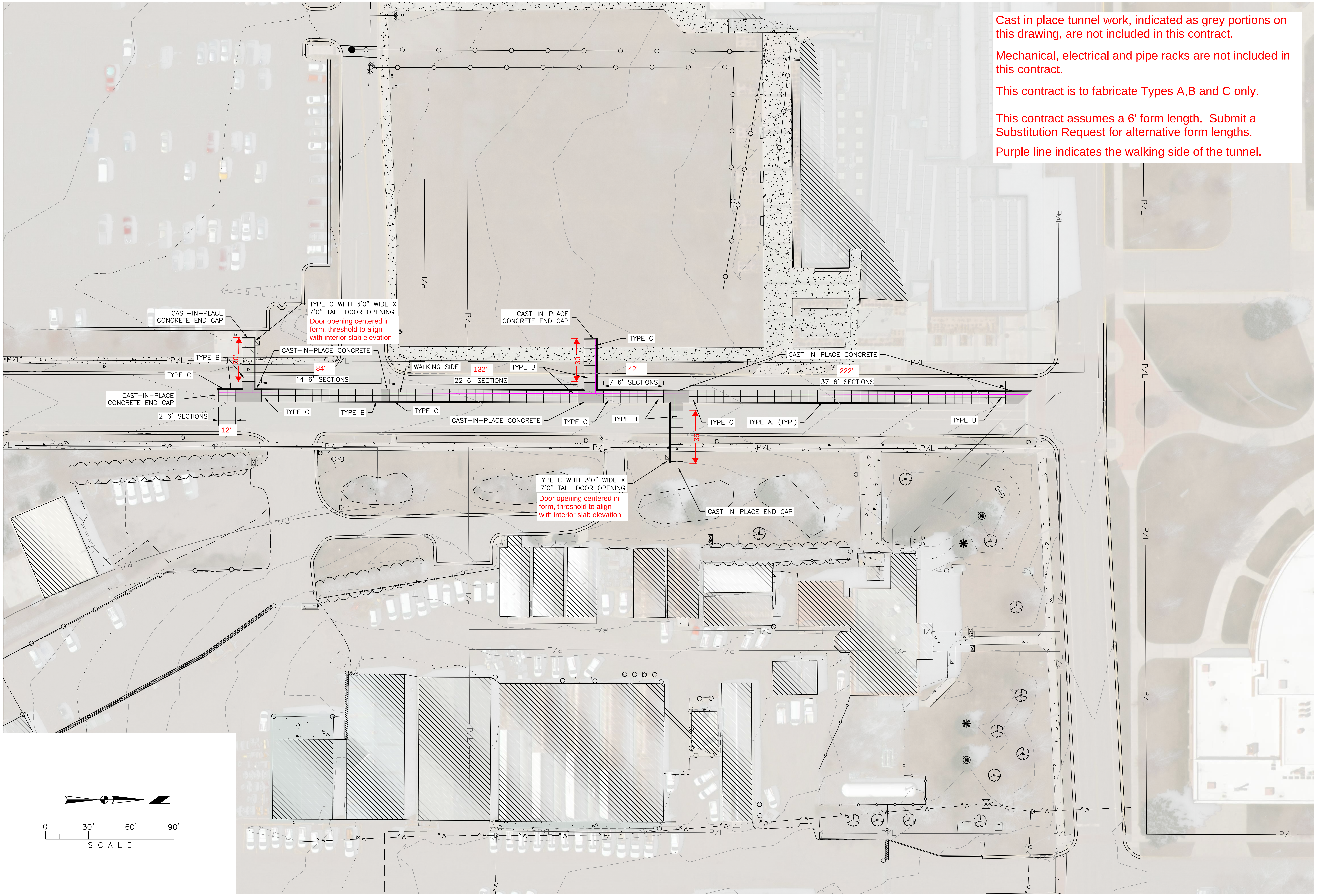

Door opening centered in form, threshold to align with interior slab elevation

Door opening centered in form, threshold to align with interior slab elevation

Cast in place tunnel work, indicated as grey portions on this drawing, are not included in this contract.

Mechanical, electrical and pipe racks are not included in this contract.

This contract is to fabricate Types A,B and C only.

