXCAVATION NOTE:

EXPOSED TRENCH SUBGRADE SHALL BE OBSERVED BY GEOTECHNICAL CONSULTANT PRIOR TO PLACEMENT OF UTILITY, BEDDING, OR STRUCTURAL FILL. WHERE FEASIBLE, COMPACT LOOSE SOILS TO A FIRM AND UNYIELDING CONDITION. WHERE COMPACTION OF SUBGRADE SOIL IS IMPRACTICAL, OVEREXCAVATE LOOSE OR OTHERWISE DISTURBED SOILS TO FIRM SOIL. IN AREAS WHERE MORE THAN 18 INCHES OF OVEREXCAVATION OCCURS WITHOUT ENCOUNTERING FIRM OR UNYIELDING SUBGRADE CONDITIONS, TERMINATE OVEREXCAVATION AND:

- PLACE GEOTEXTILE FABRIC (MIRAFI 500X OR EQUAL) ALONG TRENCH BOTTOM AND UP AGAINST TRENCH WALLS IN CONJUNCTION WITH STRUCTURAL FILL TO PROVIDE A FIRM WORKING SURFACE.

CONTRACTOR SHALL ASSUME OVEREXCAVATION, FABRIC AND REPLACEMENT W/ STRUCTURAL FILL IN ALL UTILITY TRENCHES FOR BIDDING PURPOSES.

(D) ROADWAY AND TRENCH RESTORATION
nts



NOTE:
PIPE SIZE VARIES – SEE SEWER PLANS FOR SPECIFIC SIZES

(E) CLEANOUT (SDCO/SSCO)
nts

SWPPP ELEMENT 1: MARK CLEARING LIMITS:

THE PROJECT SITE IS CONTAINED WITHIN A DEVELOPED COMPLEX. LIMITS OF DISTURBANCE ARE MARKED AS CLEARING LIMITS ON THE PLANS. EXISTING VEGETATION AND GRASS SHALL BE MAINTAINED IN AN UNDISTURBED STATE TO THE MAXIMUM EXTENT POSSIBLE. THERE ARE NO EXISTING TREES TO BE RETAINED OR REMOVED WITHIN THE PROJECT LIMITS. MARK LIMITS OF DISTURBANCE WITH HIGH VISIBILITY ORANGE SAFETY BARRIER FENCING.

SWPPP ELEMENT 2: ESTABLISH CONSTRUCTION ACCESS:

A STABILIZED CONSTRUCTION ENTRANCE SHALL BE INSTALLED AT LOCATIONS IDENTIFIED ON THE PLAN FOR ACCESS. ALL CONSTRUCTION TRAFFIC, SUCH AS PERSONAL VEHICLES, WORK TRUCKS, ETC. THAT WILL ROUTINELY LEAVE THE SITE SHALL REMAIN ON EXISTING PAVED SURFACES AS MUCH AS POSSIBLE. CONSTRUCTION PERSONNEL, VEHICLES, AND EQUIPMENT SHALL NOT BLOCK OR OBSTRUCT ACCESS IN THE PARKING LOT. CONSTRUCTION TRAFFIC MAY ONLY LEAVE THE EXISTING STABILIZED SURFACES IF NECESSARY FOR EQUIPMENT OR MATERIAL TRANSFERS AS LONG AS ALL DISTURBANCE IS REPAIRED TO ORIGINAL CONDITION. PAVED ROADS WILL BE CLEANED AT THE END OF EACH DAY AND SEDIMENT TRANSPORTED TO ROADS WILL BE SWEPT AND DISPOSED OF AT A CONTROLLED DISPOSAL AREA. BMPS CONSIDERED FOR THIS ELEMENT INCLUDE: HOUSEKEEPING/MAINTENANCE BMP: DAILY STREET SWEEPING AND BMP C105: STABILIZED CONSTRUCTION ENTRANCE.

SWPPP ELEMENT 3: CONTROL FLOW RATES:

THE PROPOSED PROJECT IS CONTAINED WITHIN A COMPLETELY DEVELOPED COMPLEX. CONSTRUCTION WILL BE LOCATED WITHIN AREAS THAT ARE ALREADY IMPERVIOUS. PEAK FLOWS DURING CONSTRUCTION ARE NOT EXPECTED TO EXCEED EXISTING FLOW RATES. THIS PROJECT DOES NOT REQUIRE STORMWATER DETENTION. NO ADDITIONAL DOWNSTREAM ANALYSIS IS NECESSARY SINCE THE PROJECT WILL REPLACE AN EXISTING DEVELOPMENT. PROPOSED FACILITIES WILL MIMIC EXISTING FLOWS FROM THE SITE. NO SEDIMENT LADEN WATER SHALL DISCHARGE TO THE DRAINAGE SYSTEM. NO STORMWATER INFILTRATION FACILITIES WILL BE INSTALLED AS A PART OF THIS PROJECT.

SWPPP ELEMENT 4: INSTALL SEDIMENT CONTROLS:

SEDIMENT CONTROLS WORK IN CONJUNCTION WITH BMPS IN ELEMENT #5: SOIL STABILIZATION TO RETAIN SEDIMENT ON SITE TO THE MAXIMUM AMOUNT PRACTICABLE. THE DUFF LAYER, NATIVE TOPSOIL, AND NATURAL VEGETATION OR GRASSES ON SITE SHALL BE RETAINED IN AN UNDISTURBED STATE TO THE MAXIMUM EXTENT PRACTICABLE. STRAW WATTLES SHALL BE INSTALLED ALONG THE DOWNSTREAM END OF THE WORK LIMITS. IF EXCAVATED MATERIAL OR FILL MATERIAL IS PLACED WITHIN THE PROJECT SITE SUCH THAT RUNOFF FROM THE MATERIAL WOULD FLOW OFF SITE, THEN SEDIMENT CONTROLS, SUCH AS TEMPORARY BERMS OR SILT FENCE, MUST BE INSTALLED DOWNHILL FROM THE NEWLY-GRADED MATERIAL. ANY TEMPORARY DRAINAGE CHANNELS THAT MAY BE REQUIRED DURING CONSTRUCTION WILL BE STABILIZED WITH LININGS AND CHECK DAMS. BMPS CONSIDERED FOR THIS ELEMENT INCLUDE: BMP C231: BRUSH BARRIER, BMP C232: GRAVEL FILTER BERM, BMP C233: SILT FENCE AND BMP C235: STRAW WATTLES.

SWPPP ELEMENT 5: STABILIZE SOILS:

EXISTING SOIL AND GROUND COVER SHALL BE RETAINED AND SHALL REMAIN UNDISTURBED TO THE MAXIMUM EXTENT PRACTICABLE TO MINIMIZE THE EROSION POTENTIAL ON SITE. ALL EXPOSED AND UNWORKED SOIL SHALL BE STABILIZED BY APPLICATION OF BMPS THAT PROTECT SOIL FROM THE EROSIVE FORCES OF RAINDROP IMPACTS, FLOWING WATER, AND WIND EROSION. SOIL PILES SHOULD BE COVERED WITH PLASTIC OR ROLLED EROSION CONTROL PRODUCTS (RECP) WHEN NOT IN IMMEDIATE USE.

CONSTRUCTION EROSION CONTROL BMPS SHALL BE INSTALLED PRIOR TO SOIL-DISTURBING ACTIVITIES TO THE MAXIMUM EXTENT PRACTICABLE. ANY BMPS THAT CANNOT BE INSTALLED PRIOR TO GRADING OR SOIL DISTURBANCE SHALL BE INSTALLED AND MADE OPERABLE IMMEDIATELY AFTER INSTALLATION IS MADE POSSIBLE. DISTURBED SOILS WILL BE PERMANENTLY STABILIZED ON SITE WITH PAVEMENT OR WITH PERMANENT PLANTINGS AND SEEDING. ALL EXPOSED AND UNWORKED SOIL WILL BE TEMPORARILY STABILIZED WITH SEEDING, MULCH, STRAW, NETS AND BLANKETS, OR PLASTIC COVERING PER DOE STANDARDS. NO SOIL WILL BE EXPOSED AND UNWORKED FOR MORE THAN SEVEN DAYS BETWEEN MAY 1 AND SEPTEMBER 30. NO SOIL WILL BE EXPOSED AND UNWORKED FOR MORE THAN TWO DAYS BETWEEN OCTOBER 1 AND APRIL 30. SOIL STOCKPILES MUST BE STABILIZED AND PROTECTED WITH SEDIMENT TRAPPING MEASURES. PLASTIC COVERING SHOULD BE INSTALLED ON ALL STOCKPILES THAT ARE NOT IN IMMEDIATE USE. STRAW WATTLES AND/OR SILT FENCE SHOULD ALSO BE INSTALLED AROUND THE PERIMETER OF SUCH STOCKPILES. AS RECOMMENDED IN ELEMENT 4, EXCAVATED SOIL MATERIAL SHOULD BE PLACED UPHILL FROM THE EXCAVATED AREAS. PROPOSED WORK IS LINEAR AND WILL BE UNDER THE CONTROL OF ONE GENERAL CONTRACTOR. THE CONTRACTOR SHALL ENSURE THAT APPROPRIATE CREWS AND MATERIALS ARE AVAILABLE ON SITE TO COMPLETELY STABILIZE THE SITE PRIOR TO FOUL WEATHER OR SITE CONDITIONS. BMPS CONSIDERED FOR THIS ELEMENT INCLUDE: BMP C120: TEMPORARY AND PERMANENT SEEDING, BMP C121: MULCHING, BMP C122: NETS AND BLANKETS AND BMP C123: PLASTIC COVERING.

SWPPP ELEMENT 6: PROTECT SLOPES:

THE SITE IS FLAT WITH GENTLE GRADES ON SITE. NO SIGNIFICANT CUT OR FILL SLOPES ARE PROPOSED AS A PART OF THIS PROJECT.

SWPPP ELEMENT 7: PROTECT DRAIN INLETS:

ALL DRAINAGE INLETS MADE OPERABLE DURING CONSTRUCTION SHALL BE PROTECTED SO THAT NO STORMWATER MAY ENTER THE CONVEYANCE SYSTEMS WITHOUT FILTRATION OR OTHER TREATMENT FOR SEDIMENT. IN ADDITION, EXISTING DRAINAGE INLETS NEAR THE PROJECT SITE WILL ALSO BE FITTED WITH TEMPORARY FILTER INSERTS OR OTHER APPLICABLE INLET PROTECTION. EXISTING INLETS THAT REQUIRE PROTECTION ARE IDENTIFIED ON THE CIVIL PLANS. ADDITIONAL INLET PROTECTIONS MAY BE REQUIRED IF SEDIMENT IS TRACKED ONTO PAVEMENT BEYOND THE CATCH BASINS THAT ARE IDENTIFIED ON THE PLANS. ALL APPROACH ROADS SHALL BE KEPT CLEAN AND ALL SEDIMENT AND STREET WASH WATER SHALL NOT BE ALLOWED TO ENTER STORM DRAINS WITHOUT PRIOR AND ADEQUATE TREATMENT UNLESS TREATMENT IS PROVIDED BEFORE THE STORM DRAIN DISCHARGES TO WATERS OF THE STATE. BMPS CONSIDERED FOR THIS ELEMENT INCLUDE: BMP C220: STORM DRAIN INLET PROTECTION.

SWPPP ELEMENT 8: STABILIZE CHANNELS AND OUTLETS:

NO TEMPORARY OR PERMANENT CHANNELS ARE PROPOSED FOR THIS PROJECT. IF TEMPORARY CHANNELS BECOME NECESSARY DURING CONSTRUCTION, THEY SHALL BE DESIGNED AND BUILT WITH MINIMAL SLOPES (APPROXIMATELY 0.5%). SIDE SLOPES WILL BE LIMITED TO 2:1 AND WILL BE LINED WITH TOPSOIL AND GRASS. DURING CONSTRUCTION, THE SIDES OF THE SWALE SHOULD BE STABILIZED WITH ROLLED EROSION CONTROL PRODUCTS, PLASTIC, OR CLEAN GRAVEL.

SWPPP ELEMENT 9: CONTROL POLLUTANTS:

ALL POLLUTANTS, INCLUDING WASTE MATERIALS AND DEMOLITION DEBRIS, THAT OCCUR ON SITE SHALL BE DISPOSED OF IN A MANNER THAT DOES NOT CONTAMINATE STORMWATER. DEMOLITION MATERIALS THAT WILL BE GROUND AND REUSED ON SITE SHALL BE COVERED AND ISOLATED FROM CONTACT WITH STORMWATER. COVER, CONTAINMENT, AND PROTECTION FROM VANDALISM SHALL BE PROVIDED FOR ALL CHEMICALS, LIQUID PRODUCTS, PETROLEUM PRODUCTS, AND NON-INERT WASTES PRESENT ON THE SITE. IF POSSIBLE, POTENTIAL STORMWATER POLLUTANTS SHOULD BE STORED INDOORS, IN LOCKABLE TRAILERS, OR IN SEALED SHIPPING CONTAINERS. MAINTENANCE AND REPAIR OF HEAVY EQUIPMENT AND VEHICLES INVOLVING OIL CHANGES, HYDRAULIC SYSTEM DRAIN DOWN, SOLVENT AND DE-GREASING CLEANING OPERATIONS, FUEL TANK DRAIN DOWN AND REMOVAL, AND OTHER ACTIVITIES WHICH MAY RESULT IN DISCHARGE OR SPILLAGE OF POLLUTANTS TO THE GROUND OR INTO STORMWATER RUNOFF MUST BE CONDUCTED USING SPILL PREVENTION MEASURES, SUCH AS DRIP PANS. CONTAMINATED SURFACES SHALL BE CLEANED IMMEDIATELY FOLLOWING ANY DISCHARGE OR SPILL INCIDENT. EMERGENCY REPAIRS MAY BE PERFORMED ON-SITE USING TEMPORARY PLASTIC PLACED BENEATH AND, IF RAINING, OVER THE VEHICLE. IF WHEEL WASHES OR TIRE BATHS ARE INSTALLED, WASTEWATER FROM THOSE BMPS SHALL BE DISCHARGED TO A SEPARATE ON-SITE TREATMENT SYSTEM OR TO THE SANITARY SEWER. SPECIAL PERMISSION FROM THE CITY OF BLAINE MUST BE GRANTED PRIOR TO DISCHARGING STORMWATER RUNOFF TO THE SEWER. AGRICULTURAL CHEMICALS WILL NOT BE APPLIED AT THIS SITE. WASHOUT OF CONCRETE TRUCKS AND HAND TOOLS (E.G. SCREEDS, RAKES, SHOVELS, FLOATS, OR TROWELS) WILL ONLY BE ALLOWED WITHIN FORMED AREAS AWAITING INSTALLATION OF CONCRETE OR WITHIN A DESIGNATED WASHOUT AREA ON SITE. IF POSSIBLE, ANY UNUSED CONCRETE IN THE TRUCK SHOULD BE RETURNED TO THE BATCH PLANT FOR RECYCLING.

SWPPP ELEMENT 10: CONTROL DE-WATERING:

GROUNDWATER IS ASSUMED TO BE LOWER THAN THE PROPOSED UTILITIES. AS SUCH, NO DEWATERING IS ANTICIPATED AS A PART OF THIS PROJECT. IF DEWATERING DOES BECOME NECESSARY DURING CONSTRUCTION, THE CONTRACTOR SHALL PREPARE A DEWATERING PLAN IN ACCORDANCE WITH CITY STANDARDS AND DEPT. OF ECOLOGY REQUIREMENTS. AS A PART OF THE PLAN, ALL DEWATERING WATER SHALL BE DISCHARGED TO A CONTROLLED CONVEYANCE SYSTEM FOR TREATMENT. CLEAN, NON-TURBID DEWATERING WATER SHOULD BE ROUTED DIRECTLY TO TRIBUTARIES OR WATERS OF THE STATE. HIGHLY-TURBID DEWATERING WATER SHALL BE HANDLED SEPARATELY FROM STORMWATER AND MAY BE PUMPED TO VEGETATED AREAS ON SITE OR TRUCKED OFF SITE FOR TREATMENT AND DISPOSAL.

SWPPP ELEMENT 11: MAINTAIN BMPS:

ALL TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL BMPS SHALL BE MAINTAINED AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. ALL MAINTENANCE AND REPAIR SHALL BE CONDUCTED IN ACCORDANCE WITH BMP SPECIFICATIONS.

ALL TEMPORARY EROSION AND SEDIMENT CONTROL BMPS SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED OR AFTER THE TEMPORARY BMPS ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED OR STABILIZED ON SITE. DISTURBED SOIL AREAS RESULTING FROM REMOVAL OF BMPS OR VEGETATION SHALL BE PERMANENTLY STABILIZED.

SWPPP ELEMENT 12: MANAGE THE PROJECT:

PHASING OF CONSTRUCTION:
THIS PROJECT WILL BE BUILT IN ONE PHASE. TO THE EXTENT PRACTICABLE, SITE DISTURBANCE, CLEARING, AND CONSTRUCTION WILL BE SCHEDULED APPROPRIATELY TO MINIMIZE THE TIME THAT SOIL MAY BE EXPOSED. CLEARING AND GRADING ACTIVITIES WILL OCCUR AFTER THE APPLICABLE PERMITS HAVE BEEN OBTAINED. WHEN ESTABLISHING CLEARING AND GRADING AREAS, CONSIDERATION WILL BE GIVEN TO MINIMIZING REMOVAL OF EXISTING VEGETATION AND MINIMIZING DISTURBANCE AND COMPACTION OF NATIVE SOILS EXCEPT AS NEEDED FOR BUILDING PURPOSES.

SEASONAL WORK LIMITATIONS:
FROM OCTOBER 1 THROUGH APRIL 30, SOIL WILL NOT REMAIN EXPOSED AND UNWORKED FOR MORE THAN 2 DAYS. FROM MAY 1 THROUGH SEPTEMBER 30, SOIL WILL NOT REMAIN EXPOSED AND UNWORKED FOR MORE THAN 7 DAYS. IN ADDITION, WEATHER CONDITIONS SHALL BE CONTINUALLY MONITORED (INCLUDING BEFORE HOLIDAYS AND WEEKENDS) FOR PURPOSES OF PREPARING THE SITE FOR PREDICTED WEATHER CONDITIONS. BMPS THAT ARE EFFECTIVE IN STABILIZING SOILS AND PROTECTING THEM FROM EXPOSURE TO RAIN AND WIND OR OTHER CLIMATIC CONDITIONS WILL BE IMPLEMENTED THROUGHOUT THE PROJECT. INSPECTION AND EVALUATION OF THE EFFECTIVENESS OF THE BMPS WILL OCCUR ON A DAILY BASIS. IN THE EVENT OF A FORECASTED PRECIPITATION EVENT, THE CONTRACTOR SHALL EVALUATE EXISTING BMPS ON SITE AND SHALL IMPLEMENT ADDITIONAL BMPS IF THE EXISTING SITE CONDITIONS ARE INADEQUATE TO PREVENT RAINFALL FROM CONTACTING UNSTABILIZED SURFACES.

INSPECTION AND MONITORING:
ALL BMPS WILL BE INSPECTED, MAINTAINED, AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. IN THE EVENT THAT INSPECTION AND/OR MONITORING REVEALS THAT THE BMPS IDENTIFIED IN THIS CONSTRUCTION SWPPP ARE INADEQUATE DUE TO THE ACTUAL DISCHARGE OF OR POTENTIAL TO DISCHARGE A SIGNIFICANT AMOUNT OF ANY POLLUTANT, THIS SWPPP SHALL BE APPROPRIATELY MODIFIED IN A TIMELY MANNER. A CESCL IS NOT REQUIRED, BUT IS RECOMMENDED TO PERFORM EROSION CONTROL INSPECTIONS AND TO PROVIDE RECOMMENDATIONS FOR THIS PROJECT DURING CONSTRUCTION.

MAINTENANCE OF THE CONSTRUCTION SWPPP:
THE CONSTRUCTION SWPPP WILL BE RETAINED ON SITE AND WILL BE UPDATED ON A REGULAR BASIS. A LOG WILL BE ATTACHED TO THE CONSTRUCTION SWPPP TO FACILITATE REGULAR UPDATES. MODIFICATIONS TO THE CONSTRUCTION SWPPP WILL BE MADE WHENEVER THERE IS A SIGNIFICANT CHANGE IN THE DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE OF ANY BMP. IF THE CONTRACTOR DOES NOT IMPLEMENT BMPS SPECIFIED ON THESE PLANS AND IF SITE CONDITIONS DO NOT REQUIRE THE BMPS, THE CONTRACTOR SHALL PROVIDE WRITTEN JUSTIFICATION IN THE SWPPP FOR WHY THE BMP IS UNNECESSARY.

SWPPP ELEMENT 13: PROTECT LOW IMPACT DEVELOPMENT BMPs:

LOW IMPACT DEVELPOMENT BMPs TO BE PROTECTED DURING CONSTRUCTION INCLUDE SOIL QUALITY AND DEPTH: BMP T5.13. CONSTRUCTION TRAFFIC MUST KEEP OFF PROPOSED LAWN AREAS TO BE TREATED WITH SOIL AMENDMENTS.

2500 Elm Street, Suite 1
Bellingham, WA 98225
t: 360.650.1408
f: 360.650.1401
FREELAND & ASSOCIATES

REV:	DATE:	DESCRIPTION:	BY:

CLIENT:
SKAGIT COUNTY PARKS & RECREATION
1730 CONTINENTAL PLACE
MOUNT VERNON, WA 98273

CALL BEFORE YOU DIG
FOR BURIED UTILITY LOCATIONS
1-800-424-5555

PROJECT LOCATION:
SKAGIT COUNTY FAIRGROUNDS RESTROOM REPLACEMENT
VIRGINIA STREET & 2700 MARTIN RD
MOUNT VERNON, WA 98273

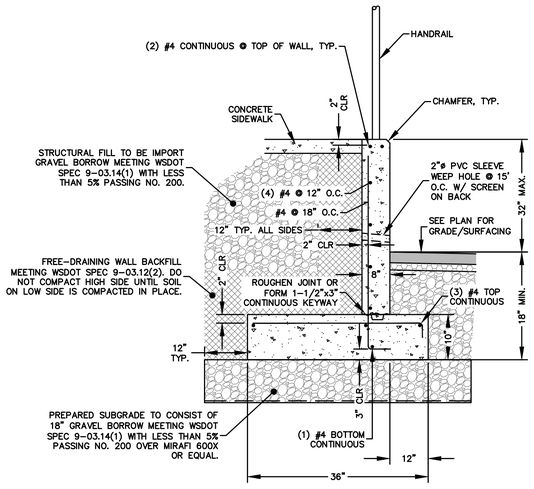
DRAWING #: 23057SP8.DWG
DRAWN BY: MPM
CHECKED BY: MDB
DESIGNED BY: MPM

SHEET CONTENTS:
DETAILS

MILES PATRICK MCEATHRON
STATE OF WASHINGTON
49494
REGISTERED PROFESSIONAL ENGINEER
03/17/2025

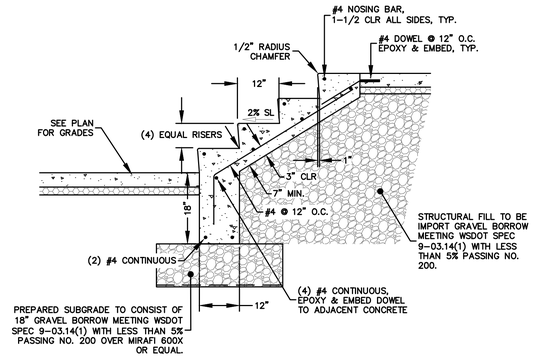
JOB #: 23057
DATE: 03-17-2025
SHEET: C7

NOTES:
1. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF ALL HANDRAILS & WALLS FOR OWNER APPROVAL PRIOR TO INSTALLATION.



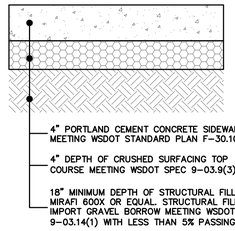
A CONCRETE WALL

NOTES:
1. INSTALL HANDRAILS ON BOTH SIDES OF EXTERIOR STAIRS WITH FOUR (4) OR MORE RISERS.
2. 12" MINIMUM HANDRAIL EXTENSIONS BEYOND TOP AND BOTTOM RISERS SHALL CONTINUE IN DIRECTION OF TRAVEL AT ALL EXTERIOR STAIRS.
3. ALL SECTIONS OF STEEL HANDRAIL SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE PROVISIONS OF ASTM A123. ALL ERECTION MARKS, STOCK NUMBERS, AND WELDING TO GALVANIZED SURFACES SHALL BE PAINTED WITH APPROVED GALVANIZING REPAIR PAINT.
4. ALL CONCRETE EXPANSION JOINTS SHALL HAVE A CORRESPONDING HANDRAIL EXPANSION JOINT.
5. ALL STAIRS SHALL MEET VISUAL CONTRAST REQUIREMENTS OF ICC A117.1 SECTION 504.5.1.
6. TROWEL SAFETY STEP GROOVES.
7. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF ALL HANDRAILS & WALLS FOR OWNER APPROVAL PRIOR TO INSTALLATION.



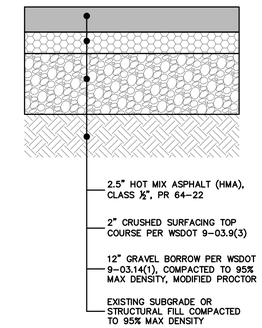
B CONCRETE STEPS

NOTES:
1. ALL DEPTHS REPRESENT COMPACTED THICKNESS.
2. CONTROL JOINTS SHALL BE 1/4 DEPTH OF SLAB. ALL CONSTRUCTION JOINTS SHALL BE DOWELED.
3. SCORING PATTERN PER ARCHITECT PLANS.



C CONCRETE SIDEWALK SECTION

NOTE:
ALL DEPTHS REPRESENT COMPACTED THICKNESSES.



SUBGRADE AND GRAVEL BASE NOTES:

(1) STRUCTURAL FILL SHALL BE PLACED IN HORIZONTAL LIFTS APPROXIMATELY 8 TO 10 INCHES IN LOOSE THICKNESS AND THOROUGHLY COMPACTED. THE FILL MUST BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY.

(2) STRUCTURAL FILL SHALL CONSIST OF CLEAN, WELL-GRADED SANDY GRAVEL, GRAVELLY SAND, OR OTHER APPROVED NATURALLY OCCURRING GRANULAR MATERIAL (PIT RUN) WITH AT LEAST 40 PERCENT RETAINED ON THE NO. 4 SIEVE, OR A WELL-GRADED CRUSHED ROCK.

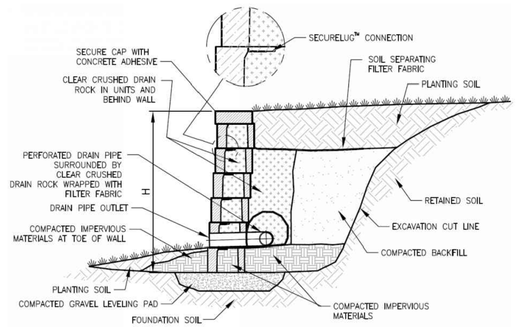
(3) STRUCTURAL FILL SHALL NOT CONTAIN MORE THAN 5 PERCENT FINES PASSING THE U.S. NO. 200 SIEVE.

(4) IF APPROVED BY A GEOTECHNICAL ENGINEER, STRUCTURAL FILL NOT MEETING THE ABOVE REQUIREMENTS CAN BE USED FOR FILL BELOW 24" OF FINAL GRADE. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF RECORD IN WRITING. GEOTECHNICAL RECOMENDATIONS/APPROVAL SHALL ACCOMPANY THE NOTIFICATION.

(5) PAVEMENT SUBGRADE SHALL BE APPROVED BY THE GEOTECHNICAL ENGINEER PRIOR TO FILL OR PAVING

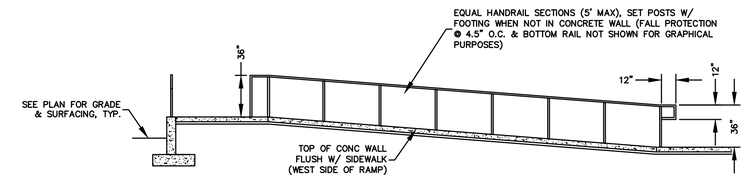
(6) HOT MIX ASPHALT ON SITE MAY BE RECYCLED WITHIN THE PARAMETERS ESTABLISHED BY WSDOT STANDARD SPECIFICATION 9-03.21, INCLUDING THE MAXIMUM ALLOWABLE PERCENTAGES LISTED IN TABLE 9-03.21(1)E.

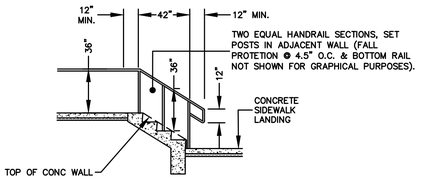
D ASPHALT PAVEMENT SECTION

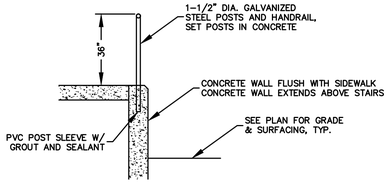


NOTES
1. WALL SHALL BE CORNERSTONE100 BLOCKS MANUFACTURED BY CORNERSTONE WALL SOLUTIONS.
2. CAP BLOCKS TO BE CORNERSTONE.
3. MAXIMUM EXPOSED WALL FACE TO BE 2.4' (1 BURIED BLOCK, 3 EXPOSED BLOCKS, 1 CAP BLOCK)
4. 4"ø BACK OF WALL DRAIN W/ DRAIN PIPE OUTLETS REQUIRED EVERY 15' ON CENTER.

E BLOCK WALL

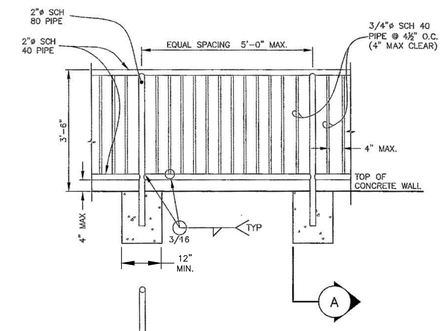






NOTES:
1. 12" MINIMUM HANDRAIL EXTENSIONS BEYOND TOP AND BOTTOM RISERS AND ACCESSIBLE RAMPS. SHALL CONTINUE IN DIRECTION OF TRAVEL.
2. ALL SECTIONS OF STEEL HANDRAIL SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE PROVISIONS OF ASTM A123. ALL ERECTION MARKS, STOCK NUMBERS, AND WELDING TO GALVANIZED SURFACES SHALL BE PAINTED WITH APPROVED GALVANIZING REPAIR PAINT.
3. ALL CONCRETE EXPANSION JOINTS SHALL HAVE A CORRESPONDING HANDRAIL EXPANSION JOINT.
4. INTENT IS FOR SECTIONS TO BE EQUALLY SPACED, 5' MAX BETWEEN POSTS.
5. CONTRACTOR TO SUBMIT SHOP DRAWINGS OF ALL HANDRAILS & WALLS FOR OWNER APPROVAL PRIOR TO INSTALLATION.
6. THIS ITEM SHALL INCLUDE THE FURNISHING OF ALL MATERIALS FOR, AND THE CONSTRUCTION OF, THE STEEL HANDRAIL AS SHOWN.

FALL PROTECTION NOTE:
4.5" O.C. SPACING IS REQUIRED FOR FALL PROTECTION ON ALL HANDRAILS WITH THE EXCEPTION OF THE EAST HANDRAIL IN THE ADA RAMP. ALL OTHER HANDRAILS MUST HAVE FALL PROTECTION.



NOTE:
- ALL SECTIONS OF THE STEEL HANDRAIL SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE PROVISIONS OF A.S.T.M. A123. ALL ERECTION MARKS, STOCK NUMBERS, AND WELDING TO GALVANIZED SURFACES SHALL BE PAINTED WITH APPROVED GALVANIZING REPAIR PAINT.
- ALL CONCRETE EXPANSION JOINTS SHALL HAVE A CORRESPONDING HANDRAIL EXPANSION JOINT.

F HANDRAIL

2500 Elm Street, Suite 1
Bellingham, WA 98225
t: 360.650.1408
f: 360.650.1401
FREELAND & ASSOCIATES

REV:	DATE:	DESCRIPTION:	BY:

CLIENT:
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VIRGINIA STREET & 2700 MARTIN RD
MOUNT VERNON, WA 98273

DRAWING #: 23057SP&DWG
DRAWN BY: MPM
CHECKED BY: MDB
DESIGNED BY: MPM

SHEET CONTENTS:
DETAILS

JOB #: 23057
DATE: 03-17-2025
SHEET: C8

GENERAL/GRADING

1. AT THE DISCRETION OF THE CITY, ANY ERRORS OR OMISSIONS IN THE APPROVED PLANS OR INFORMATION USED AS A BASIS FOR SUCH APPROVALS MAY CONSTITUTE GROUNDS FOR WITHDRAWAL OF ANY APPROVALS AND/OR STOPPAGE OF ANY OR ALL PERMITTED WORK. IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER TO SHOW CAUSE WHY SUCH WORK SHOULD RESUME AND MAKE SUCH CHANGES IN PLANS THAT MAY BE REQUIRED BY THE CITY PRIOR TO RE-APPROVAL OF THE PLANS.
2. AN ENGINEERING INSPECTION CARD IS PROVIDED WITH THE ISSUANCE OF EACH PERMIT. THESE ARE THE MINIMUM REQUIRED INSPECTIONS. OTHER INSPECTIONS MIGHT BE REQUIRED AS DETERMINED BY THE CITY INSPECTOR AND THE SCOPE OF THE WORK.
3. THE CONTRACTOR SHALL CALL FOR REQUIRED INSPECTIONS BY CALLING THE INSPECTION LINE NUMBER (360)336-6243. FAILURE TO PROPERLY NOTIFY THE CITY OF REQUIRED INSPECTION MIGHT RESULT ON NON-ACCEPTANCE OF THE WORK.
4. ALL CONTRACTORS WORKING IN THE CITY OF MOUNT VERNON MUST HAVE A CITY OF MOUNT VERNON BUSINESS LICENSE.
5. IT IS THE GENERAL CONTRACTOR'S RESPONSIBILITY TO LOCATE ALL UTILITIES PRIOR TO THE START OF CONSTRUCTION. CONTACT 'ONE CALL': 1-800 424-5555 (OR 811)
6. ALL CONTRACTORS, SUBCONTRACTORS, TRADES AND CRAFTS PERFORMING WORK DURING CONSTRUCTION MUST ADHERE TO THE SAFETY REGULATIONS FOR CONTRACTORS AND OWNER'S EMPLOYEES IN ACCORDANCE WITH CURRENT WISHA STANDARDS AND REQUIREMENTS.
7. IN ADDITION TO MEETING THE CURRENT CITY OF MOUNT VERNON ENGINEERING STANDARD, ALL CONSTRUCTION SHALL BE IN CONFORMANCE WITH THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS AND THE AMERICAN PUBLIC WORKS ASSOCIATION STANDARDS AND PRACTICES.
8. TRAFFIC CONTROL SHALL STRICTLY ADHERE TO THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) STANDARDS. BEFORE ISSUANCE OF A RIGHT-OF WAY PERMIT, THERE IS TO BE AN APPROVED TRAFFIC CONTROL PLAN BY THE CITY'S DEVELOPMENT SERVICES ENGINEERING DIVISION. NO FULL ROAD CLOSURES WILL BE ALLOWED UNLESS APPROVED BY THE PUBLIC WORKS DIRECTOR.
9. 72 HOUR NOTICE IS REQUIRED FOR LANE CLOSURE NOTIFICATIONS
10. SURVEY STAKING IS REQUIRED FOR ALL UTILITIES AND LOT CORNERS.
11. SCHEDULE ALL INSPECTIONS 24 HOURS IN ADVANCE.
12. WORKING HOURS ARE FROM 7 AM TO 9 PM MONDAY THROUGH FRIDAY.
13. THE PERMITEE IS RESPONSIBLE FOR DAMAGES TO CITY PROPERTY, PAVEMENT, WALKS, UTILITIES, STREET STRIPING, THERMOPLASTICS OR UNDERGROUND CABLES. TRAFFIC SIGNAL DETECTION LOOPS DAMAGED BY CONSTRUCTION WILL BE REPLACED AT THE CONTRACTOR'S EXPENSE UNLESS DIRECTED OTHERWISE BY THE PUBLIC WORKS DIRECTOR.
14. COATED 12 GAUGE OR 14 GAUGE LOCATION WIRE MUST BE INSTALLED OVER ALL UNDERGROUND PVC OR OTHER NON-METALLIC PIPE UNLESS DIRECTED OTHERWISE BY THE INSPECTOR.
15. REVISIONS TO THE APPROVED CIVIL PLANS MUST BE SUBMITTED FOR REVIEW AND APPROVAL BY THE DEVELOPMENT SERVICES ENGINEERING MANAGER.
16. CONSTRUCTION AS-BUILT REQUIREMENTS ARE AS FOLLOWS: THE SITE SHALL BE RESURVEYED AND PLANS APPROPRIATELY MODIFIED BY THE ENGINEER OF RECORD. SUBMIT 1 RED LINED COPY OF PLANS TO APPROVE FOR AS-BUILT.
17. AFTER APPROVAL AND RETURN OF RED LINE PLANS, NEED 1 HARD COPY PLUS 1 AUTOCAD, 1 PDF AND 1 TIF FILE OF FINAL AS-BUILT ON CD, PRIOR TO THE ISSUANCE OF THE CERTIFICATE OF OCCUPANCY OR FINAL INSPECTION.
18. ALL GRADING DESIGN AND CONSTRUCTION ACTIVITY SHALL COMPLY TITLE 15.16, ALL MOUNT VERNON MUNICIPAL CODE, INCLUDING BUT NOT LIMITED TO 13.33 STORMWATER DRAINAGE UTILITY AND 15.40 CRITICAL AREAS.
19. ALL GRADING DESIGN AND CONSTRUCTION ACTIVITY SHALL COMPLY WITH THE CITY OF MOUNT VERNON ENGINEERING STANDARDS AND THE CURRENT WSDOT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.
20. A PRE-CONSTRUCTION MEETING IS REQUIRED PRIOR TO ANY CONSTRUCTION OR GRADING ACTIVITY.
21. A COPY OF THE FILL & GRADE PERMIT AND APPROVED PLANS SHALL BE KEPT ON-SITE DURING CONSTRUCTION.
22. DEVIATION AND REVISIONS TO THE APPROVED PLANS SHALL BE APPROVED BY THE PROJECT'S ENGINEER AND THE CITY OF MOUNT VERNON.
23. RETAINING WALL GREATER THAN 4-FEET IN HEIGHT REQUIRE SEPARATE BUILDING PERMIT.
24. NO GRADING ACTIVITY MAY OCCUR WITHIN A CRITICAL AREA OR CRITICAL AREA BUFFER WITHOUT SPECIFIC APPROVAL.
25. IT SHALL BE THE RESPONSIBILITY OF BOTH THE PERMITTEE AND THE PROPERTY OWNER TO ADVISE THE CITY IMMEDIATELY OF ANY DISCREPANCIES, HAZARDOUS CONDITIONS OR PROBLEMS AFFECTING SAFETY AND STABILITY OF THE PROJECT
26. UNLESS OTHERWISE RECOMMENDED IN THE GEOTECHNICAL REPORT: THE SLOPE OF CUT SURFACES SHALL BE NO STEEPER THAN IS SAFE FOR THE INTENDED USE, AND SHALL NOT BE STEEPER THAN THREE UNITS HORIZONTAL TO ONE UNIT VERTICAL (3:1).
27. ALL FILL MATERIAL SHALL MEET THE STANDARD FOR THE INTENDED FUTURE USE. MATERIAL TO BE PLACE IN AREAS OF FUTURE BUILDING SITE SHALL BE STRUCTURAL FILL MATERIAL. TESTING SHALL BE REQUIRED AS DEEMED NECESSARY BY THE CITY OF MOUNT VERNON.
28. THE GROUND SURFACE SHALL BE PREPARED TO RECEIVE FILL BY REMOVING VEGETATION, TOPSOIL AND OTHER UNSUITABLE MATERIALS, AND SCARIFYING THE GROUND TO PROVE A BOND WITH THE FILL MATERIAL.
29. FILL MATERIAL SHALL NOT INCLUDE ORGANIC, FROZEN OR OTHER DELETERIOUS MATERIALS. NO ROCK OR SIMILAR IRREDUCIBLE MATERIAL GREATER THAN 12-INCHES IN ANY DIMENSION SHALL BE INCLUDED IN FILLS.
30. ALL FILL MATERIAL SHALL BE COMPACTED AT A MINIMUM TO 90 PERCENT OF MAXIMUM DENSITY AS DETERMINED BY ASTMD 1557 MODIFIED PROCTOR, IN LIFTS NOT EXCEEDING 12-INCHES IN DEPTH. TESTS TO DETERMINE THE DENSITY OF COMPACTED FILLS SHALL BE MADE ON THE BASIS OF NOT LESS THAN ONE TEST PER 7000 SQUARE FEET OF COMPACTED AREA PER 2-FOOT VERTICAL LIFT. ADDITIONAL TESTING MAY BE REQUIRED AT THE DIRECTION OF THE CITY INSPECTOR.
31. COMPACTION OF TEMPORARY STOCKPILE FILLS SHALL NOT BE REQUIRED, EXCEPT WHERE THE BUILDING OFFICIAL DETERMINES THAT COMPACTION IS NECESSARY AS A SAFETY MEASURE.
32. PROPERTY LOCATION AND APPROVED SETBACKS MUST BE ESTABLISHED AND STAKES SET UNDER THE SUPERVISION OF A REGISTERED LAND SURVEYOR WHEN GRADING ACTIVITIES OCCUR. THOSE STAKES MUST BE MAINTAINED IN PLACE UNTIL FINAL INSPECTION OF WORKS SO THAT THE INSPECTOR CAN DETERMINE AT ANY TIME IF THE EXCAVATION IS PROPERLY LOCATED AS RELATED TO PROPERTY LINES.
33. SETBACK DIMENSIONS SHALL BE MEASURED PERPENDICULAR TO THE PROPERTY LINE.
34. THE SETBACK AT THE TOP OF A CUT SLOPE SHALL NOT BE LESS THAN 5-FEET OR THAN IS REQUIRED TO ACCOMMODATE ANY REQUIRED INTERCEPTOR DRAINS, WHICHEVER IS GREATER.
35. THE TOE OF A SLOPE DISTANCE TO PROPERTY AND EASEMENT LINES SHALL BE AS FOLLOWS: FOR SLOPES LESS THAN 11-FEET IN HEIGHT THE MINIMUM DISTANCE SHALL BE 5-FEET. FOR SLOPES 11-FEET IN HEIGHT OR GREATER THE MINIMUM DISTANCE SHALL BE HEIGHT/2
36. THE TOP OR TOE OF A SLOPE DISTANCE TO A STRUCTURE SHALL BE NOT LESS THAN 10 FEET.
37. DRAINAGE SHALL BE PROVIDED IN ACCORDANCE WITH CITY OF MOUNT VERNON MUNICIPAL CODE 13.33 AND ENGINEERING STANDARDS AS THEY ARE CURRENTLY WRITTEN OR AS THEY MAY BE AMENDED IN THE FUTURE.
38. TERRACING AND BENCHING SHALL BE PROVIDED AS RECOMMENDED IN THE GEOTECHNICAL REPORT
39. INTERCEPTOR DRAINS SHALL BE INSTALLED ALONG THE TOP OF CUT SLOPES RECEIVING DRAINAGE FROM A TRIBUTARY WIDTH GREATER THAN 40-FEET, MEASURE HORIZONTALLY. DRAINS SHALL BE CONSTRUCTED OF SOLID, NOT FLEXIBLE, PIPE.
40. DOWN DRAINS SHALL TERMINATE INTO A CATCH BASIN OR OTHER APPROVED RECEIVER TO PREVENT SCOURING AT THE OUTFALL.
41. FOR CONSTRUCTION SITE 1-ACRE OR LARGER A CERTIFIED EROSION & SEDIMENT CONTROL LEAD SHALL BE IDENTIFIED FOR THE PROJECT AND SHALL BE ON-CALL AT ALL TIMES. THE NAME AND PHONE NUMBER OF THE CONTACT PERSON SHALL BE POSTED ON SITE.
42. NO TRACKING OF MUD OR DEBRIS ON TO PUBLIC STREETS IS ALLOWED.
43. ALL GRADING ACTIVITY IS LIMITED TO THE HOURS BETWEEN 7:00 AM AND 9:00 PM MONDAY THROUGH FRIDAY AND 8:00 AM AND 9:00 PM SATURDAY AND SUNDAY. THE BUILDING OFFICIAL IS AUTHORIZED TO GRANT AN EXTENSION OF WORKING HOURS.
44. PROJECTS SHALL BE INSPECTED AT VARIOUS STAGES OF THE WORK TO DETERMINE THAT ADEQUATE CONTROL IS BEING EXERCISED. STAGES OF WORK SUBJECT TO INSPECTION INCLUDE, BUT ARE NOT LIMITED TO: PRE-CONSTRUCTION, EROSION CONTROL, GRADING ACTIVITIES, INSTALLATION OF UTILITIES, STORMWATER FACILITIES, RETAINING WALLS, LANDSCAPING AND COMPLETION OF PROJECT.

STORM SEWER

1. ALL PIPE MATERIAL, JOINTS AND PROTECTIVE TREATMENT SHALL BE IN ACCORDANCE WITH WSDOT SPECIFICATIONS UNLESS OTHERWISE SPECIFIED.
2. ON SITE-CONVEYANCE PIPE SHALL BE RIGID GASKETED PIPES
3. STORM PIPE SHALL BE A MINIMUM OF 12 INCHES DIAMETER UNLESS OTHERWISE SPECIFIED
4. WYES OR TEES WILL BE ALLOWED ON ROOF/YARD DRAIN SYSTEMS WITH CLEAN-OUTS UPSTREAM. CLEAN-OUTS MUST BE LOCATED OUTSIDE CITY ROW.
5. ALL CONNECTIONS TO STORM STRUCTURES MUST HAVE SAND COLLARS IF SMOOTH OUTSIDE WALL PVC AND MUST BE INSPECTED PRIOR TO BACKFILLING. CONNECTIONS TO THE STORM WATER SYSTEM SHALL BE MADE ONLY AT STRUCTURES UNLESS OTHERWISE APPROVED.
6. STORM SEWER STUB TO BE IDENTIFIED WITH A PAINTED WHITE PRESSURE TREATED 2" X 4" MARKER BOARD INDICATING THE DEPTH TO THE TOP OF THE PIPE WITH A CLEAN OUT AT THE PROPERTY LINE.
7. PIPE COVER SHALL BE 24" MINIMUM UNLESS OTHERWISE SPECIFIED.
8. RESTRICTOR ORIFICE/ FLOW CONTROL ASSEMBLY MUST BE INSPECTED PRIOR TO INSTALLATION.
9. NEW STORM SEWER SYSTEMS AND RECONNECTION TO EXISTING SYSTEMS MUST BE VACTORED, SCREENED AND FLUSHED PRIOR TO FINAL ACCEPTANCE.
10. DETENTION PONDS DESIGNED FOR USE AS SEDIMENT PONDS SHALL BE CLEANED OF SEDIMENT ACCUMULATION BEFORE CONNECTION TO CITY STORMWATER SYSTEM AND BEFORE ACCEPTANCE OF THE PROJECT
11. PVC PIPE SHALL BE ENCASED IN A STEEL OR DUCTILE IRON CASING WHEN CROSSING UNDER IMPROVEMENTS WHERE THE ABILITY TO REMOVE AND REPLACE PIPE WITHOUT DISTURBANCE TO THE IMPROVEMENT IS NEEDED
12. CASINGS SHALL EXTEND A MINIMUM OF 5' PAST EACH EDGE OF THE IMPROVEMENT, OR A DISTANCE EQUAL TO THE DEPTH OF PIPE, WHICHEVER IS GREATER. THE CARRIER PIPE SHALL BE SUPPORTED BY CASING SPACERS WHERE CASING LENGTH EXCEEDS 10'

SANITARY SEWER

1. APPROVED SANITARY SEWER PIPE: SDR 35 PVC (ASTM 3034) WITH FLEXIBLE GASKETED JOINTS UNLESS OTHERWISE SPECIFIED.
2. DEPTH OF COVER SHALL BE 2 FOOT MINIMUM AND 20 FOOT MAXIMUM.
3. TRENCH EXCAVATION SHALL BE ACCORDING TO WSDOT STANDARD.
4. ALL CLEANOUTS SHALL BE ACCORDING TO DETAILS ON DRAWINGS.
5. MINIMUM MANHOLE DEPTH IS 5 FOOT MINIMUM WITH APPROVAL BY PUBLIC WORKS DIRECTOR
6. ALL MANHOLE CONNECTIONS MUST BE INSPECTED PRIOR TO BACKFILL. EACH BARREL SECTION TO BE GROUTED INSIDE AND OUTSIDE.
7. NEW SANITARY SEWER SYSTEMS AND RECONNECTION TO EXISTING SYSTEMS MUST BE SCREENED, FLUSHED, VIDEO INSPECTED AND A COPY OF THE INSPECTION PROVIDED TO THE CITY PRIOR TO FINAL ACCEPTANCE.
8. SEWER PIPE 8 INCHES OR LARGER MUST BE VIDEO INSPECTED BY AN APPROVED CONTRACTOR AND PRESSURES TESTED AT 4 POUNDS PER SQUARE INCH FOR 15 MINUTES.
9. ALL BUILDING SIDE SEWERS SHALL BE PRESSURE TESTED FROM THE LOT STUB/CLEAN-OUT TO THE BUILDING PER MVMC 13.16. TESTING METHOD WILL DEPEND ON SITE CONDITIONS AND AS DETERMINED BY CITY INSPECTOR. HYDROSTATIC PRESSURE TESTING IS PREFERRED.
10. SANITARY SEWER MANHOLE CHANNELS SHALL BE ½ TO ¾ DIAMETER OF THE PIPE.
11. SANITARY SEWER STUB TO BE IDENTIFIED WITH A 2" X4" PAINTED GREEN PRESSURE TREATED MARKER BOARD INDICATING THE DEPTH TO THE TOP OF THE PIPE WITH A CLEAN OUT AT THE PROPERTY LINE.
12. THE CONTRACTOR SHALL PLUG THE OUTLET OF THE NEW SEWER CONNECTION DISCHARGING TO AN EXISTING SANITARY SEWER SYSTEM UNTIL FINAL ACCEPTANCE OF THE NEW SYSTEM.
13. THE CONTRACTOR SHALL VERIFY MINIMUM 2% SLOPE AND INVERT ELEVATIONS OF SEWER LATERAL. A MINIMUM OF 3 FEET SHALL BE PROVIDED FROM THE PROPOSED BUILDING FF ELEVATION TO THE SEWER MAIN TO ENSURE POSITIVE FLOW.
14. THE CONTRACTOR IS REQUIRED TO KEEP RECORDS OF SEWER INVERT ELEVATIONS FOR AS-BUILT PLANS. REDLINE AS-BUILT PLAN NOTING ANY CHANGES FROM THE PLANS SHALL BE PROVIDED TO THE ENGINEER FOLLOWING CONSTRUCTION.
15. DUCTILE IRON SLEEVE REQUIRED UNDER WALL FOUNDATIONS.
16. ALL WORK SHALL BE INSPECTED AND APPROVED BY A REPRESENTATIVE OF CITY OF MOUNT VERNON, AND 24 HOURS NOTICE MUST BE GIVEN PRIOR TO STARTING WORK OR SCHEDULE INSPECTIONS.

STREETS/PAVEMENTS

1. SUB GRADE MUST BE INSPECTED PRIOR TO PAVEMENT REPLACEMENT.
2. CURBS, GUTTERS AND SIDEWALKS TO HAVE EXPANSION JOINT EVERY 15 FEET FULL THICKNESS OF SIDEWALK.
3. EXPANSION MATERIAL REQUIRED BETWEEN BACK OF CURB AND SIDEWALK.
4. SIDEWALK RAMPS MUST MEET AMERICAN WITH DISABILITY ACT (ADA) REQUIREMENTS.
5. TRUNCATED DOMES SHALL BE IMBEDDED AND NOT GLUED.
6. ALL ASPHALT SEAMS MUST BE SAW CUT AND CRACK SEALED AND SAND HEAT IMMEDIATELY APPLIED TO PREVENT FROM PEELING DUE TO TRAFFIC
7. ALL STRIPING AND SIGNAGE (NEW AND REPLACEMENT) SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR/PERMITEE.
8. ALL EARTHWORKS UNDER PAVING AND SIDEWALKS TO BE USED BY VEHICULAR TRAFFIC SHALL BE COMPACTED TO AT LEAST 95% OF THE MAXIMUM DRY DENSITY PER ASTM D-1557-70 (PROCTOR). ALL OTHER AREAS SHALL BE COMPACTED TO 90%. SUBGRADE CERTIFIED BY GEOTECHNICAL CONSULTANT AND RESPECTIVE REPORTS SHALL BE PROVIDED TO THE CITY
9. SUB GRADE DENSITIES WILL BE REQUIRED ON SITE. DENSITY AND SPECIAL INSPECTION REPORTS SHALL BE PROVIDED TO THE CITY.
10. BACKFILL MATERIAL IN CITY RIGHT-OF-WAY AND PRIVATE PROPERTY IS TO BE GRAVEL BASE PLACED ON LOOSE LIFTS NOT TO EXCEED 8" IN DEPTH. NO NATIVE FILL IS ALLOWED.
11. CONTROL DENSITY FILL IS REQUIRED ON ARTERIAL STREETS AND ON AREAS OF DIFFICULT COMPACTION WHEN APPROVED BY THE CITY.
12. FINAL ASPHALT RESTORATION SHALL BE COMPLETED WITHIN 14 DAYS OF COMMENCING STREET/TRENCH WORK. EXTENSION MIGHT BE GRANTED BY DEVELOPMENT SERVICES ENGINEERING MANAGER.
13. "POT HOLING" IS GENERALLY NOT ALLOWED.
14. ALL PAVEMENT REPAIR SHALL BE SAWCUT BEFORE REMOVAL.

EARTHWORK

1. THE CONTRACTOR SHALL CLEAR, GRUB AND CLEAN UP THOSE AREAS SHOWN ON THE PLANS.
2. THE CONTRACTOR SHALL RAZE, REMOVE AND DISPOSE OFF-SITE OF ALL BUILDING AND FOUNDATIONS, STRUCTURES, FENCES AND OTHER OBSTRUCTIONS. SALVAGE AND RELOCATE STRUCTURES IF NOTED ON THE PLANS.
3. THE CONTRACTOR SHALL EXCAVATE AND GRADE TO THE ALIGNMENT, GRADE AND CROSS-SECTIONS SHOWN IN THE PLANS OR ESTABLISHED BY THE ENGINEER.
4. MAXIMUM DENSITY AND OPTIMUM MOISTURE FOR GRANULAR MATERIALS SHALL BE DETERMINED USING ASTM D-1557 TEST METHOD.
5. MATERIAL DETERMINED BY GEOTECHNICAL TESTING AGENCY TO BE UNSUITABLE AND NOT FIT FOR SUB-GRADE SHALL BE EXCAVATED 24 INCHES AND REPLACED WITH STRUCTURAL FILL. STRUCTURAL FILL TO MEET GRAVEL BORROW PER WSDOT STANDARD SPEC 9-03.14(1) WITH LESS THAN 5% PASSING THE NO. 200 OVER MIRAFI 600X.

CITY OF MOUNT VERNON REQUIRED INSPECTIONS

CONTRACTOR SHALL FOLLOW PERMIT REQUIREMENTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CALL FOR ALL REQUIRED CITY INSPECTIONS.

FLOOD ELEVATION CERTIFICATES

(3) CERTIFICATES ARE REQUIRED. CONTRACTOR MUST COORDINATE W/ SURVEYOR (JOHN SEMRAU). THE FIRST TO ESTABLISH GRADE, THE SECOND PRIOR TO PLACING THE BUILDING, THE THIRD PRIOR TO FINAL OCCUPANCY.

SUBMITTALS

CONTRACTOR SHALL PROVIDE ENGINEER MATERIAL SUBMITTALS FOR APPROVAL PRIOR TO INSTALLATION INCLUDING:

- PRE-CONSTRUCTION PHOTOGRAPHS SHOWING EXISTING CONDITIONS
- PRODUCT DATA FOR GEOTEXTILES
- MANUFACTURER'S PRODUCT DATA, TEST REPORTS, MATERIAL CERTIFICATIONS FOR CONCRETE MIX, JOINT FILLERS AND SEALERS
- MATERIAL TEST REPORTS INCLUDING SIEVE ANALYSIS MEETING SPEC
- PIPE, FITTINGS, COUPLINGS, VALVES
- JUNCTION BOXES, VALVE BOXES, CASTINGS
- SHOP DRAWINGS: RETAINING WALL, HANDRAILS

EROSION CONTROL

APPROVAL OF THIS EROSION AND SEDIMENT CONTROL (ESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G., SIZE AND LOCATION OF ROADS, PIPES, RESTRICTORS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.).

1. PRIOR TO COMMENCING CONSTRUCTION, ALL CRITICAL AREAS, INCLUDING WETLAND BUFFERS, STREAM BUFFER, LANDFILL AREAS, AND CONDITIONS AS DETERMINED BY THE CITY ONSPECTOR SHALL BE CONTINUOUSLY DEMARCATED IN THE FIELD USING FLAGGING TAPE OR FENCING. ALL WORK AND MATERIALS SHALL BE IN ACCORDANCE WITH CITY OF MOUNT VERNON STANDARDS AND SPECIFICATIONS.
2. EROSION CONTROL METHODS AND MATERIALS SHALL MEET REQUIREMENTS OF THE APWA/WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION(CURRENT EDITION) AND REQUIREMENTS SET FORTH IN VOLUME II OF THE "STORMWATER MANAGEMENT MANUAL FOR THE PUGET SOUND BASIN (THE TECHNICAL MANUAL)", BY THE WASHINGTON STATE DEPARTMENT OF ECOLOGY, EDITION CURRENTLY ADOPTED BY THE CITY OF MOUNT VERNON. THE CONTRACTOR SHALL FOLLOW RECOMMENDATIONS MADE BY SUPPLIERS AND MANUFACTURERS OF MATERIALS AND EQUIPMENT USED.
3. THE ESC FACILITIES SHOWN ON THIS PLAN MUST BE INSTALLED AND IN OPERTAION IN ADVANCE OF ALL CLEARING AND GRADING ACTIVITIES IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT-LADEN WATER DOES NOT ENTER THE DRAINAGE SYSTEM OR VIOLATE APPLICABLE WATER STANDARDS. WHEREVER POSSIBLE, MAINTAIN NATURAL VEGETATION FOR SILT CONTROL.
4. THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS. ADDITIONALLY, MORE ESC FACILITIES MAY BE REQUIRED TO ENSURE COMPLETE SILTATION CONTROL. DURING THE COURSE OF CONSTRUCTION, IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE CONTRACTOR TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY CONSTRUCTION ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES OVER AND ABOVE THE MINIMUM REQUIREMENTS AS MAY BE NEEDED.
5. ANY PERMANENT RETENTION/DETENTION FACILITY USED AS A TEMPORARY SETTLING BASIN SHALL BE MODIFIED WITH THE NECESSARY EROSION CONTROL MEASURES AND SHALL PROVIDE ADEQUATE STORAGE CAPACITY.
6. A COPY OF THE APPROVED EROSION CONTROL PLANS MUST BE KEPT ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
7. A CLEARING CONTROL FENCE SHALL BE INSTALLED AT THE DRIP LINE OF TREES TO BE SAVED WHEREVER THE TREE CANOPIES EXTEND INTO THE AREA TO BE CLEARED.
8. OFF-SITE STREETS MUST BE KEPT CLEAN AT ALL TIMES. IF DIRT IS DEPOSITED ON THE PUBLIC STREET SYSTEM, THE STREET SHALL BE IMMEDIATELY CLEANED WITH POWER SWEEPER OR OTHER APPROVED EQUIPMENT. ALL ADJACENT OFF-SITE PROPERTIES AND DRAINAGE FACILITIES SHALL BE PROTECTED FROM DAMAGE. ALL VEHICLES SHALL LEAVE THE SITE BY WAY OF THE CONSTRUCTION ENTRANCE AND SHALL BE CLEANED OF ALL DIRT THAT WOULD BE DEPOSITED ON THE PUBLIC STREETS.
9. ALL PROPERTIES ADJACENT TO THE PROJECT SITE SHALL BE PROTECTED FROM SEDIMENT DEPOSITION AND RUNOFF. DO NOT FLUSH SEDIMENT OR CONCRETE BY-PRODUCTS OR CLEAN TRUCKS NEAR OR INTO THE STORM DRAINAGE OR SEWER SYSTEMS.
10. THE IMPLEMENTATION OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE FACILITIES IS THE RESPONSIBILITY OF THE OWNER/APPLICANT/ESC SUPERVISOR UNTIL ALL CONSTRUCTION IS APPROVED.
11. ANY AREAS OF EXPOSED SOILS, INCLUDING ROADWAY EMBANKMENTS, THAT WILL NOT BE DISTURBED FOR TWO DAYS DURING THE WET SEASON OR SEVEN DAYS DURING THE DRY SEASON SHALL BE IMMEDIATELY STABILIZED WITH THE APPROVED ESC METHODS.
12. ANY AREA NEEDING ESC MEASURES NOT REQUIRING IMMEDIATE ATTENTION SHALL BE ADDRESSED WITHIN FIFTEEN (15) CALENDAR DAYS.
13. THE ESC FACILITIES ON ACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH AND WITHIN FORTY-EIGHT HOURS FOLLOWING A STORM EVENT.
14. AT NO TIME SHALL MORE THAN ONE (1) FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT -LADEN WATER INTO THE DOWNSTREAM SYSTEM.
15. STABILIZED CONSTRUCTION ENTRANCES AND ROADS SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES, SUCH AS WASH PADS, MAY BE REQUIRED TO ENSURE THAT ALL OFF-SITE PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.
16. PRIOR TO THE BEGINNING OF THE WET SEASON THE CONTRACTOR SHALL DETERMINE BMP MEASURES. ALL DISTURBED AREAS SHALL BE INSPECTED BY THE CONTRACTOR TO IDENTIFY WHICH AREAS SHALLBE STABILIZED IN PREPARATION FOR THE WINTER RAINS. DISTURBED AREAS SHALL BE STABILIZED WITHIN ONE WEEK OF THE BEGINNING OF THE WET SEASON.

EROSION CONTROL NOTES

1. A COPY OF THE APPROVED TESC PLAN SHALL BE ON THE JOB SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
2. APPROVAL OF THIS TEMPORARY EROSION & SEDIMENTATION CONTROL (TESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT STRUCTURES, DRIVEWAYS OR DRAINAGE DESIGN (E.G., SIZE AND LOCATION OF ROADS, PIPES, RESTRICTORS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.).
3. THE IMPLEMENTATION OF THIS TESC PLAN AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT AND UPGRADING OF THESE TESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS APPROVED.
4. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED IN THE FIELD PRIOR TO CONSTRUCTION. DURING CONSTRUCTION, NO DISTURBANCE BEYOND THE FLAGGED CLEARING LIMITS SHALL BE PERMITTED. THE FLAGGING SHALL BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF THE CONSTRUCTION.
5. TESC FACILITIES SHOWN ON THIS PLAN SHALL BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, UNLESS REVISED BY A CERTIFIED EROSION AND SEDIMENT CONTROL LEAD. TESC FACILITIES SHALL BE INSTALLED IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER DRAINAGE SYSTEM OR VIOLATE APPLICABLE WATER STANDARDS.
6. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD. THESE TESC FACILITIES SHALL BE UPGRADED (E.G., ADDITIONAL SUMPS, RELOCATION OF DITCHES AND SILT FENCES, ETC.) AS NEEDED FOR UNEXPECTED STORM EVENTS.
7. THE TESC FACILITIES SHALL BE INSPECTED DAILY BY THE CESCL AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTION.
8. ANY AREA NEEDING TESC MEASURES, NOT REQUIRING IMMEDIATE ATTENTION, SHALL BE ADDRESSED WITHIN FIFTEEN (15) DAYS.
9. THE TESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN 24 HOURS FOLLOWING A STORM EVENT THAT PRODUCES RUNOFF FROM THE SITE.
10. WASH PADS MAY BE NECESSARY TO ENSURE PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.
11. MULCHING OF ANY TYPE SHALL BE INSTALLED PER THE RATES AND STANDARDS PRESENTED IN VOL. II, TABLE 4.1.8 OF THE STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON, 2014 EDITION BY DEPARTMENT OF ECOLOGY.
12. ALL WORK AND MATERIAL SHALL BE IN ACCORDANCE WITH WASHINGTON STATE DEPARTMENT OF TRANSPORTATION STANDARDS AND SPECIFICATIONS.
13. EROSION & SEDIMENTATION CONTROL FACILITIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DETAILS ON THIS PLAN. LOCATIONS MAY BE MOVED TO SUIT FIELD CONDITIONS, SUBJECT TO APPROVAL BY THE CONTRACTORS CESCL OR ENGINEER OF RECORD.
14. COVER ALL DIRT/TOPSOIL PILES WITH PLASTIC SHEETING (BMP C123) DURING CONSTRUCTION WHEN NOT IN USE.
15. NETS AND/OR EROSION CONTROL BLANKETS (BMP C122) MAY BE USED IN LIEU OF TEMPORARY MULCHING.
16. CONSTRUCTION SCHEDULE- PENDING APPROVAL OF PLANS FROM JURISDICTIONS.
17. ADDITIONAL BMPs SHALL BE USED OR REQUIRED AS CONDITIONS WARRANT. BMPs SHALL BE INSTALLED PER RECOMMENDATIONS IN THE DOE STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON, CURRENT EDITION.

2500 Elm Street, Suite 1
Bellingham, WA 98225
t: 360.650.1408
f: 360.650.1401
FREELAND & ASSOCIATES

REV:	DATE:	DESCRIPTION:	BY:

CLIENT: SKAGIT COUNTY PARKS & RECREATION
1730 CONTINENTAL PLACE
MOUNT VERNON, WA 98273

CALL BEFORE YOU DIG
FOR BURIED UTILITY LOCATIONS
1-800-424-5555

PROJECT LOCATION: SKAGIT COUNTY FAIRGROUNDS
RESTROOM REPLACEMENT
VIRGINIA STREET & 2700 MARTIN RD
MOUNT VERNON, WA 98273

DRAWING #: 23057SPSB.DWG
DRAWN BY: MPM
CHECKED BY: MDB
DESIGNED BY: MPM

SHEET CONTENTS: NOTES

MILES PATRICK MCFARLAND
STATE OF WASHINGTON
49494
REGISTERED PROFESSIONAL ENGINEER
03/17/2025

JOB #: 23057
DATE: 03-17-2025

SHEET: C9

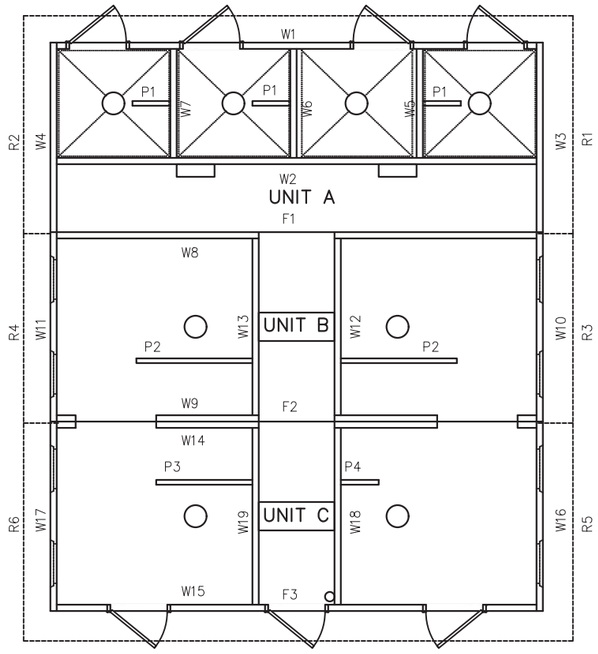
CHEYENNE

MANUFACTURED BY:
CXT INC. (ID)
6701 E. FLAMINGO AVE BLDG 300
NAMPA, ID 83687

SITE ADDRESS:
FAIRGROUNDS
501 TAYLOR STREET
MOUNT VERNON, WA 98273

PANEL MARK NO. KEY PLAN

BACK



AREA SQ FT: 743.11 SQ FT.