This contract assumes a 6' form length. Submit a Substitution Request for alternative form lengths.

Purple line indicates the walking side of the tunnel.

MONTANA STATE UNIVERSITY

MSU
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA
PHONE: 406.994.5413
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UTILITY TUNNEL EXTENSION
MONTANA STATE UNIVERSITY

TD&H Engineering
406.586.0277 • tdhengineering.com
234 E. BABCOCK ST., SUITE 3 • BOZEMAN, MONTANA 59715

DRAWN BY: ZJL
REVIEWED BY: ACH

REV.	DESCRIPTION	DATE

PPA#22-0006

A & E #: #####

TD&H # B22-055

SHEET TITLE
7TH AVE UTILITY TUNNEL

SHEET
C1.0

DATE
03.02.2023

J:\2022\B22-055 MSU Facilities Yard Relocation\CADD\CIVIL\TEMP\B22-055 C1.0.dwg, 3/2/2023 1:50:38 PM, ZJL

GENERAL STRUCTURAL NOTES:

THESE DRAWINGS HAVE BEEN PREPARED SOLELY FOR USE IN THE BIDDING AND PROCUREMENT OF THE PRECAST CONCRETE TUNNEL SECTIONS REQUIRED FOR THE CONSTRUCTION OF THE 7TH AVENUE UTILITY TUNNEL EXPANSION AT MONTANA STATE UNIVERSITY. POSSESSION OF THESE DRAWINGS DOES NOT GRANT A LICENSE TO CONSTRUCT OR FABRICATE THE WHOLE, OR PARTS OF THIS PROJECT IN OTHER LOCATIONS.

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

THESE GENERAL NOTES SUPPLEMENT THE PROJECT SPECIFICATIONS. REFER TO THE PROJECT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS. NOTES AND DETAILS ON THE STRUCTURAL DRAWINGS SHALL TAKE PRECEDENCE OVER THE GENERAL NOTES AND TYPICAL DETAILS. WHERE NO DETAILS ARE GIVEN, CONSTRUCTION SHALL BE AS SHOWN FOR SIMILAR WORK.

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

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

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

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

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

ASSUMED FUTURE CONSTRUCTION:
VERTICAL: NONE
HORIZONTAL: ADDITIONAL UTILITY TUNNEL EXTENSIONS ARE ANTICIPATED TO FACILITATE FUTURE CONSTRUCTION ON BOTH THE EAST AND WEST SIDE OF 7TH AVENUE AS WELL AS TO THE SOUTH OF THE PROPOSED TUNNEL TERMINATION.

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

1. DEAD LOADS (TUNNEL LID): -TUNNEL SECTION SELF WEIGHT + 600 PSF (5'-0" MAX. SOIL BACKFILL AT 120 PCF EQUIV. FLUID WEIGHT) SOIL OVERBURDEN
2. LIVE LOADS (TUNNEL LID): -250 PSF (TO BE CONSIDERED DURING AND AFTER CONSTRUCTION OF ROADWAY SURFACE

   -HS20-44 VEHICLE (NON-CONCURRENT WITH 250 PSF DISTRIBUTED LL)
3. TUNNEL SIDE WALLS: -LATERAL EARTH PRESSURE (EQUIV. FLUID WEIGHT) = 80 PCF x H

STRUCTURAL OBSERVATIONS:
THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE ENGINEER OF RECORD A MINIMUM OF 24 HOURS IN ADVANCE OF REQUIRED OBSERVATION(S). CONTRACTOR SHALL PROVIDE SUFFICIENT NOTICE AND ACCESS FOR THE OBSERVER. APPROVAL BY THE MUNICIPAL INSPECTOR DOES NOT PRECLUDE OBSERVATIONS BY THE ENGINEER OF RECORD AND APPROVAL BY THE ENGINEER OF RECORD DOES NOT PRECLUDE THE INSPECTION PROCESS BY THE MUNICIPAL INSPECTOR AND ANY OTHER CODE REQUIREMENTS FOR INSPECTION.

UPON COMPLETION OF WORK THE STRUCTURAL OBSERVER SHALL SUBMIT A REPORT TO THE OWNER AND BUILDING OFFICIAL ATTESTING TO THE VISUAL OBSERVATION MADE. THE REPORT SHALL IDENTIFY ANY REPORTED DEFICIENCIES WHICH HAVE NOT BEEN RESOLVED.

STRUCTURAL OBSERVATIONS SHALL BE PERFORMED TO DOCUMENT GENERAL CONFORMANCE OF THE STRUCTURAL DRAWINGS AND SPECIFICATIONS AT THE FOLLOWING STAGES:
- COMMENCEMENT OF E.A.P. INSTALLATION
- PRIOR TO FIRST PRECAST CONCRETE SECTION INSTALLATION
- PRIOR TO FIRST CAST-IN-PLACE CONNECTOR/NODE PLACEMENT
- SUBSTANTIAL COMPLETION PRECAST INSTALLATION
- PRIOR TO GROUTING OF PRECAST CONCRETE BOLT POCKETS
- AS REQUIRED TO ADDRESS STRUCTURAL ISSUES

MISCELLANEOUS:

DRAWINGS INDICATE GENERAL AND TYPICAL DETAILS OF CONSTRUCTION. WHERE CONDITIONS ARE NOT SPECIFICALLY INDICATED BUT ARE OF SIMILAR CHARACTER TO DETAILS SHOWN, SIMILAR DETAILS OF CONSTRUCTION SHALL BE USED, SUBJECT TO REVIEW AND APPROVAL BY THE ARCHITECT.

ENGINEER SHALL REVIEW SHOP DRAWINGS ONLY FOR THE CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND FOR COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. DIMENSIONS AND QUANTITIES NOTED ON THE SHOP DRAWINGS ARE NOT GUARANTEED BY THE ENGINEER, AND THEREFORE, MUST BE VERIFIED BY THE GENERAL CONTRACTOR. CONTRACTOR IS RESPONSIBLE FOR INFORMATION THAT PERTAINS TO THE FABRICATION PROCESSES OR TO TECHNIQUES OF CONSTRUCTION, AND FOR COORDINATION OF THE WORK OF ALL TRADES. SHOP DRAWINGS MUST BE REVIEWED, STAMPED, AND SIGNED BY THE CONTRACTOR PRIOR TO THE REVIEW BY THE ENGINEER.

STRUCTURAL DESIGN ITEMS REQUIRING DEFERRED SUBMITTALS INCLUDE:
- PRECAST CONCRETE TUNNEL SECTIONS
- VERTICALLY RAMMED ENGINEERED AGGREGATE PIERS (E.A.P.'S).

SUBMIT DOCUMENTS FOR DEFERRED SUBMITTAL ITEMS TO THE ARCHITECT/ENGINEER FOR REVIEW. WHEN REQUESTED BY THE BUILDING OFFICIAL, DEFERRED SUBMITTAL DESIGN DRAWINGS, SHOP DRAWINGS, AND CALCULATIONS FOR THE DESIGN AND FABRICATION OF ITEMS THAT ARE DESIGNED BY OTHERS SHALL BEAR THE SEAL AND SIGNATURE OF A STRUCTURAL ENGINEER REGISTERED IN THE STATE WHERE THE PROJECT IS LOCATED. THE DEFERRED SUBMITTAL SHALL BE SUBMITTED TO THE ARCHITECT PRIOR TO FABRICATION AND ARE SUBJECT TO REVIEW AND ACCEPTANCE OF THE STRUCTURAL ENGINEER FOR LOADS IMPOSED ON THE SUPPORTING STRUCTURE. CALCULATIONS SHALL BE INCLUDED FOR ALL CONNECTIONS TO THE STRUCTURE, CONSIDERING LOCALIZED EFFECTS ON STRUCTURAL ELEMENTS INDUCED BY THE CONNECTION LOADS. DESIGN SHALL BE BASED ON THE REQUIREMENTS OF THE CODES AND DESIGN CRITERIA NOTED IN THESE GENERAL STRUCTURAL NOTES. UPON REVIEW AND NOTATION INDICATING THAT THE DEFERRED SUBMITTAL ITEMS ARE IN GENERAL CONFORMANCE WITH THE DESIGN OF THE BUILDING, THE ARCHITECT/ENGINEER WILL FORWARD THE DEFERRED SUBMITTAL DOCUMENTS TO THE BUILDING OFFICIAL. DO NOT INSTALL DEFERRED SUBMITTAL ITEMS UNTIL THEIR DESIGN AND SUBMITTAL DOCUMENTS HAVE BEEN APPROVED BY THE BUILDING OFFICIAL.