FRONT

NOTES

1. BUILDING IS DESIGNED TO COMPLY TO WITH THE 2021 INTERNATIONAL BUILDING CODE (IBC).
2. DESIGN COMPLIES WITH THE PROVISIONS OF THE 2021 IBC FOR THE FOLLOWING LOADS:
   GROUND SNOW LOAD = 120 PSF
   ROOF SNOW LOAD = 100 PSF
   FLOOR LOAD = 400 PSF
   IBC DESIGN SPECTRAL RESPONSE S_S = 1.402, S_1 = 0.748
   SITE CLASS D
   RISK CATEGORY: II
   SEISMIC DESIGN CATEGORY: D
   BEARING WALL SYSTEM R = 4.0
   A-5 INTERMEDIATE PRECAST SHEARWALLS
   WIND - V = 150 MPH
   WIND - V_{ASD} = 116 MPH
   WIND EXPOSURE: C
   OCCUPANT LOAD: 11
   ***BUILDING IS NOT TO BE PLACED IN A LOCATION WHERE LOADS EXCEED THE VALUES ABOVE
   ***BUILDING IS NOT TO BE PLACED IN A WIND BORNE DEBRIS REGION
3. CONSTRUCTION TYPE: V-B
   OCCUPANCY: B
   EXTERIOR WALLS: 1-HR RATED PER IBC TABLE 721.1(2), ITEM 4-1.1
   MINIMUM FIRE SEPARATION DISTANCE: 10' PER IBC TABLE 705.8
   MAXIMUM UNPROTECTED OPENING AREA: 6.33% (WALL W4, W11, & W17 AND W3, W10, & W16)
4. CONCRETE STRENGTH f'ci = 2500 PSI INITIAL f'c = 5000 PSI
   FINAL AIR ENTRAINMENT 6% ± 1 1/2% IN PLASTIC CONCRETE.
   REINFORCING STEEL: ASTM A615 #3 GRADE 40, #4 AND LARGER GRADE 60 Fy=60 KSI MINIMUM LAP 18" AT SPLICES. TIE BARS WITH DOUBLE ANNEALED 16 GA IRON WIRE. REINFORCING TO BE PLACED IN CENTER OF PANEL UNO. REINFORCING STEEL SHALL BE ACCURATELY PLACED, WELDED WIRE FABRIC (W.W.F.): ASTM A1064 GRADE 80, 4x4xW6.7xW6.7, Fy=80 KSI (OR EQUIVALENT), SMOOTH WIRE, MIN. LAP 2 SQUARES.
5. EMBEDDED ITEMS IDENTIFIED ON DRAWINGS (i.e. PS-2, R301) REFER TO CXT STANDARD EMBEDMENT CATALOG.
6. BACK OF PANELS TO HAVE SMOOTH TROWEL FINISH U.N.O. ALL SURFACES TO BE TEXTURED ARE NOTED ON PANEL DWG'S
7. REFER TO SEPARATE CXT INCORPORATED SPECIFICATIONS COVERING DESIGN, MATERIALS, PRODUCTION, AND INSTALLATION CRITERIA FOR SPECIFIC STYLE OF BUILDING.
8. ALL REBAR BENDS TO HAVE A MINIMUM RADIUS OF 6x THE BAR DIAMETER. ALL EMBEDED CONDUIT TO HAVE THE MINIMUM OF 6" BEND RADIUS.
9. INSTALLATION TO MEET APPLICABLE LOCAL, STATE & FEDERAL CODES, BY OTHERS.
10. ADEQUATE PLUMBING FACILITIES MUST BE PROVIDED IN ACCORDANCE WITH 2021 IBC 2902.3.2 (NOT BY CXT).
11. BUILDING IS UNCONDITIONED. SEASONAL USE ONLY. PLUMBING SYSTEM IS PROTECTED FROM FREEZING BY WINTERIZATION IN ACCORDANCE WITH CXT INSTRUCTIONS.
12. BUILDING NOT TO BE LOCATED IN FLOOD ZONE
13. SPECIAL INSPECTIONS REQUIRED BY 2021 IBC TABLE 1705 FOR CONCRETE, REBAR AND WELDING HAVE BEEN REVIEWED AND PER 2021 IBC 1704.2.5.1 ARE COVERED UNDER CXT INC'S PCI CERTIFICATION. CXT INC. HAS BEEN CERTIFIED BY THE PRECAST/PRE-STRESSED CONCRETE INSTITUTE (PCI), WITH A SCOPE OF C1 AND CERTIFICATION NUMBER 231589, TO BE AN APPROVED FABRICATOR. THIS CERTIFICATION EXPIRES ON 06/30/24.

APPLICABLE CODES

2021 INTERNATIONAL BUILDING CODE W/ STATEWIDE AMENDMENTS
2017 ICC/ANSI A117.1 ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES, W/ STATEWIDE AMENDMENTS
2021 INTERNATIONAL FIRE CODE W/ STATEWIDE AMENDMENTS
2021 UNIFORM PLUMBING CODE W/ STATEWIDE AMENDMENTS
2023 NATIONAL ELECTRICAL CODE (NEC) W/ STATEWIDE AMENDMENTS
2021 INTERNATIONAL MECHANICAL CODE W/ STATEWIDE AMENDMENTS
2021 WASHINGTON STATE ENERGY CODE (2021 IECC)

SPECIAL CONDITIONS AND/OR LIMITATIONS

ACCESSIBILITY TO THIS BUILDING, INCLUDING PARKING, IS TO BY PROVIDED BY OTHER AND CONSTRUCTED IN ACCORDANCE WITH ALL LOCAL BUILDING CODES

INDEX OF DRAWINGS

CASTING TOLERANCES:

OVERALL LENGTH OR WIDTH
10 FT OR UNDER = ± 1/8"
10 TO 20 FT = +1/8", -3/16"
20 TO 40 FT = ±1/4"
EDGE RIENFORCEMENT TO BE NO MORE THAN 4" FROM FORM
TOTAL THICKNESS = -1/8, +1/4
VARIATION FROM SQUARE = ±1/8 PER 6 FT OF DIAGONAL
LOCAL SMOOTHNESS = 1/4" IN 10 FT
SWEEP = ±1/4"
POSITION OF TENDONS = ±1/4"
POSITION OF BLOCKOUTS = ±1/4"
SIZE OF BLOCKOUTS = ±1/4"
POSITION OF EMBEDS = ±1/4"
TIPPING AND FLUSHNESS OF PLATES = +1/16, -1/4
BOWING = LENGTH/360
END SQUARENESS = ±1/8"

WASHINGTON STATE TAG, APPROVAL, & PE DRAWINGS (ECC ONLY) REQUIRED

WALL TEXTURE:	BARNWOOD
WALL COLOR:	SW7582 SALUTE
ROOF TEXTURE:	RIBBED METAL
ROOF COLOR:	GRANITE ROCK
TRIM PAINT:	DTM ALKYD ENAMEL BLACK
SEALER:	STANDARD
PACKAGE:	STANDARD/ MARINE SHOWERS ONLY

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

LBFoster®
CXT® Products

6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE

SCALE	N/A	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	N/A

COVER SHEET

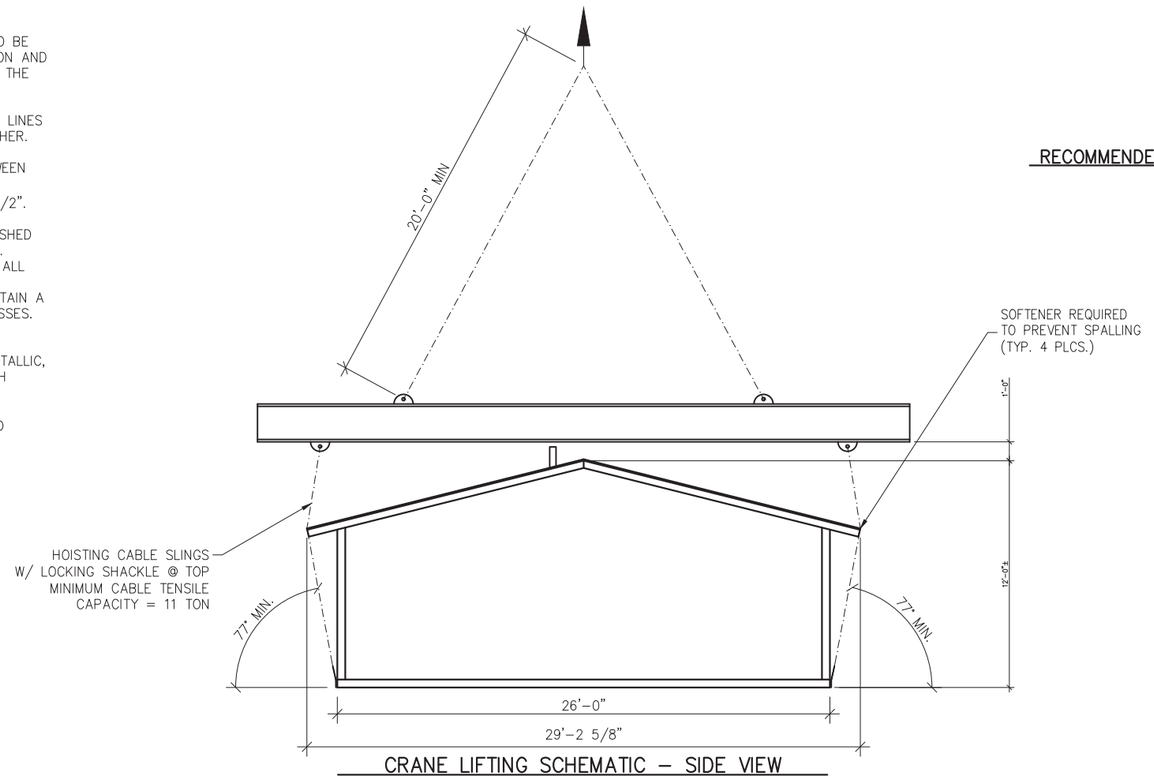
DWG NO.	SHEET	REV.
CH-01	1 / 44	0

CHEYENNE

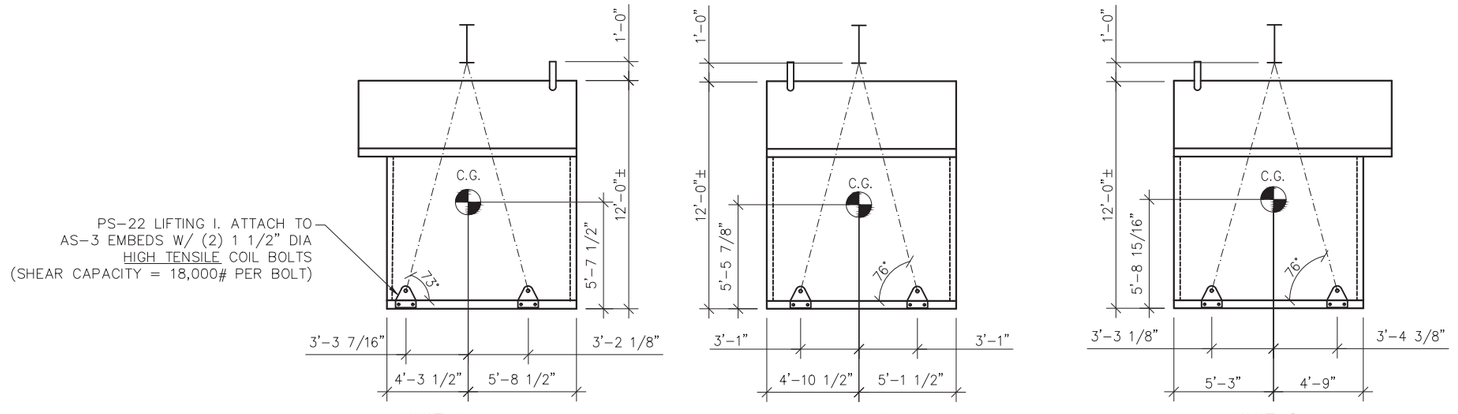
RECOMMENDED HANDLING AND INSTALLATION INSTRUCTIONS

NOTES:

1. THE ARAPAHOE STYLE BUILDING CONSISTS OF TWO SEPARATE UNITS TO BE PLACED AND JOINED AT THE PROJECT SITE. PROPER SITE PREPARATION AND HANDLING IS ESSENTIAL FOR THE SAFE AND PROPER INSTALLATION OF THE BUILDING.
2. PROVIDE SHALLOW TRENCH WITH ROLLED EDGES ALONG BUILDING JOINT LINES TO PREVENT TRAPPING MATERIAL BETWEEN UNITS BEING DRAWN TOGETHER.
3. PLACE UNITS AS CLOSE TO ONE ANOTHER AS POSSIBLE. SPACE BETWEEN UNITS SHOULD NOT EXCEED 1" AT INITIATION OF POST-TENSIONING. MAXIMUM ALLOWABLE FINISH JOINT SPACE BETWEEN UNITS SHALL BE 1/2".
4. POST-TENSIONING TO DRAW UNITS INTO CONTACT SHALL BE ACCOMPLISHED WITH EQUIPMENT PROVIDED BY CXT BY PROPERLY TRAINED PERSONNEL. INSTRUCTIONS PROVIDED BY CXT SHALL BE CAREFULLY ADHERED TO. ALL NECESSARY SAFETY PRECAUTIONS SHALL BE TAKEN BY INSTALLATION PERSONNEL. STRESS TENDONS TO DRAW UNITS TOGETHER AND TO RETAIN A MINIMUM EFFECTIVE FORCE IN EACH TENDON OF 2 KIPS AFTER ALL LOSSES.
5. AFTER COMPLETION OF BUILDING PLACEMENT, BLOCKOUTS AT POST-TENSIONING ANCHORAGE POINTS SHALL BE FILLED WITH NON-METALLIC, NON-SHRINK GROUT. PROVIDE SMOOTH, NEAT FINISH COMPATIBLE WITH SURROUNDING CONCRETE SURFACES. MATCH CONCRETE COLOR.
6. PROVIDE UTILITY CONNECTIONS (PLUMBING & ELECTRICAL) AS REQUIRED AND/OR AS CALLED FOR ON THE DRAWINGS.
7. FILL FLOOR BLOCKOUTS AFTER COMPLETION OF UTILITY HOOKUPS WITH CONCRETE. SLOPE TO DRAIN.



CRANE LIFTING SCHEMATIC – SIDE VIEW

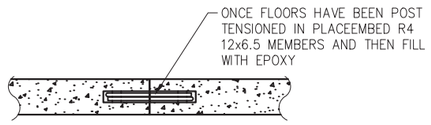


CRANE LIFTING SCHEMATIC – END VIEW

NOTES:
1. C.G. IS APPROXIMATE.
2. WEIGHT IS APPROXIMATE.

SHIPPING WEIGHTS AND DIMENSIONS				
SECTION	WEIGHT	LENGTH	WIDTH	HEIGHT
A (BACK)	70,000	29'-3"	11'-6"	12'-0"
B (FRONT)	68,500	29'-3"	10'-0"	12'-0"
B (FRONT)	68,500	29'-3"	11'-6"	12'-0"

FIELD SECTIONAL CONNECTION DETAIL



ELEVATION
VIEW
FINAL VIEW

EMBEDDED MATERIALS	
ITEM	QTY
P.T. CABLE 40'-0"	4
CHUCKS & WEDGES	8
GROUT	4 BAGS
REBAR R4 12"x6.5"	8
HIT-HY-200-A EPOXY	4

APPROXIMATE WEIGHT

HEIDEN, WILLIAM RICHARD III
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6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE

SCALE	N/A	DATE	01/25/24
DRAWN	C. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	N/A

HANDLING INSTRUCTIONS

DWG NO.	SHEET	REV.
CH-01	2 / 44	0

DOOR SCHEDULE

	TYPE	FRAME	DOOR SIZE	MATERIAL	DOOR TYPE	LATCH	LOCK
(A)	SINGLE	3/0 x 6/8 x 3-3/4"	3/0 x 6/8 x 1-3/4"	GALVANIZED	LH REVERSE	MORTISE	N/A
	GLAZING	HINGES	KICK PLATE	STOP	SWEEP	THRESHOLD	VENTILATION
	N/A	SPRING HINGE 4-1/2" x 4 1/2"	N/A	FLOOR	3'	3' x 4" x 1/4"	LOUVER
(B)	TYPE	FRAME	DOOR SIZE	MATERIAL	DOOR TYPE	LATCH	LOCK
	SINGLE	3/0 x 6/8 x 3-3/4"	3/0 x 6/8 x 1-3/4"	GALVANIZED	RH REVERSE	MORTISE	N/A
	GLAZING	HINGES	KICK PLATE	STOP	SWEEP	THRESHOLD	VENTILATION
	N/A	SPRING HINGE 4-1/2" x 4 1/2"	N/A	FLOOR	3'	3' x 4" x 1/4"	LOUVER
(C)	TYPE	FRAME	DOOR SIZE	MATERIAL	DOOR TYPE	LATCH	LOCK
	SINGLE	3/0 x 6/8 x 3-3/4"	3/0 x 6/8 x 1-3/4"	GALVANIZED	LH REVERSE	MORTISE THUMBTURN	N/A
	GLAZING	HINGES	KICK PLATE	STOP	SWEEP	THRESHOLD	VENTILATION
	N/A	SS SPRING HINGE 4-1/2" x 4 1/2"	N/A	WALL	3'	3' x 4" x 1/4"	N/A
(D)	TYPE	FRAME	DOOR SIZE	MATERIAL	DOOR TYPE	LATCH	LOCK
	SINGLE	3/0 x 6/8 x 3-3/4"	3/0 x 6/8 x 1-3/4"	GALVANIZED	RH REVERSE	MORTISE THUMBTURN	N/A
	GLAZING	HINGES	KICK PLATE	STOP	SWEEP	THRESHOLD	VENTILATION
	N/A	SS SPRING HINGE 4-1/2" x 4 1/2"	8"x34" US32D	OVERHEAD SLIDING DOOR STOP	3'	3' x 4" x 1/4"	N/A
(E)	TYPE	FRAME	DOOR SIZE	MATERIAL	DOOR TYPE	LATCH	LOCK
	SINGLE	3/0 x 6/8 x 3-3/4"	3/0 x 6/8 x 1-3/4"	GALVANIZED	LH REVERSE	PASSAGE	DEADBOLT
	GLAZING	HINGES	KICK PLATE	STOP	SWEEP	THRESHOLD	VENTILATION
	N/A	SPRING HINGE 4-1/2" x 4 1/2"	8"x34" US32D	WALL	3'	3' x 4" x 1/4"	N/A

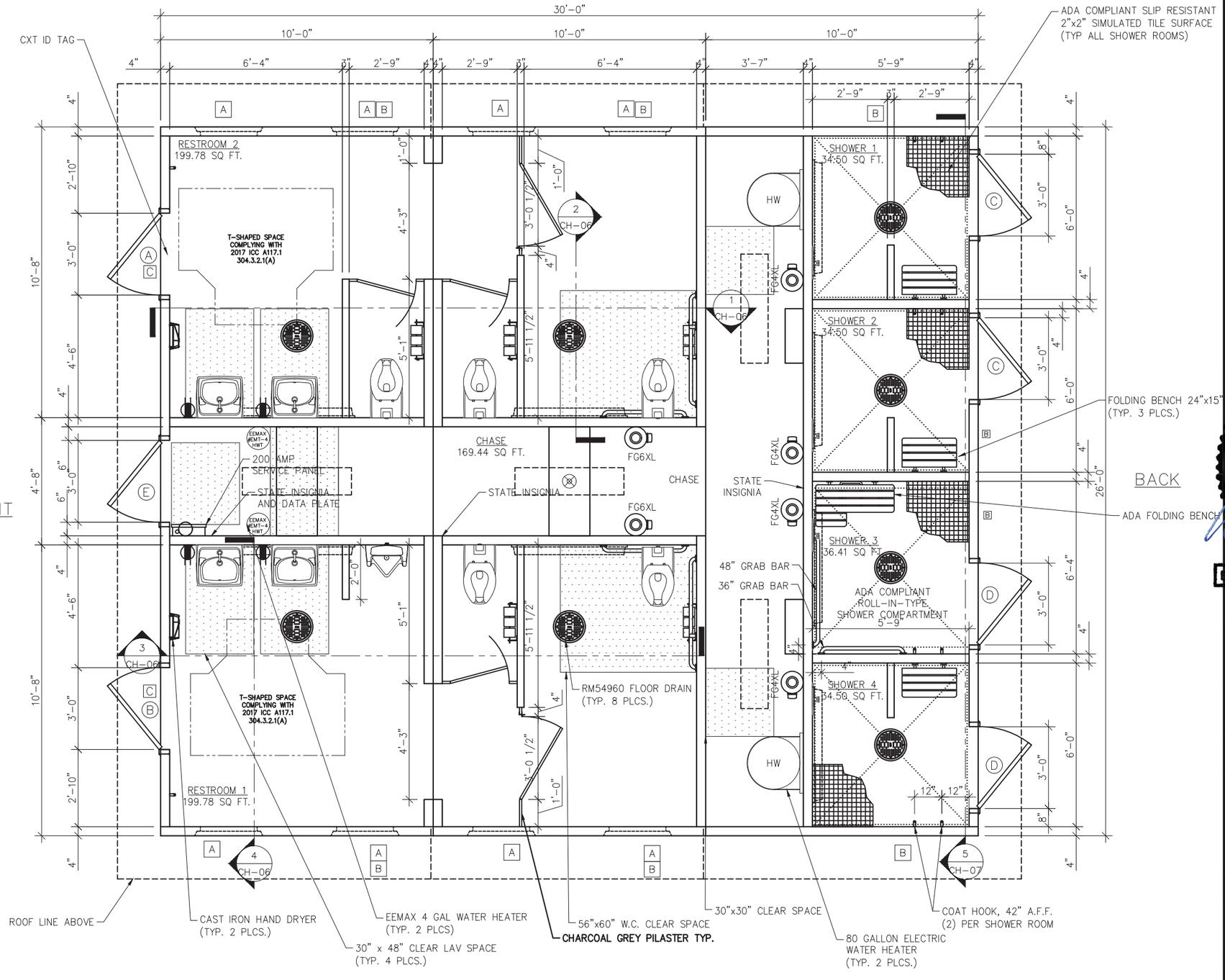
1. ALL EXTERIOR DOORS AND WINDOWS TO BE LISTED AND LABELED AS COMPLIANT WITH AAMA/WDMA/CSA101/I.S.2/A440 OR TESTED PER AASTM E330.
2. DOOR HARDWARE SHALL NOT REQUIRE TIGHT GRASPING, TIGHT PINCHING OR TWISTING OF THE WRIST OR SPECIAL KNOWLEDGE TO OPERATE.
3. UNLATCHING OF ANY DOOR SHALL NOT REQUIRE MORE THAN ONE OPERATION.

FRONT

WINDOW & VENT SCHEDULE

SYMBOL	DESCRIPTION
A	MS-4 WINDOW EMBED
B	MS-2 VENT EMBED
C	DOOR LOUVER

LEXAN SELF-IGNITION > 1000, SMOKE DENSITY < 75, CLASS CC1.



NOTES:
1. PLUMBING COMPONENTS ARE SHOWN FOR GENERAL ARRANGMENT ONLY. SEE SHEETS CH-37 THRU CH-42 FOR COMPLETE SYSTEM DISCRIPTIONS
2. SEE DRAWING CH-37 FOR SIZE AND LOCATION OF FLOOR BLOCKOUTS

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
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EXPIRES April 23, 2025

June 10, 2024

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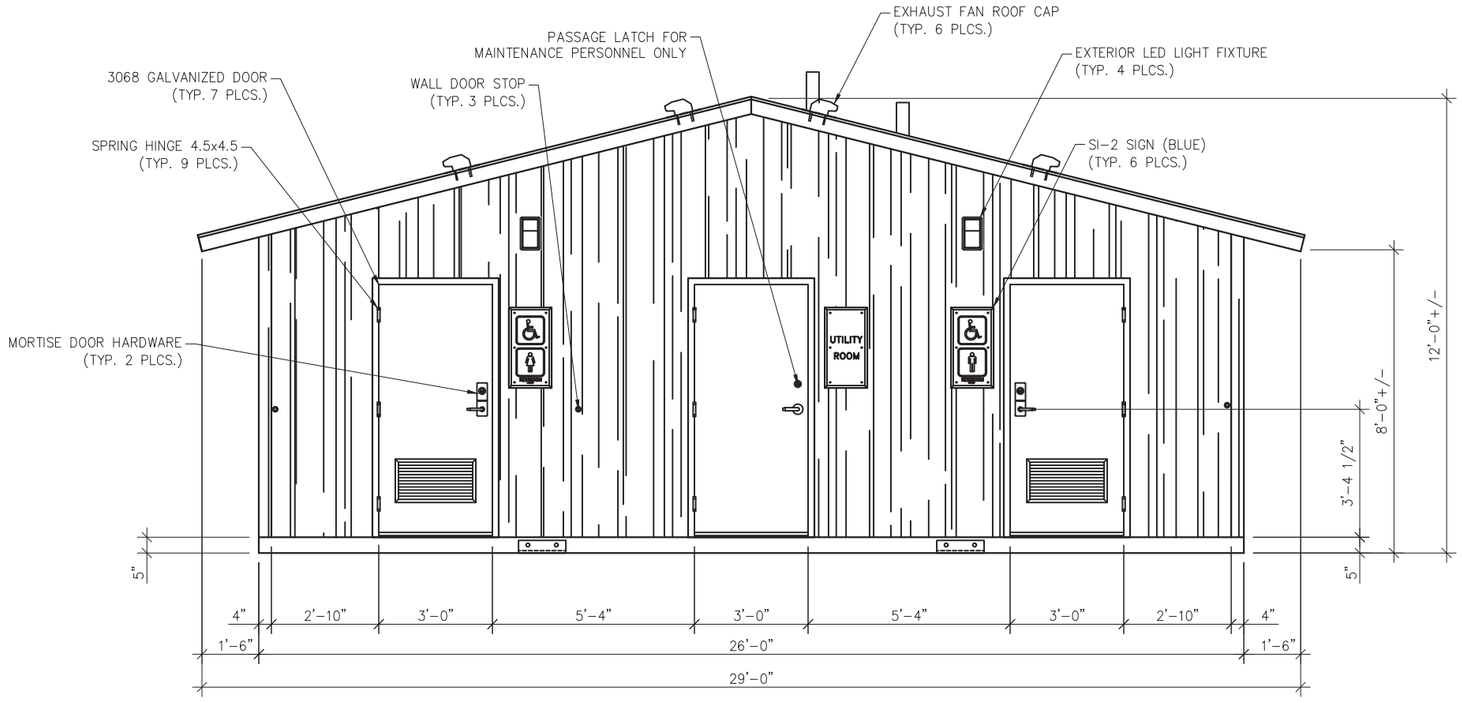
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

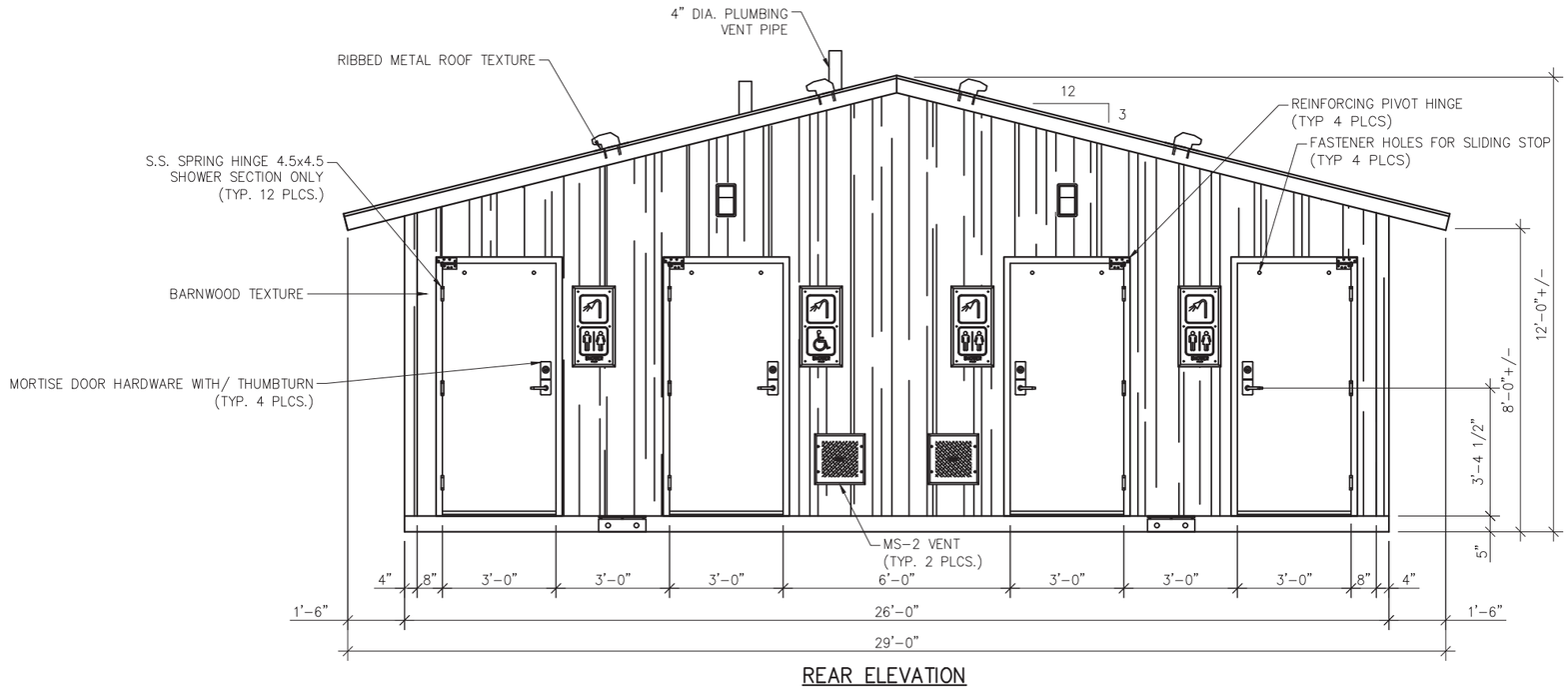
REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

FLOOR PLAN

DWG NO.	SHEET	REV.
CH-01	3 / 44	0



FRONT ELEVATION



REAR ELEVATION

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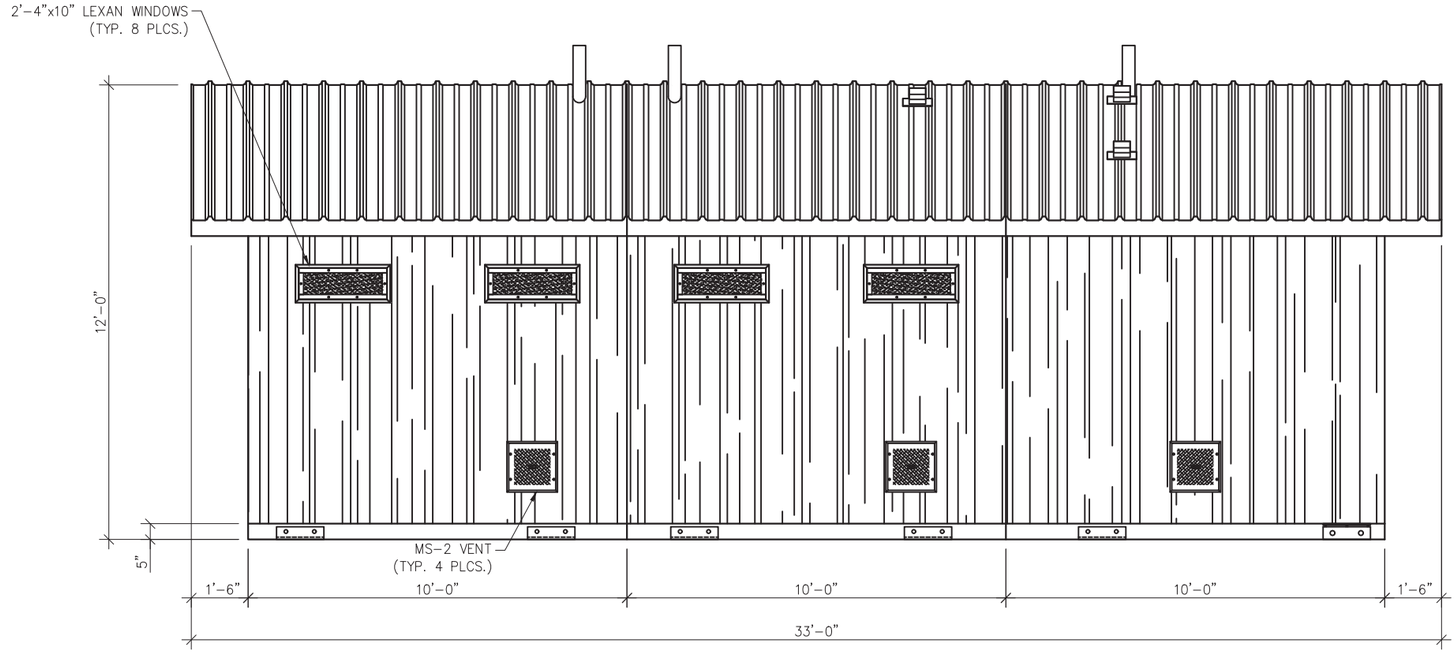
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

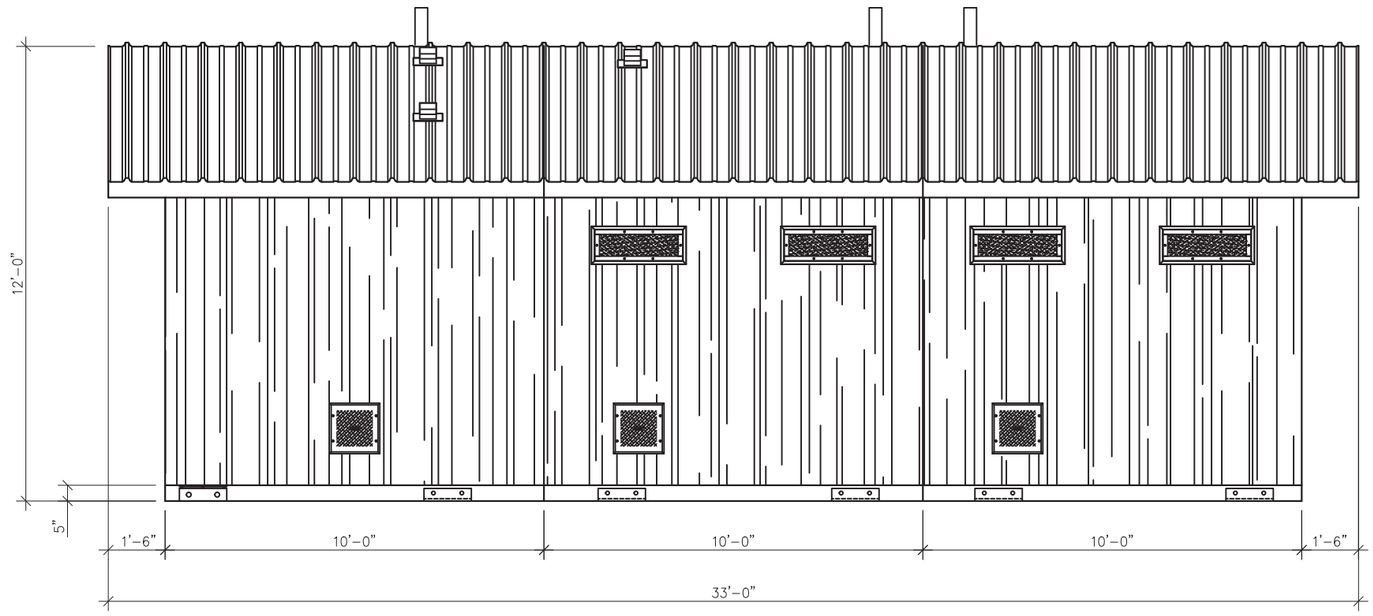
REV.	DESCRIPTION	APPROVAL	DATE
SCALE	1/4"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	48

BUILDING
ELEVATIONS

DWG NO.	SHEET	REV.
CH-01	4 / 44	0



RH SIDE ELEVATION



LH SIDE ELEVATION

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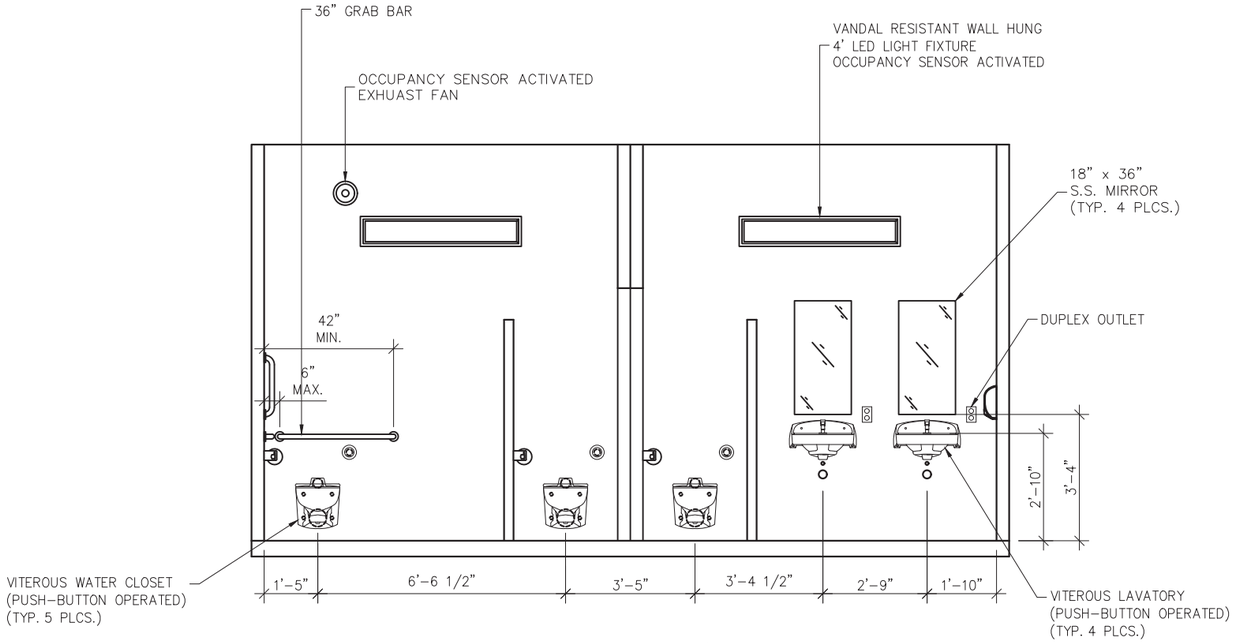
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE

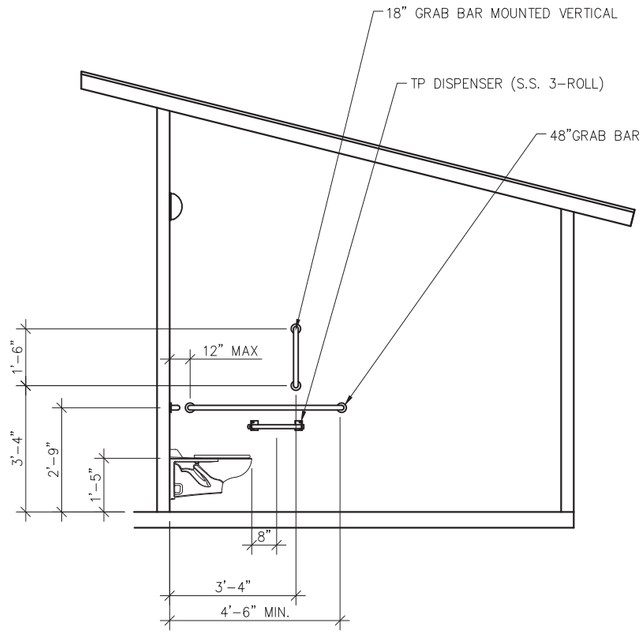
SCALE	1/4"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	48

INTERIOR
ELEVATIONS

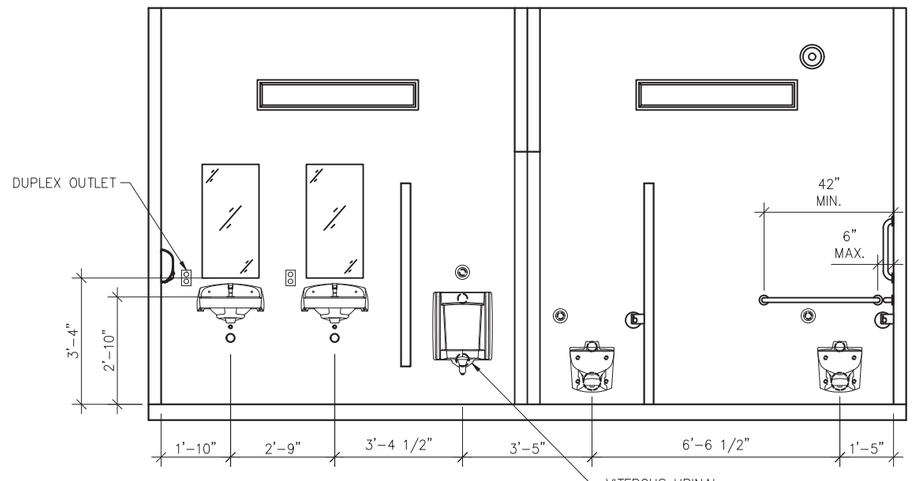
DWG NO.	SHEET	REV.
CH-01	5 / 44	0



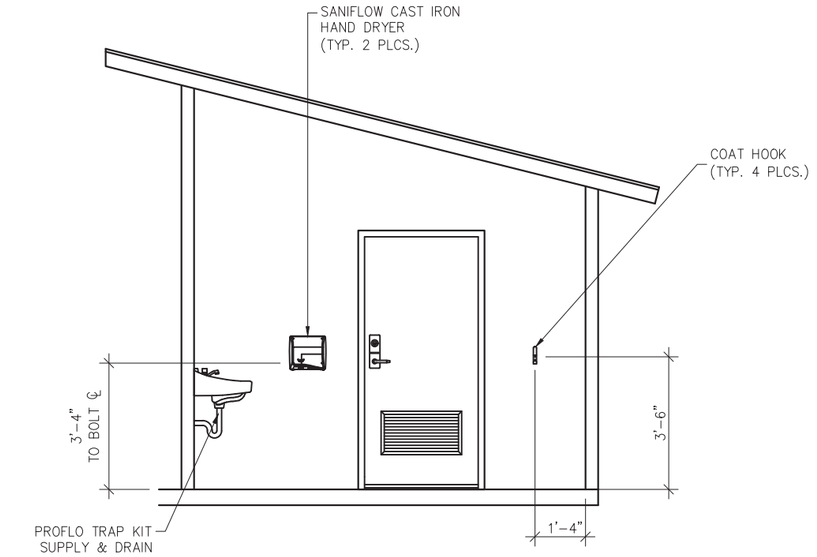
1 INTERIOR ELEVATION – WOMEN'S RESTROOM



2 INTERIOR ELEVATION



3 INTERIOR ELEVATION -MEN'S RESTROOM



4 INTERIOR ELEVATION

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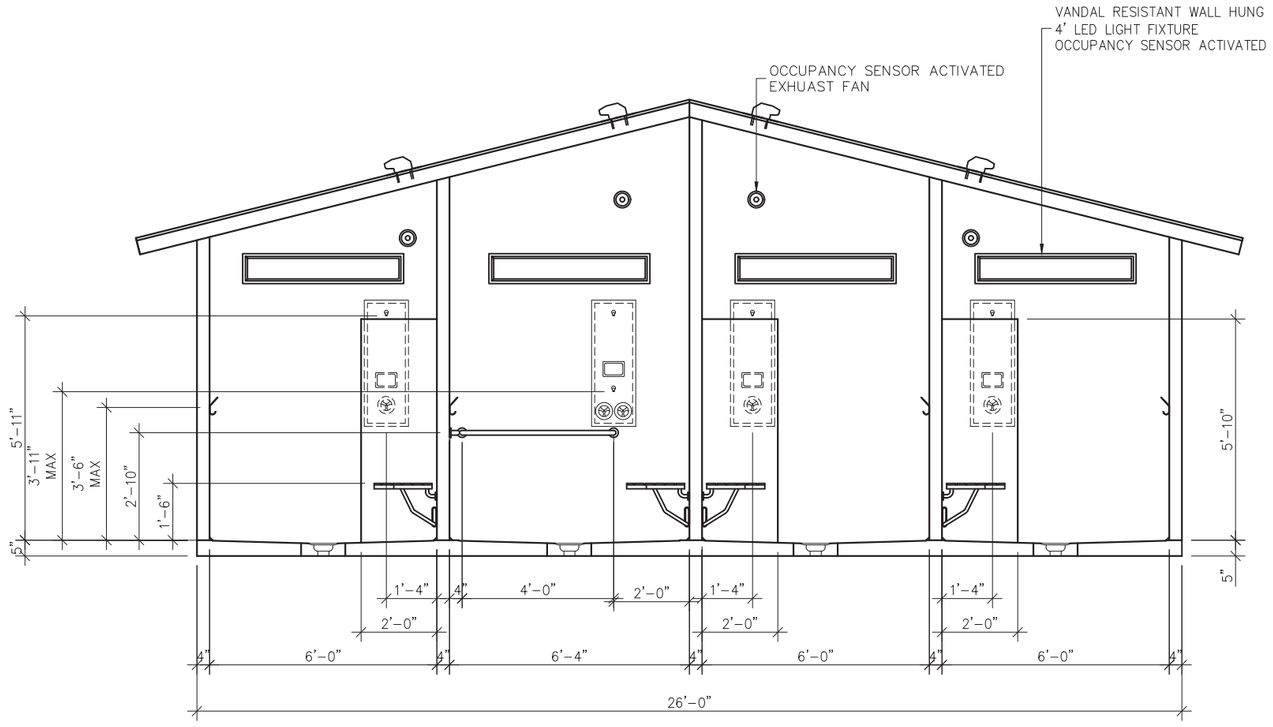
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	1"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	12

FINISH
DETAILS

DWG NO.	SHEET	REV.
CH-01	6 / 44	0



5 INTERIOR ELEVATION -SHOWERS

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PROJECT TITLE
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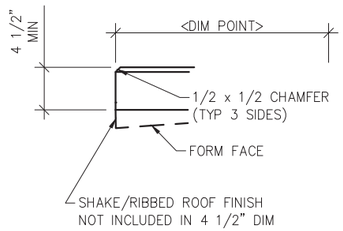
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE

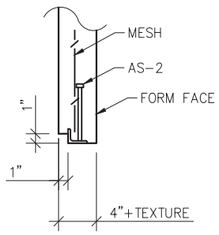
SCALE	1/4"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	48

INTERIOR ELEVATIONS
DETAILS

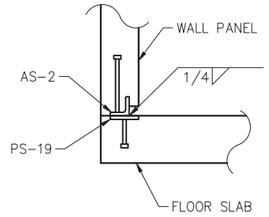
DWG NO.	SHEET	REV.
CH-01	7 / 44	0



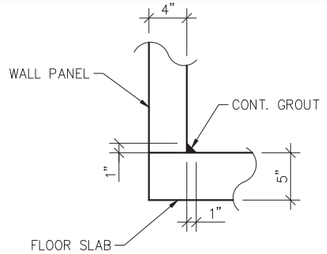
1 TYPICAL ROOF SLAB EDGE
SCALE: 3/4"=1'-0"



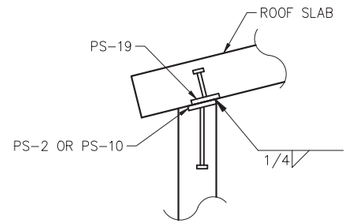
2 AS-2 CAST DETAIL
SCALE: 3/4"=1'-0"



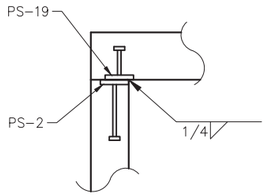
3 TYPICAL WALL TO FLOOR SLAB WELDED CONNECTION
SCALE: 3/4"=1'-0"



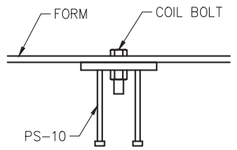
4 TYPICAL WALL TO FLOOR SLAB JOINT DETAIL
SCALE: 3/4"=1'-0"



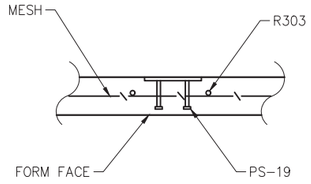
5 TYPICAL WALL TO ROOF SLAB WELDED CONNECTION
SCALE: 3/4"=1'-0"



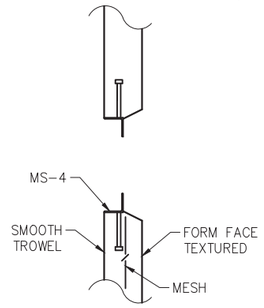
6 TYPICAL WALL TO WALL PANEL WELDED CONNECTION
SCALE: 3/4"=1'-0"



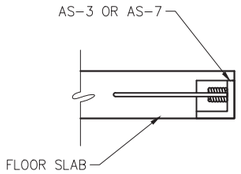
7 PS-10 CASTING DETAIL
SCALE: 1"=1'-0"



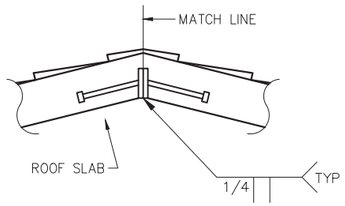
8 PS-19 CASTING DETAIL
SCALE: 3/4"=1'-0"



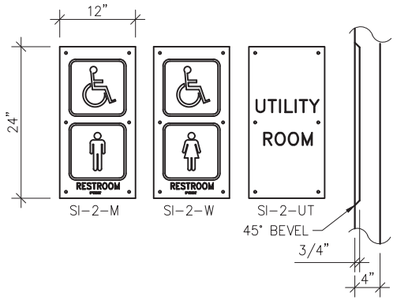
9 MS-4 EMBED CASTING DETAIL
SCALE: 3/4"=1'-0"



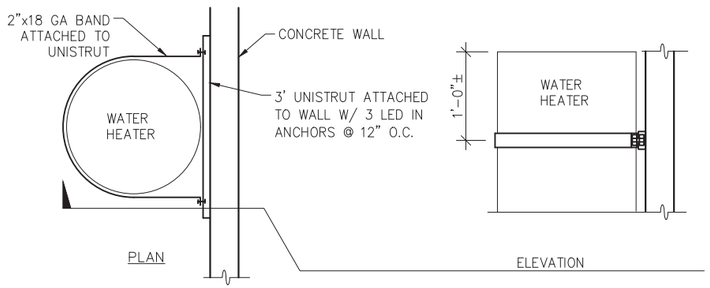
10 FLOOR LIFT PLATE DETAIL
SCALE: 3/4"=1'-0"



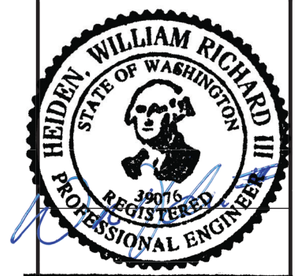
11 ROOF PEAK WELDMENT DETAIL
SCALE: 3/4"=1'-0"



12 SI-2 DETAIL
SCALE: 3/4"=1'-0"



13 FLOOR MOUNTED WATER HEATER RESTRAIN
SCALE: NTS



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901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

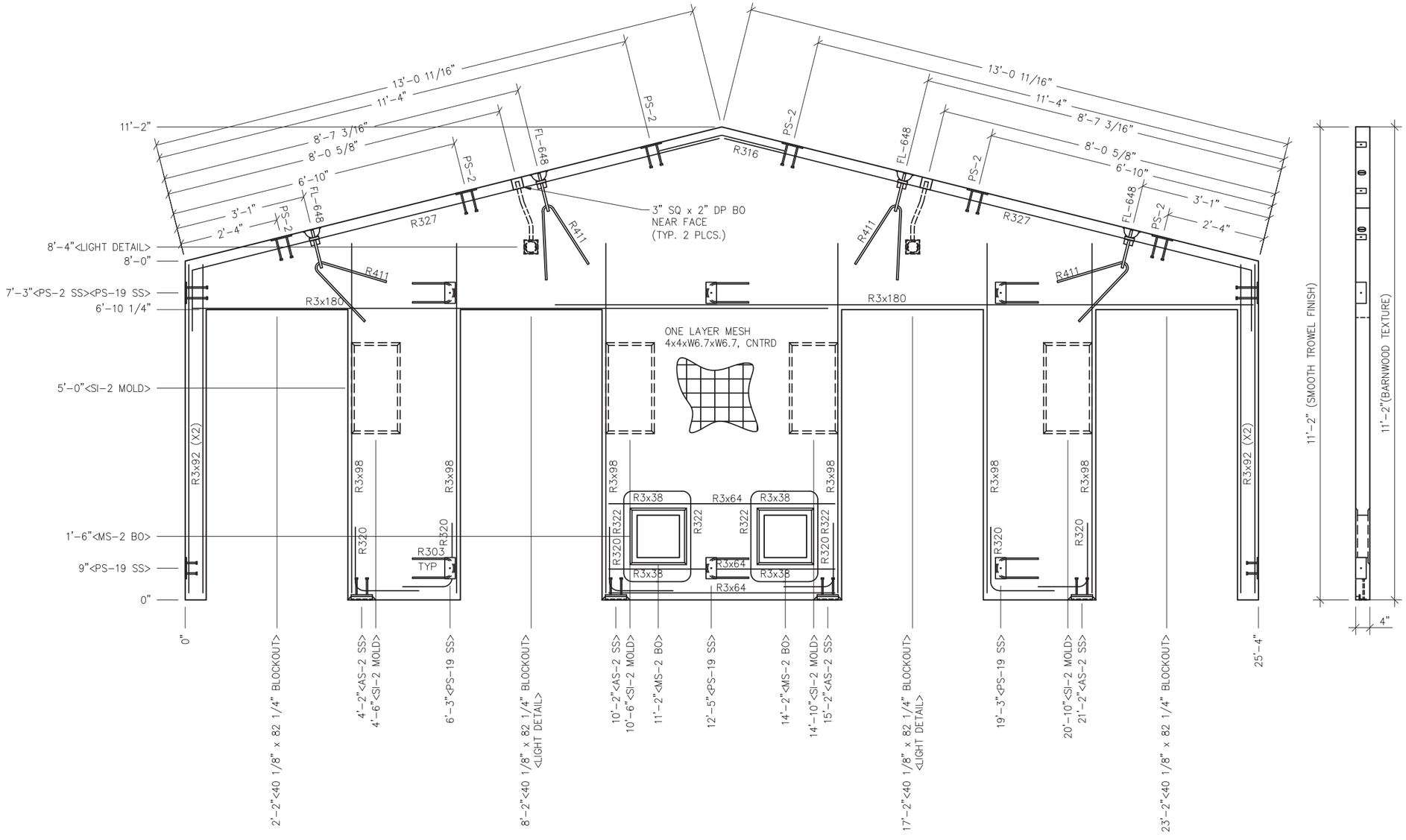
REV.	DESCRIPTION	APPROVAL	DATE

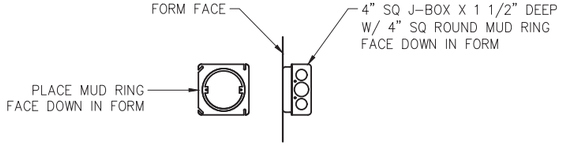
SCALE	AS NOTED	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	16

CASTING DETAILS

DWG NO.	SHEET	REV.
CH-01	8 / 44	0

MARINE PACKAGE





LIGHT DETAIL

NOTES:
1. EXCEPT R3X64, R303, R327, R316, & R411, REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER

EMBEDDED MATERIALS	
ITEM	QTY
AS-2 SS	4
PS-2 SS	8
PS-19 SS	8
FL648	4
R411	4
R3x64	3
R3x92	4
R3x98	12
R3x180	2
R303	6
R316	1
R327	2
R320	6
40 1/8" x 82 1/4" B.O.	4
SI-2 MOLD	4
4x4 J-BOX	2
ROUND MUD RING	2
BLOCKOUT 3"x3"x2" DEEP	1
R322	4

MARINE PACKAGE
SURFACE AREA: 48.0 SF
APPROXIMATE WEIGHT: 1,200 LBS

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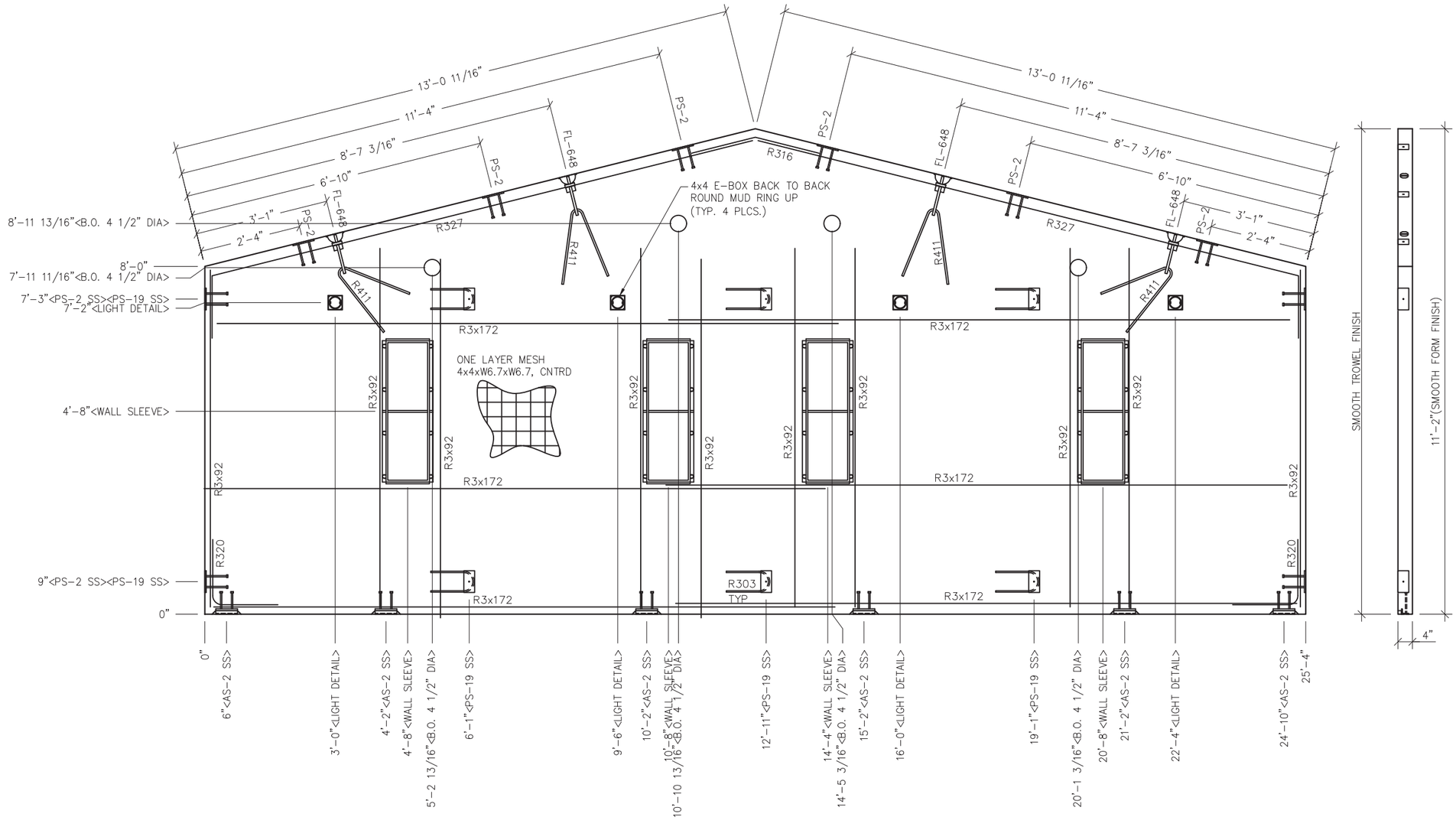
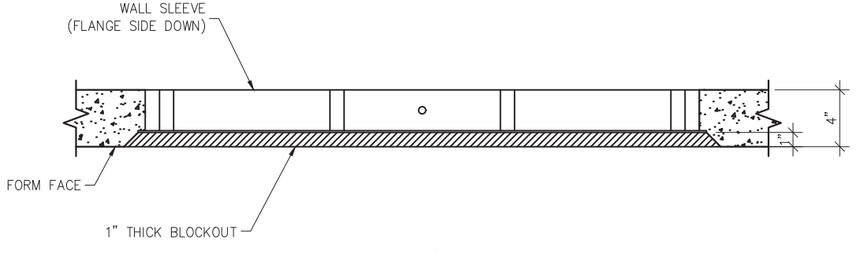
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W1

DWG NO.	SHEET	REV.
CH-01	9 / 44	0

MARINE PACKAGE





WALL SLEEVE BLOCKOUT DETAIL

NOTES:
1. EXCEPT R303, R411, R327, R316, & R3x172 REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER ALL OTHER BARS TO BE CENTERED IN PANEL.

EMBEDDED MATERIALS	
ITEM	QTY
AS-2 SS	6
PS-2 SS	10
PS-19 SS	6
FL648	4
R411	4
R303	6
R316	1
R320	2
R327	2
R3x92	10
R3x172	6
BLOCKOUT 4 1/2" DIA	4
4x4 E-BOX	16
ROUND MUD RING	4
SHOWER WALL SLEEVE	4

MARINE PACKAGE
SQ. FT.: 77.0
APPROXIMATE WEIGHT:

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REGISTERED
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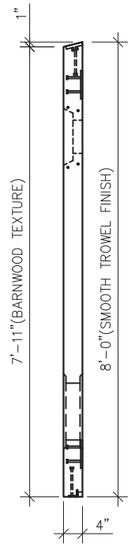
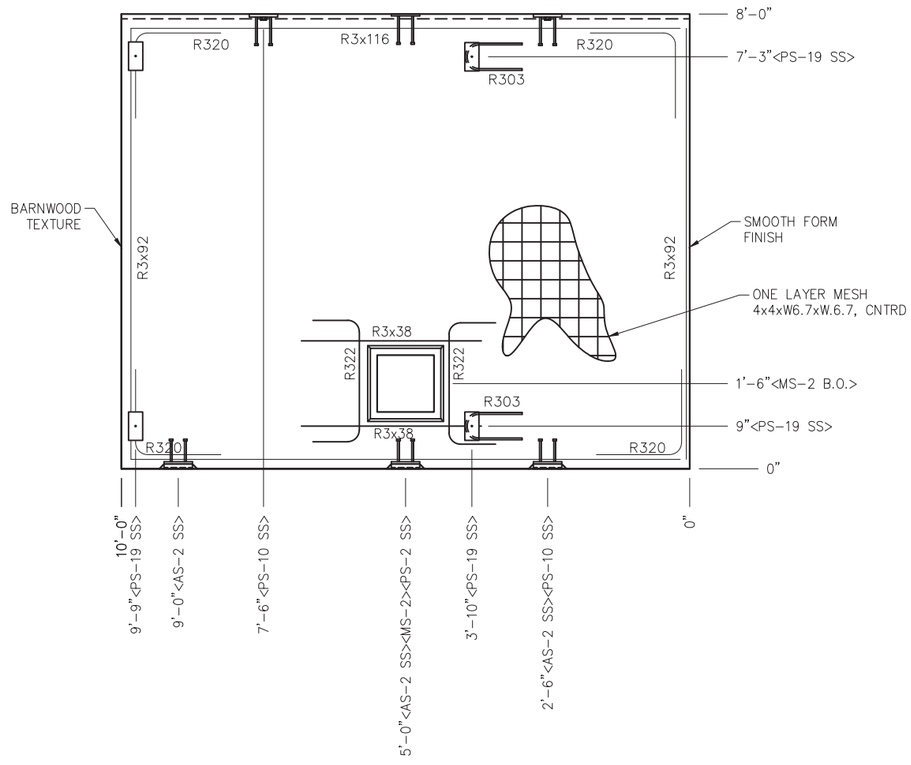
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W2

DWG NO.	SHEET	REV.
CH-01	10 / 44	0





NOTES:
1. EXCEPT R3x38, R303, & R322 REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER
2. ALL OTHER REBAR TO BE CENTERED IN PANEL.

EMBEDDED MATERIALS	
ITEM	QTY
AS-2 SS	3
PS-2 SS	1
PS-10 SS	2
PS-19 SS	4
R303	2
R320	4
R322	2
R3x38	2
R3x92	2
R3x116	2
MS-2 BLOCKOUT	1

MARINE PACKAGE
APPROXIMATE WEIGHT: 86.2

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

LBFoster®
CXT® Products

6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

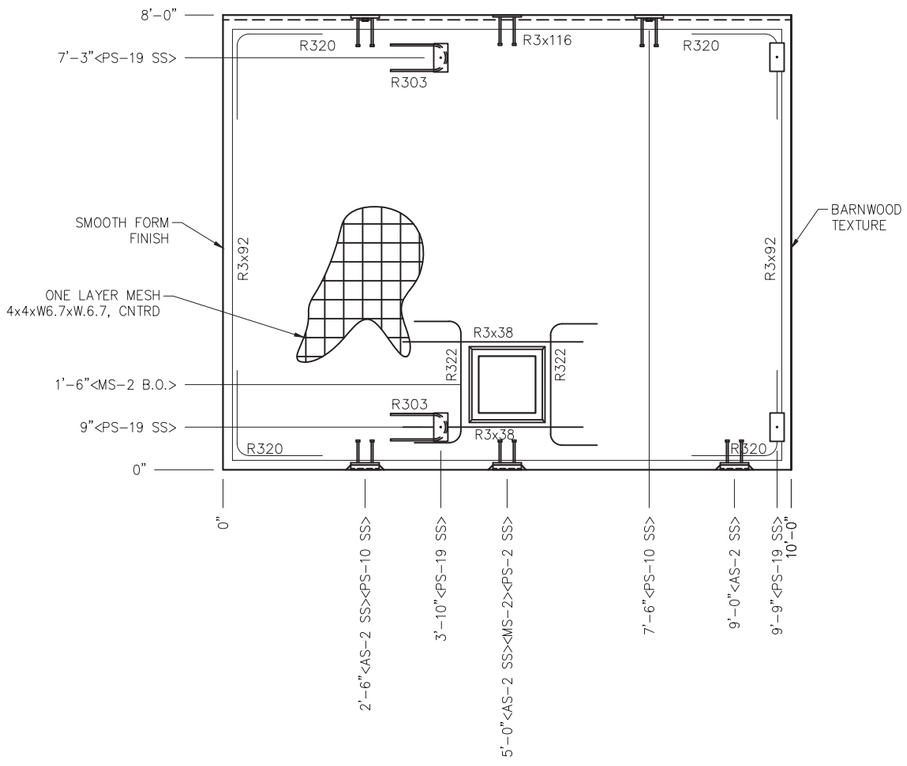
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

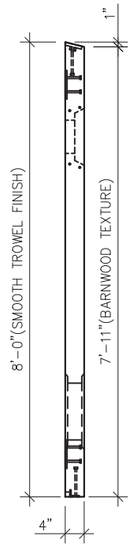
REV.	DESCRIPTION	APPROVAL	DATE

SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W3

DWG NO.	SHEET	REV.
CH-01	11 / 44	0





NOTES:

1. EXCEPT R3x38, R303, & R322 REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER
2. ALL OTHER REBAR TO BE CENTERED IN PANEL.

EMBEDDED MATERIALS	
ITEM	QTY
AS-2 SS	3
PS-2 SS	1
PS-10 SS	2
PS-19 SS	3
R303	2
R320	4
R322	2
R3x38	2
R3x92	2
R3x116	2
MS-2 BLOCKOUT	1

MARINE PACKAGE
APPROXIMATE WEIGHT:
86.2

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PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

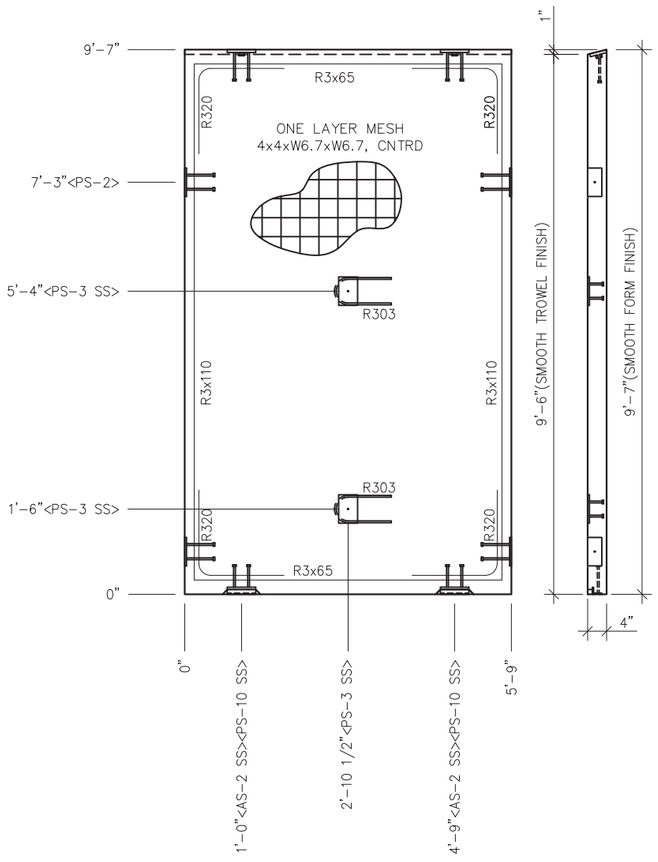
REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W4

DWG NO.	SHEET	REV.
CH-01	12 / 44	0

MARINE PACKAGE

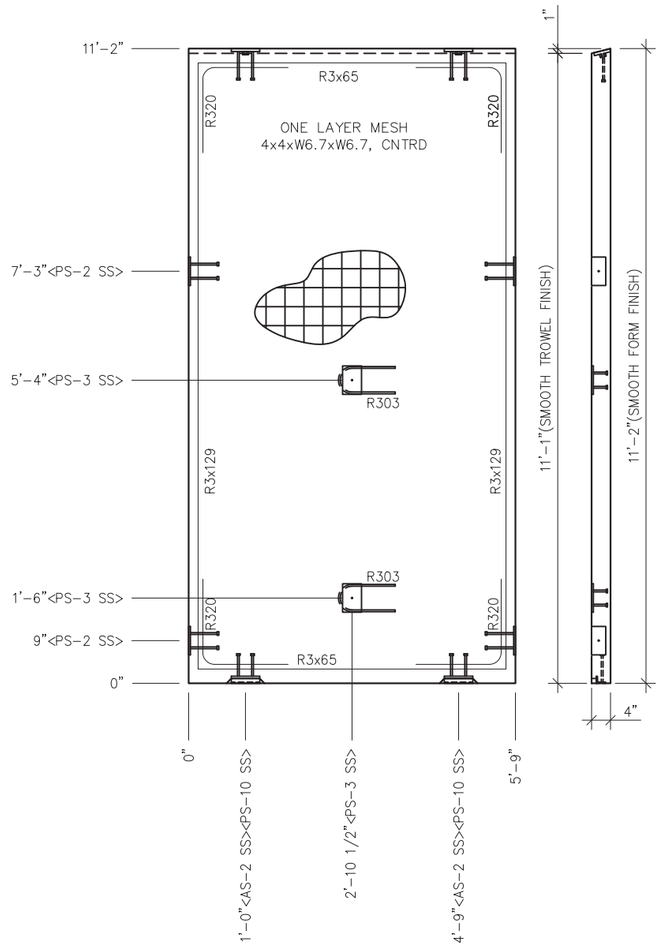
EMBEDDED MATERIALS			
ITEM	QTY	ITEM	QTY
AS-2 SS	2		
PS-10 SS	2		
PS-2 SS	4		
R320	4		
R3x65	2		
R3x110	2		
PS-3 SS	2		
R303	2		
MARINE PACKAGE			
CU. FT. CONC.	SQ. FT. W.M.F.	APPROX CONC WEIGHT	
18.2 (0.68)	55	2,735	



WALL PANEL MARK W5

MARINE PACKAGE

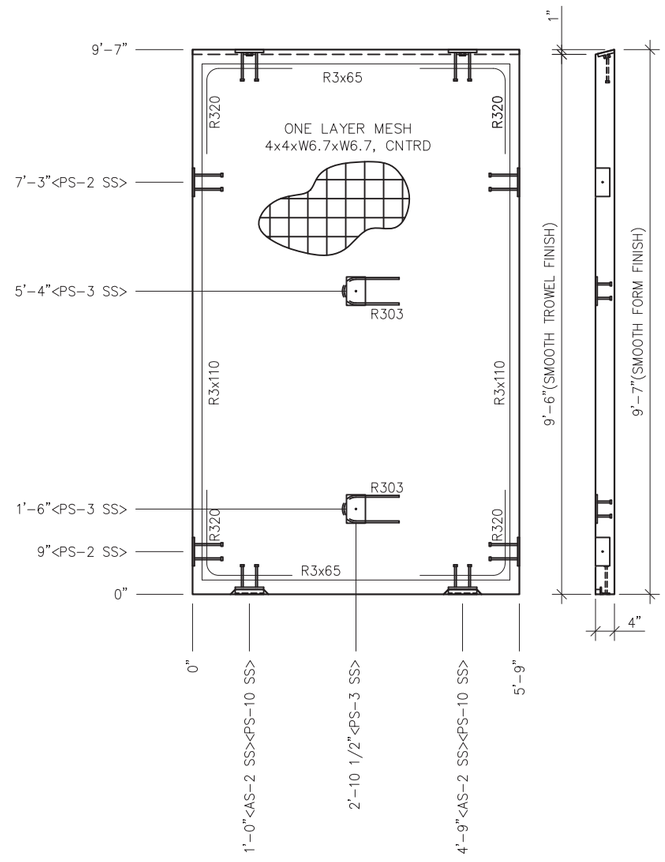
EMBEDDED MATERIALS			
ITEM	QTY	ITEM	QTY
AS-2 SS	2		
PS-10 SS	2		
PS-2 SS	4		
R320	4		
R3x65	2		
R3x129	2		
PS-3 SS	2		
R303	2		
MARINE PACKAGE			
CU. FT. CONC.	SQ. FT. W.M.F.	APPROX CONC WEIGHT	
21.3 (0.79)	65	3,190	



WALL PANEL MARK W6

MARINE PACKAGE

EMBEDDED MATERIALS			
ITEM	QTY	ITEM	QTY
AS-2 SS	2		
PS-10 SS	2		
PS-2 SS	4		
R320	4		
R3x65	2		
R3x110	2		
PS-3 SS	2		
R303	2		
MARINE PACKAGE			
CU. FT. CONC.	SQ. FT. W.M.F.	APPROX CONC WEIGHT	
18.2 (0.68)	55	2,735	



WALL PANEL MARK W7

NOTES:
1. EXCEPT R303, REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER.
2. ALL OTHER REBAR TO BE CENTERED IN PANEL

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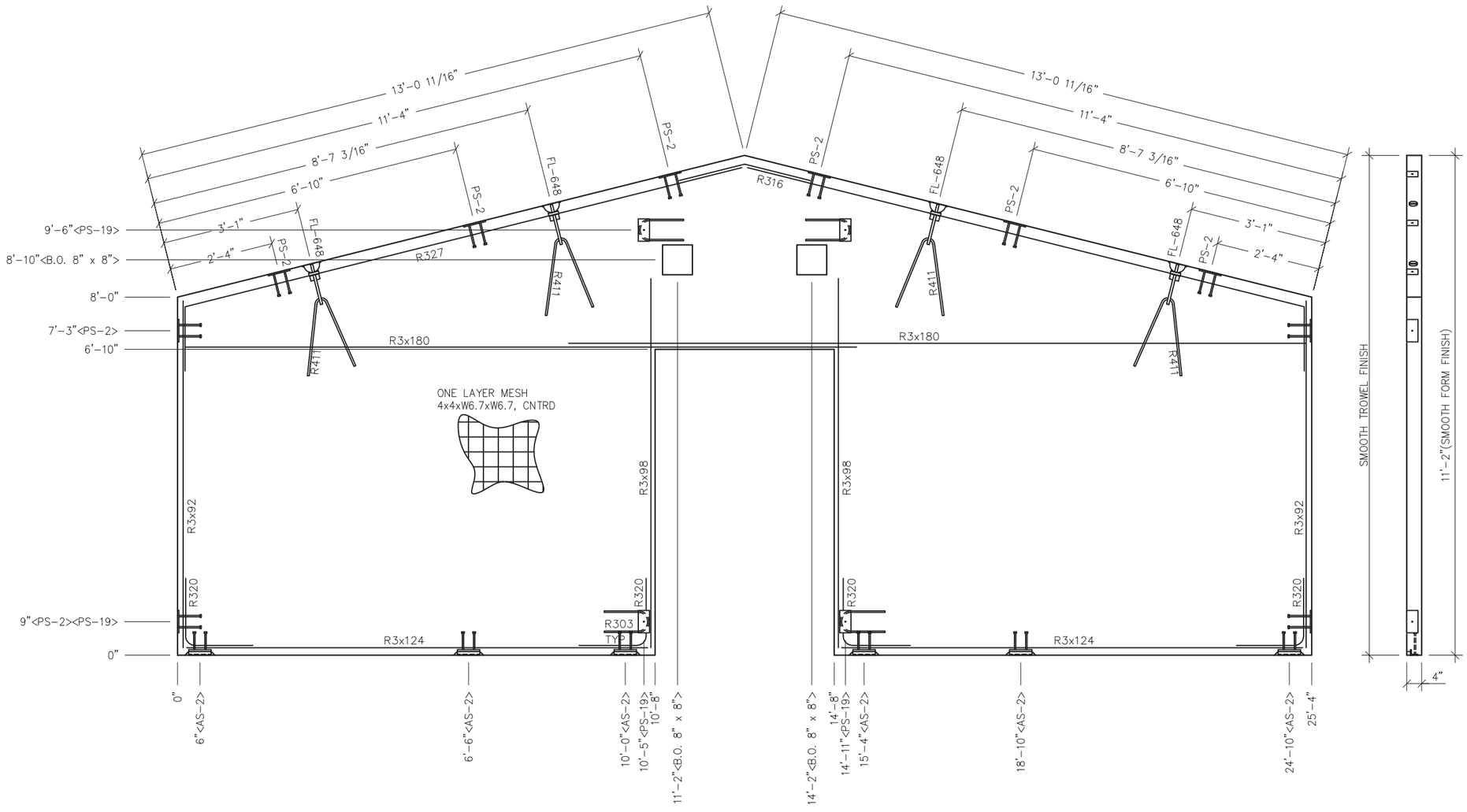
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W5,W6, & W7

DWG NO.	SHEET	REV.
CH-01	13 / 44	0



NOTES:
1. EXCEPT R303, R411, R327 & R316, REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER

EMBEDDED MATERIALS	
ITEM	QTY
AS-2	6
PS-2	8
PS-19	4
FL648	4
R411	4
R303	4
R316	1
R320	4
R327	2
R3x92	2
R3x98	2
R3x124	2
R3x180	2
BLOCKOUT 8"x8"	2

APPROXIMATE WEIGHT: 71.5 KIPS

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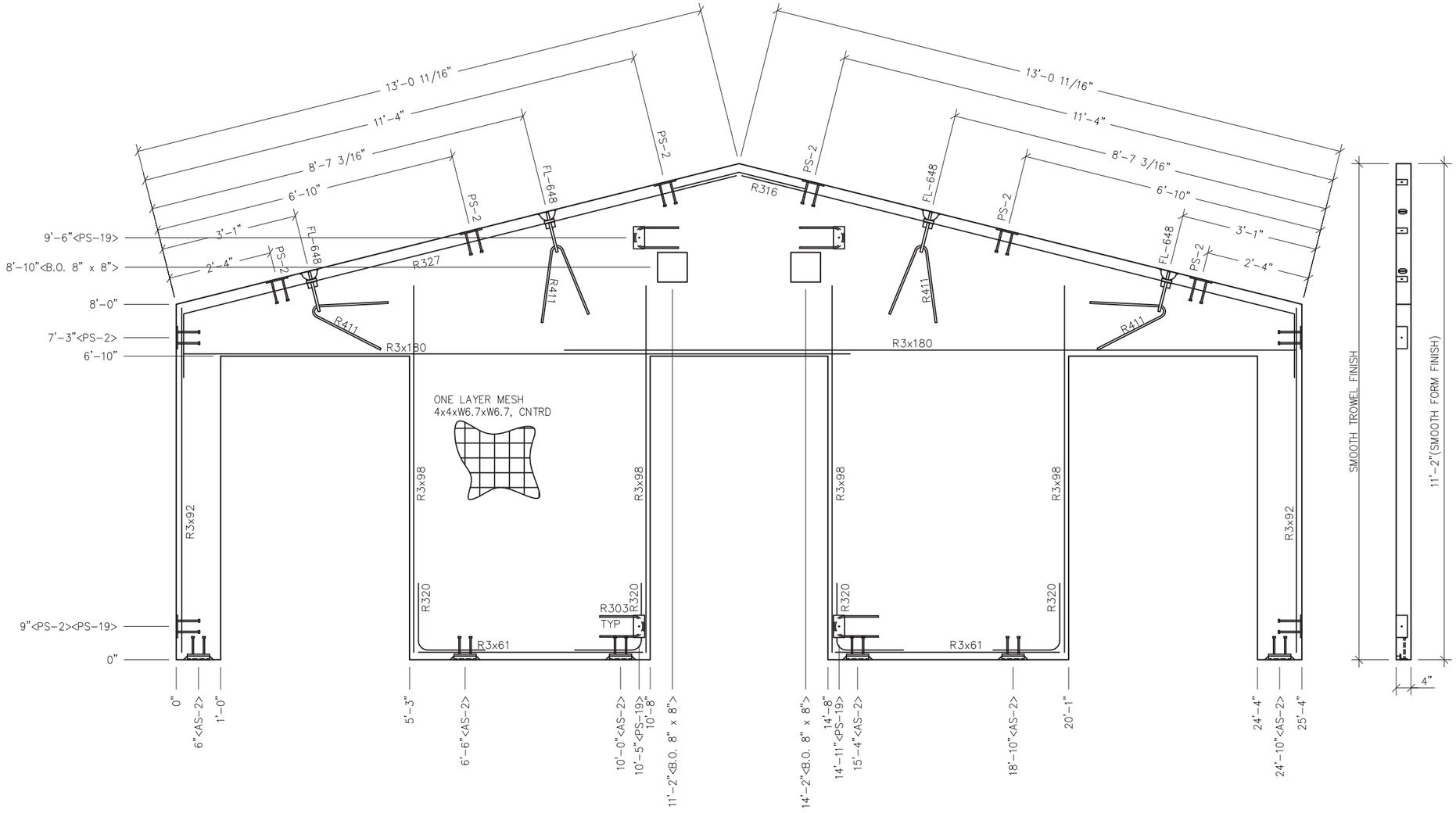
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W8

DWG NO.	SHEET	REV.
CH-01	14 / 44	0



NOTES:
1. EXCEPT R303, R411, R327 & R316, REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER

EMBEDDED MATERIALS	
ITEM	QTY
AS-2	6
PS-2	10
PS-19	4
FL648	4
R411	4
R303	4
R316	1
R320	4
R327	2
R3x92	2
R3x98	4
R3x61	2
R3x180	2
BLOCKOUT 8"x8"	2

APPROXIMATE WEIGHT: 52,1[illegible] LBS.

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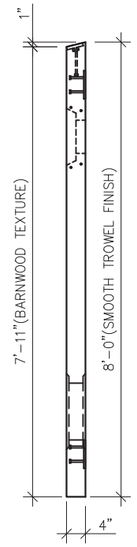
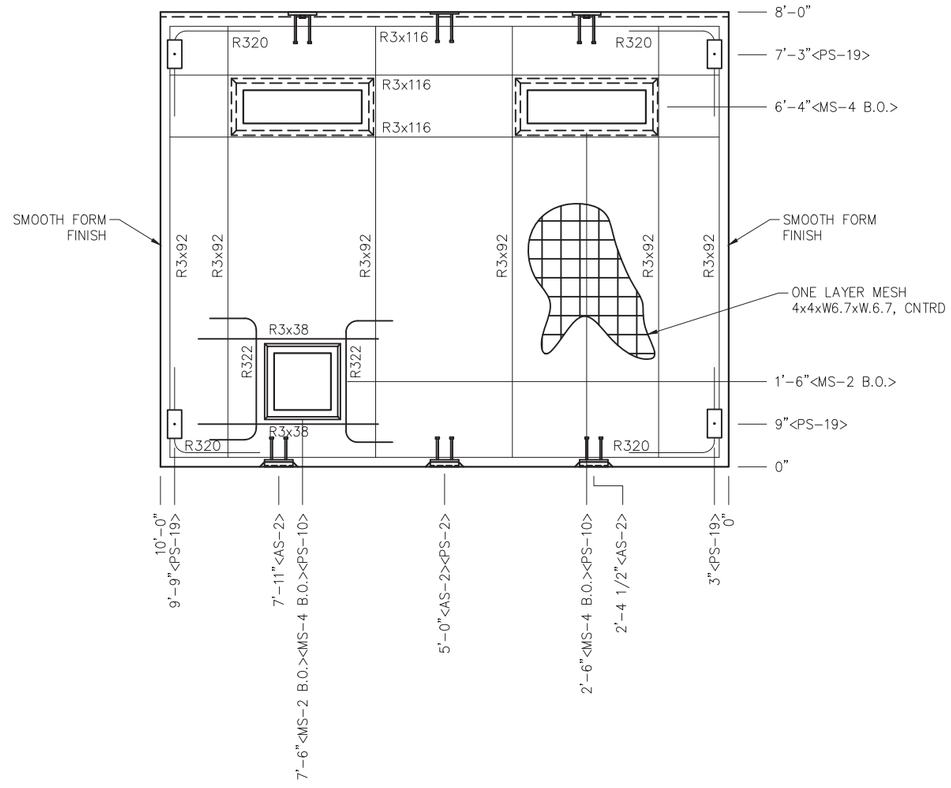
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W9

DWG NO.	SHEET	REV.
CH-01	15 / 44	0





NOTES:
1. EXCEPT R322 & R3x38 REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER
2. ALL OTHER REBAR TO BE CENTERED IN PANEL.

EMBEDDED MATERIALS	
ITEM	QTY
AS-2	3
PS-2	1
PS-10	2
PS-19	4
R320	4
R322	2
R3x38	2
R3x92	6
R3x116	4
MS-2 BLOCKOUT	2
MS-4 BLOCKOUT	2

SURFACE AREA: 25.4 SF
APPROXIMATE WEIGHT: 6,350 LBS

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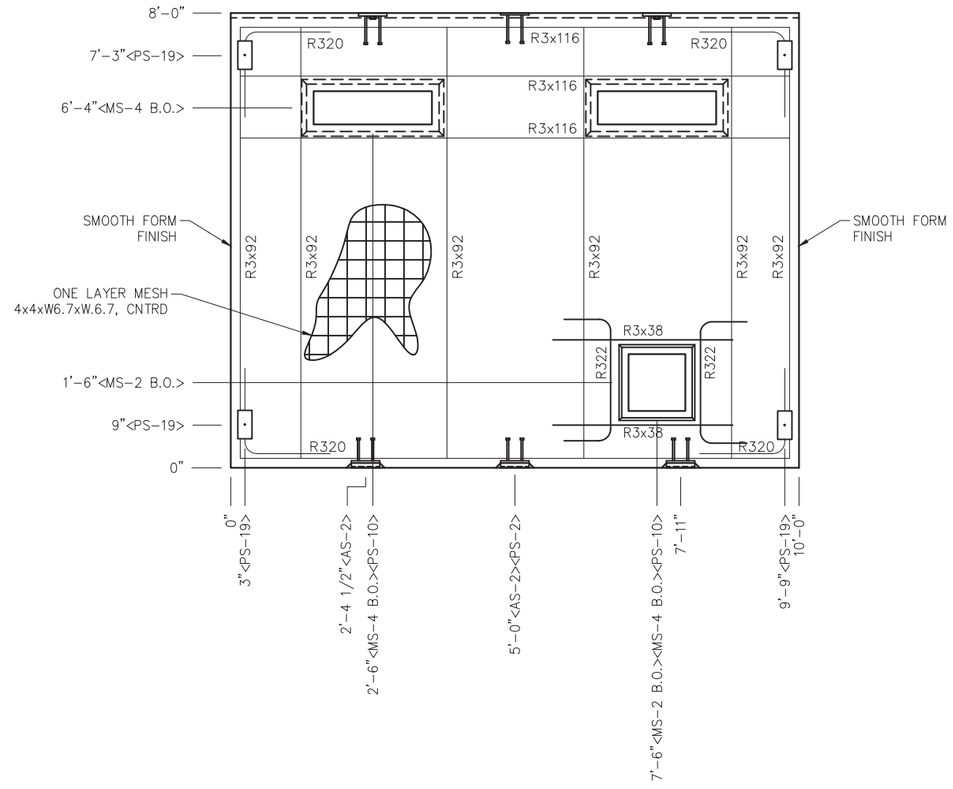
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

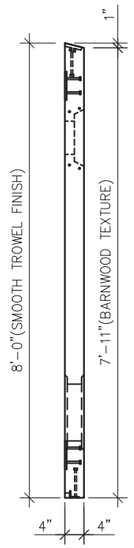
REV.	DESCRIPTION	APPROVAL	DATE

SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W10

DWG NO.	SHEET	REV.
CH-01	16 / 44	0





NOTES:
1. EXCEPT R322 & R3x38 REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER
2. ALL OTHER REBAR TO BE CENTERED IN PANEL.

EMBEDDED MATERIALS	
ITEM	QTY
AS-2	3
PS-2	1
PS-10	2
PS-19	4
R320	8
R322	2
R3x38	1
R3x92	12
R3x116	8
MS-2 BLOCKOUT	2
MS-4 BLOCKOUT	2

SURFACE AREA: 25.4 SQ. FT.
APPROXIMATE WEIGHT: 6,350 LBS.

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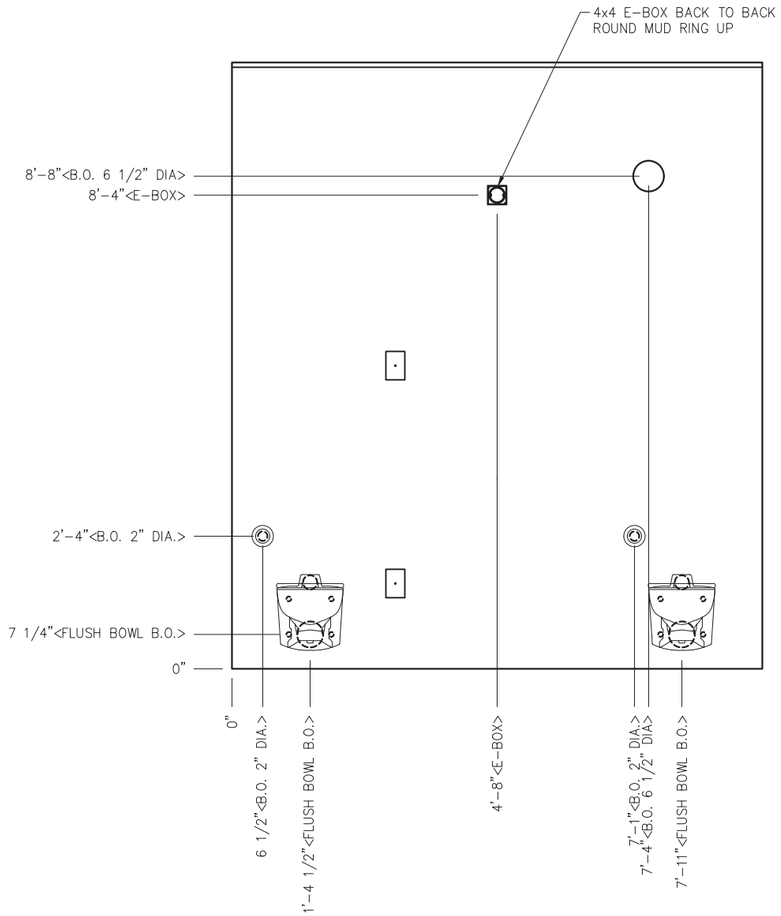
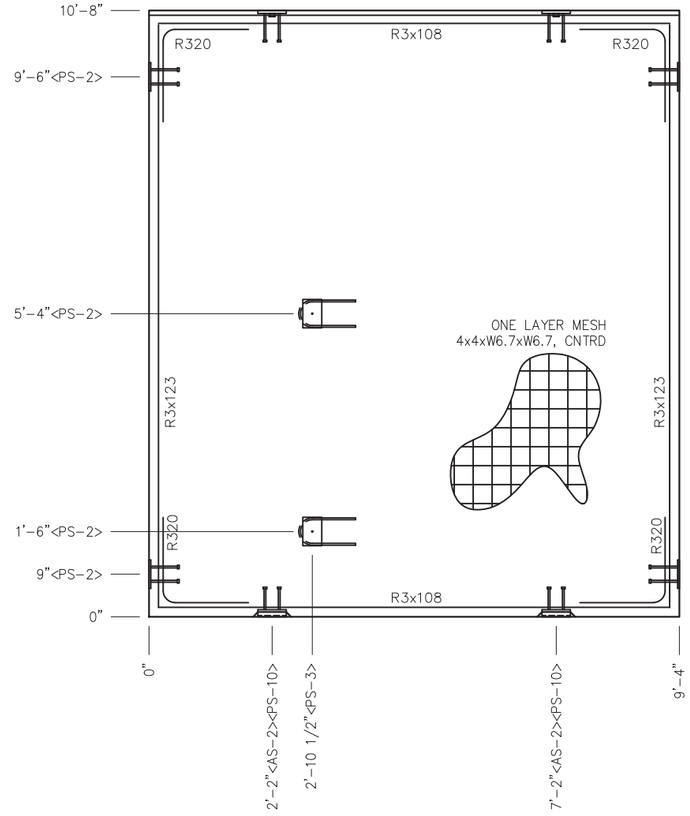
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

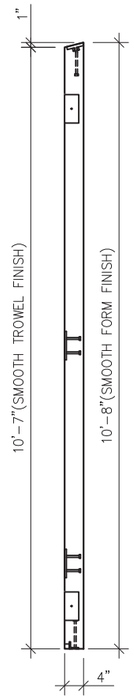
REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W11

DWG NO.	SHEET	REV.
CH-01	17 / 44	0

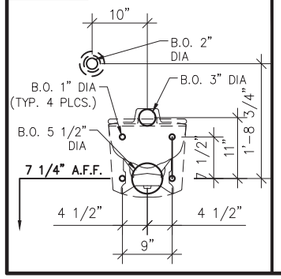






BLOCKOUT DETAIL

FLUSH VALVE BOWL DETAIL
AMERICAN STANDARD 0356.421



NOTES:
1. REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER

EMBEDDED MATERIALS	
ITEM	QTY
AS-2	2
PS-2	4
PS-3	2
PS-2	2
R303	2
R320	4
R3x108	2
R3x123	2
4x4 E-BOX	2
ROUND MUD RING	1
BLOCKOUT 6 1/2" DIAMETER	1
FLUSH BOWL BLOCKOUT	1
BLOCKOUT 2" DIAMETER	1

APPROXIMATE WEIGHT: 33,000 LBS

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PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

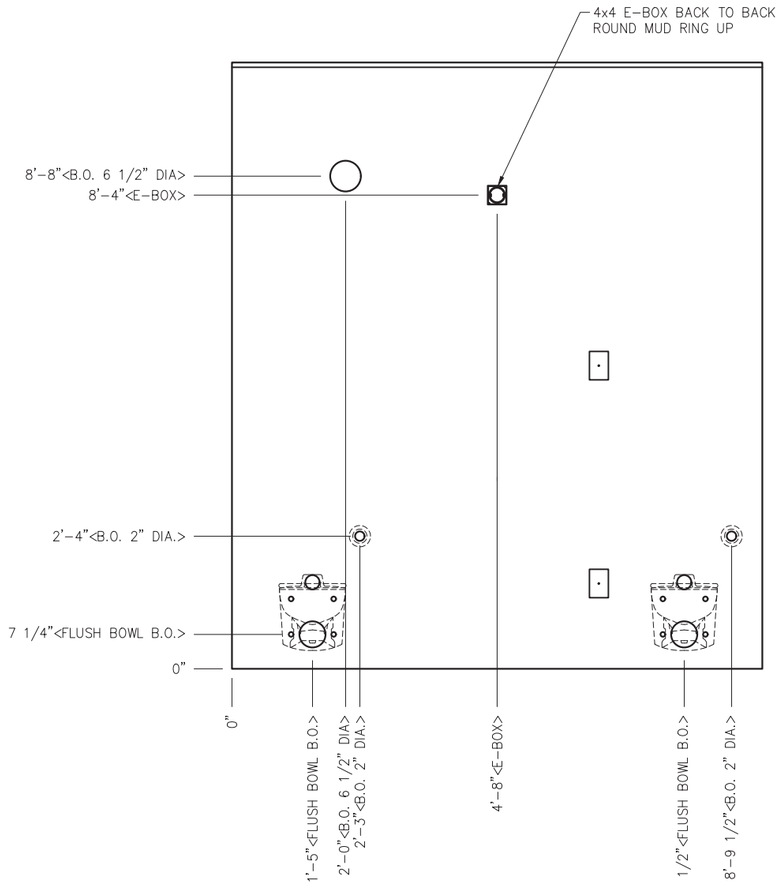
NOTICE

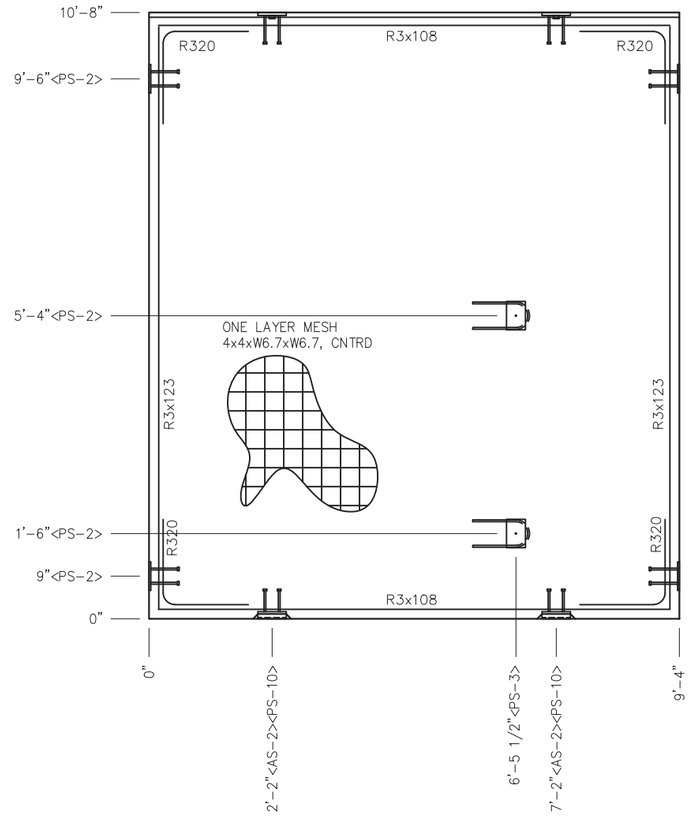
REV.	DESCRIPTION	APPROVAL	DATE

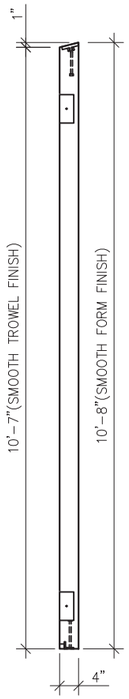
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W12

DWG NO.	SHEET	REV.
CH-01	18 / 44	0







EMBEDDED MATERIALS	
ITEM	QTY
AS-2	2
PS-2	6
PS-10	2
R303	2
R320	4
R3x108	2
R3x123	2
4x4 E-BOX	2
ROUND MUD RING	1
BLOCKOUT 6 1/2" DIAMETER	1
FLUSH BOWL BLOCKOUT	1
BLOCKOUT 2" DIAMETER	1

APPROXIMATE WEIGHT: 33.0 K

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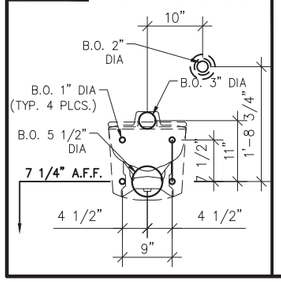
BLOCKOUT DETAIL

FLUSH VALVE BOWL DETAIL
AMERICAN STANDARD 0356.421



NOTES:
1. REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER

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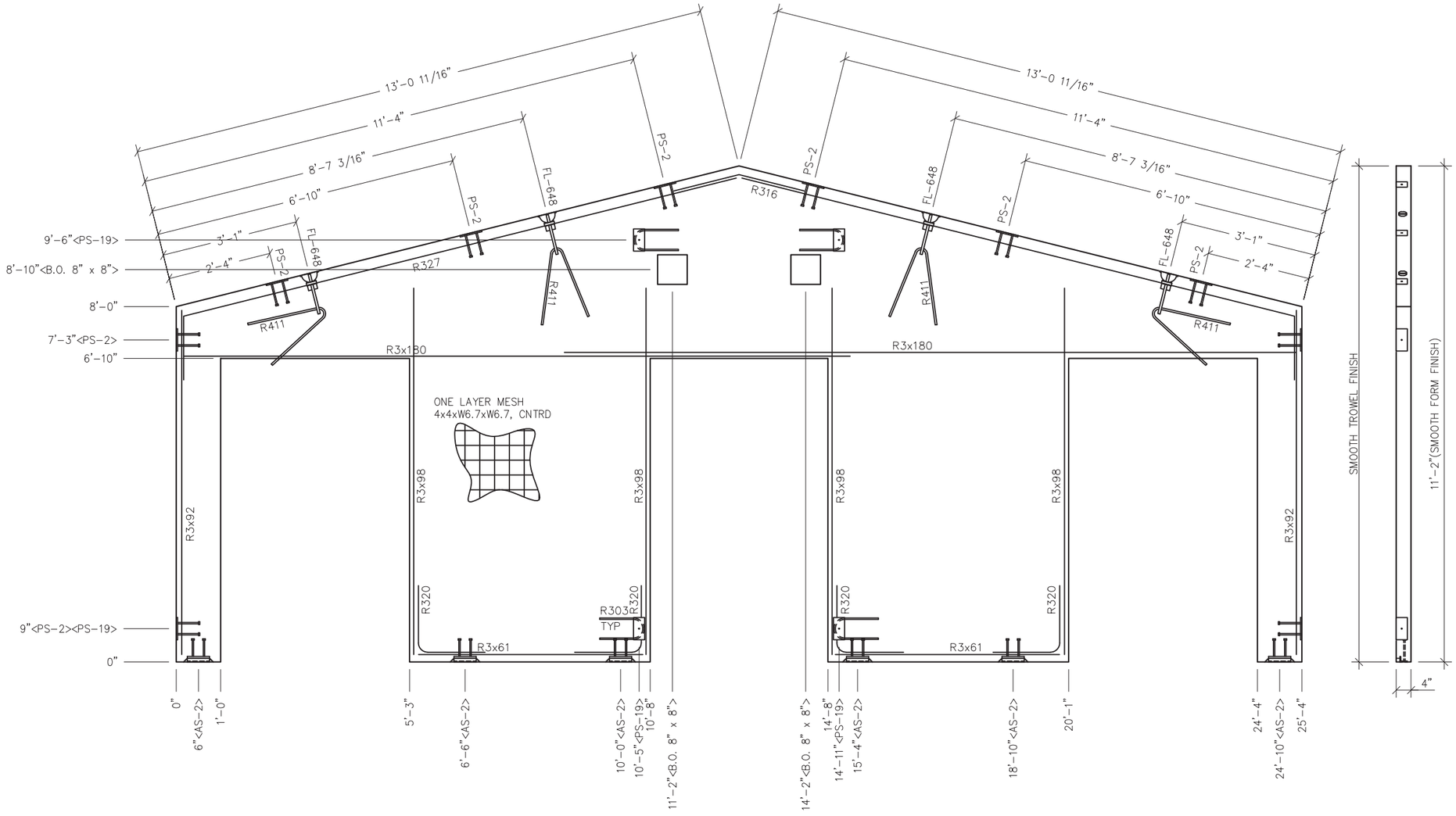
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE

SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W13

DWG NO.	SHEET	REV.
CH-01	19 / 44	0



EMBEDDED MATERIALS	
ITEM	QTY
AS-2	6
PS-2	10
PS-19	4
FL648	4
R411	4
R303	4
R316	1
R320	4
R327	2
R3x92	2
R3x98	4
R3x61	2
R3x180	2
BLOCKOUT 8"x8"	2

APPROXIMATE WEIGHT: 52,1

NOTES:
1. EXCEPT R303, R411, R327 & R316, REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER

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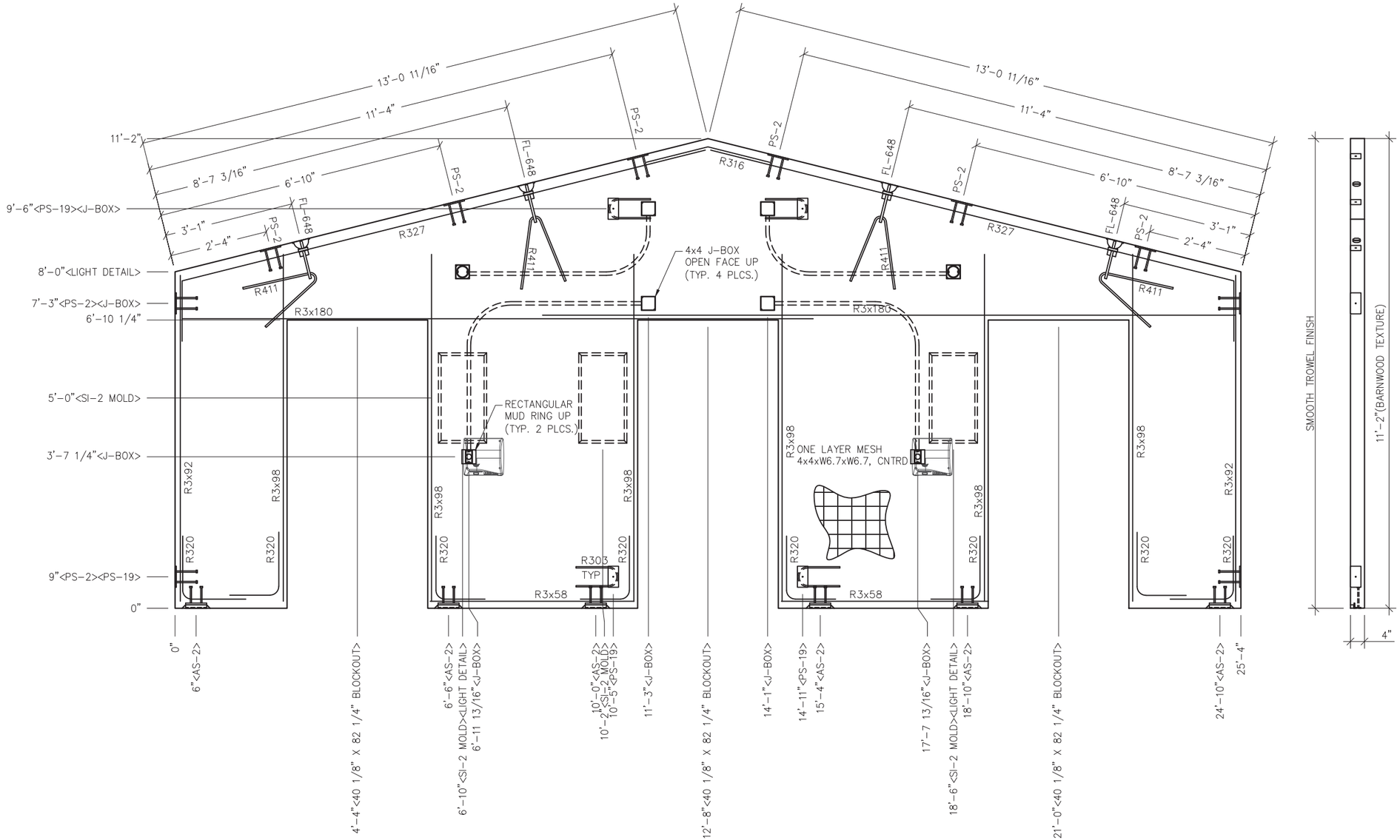
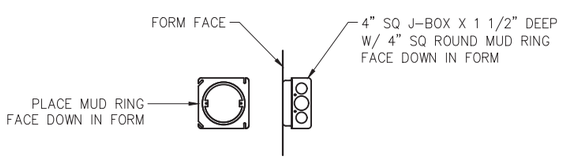
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W14

DWG NO.	SHEET	REV.
CH-01	20 / 44	0





LIGHT DETAIL

EMBEDDED MATERIALS	
ITEM	QTY
AS-2	6
PS-2	10
PS-19	4
FL648	4
R411	4
R3x58	2
R3x92	2
R3x98	6
R3x180	2
R303	4
R316	1
R327	2
R320	8
40 1/8" x 82 1/4" B.O.	3
SI-2 MOLD	3
4x4 J-BOX	8
ROUND MUD RING	2

SHIPPING WEIGHT: 156 lbs
APPROXIMATE WEIGHT

NOTES:
1. EXCEPT R303, R411, R327 & R316, REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER

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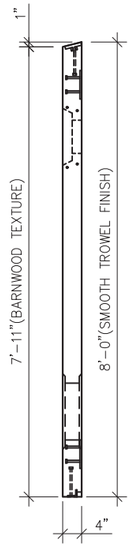
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

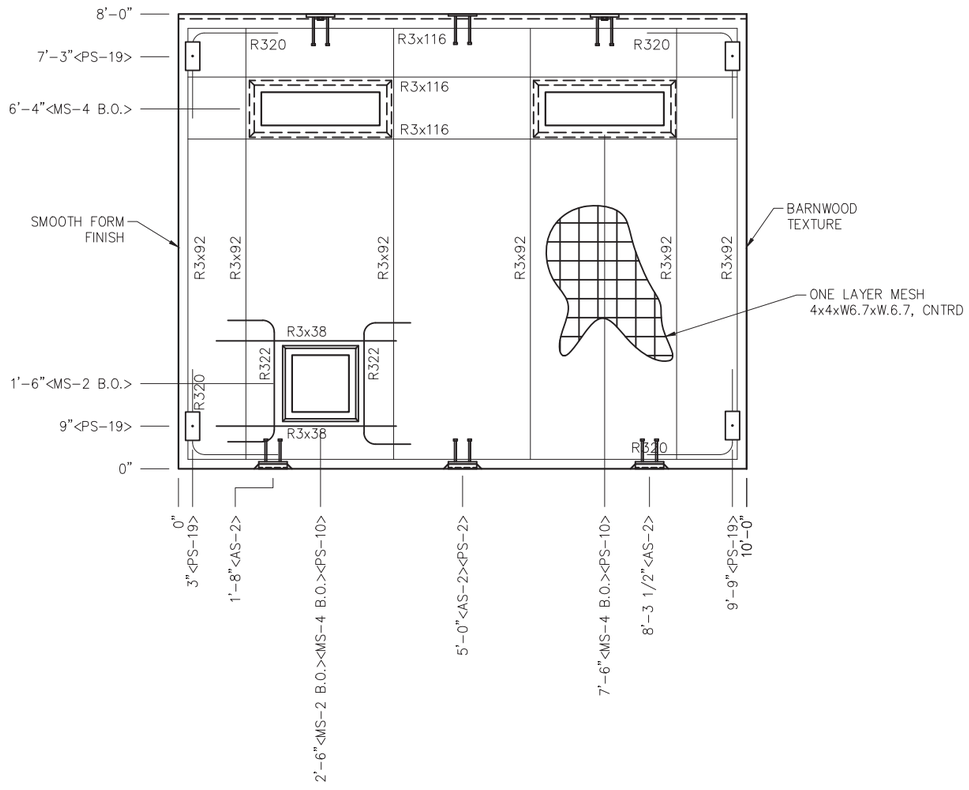
REV.	DESCRIPTION	APPROVAL	DATE

SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W15

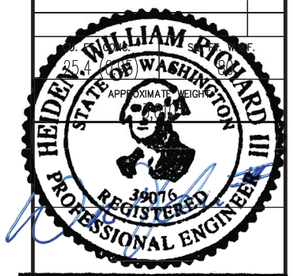
DWG NO.	SHEET	REV.
CH-01	21 / 44	0





EMBEDDED MATERIALS	
ITEM	QTY
AS-2	3
PS-2	1
PS-10	2
PS-19	4
R320	4
R322	2
R3x38	2
R3x92	6
R3x116	4
MS-2 BLOCKOUT	2
MS-4 BLOCKOUT	2

SURFACE AREA: 25.4 SQ. FT.
APPROXIMATE WEIGHT: 1,588 LBS



EXPIRES April 23, 2025

June 10, 2024

LBFoster®
CXT® Products

6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

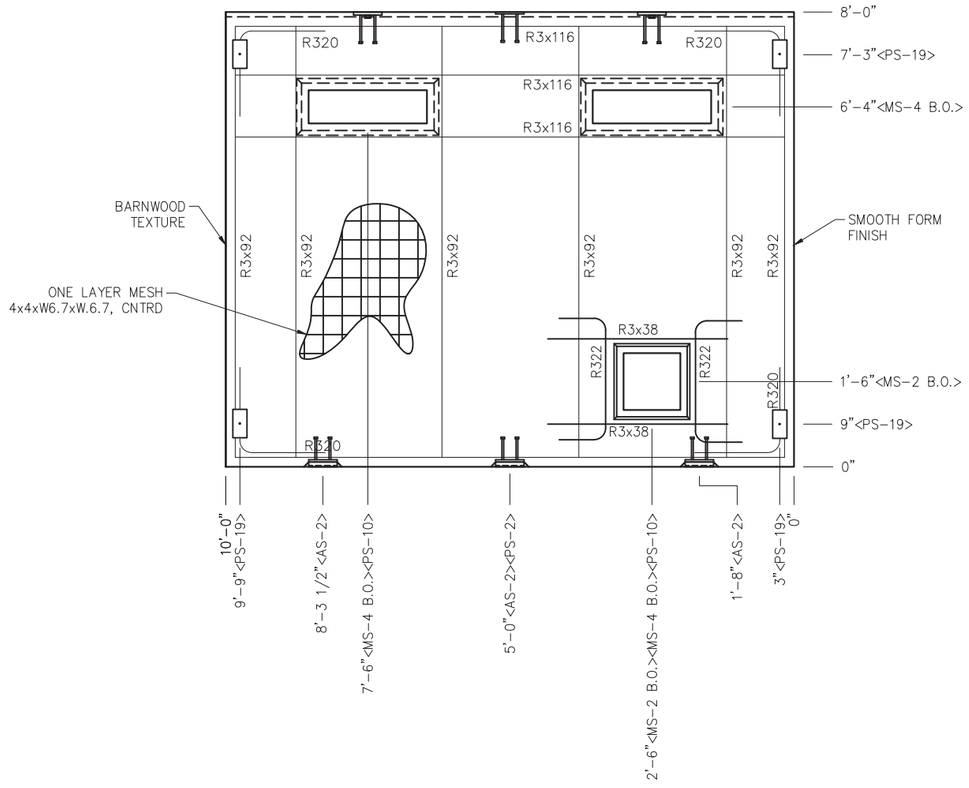
REV.	DESCRIPTION	APPROVAL	DATE

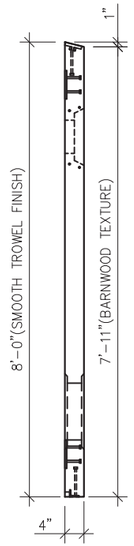
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W16

DWG NO.	SHEET	REV.
CH-01	22 / 44	0

NOTES:
1. EXCEPT R322 & R3x38 REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER
2. ALL OTHER REBAR TO BE CENTERED IN PANEL.





NOTES:
1. EXCEPT R322 & R3x38 REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER
2. ALL OTHER REBAR TO BE CENTERED IN PANEL.

EMBEDDED MATERIALS	
ITEM	QTY
AS-2	3
PS-2	1
PS-10	2
PS-19	4
R320	4
R322	2
R3x38	2
R3x92	6
R3x116	4
MS-2 BLOCKOUT	2
MS-4 BLOCKOUT	2

SURFACE AREA: 25.4 SQ. FT.
APPROXIMATE WEIGHT: 2,540 LBS.

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

LBFoster®
CXT® Products

6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

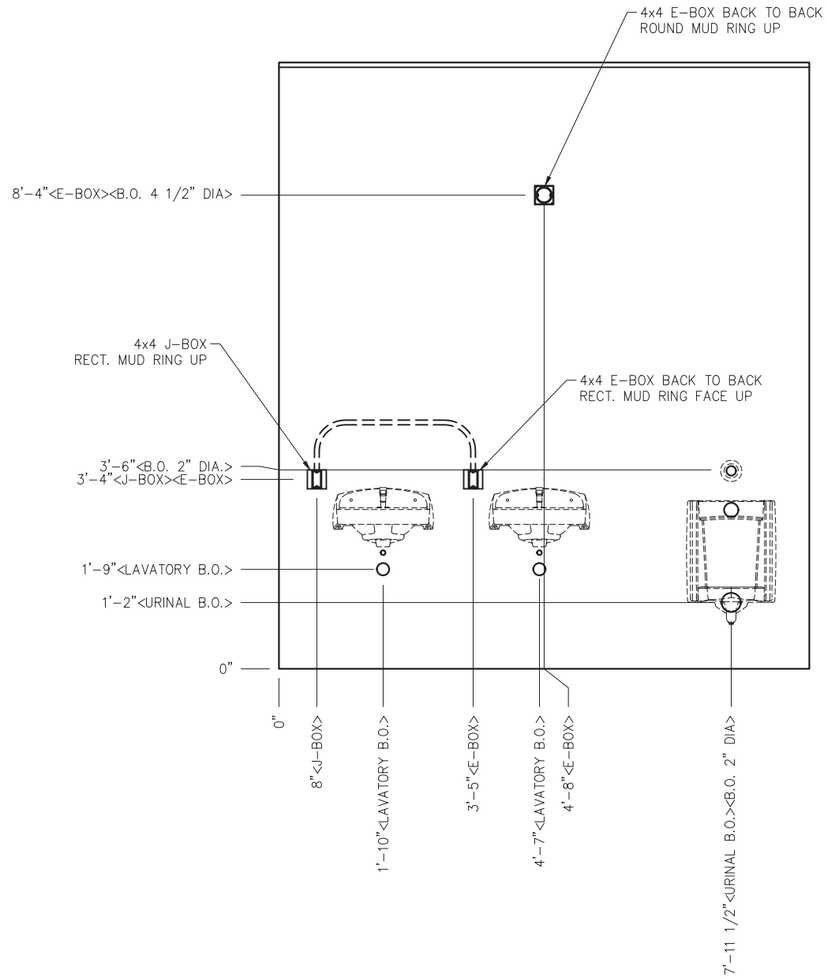
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE

SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W17

DWG NO.	SHEET	REV.
CH-01	23 / 44	0



EMBEDDED MATERIALS	
ITEM	QTY
AS-2	2
PS-2	4
PS-3	2
PS-10	2
R303	2
R320	4
R3x108	2
R3x123	2
4x4 E-BOX	4
4x4 J-BOX	1
RECTANGULAR MUD RING	2
ROUND MUD RING	1
URINAL BLOCKOUT	1
BLOCKOUT 2" DIAMETER	1
LAVATORY BLOCKOUT	2

APPROXIMATE WEIGHT: 33.0 PSF

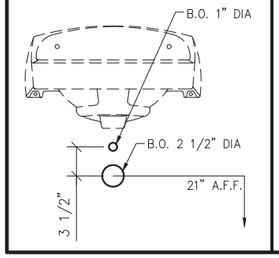
HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

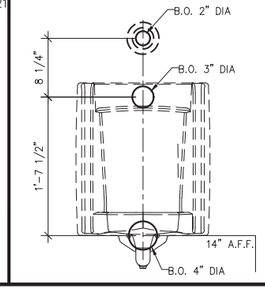
BLOCKOUT DETAIL

LAVATORY DETAIL
AMERICAN STANDARD 0356.421



BLOCKOUT DETAIL

URINAL DETAIL
AMERICAN STANDARD 6515.001



NOTES:
1. REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER

LBFoster®
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6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
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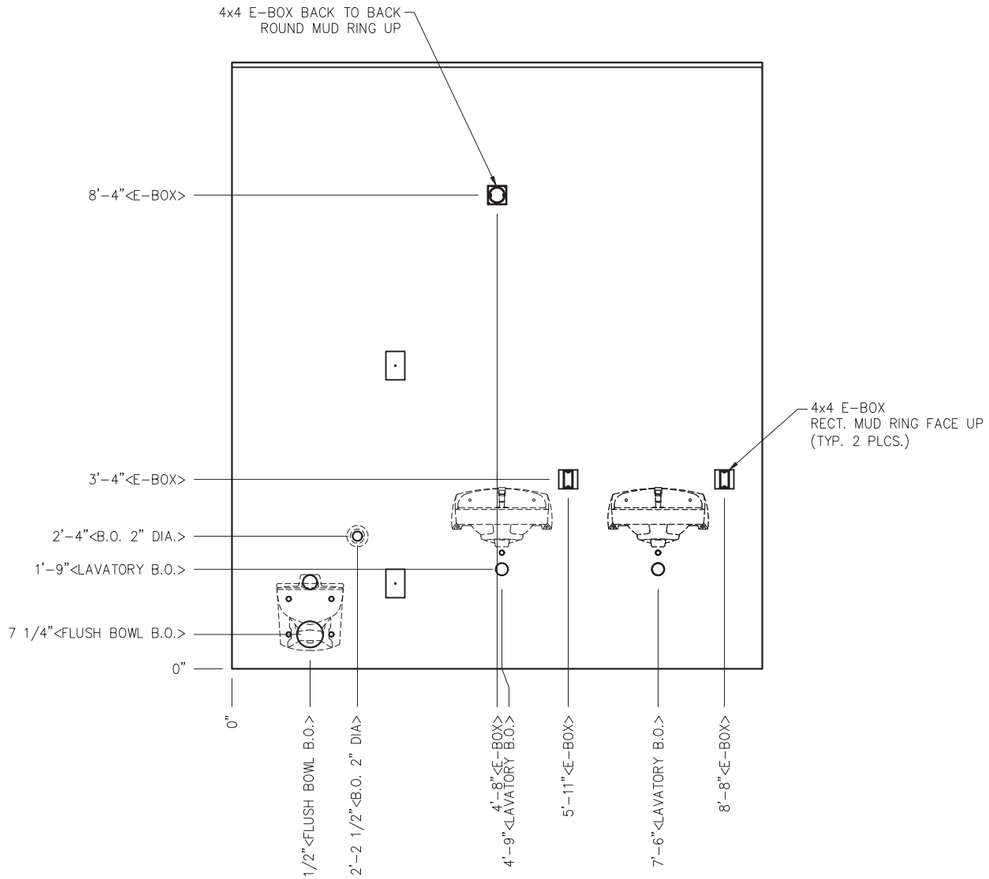
362 Waverly Road Williamstown, WV 26187

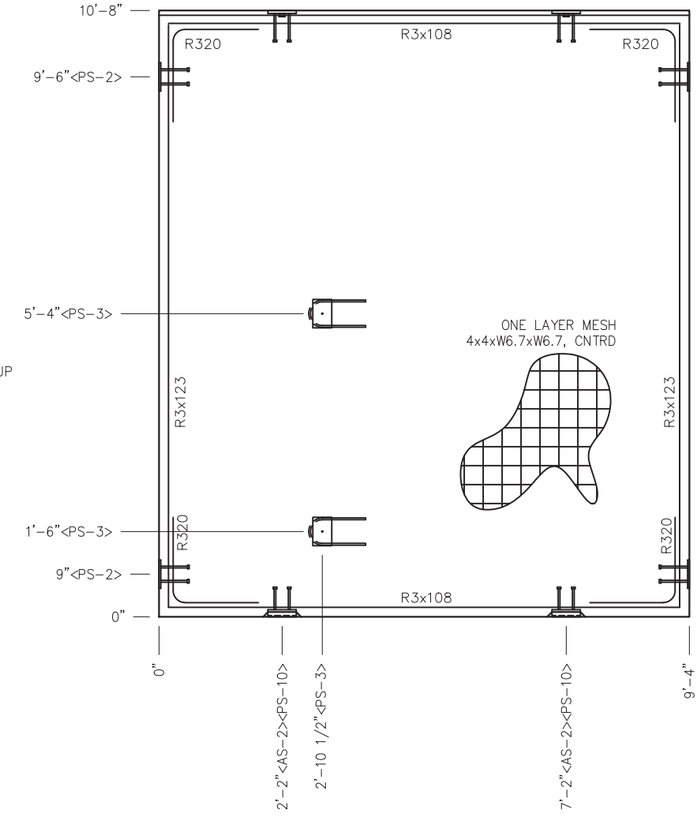
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

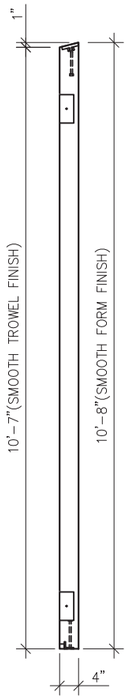
REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W18

DWG NO.	SHEET	REV.
CH-01	24 / 44	0







EMBEDDED MATERIALS	
ITEM	QTY
AS-2	2
PS-2	4
PS-3	2
PS-10	2
R303	2
R320	4
R3x108	4
R3x123	4
4x4 E-BOX	6
ROUND MUD RING	1
RECTANGULAR MUD RING	2
FLUSH BOWL BLOCKOUT	1
BLOCKOUT 2" DIAMETER	1
LAVATORY BLOCKOUT	1

APPROXIMATE WEIGHT: 33.0 K

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

LBFoster®
CXT® Products

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362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

NOTICE

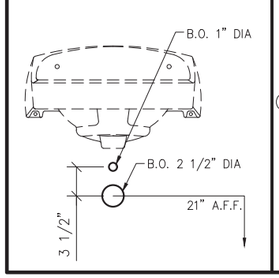
REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

WALL PANEL
MARK W19

DWG NO.	SHEET	REV.
CH-01	25 / 44	0

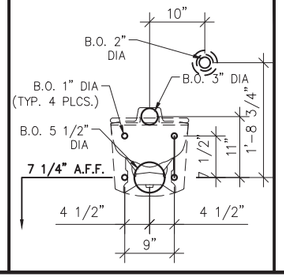
BLOCKOUT DETAIL

LAVATORY DETAIL
AMERICAN STANDARD 0356.421



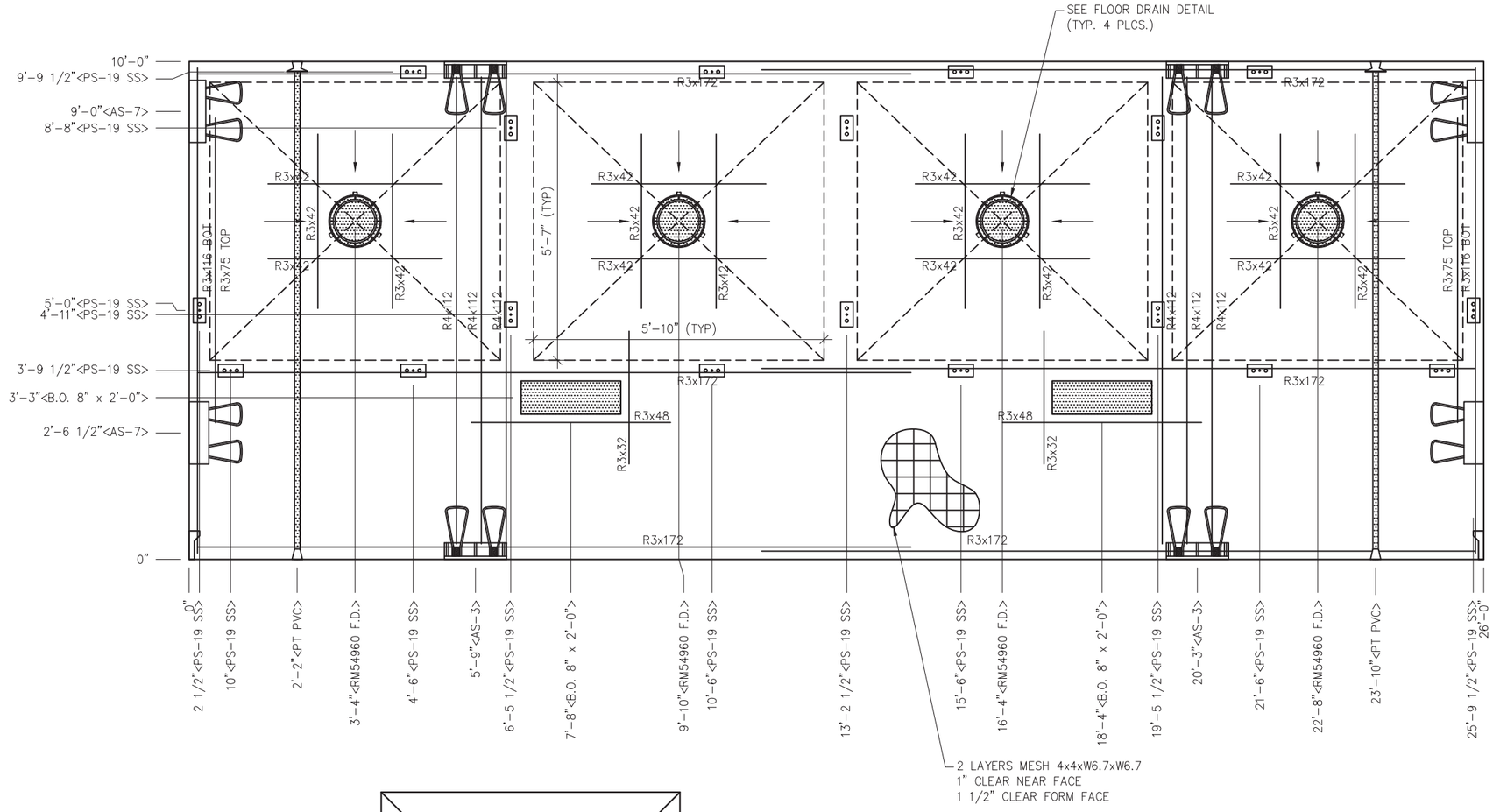
BLOCKOUT DETAIL

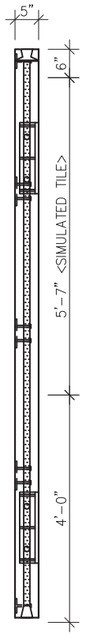
FLUSH VALVE BOWL DETAIL
AMERICAN STANDARD 0356.421



NOTES:
1. REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER

MARINE PACKAGE

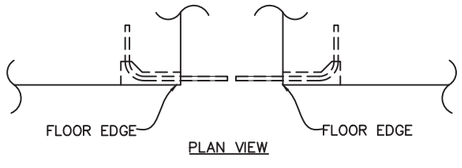




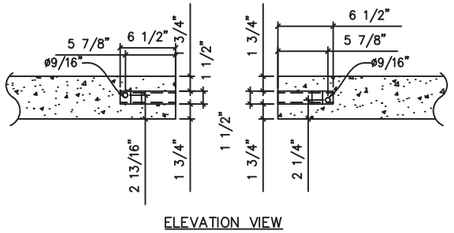
EMBEDDED MATERIALS	
ITEM	QTY
AS-7	4
R4x112	9
R3x42	12
AS-3	4
R3x75	2
R3x116	2
R3x172	6
PS-19 SS	16
RM54960 F.D.	4
SECTIONAL B.O.	2
BLOCKOUT 24" x 8"	2
PT CHUCK	2
1" PVC SCH40 x 9'-9"	2
	2

MARINE PACKAGE
SLAB WEIGHT:
68.9 KIPS
APPROXIMATE WEIGHT

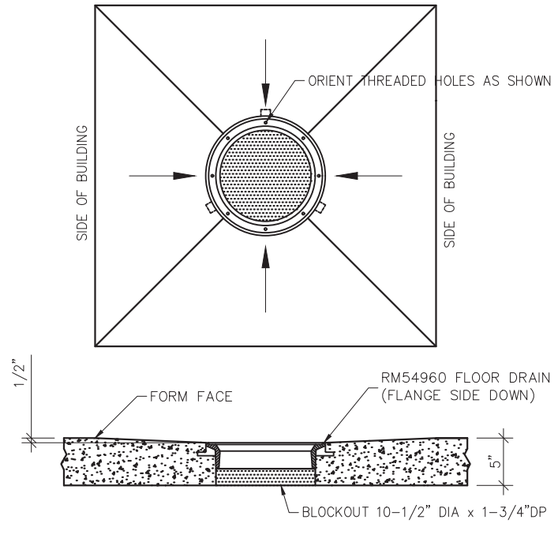
SECTIONAL CONNECTION DETAIL



PLAN VIEW

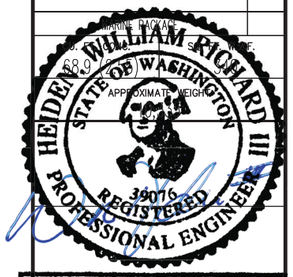


ELEVATION VIEW



FLOOR DRAIN BLOCKOUT DETAIL

NOTES:
1. FLOOR TO BE CAST UPSIDE DOWN
2. TILE SHOWER PAN DEPTH 3/4"
3. EXCEPT R3x75, R3x116, & R4x112, REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL WITH 1 1/4" MIN. COVER
4. R4x112 TO BE PLACED IN TOP OF PANEL WITH 1 1/4" COVER
5. ALL OTHER BARS TO BE CENTERED IN PANEL, UNO.



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June 10, 2024

LBFoster®
CXT® Products

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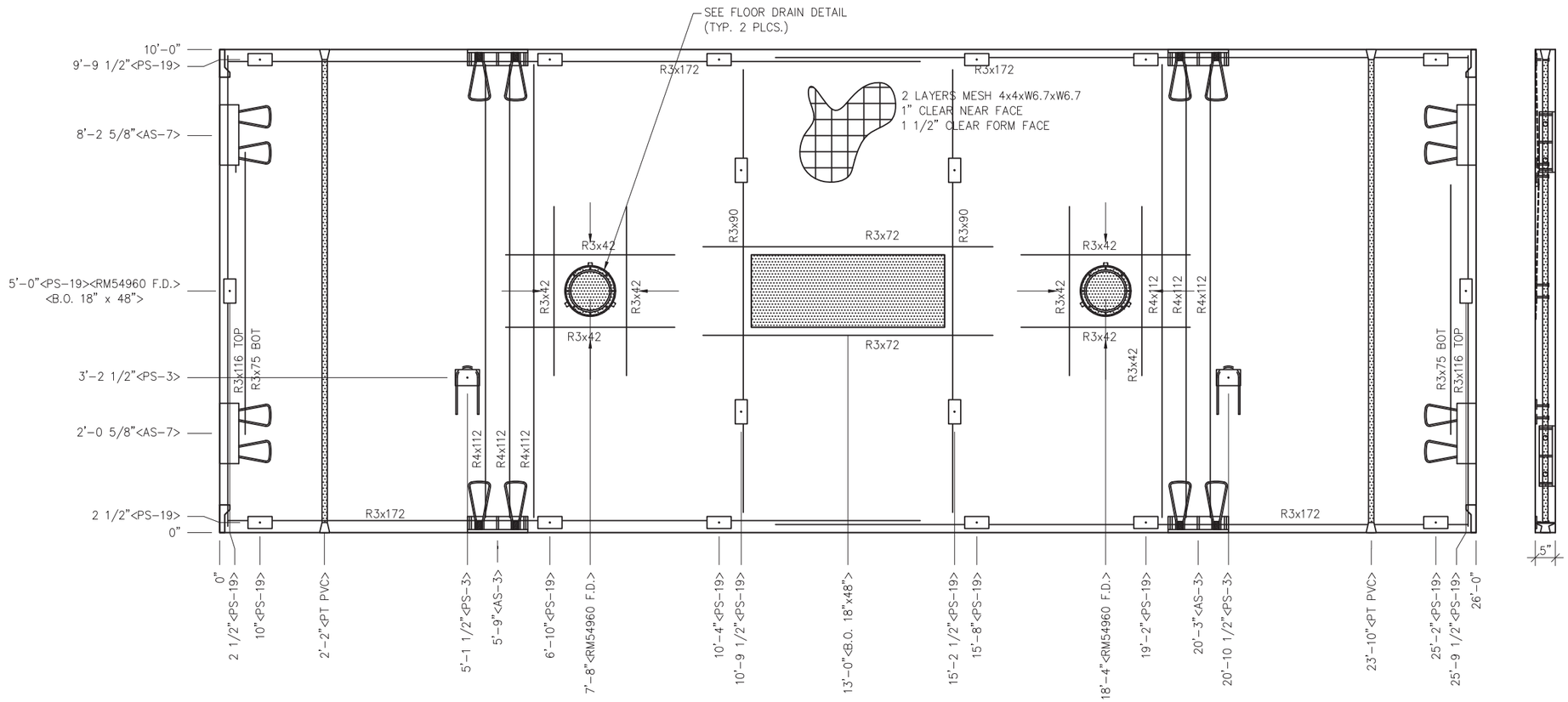
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

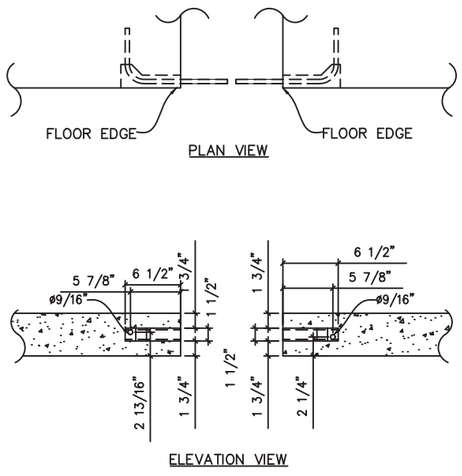
REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

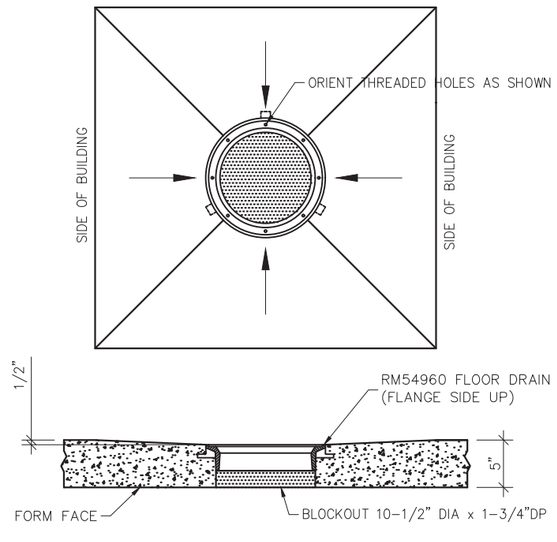
FLOOR SLAB
MARK F1

DWG NO.	SHEET	REV.
CH-01	26 / 44	0



SECTIONAL CONNECTION DETAIL



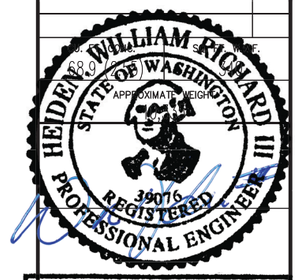


FLOOR DRAIN BLOCKOUT DETAIL

NOTES:
1. SLOPE 1/2" TO FLOOR DRAIN BLOCKOUT AS INDICATED BY ARROWS.
2. EXCEPT R303, R3x75, R3x116, & R4x112, REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL WITH 1 1/4" MIN. COVER
3. R4x112 TO BE PLACED IN BOTTOM OF PANEL WITH 1 1/4" COVER
4. ALL OTHER BARS TO BE CENTERED IN PANEL, UNO.

EMBEDDED MATERIALS	
ITEM	QTY
AS-3	4
R4x112	6
R3x42	8
R3x72	2
R3x75	2
R3x90	2
R3x116	2
R3x172	4
PS-19	18
FLOOR DRAIN	2
SECTIONAL B.O.	4
BLOCKOUT 48" x 18"	1
1" PVC SCH40 x 9'-6"	2
AS-7	4

68.9
APPROXIMATE WEIGHT



EXPIRES April 23, 2025

June 10, 2024

LBFoster®
CXT® Products

6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

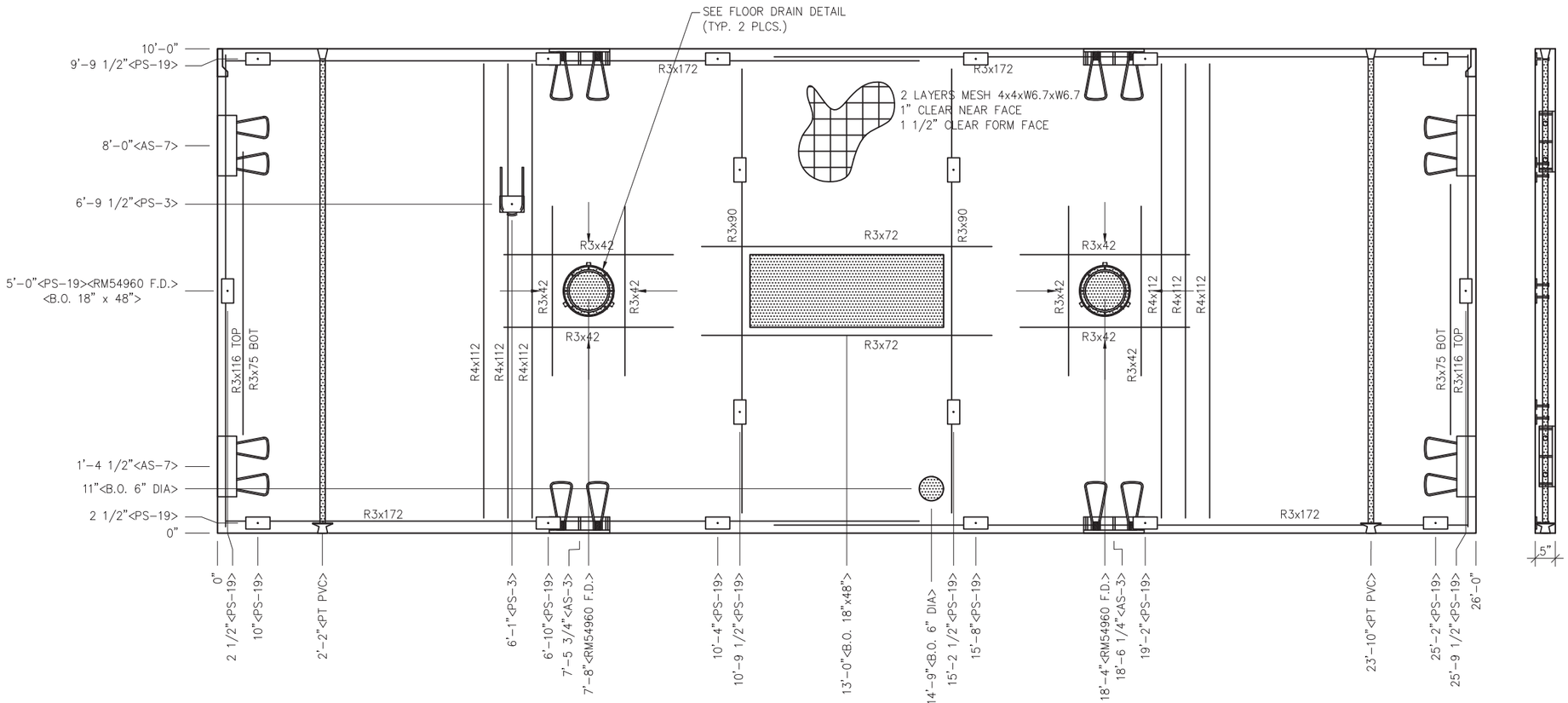
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

NOTICE

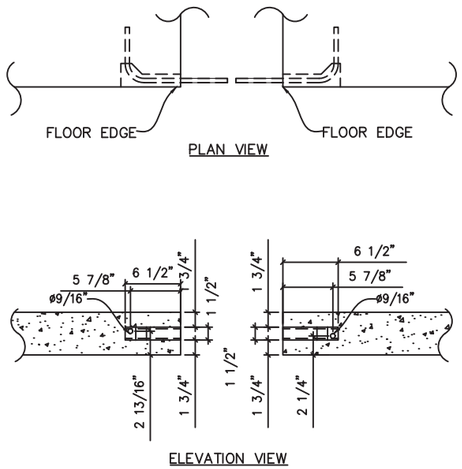
REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

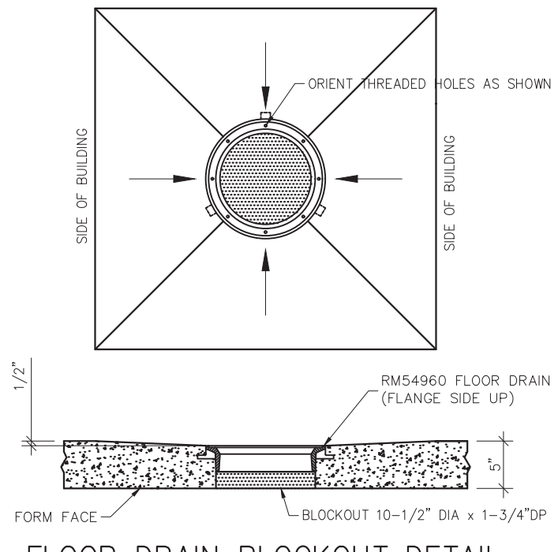
FLOOR SLAB
MARK F2

DWG NO.	SHEET	REV.
CH-01	27 / 44	0



SECTIONAL CONNECTION DETAIL



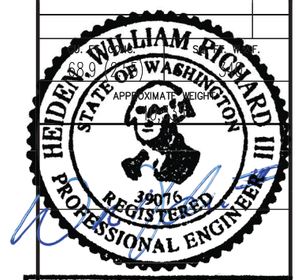


FLOOR DRAIN BLOCKOUT DETAIL

NOTES:
1. SLOPE 1/2" TO FLOOR DRAIN BLOCKOUT AS INDICATED BY ARROWS.
2. EXCEPT R303, R3x75, R3x116, & R4x112, REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL WITH 1 1/4" MIN. COVER
3. R4x112 TO BE PLACED IN BOTTOM OF PANEL WITH 1 1/4" COVER
4. ALL OTHER BARS TO BE CENTERED IN PANEL, UNO.

EMBEDDED MATERIALS	
ITEM	QTY
AS-3	4
R4x112	6
R3x42	8
R3x72	2
R3x75	2
R3x90	2
R3x116	2
R3x172	4
PS-19	18
RM54960 F.D.	2
SECTIONAL B.O.	2
BLOCKOUT 48" x 18"	1
PT CHUCK	2
1" PVC SCH40 x 9'-9"	2
R303	1
PS-3	1
BLOCKOUT 6" DIAMETER	1
AS-7	4

APPROXIMATE WEIGHT: 68.9 K



EXPIRES April 23, 2025

June 10, 2024

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CXT® Products

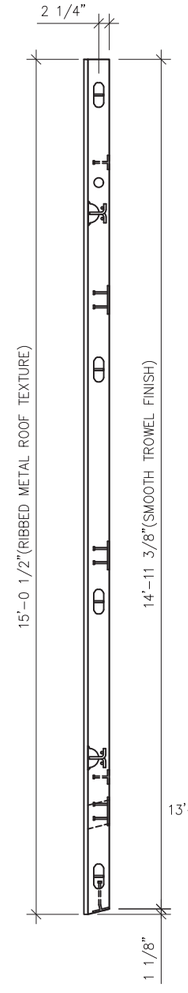
6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

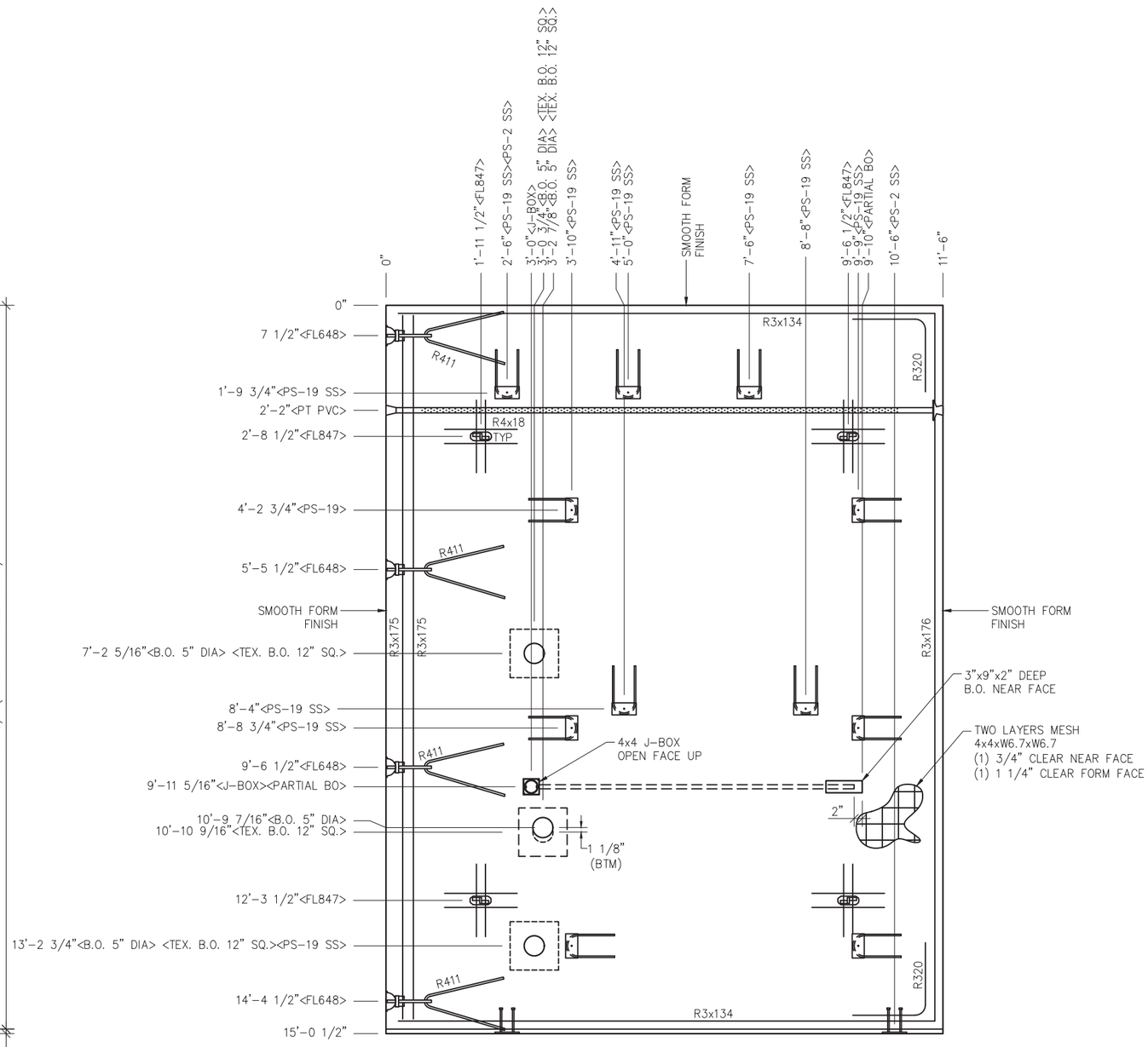
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

FLOOR SLAB
MARK F3

DWG NO.	SHEET	REV.
CH-01	28 / 44	0





NOTES:
1. EXCEPT R411, R3x175, & R4x18, BARS TO BE PLACED IN PAIRS, ONE EACH FACE OF PANEL W/ 3/4"CLEAR NEAR FACE & 1 1/4" CLEAR FORM FACE
2. PLACE BARS R4x18, UP IN FORM W/ 1 1/4" COVER
3. ALL OTHER BARS TO BE CENTERED IN PANEL

EMBEDDED MATERIALS	
ITEM	QTY
PS-19	11
FL847	4
FL648	4
R411	4
R4x18	4
R320	2
R3x134	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
BLOCKOUT 5" DIAMETER	3
TEXTURE BLOCKOUT 12" SQUARE	3
PS-2 SS	2
PARTIAL BLOCKOUT 3"x9"x2" DEEP	1
4x4 J-BOX	1
R303	11

MARINE PACKAGE
APPROXIMATE WEIGHT: 171,200 LBS

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

LBFoster®
CXT® Products

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901 N. Highway 77 Hillsboro, TX 76645
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PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

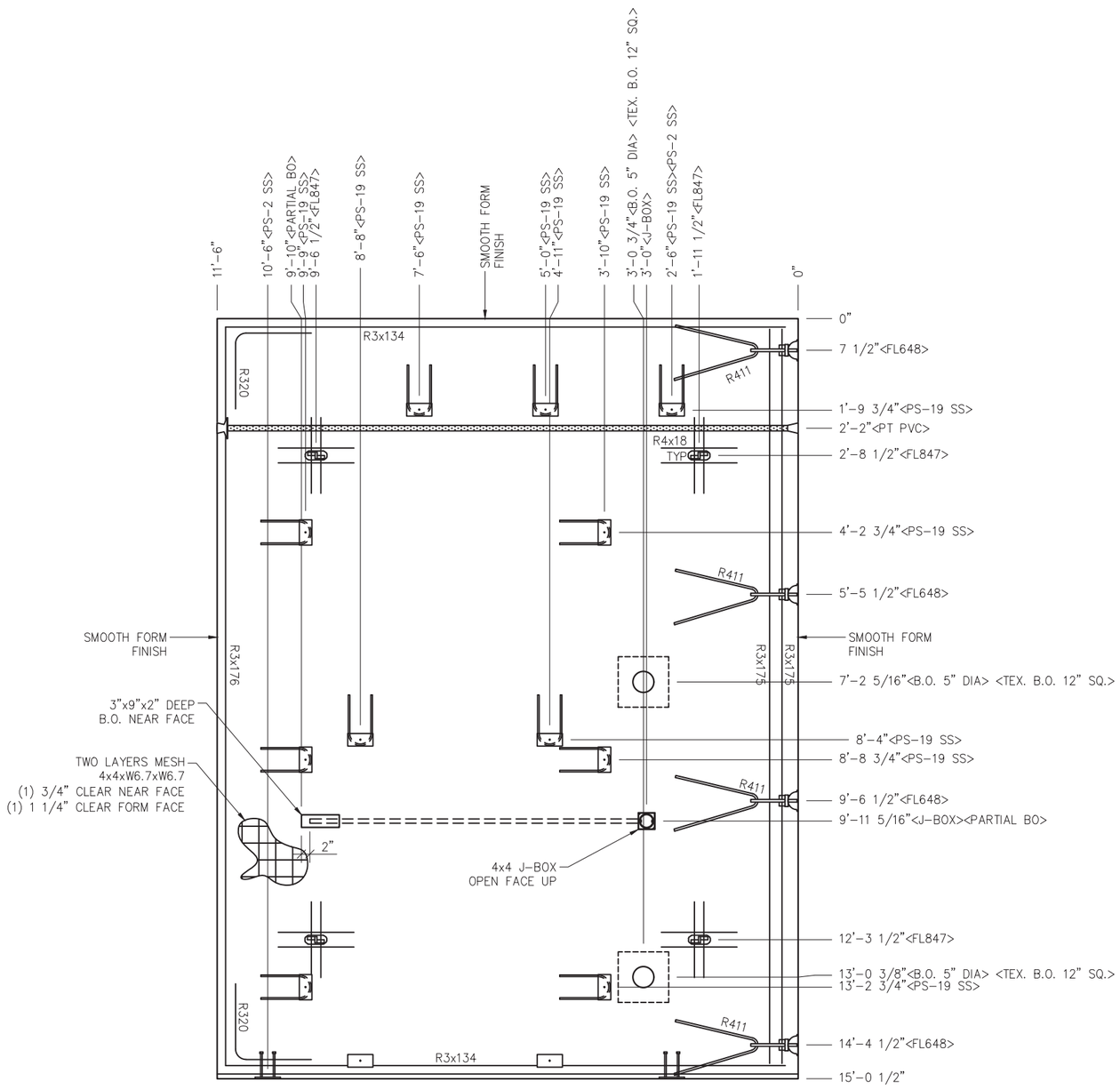
REV.	DESCRIPTION	APPROVAL	DATE

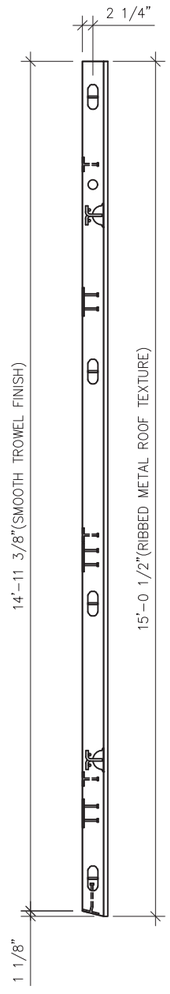
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	C. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

ROOF SLAB
MARK R1

DWG NO.	SHEET	REV.
CH-01	29 / 44	0

MARINE PACKAGE





NOTES:
1. EXCEPT R411, R3x175, & R4x18, BARS TO BE PLACED IN PAIRS, ONE EACH FACE OF PANEL W/ 3/4" CLEAR NEAR FACE & 1 1/4" CLEAR FORM FACE
2. PLACE BARS R4x18, UP IN FORM W/ 1 1/4" COVER
3. ALL OTHER BARS TO BE CENTERED IN PANEL

EMBEDDED MATERIALS	
ITEM	QTY
PS-19 SS	13
FL847	4
FL648	4
R411	4
R4x18	16
R320	2
R3x134	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
BLOCKOUT 5" DIAMETER	2
TEXTURE BLOCKOUT 12" SQUARE	2
PS-2 SS	2
PARTIAL BLOCKOUT 3"x9"x2" DEEP	1
4x4 J-BOX	1
R303	11

MARINE PACKAGE
APPROXIMATE WEIGHT:

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

LBFoster
CXT® Products

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901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

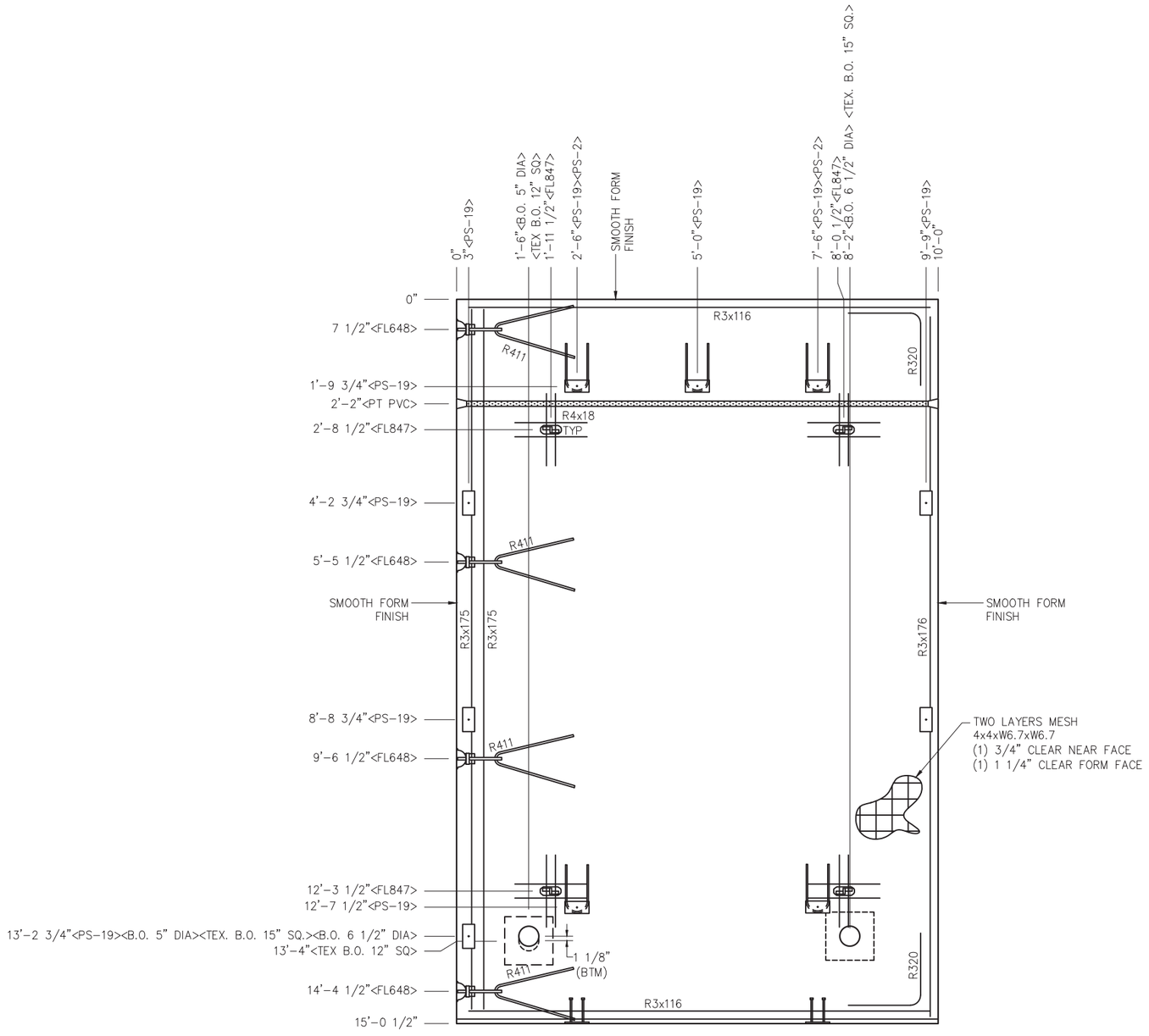
NOTICE

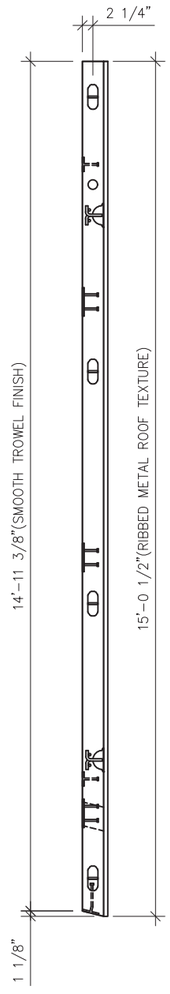
CXT Incorporated

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

ROOF SLAB
MARK R2

DWG NO.	SHEET	REV.
CH-01	30 / 44	0





NOTES:
1. EXCEPT R411, R3x175, & R4x18, BARS TO BE PLACED IN PAIRS, ONE EACH FACE OF PANEL W/ 3/4"CLEAR NEAR FACE & 1 1/4" CLEAR FORM FACE
2. PLACE BARS R4x18, UP IN FORM W/ 1 1/4" COVER
3. ALL OTHER BARS TO BE CENTERED IN PANEL

EMBEDDED MATERIALS	
ITEM	QTY
PS-19	10
FL847	4
FL648	4
R411	4
R4x18	16
R320	2
R3x116	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
BLOCKOUT 5" DIAMETER	1
TEXTURE BLOCKOUT 12" SQUARE	1
BLOCKOUT 6 1/2" DIAMETER	1
TEXTURE BLOCKOUT 15" SQUARE	1
R303	5
PS-2	2

SLAB WEIGHT: 60.7 PSF
APPROXIMATE WEIGHT

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

LBFoster®
CXT® Products

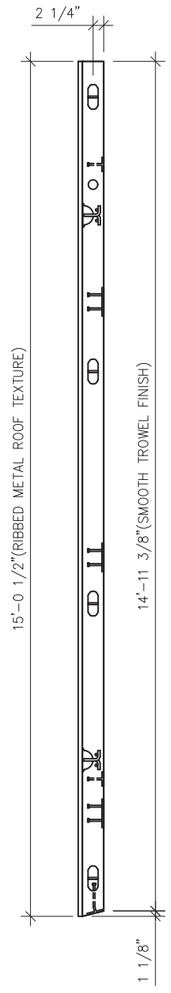
6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

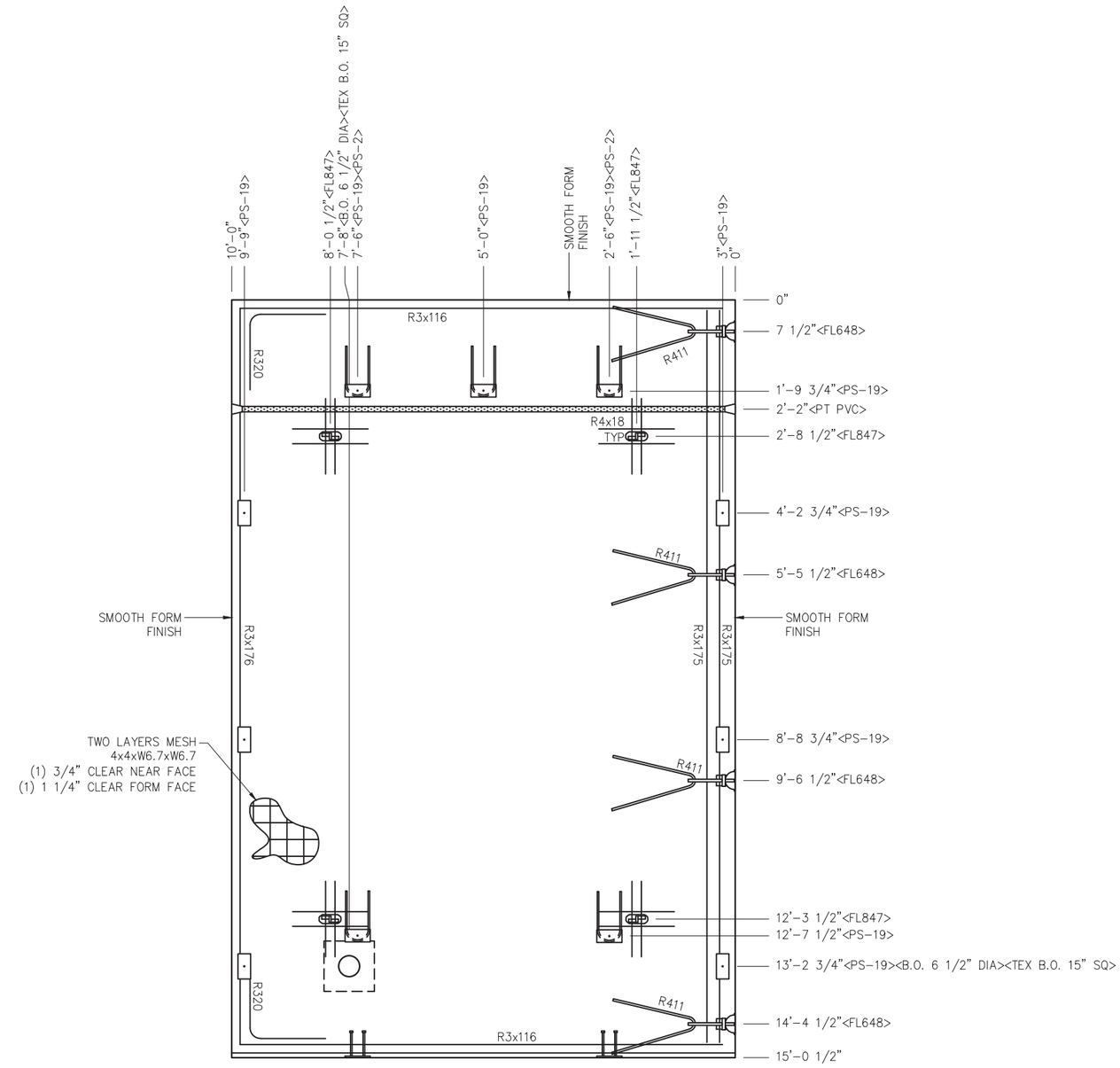
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

ROOF SLAB
MARK R3

DWG NO.	SHEET	REV.
CH-01	31 / 44	0





NOTES:
1. EXCEPT R411, R3x175, & R4x18, BARS TO BE PLACED IN PAIRS, ONE EACH FACE OF PANEL W/ 3/4"CLEAR NEAR FACE & 1 1/4" CLEAR FORM FACE
2. PLACE BARS R4x18, UP IN FORM W/ 1 1/4" COVER
3. ALL OTHER BARS TO BE CENTERED IN PANEL

EMBEDDED MATERIALS	
ITEM	QTY
PS-19	11
FL847	4
FL648	4
R411	4
R4x18	4
R320	2
R3x116	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
BLOCKOUT 6 1/2" DIAMETER	1
TEXTURE BLOCKOUT 15" SQUARE	1
R303	5
PS-2	2

APPROXIMATE WEIGHT: 60.7 KIPS

HEIDEN WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
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June 10, 2024

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CXT® Products

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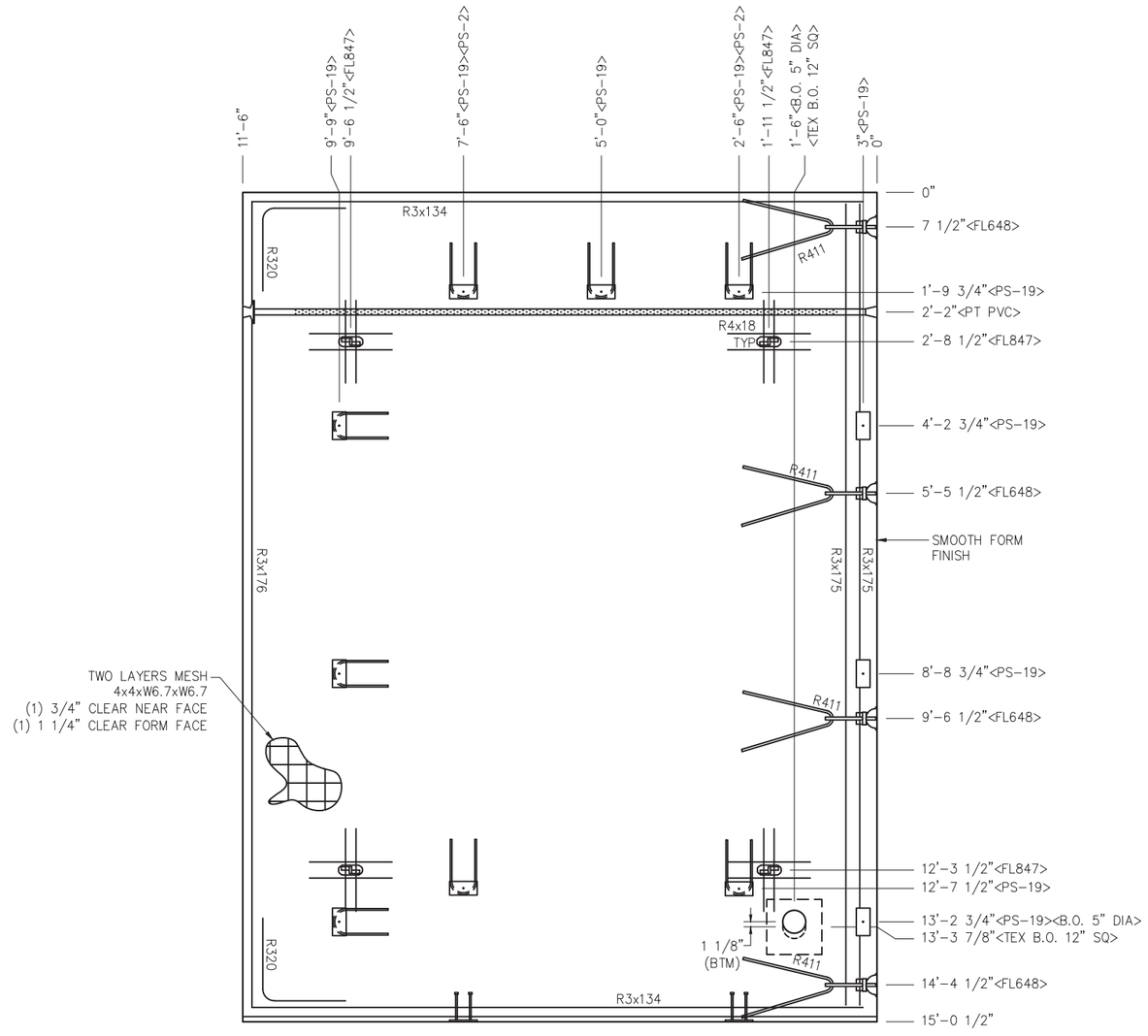
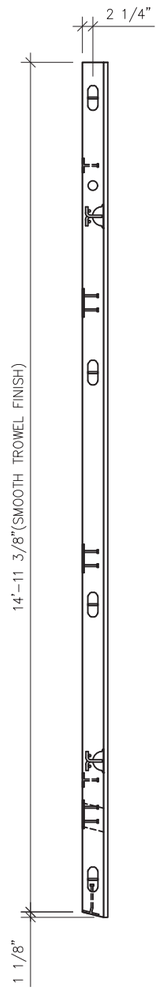
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

ROOF SLAB
MARK R4

DWG NO.	SHEET	REV.
CH-01	32 / 44	0





NOTES:
1. EXCEPT R411, R3x175, & R4x18, BARS TO BE PLACED IN PAIRS, ONE EACH FACE OF PANEL W/ 3/4"CLEAR NEAR FACE & 1 1/4" CLEAR FORM FACE
2. PLACE BARS R4x18, UP IN FORM W/ 1 1/4" COVER
3. ALL OTHER BARS TO BE CENTERED IN PANEL

EMBEDDED MATERIALS	
ITEM	QTY
PS-19	11
FL847	4
FL648	4
R411	4
R4x18	16
R320	2
R3x134	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
BLOCKOUT 5" DIAMETER	1
TEXTURE BLOCKOUT 12" SQUARE	1
R303	8
PS-2	2

APPROXIMATE WEIGHT:

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

LBFoster
CXT® Products

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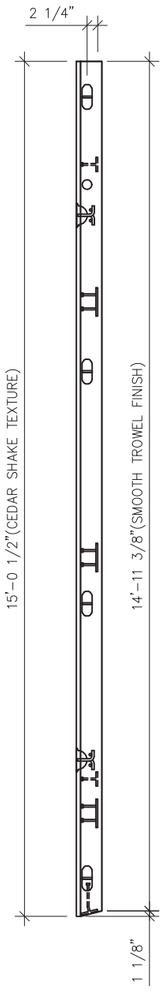
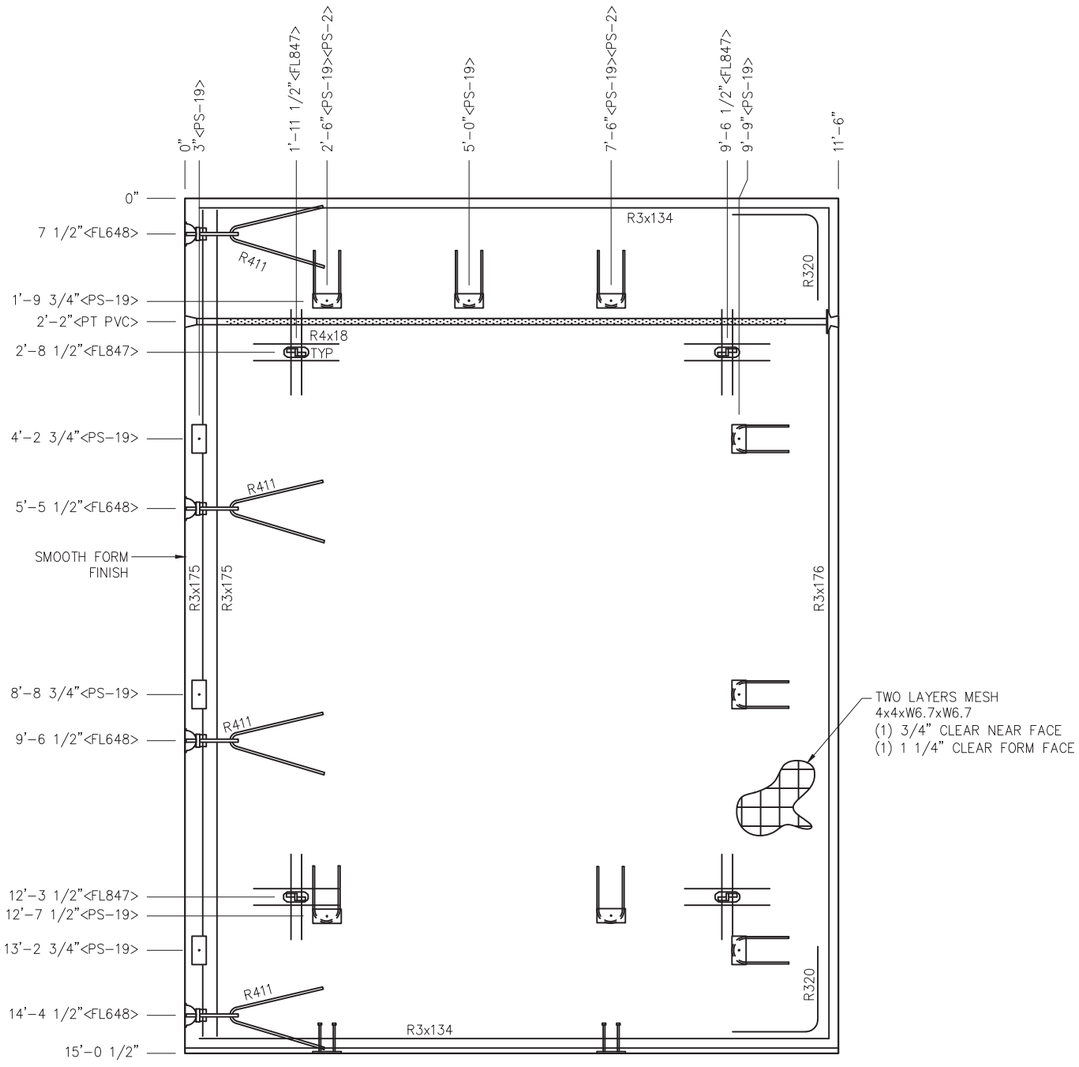
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

ROOF SLAB
MARK R5

DWG NO.	SHEET	REV.
CH-01	33 / 44	0





NOTES:
1. EXCEPT R411, R3x175, & R4x18, BARS TO BE PLACED IN PAIRS, ONE EACH FACE OF PANEL W/ 3/4"CLEAR NEAR FACE & 1 1/4" CLEAR FORM FACE
2. PLACE BARS R4x18, UP IN FORM W/ 1 1/4" COVER
3. ALL OTHER BARS TO BE CENTERED IN PANEL

EMBEDDED MATERIALS	
ITEM	QTY
PS-19	11
FL847	4
FL648	4
R411	4
R4x18	16
R320	2
R3x134	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
PS-2	2
R303	8

APPROXIMATE WEIGHT:

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

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CXT® Products

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PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE

SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

ROOF SLAB
MARK R6

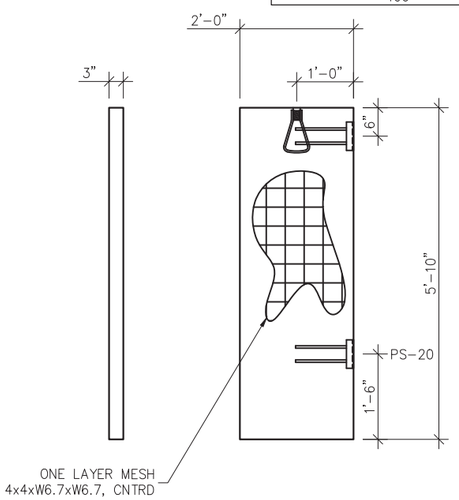
DWG NO.	SHEET	REV.
CH-01	34 / 44	0

MARINE PACKAGE

EMBEDDED MATERIALS	
ITEM	QTY
PS-20 SS	2
B-18	1
MARINE PACKAGE	

CU. FT. CONC.	SQ. FT. W.W.F.
2.9 (0.12)	11

APPROXIMATE WEIGHT
435

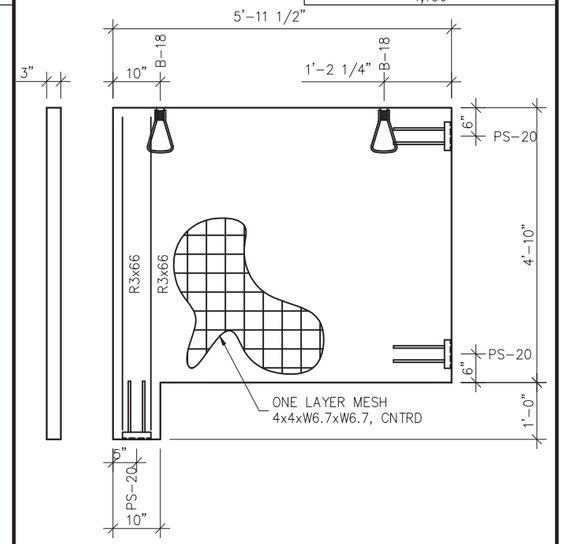


MARK P1 – 3 REQUIRED

EMBEDDED MATERIALS	
ITEM	QTY
PS-20	3
B-18	2
R3x66	2

CU. FT. CONC.	SQ. FT. W.W.F.
7.70 (0.28)	31

APPROXIMATE WEIGHT
1,150

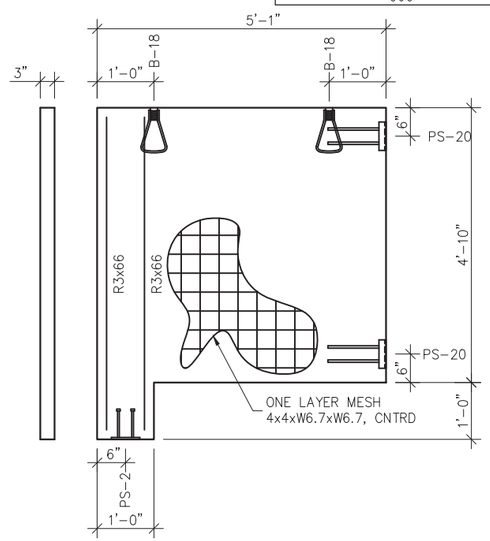


MARK P2 – 2 REQUIRED

EMBEDDED MATERIALS	
ITEM	QTY
PS-2	1
PS-20	2
B-18	2
R3x66	2

CU. FT. CONC.	SQ. FT. W.W.F.
6.4 (0.24)	26

APPROXIMATE WEIGHT
960

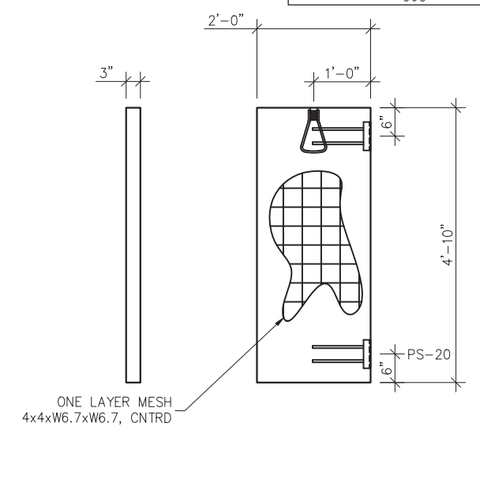


MARK P3 – 1 REQUIRED

EMBEDDED MATERIALS	
ITEM	QTY
PS-20	2
B-18	1

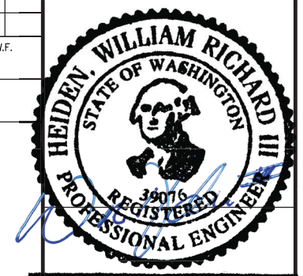
CU. FT. CONC.	SQ. FT. W.W.F.
2.4 (0.09)	10

APPROXIMATE WEIGHT
365



MARK P4 – 1 REQUIRED

1. RECESS B-18 INSERTS 1/2", GROUT CLOSED AT FINAL ASSEMBLY.
2. REINFORCING BARS TO BE PLACED IN PAIRS ONE EACH FACE OF PANEL W/ 3/4" MIN. COVER
3. CUP STONE ALL EDGES.



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June 10, 2024

LBFoster®
CXT® Products

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901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/8"=1'-0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	32

PARTITIONS
P1, P2, P3, & P4

DWG NO.	SHEET	REV.
CH-01	35 / 44	0

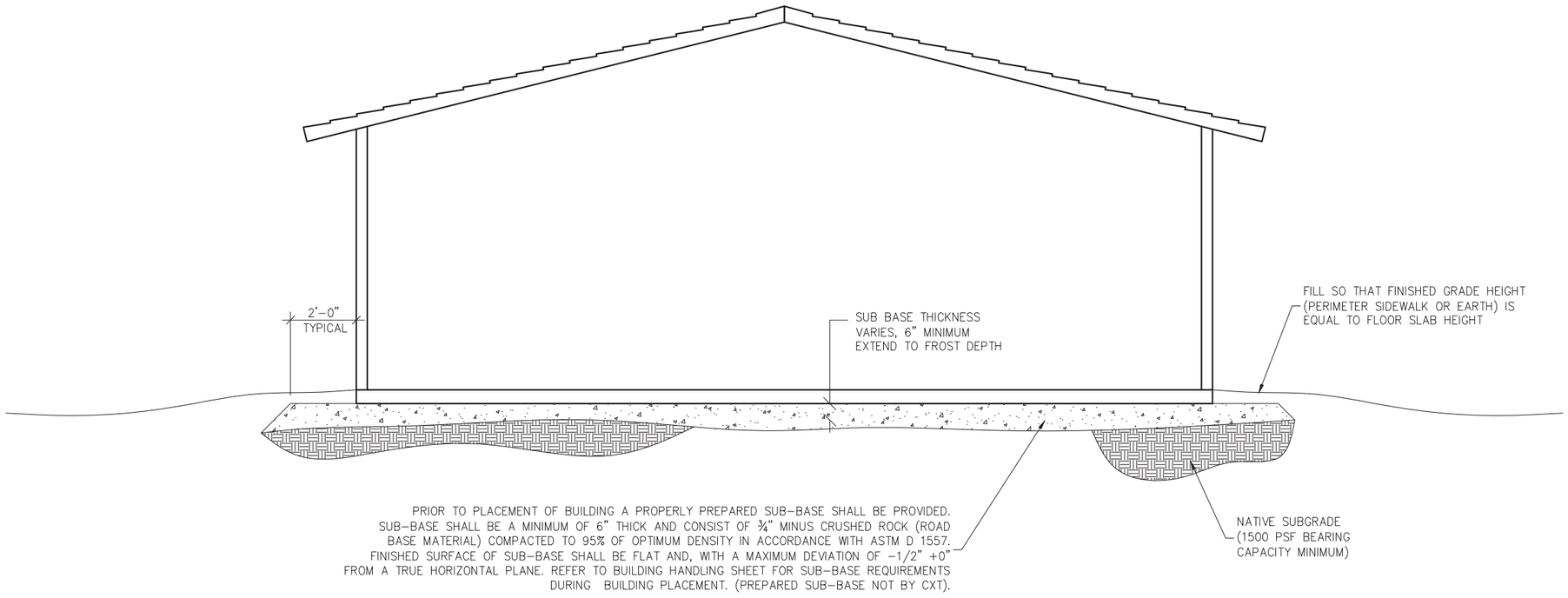
NOTE:

THIS FACTORY ASSEMBLED BUILDING, AS CONSTRUCTED, PROVIDES A RIGID BOX TYPE STRUCTURAL SYSTEM. VERTICAL LOADS ARE TRANSFERRED PRIMARILY THROUGH BEARING WALLS TO THE STRUCTURAL SLAB FLOOR OF THE BUILDING. THE VERTICAL LOADS ARE THEN DISTRIBUTED THROUGH THE REINFORCED CONCRETE FLOOR TO THE PREPARED GRANULAR, NON–FROST SUSCEPTIBLE (NFS) SUB–BASE WHICH DISTRIBUTES THE VERTICAL LOADS IN RELATIVELY UNIFORM FASHION TO THE NATIVE SUB–GRADE. AS WITH MOST CONSTRUCTION, THIS DOES REQUIRE THE NATIVE SUB–GRADE TO BE STRIPPED OF VEGETATION AND TOP SOIL PRIOR TO PLACEMENT OF THE PREPARED GRANULAR SUB–BASE. DUE TO THE INHERENT STIFFNESS OF THE BUILDING, IT WILL REMAIN SAFE AND STRUCTURALLY SOUND IN THE UNLIKELY EVENT OF FREEZING ACTION BELOW THE BUILDING REGARDLESS OF NATURAL FREEZE/ THAW CYCLES ANTICIPATED TO BE ENCOUNTERED IN THE STATE OF WASHINGTON.

LATERAL LOADS ARE TRANSFERRED TO THE GROUND THROUGH FRICTIONAL RESISTANCE WITHOUT SLIDING OR SHIFTING BETWEEN THE BUILDING FLOOR SLAB AND THE PREPARED SOIL AND GRAVEL SUB–BASE ON WHICH THE BUILDING RESTS. SEISMIC ANALYSES ARE BASED ON LOADS DETERMINED IN ACCORDANCE WITH THE INTERNATIONAL BUILDING CODE USING PARAMETERS, WHICH MEET OR EXCEED THE CODE PRESCRIBED REQUIREMENTS FOR THIS INSTALLATION.

THIS BUILDING AS DESIGNED, RESTING ON A PROPERLY PREPARED GRANULAR SUB–BASE WILL BE SAFE AND STRUCTURALLY SOUND FOR VERTICAL AND LATERAL LOADS AS DISCUSSED ABOVE. A FULL DEPTH FOUNDATION WALL AT THE BUILDING PERIMETER AND AN ANCHORAGE SYSTEM, TYPICAL FOR OTHER TYPES OF BUILDING CONSTRUCTION, ARE NOT REQUIRED FOR THIS BUILDING.

THE "FOUNDATION" FOR THIS STRUCTURE IS ESSENTIALLY THE COMBINATION OF THE COMPACTED SUB–BASE MATERIAL AND THE BUILDING'S REINFORCED SLAB. THE COMBINATION OF THE COMPACTED SUB–BASE MATERIAL AND THE BUILDING'S REINFORCED SLAB NEED TO BE AT LEAST 12" THICK AND THE COMPACTED SUB–BASE MATERIAL SHALL EXTEND BELOW THE LOCAL FROST DEPTH



HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

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CXT® Products

6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH–329

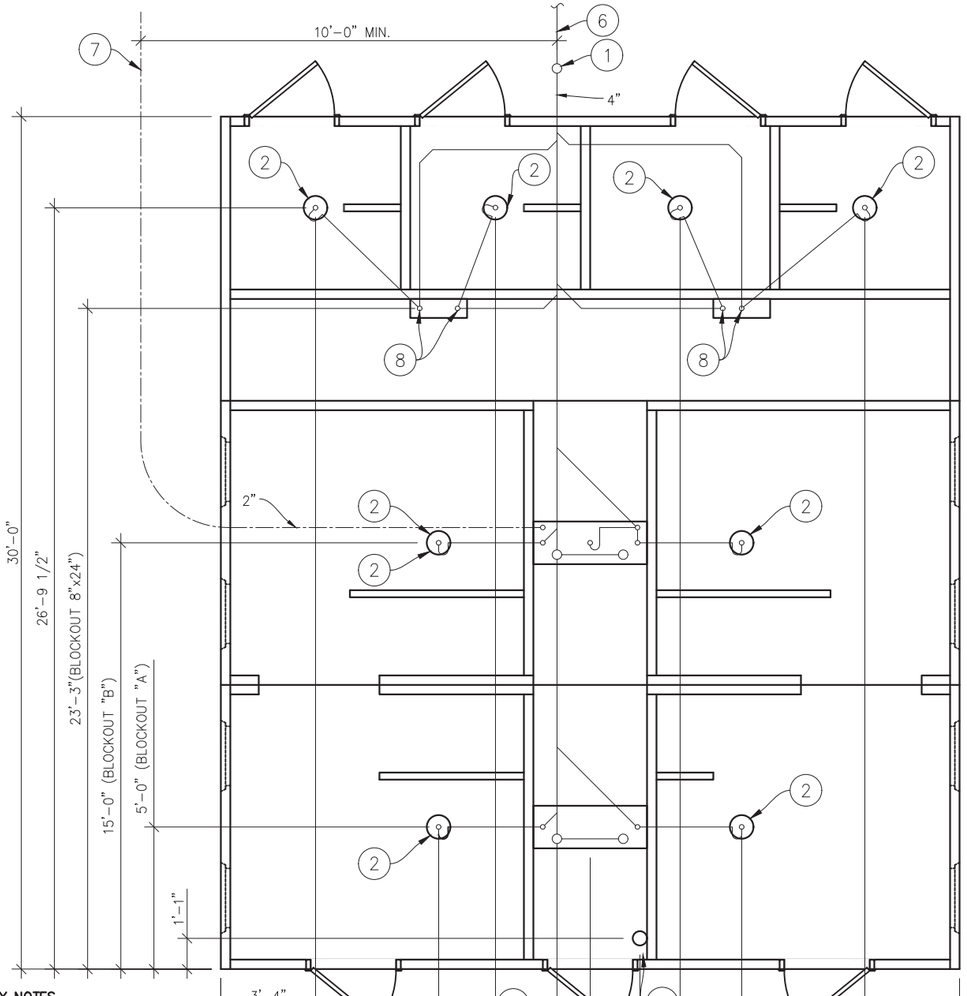
REV.	DESCRIPTION	APPROVAL	DATE

SCALE	N/A	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH–329
CHECKED	N. PENNER	PLOT	N/A

FOUNDATION
DETAIL

DWG NO.	SHEET	REV.
CH–01	36 / 44	0

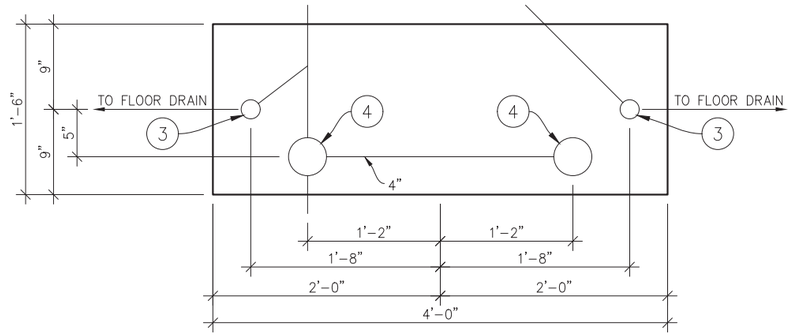
ALL PIPING INDICATED ON THIS SHEET IS NOT BY CXT



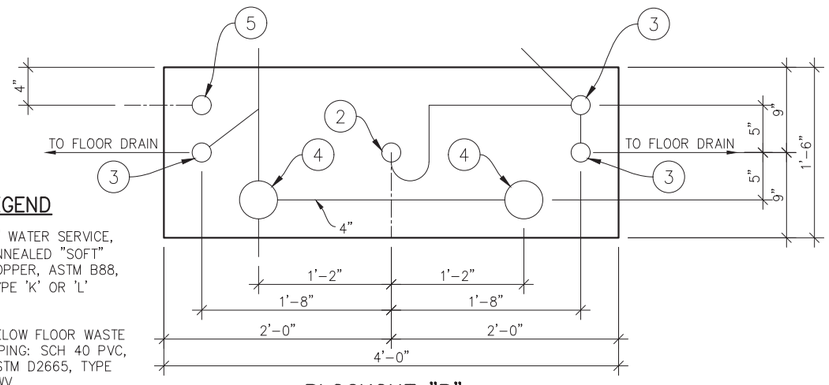
BELOW FLOOR PIPING – KEY NOTES

1. 4" CLEAN OUT TO GRADE.
2. 2" FLOOR DRAIN WITH FIELD INSTALLED TRAP SEAL (1'–6"X4'–0" BLOCKOUT)
3. 2" VENT PIPES EXTENDED 12" ABOVE FINISHED FLOOR LEVEL, PROVIDE TEST PLUGS. (18" x 48" BLOCKOUT)
4. 4" WASTE PIPE EXTENDED 12" ABOVE FINISHED FLOOR LEVEL, PROVIDE TEST PLUG. (18" x 48" BLOCKOUT)
5. 2" TYPE K OR L ANNEALED "SOFT" COPPER WATER SERVICE EXTENDED 12" ABOVE FINISHED FLOOR LEVEL, PROVIDE CAP AT END. (18" x 48" BLOCKOUT)
6. 30" MIN. BURY, PROVIDE TRACER TAPE.
7. MIN. BURY PER LOCAL REQUIREMENTS TO PROTECT AGAINST FREEZING AND DAMAGE.
8. 2" VENT PIPES EXTENDED 12" ABOVE FINISHED FLOOR LEVEL, PROVIDE TEST PLUGS. (8" x 2'–0" BLOCKOUT)
9. 2" FLOOR DRAIN WITH FIELD INSTALLED TRAP SEAL (10" DIA BLOCKOUT)
10. ELECTRICAL STUB UP. (6" DIA BLOCKOUT)

FLOOR DRAIN BLOCKOUTS & BELOW FLOOR PIPING



BLOCKOUT "A"

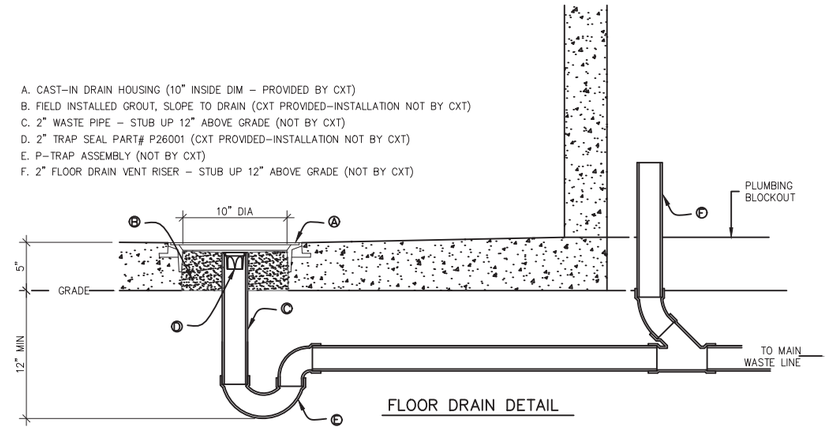


BLOCKOUT "B"

PIPING LEGEND

- 2" WATER SERVICE, ANNEALED "SOFT" COPPER, ASTM B88, TYPE 'K' OR 'L'
- BELOW FLOOR WASTE PIPING: SCH 40 PVC, ASTM D2665, TYPE DWV
- BELOW FLOOR VENT PIPING: SCH 40 PVC, ASTM D2665, TYPE DWV

A. CAST–IN DRAIN HOUSING (10" INSIDE DIM – PROVIDED BY CXT)
B. FIELD INSTALLED GROUT, SLOPE TO DRAIN (CXT PROVIDED–INSTALLATION NOT BY CXT)
C. 2" WASTE PIPE – STUB UP 12" ABOVE GRADE (NOT BY CXT)
D. 2" TRAP SEAL PART# P26001 (CXT PROVIDED–INSTALLATION NOT BY CXT)
E. P–TRAP ASSEMBLY (NOT BY CXT)
F. 2" FLOOR DRAIN VENT RISER – STUB UP 12" ABOVE GRADE (NOT BY CXT)



FLOOR DRAIN DETAIL

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

LBFoster®
CXT® Products

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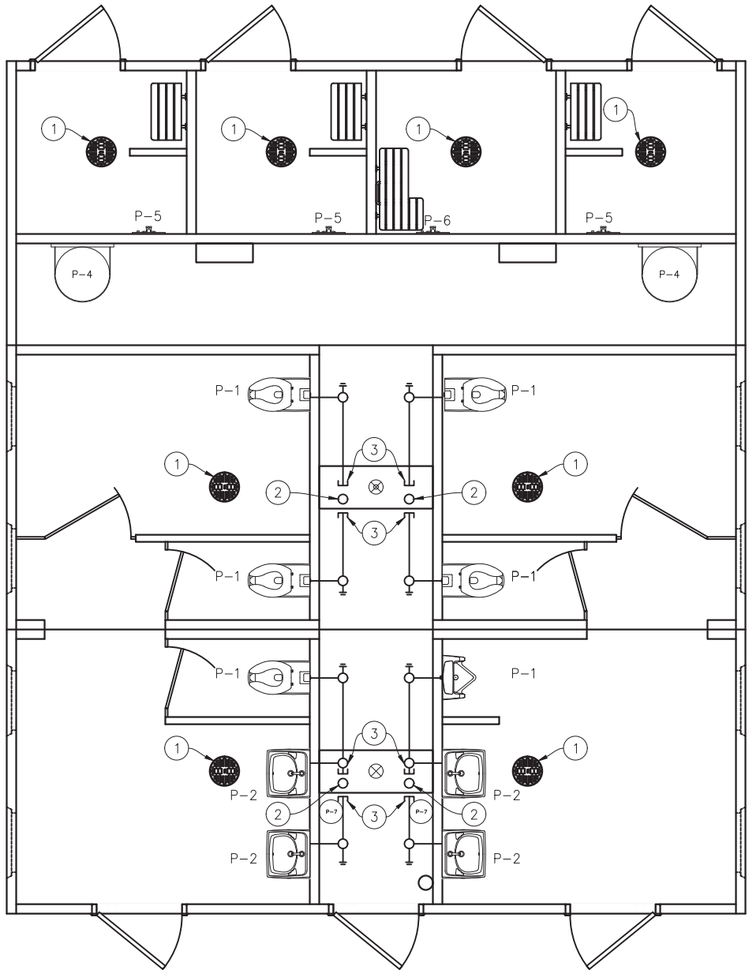
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH–329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/16"=1'–0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH–329
CHECKED	N. PENNER	PLOT	64

FLOOR DRAIN LOCATIONS & BELOW FLOOR PIPING

DWG NO.	SHEET	REV.
CH–01	37 / 44	0



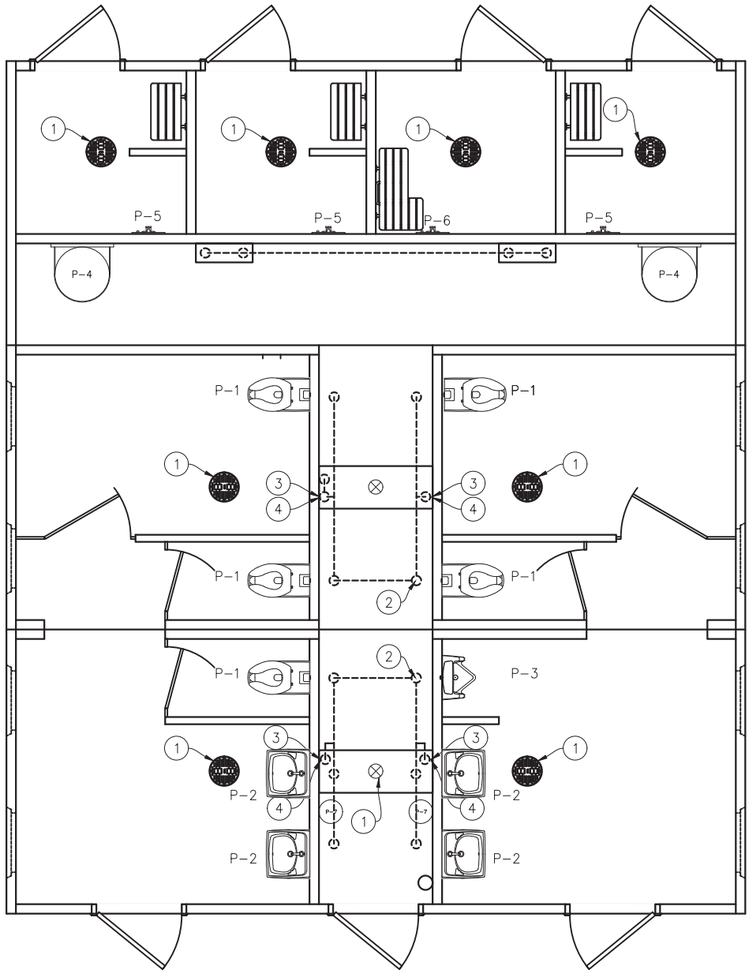
WASTE PIPING

WASTE PIPING – KEY NOTES

1. 2" FLOOR DRAIN, FIELD INSTALLED (NOT BY CXT) (1'–6"x4'–0" BO) & (10" DIA BO)
2. 4" WASTE THROUGH FLOOR, FIELD INSTALLED (NOT BY CXT) (1'–6"x4'–0" BO)
3. PROVIDE TEST PLUG IN END OF WASTE PIPE. CONTINUATION OF PIPING IS FIELD INSTALLED & NOT BY CXT.

PIPING LEGEND

- COLD WATER; COPPER. ASTM B88, TYPE "K" OR "L"
- HOT WATER; COPPER, ASTM B88, TYPE "K" OR "L"
- VENT PIPING; SCH 40 PVC, ASTM D2665, TYPE DWV
- WASTE PIPE; SCH 40 PVC, ASTM D2665, TYPE DWV
- FIELD PIPING; (NOT BY CXT)



VENT PIPING

VENT PIPING – KEY NOTES

1. 2" FLOOR DRAIN, FIELD INSTALLED (NOT BY CXT)
2. 3" VENT THROUGH ROOF.
3. 2" VENT WITH TEST PLUG. (8"x2'–0" BO AND 1'–6"x4'–0" BO)
4. FIELD INSTALLED 2" VENT PIPING FROM FLOOR DRAINS. (NOT BY CXT) (8"x2'–0" BO AND 1'–6"x4'–0" BO)

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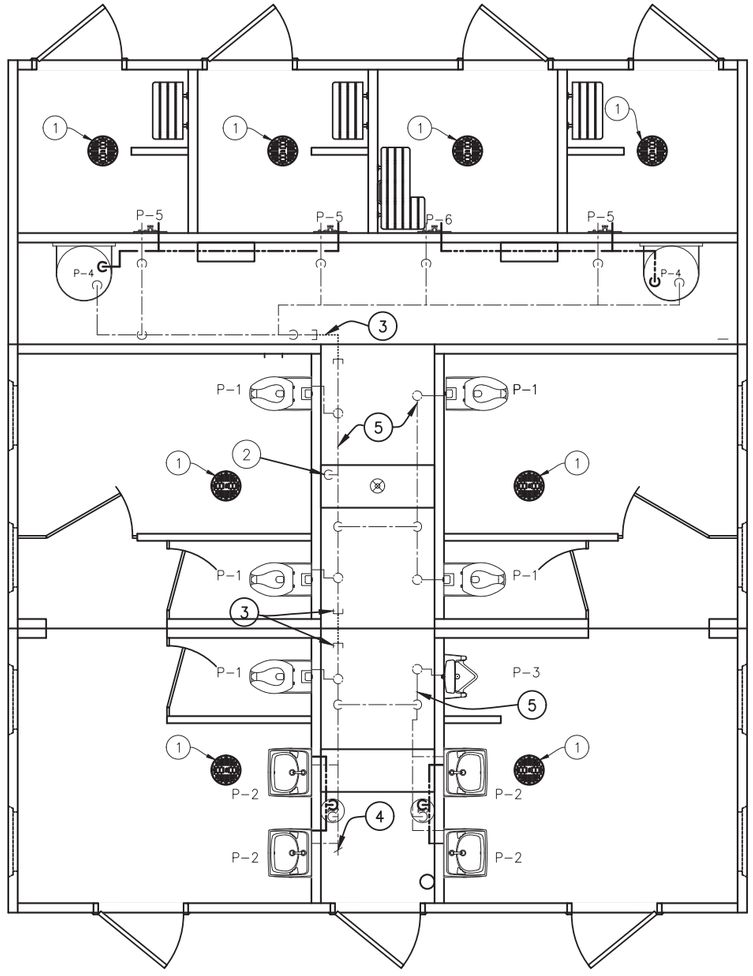
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

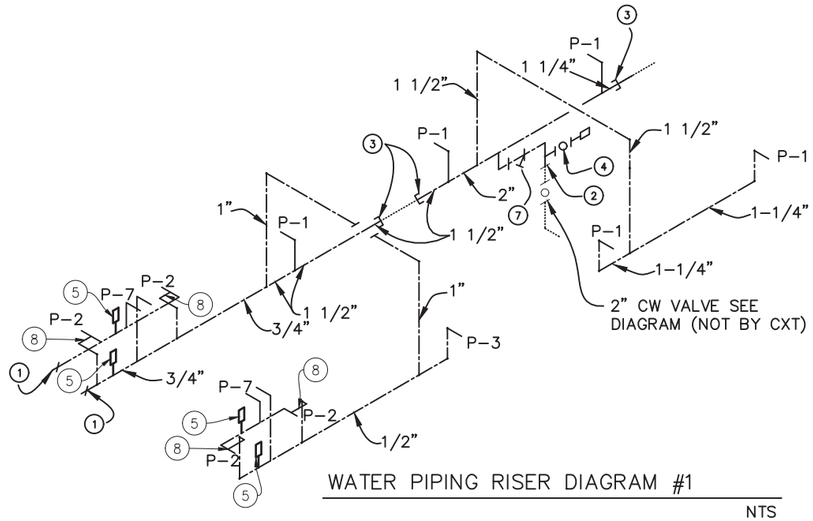
REV.	DESCRIPTION	APPROVAL	DATE

SCALE	3/16"=1'–0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH–329
CHECKED	N. PENNER	PLOT	64

PARTIAL PLUMBING PLANS

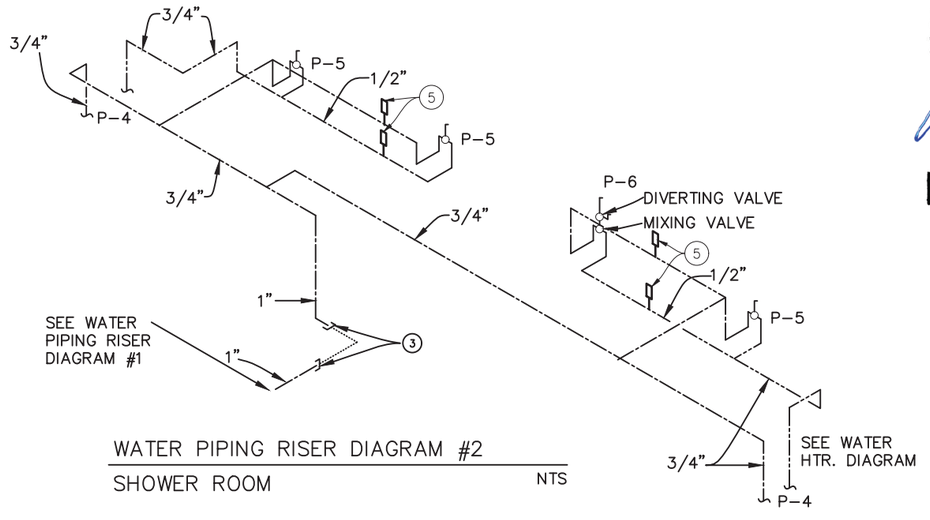
DWG NO.	SHEET	REV.
CH–01	38 / 44	0





WATER PIPING RISER DIAGRAM #1

NTS



WATER PIPING RISER DIAGRAM #2

SHOWER ROOM

NTS

WATER PIPING – KEY NOTES

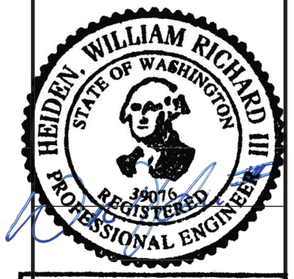
1. 2" FLOOR DRAIN, FIELD INSTALLED (NOT BY CXT) (10"ø AND 1'–6"x4'–0" BO)
2. FIELD INSTALLED 2" WATER SUPPLY WITH SHUT–OFF VALVE NEAR FLOOR. (NOT BY CXT)
3. CAPPED WATER LINES. CONNECTION BETWEEN SIDES IS TO BE FIELD INSTALLED. (NOT BY CXT)
4. 3/4" HOSE BIBB WITH VACUUM BREAKER AND WHEEL HANDLE
5. WATER PIPING ALONG WALL, SEE DIAGRAM ON CH–39.
6. WATER HEATER SECURED TO WALL
7. HOT WATER PIPING AT CEILING, INSTALL TO MISS LIGHT FIXTURE. INSULATE WITH 1" PRE MOLDED PIPE INSULATION.

WATER PIPING RISER – KEY NOTES

1. 3/4" HOSE BIBB WITH VACUUM BREAKER. & WHEEL HANDEL
2. TO THIS POINT BY CXT.
3. PLUGGED WATER LINES TO THIS POINT, BY CXT. PIPING BETWEEN THESE POINTS, NOT BY CXT.
4. 1/2" AIR QUICK CONNECTION W/ BALL VALVE FOR BLOWING OUT WATER PIPING.
5. ASSE 1010 WATER HAMMER ARRESTOR SIOUX CHIEF HYDRA–RESTOR #654–C OR EQUAL
6. WYE STRAINER
7. ASSE 1070 WATER TEMPERATURE LIMITING DEVICE

SPECIAL NOTES:
1. TOTAL FIXTURE COUNT: (15)
2. FLOWING PRESSURE: 45 PSI MIN, 80 PSI MAX
3. TOTAL DEVELOPED LENGTH = 31'–2"*

*APPROXIMATE DISTANCE FROM THE SOURCE TO THE FARTHEST FIXTURE



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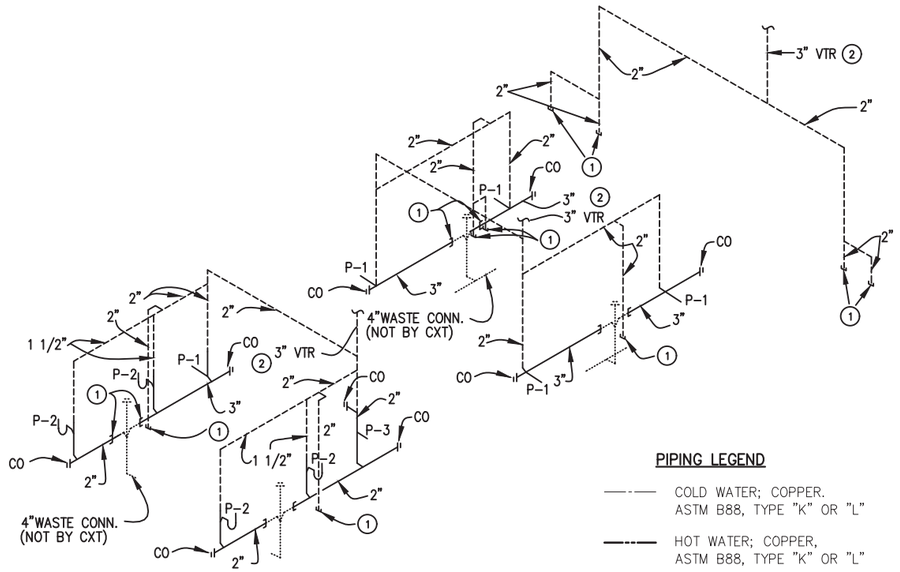
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE
SCALE	3/16"=1'–0"	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH–329
CHECKED	N. PENNER	PLOT	64

PLUMBING PLANS & NOTES

DWG NO.	SHEET	REV.
CH–01	39 / 44	0



WASTE & VENT RISER DIAGRAM

NTS

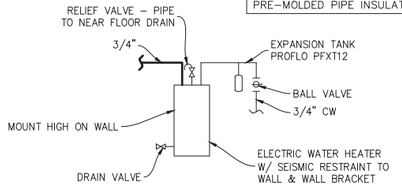
WASTE & VENT RISER – KEY NOTES

1. TO THIS POINT BY CXT.
2. ALIGN VTR W/BLOCKOUT IN ROOF.

PIPING LEGEND

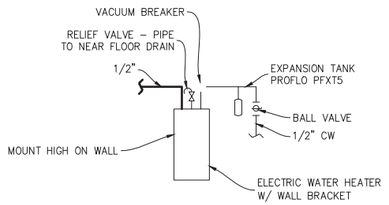
- COLD WATER; COPPER. ASTM B88, TYPE "K" OR "L"
- HOT WATER; COPPER, ASTM B88, TYPE "K" OR "L"
- VENT PIPING; SCH 40 PVC, ASTM D2665, TYPE DWV
- WASTE PIPE; SCH 40 PVC, ASTM D2665, TYPE DWV
- FIELD PIPING; (NOT BY CXT)

NOTE:
INSULATE HW PIPING WITH 1" (R3.6)
PRE-MOLDED PIPE INSULATION WITH ASJ



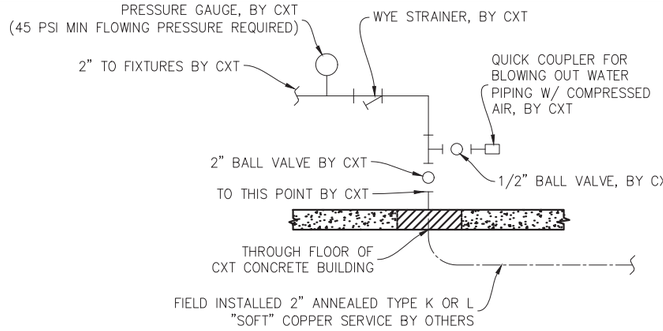
80 GALLON WATER HEATER PIPING DIAGRAM

NTS



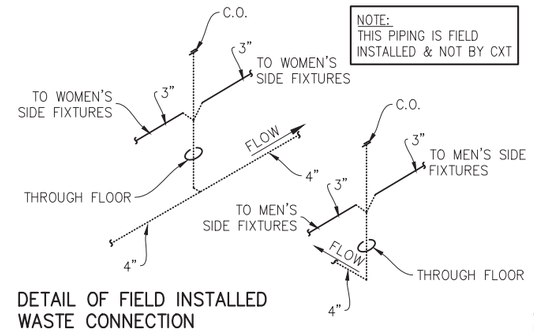
EEMAX EMT-4 WATER HEATER PIPING DIAGRAM

NTS



WATER SERVICE DETAIL

NTS



NOTE:
THIS PIPING IS FIELD INSTALLED & NOT BY CXT

DETAIL OF FIELD INSTALLED WASTE CONNECTION

NTS

SYM	DESCRIPTION	MANUFACTURER	CXT PART NUMBER	FLUSH VL/FAUCET	SUPPLIES	QTY	HW	CW	WASTE	VENT	SUPPLIES / NOTES
P-1	WATER CLOSET (PUSH BUTTON)	AMERICAN STANDARD	2634.101 (W.C.) 5905.100 (W.C. SEAT)	SLOAN "ROYAL" #952-1.6 L-3 W=4"	SLOAN HY33A	4		1-1/4"	3"	2"	1. OFFSET FLUSH VALVE TAILPIECE PER ADA, RIGHT OR LEFT HAND, AS REQUIRED. 2. MOUNT RIM AT 17" ABOVE FLOOR. 3. USE CLOSET GASKET JG13534 AND Z1203 FINISH KIT
P-2	LAVATORY (PUSH BUTTON)	AMERICAN STANDARD	0356.421 (LAV)	SYMMONS SLS-7000		4	1/2"	1/2"	1-1/2"	1-1/2"	1. 1/2X15 COMP ANG LAV BSCR1915AC 2. 3 PC COVER SET PF202WH.
P-3	URINAL (PUSH BUTTON)	AMERICAN STANDARD	6515.001(URINAL)	SLOAN "ROYAL" #995.1	SLOAN HY33A	1	–	3/4"	2"	2"	1. MOUNT RIM AT 17" ABOVE FLOOR.
P-4	WATER HEATER	AO SMITH	DEN 80 – NONSIMULTANEOUS 5.5KW 5.5KW – 240V			2	3/4"	3/4"	–	–	1. PROFLO PFXT12 EXPANSION TANK 2. 80 GALLON ELECTRIC TANK TYPE, 240 VOLTS, SINGLE PHASE
P-5	SHOWER, NON-ADA	ACORN	ACORN ADA (PL54895) M1741-E707-1-8DIV			3	1/2"	1/2"	–	–	1. ACCESSORIES: TSM # 895 , TSM #730-PHI SEAT 2. PROVIDE CAST IN WALL SLEEVE. THERMOSTATIC VALVE SET TO LIMIT THE MAXIMUM SETTING OF THE VALVE TO 120°F.
P-6	SHOWER, ADA	ACORN	ACORN ADA (PL54890) M1741-E706-1-8DIV			1	1/2"	1/2"	–	–	1. ACCESSORIES: TSM # 895 , TSM #730-PHI SEAT 2. PROVIDE CAST IN WALL SLEEVE. THERMOSTATIC VALVE SET TO LIMIT THE MAXIMUM SETTING OF THE VALVE TO 120°F.
P-7	WATER HEATER	EEMAX	EMT-4			2	1/2"	1/2"	–	–	1. 4 GALLON 120V WALL MOUNTED WATER HEATER. PROVIDE GFCI OUTLET IN CHASE PER MF'R RECOMMENDATIONS.
P-8	NOT USED										
P-9	FLOOR DRAIN	TRAVIS	54960-CXT			8	–	–	2"	2"	1. 2" TRAP SEAL PART# P26001 (QTY 3)
		SIOUX CHIEF (CHASE)	840-2A			1					

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
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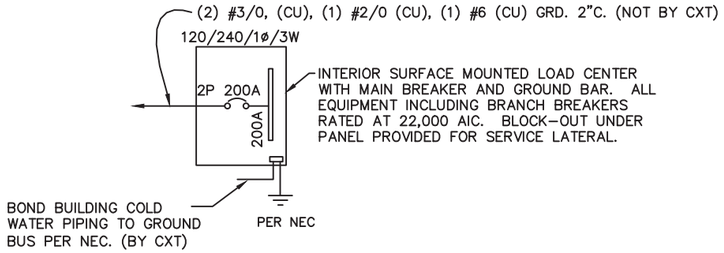
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE

SCALE	3/16"=1'-0"	DATE	01/25/24
DRAWN	C. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	64

PLUMBING DETAILS, DIAGRAMS, & SCHEDULE

DWG NO.	SHEET	REV.
CH-01	40 / 44	0



ONE-LINE POWER DIAGRAM

NTS

GENERAL ELECTRICAL NOTES

1. RECESSED JUNCTION BOXES FOR SINGLE DEVICES SHALL HAVE SINGLE GANG MUD RINGS CAST IN CONCRETE WALLS.
2. ALL RECEPTACLES SHALL BE GFCI PROTECTED BY CIRCUIT BREAKERS, OR BY OTHER GFCI RECEPTACLES.
3. ALL CONDUIT SHALL BE SIZED PER NEC. EXPOSED CONDUIT SHALL BE EMT/FMC, RECESSED SHALL BE PVC.
4. INSTALL ALL WIRING IN CONDUIT OR RELATED ENCLOSURES.
5. ALL ELECTRICAL INSTALLATIONS SHALL MEET THE 2023 NATIONAL ELECTRIC CODE W/ STATEWIDE AMENDMENTS.
6. MINIMUM WIRE SIZE SHALL BE #12 AWG COPPER, THHN INSULATION UNLESS NOTED OTHERWISE.
7. ROUTE ALL CONDUITS IN UTILITY ROOM AT CEILING OR FACE OF WALLS.
8. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC IN NATURE & MAY NOT SHOW EXACT LOCATIONS OF DEVICES. REFER TO WALL PANEL & OTHER DRAWINGS FOR EXACT LOCATIONS OF J-BOXES, ETC..
9. ALL CONDUCTORS AND CABLES MUST BE PROPERLY TERMINATED IN APPROVED BOXES, BEFORE CONNECTING THE CIRCUIT TO THE BREAKER AND BEFORE RECEIVING FINAL INSPECTION APPROVAL IN THE FACTORY
10. PROVIDE CIRUIT BREAKER LOCKOUT TAB FOR ALL HAND DRYERS AND FANS.
11. PROVIDE WATER HEATER WITH A 100A DISCONNECT. A 240V. 70A DEDICATED CIRCUIT

EXHAUST FAN SCHEDULE

SYM	MFR	MODEL #	CFM	SONES	VOLTS	AMPS	WATTS	NTS.
EF-1	FANTECH	FG-4XL	150	6.0	120	0.75	72	1.2
EF-1	FANTECH	FG-6XL	460	6.0	120	1.31	150	1

NOTE
1. FANS LISTED FOR WET LOCATION, CONTROL VIA OCCUPANCY SENSOR.

PANEL SCHEDULE

AMP 200 — PANEL — TOTAL CONNECTED VA LOAD 28,832
SURFACE MOUNT — 120/240V, 1P, 3W — TOTAL CALCULATED VA LOAD 34,631

CIRCUIT NO.	DESCRIPTION	OCP	TYPE	LOAD (VA)	(A)	PH.	CIRCUIT NO.	DESCRIPTION	OCP	TYPE	LOAD (VA)	(A)
1	LIGHTS AND EXHAUST FANS - RR MENS	1P/20A*	N	198	1.7	A	2	LIGHTS AND EXHAUST FANS - RR WOMENS	1P/20A*	R	198	1.7
3	RECEPTACLE - CHASE	1P/20A	R	180	1.5	B	4	LIGHTS - CHASE	1P/20A	N	96	0.8
5	OUTDOOR LIGHT	1P/20A	C	56	0.5	A	6	LIGHTS AND EXHAUST FANS SHOWERS	1P/20A*	N	304	2.5
7	HAND DRYER - RR MENS	1P/20A*	L	1,140	9.5	B	8	HAND DRYER - RR WOMENS	1P/20A*	N	1,140	9.5
9	RECEPTACLE - RR MENS	1P/20A	R	360	3.0	A	10	RECEPTACLE - RR WOMENS	1P/20A	R	360	3.0
11	WATER HEATER #1	2P/60A	C	5,500	45.8	B	12	WATER HEATER #2	2P/60A	C	5,500	45.8
13			C	5,500		A	14			C	5,500	
15	EEMAX WATER HEATER GFCI OUTLET	1P/20A	R	1,400	11.7	B	16	EEMAX WATER HEATER GFCI OUTLET	1P/20A	R	1,400	11.7
17						A	18					
19						B	20					
21						A	22					
23						B	24					
25						A	26					
27						B	28					
29						B	30					
31						A	32					
33						B	34					
35						B	36					
37						B	38					
39						B	40					

NOTE: MAXIMUM ALLOWABLE AIC IS 22K AMPS, PANEL MODIFICATIONS WILL BE REQUIRED (NOT BY CXT) IF TRANSFORMER CAPACITY EXCEEDS 175 KVA.
*PROVIDE CIRCUIT BREAKER LOCKOUT TAB CONFORMING TO NEC 110.25

LOAD	CONNECTED		CALCULATED	
(C)ONTINUOUS	22,056	x1.25	27,570	VA
(R)EC (1ST 10KVA)	3,898	x1.00	3,898	VA
(N)ON-CONTINUOUS	1,738	x1.00	1,738	VA
(L)ARGEST MOTOR	1,140	x1.25	1,425	VA
TOTAL LOAD	28,832		34,631	VA
			144.3	AMPS

LIGHTING FIXTURE SCHEDULE

FIXTURE NUMBER	VOLTAGE	WATTS	DESCRIPTION
A	120	25	**LUMINAIRE VPF8 INTERIOR LIGHT FIXTURE, VPF8-4FT-NODIM-25W-40K-MV-CLP-WHT-WL-20CC** SURFACE MOUNTED, LED LAMP 4 FT, WRAP AROUND LENS, LOW TEMPERATURE DRIVER, BUILT IN OCCUPANCY SENSOR ACTIVATED W/ ADDITIONAL OCCUPANCY SENSOR FOR FAN CONTROL
B	120	14	**SWOOP 610 LED EXTERIOR LIGHT, YWP610-14W HP-3500K-120-CP-BRZ-CAB/PC** EXTERIOR, VANDAL RESISTANT, WALL MOUNTED, 14 WATT, CLEAR PRISMATIC LENS, BUILT IN PHOTOELECTRIC CONTROL
C	120	25	**LUMINAIRE VPF8 INTERIOR LIGHT FIXTURE, VPF8-4FT-NODIM-25W-40K-MV-CLP-WHT-WL-OCC** SURFACE MOUNTED, LED LAMP 4 FT, WRAP AROUND LENS, LOW TEMPERATURE DRIVER, BUILT IN OCCUPANCY SENSOR ACTIVATED
D	120	25	**LUMINAIRE VPF84 INTERIOR LIGHT FIXTURE, VPF8-4FT-NODIM-25W-40K-MV-CLP-WHT-WL** SURFACE MOUNTED, LED LAMP 4 FT, WRAP AROUND LENS, LOW TEMPERATURE DRIVER, SWITCH ACTIVATED

NOTE: THE SOURCE OF EFFICACY OF EXTERIOR LIGHTING IS TO BE A MINIMUM OF 45 LUMENS PER WATT

HEIDEN, WILLIAM RICHARD III — STATE OF WASHINGTON — 39076 — REGISTERED PROFESSIONAL ENGINEER

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362 Waverly Road Williamstown, WV 26187

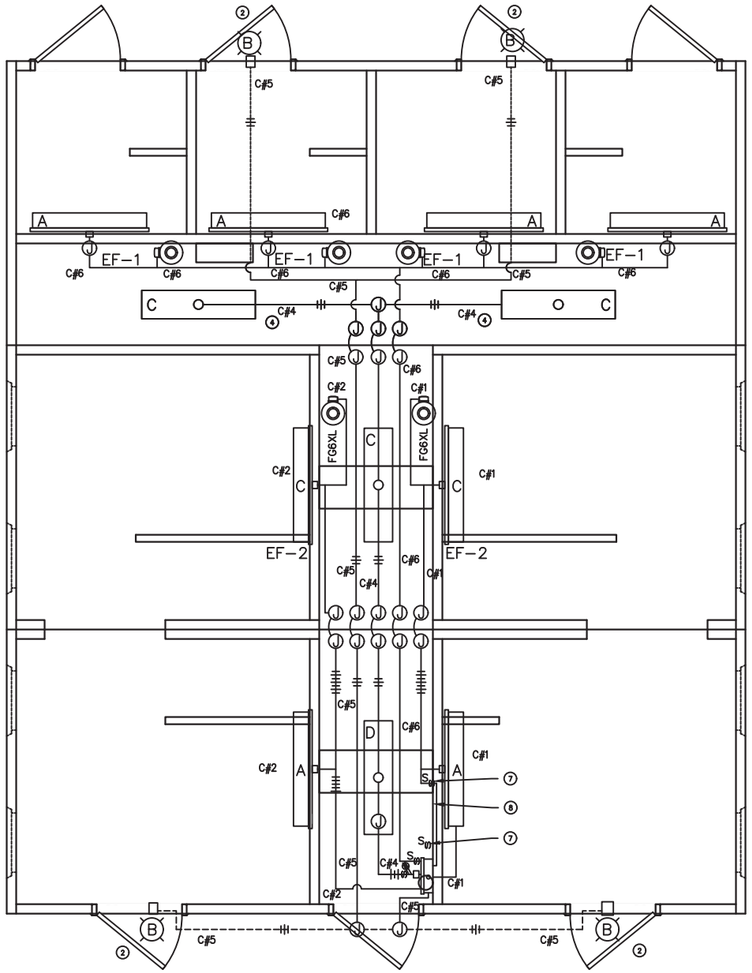
PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE

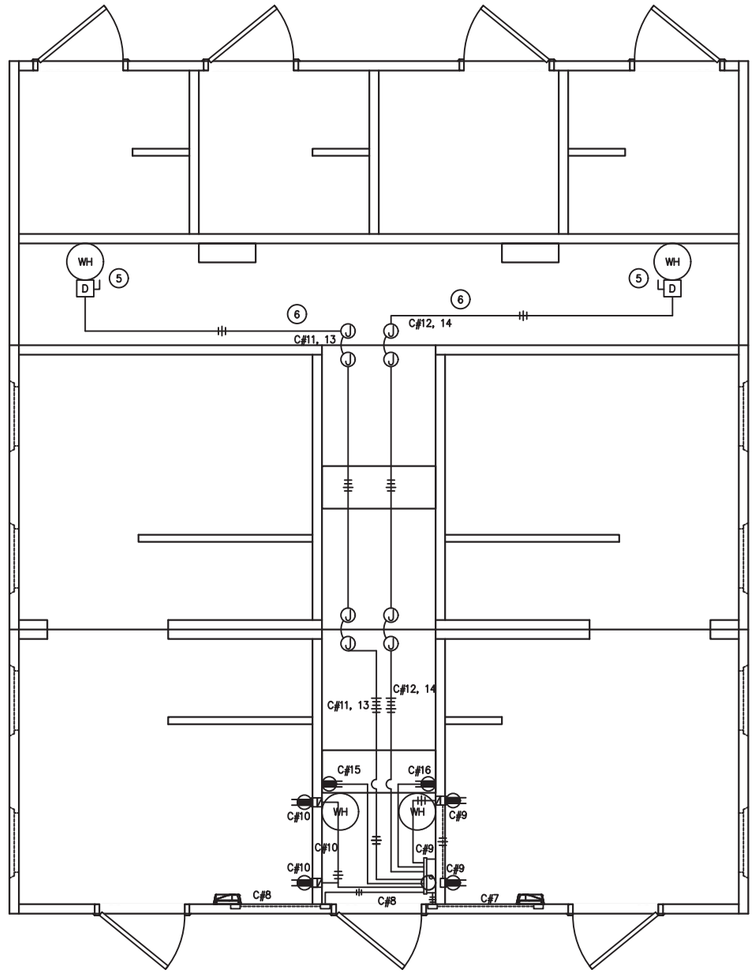
SCALE	N/A	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	N/A

ELECTRICAL NOTES, LEGEND & SCHEDULES

DWG NO.	SHEET	REV.
CH-01	41 / 44	0



LIGHTING & EXHAUST FAN PLAN



RECEPTACLE, WATER HEATER, & HAND DRYER PLAN

KEY NOTES

1. CIRCUIT AS NEEDED FOR THE LOAD OF THE EXHAUST FANS. WIRE THROUGH OCCUPANCY SENSOR
2. EXTERIOR LIGHT FIXTURES TO BE CONTROLLED BY INTEGRAL PHOTOCELL.
3. SHOWER ROOM LIGHTS AND EXHAUST FANS EF-2 ARE TO OPERATE BY OCCUPANCY SENSOR.
4. CHASE LIGHT BY LOAD CENTER TO BE SWITCH ACTIVATED. OTHER CHASE LIGHTS TO BE OPERATED BY OCCUPANY SENSOR.
5. PROVIDE WATER HEATER WITH A 100 AMP DISCONNECT, A 240V, 70 AMP DEDICATED CIRCUIT.
6. INSTALL 3-#6 AWG IN A 3/4" CONDUIT.
7. RESTROOM LIGHTS AND FANS TO OPERATE BY OCCUPANCY SENSOR.

(X)	NOTE REFERENCE
	COMBINATION SWITCH AND DUPLEX RECEPTACLE
x	GFI DUPLEX RECEPTACLE (x = BREAKER # IF SHOWN)
	ON / OFF SWITCH
J J	JUNCTION BOX
	RECESSED JUNCTION BOX

SYMBOLS

	LOAD CENTER "A"
X	WALL MOUNTED LED FIXTURE
X	CEILING MOUNTED LED FIXTURE
(X)	EXTERIOR LIGHT FIXTURE
	HAND DRYER WITH DISCONNECT SWITCH
WH	WATER HEATER
D	SAFETY DISCONNECT
(X)	PANEL OR DEVICE AS NOTED
	SURFACE MOUNTED CONDUIT, CROSSHATCH OR SLASH AND NUMBER DENOTES WIRES, (ALL #12AWG UNO, UNLESS NOTED) ONE WIRE TO BE GROUND
12	
	CONCEALED CONDUIT

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DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	64

ELECTRICAL PLAN

DWG NO.	SHEET	REV.
CH-01	42 / 44	0

WALL PANEL W1

EMBEDDED MATERIALS

ITEM	QTY
AS-2 SS	4
PS-2 SS	8
PS-19 SS	8
FL648	4
R411	4
R3x64	3
R3x92	4
R3x98	12
R3x180	2
R303	6
R316	1
R327	2
R320	6
40 1/8" x 82 1/4" B.O.	4
SI-2 MOLD	4
4x4 J-BOX	2
ROUND MUD RING	2
BLOCKOUT 3"x3"x2" DEEP	1
R322	4
MARINE PACKAGE	

CU. FT. CONC.	SQ. FT. W.W.F.
48.0 (1.78)	174

APPROXIMATE WEIGHT
7,200

WALL PANEL W2

EMBEDDED MATERIALS

ITEM	QTY
AS-2 SS	6
PS-2 SS	10
PS-19 SS	6
FL648	4
R411	4
R303	6
R316	1
R320	2
R327	2
R3x92	10
R3x172	6
BLOCKOUT 4 1/2" DIA	4
4x4 E-BOX	16
ROUND MUD RING	4
SHOWER WALL SLEEVE	4
MARINE PACKAGE	

CU. FT. CONC.	SQ. FT. W.W.F.
77.0 (2.85)	2432

APPROXIMATE WEIGHT
11,550

WALL PANEL W3

EMBEDDED MATERIALS

ITEM	QTY
AS-2 SS	3
PS-2 SS	1
PS-10 SS	2
PS-19 SS	4
R303	2
R320	4
R322	2
R3x38	2
R3x92	2
R3x116	2
MS-2 BLOCKOUT	1
MARINE PACKAGE	

CU. FT. CONC.	SQ. FT. W.W.F.
26.2 (0.98)	80

APPROXIMATE WEIGHT
3,930

WALL PANEL W4

EMBEDDED MATERIALS

ITEM	QTY
AS-2 SS	3
PS-2 SS	1
PS-10 SS	2
PS-19 SS	3
R303	2
R320	4
R322	2
R3x38	2
R3x92	2
R3x116	2
MS-2 BLOCKOUT	1
MARINE PACKAGE	

CU. FT. CONC.	SQ. FT. W.W.F.
26.2 (0.98)	80

APPROXIMATE WEIGHT
3,930

WALL PANEL W5

EMBEDDED MATERIALS

ITEM	QTY	ITEM	QTY
AS-2 SS	2		
PS-10 SS	2		
PS-2 SS	4		
R320	4		
R3x65	2		
R3x110	2		
PS-3 SS	2		
R303	2		
MARINE PACKAGE			

CU. FT. CONC.	SQ. FT. W.W.F.	APPROX CONC WEIGHT
18.2 (0.68)	55	2,735

WALL PANEL W6

EMBEDDED MATERIALS

ITEM	QTY	ITEM	QTY
AS-2 SS	2		
PS-10 SS	2		
PS-2 SS	4		
R320	4		
R3x65	2		
R3x129	2		
PS-3 SS	2		
R303	2		
MARINE PACKAGE			

CU. FT. CONC.	SQ. FT. W.W.F.	APPROX CONC WEIGHT
21.3 (0.79)	65	3,190

WALL PANEL W7

EMBEDDED MATERIALS

ITEM	QTY	ITEM	QTY
AS-2 SS	2		
PS-10 SS	2		
PS-2 SS	4		
R320	4		
R3x65	2		
R3x110	2		
PS-3 SS	2		
R303	2		
MARINE PACKAGE			

CU. FT. CONC.	SQ. FT. W.W.F.	APPROX CONC WEIGHT
18.2 (0.68)	55	2,735

WALL PANEL W8

EMBEDDED MATERIALS

ITEM	QTY
AS-2	6
PS-2	8
PS-19	4
FL648	4
R411	4
R303	4
R316	1
R320	4
R327	2
R3x92	2
R3x98	2
R3x124	2
R3x180	2
BLOCKOUT 8"x8"	2

CU. FT. CONC.	SQ. FT. W.W.F.
71.5 (2.65)	215

APPROXIMATE WEIGHT
10,725

WALL PANEL W9

EMBEDDED MATERIALS

ITEM	QTY
AS-2	6
PS-2	10
PS-19	4
FL648	4
R411	4
R303	4
R316	1
R320	4
R327	2
R3x92	2
R3x98	4
R3x61	2
R3x180	2
BLOCKOUT 8"x8"	2

CU. FT. CONC.	SQ. FT. W.W.F.
52.1 (1.93)	240

APPROXIMATE WEIGHT
7,815

WALL PANEL W10

EMBEDDED MATERIALS

ITEM	QTY
AS-2	3
PS-2	1
PS-10	2
PS-19	4
R320	4
R322	2
R3x38	2
R3x92	6
R3x116	4
MS-2 BLOCKOUT	2
MS-4 BLOCKOUT	2

CU. FT. CONC.	SQ. FT. W.W.F.
25.4 (0.95)	80

APPROXIMATE WEIGHT
3,810

WALL PANEL W11

EMBEDDED MATERIALS

ITEM	QTY
AS-2	3
PS-2	1
PS-10	2
PS-19	4
R320	8
R322	2
R3x38	1
R3x92	12
R3x116	8
MS-2 BLOCKOUT	2
MS-4 BLOCKOUT	2

CU. FT. CONC.	SQ. FT. W.W.F.
25.4 (0.95)	80

APPROXIMATE WEIGHT
3,810

WALL PANEL W12

EMBEDDED MATERIALS

ITEM	QTY
AS-2	2
PS-2	4
PS-3	2
PS-2	2
R303	2
R320	4
R3x108	2
R3x123	2
4x4 E-BOX	2
ROUND MUD RING	1
BLOCKOUT 6 1/2" DIAMETER	1
FLUSH BOWL BLOCKOUT	1
BLOCKOUT 2" DIAMETER	1

CU. FT. CONC.	SQ. FT. W.W.F.
33.0 (1.22)	100

APPROXIMATE WEIGHT
4,950

WALL PANEL W13

EMBEDDED MATERIALS

ITEM	QTY
AS-2	2
PS-2	6
PS-10	2
R303	2
R320	4
R3x108	2
R3x123	2
4x4 E-BOX	2
ROUND MUD RING	1
BLOCKOUT 6 1/2" DIAMETER	1
FLUSH BOWL BLOCKOUT	1
BLOCKOUT 2" DIAMETER	1

CU. FT. CONC.	SQ. FT. W.W.F.
33.0 (1.22)	100

APPROXIMATE WEIGHT
4,950

WALL PANEL W14

EMBEDDED MATERIALS

ITEM	QTY
AS-2	6
PS-2	10
PS-19	4
FL648	4
R411	4
R303	4
R316	1
R320	4
R327	2
R3x92	2
R3x98	4
R3x61	2
R3x180	2
BLOCKOUT 8"x8"	2

CU. FT. CONC.	SQ. FT. W.W.F.
52.1 (1.93)	240

APPROXIMATE WEIGHT
7,815

WALL PANEL W15

EMBEDDED MATERIALS

ITEM	QTY
AS-2	6
PS-2	10
PS-19	4
FL648	4
R411	4
R3x58	2
R3x92	2
R3x98	6
R3x180	2
R303	4
R316	1
R327	2
R320	8
40 1/8" x 82 1/4" B.O.	3
SI-2 MOLD	3
4x4 J-BOX	8
ROUND MUD RING	2

CU. FT. CONC.	SQ. FT. W.W.F.
56.7 (2.1)	174

APPROXIMATE WEIGHT
8,505

WALL PANEL W16

EMBEDDED MATERIALS

ITEM	QTY
AS-2	3
PS-2	1
PS-10	2
PS-19	4
R320	4
R322	2
R3x38	2
R3x92	6
R3x116	4
MS-2 BLOCKOUT	2
MS-4 BLOCKOUT	2

CU. FT. CONC.	SQ. FT. W.W.F.
25.4 (0.95)	80

APPROXIMATE WEIGHT
3,810

HEIDEN, WILLIAM RICHARD III
STATE OF WASHINGTON
39076
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES April 23, 2025

June 10, 2024

LBFoster®
CXT® Products

6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE

SCALE	N/A	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	N/A

B.O.M.

DWG NO.	SHEET	REV.
CH-01	43 / 44	0

WALL PANEL W17

EMBEDDED MATERIALS

ITEM	QTY
AS-2	3
PS-2	1
PS-10	2
PS-19	4
R320	4
R322	2
R3x38	2
R3x92	6
R3x116	4
MS-2 BLOCKOUT	2
MS-4 BLOCKOUT	2

CU. FT. CONC.	SQ. FT. W.W.F.
25.4 (0.95)	80

APPROXIMATE WEIGHT
3,810

WALL PANEL W18

EMBEDDED MATERIALS

ITEM	QTY
AS-2	2
PS-2	4
PS-3	2
PS-10	2
R303	2
R320	4
R3x108	2
R3x123	2
4x4 E-BOX	4
4x4 J-BOX	1
RECTANGULAR MUD RING	2
ROUND MUD RING	1
URINAL BLOCKOUT	1
BLOCKOUT 2" DIAMETER	1
LAVATORY BLOCKOUT	2

CU. FT. CONC.	SQ. FT. W.W.F.
33.0 (1.22)	100

APPROXIMATE WEIGHT
4,950

WALL PANEL W19

EMBEDDED MATERIALS

ITEM	QTY
AS-2	2
PS-2	4
PS-3	2
PS-10	2
R303	2
R320	4
R3x108	4
R3x123	4
4x4 E-BOX	6
ROUND MUD RING	1
RECTANGULAR MUD RING	2
FLUSH BOWL BLOCKOUT	1
BLOCKOUT 2" DIAMETER	1
LAVATORY BLOCKOUT	1

CU. FT. CONC.	SQ. FT. W.W.F.
33.0 (1.22)	100

APPROXIMATE WEIGHT
4,950

PARTITION MARK P1 (3 REQUIRE)

EMBEDDED MATERIALS

ITEM	QTY
PS-20 SS	2
B-18	1

MARINE PACKAGE

CU. FT. CONC.	SQ. FT. W.W.F.
2.9 (0.12)	11

APPROXIMATE WEIGHT
435

PARTITION MARK P2 (2 REQUIRE)

EMBEDDED MATERIALS

ITEM	QTY
PS-20	3
B-18	2
R3x66	2

CU. FT. CONC.	SQ. FT. W.W.F.
7.70 (0.28)	31

APPROXIMATE WEIGHT
1,150

PARTITION MARK P3

EMBEDDED MATERIALS

ITEM	QTY
PS-2	1
PS-20	2
B-18	2
R3x66	2

CU. FT. CONC.	SQ. FT. W.W.F.
6.4 (0.24)	26

APPROXIMATE WEIGHT
960

PARTITION MARK P4

EMBEDDED MATERIALS

ITEM	QTY
PS-20	2
B-18	1

CU. FT. CONC.	SQ. FT. W.W.F.
2.4 (0.09)	10

APPROXIMATE WEIGHT
365

FLOOR SLAB F1

EMBEDDED MATERIALS

ITEM	QTY
AS-7	4
R4x112	9
R3x42	12
AS-3	4
R3x75	2
R3x116	2
R3x172	6
PS-19 SS	16
RM54960 F.D.	4
SECTIONAL B.O.	2
BLOCKOUT 24" x 8"	2
PT CHUCK	2
1" PVC SCH40 x 9'-9"	2
	2

MARINE PACKAGE

CU. FT. CONC.	SQ. FT. W.W.F.
68.9 (2.55)	340

APPROXIMATE WEIGHT
10,335

FLOOR SLAB F2

EMBEDDED MATERIALS

ITEM	QTY
AS-3	4
R4x112	6
R3x42	8
R3x72	2
R3x75	2
R3x90	2
R3x116	2
R3x172	4
PS-19	18
FLOOR DRAIN	2
SECTIONAL B.O.	4
BLOCKOUT 48" x 18"	1
1" PVC SCH40 x 9'-6"	2
AS-7	4

CU. FT. CONC.	SQ. FT. W.W.F.
68.9 (2.55)	340

APPROXIMATE WEIGHT
10,335

FLOOR SLAB F3

EMBEDDED MATERIALS

ITEM	QTY
AS-3	4
R4x112	6
R3x42	8
R3x72	2
R3x75	2
R3x90	2
R3x116	2
R3x172	4
PS-19	18
RM54960 F.D.	2
SECTIONAL B.O.	2
BLOCKOUT 48" x 18"	1
PT CHUCK	2
1" PVC SCH40 x 9'-9"	2
R303	1
PS-3	1
BLOCKOUT 6" DIAMETER	1
AS-7	4

CU. FT. CONC.	SQ. FT. W.W.F.
68.9 (2.55)	340

APPROXIMATE WEIGHT
10,335

ROOF SLAB R1-R

EMBEDDED MATERIALS

ITEM	QTY
PS-19	11
FL847	4
FL648	4
R411	4
R4x18	4
R320	2
R3x134	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
BLOCKOUT 5" DIAMETER	3
TEXTURE BLOCKOUT 12" SQUARE	3
PS-2 SS	2
PARTIAL BLOCKOUT 3"x9"x2" DEEP	1
4x4 J-BOX	1
R303	11

MARINE PACKAGE

CU. FT. CONC.	SQ. FT. W.W.F.
71.2 (2.64)	345

APPROXIMATE WEIGHT
10,680

ROOF SLAB R1-L

EMBEDDED MATERIALS

ITEM	QTY
PS-19 SS	13
FL847	4
FL648	4
R411	4
R4x18	16
R320	2
R3x134	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
BLOCKOUT 5" DIAMETER	2
TEXTURE BLOCKOUT 12" SQUARE	2
PS-2 SS	2
PARTIAL BLOCKOUT 3"x9"x2" DEEP	1
4x4 J-BOX	1
R303	11

MARINE PACKAGE

CU. FT. CONC.	SQ. FT. W.W.F.
71.2 (2.64)	345

APPROXIMATE WEIGHT
10,680

ROOF SLAB R2-R

EMBEDDED MATERIALS

ITEM	QTY
PS-19	10
FL847	4
FL648	4
R411	4
R4x18	16
R320	2
R3x116	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
BLOCKOUT 5" DIAMETER	1
TEXTURE BLOCKOUT 12" SQUARE	1
BLOCKOUT 6 1/2" DIAMETER	1
TEXTURE BLOCKOUT 15" SQUARE	1
R303	5
PS-2	2

CU. FT. CONC.	SQ. FT. W.W.F.
60.7 (2.25)	300

APPROXIMATE WEIGHT
9,105

ROOF SLAB R2-L

EMBEDDED MATERIALS

ITEM	QTY
PS-19	11
FL847	4
FL648	4
R411	4
R4x18	4
R320	2
R3x116	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
BLOCKOUT 6 1/2" DIAMETER	1
TEXTURE BLOCKOUT 15" SQUARE	1
R303	5
PS-2	2

CU. FT. CONC.	SQ. FT. W.W.F.
60.7 (2.25)	300

APPROXIMATE WEIGHT
9,105

ROOF SLAB R3-R

EMBEDDED MATERIALS

ITEM	QTY
PS-19	11
FL847	4
FL648	4
R411	4
R4x18	16
R320	2
R3x134	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
BLOCKOUT 5" DIAMETER	1
TEXTURE BLOCKOUT 12" SQUARE	1
R303	8
PS-2	2

CU. FT. CONC.	SQ. FT. W.W.F.
71.2 (2.64)	345

APPROXIMATE WEIGHT
10,680

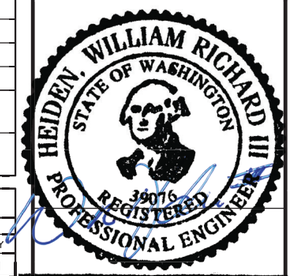
ROOF SLAB R3-L

EMBEDDED MATERIALS

ITEM	QTY
PS-19	11
FL847	4
FL648	4
R411	4
R4x18	16
R320	2
R3x134	2
R3x175	2
R3x176	1
PT CHUCK	1
1" PVC SCH40 x 11'-3"	1
PS-2	2
R303	8

CU. FT. CONC.	SQ. FT. W.W.F.
71.2 (2.64)	345

APPROXIMATE WEIGHT
10,680



EXPIRES April 23, 2025

June 10, 2024

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CXT® Products

6701 E Flamingo Ave Bldg 300 Nampa, ID 83687
901 N. Highway 77 Hillsboro, TX 76645
362 Waverly Road Williamstown, WV 26187

PROJECT TITLE
CHEYENNE
BUILDING NUMBER CH-329

REV.	DESCRIPTION	APPROVAL	DATE

SCALE	N/A	DATE	01/25/24
DRAWN	G. SCHUETTE	FILE NO.	CH-329
CHECKED	N. PENNER	PLOT	N/A

B.O.M.

DWG NO.	SHEET	REV.
CH-01	44 / 44	0

CXT Inc. (Precast Division)

Calculations
CHEYENNE CH-329
Structural Analysis

Design Loads
400 psf Live Floor Load
120 psf Ground Snow Load
Wind Speed – 150 mph Exp. C
Seismic Design Category: D

Design Standards
2021 International Building Code
ASCE 7-16/ ACI 318-19

UL-752 Bullet Resistance
Classification: Level IV
Report #: 2012-647

EXPIRES April 23, 2025

June 10, 2024

Table of Contents

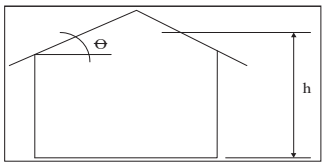
All attached documents are for reference only and designed or approved by others.

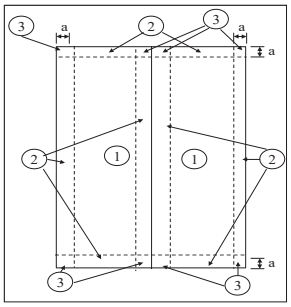
EXPIRES April 23, 2025

June 10, 2024

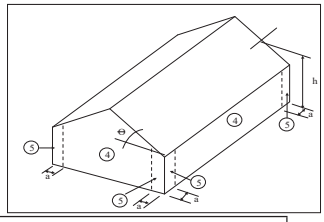
Main Wind Force Resisting System Loads (ASCE 7-16)

CHEYENNE CH-329		
Category	II	IBC TABLE 1604.5: Risk Category of Buildings and Other Structures.
Exposure	C	See § 26.7.3: Exposure Categories, General.
Velocity	150 mph	See Figure 26.5-1A thru 26.5-2D: Basic Wind Speed (3 second Gust)
h.wind	7.96 ft	Windward wall height
h.lee	7.96 ft	Leeward wall height
W.building	26 ft	Width of the building
L.building	30 ft	Length of the building
H.building	11.58 ft	Height of the building (to the ridge). Enter 0 if unknown.
Roof Rise	3	Roof pitch (per foot)
ϑ	14.04 deg	Roof Angle
Kd	0.85	Wind directionality factor. 0.85 when using load combinations, 1.0 otherwise.
K_1	0.00	
K_2	0.00	
K_3	0.00	See Figure 26.8-1: Multipliers for Obtaining Topographical Factor Kzt





Kzt	1	Topographic factor
h	9.769 ft	Mean roof height
n_a	7.68	Natural frequency
Flexibility	Rigid	Building flexibility
α	9.5	Terrain factor
z_g	900 ft	Terrain factor



Velocity Pressure Exposure Coefficient		
K(z)	0.849	at windward eave

Velocity Pressure (27.3.2)	
q_z	41.56 psf

Gable	Type of Roof - Gable or Hip?

Partially Enclosed if the building meets both of the following conditions:
1. Total area of openings in one wall exceeds area of openings in the balance of the building by more than 10%.
2 Total area of openings in one wall exceeds 4 sq. ft. or 1% of area of that wall and the total area of openings in the balance of the building does not exceed 20% of the area in the balance of the building.

Zone	Opening Area	Gross Area	Agi	Aoi	Condition 1	Condition 2	Condition 3	Condition 4	Type:
Windward sidewall	0 sq ft	238.8 sq ft	1526.7 sq ft	0 sq ft	0.00	0.00	0.00	0.00	Enclosed
Windward endwall	0 sq ft	254.0 sq ft	1511.5 sq ft	0 sq ft	0.00	0.00	0.00	0.00	Enclosed
Leeward sidewall	0 sq ft	238.8 sq ft	1526.7 sq ft	0 sq ft	0.00	0.00	0.00	0.00	Enclosed
Leeward endwall	0 sq ft	254.0 sq ft	1511.5 sq ft	0 sq ft	0.00	0.00	0.00	0.00	Enclosed
Roof	0 sq ft	780.0 sq ft	985.5 sq ft	0 sq ft	0.00	0.00	0.00	0.00	Enclosed

Enclosed

Gust Factor - (26.9)	
G =	0.85

External Pressure Coefficients				
C_{po}	0.8	See 27.3.3 Roof Overhangs		
Cp	0.8	Windward wall (Use with qz) Fig. 27.3-1		
	-0.500	Leeward wall (wind normal to ridge) (Use with qh)	L/B =	0.87
	-0.469	Leeward wall (wind parallel to ridge) (Use with qh)	L/B =	1.15
	-0.7	Sidewalls (Use with qh) Fig. 27.4-1		

Internal Pressures:	
Negative:	-7.48 psf
Positive:	7.48 psf

	Pos. Windward	Neg. Windward	Leeward
Roof Pressure Coefficients (Fig 27.3-1) Normal to Ridge when Theta >= 10degrees	-0.108	-0.639	-0.481

Roof Pressures Wind Perpendicular to Ridge w/ ϑ >= 10 deg	
w/ Negative Internal	3.67 psf
w/ Positive Internal	-30.06 psf

*WORST CASE LOADING

	0 to h/2	h/2 to h	h to 2h	> 2h
Roof Pressure Coefficients (Fig 27.3-1) Normal to Ridge when Theta < 10 deg.	-0.90	-0.90	-0.50	-0.30
Roof Pressure Coefficients (Fig 27.3-1) PARALLEL to Ridge	-0.90	-0.90	-0.50	-0.30

Wall Pressures:	w/ Negative	w/ Positive Internal
Windward	35.74 psf	20.78 psf
Leeward (wind normal)	-16.00 psf	-25.14 psf
Leeward (wind parallel)	-16.00 psf	-24.06 psf
Side Wall	-17.25 psf	-32.21 psf

Additional Overhang Pressure:	28.26 psf

Roof Pressures: Wind Parallel to ridge for all roof slopes:	
Location	w/ Positive Internal
0 to h/2	-39.28 psf
h/2 to h	-39.28 psf
h to 2h	-25.14 psf
Over 2h	-18.08 psf

Roof Pressures: Wind Perpendicular to ridge for ϑ < 10 deg:	
Location	w/ Positive Internal
0 to h/2	0.00 psf
h/2 to h	0.00 psf
h to 2h	0.00 psf
Over 2h	0.00 psf

Wind Speed:	**150 mph**	Roof Slope:	**3.00 : 12**	**COMPONENTS & CLADDING**	
Exposure:	**C**	Mean Roof Height:	**9.77 ft**		
	Effective Area				
Zone	10.0 sq ft		100.0 sq ft		500.0 sq ft	
1	-38.21 psf	19.98 psf	-34.05 psf	11.67 psf	-34.05 psf	11.67 psf
2	-71.45 psf	19.98 psf	-50.67 psf	11.67 psf	-50.67 psf	11.67 psf
2oh	-91.44 psf	-	-91.44 psf	-	-91.44 psf	-
3	-108.86 psf	19.98 psf	-83.92 psf	11.67 psf	-83.92 psf	11.67 psf
3oh	-153.78 psf	-	-103.90 psf	-	-103.90 psf	-
4	-46.52 psf	40.76 psf	-38.21 psf	33.70 psf	-34.05 psf	28.29 psf
5	-58.99 psf	40.76 psf	-46.52 psf	33.70 psf	-34.05 psf	28.29 psf
a:	**3.00 ft**					

Higher pressures at the ridge line only applies to roof pitches > 7 degrees

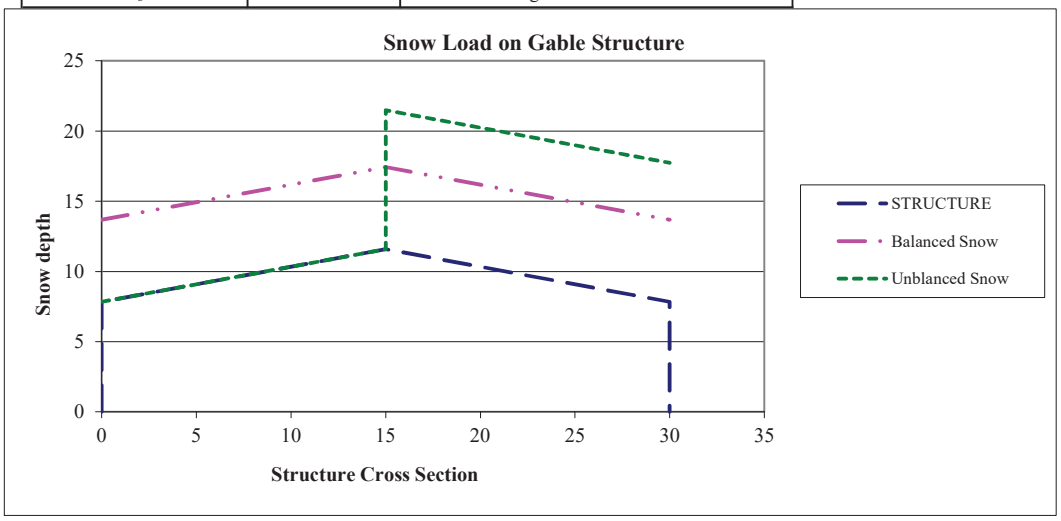
ASCE 7-16 SNOW LOAD CALCULATION

Category	II	IBC TABLE 1604.5: Risk Category of Buildings and Other Structures.
Exposure	C	See § 26.7.3: Exposure Categories, General.
Pg	120 psf	See ASCE Figure 7.2-1: Ground Snow Load
W.building	26 ft	Length of the building
L.building	30 ft	Width of the building
H.building	11.58 ft	Height of the building (to the ridge). Enter 0 if unknown.
Roof Rise (per foot)	3	Roof pitch
ϑ	14.04 deg	Roof Angle

ASCE Table 7.3-2 - Thermal Condition:	C_t
All structures except as indicated below:	1.0
Structures kept just above freezing and others with cold, ventilated roofs in which the thermal resistance (R-value) between the ventilated space and the heated space exceeds 25*h (deg*sq ft/BTU).	1.1
Unheated and open air structures	1.2
Structures intentionally kept below freezing	1.3
Continuously heated greenhouses with a roof having a thermal resistance value (R-value) less than 2.0*h (deg*sq ft/BTU).	0.85

C_t	1.2	(Choose from table above)
Is	1	ASCE Table 1.5-2
Surface	Unobstructed	ASCE § 7.4
Roof type	Gable	
Hor. Eave to Ridge Distance - windward	13 ft	
Roof Exposure	Partially exposed	ASCE Table 7.3-1
C_e	1	ASCE Table 7.3-1
Cs	1	Slope Factor from Figure 7.4-1
Low Sloped?:	Yes	ASCE § 7.3.4
P_f	100.80 psf	Flat Roof Snow Load
P_s	100.80 psf	Sloped Roof Snow Load
Use unbalanced?	Yes	ASCE § 7.6.1
$P_{windward}$	0.00 psf	ASCE § 7.6.1
$P_{leeward\_1}$	120.00 psf	ASCE § 7.6.1
$P_{leeward\_2}$	120.00 psf	ASCE § 7.6.1
Distance from Ridge to Edge of $P_{leeward1}$ loading	13.0 ft	ASCE Figure 7.6-2

γ	29.60 pcf	Snow density	Eq. 7.7-1 of ASCE 7
S	4	Run per rise of 1	ASCE § 7.1
h_d	5.85 ft	Height of drifting snow on leeward side	
h_b	3.41 ft	Height of balanced snow	



Seismic Loads (ASCE 7-16)

CHEYENNE CH-329				
Category	II	IBC TABLE 1604.5: Risk Category of Buildings and Other Structures.		
Ss	1.402 g	Max. Earthquake Ground Motion of 0.2 sec Spectral Response Acceleration	*ASCE Figure 22-1*	
S_1	0.748 g	Max. Earthquake Ground Motion of 1.0 sec Spectral Response Acceleration	*ASCE Figure 22-2*	
Site Class	D (Default)	Site classification (Use D if unknown unless jurisdiction, or geotechnical data determines Site Class E or F.)	*ASCE 20.1*	
T_L	16.0 sec	Long Period Transition Period	*ASCE Figure 22-14*	
Seismic Force Resisting System	A.5	Intermediate precast shear walls	*ASCE Table 12.2-1*	
R	4.00	Response Modification Factor		
Ω_0	2.5	System Over strength Factor		
C_t	0.02	Approximate period parameter	ASCE Table 12.8-2	
x	0.75	Approximate period parameter	ASCE Table 12.8-2	
hn	9.98 ft	Height in feet from base to highest level of structure		

				Value 1*	Value 2*	
						*=Used for interpolation
F_a	1.2	Interpolated Value	*ASCE Table 11.4-1*	1	1	***1.2 used per ASCE 11.4-2
F_v	1.7	Interpolated Value	*ASCE Table 11.4-2*	1.7	1.7	

$S_{MS} = F_a * S_S$	1.682 g	Adjusted MCE Spectral Response Acceleration at short periods	*ASCE 11.4-1*
$S_{M1} = F_v * S_1$	1.272 g	Adjusted MCE Spectral Response Acceleration at 1 sec period	*ASCE 11.4-2*
		(MCE = Maximum considered earthquake)	

$S_{DS} = 2/3\ S_{MS}$	1.122 g	Design Spectral Acceleration Parameters	*ASCE 11.4-3*
$S_{D1} = 2/3\ S_{M1}$	0.848 g	Design Spectral Acceleration Parameters	*ASCE 11.4-4*

I_E	1	Importance Factor	*ASCE Table 1.5-2*

Seismic Design Category		D
Based on S_{DS}	D	Table 11.6-1
Based on S_{D1}	D	Table 11.6-2

Geotechnical Investigation Report Required? **Yes per ASCE 11.8.2 and 11.8.3, IBC 1803**

EQUIVALENT LATERAL FORCE PROCEDURE		
$T_a = C_t * hn^x$	0.11 sec	Approximate fundamental period *ASCE 12.8-7*
$T_s = S_{D1}/S_{DS}$	0.76 sec	
T	0.11 sec	Fundamental period of the structure (can be taken as Ta per ASCE 12.8.2)
$C_s = S_{DS}/(R/I)$	0.280	*ASCE 12.8-2*
$C_{s.min}$	0.094	*ASCE 12.8-5 & 12.8-6*
$C_{s.max}$	1.888	*ASCE 12.8-3 & 12.8-4*
C_s	0.280	
k	1.000	*ASCE 12.8.3*
W	221.33 kip	
$V = C_s * W$	155.15 kip	*ASCE 12.8-1* *Shear **with** snow load*
M_o =	1528.1 k-ft	*Overturning Moment **with** snow load*
$V = C_s * W$	141.63 kip	*Shear **without** snow load*
M_o =	1392.0 k-ft	*Overturning Moment **without** snow load*

WITH SNOW LOAD

Level	Story Height	h_i or h_x	P_f (flat roof snow load)	w_i	$w_i * h_i^k$	*12.8-12* C_{vx}	*12.8-11;11.7* F_x	V_x (Story shear)	M_x	*12.10-1* F_{px} (diaphragm force)
Roof	9.77 ft	9.98 ft	100.8 psf	135.27 kip	1349.7 k-ft	0.987	153.12 kip	153.12 kip	0.0 k-ft	60.69 kip
Walls	0.00 ft	0.00 ft								
Floor	0.21 ft	0.21 ft		86.06 kip	17.9 k-ft	0.013	2.03 kip	155.15 kip	1495.8 k-ft	38.61 kip
Base	0 ft	0.00 ft	W=	221.33 kip	1367.6 k-ft			M_o =	1528.1 k-ft	

WITHOUT SNOW LOAD

Level	Story Height	h_i or h_x	P_f (flat roof snow load)	w_i	$w_i * h_i^k$	*12.8-12* C_{vx}	*12.8-11;11.7* F_x	V_x (Story shear)	M_x	*12.10-1* F_{px} (diaphragm force)
Roof	9.77 ft	9.98 ft	0 psf	115.98 kip	1157.2 k-ft	0.985	139.47 kip	139.47 kip	0.0 k-ft	52.03 kip
Walls	0.00 ft	0.00 ft								
Floor	0.21 ft	0.21 ft		86.06 kip	17.9 k-ft	0.015	2.16 kip	141.63 kip	1362.5 k-ft	38.61 kip
Base	0 ft	0.00 ft	W=	202.04 kip	1175.1 k-ft			Mo =	1392.0 k-ft	

Center of Mass & Rigidity

CHEYENNE CH-329

					X	Y	
	Upper Left = 0,0		Lower Right		396	348	
Wall	X Relative	Y Relative	Shear Force		Dist to CoRx	Dist to CoRy	
	Stiffness	Stiffness	lbs	plf	dx (IN)	dy (IN)	
W1	14.03%	0.00%	5,323	210	162.823	1.730	
W2	22.06%	0.00%	8,368	330	89.823	0.875	
W3	0.00%	11.34%	4,302	430	104.823	153.178	
W4	0.00%	11.34%	4,302	430	104.823	154.822	
W5	0.00%	3.48%	1,320	230	126.323	80.822	
W6	0.00%	2.55%	966	168	126.323	2.822	
W7	0.00%	3.48%	1,320	230	126.323	77.178	
W8	19.43%	0.00%	7,371	291	42.823	0.828	
W9	14.80%	0.00%	5,613	222	73.177	0.821	
W10	0.00%	10.97%	4,160	416	15.575	153.178	
W11	0.00%	10.97%	4,160	416	15.575	154.822	
W12	0.00%	6.79%	2,577	276	15.177	25.178	
W13	0.00%	6.79%	2,577	276	15.177	25.822	
W14	14.80%	0.00%	5,613	222	77.177	0.821	
W15	14.87%	0.00%	5,642	223	193.177	1.401	
W16	0.00%	10.97%	4,160	416	134.779	153.178	
W17	0.00%	10.97%	4,160	416	134.779	154.822	
W18	0.00%	6.79%	2,577	276	135.177	25.178	
W19	0.00%	3.57%	1,353	145	135.177	25.822	
P1-1	0.00%	0.00%	-	-	126.323	92.822	
P1-2	0.00%	0.00%	-	-	126.323	16.822	
P1-3	0.00%	0.00%	-	-	126.323	91.178	
P2-1	0.00%	0.00%	-	-	37.177	63.570	
P2-2	0.00%	0.00%	-	-	37.177	61.921	
P3	0.00%	0.00%	-	-	113.677	60.460	
P4	0.00%	0.00%	-	-	113.677	39.178	

			Left Edge	Top Edge	Right Edge	Bottom Edge	Snow/Live	Center of Gravity		Live	Live
Slab	Thickness	Weight	X	Y	X	Y	(psf)	X	Y	w snow	w/o snow
R1	4.5	10680	258	174	396	348	100.8	327.0	261.0	14042	10680
R2	4.5	10680	258	0	396	174	100.8	327.0	87.0	14042	10680
R3	4.5	9105	138	174	258	348	100.8	198.0	261.0	12028	9105
R4	4.5	9105	138	0	258	174	100.8	198.0	87.0	12028	9105
R5	4.5	10680	0	174	138	348	100.8	69.0	261.0	14042	10680
R6	4.5	10680	0	0	138	174	100.8	69.0	87.0	14042	10680
F1	5	10335	258	18	378	330	400	318.0	174.0	10335	0
F2	5	10335	138	18	258	330	400	198.0	174.0	10335	0
F3	5	10335	18	18	138	330	400	78.0	174.0	10335	0
Totals		110100						201.3	173.7		

Torsional Eccentricity		Wgt	Wgt		wgt	wgt
ex	ey	(w snow)	(w/o snow)		(w snow)	(w/o snow)
11.86	1.11	221,328	202,035	roof	135,273	115,980
Center of Gravity				floor	86,055	
X	Y					
201.3	173.7					
Center of Rigidty						
X	Y					
213.2	174.8					

	Wall Overturning Checks Using Weight of Adjacent Walls Force Transferred by Connections Between Walls					
	Anchorage Required to Resist Overturning From Design Moment	Toward Lower Right Anchor Resistance		Toward Upper Left Anchor Resistance		Overturning status using just connection to adjacent walls
Wall	(kip-ft)	Moment (kip-ft)	check	Moment (kip-ft)	check	
W1	10.47	173.52	OK	174.83	OK	None Required
W2	64.81	173.52	OK	174.83	OK	None Required
W3	65.51	41.13	Need More	25.58	Need More	TRY BASE ANCHORS
W4	65.51	41.13	Need More	25.58	Need More	TRY BASE ANCHORS
W5	24.38	18.86	Need More	18.86	Need More	TRY BASE ANCHORS
W6	19.32	18.86	Need More	18.86	Need More	TRY BASE ANCHORS
W7	24.38	18.86	Need More	18.86	Need More	TRY BASE ANCHORS
W8	44.46	185.47	OK	185.47	OK	None Required
W9	14.80	124.61	OK	124.61	OK	None Required
W10	62.89	54.06	Need More	54.06	Need More	TRY BASE ANCHORS
W11	62.89	54.06	Need More	54.06	Need More	TRY BASE ANCHORS
W12	48.93	41.58	Need More	58.41	OK	TRY BASE ANCHORS
W13	48.93	41.58	Need More	58.41	OK	TRY BASE ANCHORS
W14	14.80	125.30	OK	125.30	OK	None Required
W15	12.54	184.78	OK	184.78	OK	None Required
W16	62.89	54.06	Need More	54.06	Need More	TRY BASE ANCHORS
W17	62.89	54.06	Need More	54.06	Need More	TRY BASE ANCHORS
W18	48.93	30.94	Need More	29.63	Need More	TRY BASE ANCHORS
W19	16.42	57.18	OK	41.31	OK	None Required
P1-1	-0.68	0.00	OK	0.00	OK	None Required
P1-2	-0.68	0.00	OK	0.00	OK	None Required
P1-3	-0.68	0.00	OK	0.00	OK	None Required
P2-1	-5.93	0.00	OK	18.24	OK	None Required
P2-2	-5.93	18.24	OK	0.00	OK	None Required
P3	-4.30	15.57	OK	0.00	OK	None Required
P4	-0.66	0.00	OK	0.00	OK	None Required

Overturning resistance considers only the weight of the wall, the weight of the roof supported by the wall, and connection to adjacent walls. Roof weight supported by other walls has not been considered. Connection to adjacent walls is taken as the connection capacity, not to exceed that portion of the adjacent wall weight that can be reasonably attributed to the connection.

	Wall Overturning Checks Using Base Anchors Only Must investigate ONLY if connection to adjacent walls is insufficient						
	Design Moment (kip-ft)	Toward Lower Right Anchor Resistance Moment (kip-ft)	check	Toward Upper Left Anchor Resistance Moment (kip-ft)	check	Combined Loading Unity Check	Required Tension Capacity per Base Anchor (lb)
Wall							
W1	10.47	137.40	OK	137.40	OK	OK	(3218)
W2	64.81	203.30	OK	203.30	OK	OK	(1430)
W3	65.51	45.41	Try Both	39.93	Try Both	OK	2957
W4	65.51	45.41	Try Both	39.93	Try Both	OK	2957
W5	24.38	18.06	Try Both	18.06	Try Both	OK	961
W6	19.32	18.06	Try Both	18.06	Try Both	OK	80
W7	24.38	18.06	Try Both	18.06	Try Both	OK	961
W8	44.46	193.51	OK	193.51	OK	OK	(1855)
W9	14.80	193.51	OK	193.51	OK	OK	(1445)
W10	62.89	42.48	Try Both	42.48	Try Both	OK	589
W11	62.89	42.48	Try Both	42.48	Try Both	OK	589
W12	48.93	28.48	Try Both	28.48	Try Both	OK	787
W13	48.93	28.48	Try Both	28.48	Try Both	OK	787
W14	14.80	193.51	OK	193.51	OK	OK	(1454)
W15	12.54	193.51	OK	193.51	OK	OK	(2266)
W16	62.89	42.54	Try Both	42.39	Try Both	OK	590
W17	62.89	42.54	Try Both	42.39	Try Both	OK	590
W18	48.93	28.48	Try Both	28.48	Try Both	OK	2068
W19	16.42	28.48	OK	28.48	OK	OK	(2667)
P1-1	-0.68	0.00	OK	0.00	OK	OK	0
P1-2	-0.68	0.00	OK	0.00	OK	OK	0
P1-3	-0.68	0.00	OK	0.00	OK	OK	0
P2-1	-5.93	1.43	OK	19.06	OK	OK	(4362)
P2-2	-5.93	1.43	OK	19.06	OK	OK	(1070)
P3	-4.30	1.73	OK	15.90	OK	OK	(937)
P4	-0.66	0.00	OK	0.00	OK	OK	0

	Wall Overturning Checks Using Base Anchors and Connection to Adjacent Walls Must investigate ONLY if both base anchor alone and adjacent walls alone are insufficient					
	Base Anchor Shear Required (% Capacity)	Base Anchor Tension Available (% Capacity)	Available Overturning Resistance (kip-ft) From Base Anchors		Overturning Unity Check of Base Anchors	
Wall			Lower Right	Upper Left	Lower Right	Upper Left
W1	0.0%	100.0%	310.92	312.23	OK	OK
W2	0.0%	100.0%	376.82	378.12	OK	OK
W3	0.0%	100.0%	86.54	65.51	OK	OK
W4	0.0%	100.0%	86.54	65.51	OK	OK
W5	0.0%	100.0%	36.92	36.92	OK	OK
W6	0.0%	100.0%	36.92	36.92	OK	OK
W7	0.0%	100.0%	36.92	36.92	OK	OK
W8	0.0%	100.0%	378.99	378.99	OK	OK
W9	0.0%	100.0%	318.12	318.12	OK	OK
W10	0.0%	100.0%	96.54	96.54	OK	OK
W11	0.0%	100.0%	96.54	96.54	OK	OK
W12	0.0%	100.0%	70.06	86.89	OK	OK
W13	0.0%	100.0%	70.06	86.89	OK	OK
W14	0.0%	100.0%	318.81	318.81	OK	OK
W15	0.0%	100.0%	378.30	378.30	OK	OK
W16	0.0%	100.0%	96.60	96.45	OK	OK
W17	0.0%	100.0%	96.60	96.45	OK	OK
W18	0.0%	100.0%	59.41	58.11	OK	OK
W19	0.0%	100.0%	85.66	69.79	OK	OK
P1-1	0.0%	100.0%	0.00	0.00	OK	OK
P1-2	0.0%	100.0%	0.00	0.00	OK	OK
P1-3	0.0%	100.0%	0.00	0.00	OK	OK
P2-1	0.0%	100.0%	1.43	37.31	OK	OK
P2-2	0.0%	100.0%	19.68	19.06	OK	OK
P3	0.0%	100.0%	17.30	15.90	OK	OK
P4	0.0%	100.0%	0.00	0.00	OK	OK

ID: **CHEYENNE CH-329**

DESIGN OF ROOF PANELS MARK R1 & R2

Notes:

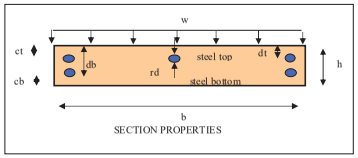
Material Properties

f ' c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy	80000 psi	
Lightweight?	No	
C_d (Concrete density)	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Geometric Properties

Ls (overall length of slab)	15.04 ft		
Bs (overall width of slab)	11.5 ft		
Design will be performed as :	**Two-way slab**		
tfr (roof finish thickness)	0.375 in		
b (section width)	12 in		*(typically 12 inches)*
h (section thickness)	4.5 in		
ct (cover top)	1 1/4 in		
cb (cover bottom)	3/4 in		
rd (assumed reinf. diameter)	0.319 in		*(if centered enter 0)*
dt (effective depth top)	1.410 in		
db (effective depth bottom)	3.431 in		
oh1 (overhang length and qty for Bs)	18 in	1	*[qty of overhangs in Bs direction]*
oh2 (overhang length and qty for ls)	18 in	1	*[qty of overhangs in ls direction]*
Cs (% of DL used for Seismic)	0.280		*[from seismic analysis]*
NBs (qty of walls in Bs direction)	2		*[walls that support one or more roof panels in the short direction]*
Nls (qty of walls in ls direction)	3		*[walls that support one or more roof panels in the long direction]*

fr (rupture modulus)	530.3 psi	*ACI 19.2.3.1*
Ig = (b*hr^3)/12	91.125 in^4	
Ag = (b*h)	54 in^2	
Yt = h/2	2.3 in	
Mcr	21.478 kip in	*ACI 24.2.3.5*
β1	0.8	*ACI Table 22.2.2.4.3*
Δ initial	360	*ACI Table 24.2.2*
Δ long-term	480	*ACI Table 24.2.2*
B	8.830 in	
kd	0.463 in	
Icr	1.61 in^4	
a	0.32 in	



(reinforcement ratio provided)		ω
$\rho_{prov\ ideal}$ (bottom mesh)	0.0049	0.0784 psi
$\rho_{prov\ ideal}$ (top mesh)	0.0119	0.1904 psi
$\rho_{prov\ ideal}$ (both layers)	0.0138	0.2208 psi

Reinforcement Limits

ρ_t (maximum tensile reinforcement)	0.0166	
$\rho_{s\ min\ temp}$ (min. temperature reinforcement)	0.0018	*ACI 7.6.1.1 and 8.6.1.1*
$\rho_{s\ min\ t}$ (minimum tensile reinforcement)	0.0027	*ACI 9.6.1.2*

Wire Mesh (Top)		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	**0.20 in^2**	**= As'**

Wire Mesh (Bottom)		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	**0.20 in^2**	**= As**

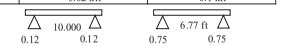
Loading

Design Loads	
Pressure on Slab	
D (Dead load))	60.938 psf
S (Snow Load)	120 psf
L (Live Load)	0 psf
Lr (Live Roof Load)	30 psf
W (Wind Load)	108.86 psf
E (Earthquake Load)	17.09 psf

Sustained Loading	
Pressure on slab	**W**
D (Dead load)	60.938 psf
S (Snow Load)	120 psf
Lr (Live Roof Load)	30 psf

Factored Design Loads		Pressure on Section	Pressure on Section
Factored Loading per ACI equation indicated	Factored Pressure on Slab **W**	**wB** = W*(L^4 / B^4 + L^4)*be	**wL** = W*(B^4 / B^4 + L^4)*be
ACI 318-19 5.3.1c	319.555 psf	0.06 klf	0.26 klf

B (Span in the short direction)		10.000 ft	
L (Span in the long direction)		6.77 ft	
Factored Sustained Loads		Pressure on Section	Pressure on Section
Factored Loading per ACI equation indicated	Factored Pressure on Slab **W**	**wB** = W*(L^4 / B^4 + L^4)*be	**wL** = W*(B^4 / B^4 + L^4)*be
ASCE 7-16 CC 2-1b	120.938 psf	0.02 klf	0.1 klf



Unfactored Design Loads		Pressure on Section	Pressure on Section
Factored Loading per ACI	Factored Pressure on Slab **W**	**wB** = W*(L^4 / B^4 + L^4)*be	**wL** = W*(B^4 / B^4 + L^4)*be
ASCE 7-16 2.4.1.6	222.4245 psf	0.04 klf	0.18 klf

SUMMARY
Use 1 Layer of Wire Mesh on Top: W6.7 x W6.7 x 4 x 4
Use 1 Layer of Wire Mesh on Bottom: W6.7 x W6.7 x 4 x 4

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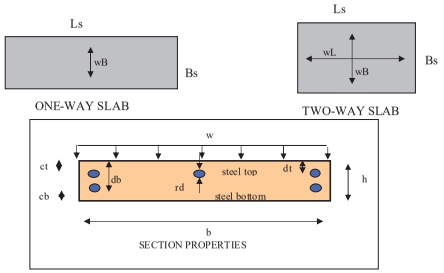
DESIGN OF ROOF PANELS MARK R1 & R2

Notes:



Material Properties

f' c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy	80000 psi	
Lightweight?	No	
C_d (Concrete density)	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

fr (rupture modulus)	530.3 psi	*ACI 19.2.3.1*
Ig = (b*h^3)/12	91.125 in^4	
Ag = (b*h)	54 in^2	
Yt = h/2	2.3 in	
Mcr	21.478 kip in	*ACI 24.2.3.5*
β1	0.8	*ACI Table 22.2.2.4.3*
Δ initial	360	*ACI Table 24.2.2*
Δ long-term	480	*ACI Table 24.2.2*
B	8.830 in	
kd	0.463 in	
Icr	1.61 in^4	
a	0.32 in	

Geometric Properties

Ls (overall length of slab)	15.04 ft		
Bs (overall width of slab)	11.5 ft		
Design will be performed as :	**Two-way slab**		
tfr (roof finish thickness)	0.375 in		
b (section width)	12 in		*(typically 12 inches)*
h (section thickness)	4.5 in		
ct (cover top)	1 1/4 in		
cb (cover bottom)	3/4 in		
rd (assumed reinf. diameter)	0.319 in		*(if centered enter 0)*
dt (effective depth top)	1.410 in		
db (effective depth bottom)	3.431 in		
oh1 (overhang length and qty for Bs)	18 in	1	*[qty of overhangs in Bs direction]*
oh2 (overhang length and qty for ls)	18 in	1	*[qty of overhangs in ls direction]*
Cs (% of DL used for Seismic)	0.280		*[from seismic analysis]*
NBs (qty of walls in Bs direction)	2		*[walls that support one or more roof panels in the short direction]*
Nls (qty of walls in ls direction)	3		*[walls that support one or more roof panels in the long direction]*

(reinforcement ratio provided)		ω
$\rho_{prov\,ided}$ (bottom mesh)	0.0049	0.0784 psi
$\rho_{prov\,ided}$ (top mesh)	0.0119	0.1904 psi
$\rho_{prov\,ided}$ (both layers)	0.0138	0.2208 psi

Flexure

Flexural Moments for Bs	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI Table 21.2.2	ϕMn trial = ϕf'cbd^2ω(1-0.59ω)	DM = Mu - ϕM	ϕMn =	Check ϕMn > Mu	% allowed
Mpos (positive Moment) = (wB*B^2) / 8	0.75 kip-ft	0.023	0.003	Tension	0.9	3.96 kip-ft		3.96 kip-ft	O.K.	18.94%

Flexural Moments for ls	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI Table 21.2.2	ϕMn trial = ϕf'cbd^2ω(1-0.59ω)	DM = Mu - ϕM	ϕMn =	Check ϕMn > Mu	% allowed
Mpos (positive Moment) = (wL*L^2) / 8	1.490 kip-ft	0.023	0.003	Tension	0.9	3.96 kip-ft		3.96 kip-ft	O.K.	37.62%

	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI Table 21.2.2	S Elastic Section Modulus	Mn Per ACI 14.5.2.1a	Mn Per ACI 14.5.2.1b	ϕMn Per ACI 14.5.2.1	Check ϕMn > Mu	% allowed
Mneg (negative Moment) = (wB*oh1^2) / 2	0.068 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	9.43%
Mneg (negative Moment) = (wB*oh2^2) / 2	0.068 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	9.43%
Mneg (negative Moment) = (wL*oh1^2) / 2	0.293 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	40.86%
Mneg (negative Moment) = (wL*oh2^2) / 2	0.293 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	40.86%

Shear

Maximum Shear for Bs	Vu	ϕv per Table ACI 21.2.1	Vc per ACI 22.5.5.1	ϕVc	Check ϕVc > Vu	% allowed
Vu = wB (B/2)	0.30 kip	0.85	5.82 kip	4.95 kip	O.K.	6.06%
Vu for side overhang 1 = wB*oh1	0.09 kip	0.85	2.39 kip	2.03 kip	O.K.	4.43%
Vu for side overhang 1 = wB*oh2	0.09 kip	0.85	2.39 kip	2.03 kip	O.K.	4.43%

Shear for Ls	Vu	ϕv per Table ACI 21.2.1	Vc per ACI 22.5.5.1	ϕVc	Check ϕVc > Vu	% allowed
Vu = wL (L/2)	0.34 kip	0.85	5.82 kip	4.95 kip	O.K.	6.84%
Vu for end overhang 2 = wL *oh1	0.15 kip	0.85	2.39 kip	2.03 kip	O.K.	7.38%
Vu for end overhang 2 = wL *oh2	0.15 kip	0.85	2.39 kip	2.03 kip	O.K.	7.38%

	Months	Epsilon
Sustained Load Duration Per Table 24.2.4.1.3	6	1.2

Span type:	Simple span	1

Deflection

	Service Loads													
Span	Ma.serv	Ma.sus	Ieff.serv Per Table 24.2.3.5	Ieff.sustained Per Table 24.2.3.5	Immediate Deflection Δi AISC 15th Edition Table 3-23	ρ'	λΔ per ACI 24.2.4.1.1	Long-Term Deflection Δlt	Δ total long-term deflection (Δi + Δlt)	Δ allow (immediate)	Δ allow (long term)	Check short term deflection	Check total long term deflection	% allowed - short term	% allowed - total long term
B	0.75 kip-ft	0.25 kip-ft	91.13 in^4	91.13 in^4	0.012 in	0.0049	0.9639	0.011 in	0.023 in	0.3333 in	0.2500 in	O.K.	O.K.	3.46%	9.05%
L	1.49 kip-ft	0.573 kip-ft	4.36 in^4	91.13 in^4	0.000 in	0.0049	0.9639	0.011 in	0.023 in	0.2257 in	0.1693 in	O.K.	O.K.	0.00%	13.37%

ID: **CHEYENNE CH-329**

DESIGN OF ROOF PANELS MARK R3 & R4

Notes:

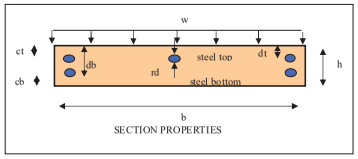
Material Properties

f ' c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy	80000 psi	
Lightweight?	No	
C_d (Concrete density)	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

fr (rupture modulus)	530.3 psi	*ACI 19.2.3.1*
Ig = (b*hr^3)/12	91.125 in^4	
Ag = (b*h)	54 in^2	
Yt = h/2	2.3 in	
Mcr	21.478 kip in	*ACI 24.2.3.5*
β1	0.8	*ACI Table 22.2.2.4.3*
Δ initial	360	*ACI Table 24.2.2*
Δ long-term	480	*ACI Table 24.2.2*
B	8.830 in	
kd	0.463 in	
Icr	1.61 in^4	
a	0.32 in	

ONE-WAY SLAB

TWO-WAY SLAB



SECTION PROPERTIES

Geometric Properties

Ls (overall length of slab)	15.04 ft		
Bs (overall width of slab)	10 ft		
Design will be performed as :	**Two-way slab**		
tfr (roof finish thickness)	0.375 in		
b (section width)	12 in	*(typically 12 inches)*	
h (section thickness)	4.5 in		
ct (cover top)	1 1/4 in		
cb (cover bottom)	3/4 in		
rd (assumed reinf. diameter)	0.319 in	*(if centered enter 0)*	
dt (effective depth top)	1.410 in		
db (effective depth bottom)	3.431 in		
oh1 (overhang length and qty for Bs)	0 in	0	*[qty of overhangs in Bs direction]*
oh2 (overhang length and qty for ls)	18 in	1	*[qty of overhangs in ls direction]*
Cs (% of DL used for Seismic)	0.280	*[from seismic analysis]*	
NBs (qty of walls in Bs direction)	2	*[walls that support one or more roof panels in the short direction]*	
Nls (qty of walls in ls direction)	2	*[walls that support one or more roof panels in the long direction]*	

(reinforcement ratio provided)		ω
$\rho_{prov\,tdeal}$ (bottom mesh)	0.0049	0.0784 psi
$\rho_{prov\,tdeal}$ (top mesh)	0.0119	0.1904 psi
$\rho_{prov\,tdeal}$ (both layers)	0.0138	0.2208 psi

Reinforcement Limits

ρ_t (maximum tensile reinforcement)	0.0166	
$\rho_{s\,min\,temp}$ (min. temperature reinforcement)	0.0018	*ACI 7.6.1.1 and 8.6.1.1*
$\rho_{s\,min\,t}$ (minimum tensile reinforcement)	0.0027	*ACI 9.6.1.2*

Wire Mesh (Top)		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	**0.20 in^2**	**= As'**

Wire Mesh (Bottom)		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	**0.20 in^2**	**= As**

Loading

Design Loads	
Pressure on Slab	
D (Dead load))	60.938 psf
S (Snow Load)	120 psf
L (Live Load)	0 psf
Lr (Live Roof Load)	30 psf
W (Wind Load)	108.86 psf
E (Earthquake Load)	17.09 psf

Sustained Loading	
Pressure on slab	**W**
D (Dead load)	60.938 psf
S (Snow Load)	120 psf
Lr (Live Roof Load)	30 psf

Factored Design Loads		Pressure on Section	Pressure on Section
Factored Loading per ACI equation indicated	Factored Pressure on Slab **W**	**wB** = W*(L^4 / B^4 + L^4)*be	**wL** = W*(B^4 / B^4 + L^4)*be
ACI 318-19 5.3.1c	319.555 psf	0.25 klf	0.07 klf

B (Span in the short direction)	10.000 ft
L (Span in the long direction)	13.54 ft

Factored Sustained Loads		Pressure on Section	Pressure on Section
Factored Loading per ACI equation indicated	Factored Pressure on Slab **W**	**wB** = W*(L^4 / B^4 + L^4)*be	**wL** = W*(B^4 / B^4 + L^4)*be
ASCE 7-16 CC 2-1b	120.938 psf	0.09 klf	0.028 klf

Unfactored Design Loads		Pressure on Section	Pressure on Section
Factored Loading per ACI	Factored Pressure on Slab **W**	**wB** = W*(L^4 / B^4 + L^4)*be	**wL** = W*(B^4 / B^4 + L^4)*be
ASCE 7-16 2.4.1 6	222.4245 psf	0.17 klf	0.05 klf

SUMMARY
Use 1 Layer of Wire Mesh on Top: W6.7 x W6.7 x 4 x 4
Use 1 Layer of Wire Mesh on Bottom: W6.7 x W6.7 x 4 x 4

ID: **CHEYENNE CH-329**

DESIGN OF ROOF PANELS MARK R3 & R4

Notes:

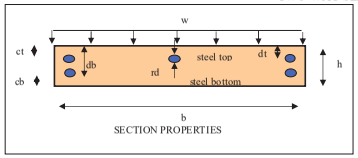
Material Properties

f' c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy	80000 psi	
Lightweight?	No	
C_d (Concrete density)	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

fr (rupture modulus)	530.3 psi	*ACI 19.2.3.1*
Ig = (b*h^3)/12	91.125 in^4	
Ag = (b*h)	54 in^2	
Yt = h/2	2.3 in	
Mcr	21.478 kip in	*ACI 24.2.3.5*
β1	0.8	*ACI Table 22.2.2.4.3*
Δ initial	360	*ACI Table 24.2.2*
Δ long-term	480	*ACI Table 24.2.2*
B	8.830 in	
kd	0.463 in	
Icr	1.61 in^4	
a	0.32 in	

ONE-WAY SLAB

TWO-WAY SLAB



SECTION PROPERTIES

Geometric Properties

Ls (overall length of slab)	15.04 ft		
Bs (overall width of slab)	10 ft		
Design will be performed as :	**Two-way slab**		
tfr (roof finish thickness)	0.375 in		
b (section width)	12 in		*(typically 12 inches)*
h (section thickness)	4.5 in		
ct (cover top)	1 1/4 in		
cb (cover bottom)	3/4 in		
rd (assumed reinf. diameter)	0.319 in		*(if centered enter 0)*
dt (effective depth top)	1.410 in		
db (effective depth bottom)	3.431 in		
oh1 (overhang length and qty for Bs)	0 in	0	*[qty of overhangs in Bs direction]*
oh2 (overhang length and qty for ls)	18 in	1	*[qty of overhangs in ls direction]*
Cs (% of DL used for Seismic)	0.280		*[from seismic analysis]*
NBs (qty of walls in Bs direction)	2		*[walls that support one or more roof panels in the short direction]*
Nls (qty of walls in ls direction)	2		*[walls that support one or more roof panels in the long direction]*

(reinforcement ratio provided)		ω
$\rho_{prov\ided}$ (bottom mesh)	0.0049	0.0784 psi
$\rho_{prov\ided}$ (top mesh)	0.0119	0.1904 psi
$\rho_{prov\ided}$ (both layers)	0.0138	0.2208 psi

Flexure

Flexural Moments for Bs	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI Table 21.2.2	ϕMn trial = ϕf'cbd^2ω(1-0.59ω)	DM = Mu - ϕM	ϕMn =	Check ϕMn > Mu	% allowed
Mpos (positive Moment) = (wB*B^2) / 8	3.13 kip-ft	0.023	0.003	Tension	0.9	3.96 kip-ft		3.96 kip-ft	O.K.	79.04%

Flexural Moments for ls	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI Table 21.2.2	ϕMn trial = ϕf'cbd^2ω(1-0.59ω)	DM = Mu - ϕM	ϕMn =	Check ϕMn > Mu	% allowed
Mpos (positive Moment) = (wL*L^2) / 8	1.604 kip-ft	0.023	0.003	Tension	0.9	3.96 kip-ft		3.96 kip-ft	O.K.	40.51%

	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI Table 21.2.2	S Elastic Section Modulus	Mn Per ACI 14.5.2.1a	Mn Per ACI 14.5.2.1b	ϕMn Per ACI 14.5.2.1	Check ϕMn > Mu	% allowed
Mneg (negative Moment) = (wB*oh1^2) / 2	0.000 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	0.00%
Mneg (negative Moment) = (wB*oh2^2) / 2	0.281 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	39.28%
Mneg (negative Moment) = (wL*oh1^2) / 2	0.000 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	0.00%
Mneg (negative Moment) = (wL*oh2^2) / 2	0.079 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	11.00%

Shear

Maximum Shear for Bs	Vu	ϕv per Table ACI 21.2.1	Vc per ACI 22.5.5.1	ϕVc	Check ϕVc > Vu	% allowed
Vu = wB (B/2)	1.25 kip	0.85	5.82 kip	4.95 kip	O.K.	25.26%
Vu for side overhang 1 = wB*oh1	0.00 kip	0.85	2.39 kip	2.03 kip	O.K.	0.00%
Vu for side overhang 1 = wB*oh2	0.38 kip	0.85	2.39 kip	2.03 kip	O.K.	18.44%

Shear for Ls	Vu	ϕv per Table ACI 21.2.1	Vc per ACI 22.5.5.1	ϕVc	Check ϕVc > Vu	% allowed
Vu = wL (L/2)	0.19 kip	0.85	5.82 kip	4.95 kip	O.K.	3.83%
Vu for end overhang 2 = wL *oh1	0.00 kip	0.85	2.39 kip	2.03 kip	O.K.	0.00%
Vu for end overhang 2 = wL *oh2	0.04 kip	0.85	2.39 kip	2.03 kip	O.K.	2.07%

	Months	Epsilon
Sustained Load Duration Per Table 24.2.4.1.3	6	1.2

Span type:	Simple span	1

Deflection

	Service Loads													
Span	Ma.serv	Ma.sus	Ieff.serv Per Table 24.2.3.5	Ieff.sustained Per Table 24.2.3.5	Immediate Deflection Δi AISC 15th Edition Table 3-23	ρ'	λΔ per ACI 24.2.4.1.1	Long-Term Deflection Δl-t	Δ total long-term deflection (Δi + Δl t)	Δ allow (immediate)	Δ allow (long term)	Check short term deflection	Check total long term deflection	% allowed - short term	% allowed - total long term
B	3.13 kip-ft	1.125 kip-ft	1.88 in^4	91.13 in^4	0.052 in	0.0049	0.9639	0.050 in	0.102 in	0.3333 in	0.2500 in	O.K.	O.K.	15.55%	40.72%
L	1.604 kip-ft	0.642 kip-ft	3.54 in^4	91.13 in^4	0.000 in	0.0049	0.9639	0.050 in	0.102 in	0.4513 in	0.3385 in	O.K.	O.K.	0.00%	30.07%

ID: **CHEYENNE CH-329**

DESIGN OF ROOF PANELS MARK R5 & R6

Notes:

Material Properties

f' c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy	80000 psi	
Lightweight?	No	
C_d (Concrete density)	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

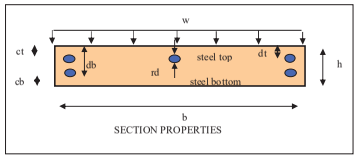
ONE-WAY SLAB

TWO-WAY SLAB

Geometric Properties

Ls (overall length of slab)	15.04 ft		
Bs (overall width of slab)	11.5 ft		
Design will be performed as :	**Two-way slab**		
tfr (roof finish thickness)	0.375 in		
b (section width)	12 in		*(typically 12 inches)*
h (section thickness)	4.5 in		
ct (cover top)	1 1/4 in		
cb (cover bottom)	3/4 in		
rd (assumed reinf. diameter)	0.319 in		*(if centered enter 0)*
dt (effective depth top)	1.410 in		
db (effective depth bottom)	3.431 in		
oh1 (overhang length and qty for Bs)	18 in	1	*[qty of overhangs in Bs direction]*
oh2 (overhang length and qty for ls)	18 in	1	*[qty of overhangs in ls direction]*
Cs (% of DL used for Seismic)	0.280		*[from seismic analysis]*
NBs (qty of walls in Bs direction)	2		*[walls that support one or more roof panels in the short direction]*
Nls (qty of walls in ls direction)	2		*[walls that support one or more roof panels in the long direction]*

fr (rupture modulus)	530.3 psi	*ACI 19.2.3.1*
Ig = (b*hr^3)/12	91.125 in^4	
Ag = (b*h)	54 in^2	
Yt = h/2	2.3 in	
Mcr	21.478 kip in	*ACI 24.2.3.5*
β1	0.8	*ACI Table 22.2.2.4.3*
Δ initial	360	*ACI Table 24.2.2*
Δ long-term	480	*ACI Table 24.2.2*
B	8.830 in	
kd	0.463 in	
Icr	1.61 in^4	
a	0.32 in	



SECTION PROPERTIES

(reinforcement ratio provided)		ω
$\rho_{prov\ bot}$ (bottom mesh)	0.0049	0.0784 psi
$\rho_{prov\ top}$ (top mesh)	0.0119	0.1904 psi
$\rho_{prov\ tot}$ (both layers)	0.0138	0.2208 psi

Reinforcement Limits

ρ_t (maximum tensile reinforcement)	0.0166	
$\rho_{s\ min\ temp}$ (min. temperature reinforcement)	0.0018	*ACI 7.6.1.1 and 8.6.1.1*
$\rho_{s\ min\ t}$ (minimum tensile reinforcement)	0.0027	*ACI 9.6.1.2*

Wire Mesh (Top)		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	**0.20 in^2**	**= As'**

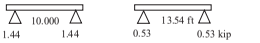
Wire Mesh (Bottom)		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	**0.20 in^2**	**= As**

Loading

Design Loads	
Pressure on Slab	
D (Dead load))	60.938 psf
S (Snow Load)	120 psf
L (Live Load)	0 psf
Lr (Live Roof Load)	30 psf
W (Wind Load)	108.86 psf
E (Earthquake Load)	17.09 psf

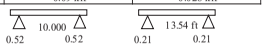
Sustained Loading	
Pressure on slab	**W**
D (Dead load)	60.938 psf
S (Snow Load)	120 psf
Lr (Live Roof Load)	30 psf

Factored Design Loads		Pressure on Section	Pressure on Section
Factored Loading per ACI equation indicated	Factored Pressure on Slab **W**	**wB** = W*(L^4 / B^4 + L^4)*be	**wL** = W*(B^4 / B^4 + L^4)*be
ACI 318-19 5.3.1c	319.555 psf	0.25 klf	0.07 klf



B (Span in the short direction)	10.000 ft
L (Span in the long direction)	13.54 ft

Factored Sustained Loads		Pressure on Section	Pressure on Section
Factored Loading per ACI equation indicated	Factored Pressure on Slab **W**	**wB** = W*(L^4 / B^4 + L^4)*be	**wL** = W*(B^4 / B^4 + L^4)*be
ASCE 7-16 CC 2-1b	120.938 psf	0.09 klf	0.028 klf



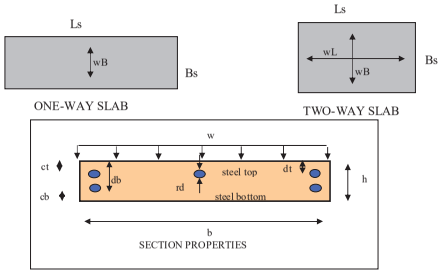
Unfactored Design Loads		Pressure on Section	Pressure on Section
Factored Loading per ACI	Factored Pressure on Slab **W**	**wB** = W*(L^4 / B^4 + L^4)*be	**wL** = W*(B^4 / B^4 + L^4)*be
ASCE 7-16 2.4.1.6	222.4245 psf	0.17 klf	0.05 klf

SUMMARY
Use 1 Layer of Wire Mesh on Top: W6.7 x W6.7 x 4 x 4
Use 1 Layer of Wire Mesh on Bottom: W6.7 x W6.7 x 4 x 4

ID: **CHEYENNE CH-329**

DESIGN OF ROOF PANELS MARK R5 & R6

Notes:



Material Properties

f' c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy	80000 psi	
Lightweight?	No	
C_d (Concrete density)	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

fr (rupture modulus)	530.3 psi	*ACI 19.2.3.1*
Ig = (b*h^3)/12	91.125 in^4	
Ag = (b*h)	54 in^2	
Yt = h/2	2.3 in	
Mcr	21.478 kip in	*ACI 24.2.3.5*
β1	0.8	*ACI Table 22.2.2.4.3*
Δ initial	360	*ACI Table 24.2.2*
Δ long-term	480	*ACI Table 24.2.2*
B	8.830 in	
kd	0.463 in	
Icr	1.61 in^4	
a	0.32 in	

Geometric Properties

Ls (overall length of slab)	15.04 ft		
Bs (overall width of slab)	11.5 ft		
Design will be performed as :	**Two-way slab**		
tfr (roof finish thickness)	0.375 in		
b (section width)	12 in		*(typically 12 inches)*
h (section thickness)	4.5 in		
ct (cover top)	1 1/4 in		
cb (cover bottom)	3/4 in		
rd (assumed reinf. diameter)	0.319 in		*(if centered enter 0)*
dt (effective depth top)	1.410 in		
db (effective depth bottom)	3.431 in		
oh1 (overhang length and qty for Bs)	18 in	1	*[qty of overhangs in Bs direction]*
oh2 (overhang length and qty for ls)	18 in	1	*[qty of overhangs in ls direction]*
Cs (% of DL used for Seismic)	0.280		*[from seismic analysis]*
NBs (qty of walls in Bs direction)	2		*[walls that support one or more roof panels in the short direction]*
Nls (qty of walls in ls direction)	2		*[walls that support one or more roof panels in the long direction]*

(reinforcement ratio provided)		ω
$\rho_{prov\,ided}$ (bottom mesh)	0.0049	0.0784 psi
$\rho_{prov\,ided}$ (top mesh)	0.0119	0.1904 psi
$\rho_{prov\,ided}$ (both layers)	0.0138	0.2208 psi

Flexure

Flexural Moments for Bs	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI Table 21.2.2	ϕMn trial = ϕf'cbd^2ω(1-0.59ω)	DM = Mu - ϕM	ϕMn =	Check ϕMn > Mu	% allowed
Mpos (positive Moment) = (wB*B^2) / 8	3.13 kip-ft	0.023	0.003	Tension	0.9	3.96 kip-ft		3.96 kip-ft	O.K.	79.04%

Flexural Moments for ls	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI Table 21.2.2	ϕMn trial = ϕf'cbd^2ω(1-0.59ω)	DM = Mu - ϕM	ϕMn =	Check ϕMn > Mu	% allowed
Mpos (positive Moment) = (wL*L^2) / 8	1.604 kip-ft	0.023	0.003	Tension	0.9	3.96 kip-ft		3.96 kip-ft	O.K.	40.51%

	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI Table 21.2.2	S Elastic Section Modulus	Mn Per ACI 14.5.2.1a	Mn Per ACI 14.5.2.1b	ϕMn Per ACI 14.5.2.1	Check ϕMn > Mu	% allowed
Mneg (negative Moment) = (wB*oh1^2) / 2	0.281 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	39.28%
Mneg (negative Moment) = (wB*oh2^2) / 2	0.281 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	39.28%
Mneg (negative Moment) = (wL*oh1^2) / 2	0.079 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	11.00%
Mneg (negative Moment) = (wL*oh2^2) / 2	0.079 kip-ft	0.008	0.003	Tension	0.6	40.500 in^3	1.193 kip-ft	14.344 kip-ft	0.716 kip-ft	O.K.	11.00%

Shear

Maximum Shear for Bs	Vu	ϕv per Table ACI 21.2.1	Vc per ACI 22.5.5.1	ϕVc	Check ϕVc > Vu	% allowed
Vu = wB (B/2)	1.25 kip	0.85	5.82 kip	4.95 kip	O.K.	25.26%
Vu for side overhang 1 = wB*oh1	0.38 kip	0.85	2.39 kip	2.03 kip	O.K.	18.44%
Vu for side overhang 1 = wB*oh2	0.38 kip	0.85	2.39 kip	2.03 kip	O.K.	18.44%

Shear for Ls	Vu	ϕv per Table ACI 21.2.1	Vc per ACI 22.5.5.1	ϕVc	Check ϕVc > Vu	% allowed
Vu = wL (L/2)	0.19 kip	0.85	5.82 kip	4.95 kip	O.K.	3.83%
Vu for end overhang 2 = wL *oh1	0.04 kip	0.85	2.39 kip	2.03 kip	O.K.	2.07%
Vu for end overhang 2 = wL *oh2	0.04 kip	0.85	2.39 kip	2.03 kip	O.K.	2.07%

	Months	Epsilon
Sustained Load Duration Per Table 24.2.4.1.3	6	1.2

Span type:	Simple span	1

Deflection

	Service Loads													
Span	Ma.serv	Ma.sus	Ieff.serv Per Table 24.2.3.5	Ieff.sustained Per Table 24.2.3.5	Immediate Deflection Δi AISC 15th Edition Table 3-23	ρ'	λΔ per ACI 24.2.4.1.1	Long-Term Deflection Δlt	Δ total long-term deflection (Δi + Δlt)	Δ allow (immediate)	Δ allow (long term)	Check short term deflection	Check total long term deflection	% allowed - short term	% allowed - total long term
B	3.13 kip-ft	1.125 kip-ft	1.88 in^4	91.13 in^4	0.052 in	0.0049	0.9639	0.050 in	0.102 in	0.3333 in	0.2500 in	O.K.	O.K.	15.55%	40.72%
L	1.604 kip-ft	0.642 kip-ft	3.54 in^4	91.13 in^4	0.000 in	0.0049	0.9639	0.050 in	0.102 in	0.4513 in	0.3385 in	O.K.	O.K.	0.00%	30.07%

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W1

Notes

Material Properties

f'c	5000 psi
Steel Reinforcement	Plain WWF Grade 80
Fy wire mesh	80000 psi
Fy rebar	60000 pcf
Lightweight?	No
Concrete density	150 pcf
λ	1
E (Steel)	29000000 psi
E (Concrete)	4286826 psi
n (modular ratio)	6.76

O.K. — *ACI 19.2.4.1(a)*; *ACI 20.2.2.2*; *ACI 19.2.2.1(a)*

Shear Parameters

ϕv	0.85
Vc	3.394 kip
ϕVc	2.885 kip

ACI Table ACI 21.2.1; *ACI 22.5.5.1*

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025
ρmin.hor	0.0025
Max Vertical spacing	12 in
Max Horizontal spacing	12 in

ACI Table 11.6.1; *ACI Table 11.6.1*; *ACI 11.7.2.2*; *ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.5 kip

Assumption check

0.06*f'c*Ag	14.4 kip
Check	O.K.

ACI 11.8.1.1(d)

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.1 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0 kip
ϕVc/2	1.44 kip
Check Shear	O.K.

Allowable Capacity

Ig = (b*h^3)/12	64 in^4
Ag = (b*h)	48 in^2
Yt = h/2	2
fr (rupture modulus)	530.330 psi
Mcr	16.971 kip-in
B1	0.8
Trial Ast req'd	0.079 in^2
B	8.829624606
kd	0.569 in
Icr	3.52 in^4
a = As * fy / (0.85 * f'c *b)	0.33483 psi
c	0.419 in
Ase	0.22 in^2
Icrdeflection	4.19 in^4
Ie	64.00 in^4
delta	360
τ_t (maximum tensile reinforcement)	0.0166
τ_{temp} (min. temperature reinforcement)	0.0018
τ_{min} (minimum tensile reinforcement)	0.0027
τ_{trial} (trial reinforcement ratio bottom)	0.0033
$\rho_{provided}$ (reinforcement ratio provided)	0.0080
a	0.32 in

ACI 24.2.3.5; ACI Table 22.2.2.4.3; ACI Table 24.2.2

ACI's Alternate Design of Slender Walls	*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:	
Cross section is constant over the height of the wall	*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect	*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3	*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*fc*Ag	*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and	*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length	*ACI 11.8.2.2*

Geometric Properties

X Corridinate	376
Y Corridinate	22
Direction of Wall	Y
Center of gravity X	376.000
Center of gravity Y	173.092
Wall Weight	7200.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	Yes
lop (length of opening on wall)	0 ft
H (height of wall)	115 in
Lh (length of wall)	25.333 ft
Analysis will be performed as :	One-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
nl (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh	
Wire Size	W6.7
spacing	4 in
Mesh Area	0.20 in^2

= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.09 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.06 klf

Deflection

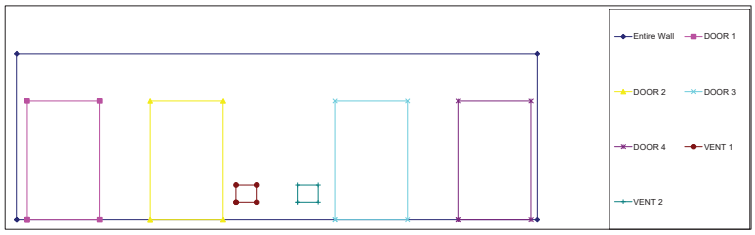
Service Loads	
Axial	1.10 kip
Lateral	0 klf
Allowed service deflection	0.32 in
Msa	0.550 kip-in
M	0.553 kip-in
Δs	0.003 in
Check deflection	O.K.

ACI 14-9; ACI 14-8

Flexure

Assumption check		
Span	Hw	Lw
εt	0.012	0.012
εty	0.003	0.003
Check	Tension	Tension
ϕb	0.9	0.9
Mua	1.093 kip-ft	
Mu	1.090 kip-ft	1.090 kip-ft
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft
As Add'l req'd	0.00 in^2	0.00 in^2
Add'l bar size:	3	3
qty req d	0	0
or spacing of:	0	0
As add'l =	0.000 kip-ft	0.000 kip-ft
Ast = As + As add'l	0.20 in^2	0.20 in^2
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft
Check ϕMn > Mu	O.K.	O.K.
% allowed	49.34%	49.34%

ACI 21.2.2.1; ACI 11.8.1.1(b); ACI Table 21.2.2; ACI 11.8.3.1d



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12
DOOR 1	0.49 ft	0 ft	3.54 ft	2.73 ft	1213.04	0.14 klf	0.4 klf	0.42 kip-ft
DOOR 2	6.49 ft	0 ft	3.54 ft	2.73 ft	1213.04	0.14 klf	0.4 klf	0.42 kip-ft
DOOR 3	15.49 ft	0 ft	3.54 ft	2.73 ft	1213.04	0.14 klf	0.4 klf	0.42 kip-ft
DOOR 4	21.49 ft	0 ft	3.54 ft	2.73 ft	1213.04	0.14 klf	0.4 klf	0.42 kip-ft
VENT 1	10.67 ft	1 ft	1 ft	7.58 ft	50.17	0.38 klf	0.64 klf	0.05 kip-ft
VENT 2	13.67 ft	1 ft	1 ft	7.58 ft	50.17	0.38 klf	0.64 klf	0.05 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn** = ϕAsFy(db - a/2)	Check ϕMn > Mu
DOOR 1	0.9	0.003 in^2	No. 3	1	15.45 kip-ft	O.K.
DOOR 2	0.9	0.003 in^2	No. 3	1	15.45 kip-ft	O.K.
DOOR 3	0.9	0.003 in^2	No. 3	1	15.45 kip-ft	O.K.
DOOR 4	0.9	0.003 in^2	No. 3	1	15.45 kip-ft	O.K.
VENT 1	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.
VENT 2	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity in Shear	Maximum R - Distance	Maximum L - Distance	Shear kip	Moment + kip - ft	Moment - kip - ft	Moment + kip - ft	Moment - kip - ft
4	254	254	48.836	137.40	137.40	173.52	174.83

Total Tension	Base Anchors					
14.564	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	50 in	3.64	12.21	254 in	2.986 kip*ft	77.068 kip*ft
Base Anchor 2	122 in	3.64	12.21	182 in	17.780 kip*ft	39.568 kip*ft
Base Anchor 3	182 in	3.64	12.21	122 in	39.568 kip*ft	17.780 kip*ft
Base Anchor 4	254 in	3.64	12.21	50 in	77.068 kip*ft	2.986 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Overturning Moment Resistance (kip-ft) Low Right
Wall Connection 1	2	***1.531***	4.765	32.08%	W4	0	304.000	3.062	0.000	77.571
Wall Connection 2	2	***2.703***	2.504	25.00%	W7	74	230.000	2.504	15.443	47.998
Wall Connection 3	2	***2.703***	2.618	25.00%	W6	149	155.000	2.618	32.507	33.816
Wall Connection 4	2	***2.703***	2.504	25.00%	W5	230	74.000	2.504	47.998	15.443
Wall Connection 5	2	***1.531***	4.765	32.08%	W3	304	0.000	3.062	77.571	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
15830	48836	33006	525	12001	OK	3958	(33006)	OK

RIGIDITY

CALCULATED VALUES	59%	Final	9.912712471

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
	Entire Wall	304	115	Y	Y	16.821	0.059
DOOR 1	A'	304	82.24	Y	Y	24.056	0.042
	A	5.88	82.24	Y	N	0.000	0.000
	B	255.64	82.24	Y	Y	20.032	0.050
DOOR 2	B'	304	82.24	Y	Y	24.056	0.042
	C	77.88	82.24	Y	Y	4.602	0.217
	D	183.64	82.24	Y	Y	13.954	0.072
DOOR 3	C'	304	82.24	Y	Y	24.056	0.042
	E	185.88	82.24	Y	Y	14.145	0.071
	F	75.64	82.24	Y	Y	4.398	0.227
DOOR 4	D'	304	82.24	Y	Y	24.056	0.042
	G	257.88	82.24	Y	Y	20.219	0.049
	H	3.64	82.24	Y	N	0.000	0.000
VENT 1	E'	304	12.04	Y	Y	168.240	0.006
	I	128.04	12.04	Y	Y	70.689	0.014
	J	163.96	12.04	Y	Y	90.623	0.011
VENT 2	F'	304	12.04	Y	Y	168.240	0.006
	L	164.04	12.04	Y	Y	90.668	0.011
	M	127.96	12.04	Y	Y	70.644	0.014

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
DOOR 1	Entire Wall	A'	A'a	-	Deflection	0.018
	A	B	AB	+	Stiffness	20.032
	A'a	AB	A'b	+	Deflection	0.068
DOOR 2	A'b	B'	B'a	-	Deflection	0.026
	C	D	CD	+	Stiffness	18.556
	B'a	CD	B'b	+	Deflection	0.080
DOOR 3	B'b	C'	C'a	-	Deflection	0.039
	E	F	EF	+	Stiffness	18.544
	C'a	EF	C'b	+	Deflection	0.092
DOOR 4	C'b	D'	D'a	-	Deflection	0.051
	G	H	GH	+	Stiffness	20.219
	D'a	GH	D'b	+	Deflection	0.100
VENT 1	D'b	E'	E'a	-	Deflection	0.094
	I	J	IJ	+	Stiffness	161.312
	E'a	IJ	E'b	+	Deflection	0.101
VENT 2	E'b	F'	F'a	-	Deflection	0.095
	L	M	LM	+	Stiffness	161.312
	F'a	LM	Final	+	Deflection	0.101

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W2

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psi	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.62 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.22 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0 kip
ϕVc/2	1.44 kip
Check Shear	O.K.

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
Icr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Geometric Properties

X Corridinate	303
Y Corridinate	22
Direction of Wall	Y
Center of gravity X	303.000
Center of gravity Y	173.947
Wall Weight	11550.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	Yes
lop (length of opening on wall)	0 ft
H (height of wall)	115 in
Lh (length of wall)	25.333 ft
Analyisis will be performed as :	One-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh	
Wire Size	W6.7
spacing	4 in
Mesh Area	0.20 in^2 = As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.09 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

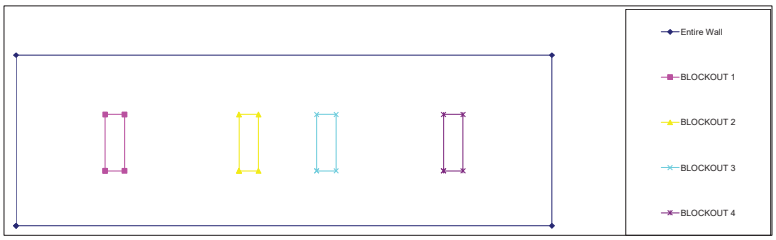
Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.06 klf

Deflection

Service Loads		
Axial	1.22 kip	
Lateral	0 klf	
Allowed service deflection	0.32 in	
Msa	0.610 kip-in	
M	0.614 kip-in	ACI 14-9
Δs	0.003 in	ACI 14-8
Check deflection	O.K.	

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	1.098 kip-ft		
Mu	1.100 kip-ft	1.100 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As AddTl req'd	0.00 in^2	0.00 in^2	
AddTl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addTl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addTl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	49.80%	49.80%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	Mu (wu*L^2)/12
BLOCKOUT 1	4.21 ft	3.08 ft	0.92 ft	3.33 ft	145.97	0.17 klf	0.43 klf	0.03 kip-ft
BLOCKOUT 2	10.54 ft	3.08 ft	0.92 ft	3.33 ft	145.97	0.17 klf	0.43 klf	0.03 kip-ft
BLOCKOUT 3	14.21 ft	3.08 ft	0.92 ft	3.33 ft	145.97	0.17 klf	0.43 klf	0.03 kip-ft
BLOCKOUT 4	20.21 ft	3.08 ft	0.92 ft	3.33 ft	145.97	0.17 klf	0.43 klf	0.03 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	ϕMn = ϕAsFy(db - a/2)	Check ϕMn > Mu
BLOCKOUT 1	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.
BLOCKOUT 2	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.
BLOCKOUT 3	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.
BLOCKOUT 4	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
			Overturning				
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
6	298	298	61.420	203.30	203.30	173.52	174.83

Total Tension	Base Anchors					
21.502	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	6 in	***3.47***	***6.29***	298 in	0.035 kip*ft	86.147 kip*ft
Base Anchor 2	50 in	3.64	12.21	254 in	2.545 kip*ft	65.689 kip*ft
Base Anchor 3	122 in	3.64	12.21	182 in	15.155 kip*ft	33.726 kip*ft
Base Anchor 4	182 in	3.64	12.21	122 in	33.726 kip*ft	15.155 kip*ft
Base Anchor 5	254 in	3.64	12.21	50 in	65.689 kip*ft	2.545 kip*ft
Base Anchor 6	298 in	***3.47***	***6.29***	6 in	86.147 kip*ft	0.035 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	10.088	67.92%	W4	0	304.000	3.062	0.000	77.571
Wall Connection 2	2	***2.703***	2.504	25.00%	W7	74	230.000	2.504	15.443	47.998
Wall Connection 3	2	***2.703***	2.618	25.00%	W6	149	155.000	2.618	32.507	33.816
Wall Connection 4	2	***2.703***	2.504	25.00%	W5	230	74.000	2.504	47.998	15.443
Wall Connection 5	2	***1.531***	10.088	67.92%	W3	304	0.000	3.062	77.571	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
24968	61420	36452	826	18867	OK	4161	(36452)	OK

RIGIDITY

	CALCULATED VALUES	93%	Final	15.58404675

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
	Entire Wall	304	115	Y	Y	16.821	0.059
BLOCKOUT 1	A'	304	38.08	Y	Y	52.944	0.019
	A	50.52	38.08	Y	Y	7.436	0.134
	B	242.44	38.08	Y	Y	42.098	0.024
BLOCKOUT 2	B'	304	38.08	Y	Y	52.944	0.019
	C	126.48	38.08	Y	Y	21.493	0.047
	D	166.48	38.08	Y	Y	28.646	0.035
BLOCKOUT 3	C'	304	38.08	Y	Y	52.944	0.019
	E	170.52	38.08	Y	Y	29.365	0.034
	F	122.44	38.08	Y	Y	20.766	0.048
BLOCKOUT 4	D'	304	38.08	Y	Y	52.944	0.019
	G	242.52	38.08	Y	Y	42.112	0.024
	H	50.44	38.08	Y	Y	7.421	0.135

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
BLOCKOUT 1	Entire Wall	A'	A'a	-	Deflection	0.041
	A	B	AB	+	Stiffness	49.534
	A'a	AB	A'b	+	Deflection	0.061
BLOCKOUT 2	A'b	B'	B'a	-	Deflection	0.042
	C	D	CD	+	Stiffness	50.139
	B'a	CD	B'b	+	Deflection	0.062
BLOCKOUT 3	B'b	C'	C'a	-	Deflection	0.043
	E	F	EF	+	Stiffness	50.131
	C'a	EF	C'b	+	Deflection	0.063
BLOCKOUT 4	C'b	D'	D'a	-	Deflection	0.044
	G	H	GH	+	Stiffness	49.533
	D'a	GH	Final	+	Deflection	0.064

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W3

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.57 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.18 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	0.09 kip	
ϕVc/2	1.44 kip	
Check Shear	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
I.cr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Geometric Properties

X Corridinate	258
Y Corridinate	328
Direction of Wall	X
Center of gravity X	318.000
Center of gravity Y	328.000
Wall Weight	3930.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	95.5 in
Lh (length of wall)	10.000 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.5*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.03 klf
Hw = W*(H^4 / H^4 + L^4)	0.07 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.02 klf
Hw = W*(H^4 / H^4 + L^4)	0.04 klf

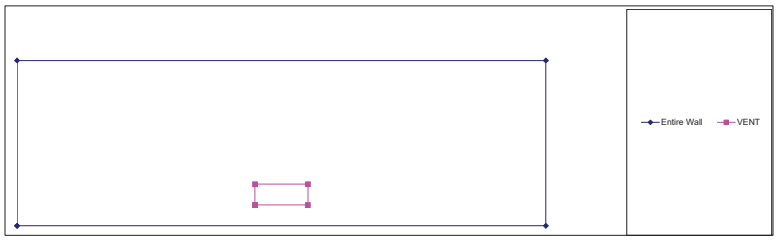
Deflection

Service Loads	
Axial l	1.18 kip
Lateral	0.02 klf
Allowed service deflection	0.27 in
Msa	2.490 kip-in
M	2.500 kip-in
Δs	0.009 in
Check deflection	O.K.

ACI 14-9
ACI 14-8

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.615 kip-ft		
Mu	0.620 kip-ft	0.620 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	28.07%	28.07%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12
VENT	4.5 ft	1 ft	1 ft	5.96 ft	49.92	0.3 klf	0.56 klf	0.05 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu
VENT	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
			Overturning				
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
3	108	90	36.627	45.41	39.93	41.13	25.58

Total Tension	Base Anchors					
10.923	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	30 in	3.64	12.21	90 in	2.528 kip*ft	27.308 kip*ft
Base Anchor 2	60 in	3.64	12.21	60 in	10.114 kip*ft	12.137 kip*ft
Base Anchor 3	108 in	3.64	12.21	12 in	32.769 kip*ft	0.485 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Overturning Moment Resistance (kip-ft) Low Right
Wall Connection 1	2	***2.703***	4.023	12.17%	W2	45	75.000	4.023	15.085	25.142
Wall Connection 2	2	***2.703***	2.649	12.17%	W1	118	2.000	2.649	26.048	0.441

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
12131	36627	24496	1075	20102	OK	4044	(24496)	OK

RIGIDITY

	CALCULATED VALUES	99%	Final	6.827607152

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
VENT	Entire Wall	120	95.5	Y	Y	6.917	0.145
	A'	120	11.98	Y	Y	66.557	0.015
	A	54	11.98	Y	Y	29.565	0.034
	B	54	11.98	Y	Y	29.565	0.034

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
VENT	Entire Wall	A'	A'a	-	Deflection	0.130
	A	B	AB	+	Stiffness	59.130
	A'a	AB	Final	+	Deflection	0.146

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W4

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.41 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.07 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0.09 kip
ϕVc/2	1.44 kip
Check Shear	O.K.

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
Icr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Geometric Properties

X Corridinate	258
Y Corridinate	20
Direction of Wall	X
Center of gravity X	318.000
Center of gravity Y	20.000
Wall Weight	3930.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	95.5 in
Lh (length of wall)	10.000 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.5*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.03 klf
Hw = W*(H^4 / H^4 + L^4)	0.07 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

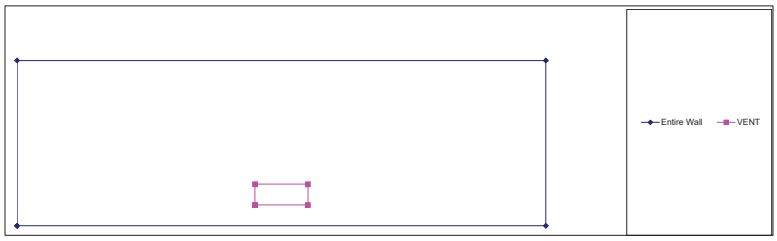
Lw = W*(L^4 / L^4 + H^4)	0.02 klf
Hw = W*(H^4 / H^4 + L^4)	0.04 klf

Deflection

Service Loads		
Axial l	1.07 kip	
Lateral	0.02 klf	
Allowed service deflection	0.27 in	
Msa	2.435 kip-in	
M	2.444 kip-in	ACI 14-9
Δs	0.008 in	ACI 14-8
Check deflection	O.K.	

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.609 kip-ft		
Mu	0.610 kip-ft	0.610 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	27.61%	27.61%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12
VENT	4.5 ft	1 ft	1 ft	5.96 ft	49.92	0.3 klf	0.56 klf	0.05 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu
VENT	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
			Overturning				
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
3	108	90	36.627	45.41	39.93	41.13	25.58

Total Tension	Base Anchors					
10.923	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	30 in	3.64	12.21	90 in	2.528 kip*ft	27.308 kip*ft
Base Anchor 2	60 in	3.64	12.21	60 in	10.114 kip*ft	12.137 kip*ft
Base Anchor 3	108 in	3.64	12.21	12 in	32.769 kip*ft	0.485 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Overturning Moment Resistance (kip-ft) Low Right
Wall Connection 1	2	***2.703***	4.023	12.17%	W2	45	75.000	4.023	15.085	25.142
Wall Connection 2	2	***2.703***	2.649	12.17%	W1	118	2.000	2.649	26.048	0.441

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
12131	36627	24496	1075	20102	OK	4044	(24496)	OK

RIGIDITY

	CALCULATED VALUES	99%	Final	6.827607152

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
VENT	Entire Wall	120	95.5	Y	Y	6.917	0.145
	A'	120	11.98	Y	Y	66.557	0.015
	A	54	11.98	Y	Y	29.565	0.034
	B	54	11.98	Y	Y	29.565	0.034

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
VENT	Entire Wall	A'	A'a	-	Deflection	0.130
	A	B	AB	+	Stiffness	59.130
	A'a	AB	Final	+	Deflection	0.146

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W5

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.47 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.12 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	0.07 kip	
ϕVc/2	1.44 kip	
Check Shear	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
Icr	3.52 in^4	
a = As * fy / (0.85 * f'c *b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Geometric Properties

X Corridinate	305
Y Corridinate	94
Direction of Wall	X
Center of gravity X	339.500
Center of gravity Y	94.000
Wall Weight	2735.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	114.5 in
Lh (length of wall)	5.750 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.5*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.08 klf
Hw = W*(H^4 / H^4 + L^4)	0.01 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.05 klf
Hw = W*(H^4 / H^4 + L^4)	0.01 klf

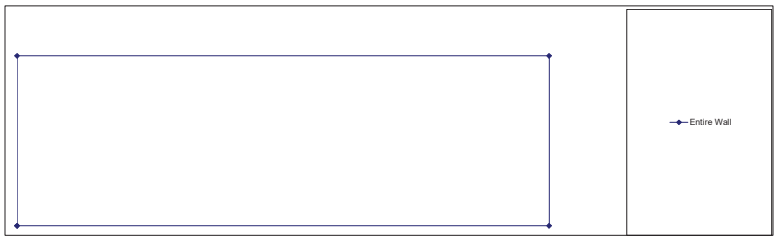
Deflection

Service Loads	
Axial l	1.12 kip
Lateral	0.05 klf
Allowed service deflection	0.32 in
Msa	7.388 kip-in
M	7.430 kip-in
Δs	0.037 in
Check deflection	O.K.

ACI 14-9
ACI 14-8

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.171 kip-ft		
Mu	0.170 kip-ft	0.170 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	7.70%	7.70%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
2	57	57	24.418	18.06	18.06	18.86	18.86

Total Tension	Base Anchors					
7.282	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	12 in	3.64	12.21	57 in	0.767 kip*ft	17.295 kip*ft
Base Anchor 2	57 in	3.64	12.21	12 in	17.295 kip*ft	0.767 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	8.426	25.49%	W2	0	69.000	3.062	0.000	17.607
Wall Connection 2	2	***2.703***	0.435	100.00%	P1-1	34.5	34.500	0.435	1.251	1.251
Wall Connection 3	2	***1.531***	5.548	25.49%	W1	69	0.000	3.062	17.607	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
4258	24418	20160	574	20365	OK	2129	(20160)	OK

RIGIDITY

CALCULATED VALUES	100%	Final	2.094730808

Pier	Length	Height	Fixed Top?	Useable?	Stiffness (k)	Deflection
Label	(inches)	(inches)	(Y/N)	(Y/N)	(1000 kip / IN)	(in / 1000 kip)
Entire Wall	69	114.5	Y	Y	2.095	0.477

Combine Logic					
First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
Entire Wall	0	Final			2.095

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W6

Notes

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.53 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.18 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0.08 kip
ϕVc/2	1.44 kip
Check Shear	O.K.

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
Icr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.20 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Geometric Properties

X Corridinate	305
Y Corridinate	172
Direction of Wall	X
Center of gravity X	339.500
Center of gravity Y	172.000
Wall Weight	3190.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	133.5 in
Lh (length of wall)	5.750 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.09 klf
Hw = W*(H^4 / H^4 + L^4)	0.01 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

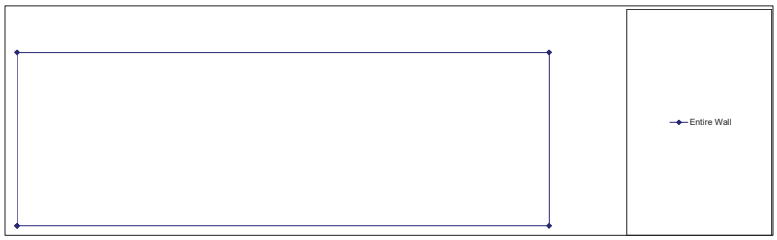
Lw = W*(L^4 / L^4 + H^4)	0.06 klf
Hw = W*(H^4 / H^4 + L^4)	0 klf

Deflection

Service Loads		
Axial	1.18 kip	
Lateral	0.06 klf	
Allowed service deflection	0.37 in	
Msa	11.729 kip-in	
M	11.823 kip-in	ACI 14-9
Δs	0.080 in	ACI 14-8
Check deflection	O.K.	

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.214 kip-ft		
Mu	0.210 kip-ft	0.210 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	9.51%	9.51%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
2	57	57	24.418	18.06	18.06	18.86	18.86

Total Tension	Base Anchors					
7.282	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	12 in	3.64	12.21	57 in	0.767 kip*ft	17.295 kip*ft
Base Anchor 2	57 in	3.64	12.21	12 in	17.295 kip*ft	0.767 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	8.480	25.66%	W2	0	69.000	3.062	0.000	17.607
Wall Connection 2	2	***2.703***	0.435	100.00%	P1-2	34.5	34.500	0.435	1.251	1.251
Wall Connection 3	2	***1.531***	5.584	25.66%	W1	69	0.000	3.062	17.607	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
3533	24418	20885	420	20365	OK	1766	(20885)	OK

RIGIDITY

CALCULATED VALUES	100%	Final	1.532921608

Pier	Length	Height	Fixed Top?	Useable?	Stiffness (k)	Deflection
Label	(inches)	(inches)	(Y/N)	(Y/N)	(1000 kip / IN)	(in / 1000 kip)
Entire Wall	69	133.5	Y	Y	1.533	0.652

Combine Logic					
First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
Entire Wall	0	Final			1.533

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W7

Notes

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psi	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.63 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.24 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0.07 kip
ϕVc/2	1.44 kip
Check Shear	O.K.

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
Icr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Geometric Properties

X Corridinate	305
Y Corridinate	252
Direction of Wall	X
Center of gravity X	339.500
Center of gravity Y	252.000
Wall Weight	2735.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	114.5 in
Lh (length of wall)	5.750 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.08 klf
Hw = W*(H^4 / H^4 + L^4)	0.01 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.05 klf
Hw = W*(H^4 / H^4 + L^4)	0.01 klf

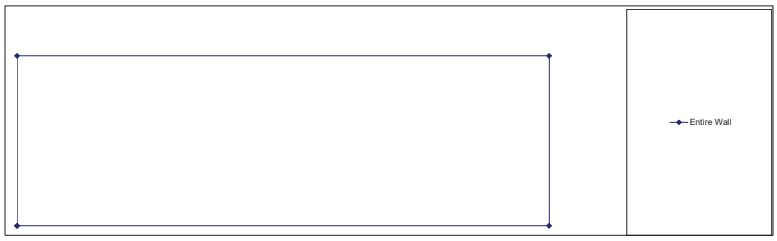
Deflection

Service Loads	
Axial l	1.24 kip
Lateral	0.05 klf
Allowed service deflection	0.32 in
Msa	7.448 kip-in
M	7.495 kip-in
Δs	0.037 in
Check deflection	O.K.

ACI 14-9
ACI 14-8

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.178 kip-ft		
Mu	0.180 kip-ft	0.180 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As AddTl req'd	0.00 in^2	0.00 in^2	
AddTl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addTl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addTl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	8.15%	8.15%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
2	57	57	24.418	18.06	18.06	18.86	18.86

Total Tension	Base Anchors					
7.282	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	12 in	3.64	12.21	57 in	0.767 kip*ft	17.295 kip*ft
Base Anchor 2	57 in	3.64	12.21	12 in	17.295 kip*ft	0.767 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	8.100	24.51%	W2	0	69.000	3.062	0.000	17.607
Wall Connection 2	2	***2.703***	0.435	100.00%	P1-3	34.5	34.500	0.435	1.251	1.251
Wall Connection 3	2	***1.531***	5.334	24.51%	W1	69	0.000	3.062	17.607	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
4258	24418	20160	574	20365	OK	2129	(20160)	OK

RIGIDITY

CALCULATED VALUES	100%	Final	2.094730808

Pier	Length	Height	Fixed Top?	Useable?	Stiffness (k)	Deflection
Label	(inches)	(inches)	(Y/N)	(Y/N)	(1000 kip / IN)	(in / 1000 kip)
Entire Wall	69	114.5	Y	Y	2.095	0.477

Combine Logic					
First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
Entire Wall	0	Final			2.095

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W8

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.33 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.02 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0 kip
ϕVc/2	1.44 kip
Check Shear	O.K.

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
Icr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ε_t (maximum tensile reinforcement)	0.0166	
ε_{temp} (min. temperature reinforcement)	0.0018	
ε_{min} (minimum tensile reinforcement)	0.0027	
ε_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Geometric Properties

X Corridinate	256
Y Corridinate	22
Direction of Wall	Y
Center of gravity X	256.000
Center of gravity Y	173.994
Wall Weight	10725.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	Yes
lop (length of opening on wall)	0 ft
H (height of wall)	115 in
Lh (length of wall)	25.333 ft
Analyisis will be performed as :	One-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh	
Wire Size	W6.7
spacing	4 in
Mesh Area	0.20 in^2

= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.09 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.06 klf

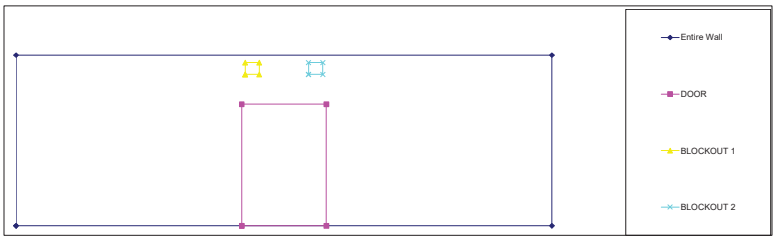
Deflection

Service Loads	
Axial	1.02 kip
Lateral	0 klf
Allowed service deflection	0.32 in
Msa	0.510 kip-in
M	0.513 kip-in
Δs	0.003 in
Check deflection	O.K.

ACI 14-9
ACI 14-8

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	1.085 kip-ft		
Mu	1.090 kip-ft	1.090 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As AddTl req'd	0.00 in^2	0.00 in^2	
AddTl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addTl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addTl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	49.34%	49.34%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12
DOOR	10.67 ft	0 ft	4 ft	2.75 ft	1366.67	0.14 klf	0.4 klf	0.53 kip-ft
BLOCKOUT 1	10.83 ft	8.5 ft	0.67 ft	0.42 ft	22.22	0.02 klf	0.28 klf	0.01 kip-ft
BLOCKOUT 2	13.83 ft	8.5 ft	0.67 ft	0.42 ft	22.22	0.02 klf	0.28 klf	0.01 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu
DOOR	0.9	0.004 in^2	No. 3	1	15.57 kip-ft	O.K.
BLOCKOUT 1	0.9	0.001 in^2	No. 3	1	1.68 kip-ft	O.K.
BLOCKOUT 2	0.9	0.001 in^2	No. 3	1	1.68 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
6	298	298	61.420	193.51	193.51	185.47	185.47

Total Tension	Base Anchors					
21.502	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	6 in	***3.47***	***6.29***	298 in	0.035 kip*ft	86.147 kip*ft
Base Anchor 2	78 in	3.64	12.21	226 in	6.195 kip*ft	52.004 kip*ft
Base Anchor 3	120 in	3.64	12.21	184 in	14.662 kip*ft	34.471 kip*ft
Base Anchor 4	184 in	3.64	12.21	120 in	34.471 kip*ft	14.662 kip*ft
Base Anchor 5	226 in	3.64	12.21	78 in	52.004 kip*ft	6.195 kip*ft
Base Anchor 6	298 in	***3.47***	***6.29***	6 in	86.147 kip*ft	0.035 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	7.367	50.00%	W11	0	304.000	3.062	0.000	77.571
Wall Connection 2	2	***2.703***	4.259	34.82%	W13	126	178.000	4.259	44.723	63.180
Wall Connection 3	2	***2.703***	4.259	34.82%	W12	178	126.000	4.259	63.180	44.723
Wall Connection 4	2	***1.531***	7.367	50.00%	W10	304	0.000	3.062	77.571	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
22187	61420	39233	727	16619	OK	3698	(39233)	OK

RIGIDITY

	CALCULATED VALUES	82%	Final	13.72730171

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
	Entire Wall	304	115	Y	Y	16.821	0.059
DOOR	A'	304	82	Y	Y	24.130	0.041
	A	128.04	82	Y	Y	9.158	0.109
	B	127.96	82	Y	Y	9.151	0.109
BLOCKOUT 1	B'	304	7.96	Y	Y	254.548	0.004
	C	129.96	7.96	Y	Y	108.708	0.009
	D	166	7.96	Y	Y	138.922	0.007
BLOCKOUT 2	C'	304	7.96	Y	Y	254.548	0.004
	E	165.96	7.96	Y	Y	138.888	0.007
	F	130	7.96	Y	Y	108.742	0.009

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
DOOR	Entire Wall	A'	A'a	-	Deflection	0.018
	A	B	AB	+	Stiffness	18.308
	A'a	AB	A'b	+	Deflection	0.073
BLOCKOUT 1	A'b	B'	B'a	-	Deflection	0.069
	C	D	CD	+	Stiffness	247.630
	B'a	CD	B'b	+	Deflection	0.073
BLOCKOUT 2	B'b	C'	C'a	-	Deflection	0.069
	E	F	EF	+	Stiffness	247.630
	C'a	EF	Final	+	Deflection	0.073

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W9

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psi	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.25 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	0.94 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0 kip
ϕVc/2	1.44 kip
Check Shear	O.K.

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
I.cr	3.52 in^4	
a = As * fy / (0.85 * f'c *b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Geometric Properties

X Corridinate	140
Y Corridinate	22
Direction of Wall	Y
Center of gravity X	140.000
Center of gravity Y	174.001
Wall Weight	7815.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	Yes
lop (length of opening on wall)	0 ft
H (height of wall)	115 in
Lh (length of wall)	25.333 ft
Analyisis will be performed as :	One-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh	
Wire Size	W6.7
spacing	4 in
Mesh Area	0.20 in^2 = As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.09 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

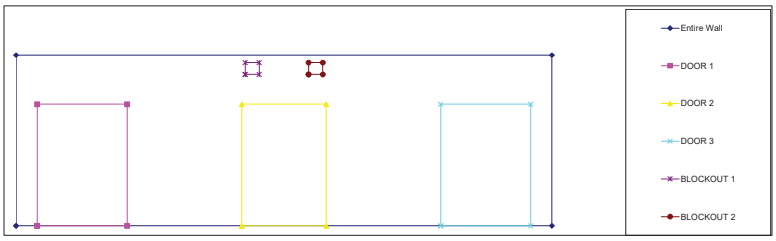
Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.06 klf

Deflection

Service Loads		
Axial	0.94 kip	
Lateral	0 klf	
Allowed service deflection	0.32 in	
Msa	0.470 kip-in	
M	0.472 kip-in	ACI 14-9
Δs	0.002 in	ACI 14-8
Check deflection	O.K.	

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	1.082 kip-ft		
Mu	1.080 kip-ft	1.080 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	48.89%	48.89%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	Mu (wu*L^2)/12
DOOR 1	1 ft	0 ft	4.25 ft	2.75 ft	1452.08	0.14 klf	0.4 klf	0.6 kip-ft
DOOR 2	10.67 ft	0 ft	4 ft	2.75 ft	1366.67	0.14 klf	0.4 klf	0.53 kip-ft
DOOR 3	20.08 ft	0 ft	4.25 ft	2.75 ft	1452.08	0.14 klf	0.4 klf	0.6 kip-ft
BLOCKOUT 1	10.83 ft	8.5 ft	0.67 ft	0.42 ft	22.22	0.02 klf	0.28 klf	0.01 kip-ft
BLOCKOUT 2	13.83 ft	8.5 ft	0.67 ft	0.42 ft	22.22	0.02 klf	0.28 klf	0.01 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	ϕMn = ϕAsFy(db - a/2)	Check ϕMn > Mu
DOOR 1	0.9	0.004 in^2	No. 3	1	15.57 kip-ft	O.K.
DOOR 2	0.9	0.004 in^2	No. 3	1	15.57 kip-ft	O.K.
DOOR 3	0.9	0.004 in^2	No. 3	1	15.57 kip-ft	O.K.
BLOCKOUT 1	0.9	0.001 in^2	No. 3	1	1.68 kip-ft	O.K.
BLOCKOUT 2	0.9	0.001 in^2	No. 3	1	1.68 kip-ft	O.K.

CONNECTIONS

Full Resistance Value							
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
6	298	298	61.420	193.51	193.51	124.61	124.61

Total Tension	Base Anchors					
21.502	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	6 in	***3.47***	***6.29***	298 in	0.035 kip*ft	86.147 kip*ft
Base Anchor 2	78 in	3.64	12.21	226 in	6.195 kip*ft	52.004 kip*ft
Base Anchor 3	120 in	3.64	12.21	184 in	14.662 kip*ft	34.471 kip*ft
Base Anchor 4	184 in	3.64	12.21	120 in	34.471 kip*ft	14.662 kip*ft
Base Anchor 5	226 in	3.64	12.21	78 in	52.004 kip*ft	6.195 kip*ft
Base Anchor 6	298 in	***3.47***	***6.29***	6 in	86.147 kip*ft	0.035 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Overturning Moment Resistance (kip-ft) Low Right
Wall Connection 1	2	***1.531***	7.367	50.00%	W11	0	304.000	3.062	0.000	77.571
Wall Connection 2	2	***2.703***	1.857	15.18%	W13	126	178.000	1.857	19.495	27.540
Wall Connection 3	2	***2.703***	1.857	15.18%	W12	178	126.000	1.857	27.540	19.495
Wall Connection 4	2	***1.531***	7.367	50.00%	W10	304	0.000	3.062	77.571	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
16773	61420	44647	554	12657	OK	2795	(44647)	OK

RIGIDITY

CALCULATED VALUES	62%	Final	10.45417875

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
	Entire Wall	304	115	Y	Y	16.821	0.059
DOOR 1	A'	304	82	Y	Y	24.130	0.041
	A	12	82	Y	Y	0.059	16.979
	B	241	82	Y	Y	18.865	0.053
DOOR 2	B'	304	82	Y	Y	24.130	0.041
	C	128.04	82	Y	Y	9.158	0.109
	D	127.96	82	Y	Y	9.151	0.109
DOOR 3	C'	304	82	Y	Y	24.130	0.041
	E	240.96	82	Y	Y	18.862	0.053
	F	12.04	82	Y	Y	0.059	16.817
BLOCKOUT 1	D'	304	7.96	Y	Y	254.548	0.004
	G	129.96	7.96	Y	Y	108.708	0.009
	H	166	7.96	Y	Y	138.922	0.007
BLOCKOUT 2	E'	304	7.96	Y	Y	254.548	0.004
	I	165.96	7.96	Y	Y	138.888	0.007
	J	130	7.96	Y	Y	108.742	0.009

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
DOOR 1	Entire Wall	A'	A'a	-	Deflection	0.018
	A	B	AB	+	Stiffness	18.924
	A'a	AB	A'b	+	Deflection	0.071
DOOR 2	A'b	B'	B'a	-	Deflection	0.029
	C	D	CD	+	Stiffness	18.308
	B'a	CD	B'b	+	Deflection	0.084
DOOR 3	B'b	C'	C'a	-	Deflection	0.043
	E	F	EF	+	Stiffness	18.922
	C'a	EF	C'b	+	Deflection	0.095
BLOCKOUT 1	C'b	D'	D'a	-	Deflection	0.092
	G	H	GH	+	Stiffness	247.630
	D'a	GH	D'b	+	Deflection	0.096
BLOCKOUT 2	D'b	E'	E'a	-	Deflection	0.092
	I	J	IJ	+	Stiffness	247.630
	E'a	IJ	Final	+	Deflection	0.096

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W10

Notes

ACI's Alternate Design of Slender Walls	ACI 11.8.1 & 11.8.2
Assumptions from this methodology:	
Cross section is constant over the height of the wall	ACI 11.8.1.1 (a)
Wall is tension-controlled for out-of-plane moment effect	ACI 11.8.1.1 (b)
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3	ACI 11.8.1.1 (c)
Pu at mid-height shall not exceed 0.06*f'c* Ag	ACI 11.8.1.1 (d)
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and	ACI 11.8.2.1
Concentrated gravity loads are distributed over the wall length	ACI 11.8.2.2

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	ACI 19.2.4.1(a)
E (Steel)	29000000 psi	ACI 20.2.2.2
E (Concrete)	4286826 psi	ACI 19.2.2.1(a)
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	ACI Table ACI 21.2.1
Vc	3.394 kip	ACI 22.5.5.1
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	ACI Table 11.6.1
ρmin.hor	0.0025	ACI Table 11.6.1
Max Vertical spacing	12 in	ACI 11.7.2.2
Max Horizontal spacing	12 in	ACI 11.7.2.2

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.3 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	0.99 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	0.09 kip	
ϕVc/2	1.44 kip	
Check Shear	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
Icr	3.52 in^4	
a = As * fy / (0.85 * f'c *b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{total} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Geometric Properties

X Corridinate	138
Y Corridinate	328
Direction of Wall	X
Center of gravity X	197.602
Center of gravity Y	328.000
Wall Weight	3810.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	95.5 in
Lh (length of wall)	10.000 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh	
Wire Size	W6.7
spacing	4 in
Mesh Area	0.20 in^2 = As

Factored Laterally Applied Loads

Factored Loading per ACI	ACI 5.3.1d & 5.3.3
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.03 klf
Hw = W*(H^4 / H^4 + L^4)	0.07 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

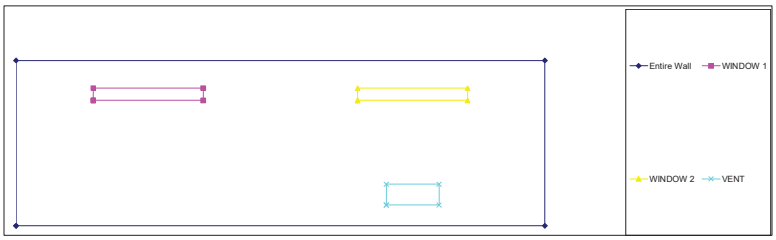
Lw = W*(L^4 / L^4 + H^4)	0.02 klf
Hw = W*(H^4 / H^4 + L^4)	0.04 klf

Deflection

Service Loads	
Axial l	0.99 kip
Lateral	0.02 klf
Allowed service deflection	0.27 in
Msa	2.395 kip-in
M	2.403 kip-in (ACI 14-9)
Δs	0.008 in (ACI 14-8)
Check deflection	O.K.

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.604 kip-ft		
Mu	0.600 kip-ft	0.600 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	27.16%	27.16%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12
WINDOW 1	1.46 ft	6.04 ft	2.08 ft	1.33 ft	61.19	0.07 klf	0.33 klf	0.12 kip-ft
WINDOW 2	6.46 ft	6.04 ft	2.08 ft	1.33 ft	61.19	0.07 klf	0.33 klf	0.12 kip-ft
VENT	7 ft	1 ft	1 ft	5.96 ft	49.92	0.3 klf	0.56 klf	0.05 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu
WINDOW 1	0.9	0.002 in^2	No. 3	1	7.1 kip-ft	O.K.
WINDOW 2	0.9	0.002 in^2	No. 3	1	7.1 kip-ft	O.K.
VENT	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
3	90	90	36.627	42.48	42.48	54.06	54.06

Total Tension	Base Anchors					
10.923	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	30 in	3.64	12.21	90 in	3.034 kip*ft	27.308 kip*ft
Base Anchor 2	60 in	3.64	12.21	60 in	12.137 kip*ft	12.137 kip*ft
Base Anchor 3	90 in	3.64	12.21	30 in	27.308 kip*ft	3.034 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***2.703***	6.076	20.72%	W9	2	118.000	5.406	0.901	53.159
Wall Connection 2	2	***2.703***	6.679	20.72%	W8	118	2.000	5.406	53.159	0.901

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
11735	36627	24892	1040	19441	OK	3912	(24892)	OK

RIGIDITY

CALCULATED VALUES	95%	Final	6.602860282

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
	Entire Wall	120	95.5	Y	Y	6.917	0.145
WINDOW 1	A'	120	7.06	Y	Y	113.184	0.009
	A	17.52	7.06	Y	Y	15.694	0.064
	B	77.52	7.06	Y	Y	72.999	0.014
WINDOW 2	B'	120	7.06	Y	Y	113.184	0.009
	C	77.52	7.06	Y	Y	72.999	0.014
	D	17.52	7.06	Y	Y	15.694	0.064
VENT	C'	120	11.98	Y	Y	66.557	0.015
	E	84	11.98	Y	Y	46.430	0.022
	F	24	11.98	Y	Y	12.331	0.081

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
WINDOW 1	Entire Wall	A'	A'a	-	Deflection	0.136
	A	B	AB	+	Stiffness	88.694
	A'a	AB	A'b	+	Deflection	0.147
WINDOW 2	A'b	B'	B'a	-	Deflection	0.138
	C	D	CD	+	Stiffness	88.694
	B'a	CD	B'b	+	Deflection	0.149
VENT	B'b	C'	C'a	-	Deflection	0.134
	E	F	EF	+	Stiffness	58.761
	C'a	EF	Final	+	Deflection	0.151

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W11

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.3 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	0.99 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	0.09 kip	
ϕVc/2	1.44 kip	
Check Shear	O.K.	

Geometric Properties

X Corridinate	138
Y Corridinate	20
Direction of Wall	X
Center of gravity X	197.602
Center of gravity Y	20.000
Wall Weight	3810.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	95.5 in
Lh (length of wall)	10.000 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.03 klf
Hw = W*(H^4 / H^4 + L^4)	0.07 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.02 klf
Hw = W*(H^4 / H^4 + L^4)	0.04 klf

Deflection

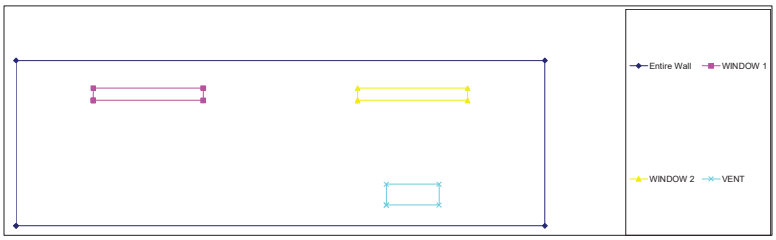
Service Loads		
Axial	0.99 kip	
Lateral	0.02 klf	
Allowed service deflection	0.27 in	
Msa	2.395 kip-in	
M	2.403 kip-in	ACI 14-9
Δs	0.008 in	ACI 14-8
Check deflection	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
I.cr	3.52 in^4	
a = As * fy / (0.85 * f'c *b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.604 kip-ft		
Mu	0.600 kip-ft	0.600 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	27.16%	27.16%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12
WINDOW 1	1.46 ft	6.04 ft	2.08 ft	1.33 ft	61.19	0.07 klf	0.33 klf	0.12 kip-ft
WINDOW 2	6.46 ft	6.04 ft	2.08 ft	1.33 ft	61.19	0.07 klf	0.33 klf	0.12 kip-ft
VENT	7 ft	1 ft	1 ft	5.96 ft	49.92	0.3 klf	0.56 klf	0.05 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu
WINDOW 1	0.9	0.002 in^2	No. 3	1	7.1 kip-ft	O.K.
WINDOW 2	0.9	0.002 in^2	No. 3	1	7.1 kip-ft	O.K.
VENT	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
3	90	90	36.627	42.48	42.48	54.06	54.06

Total Tension	Base Anchors					
10.923	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	30 in	3.64	12.21	90 in	3.034 kip*ft	27.308 kip*ft
Base Anchor 2	60 in	3.64	12.21	60 in	12.137 kip*ft	12.137 kip*ft
Base Anchor 3	90 in	3.64	12.21	30 in	27.308 kip*ft	3.034 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***2.703***	6.076	20.72%	W9	2	118.000	5.406	0.901	53.159
Wall Connection 2	2	***2.703***	6.679	20.72%	W8	118	2.000	5.406	53.159	0.901

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
11735	36627	24892	1040	19441	OK	3912	(24892)	OK

RIGIDITY

CALCULATED VALUES	95%	Final	6.602860282

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
	Entire Wall	120	95.5	Y	Y	6.917	0.145
WINDOW 1	A'	120	7.06	Y	Y	113.184	0.009
	A	17.52	7.06	Y	Y	15.694	0.064
	B	77.52	7.06	Y	Y	72.999	0.014
WINDOW 2	B'	120	7.06	Y	Y	113.184	0.009
	C	77.52	7.06	Y	Y	72.999	0.014
	D	17.52	7.06	Y	Y	15.694	0.064
VENT	C'	120	11.98	Y	Y	66.557	0.015
	E	84	11.98	Y	Y	46.430	0.022
	F	24	11.98	Y	Y	12.331	0.081

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
WINDOW 1	Entire Wall	A'	A'a	-	Deflection	0.136
	A	B	AB	+	Stiffness	88.694
	A'a	AB	A'b	+	Deflection	0.147
WINDOW 2	A'b	B'	B'a	-	Deflection	0.138
	C	D	CD	+	Stiffness	88.694
	B'a	CD	B'b	+	Deflection	0.149
VENT	B'b	C'	C'a	-	Deflection	0.134
	E	F	EF	+	Stiffness	58.761
	C'a	EF	Final	+	Deflection	0.151

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W12

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.41 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.09 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	0.16 kip	
ϕVc/2	1.44 kip	
Check Shear	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
Icr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.20 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Geometric Properties

X Corridinate	142
Y Corridinate	200
Direction of Wall	X
Center of gravity X	198.000
Center of gravity Y	200.000
Wall Weight	4950.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	127.5 in
Lh (length of wall)	9.333 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.06 klf
Hw = W*(H^4 / H^4 + L^4)	0.04 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

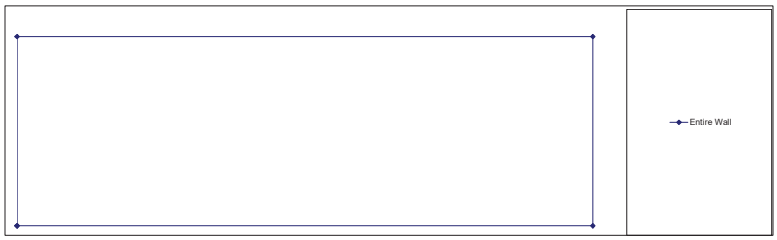
Lw = W*(L^4 / L^4 + H^4)	0.04 klf
Hw = W*(H^4 / H^4 + L^4)	0.02 klf

Deflection

Service Loads	
Axial l	1.09 kip
Lateral	0.04 klf
Allowed service deflection	0.35 in
Msa	7.318 kip-in
M	7.368 kip-in *ACI 14-9*
Δs	0.045 in *ACI 14-8*
Check deflection	O.K.

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.619 kip-ft		
Mu	0.620 kip-ft	0.620 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	28.07%	28.07%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
2	86	86	24.418	28.48	28.48	41.58	58.41

Total Tension	Base Anchors					
7.282	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	26 in	3.64	12.21	86 in	2.385 kip*ft	26.094 kip*ft
Base Anchor 2	86 in	3.64	12.21	26 in	26.094 kip*ft	2.385 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	8.583	29.28%	W9	0	112.000	3.062	0.000	28.579
Wall Connection 2	2	***2.703***	4.590	100.00%	P2-1	34	78.000	4.590	13.005	29.835
Wall Connection 3	2	***1.531***	9.435	29.28%	W8	112	0.000	3.062	28.579	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
8176	24418	16242	690	20365	OK	4088	(16242)	OK

RIGIDITY

CALCULATED VALUES	100%	Final	4.089590268

Pier	Length	Height	Fixed Top?	Useable?	Stiffness (k)	Deflection
Label	(inches)	(inches)	(Y/N)	(Y/N)	(1000 kip / IN)	(in / 1000 kip)
Entire Wall	112	127.5	Y	Y	4.090	0.245

Combine Logic					
First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
Entire Wall	0	Final			4.090

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W13

Notes

ACI's Alternate Design of Slender Walls	ACI 11.8.1 & 11.8.2
Assumptions from this methodology:	
Cross section is constant over the height of the wall	ACI 11.8.1.1 (a)
Wall is tension-controlled for out-of-plane moment effect	ACI 11.8.1.1 (b)
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3	ACI 11.8.1.1 (c)
Pu at mid-height shall not exceed 0.06*f'c* Ag	ACI 11.8.1.1 (d)
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and	ACI 11.8.2.1
Concentrated gravity loads are distributed over the wall length	ACI 11.8.2.2

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psi	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	ACI 19.2.4.1(a)
E (Steel)	29000000 psi	ACI 20.2.2.2
E (Concrete)	4286826 psi	ACI 19.2.2.1(a)
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	ACI Table ACI 21.2.1
Vc	3.394 kip	ACI 22.5.5.1
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	ACI Table 11.6.1
ρmin.hor	0.0025	ACI Table 11.6.1
Max Vertical spacing	12 in	ACI 11.7.2.2
Max Horizontal spacing	12 in	ACI 11.7.2.2

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.41 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.09 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	0.16 kip	
ϕVc/2	1.44 kip	
Check Shear	O.K.	

Geometric Properties

X Corridinate	142
Y Corridinate	149
Direction of Wall	X
Center of gravity X	198.000
Center of gravity Y	149.000
Wall Weight	4950.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	127.5 in
Lh (length of wall)	9.333 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	ACI 5.3.1d & 5.3.3
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.06 klf
Hw = W*(H^4 / H^4 + L^4)	0.04 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.04 klf
Hw = W*(H^4 / H^4 + L^4)	0.02 klf

Deflection

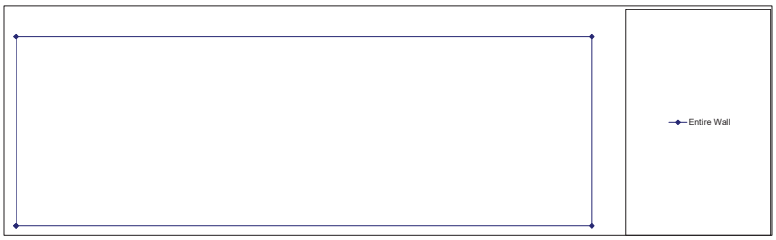
Service Loads	
Axial l	1.09 kip
Lateral	0.04 klf
Allowed service deflection	0.35 in
Msa	7.318 kip-in
M	7.368 kip-in ACI 14-9
Δs	0.045 in ACI 14-8
Check deflection	O.K.

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
Icr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.20 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.619 kip-ft		
Mu	0.620 kip-ft	0.620 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	28.07%	28.07%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu

CONNECTIONS

			Full Resistance Value				
			Overturning				
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
2	86	86	24.418	28.48	28.48	41.58	58.41

Total Tension	Base Anchors					
7.282	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	26 in	3.64	12.21	86 in	2.385 kip*ft	26.094 kip*ft
Base Anchor 2	86 in	3.64	12.21	26 in	26.094 kip*ft	2.385 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	8.583	29.28%	W9	0	112.000	3.062	0.000	28.579
Wall Connection 2	2	***2.703***	4.590	100.00%	P2-2	34	78.000	4.590	13.005	29.835
Wall Connection 3	2	***1.531***	9.435	29.28%	W8	112	0.000	3.062	28.579	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
8176	24418	16242	690	20365	OK	4088	(16242)	OK

RIGIDITY

CALCULATED VALUES	100%	Final	4.089590268

Pier	Length	Height	Fixed Top?	Useable?	Stiffness (k)	Deflection
Label	(inches)	(inches)	(Y/N)	(Y/N)	(1000 kip / IN)	(in / 1000 kip)
Entire Wall	112	127.5	Y	Y	4.090	0.245

Combine Logic					
First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
Entire Wall	0	Final			4.090

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W14

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psi	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.72 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.27 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0 kip
ϕVc/2	1.44 kip
Check Shear	O.K.

Geometric Properties

X Corridinate	136
Y Corridinate	22
Direction of Wall	Y
Center of gravity X	136.000
Center of gravity Y	174.001
Wall Weight	7815.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	Yes
lop (length of opening on wall)	0 ft
H (height of wall)	115 in
Lh (length of wall)	25.333 ft
Analyisis will be performed as :	One-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.09 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.06 klf

Deflection

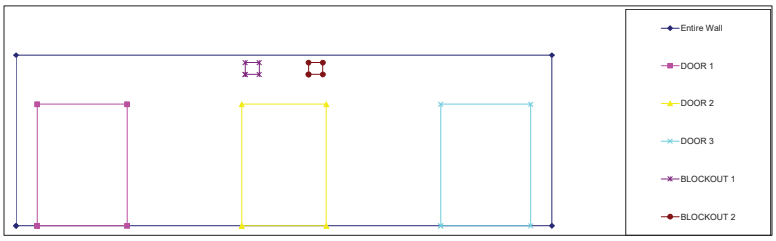
Service Loads		
Axial	1.27 kip	
Lateral	0 klf	
Allowed service deflection	0.32 in	
Msa	0.635 kip-in	
M	0.639 kip-in	ACI 14-9
Δs	0.003 in	ACI 14-8
Check deflection	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
I.cr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
τ_t (maximum tensile reinforcement)	0.0166	
τ_{temp} (min. temperature reinforcement)	0.0018	
τ_{min} (minimum tensile reinforcement)	0.0027	
τ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	1.102 kip-ft		
Mu	1.100 kip-ft	1.100 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As AddTl req'd	0.00 in^2	0.00 in^2	
AddTl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addTl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addTl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	49.80%	49.80%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	Mu (wu*L^2)/12
DOOR 1	1 ft	0 ft	4.25 ft	2.75 ft	1452.08	0.14 klf	0.4 klf	0.6 kip-ft
DOOR 2	10.67 ft	0 ft	4 ft	2.75 ft	1366.67	0.14 klf	0.4 klf	0.53 kip-ft
DOOR 3	20.08 ft	0 ft	4.25 ft	2.75 ft	1452.08	0.14 klf	0.4 klf	0.6 kip-ft
BLOCKOUT 1	10.83 ft	8.5 ft	0.67 ft	0.42 ft	22.22	0.02 klf	0.28 klf	0.01 kip-ft
BLOCKOUT 2	13.83 ft	8.5 ft	0.67 ft	0.42 ft	22.22	0.02 klf	0.28 klf	0.01 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	ϕMn = ϕAsFy(db - a/2)	Check ϕMn > Mu
DOOR 1	0.9	0.004 in^2	No. 3	1	15.57 kip-ft	O.K.
DOOR 2	0.9	0.004 in^2	No. 3	1	15.57 kip-ft	O.K.
DOOR 3	0.9	0.004 in^2	No. 3	1	15.57 kip-ft	O.K.
BLOCKOUT 1	0.9	0.001 in^2	No. 3	1	1.68 kip-ft	O.K.
BLOCKOUT 2	0.9	0.001 in^2	No. 3	1	1.68 kip-ft	O.K.

CONNECTIONS

Full Resistance Value							
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
6	298	298	61.420	193.51	193.51	125.30	125.30

Total Tension	Base Anchors					
21.502	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	6 in	***3.47***	***6.29***	298 in	0.035 kip*ft	86.147 kip*ft
Base Anchor 2	78 in	3.64	12.21	226 in	6.195 kip*ft	52.004 kip*ft
Base Anchor 3	120 in	3.64	12.21	184 in	14.662 kip*ft	34.471 kip*ft
Base Anchor 4	184 in	3.64	12.21	120 in	34.471 kip*ft	14.662 kip*ft
Base Anchor 5	226 in	3.64	12.21	78 in	52.004 kip*ft	6.195 kip*ft
Base Anchor 6	298 in	***3.47***	***6.29***	6 in	86.147 kip*ft	0.035 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Low Right
Wall Connection 1	2	***1.531***	7.367	50.00%	W17	0	304.000	3.062	0.000	77.571
Wall Connection 2	2	***2.703***	1.884	15.40%	W19	126	178.000	1.884	19.781	27.945
Wall Connection 3	2	***2.703***	1.884	15.40%	W18	178	126.000	1.884	27.945	19.781
Wall Connection 4	2	***1.531***	7.367	50.00%	W16	304	0.000	3.062	77.571	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
16773	61420	44647	554	12657	OK	2795	(44647)	OK

RIGIDITY

CALCULATED VALUES	62%	Final	10.45417875

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
	Entire Wall	304	115	Y	Y	16.821	0.059
DOOR 1	A'	304	82	Y	Y	24.130	0.041
	A	12	82	Y	Y	0.059	16.979
	B	241	82	Y	Y	18.865	0.053
DOOR 2	B'	304	82	Y	Y	24.130	0.041
	C	128.04	82	Y	Y	9.158	0.109
	D	127.96	82	Y	Y	9.151	0.109
DOOR 3	C'	304	82	Y	Y	24.130	0.041
	E	240.96	82	Y	Y	18.862	0.053
	F	12.04	82	Y	Y	0.059	16.817
BLOCKOUT 1	D'	304	7.96	Y	Y	254.548	0.004
	G	129.96	7.96	Y	Y	108.708	0.009
	H	166	7.96	Y	Y	138.922	0.007
BLOCKOUT 2	E'	304	7.96	Y	Y	254.548	0.004
	I	165.96	7.96	Y	Y	138.888	0.007
	J	130	7.96	Y	Y	108.742	0.009

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
DOOR 1	Entire Wall	A'	A'a	-	Deflection	0.018
	A	B	AB	+	Stiffness	18.924
	A'a	AB	A'b	+	Deflection	0.071
DOOR 2	A'b	B'	B'a	-	Deflection	0.029
	C	D	CD	+	Stiffness	18.308
	B'a	CD	B'b	+	Deflection	0.084
DOOR 3	B'b	C'	C'a	-	Deflection	0.043
	E	F	EF	+	Stiffness	18.922
	C'a	EF	C'b	+	Deflection	0.095
BLOCKOUT 1	C'b	D'	D'a	-	Deflection	0.092
	G	H	GH	+	Stiffness	247.630
	D'a	GH	D'b	+	Deflection	0.096
BLOCKOUT 2	D'b	E'	E'a	-	Deflection	0.092
	I	J	IJ	+	Stiffness	247.630
	E'a	IJ	Final	+	Deflection	0.096

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W15

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.74 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.28 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0 kip
ϕVc/2	1.44 kip
Check Shear	O.K.

Geometric Properties

X Corridinate	20
Y Corridinate	22
Direction of Wall	Y
Center of gravity X	20.000
Center of gravity Y	173.421
Wall Weight	8505.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	Yes
lop (length of opening on wall)	0 ft
H (height of wall)	115 in
Lh (length of wall)	25.333 ft
Analyisis will be performed as :	One-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.09 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / H^4 + L^4)	0 klf
Hw = W*(L^4 / H^4 + L^4)	0.06 klf

Deflection

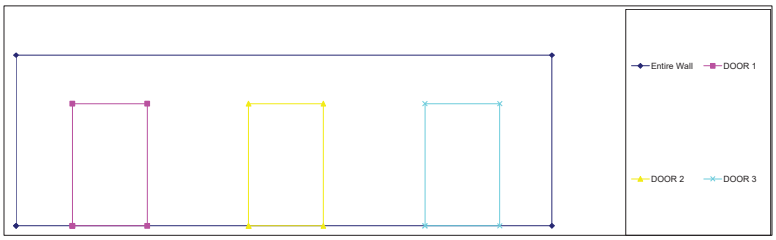
Service Loads		
Axial	1.28 kip	
Lateral	0 klf	
Allowed service deflection	0.32 in	
Msa	0.640 kip-in	
M	0.644 kip-in	ACI 14-9
Δs	0.003 in	ACI 14-8
Check deflection	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
I.cr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
τ_t (maximum tensile reinforcement)	0.0166	
τ_{temp} (min. temperature reinforcement)	0.0018	
τ_{min} (minimum tensile reinforcement)	0.0027	
τ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	1.103 kip-ft		
Mu	1.100 kip-ft	1.100 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As AddTl req'd	0.00 in^2	0.00 in^2	
AddTl bar size:	3	3	
qty req`d	0	0	
or spacing of:	0	0	
As addTl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addTl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	49.80%	49.80%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12
DOOR 1	2.66 ft	0 ft	3.54 ft	2.73 ft	1213.04	0.14 klf	0.4 klf	0.42 kip-ft
DOOR 2	10.99 ft	0 ft	3.54 ft	2.73 ft	1213.04	0.14 klf	0.4 klf	0.42 kip-ft
DOOR 3	19.33 ft	0 ft	3.54 ft	2.73 ft	1213.04	0.14 klf	0.4 klf	0.42 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu
DOOR 1	0.9	0.003 in^2	No. 3	1	15.45 kip-ft	O.K.
DOOR 2	0.9	0.003 in^2	No. 3	1	15.45 kip-ft	O.K.
DOOR 3	0.9	0.003 in^2	No. 3	1	15.45 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
6	298	298	61.420	193.51	193.51	184.78	184.78

Total Tension	Base Anchors					
21.502	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	6 in	***3.47***	***6.29***	298 in	0.035 kip*ft	86.147 kip*ft
Base Anchor 2	78 in	3.64	12.21	226 in	6.195 kip*ft	52.004 kip*ft
Base Anchor 3	120 in	3.64	12.21	184 in	14.662 kip*ft	34.471 kip*ft
Base Anchor 4	184 in	3.64	12.21	120 in	34.471 kip*ft	14.662 kip*ft
Base Anchor 5	226 in	3.64	12.21	78 in	52.004 kip*ft	6.195 kip*ft
Base Anchor 6	298 in	***3.47***	***6.29***	6 in	86.147 kip*ft	0.035 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Low Right
Wall Connection 1	2	***1.531***	7.367	50.00%	W17	0	304.000	3.062	0.000	77.571
Wall Connection 2	2	***2.703***	4.232	34.60%	W19	126	178.000	4.232	44.437	62.775
Wall Connection 3	2	***2.703***	4.232	34.60%	W18	178	126.000	4.232	62.775	44.437
Wall Connection 4	2	***1.531***	7.367	50.00%	W16	304	0.000	3.062	77.571	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
17086	61420	44334	557	12721	OK	2848	(44334)	OK

RIGIDITY

CALCULATED VALUES	62%	Final	10.50759884

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
	Entire Wall	304	115	Y	Y	16.821	0.059
DOOR 1	A'	304	82.24	Y	Y	24.056	0.042
	A	31.92	82.24	Y	Y	0.805	1.242
	B	229.6	82.24	Y	Y	17.849	0.056
DOOR 2	B'	304	82.24	Y	Y	24.056	0.042
	C	131.88	82.24	Y	Y	9.464	0.106
	D	129.64	82.24	Y	Y	9.266	0.108
DOOR 3	C'	304	82.24	Y	Y	24.056	0.042
	E	231.96	82.24	Y	Y	18.047	0.055
	F	29.56	82.24	Y	Y	0.669	1.494

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
DOOR 1	Entire Wall	A'	A'a	-	Deflection	0.018
	A	B	AB	+	Stiffness	18.654
	A'a	AB	A'b	+	Deflection	0.071
DOOR 2	A'b	B'	B'a	-	Deflection	0.030
	C	D	CD	+	Stiffness	18.730
	B'a	CD	B'b	+	Deflection	0.083
DOOR 3	B'b	C'	C'a	-	Deflection	0.042
	E	F	EF	+	Stiffness	18.717
	C'a	EF	Final	+	Deflection	0.095

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W16

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.46 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.1 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	0.09 kip	
ϕVc/2	1.44 kip	
Check Shear	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
Icr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
τ_t (maximum tensile reinforcement)	0.0166	
τ_{temp} (min. temperature reinforcement)	0.0018	
τ_{min} (minimum tensile reinforcement)	0.0027	
τ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Geometric Properties

X Corridinate	18
Y Corridinate	328
Direction of Wall	X
Center of gravity X	78.398
Center of gravity Y	328.000
Wall Weight	3810.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	95.5 in
Lh (length of wall)	10.000 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.03 klf
Hw = W*(H^4 / H^4 + L^4)	0.07 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

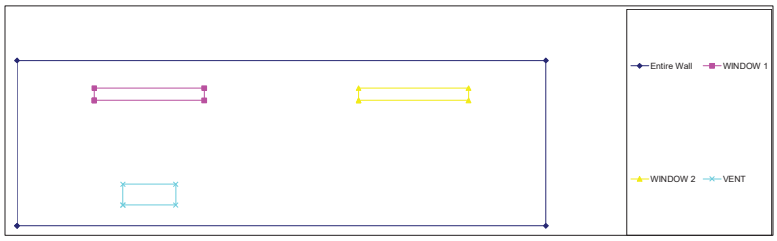
Lw = W*(L^4 / L^4 + H^4)	0.02 klf
Hw = W*(H^4 / H^4 + L^4)	0.04 klf

Deflection

Service Loads		
Axial	1.10 kip	
Lateral	0.02 klf	
Allowed service deflection	0.27 in	
Msa	2.450 kip-in	
M	2.459 kip-in	ACI 14-9
Δs	0.009 in	ACI 14-8
Check deflection	O.K.	

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.611 kip-ft		
Mu	0.610 kip-ft	0.610 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	27.61%	27.61%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12
WINDOW 1	1.46 ft	6.04 ft	2.08 ft	1.33 ft	61.19	0.07 klf	0.33 klf	0.12 kip-ft
WINDOW 2	6.46 ft	6.04 ft	2.08 ft	1.33 ft	61.19	0.07 klf	0.33 klf	0.12 kip-ft
VENT	2 ft	1 ft	1 ft	5.96 ft	49.92	0.3 klf	0.56 klf	0.05 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu
WINDOW 1	0.9	0.002 in^2	No. 3	1	7.1 kip-ft	O.K.
WINDOW 2	0.9	0.002 in^2	No. 3	1	7.1 kip-ft	O.K.
VENT	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
3	100	99.5	36.627	42.54	42.39	54.06	54.06

Total Tension	Base Anchors					
10.923	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	20.5 in	3.64	12.21	99.5 in	1.275 kip*ft	30.190 kip*ft
Base Anchor 2	60 in	3.64	12.21	60 in	10.923 kip*ft	10.978 kip*ft
Base Anchor 3	100 in	3.64	12.21	20 in	30.342 kip*ft	1.220 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Low Right
Wall Connection 1	2	***2.703***	6.219	20.72%	W15	2	118.000	5.406	0.901	53.159
Wall Connection 2	2	***2.703***	6.076	20.72%	W14	118	2.000	5.406	53.159	0.901

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
11735	36627	24892	1040	19441	OK	3912	(24892)	OK

RIGIDITY

CALCULATED VALUES	95%	Final	6.602860282

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
	Entire Wall	120	95.5	Y	Y	6.917	0.145
WINDOW 1	A'	120	7.06	Y	Y	113.184	0.009
	A	17.52	7.06	Y	Y	15.694	0.064
	B	77.52	7.06	Y	Y	72.999	0.014
WINDOW 2	B'	120	7.06	Y	Y	113.184	0.009
	C	77.52	7.06	Y	Y	72.999	0.014
	D	17.52	7.06	Y	Y	15.694	0.064
VENT	C'	120	11.98	Y	Y	66.557	0.015
	E	24	11.98	Y	Y	12.331	0.081
	F	84	11.98	Y	Y	46.430	0.022

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
WINDOW 1	Entire Wall	A'	A'a	-	Deflection	0.136
	A	B	AB	+	Stiffness	88.694
	A'a	AB	A'b	+	Deflection	0.147
WINDOW 2	A'b	B'	B'a	-	Deflection	0.138
	C	D	CD	+	Stiffness	88.694
	B'a	CD	B'b	+	Deflection	0.149
VENT	B'b	C'	C'a	-	Deflection	0.134
	E	F	EF	+	Stiffness	58.761
	C'a	EF	Final	+	Deflection	0.151

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W17

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.77 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.32 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	0.09 kip	
ϕVc/2	1.44 kip	
Check Shear	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
I.cr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.19 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Geometric Properties

X Corridinate	18
Y Corridinate	20
Direction of Wall	X
Center of gravity X	78.398
Center of gravity Y	20.000
Wall Weight	3810.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	95.5 in
Lh (length of wall)	10.000 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.03 klf
Hw = W*(H^4 / H^4 + L^4)	0.07 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.02 klf
Hw = W*(H^4 / H^4 + L^4)	0.04 klf

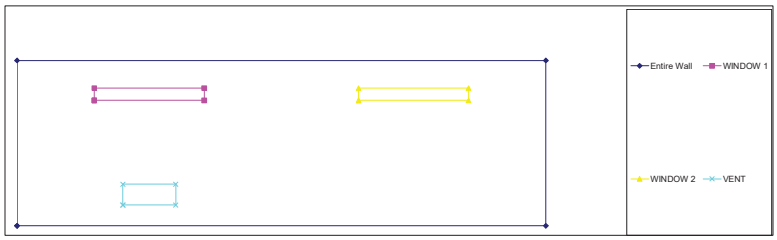
Deflection

Service Loads	
Axial l	1.32 kip
Lateral	0.02 klf
Allowed service deflection	0.27 in
Msa	2.560 kip-in
M	2.572 kip-in
Δs	0.009 in
Check deflection	O.K.

ACI 14-9
ACI 14-8

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.624 kip-ft		
Mu	0.620 kip-ft	0.620 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As AddTl req'd	0.00 in^2	0.00 in^2	
AddTl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addTl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addTl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	28.07%	28.07%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	Mu (wu*L^2)/12
WINDOW 1	1.46 ft	6.04 ft	2.08 ft	1.33 ft	61.19	0.07 klf	0.33 klf	0.12 kip-ft
WINDOW 2	6.46 ft	6.04 ft	2.08 ft	1.33 ft	61.19	0.07 klf	0.33 klf	0.12 kip-ft
VENT	2 ft	1 ft	1 ft	5.96 ft	49.92	0.3 klf	0.56 klf	0.05 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	ϕMn = ϕAsFy(db - a/2)	Check ϕMn > Mu
WINDOW 1	0.9	0.002 in^2	No. 3	1	7.1 kip-ft	O.K.
WINDOW 2	0.9	0.002 in^2	No. 3	1	7.1 kip-ft	O.K.
VENT	0.9	0 in^2	No. 3	0	0 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
3	100	99.5	36.627	42.54	42.39	54.06	54.06

Total Tension	Base Anchors					
10.923	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	20.5 in	3.64	12.21	99.5 in	1.275 kip*ft	30.190 kip*ft
Base Anchor 2	60 in	3.64	12.21	60 in	10.923 kip*ft	10.978 kip*ft
Base Anchor 3	100 in	3.64	12.21	20 in	30.342 kip*ft	1.220 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Low Right
Wall Connection 1	2	***2.703***	6.219	20.72%	W15	2	118.000	5.406	0.901	53.159
Wall Connection 2	2	***2.703***	6.076	20.72%	W14	118	2.000	5.406	53.159	0.901

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
11735	36627	24892	1040	19441	OK	3912	(24892)	OK

RIGIDITY

CALCULATED VALUES	95%	Final	6.602860282

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
	Entire Wall	120	95.5	Y	Y	6.917	0.145
WINDOW 1	A'	120	7.06	Y	Y	113.184	0.009
	A	17.52	7.06	Y	Y	15.694	0.064
	B	77.52	7.06	Y	Y	72.999	0.014
WINDOW 2	B'	120	7.06	Y	Y	113.184	0.009
	C	77.52	7.06	Y	Y	72.999	0.014
	D	17.52	7.06	Y	Y	15.694	0.064
VENT	C'	120	11.98	Y	Y	66.557	0.015
	E	24	11.98	Y	Y	12.331	0.081
	F	84	11.98	Y	Y	46.430	0.022

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
WINDOW 1	Entire Wall	A'	A'a	-	Deflection	0.136
	A	AB	A'b	+	Stiffness	88.694
	A'a	AB	A'b	+	Deflection	0.147
WINDOW 2	A'b	B'	B'a	-	Deflection	0.138
	C	D	CD	+	Stiffness	88.694
	B'a	CD	B'b	+	Deflection	0.149
VENT	B'b	C'	C'a	-	Deflection	0.134
	E	F	EF	+	Stiffness	58.761
	C'a	EF	Final	+	Deflection	0.151

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W18

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	3.394 kip	*ACI 22.5.5.1*
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	12 in	*ACI 11.7.2.2*
Max Horizontal spacing	12 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	1.56 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	1.2 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	0.16 kip	
ϕVc/2	1.44 kip	
Check Shear	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
Icr	3.52 in^4	
a = As * fy / (0.85 * f'c *b)	0.33483 psi	
c	0.419 in	
Ase	0.22 in^2	
Icrdeflection	4.20 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
τ_t (maximum tensile reinforcement)	0.0166	
τ_{temp} (min. temperature reinforcement)	0.0018	
τ_{min} (minimum tensile reinforcement)	0.0027	
τ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Geometric Properties

X Corridinate	22
Y Corridinate	200
Direction of Wall	X
Center of gravity X	78.000
Center of gravity Y	200.000
Wall Weight	4950.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	127.5 in
Lh (length of wall)	9.333 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.06 klf
Hw = W*(H^4 / H^4 + L^4)	0.04 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.04 klf
Hw = W*(H^4 / H^4 + L^4)	0.02 klf

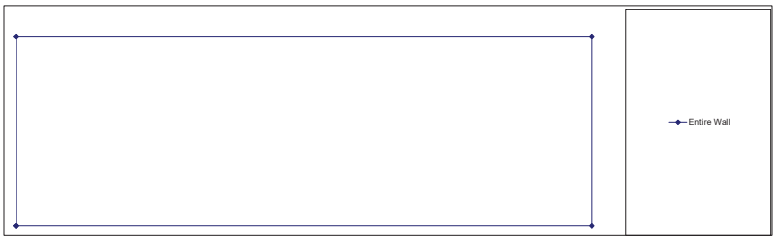
Deflection

Service Loads	
Axial l	1.20 kip
Lateral	0.04 klf
Allowed service deflection	0.35 in
Msa	7.373 kip-in
M	7.428 kip-in
Δs	0.046 in
Check deflection	O.K.

ACI 14-9
ACI 14-8

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.012	0.012	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.625 kip-ft		
Mu	0.630 kip-ft	0.630 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req`d	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	28.52%	28.52%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
2	86	86	24.418	28.48	28.48	30.94	29.63

Total Tension	Base Anchors					
7.282	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	26 in	3.64	12.21	86 in	2.385 kip*ft	26.094 kip*ft
Base Anchor 2	86 in	3.64	12.21	26 in	26.094 kip*ft	2.385 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	8.785	29.28%	W15	0	112.000	3.062	0.000	28.579
Wall Connection 2	2	***2.703***	0.365	100.00%	P4	77.5	34.500	0.365	2.357	1.049
Wall Connection 3	2	***1.531***	8.583	29.28%	W14	112	0.000	3.062	28.579	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
8176	24418	16242	690	20365	OK	4088	(16242)	OK

RIGIDITY

CALCULATED VALUES	100%	Final	4.089590268

Pier	Length	Height	Fixed Top?	Useable?	Stiffness (k)	Deflection
Label	(inches)	(inches)	(Y/N)	(Y/N)	(1000 kip / IN)	(in / 1000 kip)
Entire Wall	112	127.5	Y	Y	4.090	0.245

Combine Logic					
First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
Entire Wall	0	Final			4.090

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED W19

Notes

ACI's Alternate Design of Slender Walls	ACI 11.8.1 & 11.8.2
Assumptions from this methodology:	
Cross section is constant over the height of the wall	ACI 11.8.1.1 (a)
Wall is tension-controlled for out-of-plane moment effect	ACI 11.8.1.1 (b)
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3	ACI 11.8.1.1 (c)
Pu at mid-height shall not exceed 0.06*f'c* Ag	ACI 11.8.1.1 (d)
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and	ACI 11.8.2.1
Concentrated gravity loads are distributed over the wall length	ACI 11.8.2.2

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psi	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	ACI 19.2.4.1(a)
E (Steel)	29000000 psi	ACI 20.2.2.2
E (Concrete)	4286826 psi	ACI 19.2.2.1(a)
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	ACI Table ACI 21.2.1
Vc	3.394 kip	ACI 22.5.5.1
ϕVc	2.885 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	ACI Table 11.6.1
ρmin.hor	0.0025	ACI Table 11.6.1
Max Vertical spacing	12 in	ACI 11.7.2.2
Max Horizontal spacing	12 in	ACI 11.7.2.2

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	110.94 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	9.78 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	0 kip

Assumption check

0.06*f'c*Ag	14.4 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	0 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0.16 kip
ϕVc/2	1.44 kip
Check Shear	O.K.

Geometric Properties

X Corridinate	22
Y Corridinate	149
Direction of Wall	X
Center of gravity X	78.000
Center of gravity Y	149.000
Wall Weight	4950.000 lbs.
Central wall?	Yes
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	127.5 in
Lh (length of wall)	9.333 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	4 in
ct (cover top)	1.708 in
cb (cover bottom)	1.708 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	2 in
db (effective depth bottom)	2 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	ACI 5.3.1d & 5.3.3
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.06 klf
Hw = W*(H^4 / H^4 + L^4)	0.04 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.04 klf
Hw = W*(H^4 / H^4 + L^4)	0.02 klf

Deflection

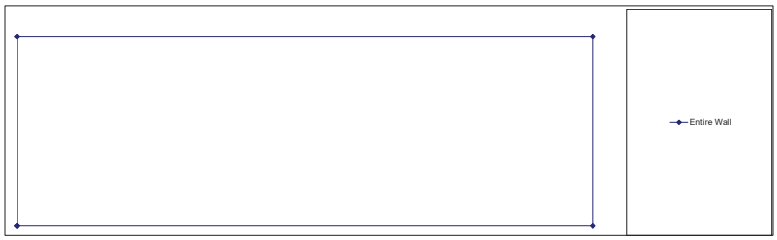
Service Loads	
Axial	0.00 kip
Lateral	0.04 klf
Allowed service deflection	0.35 in
Msa	6.773 kip-in
M	6.773 kip-in ACI 14-9
Δs	0.042 in ACI 14-8
Check deflection	O.K.

Allowable Capacity

Ig = (b*h^3)/12	64 in^4	
Ag = (b*h)	48 in^2	
Yt = h/2	2	
fr (rupture modulus)	530.330 psi	
Mcr	16.971 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.079 in^2	
B	8.829624606	
kd	0.569 in	
I.cr	3.52 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.2 in^2	
Icrdeflection	3.86 in^4	
Ie	64.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0080	
a	0.32 in	

Flexure

Assumption check		
Span	Hw	Lw
εt	0.012	0.012
εty	0.003	0.003 ACI 21.2.2.1
Check	Tension	Tension ACI 11.8.1.1(b)
ϕb	0.9	0.9 ACI Table 21.2.2
Mua	0.560 kip-ft	
Mu	0.560 kip-ft	0.560 kip-ft ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	2.210 kip-ft	2.210 kip-ft
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft
As Addl req'd	0.00 in^2	0.00 in^2
Addl bar size:	3	3
qty req'd	0	0
or spacing of:	0	0
As addl =	0.000 kip-ft	0.000 kip-ft
Ast = As + As addl	0.20 in^2	0.20 in^2
ϕMn = ϕAsFy(db - a/2)	2.209 kip-ft	2.209 kip-ft
Check ϕMn > Mu	O.K.	O.K.
% allowed	25.35%	25.35%



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.05 ksf

Material Properties	
db (effective depth bottom)	2 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu

CONNECTIONS

			Full Resistance Value				
				Overturning			
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
2	86	86	24.418	28.48	28.48	57.18	41.31

Total Tension	Base Anchors					
7.282	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	26 in	3.64	12.21	86 in	2.385 kip*ft	26.094 kip*ft
Base Anchor 2	86 in	3.64	12.21	26 in	26.094 kip*ft	2.385 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	8.785	29.28%	W15	0	112.000	3.062	0.000	28.579
Wall Connection 2	2	***2.703***	4.429	100.00%	P3	77.5	34.500	4.429	28.604	12.733
Wall Connection 3	2	***1.531***	8.583	29.28%	W14	112	0.000	3.062	28.579	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
5116	24418	19302	362	20365	OK	2558	(19302)	OK

RIGIDITY

CALCULATED VALUES	100%	Final	2.146768976

Pier	Length	Height	Fixed Top?	Useable?	Stiffness (k)	Deflection
Label	(inches)	(inches)	(Y/N)	(Y/N)	(1000 kip / IN)	(in / 1000 kip)
Entire Wall	112	127.5		Y	2.147	0.466

Combine Logic					
First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
Entire Wall	0	Final			2.147

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED P1-1

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	2.546 kip	*ACI 22.5.5.1*
ϕVc	2.164 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	9 in	*ACI 11.7.2.2*
Max Horizontal spacing	9 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	98.44 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	7.34 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	0.15 kip

Assumption check

0.06*f'c*Ag	10.8 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	0.15 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	-0.05 kip	
ϕVc/2	1.08 kip	
Check Shear	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	27 in^4	
Ag = (b*h)	36 in^2	
Yt = h/2	1.5	
fr (rupture modulus)	530.330 psi	
Mcr	9.546 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.059 in^2	
B	8.829624606	
kd	0.481 in	
I.cr	1.86 in^4	
a = As * fy / (0.85 * f'c *b)	0.33483 psi	
c	0.419 in	
Ase	0.2 in^2	
Icrdeflection	2.04 in^4	
Ie	27.00 in^4	
delta	360	ACI Table 24.2.2
τ_t (maximum tensile reinforcement)	0.0166	
τ_{temp} (min. temperature reinforcement)	0.0018	
τ_{min} (minimum tensile reinforcement)	0.0027	
τ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0110	
a	0.32 in	

Geometric Properties

X Corridinate	339.5
Y Corridinate	70
Direction of Wall	Y
Center of gravity X	339.500
Center of gravity Y	82.000
Wall Weight	435.000 lbs.
Central wall?	No
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	70 in
Lh (length of wall)	2.000 ft
Analyisis will be performed as :	One-way slab
b (section width)	12 in
h (section thickness)	3 in
ct (cover top)	1.208 in
cb (cover bottom)	1.208 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	1.5 in
db (effective depth bottom)	1.5 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.09 klf
Hw = W*(H^4 / H^4 + L^4)	0 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

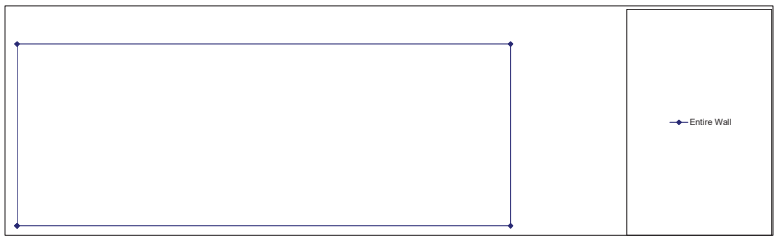
Lw = W*(L^4 / L^4 + H^4)	0.06 klf
Hw = W*(H^4 / H^4 + L^4)	0 klf

Deflection

Service Loads	
Axial l	0.15 kip
Lateral	0.06 klf
Allowed service deflection	0.19 in
Msa	3.138 kip-in
M	3.140 kip-in (ACI 14-9)
Δs	0.014 in (ACI 14-8)
Check deflection	O.K.

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.008	0.008	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.006 kip-ft		
Mu	0.010 kip-ft	0.010 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	1.610 kip-ft	1.610 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	1.606 kip-ft	1.606 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	0.62%	0.62%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.04 ksf

Material Properties	
db (effective depth bottom)	1.5 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu

CONNECTIONS

			Full Resistance Value				
			Overturning				
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
0	0	0	0.000	0.00	0.00	0.00	0.00

Total Tension	Base Anchors					
0.000	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Low Right
Wall Connection 1	2	*1.531*	5.009	50.00%	W5	0	24.000	3.062	0.000	6.124

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
0	0	0	0	15274	OK	0	0	OK

RIGIDITY

CALCULATED VALUES	100%	Final	0

Pier	Length	Height	Fixed Top?	Useable?	Stiffness (k)	Deflection
Label	(inches)	(inches)	(Y/N)	(Y/N)	(1000 kip / IN)	(in / 1000 kip)
Entire Wall	24	70	N	Y	0.139	7.200

Combine Logic					
First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
Entire Wall	0	Final			0.139

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED P1-2

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	2.546 kip	*ACI 22.5.5.1*
ϕVc	2.164 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	9 in	*ACI 11.7.2.2*
Max Horizontal spacing	9 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	98.44 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	7.34 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	0.15 kip

Assumption check

0.06*f'c*Ag	10.8 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	0.15 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	-0.05 kip
ϕVc/2	1.08 kip
Check Shear	O.K.

Allowable Capacity

Ig = (b*h^3)/12	27 in^4	
Ag = (b*h)	36 in^2	
Yt = h/2	1.5	
fr (rupture modulus)	530.330 psi	
Mcr	9.546 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.059 in^2	
B	8.829624606	
kd	0.481 in	
I.cr	1.86 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.2 in^2	
Icrdeflection	2.04 in^4	
Ie	27.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0110	
a	0.32 in	

Geometric Properties

X Corridinate	339.5
Y Corridinate	146
Direction of Wall	Y
Center of gravity X	339.500
Center of gravity Y	158.000
Wall Weight	435.000 lbs.
Central wall?	No
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	70 in
Lh (length of wall)	2.000 ft
Analyisis will be performed as :	One-way slab
b (section width)	12 in
h (section thickness)	3 in
ct (cover top)	1.208 in
cb (cover bottom)	1.208 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	1.5 in
db (effective depth bottom)	1.5 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.09 klf
Hw = W*(H^4 / H^4 + L^4)	0 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

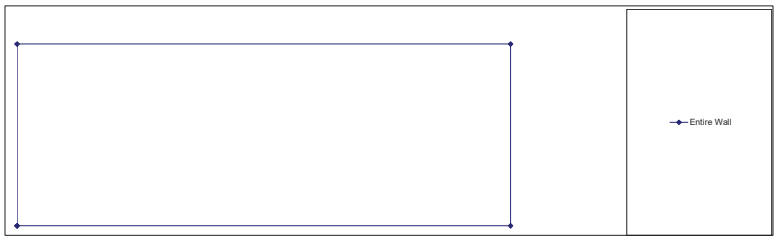
Lw = W*(L^4 / L^4 + H^4)	0.06 klf
Hw = W*(H^4 / H^4 + L^4)	0 klf

Deflection

Service Loads	
Axial l	0.15 kip
Lateral	0.06 klf
Allowed service deflection	0.19 in
Msa	3.138 kip-in
M	3.140 kip-in (ACI 14-9)
Δs	0.014 in (ACI 14-8)
Check deflection	O.K.

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.008	0.008	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.006 kip-ft		
Mu	0.010 kip-ft	0.010 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	1.610 kip-ft	1.610 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	1.606 kip-ft	1.606 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	0.62%	0.62%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.04 ksf

Material Properties	
db (effective depth bottom)	1.5 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu

CONNECTIONS

			Full Resistance Value				
			Overturning				
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
0	0	0	0.000	0.00	0.00	0.00	0.00

Total Tension	Base Anchors					
0.000	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	5.236	50.00%	W6	24	0.000	3.062	6.124	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
0	0	0	0	15274	OK	0	0	OK

RIGIDITY

CALCULATED VALUES	100%	Final	0

Pier	Length	Height	Fixed Top?	Useable?	Stiffness (k)	Deflection
Label	(inches)	(inches)	(Y/N)	(Y/N)	(1000 kip / IN)	(in / 1000 kip)
Entire Wall	24	70	N	Y	0.139	7.200

Combine Logic					
First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
Entire Wall	0	Final			0.139

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED P1-3

Notes

ACI's Alternate Design of Slender Walls	
Assumptions from this methodology:	
Cross section is constant over the height of the wall	ACI 11.8.1.1 (a)
Wall is tension-controlled for out-of-plane moment effect	ACI 11.8.1.1 (b)
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3	ACI 11.8.1.1 (c)
Pu at mid-height shall not exceed 0.06*f'c* Ag	ACI 11.8.1.1 (d)
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and	ACI 11.8.2.1
Concentrated gravity loads are distributed over the wall length	ACI 11.8.2.2

ACI 11.8.1 & 11.8.2

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	ACI 19.2.4.1(a)
E (Steel)	29000000 psi	ACI 20.2.2.2
E (Concrete)	4286826 psi	ACI 19.2.2.1(a)
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	ACI Table ACI 21.2.1
Vc	2.546 kip	ACI 22.5.5.1
ϕVc	2.164 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	ACI Table 11.6.1
ρmin.hor	0.0025	ACI Table 11.6.1
Max Vertical spacing	9 in	ACI 11.7.2.2
Max Horizontal spacing	9 in	ACI 11.7.2.2

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	98.44 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	7.34 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	0.15 kip

Assumption check

0.06*f'c*Ag	10.8 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	0.15 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	-0.05 kip	
ϕVc/2	1.08 kip	
Check Shear	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	27 in^4	
Ag = (b*h)	36 in^2	
Yt = h/2	1.5	
fr (rupture modulus)	530.330 psi	
Mcr	9.546 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.059 in^2	
B	8.829624606	
kd	0.481 in	
I.cr	1.86 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.2 in^2	
Icrdeflection	2.04 in^4	
Ie	27.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0110	
a	0.32 in	

Geometric Properties

X Corridinate	339.5
Y Corridinate	254
Direction of Wall	Y
Center of gravity X	339.500
Center of gravity Y	266.000
Wall Weight	435.000 lbs.
Central wall?	No
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	70 in
Lh (length of wall)	2.000 ft
Analyisis will be performed as :	One-way slab
b (section width)	12 in
h (section thickness)	3 in
ct (cover top)	1.208 in
cb (cover bottom)	1.208 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	1.5 in
db (effective depth bottom)	1.5 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh	
Wire Size	W6.7
spacing	4 in
Mesh Area	0.20 in^2

= As

Factored Laterally Applied Loads

Factored Loading per ACI	ACI 5.3.1d & 5.3.3
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.09 klf
Hw = W*(H^4 / H^4 + L^4)	0 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

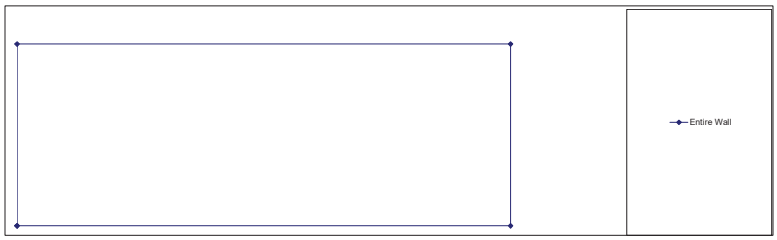
Lw = W*(L^4 / L^4 + H^4)	0.06 klf
Hw = W*(H^4 / H^4 + L^4)	0 klf

Deflection

Service Loads	
Axial l	0.15 kip
Lateral	0.06 klf
Allowed service deflection	0.19 in
Msa	3.138 kip-in
M	3.140 kip-in (ACI 14-9)
Δs	0.014 in (ACI 14-8)
Check deflection	O.K.

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.008	0.008	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.006 kip-ft		
Mu	0.010 kip-ft	0.010 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	1.610 kip-ft	1.610 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	1.606 kip-ft	1.606 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	0.62%	0.62%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.04 ksf

Material Properties	
db (effective depth bottom)	1.5 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu

CONNECTIONS

			Full Resistance Value				
			Overturning				
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
0	0	0	0.000	0.00	0.00	0.00	0.00

Total Tension	Base Anchors					
0.000	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	5.009	50.00%	W7	24	0.000	3.062	6.124	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
0	0	0	0	15274	OK	0	0	OK

RIGIDITY

CALCULATED VALUES	100%	Final	0

Pier	Length	Height	Fixed Top?	Useable?	Stiffness (k)	Deflection
Label	(inches)	(inches)	(Y/N)	(Y/N)	(1000 kip / IN)	(in / 1000 kip)
Entire Wall	24	70	N	Y	0.139	7.200

Combine Logic					
First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
Entire Wall	0	Final			0.139

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED P2-1

Notes

ACI's Alternate Design of Slender Walls	*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:	
Cross section is constant over the height of the wall	*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect	*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3	*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag	*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and	*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length	*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	2.546 kip	*ACI 22.5.5.1*
ϕVc	2.164 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	9 in	*ACI 11.7.2.2*
Max Horizontal spacing	9 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	98.44 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	7.34 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	0.14 kip

Assumption check

0.06*f'c*Ag	10.8 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	0.14 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0.07 kip
ϕVc/2	1.08 kip
Check Shear	O.K.

Allowable Capacity

Ig = (b*h^3)/12	27 in^4	
Ag = (b*h)	36 in^2	
Yt = h/2	1.5	
fr (rupture modulus)	530.330 psi	
Mcr	9.546 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.059 in^2	
B	8.829624606	
kd	0.481 in	
I.cr	1.86 in^4	
a = As * fy / (0.85 * f'c *b)	0.33483 psi	
c	0.419 in	
Ase	0.2 in^2	
Icrdeflection	2.04 in^4	
Ie	27.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0110	
a	0.32 in	

Geometric Properties

X Corridinate	176
Y Corridinate	74.5
Direction of Wall	Y
Center of gravity X	176.000
Center of gravity Y	111.252
Wall Weight	1150.000 lbs.
Central wall?	No
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	70 in
Lh (length of wall)	5.958 ft
Analysis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	3 in
ct (cover top)	1.208 in
cb (cover bottom)	1.208 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	1.5 in
db (effective depth bottom)	1.5 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh	
Wire Size	W6.7
spacing	4 in
Mesh Area	0.20 in^2 = As

Factored Laterally Applied Loads

	ACI 5.3.1d & 5.3.3
Factored Loading per ACI	
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.05 klf
Hw = W*(H^4 / H^4 + L^4)	0.05 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.03 klf
Hw = W*(H^4 / H^4 + L^4)	0.03 klf

Deflection

Service Loads	
Axial l	0.14 kip
Lateral	0.03 klf
Allowed service deflection	0.19 in
Msa	1.601 kip-in
M	1.602 kip-in ACI 14-9
Δs	0.007 in ACI 14-8
Check deflection	O.K.

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.008	0.008	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.216 kip-ft		
Mu	0.220 kip-ft	0.220 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	1.610 kip-ft	1.610 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	1.606 kip-ft	1.606 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	13.70%	13.70%	

REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.04 ksf

Material Properties	
db (effective depth bottom)	1.5 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12
BLOCKOUT	0 ft	0 ft	5.13 ft	4.83 ft	193.02	0.19 klf	0.45 klf	0.99 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu
BLOCKOUT	0.9	0.004 in^2	No. 3	1	27.98 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
			Overturning				
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
1	5	66.5	5.306	1.43	19.06	0.00	18.24

Total Tension	Base Anchors					
3.440	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	5 in	3.44	5.31	66.5 in	1.433 kip*ft	19.063 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft)	
									Up Left	Low Right
Wall Connection 1	2	***1.531***	6.116	50.00%	W12	0	71.500	3.062	0.000	18.244

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
403	5306	4903	0	8816	OK	403	(4903)	OK

RIGIDITY

CALCULATED VALUES	58%	Final	0

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
BLOCKOUT	Entire Wall	71.5	70	N	Y	2.242	0.446
	A'	71.5	12.04	Y	Y	29.415	0.034
	A	0	12.04	Y	N	0.000	0.000
	B	9.94	12.04	Y	Y	2.772	0.361

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
BLOCKOUT	Entire Wall	A'	A'a	-	Deflection	0.412
	A	B	AB	+	Stiffness	2.772
	A'a	AB	Final	+	Deflection	0.773

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED P2-2

Notes

ACI's Alternate Design of Slender Walls	ACI 11.8.1 & 11.8.2
Assumptions from this methodology:	
Cross section is constant over the height of the wall	ACI 11.8.1.1 (a)
Wall is tension-controlled for out-of-plane moment effect	ACI 11.8.1.1 (b)
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3	ACI 11.8.1.1 (c)
Pu at mid-height shall not exceed 0.06*f'c* Ag	ACI 11.8.1.1 (d)
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and	ACI 11.8.2.1
Concentrated gravity loads are distributed over the wall length	ACI 11.8.2.2

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	ACI 19.2.4.1(a)
E (Steel)	29000000 psi	ACI 20.2.2.2
E (Concrete)	4286826 psi	ACI 19.2.2.1(a)
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	ACI Table ACI 21.2.1
Vc	2.546 kip	ACI 22.5.5.1
ϕVc	2.164 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	ACI Table 11.6.1
ρmin.hor	0.0025	ACI Table 11.6.1
Max Vertical spacing	9 in	ACI 11.7.2.2
Max Horizontal spacing	9 in	ACI 11.7.2.2

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	98.44 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	7.34 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	0.14 kip

Assumption check

0.06*f'c*Ag	10.8 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	0.14 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0.07 kip
ϕVc/2	1.08 kip
Check Shear	O.K.

Allowable Capacity

Ig = (b*h^3)/12	27 in^4	
Ag = (b*h)	36 in^2	
Yt = h/2	1.5	
fr (rupture modulus)	530.330 psi	
Mcr	9.546 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.059 in^2	
B	8.829624606	
kd	0.481 in	
I.cr	1.86 in^4	
a = As * fy / (0.85 * f'c *b)	0.33483 psi	
c	0.419 in	
Ase	0.2 in^2	
Icrdeflection	2.04 in^4	
Ie	27.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0110	
a	0.32 in	

Geometric Properties

X Corridinate	176
Y Corridinate	202
Direction of Wall	Y
Center of gravity X	176.000
Center of gravity Y	236.744
Wall Weight	1150.000 lbs.
Central wall?	No
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	70 in
Lh (length of wall)	5.958 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	3 in
ct (cover top)	1.208 in
cb (cover bottom)	1.208 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	1.5 in
db (effective depth bottom)	1.5 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	ACI 5.3.1d & 5.3.3
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.05 klf
Hw = W*(H^4 / H^4 + L^4)	0.05 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

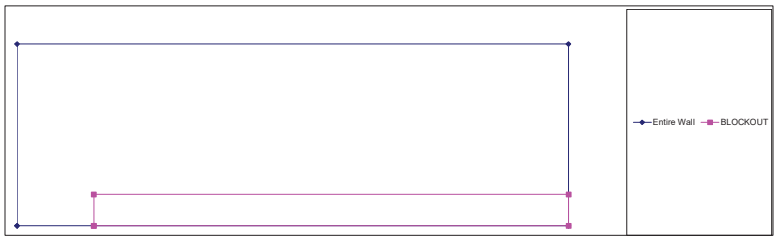
Lw = W*(L^4 / L^4 + H^4)	0.03 klf
Hw = W*(H^4 / H^4 + L^4)	0.03 klf

Deflection

Service Loads	
Axial l	0.14 kip
Lateral	0.03 klf
Allowed service deflection	0.19 in
Msa	1.601 kip-in
M	1.602 kip-in ACI 14-9
Δs	0.007 in ACI 14-8
Check deflection	O.K.

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.008	0.008	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.216 kip-ft		
Mu	0.220 kip-ft	0.220 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	1.610 kip-ft	1.610 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As Addl req'd	0.00 in^2	0.00 in^2	
Addl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	1.606 kip-ft	1.606 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	13.70%	13.70%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.04 ksf

Material Properties	
db (effective depth bottom)	1.5 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12
BLOCKOUT	0.83 ft	0 ft	5.13 ft	4.83 ft	193.02	0.19 klf	0.45 klf	0.99 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu
BLOCKOUT	0.9	0.004 in^2	No. 3	1	27.98 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
			Overturning				
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
1	5	66.5	5.306	1.43	19.06	18.24	0.00

Total Tension	Base Anchors					
3.440	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	5 in	3.44	5.31	66.5 in	1.433 kip*ft	19.063 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Low Right
Wall Connection 1	2	***1.531***	6.116	50.00%	W13	71.5	0.000	3.062	18.244	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
403	5306	4903	0	8829	OK	403	(4903)	OK

RIGIDITY

CALCULATED VALUES	58%	Final	0

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
BLOCKOUT	Entire Wall	71.5	70	N	Y	2.242	0.446
	A'	71.5	12.04	Y	Y	29.415	0.034
	A	9.96	12.04	Y	Y	2.781	0.360
	B	-0.02	12.04	Y	N	0.000	0.000

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
BLOCKOUT	Entire Wall	A'	A'a	-	Deflection	0.412
	A	B	AB	+	Stiffness	2.781
	A'a	AB	Final	+	Deflection	0.772

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED P3

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	2.546 kip	*ACI 22.5.5.1*
ϕVc	2.164 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	9 in	*ACI 11.7.2.2*
Max Horizontal spacing	9 in	*ACI 11.7.2.2*

Geometric Properties

X Corridinate	99.5
Y Corridinate	85
Direction of Wall	Y
Center of gravity X	99.500
Center of gravity Y	114.362
Wall Weight	960.000 lbs.
Central wall?	No
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	70 in
Lh (length of wall)	5.083 ft
Analyisis will be performed as :	Two-way slab
b (section width)	12 in
h (section thickness)	3 in
ct (cover top)	1.208 in
cb (cover bottom)	1.208 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	1.5 in
db (effective depth bottom)	1.5 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	98.44 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	7.34 psf

Wire Mesh	
Wire Size	W6.7
spacing	4 in
Mesh Area	0.20 in^2 = As

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	0.13 kip

Assumption check

0.06*f'c*Ag	10.8 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	0.13 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c
Vu = wuB*(Bw-2db) / 2	0.06 kip
ϕVc/2	1.08 kip
Check Shear	O.K.

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.06 klf
Hw = W*(H^4 / H^4 + L^4)	0.03 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.04 klf
Hw = W*(H^4 / H^4 + L^4)	0.02 klf

Deflection

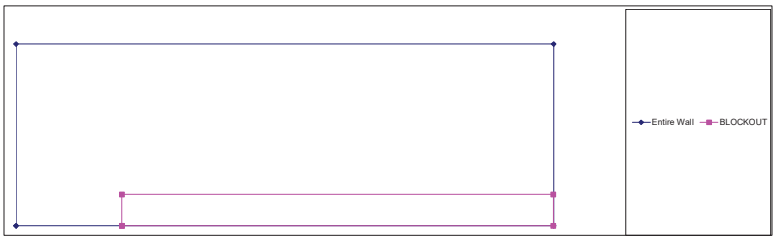
Service Loads	
Axial l	0.13 kip
Lateral	0.04 klf
Allowed service deflection	0.19 in
Msa	2.107 kip-in
M	2.108 kip-in *ACI 14-9*
Δs	0.009 in *ACI 14-8*
Check deflection	O.K.

Allowable Capacity

Ig = (b*h^3)/12	27 in^4	
Ag = (b*h)	36 in^2	
Yt = h/2	1.5	
fr (rupture modulus)	530.330 psi	
Mcr	9.546 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.059 in^2	
B	8.829624606	
kd	0.481 in	
I.cr	1.86 in^4	
a = As * fy / (0.85 * f'c *b)	0.33483 psi	
c	0.419 in	
Ase	0.2 in^2	
Icrdeflection	2.04 in^4	
Ie	27.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0110	
a	0.32 in	

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.008	0.008	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.135 kip-ft		
Mu	0.140 kip-ft	0.140 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	1.610 kip-ft	1.610 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As AddTl req'd	0.00 in^2	0.00 in^2	
AddTl bar size:	3	3	
qty req`d	0	0	
or spacing of:	0	0	
As addTl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addTl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	1.606 kip-ft	1.606 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	8.72%	8.72%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.04 ksf

Material Properties	
db (effective depth bottom)	1.5 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12
BLOCKOUT	1 ft	0 ft	4.08 ft	4.83 ft	153.51	0.19 klf	0.45 klf	0.62 kip-ft

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu
BLOCKOUT	0.9	0.002 in^2	No. 3	1	27.98 kip-ft	O.K.

CONNECTIONS

			Full Resistance Value				
			Overturning				
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
1	6	55	6.292	1.73	15.90	15.57	0.00

Total Tension	Base Anchors					
3.469	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -
Base Anchor 1	6 in	***3.47***	***6.29***	55 in	1.735 kip*ft	15.900 kip*ft

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Low Right
Wall Connection 1	2	***1.531***	6.116	50.00%	W19	61	0.000	3.062	15.565	0.000

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
336	6292	5956	0	11226	OK	336	(5956)	OK

RIGIDITY

CALCULATED VALUES	74%	Final	0

	Pier Label	Length (inches)	Height (inches)	Fixed Top? (Y/N)	Useable? (Y/N)	Stiffness (k) (1000 kip / IN)	Deflection (in / 1000 kip)
	Entire Wall	61	70	N	Y	1.581	0.632
BLOCKOUT	A'	61	12.04	Y	Y	25.007	0.040
	A	12	12.04	Y	Y	3.731	0.268
	B	0.04	12.04	Y	N	0.000	0.000

	Combine Logic					
	First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
	Entire Wall	A'	A'a	-	Deflection	0.592
BLOCKOUT	A	B	AB	+	Stiffness	3.731
	A'a	AB	Final	+	Deflection	0.860

ID:	CHEYENNE CH-329
	DESIGN OF WALL MARKED P4

Notes

ACI's Alternate Design of Slender Walls		*ACI 11.8.1 & 11.8.2*
Assumptions from this methodology:		
Cross section is constant over the height of the wall		*ACI 11.8.1.1 (a)*
Wall is tension-controlled for out-of-plane moment effect		*ACI 11.8.1.1 (b)*
ϕMn is at least Mcr, where Mcr is calculated using fr as provided in 19.2.3		*ACI 11.8.1.1 (c)*
Pu at mid-height shall not exceed 0.06*f'c* Ag		*ACI 11.8.1.1 (d)*
Wall panel shall be simply supported, axially loaded, and subject to out-of-plane uniform lateral loading where maximum moments and		*ACI 11.8.2.1*
Concentrated gravity loads are distributed over the wall length		*ACI 11.8.2.2*

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy wire mesh	80000 psi	
Fy rebar	60000 psf	
Lightweight?	No	
Concrete density	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Shear Parameters

ϕv	0.85	*ACI Table ACI 21.2.1*
Vc	2.546 kip	*ACI 22.5.5.1*
ϕVc	2.164 kip	

Minimum Wall Reinforcement Requirements

ρmin.vert	0.0025	*ACI Table 11.6.1*
ρmin.hor	0.0025	*ACI Table 11.6.1*
Max Vertical spacing	9 in	*ACI 11.7.2.2*
Max Horizontal spacing	9 in	*ACI 11.7.2.2*

Loading

Axial Design Loads (pressure from roof)		Lateral Design Loads (pressure on wall)	
D (Dead load) + Ww (Wall weight)	98.44 psf	Dead Load (DL.lat)	0 psf
S (Snow Load)	120 psf	Snow Load (SL.lat)	0 psf
L (Live Load)	0 psf	Live Load (LL.lat)	0 psf
Lr (Live Roof Load)	30 psf	Live Roof Load (LLr.lat)	0 psf
W (Wind Load)	108.86 psf	Wind Load (WL.lat)	58.99 psf
E (Earthquake Load)	17.09 psf	Earthquake Load (EL.lat)	7.34 psf

Factored Axially Applied Loads

Factored Loading per ACI	ACI 318-19 5.3.1c
Factored Pressure on Roof Wr	319.555

Axial Pressure on Section

PuB	0.13 kip

Assumption check

0.06*f'c*Ag	10.8 kip	ACI 11.8.1.1(d)
Check	O.K.	

Unfactored Axially Applied Loads

Unfactored Pressure on Roof uWr	222.4245 psf

Axial Pressure on Section

PB	0.13 kip

Shear

Factored Loading per ACI	ACI 318-19 5.3.1c	
Vu = wuB*(Bw-2db) / 2	-0.05 kip	
ϕVc/2	1.08 kip	
Check Shear	O.K.	

Allowable Capacity

Ig = (b*h^3)/12	27 in^4	
Ag = (b*h)	36 in^2	
Yt = h/2	1.5	
fr (rupture modulus)	530.330 psi	
Mcr	9.546 kip-in	ACI 24.2.3.5
B1	0.8	ACI Table 22.2.2.4.3
Trial Ast req'd	0.059 in^2	
B	8.829624606	
kd	0.481 in	
I.cr	1.86 in^4	
a = As * fy / (0.85 * f'c * b)	0.33483 psi	
c	0.419 in	
Ase	0.2 in^2	
Icrdeflection	2.03 in^4	
Ie	27.00 in^4	
delta	360	ACI Table 24.2.2
ρ_t (maximum tensile reinforcement)	0.0166	
ρ_{temp} (min. temperature reinforcement)	0.0018	
ρ_{min} (minimum tensile reinforcement)	0.0027	
ρ_{trial} (trial reinforcement ratio bottom)	0.0033	
$\rho_{provided}$ (reinforcement ratio provided)	0.0110	
a	0.32 in	

Geometric Properties

X Corridinate	99.5
Y Corridinate	202
Direction of Wall	Y
Center of gravity X	99.500
Center of gravity Y	214.000
Wall Weight	365.000 lbs.
Central wall?	No
Wall that supports 2 roof panels?	No
lop (length of opening on wall)	0 ft
H (height of wall)	58 in
Lh (length of wall)	2.000 ft
Analyisis will be performed as :	One-way slab
b (section width)	12 in
h (section thickness)	3 in
ct (cover top)	1.208 in
cb (cover bottom)	1.208 in
rd (assumed reinf. diameter)	0.292 in
dt (effective depth top)	1.5 in
db (effective depth bottom)	1.5 in
Cs (% of DL used for Seismic)	0.196
Eccentricity - Axial Load	1 in
Is wall Split	No

Wire Mesh		
Wire Size	W6.7	
spacing	4 in	
Mesh Area	0.20 in^2	= As

Factored Laterally Applied Loads

Factored Loading per ACI	*ACI 5.3.1d & 5.3.3*
Factored Pressure on Wall Ww	94.38 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.09 klf
Hw = W*(H^4 / H^4 + L^4)	0 klf

Unfactored Laterally Applied Loads

Unfactored Pressure on Wall uWw	58.99 psf

Lateral Pressure on Section

Lw = W*(L^4 / L^4 + H^4)	0.06 klf
Hw = W*(H^4 / H^4 + L^4)	0 klf

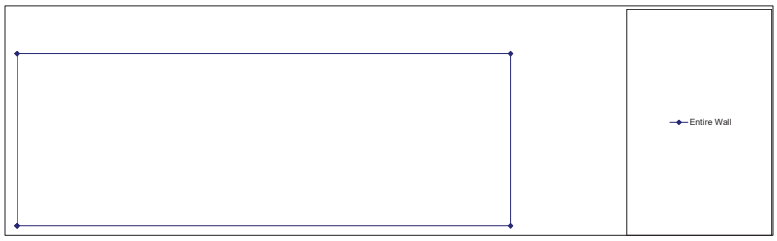
Deflection

Service Loads	
Axial l	0.13 kip
Lateral	0.06 klf
Allowed service deflection	0.16 in
Msa	2.168 kip-in
M	2.168 kip-in
Δs	0.007 in
Check deflection	O.K.

ACI 14-9
ACI 14-8

Flexure

Assumption check			
Span	Hw	Lw	
εt	0.008	0.008	
εty	0.003	0.003	ACI 21.2.2.1
Check	Tension	Tension	ACI 11.8.1.1(b)
ϕb	0.9	0.9	ACI Table 21.2.2
Mua	0.005 kip-ft		
Mu	0.010 kip-ft	0.010 kip-ft	ACI 11.8.3.1d
ϕMn trial = ϕAsFy(dt - a/2)	1.610 kip-ft	1.610 kip-ft	
ΔM =Mu - ϕM	0.000 kip-ft	0.000 kip-ft	
As AddTl req'd	0.00 in^2	0.00 in^2	
AddTl bar size:	3	3	
qty req'd	0	0	
or spacing of:	0	0	
As addTl =	0.000 kip-ft	0.000 kip-ft	
Ast = As + As addTl	0.20 in^2	0.20 in^2	
ϕMn = ϕAsFy(db - a/2)	1.606 kip-ft	1.606 kip-ft	
Check ϕMn > Mu	O.K.	O.K.	
% allowed	0.62%	0.62%	



REINFORCEMENT AT OPENINGS

Loading	
Pu (factorized load from roof)	0.26 klf
Ww (weight of panel per sq ft)	0.04 ksf

Material Properties	
db (effective depth bottom)	1.5 in

Factorized Moment

Opening	Horizontal Location	Vertical Location	L length of opening	H height above opening	(-) Weight of Opening (LBS)	Pw total factorized panel load	wu total factorized load	**Mu** (wu*L^2)/12

Flexure

Opening	ϕb	As req'd	Bar size	qty req'd:	**ϕMn =** ϕAsFy(db - a/2)	Check ϕMn > Mu

CONNECTIONS

			Full Resistance Value				
			Overturning				
Base Anchors			Lateral	Base Anchors		Wall-Wall Connection	
Quantity	Maximum	Maximum	Shear	Moment +	Moment -	Moment +	Moment -
in Shear	R - Distance	L - Distance	kip	kip - ft	kip - ft	kip - ft	kip - ft
0	0	0	0.000	0.00	0.00	0.00	0.00

Total Tension	Base Anchors					
0.000	Dist	Tension (kip)	Shear	L - Dist	Moment +	Moment -

	Wall Connections									
	Quantity of Anchors	Capacity of each Anchor	Countering Dead Load from Adjoining Wall	% of wall to use	Adjoining Wall	Dist (inches)	L - Dist	Allowable Force	Overturning Moment Resistance (kip-ft) Up Left	Low Right
Wall Connection 1	2	***1.531***	6.116	50.00%	W18	0	24.000	3.062	0.000	6.124

Wall Shear Checks

Shear Connections at Base			Wall Shear Capacity			Required Shear Capacity (lb) per Base Connector		
Design Force (lb)	Capacity (lb)	Reserve Capacity	Design (PLF)	Resistance (PLF)	check			Reserve Capacity
0	0	0	0	15274	OK	0	0	OK

RIGIDITY

CALCULATED VALUES	100%	Final	0

Pier	Length	Height	Fixed Top?	Useable?	Stiffness (k)	Deflection
Label	(inches)	(inches)	(Y/N)	(Y/N)	(1000 kip / IN)	(in / 1000 kip)
Entire Wall	24	58	N	Y	0.235	4.247

Combine Logic					
First Segment	Second Segment	Re-Name	Combine/Subtract	Method	Combined
Entire Wall	0	Final			0.235

ID:

CHEYENNE CH-329
DESIGN OF FLOOR PANEL F1, F2, & F3

Material Properties

f'c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy	80000 psi	
Lightweight?	No	
γ_c (Concrete density)	150 pcf	O.K.
λ		*ACI 19.2.4.1(a)*
E_s (Steel)	29000000 psi	*ACI 20.2.2.2*
E_c (Concrete)	4,286,682.0 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

Geometric Properties

Ls (overall length of slab)	26 ft	
Bs (overall width of slab)	10 ft	
Design will be performed as :	**Two-way slab**	
tfr (floor finish thickness)	0 in	
h (section width)	12 in	*(typically 12 inches)*
ct (cover top)	1 1/2 in	
cb (cover bottom)	1 1/2 in	
rd (assumed reinf. diameter)	0.319 in	*(if centered enter 0)*
db (effective depth top)	1.660 in	
db (effective depth bottom)	3.681 in	
oh1 (overhang length and qty. for Bs)	0 in 0	*[qty of overhangs in Bs direction]*
oh2 (overhang length and qty. for Ls)	0 in 0	*[qty of overhangs in Ls direction]*
Cs (% of DL used for Seismic)	0.280	*[from seismic analysis]*
NsL (Num. of supports along Ls)	8	*[either walls of vaults or enter "8" if no vault]*
NsB (Num. of supports along Bs)	4	*[either walls of vaults or enter "4" if no vault]*

Reinforcement Limits

ρ_{min} (maximum tensile reinforcement)	0.0166	
$\rho_{min\ temp}$ (min. temperature reinforcement)	0.0018	*ACI 7.6.1.1 and 8.6.1.1*
ρ_{min} (minimum tensile reinforcement)	0.0027	*ACI 9.6.1.2*

Loading

Design Loads

Pressure on Slab	
D (Dead load)	62.5 psf
S (Snow Load)	0 psf
L (Live Load)	0 psf
Lr (Live Floor Load)	400 psf
W (Wind Load)	0 psf
E (Earthquake Load)	17.25 psf

Sustained Loading

Pressure on slab	**W**
D (Dead load)	62.5 psf
S (Snow Load)	0 psf
Lr (Live Floor Load)	400 psf

Factored Design Loads

Factored Loading per ACI equation indicated	Factored Pressure on Slab **W**
ACI 5.3.1b	275 psf

Factored Sustained Loads

Factored Loading per ACI equation indicated	Factored Pressure on Slab **W**
ASCE7-16 CC2-1a	462.5 psf

Notes:

fr (rutture modulus)	530.3 psi	*ACI 19.2.3.1*
$I_g = (b*h^3)/12$	1.25 in^4	
$A_g = (b*h)$	60 in^2	
Yt = h/2	2.5 in	
Mcr	26.517 kip in	*ACI 24.2.3.5*
β1	0.8	*ACI Table 2.2.2.4.3*
Δ initial	360	*ACI Table 24.2.2*
Δ longa-term	480	*ACI Table 24.2.2*
B	8.830 in	
kd	0.510 in	
Icr	2.33 in^4	
a	0.32 in	
c		

(reinforcement ratio provided)

$\rho_{provided}$	0.0045	0.0728
$\rho_{provided}$	0.0125	0.2006
$\rho_{provided}$	0.0050	0.0802
$\rho_{provided}$	0.0144	0.23

Wire Mesh (Top)

Wire Size	W6.7	
spacing	4 in	
Mesh Area	**0.20 in^2**	**= As'**

Wire Mesh (Bottom)

Wire Size	W6.7	
spacing	4 in	
Mesh Area	**0.20 in^2**	**= As**

Factored Design Loads

Factored Loading per ACI equation indicated	Factored Pressure on Slab **W**
ACI 5.3.1b	275 psf

Pressure on Section **wB** =	Pressure on Section **wL** =
W*(L^4 / B^4 + L^4)*bc	W*(B^4 / B^4 + L^4)*bc
0.17 klf	0.11 klf

3.330 ft, 0.28, 0.28 | 3.71 ft, 0.20, 0.20 kip

B (Span in the short direction) 3.330 ft
L (Span in the long direction) 3.71 ft

Pressure on Section **wB** =	Pressure on Section **wL** =
W*(L^4 / B^4 + L^4)*bc	W*(B^4 / B^4 + L^4)*bc
0.281 klf	0.182 klf

3.330 ft, 0.47, 0.47 | 3.71 ft, 0.34, 0.34

Unfactored Design Loads

Factored Loading per ACI	Factored Pressure on Slab **W**
ASCE 7-16 2.4.1.4	662.5 psf

Pressure on Section **wB** =	Pressure on Section **wL** =
W*(L^4 / B^4 + L^4)*bc	W*(B^4 / B^4 + L^4)*bc
0.4 klf	0.26 klf

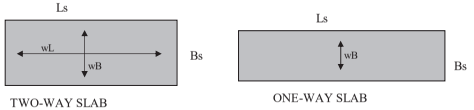
3.330 ft, 0.67, 0.67 | 3.71 ft, 0.48, 0.48

SUMMARY
Use 1 Layer of Wire Mesh on Top: W6.7 x W6.7 x 4 x 4
Use 1 Layer of Wire Mesh on Bottom: W6.7 x W6.7 x 4 x 4

ID: **CHEYENNE CH-329**

DESIGN OF FLOOR PANEL F1, F2, & F3

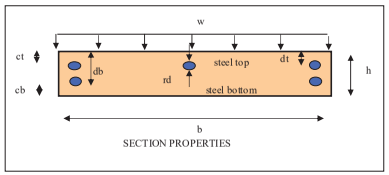
Notes:



Material Properties

f ' c	5000 psi	
Steel Reinforcement	Plain WWF Grade 80	
Fy	80000 psi	
Lightweight?	No	
C_d (Concrete density)	150 pcf	O.K.
λ	1	*ACI 19.2.4.1(a)*
E (Steel)	29000000 psi	*ACI 20.2.2.2*
E (Concrete)	4286826 psi	*ACI 19.2.2.1(a)*
n (modular ratio)	6.76	

fr (rupture modulus)	530.3 psi	*ACI 19.2.3.1*
Ig = (b*h^3)/12	125 in^4	
Ag = (b*h)	60 in^2	
Yt = h/2	2.5 in	
Mcr	26.517 kip in	*ACI 24.2.3.5*
β1	0.8	*ACI Table 22.2.2.4.3*
Δ initial	360	*ACI Table 24.2.2*
Δ long-term	480	*ACI Table 24.2.2*
B	8.830 in	
kd	0.510 in	
I.cr	2.33 in^4	
a	0.32 in	
c		



Geometric Properties

Ls (overall length of slab)	26 ft		
Bs (overall width of slab)	10 ft		
Design will be performed as :	**Two-way slab**		
tfr (floor finish thickness)	0 in		
b (section width)	12 in		*(typically 12 inches)*
h (section thickness)	5 in		
ct (cover top)	1 1/2 in		
cb (cover bottom)	1 in		
rd (assumed reinf. diameter)	0.319 in		*(if centered enter 0)*
dt (effective depth top)	1.660 in		
db (effective depth bottom)	3.681 in		
oh1 (overhang length and qty for Bs)	0 in	0	*[qty of overhangs in Bs direction]*
oh2 (overhang length and qty for Ls)	0 in	0	*[qty of overhangs in ls direction]*
Cs (% of DL used for Seismic)	0.280		*[from seismic analysis]*
NsL (Num. of supports along Ls)	8		*[either walls of vaults or enter "8" if no vault]*
NsB (Num. of supports along Bs)	4		*[either walls of vaults or enter "4" if no vault]*

(reinforcement ratio provided)		ω
$\rho_{provided}$	0.0045	0.0728
$\rho_{provided}$	0.0125	0.2006
$\rho_{provided}$	0.0050	0.0802
$\rho_{provided}$	0.0144	0.23

Flexure

Flexural Moments for Bs	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI Table 21.2.2	ϕMn trial = ϕf'cbd^2w(1-0.59w)	ΔM = Mu - ϕMn	ϕMn =	Check ϕMn > Mu	% allowed
** Mpos (positive Moment) = (wB*B^2)*0.08	0.15 kip-ft	0.025	0.003	Tension	0.9	4.25 kip-ft		4.25 kip-ft	O.K.	3.55%
** Mneg (negative Moment) = (wB*B^2)*0.1	0.19 kip-ft	0.025	0.003	Tension	0.9	3.84 kip-ft		3.84 kip-ft	O.K.	4.91%

***continuous beam moment coefficients used*

Flexural Moments for Ls	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI Table 21.2.2	ϕMn trial = ϕf'cbd^2w(1-0.59w)	ΔM = Mu - ϕMn	ϕMn =	Check ϕMn > Mu	% allowed
** Mpos (positive Moment) = (wL*L^2)*0.078	0.12 kip-ft	0.025	0.003	Tension	0.9	4.25 kip-ft		4.25 kip-ft	O.K.	2.78%
** Mneg (negative Moment) = (wB*B^2)*0.106	0.25 kip-ft	0.025	0.003	Tension	0.9	3.84 kip-ft		3.84 kip-ft	O.K.	6.46%

***continuous beam moment coefficients used*

	Mu	εt	εty Per ACI 21.2.2.1	Status Check Per ACI 11.8.1.1(b)	ϕb Per ACI 21.2.4.1	S Elastic Section Modulus	Mn Per ACI 14.5.2.1a	Mn Per ACI 14.5.2.1b	ϕMn Per ACI 14.5.2.1	Check ϕMn > Mu	% allowed
Moh1 (Moment at oh1) = 0	0.00 kip-ft	0.009	0.003	Tension	0.6	50.000 in^3	1.473 kip-ft	17.708 kip-ft	0.884 kip-ft	O.K.	0.00%
Moh2 (Moment at oh2) = 0	0.00 kip-ft	0.009	0.003	Tension	0.6	50.000 in^3	1.473 kip-ft	17.708 kip-ft	0.884 kip-ft	O.K.	0.00%

Shear

Maximum Shear for Bs	Vu	ϕv per Table ACI 21.2.1	Vc per ACI 22.5.5.1	ϕVc	Check ϕVc > Vu	% allowed
** VuB = wB * B * 0.6	0.34 kip	0.85	6.25 kip	5.31 kip	O.K.	6.40%
** Voh1 = 0	0.00 kip	0.85	2.82 kip	2.39 kip	O.K.	0.00%

***continuous beam shear coefficients used*

Shear for Ls	Vu	ϕv per Table ACI 21.2.1	Vc per ACI 22.5.5.1	ϕVc	Check ϕVc > Vu	% allowed
** VuL = wL * L * 0.605633802816901	0.41 kip	0.85	6.25 kip	5.31 kip	O.K.	7.70%
** Voh2 = 0	0.00 kip	0.85	2.82 kip	2.39 kip	O.K.	0.00%

***continuous beam shear coefficients used*

	Months	Epsilon
Sustained Load Duration Per Table 24.2.4.1.3	6	1.2

Span type:	K
Simple span	1

Deflection

Span	Ma.serv	Ma.sus	I.eff.serv Per Table 24.2.3.5	I.eff.sustained Per Table 24.2.3.5	Immediate Deflection Δi AISC 15th Edition Table 3-23	ρ'	λΔ per ACI 24.2.4.1.1	Long-Term Deflection Δl-t	Δ total long-term deflection (Δi + Δl-t)	Δ allow (immediate)	Δ allow (long term)	Check short term deflection	Check long term deflection	% allowed - short term	% allowed - long term
B	0.15 kip-ft	0.39 kip-ft	125 in^4	125 in^4	0.001 in	0.0045	0.9777	0.001 in	0.003 in	0.1110 in	0.0833 in	O.K.	O.K.	1.30%	1.70%
L	0.12 kip-ft	0.31 kip-ft	125 in^4	125 in^4	0.001 in	0.0045	0.9777	0.001 in	0.003 in	0.1237 in	0.0928 in	O.K.	O.K.	1.17%	1.53%

ID: **CHEYENNE CH-329**

Geometric properties	
Bs (width of roof panel)	29.00 ft
Ls (Length of roof panel)	33.00 ft
Ar Area of Roof	957.00 ft^2
H (height of building)	11.58 ft
Lb (length of building)	30 ft
Wb (width of building)	26 ft
Ab (Area of building)	780 ft^2
Nv (quantity of vaults)	0
Avl (Area of Vault Lips)	0.00 ft^2
Av (Area of Vault)	0.00 ft^2
Vh (Vault height)	0 ft
Cab (Closed Area of building)	761.44 ft^2
Hw (depth of floodwater)	1 ft

Loading	
Wv (weight of vault)**	0 lb
Wtr (roof panel weight)	60930 lb
Ww (total walls panel weight)	110100 lb
Fw (floor panel weight)	31005 lb
We (estimated weight of building)	202035 lb
Wev (estimated weight of building w/ vault)	202035 lb
PSFr (roof snow load)	100.8 psf
PSFf (Floor Live Load)	400 psf
Pmax (Maximum allowable pressure)	1500 psf
Fupmw (MWFRS Uplift Force)	44.84 psf
WLlat (MWFRS lateral wind pressure)	51.74 psf
γw (specific weight of water)	62.4 pcf

**Weight of vault is not considered in sliding resistance

μ (sliding factor)	0.40	**FS** (factor of safety required)	1.00

CHECK SLIDING RESISTANCE

Shear	**.7*Vseismic** (from seismic analysis with snow)	43442.3 lb
	.7*Vseismic (from seismic analysis without snow)	39655.4 lb
	Vwind = WLlat * max(Wb,Lb)*H	17975.4 lb

* Load adjustment per IBC 1605.3 load combinations.

Sliding Resistance with Snow	Pslide = u*(.6*We+.75*PSFr*Ar)	Pslide =	77428.08 lb			
					Fsreqd	
Factor of Safety	FSwind = Pslide / Vwind	FSwind =	4.3	≥	1.0	O.K.
	FSseismic = Pslide / Vseismic	Fseismic =	1.8	≥	1.0	O.K.
Sliding Resistance with No Snow	Pslide = u*.6*We	Pslide =	48488.4 lb			
					Fsreqd	
Factor of Safety	FSwind = Pslide / Vwind	Fswind =	2.7	≥	1.0	O.K.
	FSseismic = Pslide / Vseismic	Fseismic =	1.2	≥	1.0	O.K.

CHECK OVERTURNING RESISTANCE

Shear	.7*Otseismic (from seismic analysis with snow)	427.882 kip-ft
	.7*Otseismic (from seismic analysis without snow)	389.752 kip-ft
	Otwind = (WLlat*Lb*H^2 / 2) + (Fupmw*Lb*Wb^2 / 2)	558.738 kip-ft

* Load adjustment per IBC 1605.3 load combinations.

Overturning Resistance with Snow	Otrsnow = (.6*We+.75*PSFr*Ar)*(Wb/2)	Otrsnow =	1587.254 kip-ft			
					Fsreqd	
Factor of Safety	FSwind = Otrsnow / Otwind	FSwind =	2.84	≥	1.0	O.K.
	FSseismic = Otrsnow / Vseismic	Fseismic =	3.71	≥	1.0	O.K.
Overturning Resistance with No Snow	Otr = .6*We*Wb/2	Otr	1575.873 kip-ft			
					Fsreqd	
Factor of Safety	FSwind = Otr / Vwind	Fswind =	2.82	≥	1.0	O.K.
	FSseismic = Otr / Vseismic	Fseismic =	4.04	≥	1.0	O.K.

CHECK BEARING PRESSURE CONDITION

Net Pressure	Pnet = (Wev + PSFr*Ar + PSFf*Af) / Ab	782.69 psf	
Allowable	Pmax ≥ Pnet	1500 psf ≥ 782.69 psf	O.K.

By observation, if the building is placed on a properly prepared well drained granular sub-base, the design is sufficient for lateral and vertical loads.

CHECK BUOYANCY FORCE CONDITION

Buoyant Force	Fb = γw*Av*Hw+γw*Cab*(Hw-Vh)	**Fb =**	47514.13 lb			
Factor of Safety	FSb = We / Fb	**FSb =**	4.25	≥	1.00	O.K.

The weight of the building exceeds the buoyant force due to hydrostatic pressure acting on the horizontal surface of the vault, therefore, the design is sufficient against buoyancy.

Floor Design Information:

1) The referenced building is made of flood damage resistant 5000 psi reinforced concrete.
2) The vault system, if existing, is designed to minimize infiltration into system and can be considered water tight to a height of 17"
3) Flood Ventilation is available at threshold level and flood ventilation exceeding 1" per sq. ft. of floor area is provided no more than 12" A.F.F.

LIGHTING COMPLIANCE SUMMARY

2021 WSEC Compliance Forms for Commercial Buildings including Group R2, R3 & R4 over 3 stories and all R1

Project & Applicant Information	**Project Title**	CHEYNNE CH-329 - 2021 WSEC	For Building Department Use:	**Date: Jun 07, 2024**
	Project Address	501 TAYLOR ST Mount Vernon, WA 98273		
	Applicant Name	Nathan Penner		
	Applicant Phone	208-697-6804		
	Applicant Email	npenner@lbfoster.com		

For questions about this report, contact WSEC Commercial Technical Support at 360-539-5300 or via email at com.techsupport@waenergycodes.com

General Occupancy	All Group R - R2, R3 & R4 over 3 stories and all R1		**General Building Use Type**		Office, Other	**Building Cond. Floor Area**	780
General Project Types	New Building	**New Building or Addition Lighting Scope**	Interior Lighting Exterior Lighting	**Alteration Lighting Scope**		**Project Cond. Floor Area**	780
						Floors Above Grade	1
						Compliance Method	General Prescriptive
Lighting Project Description	New building with 2 multiuser restrooms, a mechanical chase, and four shower rooms.						

Lighting Compliance Scope and Method	**Project Type**	**Interior / Exterior** (Interior includes both interior & parking)	**Luminaire Replacement Scope**	**Compliance Method**	**LPA Calculation Adjustment**	**Compliance Verification**
	New Building	Interior Lighting		Space by space	Reduced lighting power density option - 20%	**COMPLIES**
	New Building	Exterior Lighting			Not applicable to exterior	**COMPLIES**
Additional Energy Efficiency (AEC) Measures Included	Reduced lighting power density - 20% lower than LPA		**Load Management (LDM) Measures Included**		No lighting or electrical load management measures included in project	

Project Title	**CHEYNNE CH-329 - 2021 WSEC**	**Date**	**Jun 07, 2024**
Lighting Power Calculation	**NEW BUILDING - INTERIOR LIGHTING**	**Compliance Verification**	**COMPLIES**
Compliance Method	**Space by space**	**LPA Calculation Adjustment**	**LPA x 0.8**

Interior Lighting Power Allowance - Space by Space

General Space Type	Specific Space Type		Gross Interior Area (SF)	LPA (Watts/SF)	Total Watts Allowed (SF x LPA x 0.8)	Total Proposed Watts (LPD + Display LPD)	Compliance Status
Office	Enclosed > 250 sf		444	0.66	293		
Workshop			167	1.26	210		
Workshop			161	1.26	203		
				Proposed Total LPD		**200**	
		Totals	**Calculation Adjustment Applied - LPA x 0.8**		**565**	**200**	**COMPLIES**

Proposed Lighting Power Density

Fixture Type	Fixture ID	Quantity of Fixtures (#F)	Watts or Wattage Limit per Fixture (WpF)	Total Linear Feet (LF)	Watts per Linear Foot (WpLF)	Total Watts Proposed (#F x WpF) or (LF x WpLF)
Individual Fixtures						
Wall-mounted	A	4	25			100
Wall-mounted	C	4	CH-41 CH-42			NaN
Wall-mounted	A	4	25			100
					Proposed Total LPD	**200**

HEIDEN, WILLIAM RICHARD — STATE OF WASHINGTON — 39026 — REGISTERED PROFESSIONAL ENGINEER
EXPIRES: April 23, 2025
June 10, 2024

Project Title	**CHEYNNE CH-329 - 2021 WSEC**	**Date**	**Jun 07, 2024**

Proposed Fixtures Details	NEW BUILDING - INTERIOR LIGHTING				
Fixture Type/Application	**Fixture ID**	**Location in Documents**	**Lamp Type**		**New or Existing-to-Remain**
Individual Fixtures					
Wall-mounted	A	CH-41, CH-42	LED		New
	Fixture Description: Luminaire VPF84			Are these fixtures located within a daylight zone?: No	
	Do these fixtures require specific application lighting controls?: None required				
Wall-mounted	C	CH-41, CH-42	LED		New
	Fixture Description: Luminaire VPF84			Are these fixtures located within a daylight zone?: No	
	Do these fixtures require specific application lighting controls?: None required				
Wall-mounted	A	CH-41, CH-42	LED		New
	Fixture Description: Luminaire VPF84			Are these fixtures located within a daylight zone?: No	
	Do these fixtures require specific application lighting controls?: None required				

Project Title	CHEYNNE CH-329 - 2021 WSEC	Date	Jun 07, 2024
Lighting Power Calculation	**NEW BUILDING - EXTERIOR LIGHTING**	**Compliance Verification**	**COMPLIES**

Exterior Lighting Zone	ZONE 3	Base Site Allowance	400

Exterior Lighting Power Allowance

Exterior Surface	Surface Sub-Type	Surface Area (SF)	LPA (Watts/SF)	Linear Feet (LF)	LPA (Watts/LF)	Total Watts Allowed (LPA x SF) or (LPA x LF)	Total Proposed Watts	Compliance Status
Building entrances and exits	Pedestrian entrances & exits			21	14	294		
					Base Site Allowance	400		
					Totals	694	56	COMPLIES

Proposed Exterior Lighting Power Density

Fixture Type	Fixture ID	Exterior Surface Type	Quantity of Fixtures (#F)	Watts or Wattage Limit per Fixture (WpF)	Total Linear Feet (LF)	Watts per Linear Foot (WpLF)	Total Watts Proposed (#F x WpF) or (LF x WpLF)
Individual Fixtures							
Wall-mounted	B	Building entrances and exits - Pedestrian entrances & exits	4	14			56
						Proposed Total LPD	**56**

June 10, 2024

Lighting, Motor and Electrical Requirements List, pg 1 of 13

The following information is necessary to check a permit application for compliance with the lighting systems, motors and electrical system requirements in the Washington State Energy Code, Commercial Provisions.

For questions about this report, contact WSEC Commercial Technical Support at 360-539-5300 or via email at com.techsupport@waenergycodes.com

Project:
CHEYNNE CH-329 - 2021 WSEC
501 TAYLOR ST
Mount Vernon, WA 98273

Date: 2024-06-07

Applies	Code Section	Component	Compliance Information Required In Permit Documentation	Location in Documents	Building Department Notes
LIGHTING SCOPE					
NA	C103.1	Construction documents - General	For a shell & core or tenant space (first build-out) project, indicate if there is no lighting scope included in the project.		
NA	C103.1	Construction documents - General	For an alteration project, indicate if there is no lighting scope included in the project.		
NA	C405.1	Lighting in sleeping units	Indicate general compliance path for permanently installed luminaires in sleeping units - vacancy controls & luminaire efficacy; or lighting power allowance.		
INTERIOR LIGHTING CONTROLS					
YES	C405.2	Interior lighting controls, general	For all interior lighting systems, indicate lighting control method (general lighting controls requirements or luminaire level lighting controls) on plans for all spaces and lighting zone(s) served; indicate exceptions applied to eligible spaces and light	CH-41, CH-42	
YES	C405.2.3	Manual controls	Indicate on plans the method of manual lighting control, location of manual control device and the area or specific application it serves.	CH-41, CH-42	
NA	C405.2.4 C405.2.4.1	Manual interior light reduction controls	For general lighting not controlled by occupancy sensors, indicate on plans which method of manual 50% lighting load reduction is provided, or indicate applicable exception.		
YES	C405.2.1 C405.2.2	Method of automatic shut-off control	Indicate on plans the method of automatic shut-off control during unoccupied periods (occupancy sensor or time switch) for all lighting zones.	CH-41, CH-42	
YES	C405.2.1	Occupant sensor controls	Indicate on plans all luminaires that are controlled by occupant sensor controls; indicate controls are configured to turn luminaires 100% off when the space is unoccupied	CH-41, CH-42	
NA	C405.2.1 C405.2.1.1	Occupant sensor controls	Indicate if occupant sensor controls are configured to be manual on or automatic on to not more than 50% power; indicate spaces eligible for exception that allows automatic on to 100% power.		
NA	C405.2.1.2	Occupant sensor controls - warehouse storage areas & library stacks	Indicate each aisleway within a warehouse or library stack space designated as a separate zone that is independently controlled		

NA			Indicate occupant sensors are configured to automatically reduce lighting power by ≥ 50% when the zone is unoccupied for over 20 minutes; indicate controls are configured to automatically restore lighting to full power when the zone or space is occupie		
NA	C405.2.1.2	Occupant sensor controls - warehouse storage areas & library stacks	Indicate method of automatic 100% shut-off (occupancy sensor or time switch)		
NA	C405.2.1.3	Occupant sensor controls - open plan office areas	For open plan office areas larger than 300 sf, indicate all general lighting control zones are ≤ 600 sf		
NA	C405.2.1.3	Occupant sensor controls - open plan office areas	Indicate all general lighting control zones are provided with vacancy controls that are configured to reduce lighting power by not less than 80% when the zone is unoccupied and turn luminaires 100% off when the control zone is unoccupied; indicate unoccup		
NA	C405.2.1.4	Occupant sensor controls - enclosed fire-rated stairwells	Indicate stairway lighting is provided with occupancy sensor controls that reduce lighting power by not less than 50% when the stairway in unoccupied and restore lighting to 100% when it is occupied.		
NA	C405.2.1.5	Occupant sensor controls - corridors	Indicate corridor lighting is provided with occupancy sensor controls that reduce lighting power by not less than 50% when the corridor is unoccupied.		
NA	C405.2.2.1	Automatic time switch controls	Indicate spaces on plans where time switch controls are configured to turn luminaires 100% off during unoccupied hours		
NA			Indicate spaces on plans where time switch controls are configured to turn on lighting to full power versus 50% power		
NA			Indicate locations of override switches on plans and the lighting zone(s) served; indicate that the area(s) served by each override switch does not exceed 5,000 sf.		
NA	C405.2.5.2 C405.2.5.4	Daylight zones - Sidelit zones	Indicate primary and secondary sidelit daylight zone floor areas on plans		
NA			For small vertical fenestration assemblies (rough opening less than 10% of primary daylight zone floor area) where daylight responsive controls are not required, provide fenestration area to daylight zone floor area calculation(s).		
NA			Indicate toplit daylight zone floor areas on plans.		
NA	C405.2.5 C405.2.5.1	Daylight responsive controls	Indicate on plans all lighting zone(s) served by daylight responsive controls; indicate that the area served by each control device does not exceed 2,500 SF		

NA			Identify sidelit and toplit daylight zones that are not provided with daylight responsive controls and the exception(s) that apply		
NA	C405.2.5.1	Daylight responsive controls	Indicate on plans that all daylight responsive controls provide continuous dimming to ≤15% full light output		
NA	C405.2.5.1	Daylight responsive controls	Indicate that daylight responsive controls are configured to completely shut off all controlled lighting fixtures within the lighting zone.		
NA	C405.2.6	Additional controls - Specific application lighting controls	Identify spaces and lighting fixtures on plans that require specific application lighting controls per this section.		
NA	C405.2.6, Items 1.1 thru 1.6	Additional lighting controls for display, accent & supplemental task lighting	Indicate on plans that all display, accent and supplemental task lighting fixtures are controlled independently from general area lighting		
NA	C405.2.6, Items 1.1 and 1.2	Display and accent lighting	For display and accent lighting fixtures, including lighting fixtures added per the C405.2.2.1 additional interior lighting power allowance, indicate on plans the separate manual controls for these fixtures and the type of automatic off controls (occupanc		
NA			For display case lighting fixtures, indicate on plans the separate manual controls for these fixtures and the type of automatic off controls (occupancy sensor or time-switch)		
NA	C405.2.6, Item 1.4	Supplemental task lighting	For supplemental task lighting fixtures including under-shelf or under-cabinet lighting, indicate on plans the separate manual controls for these fixtures and the type of automatic off controls (occupancy sensor or time-switch)		
NA	C405.2.6, Item 1.5	Lighting equipment for sale or demonstration	For lighting equipment for sale or demonstration, indicate on plans the separate manual controls for these fixtures and the type of automatic off controls (occupancy sensor or time-switch)		
NA			For exhibit lighting fixtures in galleries, museums and monuments, indicate on plans the separate manual controls for these fixtures and the type of automatic off controls (occupancy sensor or time-switch).		
NA	C405.2.6, Item 2	Permanently installed lighting in sleeping units	Indicate method of automatic off control of all installed luminaires in sleeping units (vacancy or captive key card control); also refer to Receptacles.		

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NA	C405.2.6, Item 3	Lighting for non-visual applications	For lighting serving non-visual applications (food warming and lighting for life support of nonhuman life forms), indicate on plans that lighting fixtures are controlled independently from both general area lighting and other lighting applications within		
NA			Indicate on plans separate manual controls for non-visual lighting application fixtures and applicable automatic lighting controls; indicate that the area served by each control device does not exceed 4,000 sf.		
NA			For task lighting that serves medical & dental purposes, indicate on plans that lighting fixtures are provided with manual control that is independent from general area lighting.		
NA	C405.2.6, Item 5	Means of egress lighting	Identify all means of egress lighting fixtures on plans including fixtures that function as both normal and emergency illumination		
NA			Provide calculation for total lighting power density (LPD) of all means of egress lighting fixtures; if total LPD is ≥ 0.01 Watts/SF, indicate on plans the method of automatic shut-off control during unoccupied periods (emergency relay & occupancy sens		
NA	C405.2.8	Advanced lighting controls in open office areas	For open office areas ≥ 5,000 sf, indicate which advanced lighting control system is provided (luminaire level lighting controls or networked lighting controls).		
NA	C405.2.8.1	Luminaire level lighting controls (LLLC)	Where LLLC are provided to comply with C405.2.8, or provided as the alternate lighting controls compliance method per C405.2, or to comply with C406.2.4.2 Enhanced digital interior lighting controls; provide sequence of operations that describes required		
NA	C405.2.8.1 C405.2.8.3	Luminaire level lighting controls (LLLC)	Indicate on plans that each LLLC luminaire is configured with occupancy sensing control functions (including C405.2.1.3 requirements for open office areas) and continuous full range dimming controls to brighten or dim lights based on occupancy and availab		
NA	C405.2.8.2	Networked lighting control (NLC)	Where NLC are provided to comply with C405.2.8, or to comply with C406.2.4.2 Enhanced digital interior lighting controls; provide sequence of operations that describes required NLC capabilities and performance parameters		
NA	C405.2.8.2 C405.2.8.3	Networked lighting control (NLC)	Indicate on plans that each NLC luminaire is individually addressable or document exception applied; Indicate on plans that each NLC luminaire is configured with occupancy sensing control functions (including C405.2.1.3 requirements for open office areas)		

The following information is necessary to check a permit application for compliance with the lighting systems, motors and electrical system requirements in the Washington State Energy Code, Commercial Provisions.
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NA	C405.8.3	High end trim	Where high end trim is required, luminaires shall be initially configured to limit maximum lumen output or lighting power to 85% or to the target design lighting power.		
INTERIOR LIGHTING CONTROLS - ADDITIONAL ENERGY EFFICIENCY MEASURE					
NA	C406.2.4.2	Enhanced digital interior lighting controls	To comply with the enhanced interior lighting controls measure, provide calculations that demonstrate that lighting in ≥ 50% of the project floor area is provided with LLLC (C405.2.8.1) or NLC (C405.2.8.2) controls with high end trim (C405.2.8.3)		
NA			Where LLLC is provided, indicate on plans that each LLLC controlled luminaire is configured with integral sensors; where NLC is provided, indicate on plans that each NLC controlled luminaire is configured to be independently addressable; provide sequence		
NA	C406.2.4.1	Enhanced lighting controls in Group R-2	In Group R-2 occupancies, indicate on plans a master control at the main entrance to each dwelling or sleeping unit that switches off all lights and switched receptacles (may be two controls, one for lights and the other for receptacles); indicate on plan		
INTERIOR LIGHTING CONTROLS - LIGHTING LOAD MANAGEMENT MEASURE					
NA	C406.3.1	Interior lighting DDC controls & real-time demand response	To comply with the interior lighting load management measure, indicate automatic lighting controls are connected to a central DDC system capable of activation by an external utility signal; where utility real-time demand or pricing program exists, indicat		
NA	C406.3.1	Interior lighting power reduction controls	Indicate lighting controls are configured to gradually reduce by continuous dimming the interior general area lighting power by ? 20% in response to a peak demand signal; calculate the percentage of total building floor area served by load management ligh		
NA	C406.3.1	Warehouse & retail storage interior lighting power reduction controls	For warehouse & retail storage areas, indicate method of interior general area lighting power reduction (continuous dimming by ? 20%; switching off ? 25% of lighting power).		
EXTERIOR LIGHTING CONTROLS					
YES	C405.2.9 C405.2.9.1 C405.2.9	Exterior lighting controls	For all exterior lighting, indicate on plans automatic controls (either daylight sensing or astronomic time clock) configured to turn lighting off when daylight is present; or indicate exception applied.	CH-41, CH-42	
NA			For exterior building facade & landscape lighting, indicate that controls are configured to turn this lighting off when daylight is present for a minimum of 6 hours per night, or from 1 hour after closing to 1 hour before opening per the occupancy schedul		

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NA			For outdoor parking area (not parking garage) luminaires that are mounted ≤ 24 feet high and are rated at ≥ 40 watts, indicate that controls are configured to turn this lighting off when daylight is present; in addition, indicate controls are config		
NA			For exterior lighting other than building facade, landscape and outdoor parking area lighting, indicate controls are configured to reduce lighting power by at least 50% from 12am-6am, or 1 hour after closing to 1 hour before opening, or when no activity i		
NA	C405.2.10	Parking garage lighting control	Indicate all interior parking garage lighting fixtures are provided with time switch controls (per C405.2.2.1) or occupancy sensor controls (per C405.2.1.1); indicate controls are configured to reduce lighting power by at least 30% when no activity is det		
NA	C405.2.10	Parking garage lighting control - Perimeter lighting zones	For parking garage lighting fixtures located within 20 feet of perimeter wall openings, indicate on plans that daylight sensing controls are configured to reduce lighting power by at least 50%, or exception applied		
NA	C405.2.10	Parking garage lighting control - Eye adaptation lighting	For lighting fixtures at vehicle entrances & exits, indicate on plans that daylight sensing controls are configured to reduce lighting power by at least 50% from sunrise to sunset.		
NA	C405.3	Lighting for plant growth and maintenance	For permanently installed lighting fixtures used specifically for plant growth and maintenance, indicate that the photosynthetic photon efficacy measured at the lamp or luminaire is ≥ 1.7 ï¿½mol/J in greenhouses and ≥ 1.9 ï¿½mol/J in all other indoo		
NA	C405.5.4	Exterior gas-fired lighting appliances	Indicate ignition system is a method other then continuously burning pilot light.		
INTERIOR & EXTERIOR LIGHTING CONTROL CIRCUITS					
NA	C405.2.7	Area controls - Master control switches	Indicate location(s) of lighting master control switch(es) intended to control multiple independent switches; a circuit breaker may not be used as a lighting master control switch		
NA			Verify the maximum power controlled by any single lighting control switch or automatic control device is no more than a 20 amp circuit loaded to ? 80%.		
INTERIOR LIGHTING POWER & EFFICACY					
YES	C405.4.1	Total connected interior lighting power	Include all luminaires in interior lighting fixture schedule; indicate fixture types, lamps, ballasts and rated watts per fixture; include rated wattage of lamps for luminaires with lamps connected directly to building power; include wattage limit of tran	CH-41, CH-42, WSEC	

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NA			Identify spaces eligible for lighting power exemption on plans and in WSEC interior lighting compliance reports; indicate the exception applied		
NA			Identify lighting equipment eligible for lighting power exemption in fixture schedule and in WSEC interior lighting compliance reports; indicate the exception applied.		
NA	C405.1.1	Lighting in dwelling units	Include all permanently installed luminaires in dwelling units in interior lighting fixture schedule; include luminaire lighting power and efficacy (lumens)		
NA			Include all permanently installed luminaires in sleeping units in interior lighting fixture schedule; include luminaire lighting power or efficacy (lumens) depending on compliance path taken per C405.1		
NA			For all permenantly installed luminaires, indicate in interior lighting fixture schedule that rated lamp efficacy is ≥ 65 lumens/watt or luminaire efficacy is ≥ 45 lumens/watt.		
YES	C405.4.2	Interior lighting power allowance (LPA)	Indicate which interior LPA method is applied to the entire building (Building Area Method or Space-by-Space Method); indicate LPA applied is Space-by-Space Method for partial building projects and for buildings with unfinished spaces.	BUILDING AREA METHOD	
INTERIOR LIGHTING POWER CALCULATION - INDICATE COMPLIANCE PATH TAKEN					
YES	C405.4.2.1	Building Area Method	Demonstrate that total proposed interior lighting wattage per building does not exceed the sum of the maximum allowed wattages for all building area types; identify locations of building areas on plans; provide WSEC interior lighting compliance reports.	WSEC	
NA	C405.4.2.2	Space-By-Space Method	Demonstrate that total proposed interior lighting wattage does not exceed the maximum allowed wattage; identify locations of space types on plans, including additional allowance retail display areas and areas with display, highlight and decorative lightin		
INTERIOR LIGHTING POWER & EFFICACY - ADDITIONAL ENERGY EFFICIENCY MEASURES					
YES	C406.2.3.1 C406.2.3.2	Reduced interior lighting power density (LPD)	To comply with the reduced interior LPD additional energy efficiency measure, demonstrate that total proposed interior LPD wattage is 10% or 20% lower than the total interior LPA wattage for the area the reduced lighting power measure is being applied to	WSEC	

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NA	C406.2.3.3	Reduced interior LPD - Dwelling & sleeping unit lamp efficacy	To comply with reduced interior LPD additional energy efficiency measure for a building with dwelling units or sleeping units, indicate in interior lighting fixture schedule that all permenantly installed luminaires have a rated lamp efficacy ≥ 90 lume		
EXTERIOR LIGHTING POWER & EFFICACY					
YES	C405.5.2	Total connected exterior lighting power	Include all luminaires in exterior lighting fixture schedule; indicate fixture types, lamps, ballasts and rated watts per fixture; include rated wattage of lamps for luminaires with lamps connected directly to building power; include wattage limit of tran	CH-41, CH-42, WSEC	
NA			Identify exterior lighting applications eligible for lighting power exemption on plans and in WSEC exterior lighting compliance reports; indicate the exception applied.		
NA	TABLE C405.5.3(1)	Exterior lighting zone	Indicate the building exterior lighting zone as specified by the AHJ.		
NA	C405.5.1	Exterior building grounds lighting	For building grounds lighting fixtures rated at greater than 25 watts, indicate in exterior lighting fixture schedule that fixtures have a rated lamp efficacy ≥ 100 lumens/watt or indicate the exception applied.		
EXTERIOR LIGHTING POWER CALCULATION					
YES	C405.5.3	Exterior lighting power allowance (LPA)	Demonstrate that total proposed exterior surface lighting wattage does not exceed the maximum allowed wattage (including base site allowance); identify locations of exterior surfaces on plans; provide WSEC exterior lighting compliance reports	WSEC	
NA			Demonstrate that total proposed wattage for each additional allowance exterior surface type does not exceed the LPA for the surface type (includes base site allowance remaining after C405.5.3 LPA calculation); identify locations of additional allowance ex		
LIGHTING SYSTEMS ALTERATIONS					
NA	C503.7.1	New lighting systems and controls	Where new interior or exterior lighting systems are installed within an existing building site, indicate new lighting controls comply with C405.2; indicate commissioning of lighting controls (C408.4) and lighting system energy end-use metering (C409.3) wi		
NA	C503.7.2	Interior lighting & parking garage lighting alteration	Include all new luminaires in interior lighting fixture schedule in plans, provide same lighting fixture information as for new construction per C405.4.1 and C405.4.2		

NA			For alterations that add or replace ≥ 20% of luminaires within an interior space or parking garage, indicate which interior lighting power allowance (LPA) method is applied to the alteration project area (Space-by-Space Method for partial building alte		
NA			Demonstrate that total proposed interior lighting wattage (including existing-to-remain lighting wattage) within the alteration project area does not exceed the maximum allowed wattage (Space-by-Space Method) or the sum of the maximum allowed wattages for		
NA	C503.7.2	Interior lighting alterations (LPA) - Add/replace	For alterations that add or replace < 20% of luminaires in an interior space or parking garage, calculate total existing interior lighting wattage within the project area prior to the alteration		
NA	C503.7.2	Interior lighting alterations (LPD) - Add/replace	Demonstrate that total proposed interior lighting wattage (including existing-to-remain lighting wattage) within the alteration project area does not exceed the total existing interior lighting wattage prior to the alteration; provide WSEC interior lighti		
NA			Include all new luminaires in exterior lighting fixture schedule in plans, provide same lighting fixture information as for new construction per C405.5.2		
NA	C503.7.2	Exterior lighting alterations (LPA) - Add/replace &ge 20%	For alterations that add or replace ≥ 20% of exterior lighting wattage, indicate exterior lighting power allowance (LPA) calculated in the same manner as for new construction		
NA	C503.7.2	Exterior lighting alterations (LPD) - Add/replace &ge 20%	Demonstrate that total proposed exterior lighting wattage (including existing-to-remain lighting wattage) does not exceed the maximum allowed wattage; identify locations of surface types on plans, including additional allowance surfaces; provide WSEC exte		
NA	C503.7.2	Exterior lighting alterations (LPA) - Add/replace	For alterations that add or replace < 20% of exterior lighting wattage, calculate total existing exterior lighting wattage prior to the alteration		
NA	C503.7.2	Exterior lighting alterations (LPD) - Add/replace	Demonstrate that total proposed exterior lighting wattage (including existing-to-remain lighting wattage) does not exceed the total existing exterior lighting wattage prior to the alteration; identify locations of surface types on plans, including additio		
NA	C503.7.3	Interior lighting wiring & circuiting alterations	Where new wiring is installed to serve new interior luminaires and /or luminaires are relocated to a new circuit; indicate manual and automatic lighting controls are provided (as applicable) - manual & light reduction (C405.2.3 & C405.2.4); occupancy sens		

NA			Where new wiring is installed to serve new exterior luminaires and /or luminaires are relocated to a new circuit; indicate circuit power area controls (C405.2.7) are provided; indicate commissioning of exterior lighting controls (C408.4) will be provided,		
NA	C503.7.4	Lighting panel alterations	Where a new interior and/or exterior lighting panel is installed or an existing panel is moved (including all new raceway and conductor wiring), indicate all of the same interior lighting controls requirements as for wiring & circuiting alterations apply,		
NA	C503.7.5	Newly-created rooms	Where interior space(s) are reconfigured (permanently installed walls or ceiling-height partitions) to create new enclosed spaces, indicate the following manual and automatic lighting controls are provided (as applicable) - manual & light reduction (C405.		
NA	C504.2	Lighting repairs	Identify existing luminaires being upgraded with bulb and / or ballast replacement; indicate fixture alteration does not increase existing fixture wattage		
NA	C505.1	Change of interior space use	Identify spaces on plans where the building area type or space use type is being changed from one type to another per Tables C405.4.2(1) or (2) including additional allowance retail display areas and areas with display, highlight and decorative lighting		
NA			Demonstrate that total proposed interior lighting wattage (including existing-to-remain lighting wattage) within the alteration project area does not exceed the maximum allowed wattage (Space-by-Space Method) or the sum of maximum allowed wattage per each		
RECEPTACLES					
NA	C405.10	Automatic receptacle control	Provide schedule on electrical plans that lists the number of controlled and uncontrolled receptacles in each space where controlled receptacles are required - classrooms, enclosed offices, conference rooms, copy/print rooms, break rooms and individual wo		
NA			Identify all controlled and uncontrolled receptacles on electrical plans; indicate that ≥ 50% of all receptacles are provided with automatic controls in each space where they are required; include receptacle configuration such as spacing between contro		
NA			Indicate on plans the method of automatic control for each controlled receptacle zone (occupant sensor or programmable time-of-day control); indicate that the area served by each control device does not exceed 5,000 sf.		

NA	C405.2.6, Item 2	Switched receptacles in sleeping units	Indicate method of automatic off control of all switched receptacles in sleeping units (vacancy or key card control).		
NA	C405.7.1	Electric receptacles at dwelling unit gas appliances	In all designated appliance locations within dwelling units (kitchen cooking appliances, laundry and domestic water heating), indicate electric receptacles or junction box & circuit within 12 inches of the appliance location with sufficient capacity to se		
NA	C503.7.7	Electrical receptacle alerations	For alteration project areas ≥ 5,000 sf where electric receptacles are added or replaced, indicate receptacles are provided with automatic controls per C405.10, or exception applied.		
ELECTRIC MOTORS					
NA	C405.8	Electric motor efficiency	Include all motors, including fractional hp motors, in electric motor schedule on electrical plans; indicate motor type, horsepower, rpm, rated efficiency, or exception applied.		
ELEVATORS, ESCALATORS & MOVING WALKS					
NA	C405.9.1	Elevator cabs	For luminaires in each elevator cab, provide calculations that demonstrate average efficacy is not less than 35 lumens per watt		
NA			For elevators that do not have an integral air conditioning system, indicate rated watts per cfm for elevator cab ventilation fans do not exceed 0.33 watts per cfm		
NA			Indicate automatic controls that de-energize lighting and ventilation fans when elevator is stopped and unoccupied for a period of 15 minutes or more.		
NA	C405.9.2	Escalators and moving walks	Indicate escalators and moving walks comply with ASME A17.1/CSA B44 and are provided with automatic controls that are configured to reduce operational speed to the minimum permitted when not in use, or exception applied.		
NA	C405.9.3	Escalator energy recovery	Indicate escalators are designed to recover electrical energy when resisting overspeed in the down direction.		
RENEWABLE ENERGY					
NA	C411	Renewable Energy	For new construction, including additions, change of use, and change of occupancy, with floor area ≥ 10000sf; provide documentation of on-site renewable energy capacity; provide calculations supporting applicable exceptions; if qualifying by exception provide an accounting for the additional Additional Energy Efficiency Credits that will be required		

RENEWABLE ENERGY - ADDITIONAL ENERGY EFFICIENCY MEASURE					
NA	C406.2.5	On-site and off-site renewable energy	To comply with the renewable energy measure, provide an accounting of on-site and any contracted off-site renewable energy capacity; for all off-site sources, indicate the C411.2 renewable energy source type, energy factor, and the rated capacity and calculated code credited kW; indicate on-site renewables used to comply with C411 or for a code exception elsewhere in the code; with the remaining renewable energy provide Equation 4-17 calculations showing the achieved credits and that the achieved credits are ? the base credits for the measure		
NA	C406.2.5	On-site and off-site renewable energy	Provide documentation that all off-site renewable energy systems comply with Sections C411.2.2 and C411.2.3 including all contracts, and the ownership and location of off-site generation		
ELECTRIC ENERGY STORAGE - LOAD MANAGMENT MEASURE					
NA	C406.3.4	Electric energy storage	To comply with the electrical energy storage load managment measure, indicate automatic controls shall store electricity in electric storage devices during nonpeak periods and use stored energy during peak periods; Document the total electric storage device capacity; indicate it is ? 5 Wh/sf (58 Wh/sm) of gross building area; for proration provide the proration calculations supporting the claimed credit		
GENERAL ELECTRICAL SYSTEMS					
NA	C405.6	Electrical transformers	Include electrical transformer schedule on electrical plans; indicate transformer type, size (kVA), efficiency, or exception applied.		
NA	C405.7	Dwelling unit electrical energy consumption	Indicate on electrical plans that each dwelling unit in a Group R-2 building has a separate electrical energy meter, or exception applied.		
NA	C405.11	Voltage drop	Indicate wire conductors are sized so that the maximum voltage drop from customer service conductors to branch circuit conductors is &le 5%.		
NA	C405.12	Alternating current-output uninterruptible power supplies (AC-output UPS)	Indicate in plans that AC-output UPS systems serving computer rooms meet or exceed the calculation and testing requirements identified in ENERGY STAR Program Requirements for Uninterruptible Power Supplies (UPS) ? Eligibility Criteria Version 2.0.		
COMMISSIONING (CX)					

NA	C408.4	Scope of electrical power & lighting systems commissioning	Indicate that all electrical systems (receptacles, transformers, motors, vertical & horizontal transportation) for which the WSEC requires control functions and/or configuration to perform specific functions are required to be commissioned; include docume		
NA			Where total building lighting load is ≥ 10 kW or the total lighting load of luminaires requiring daylight sensing and/or occupancy control is ≥ 5 kW, indicate that all automatic lighting control systems are required to be commissioned; or provide ca		
NA	C408.1.1	Commissioning requirements in construction documents	Indicate Cx requirements in plans and specifications for all applicable electrical and lighting control systems		
NA	C408.1.2 C103.6.3	Commissioning requirements in construction documents	General summary of Cx plan shall include the following: 1) Narrative description of activities; 2) Responsibilities of the Cx team; 3) Schedule of activities including verification of project close out documentation (C103.6); 4) Conflict of interest plan		
NA	C408.1.3 C408.1.4	Commissioning requirements in construction documents	Include in general summary that a Cx project report and Cx Compliance Checklist (Figure C408.1.4.1) shall be completed by the Certified Cx Professional and provided to the owner prior to the final electrical inspection.		
NA	C408.4.1	Functional performance testing criteria	Identify in plans and specifications the intended operation of all electrical equipment and controls during all modes of operation, including interfacing between new and existing-to-remain systems.		
PROJECT CLOSE OUT					
YES	C103.6.3	Documentation requirements	Indicate in plans that project close out documentation is required; indicate information shall include WSEC lighting compliance reports that document all interior lighting areas and space types, exterior lighting surface types, interior/exterior lighting	CH-41, CH-42, WSEC	
If "no" is selected for any question, provide explanation.					