THE STRUCTURE SHALL BE ADEQUATELY BRACED FOR SOIL, WIND, EARTHQUAKE AND CONSTRUCTION LOADS UNTIL ALL FLOOR, ROOF, AND WALL UNITS HAVE BEEN PERMANENTLY ATTACHED THERETO.

SHOP DRAWINGS SUBMITTALS SHALL BE SUBMITTED TO THE ARCHITECT PRIOR TO FABRICATION AND CONSTRUCTION FOR ALL STRUCTURAL PRODUCTS DELIVERED TO THE PROJECT. IF THE SHOP DRAWINGS DEVIATE FROM OR ADD TO THE DESIGN OF THE STRUCTURAL DRAWINGS, THEY SHALL BEAR THE SEAL AND SIGNATURE OF A STRUCTURAL ENGINEER REGISTERED IN THE STATE WHERE THE PROJECT IS LOCATED. ANY CHANGES TO THE STRUCTURAL DRAWINGS SHALL BE SUBMITTED TO THE ARCHITECT AND ARE SUBJECT TO REVIEW AND ACCEPTANCE OF THE STRUCTURAL ENGINEER OF RECORD.

EARTHWORK:

A GEOTECHNICAL INVESTIGATION IS SCHEDULED TO BE COMPLETED AFTER THE PRECAST CONCRETE TUNNEL SECTION BIDDING AND PROCURMENT PROCESS HAS BEEN HAS NOT BEEN INTITIATED. FOR THE PRELIMINARY BASIS OF DESIGN, FOUNDATION ELEMENTS OF THE UTILITY TUNNEL SECTIONS AND CONNECTION COLLARS WERE DESIGNED BASED ON AN ALLOWABLE BEARING PRESSURE OF 5500 PSF FOR BEARING ON SUBGRADE IMPROVED BY VERTICALLY RAMMED ENGINEERED AGGREGATE PIERS. SEE E.A.P. NOTES AND SPECIFICATIONS FOR SPECIFIC REQUIREMENTS. FOUNDATION ELEMENTS OF THE UTILITY TUNNEL CONNECTION COLLARS

STABILITY OF CONSTRUCTION EXCAVATION AND WORKER SAFETY ARE THE RESPONSIBILITY OF THE CONTRACTOR.

GROUNDWATER MAY BE PRESENT DURING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL DEWATERING.

PROPER DRAINAGE SHALL BE MAINTAINED DURING CONSTRUCTION TO KEEP SURFACE RUNOFF FROM ENTERING THE EXCAVATIONS AND DIRECTED AWAY FROM THE STRUCTURE.

ALL EXCAVATION IS UNCLASSIFIED, REGARDLESS OF THE MATERIAL ENCOUNTERED.

EARTHWORK (CONTINUED):

TAKE ALL NECESSARY PRECAUTIONS TO PREVENT UNDERMINING OF SOILS BELOW THE EXISTING FOUNDATIONS. IF SIGNIFICANT UNDERMINING OCCURS, CONTRACTOR SHALL NOTIFY THE OWNER, ARCHITECT, AND S.E.R. IMMEDIATELY SO THAT CORRECTIVE MEASURES MAY BE DISCUSSED AND IMPLEMENDED.

USE ONLY HAND OPERATED COMPACTION EQUIPMENT WITHIN 5 FT. OF STRUCTURES.

VERITICALLY RAMMED ENGINEERED AGGREGATE PIERS (E.A.P.'S):

THE SUBGRADE BELOW ALL FOUNDATIONS/FOOTINGS REQUIRES IMPROVEMENT UTILIZING THE INSTALLATION OF VERTICALLY RAMMED ENGINEERED AGGREGATE PIERS (E.A.P.'S).

THE DESIGN OF THE E.A.P. SYSTEM HAS BEEN DELEGATED TO THE E.A.P. SUPPLIER. THE DESIGN AND LAYOUT OF THE E.A.P.'S SHALL BE COORDINATED AND COMPLETED TO ALLOW INCLUSION OF THE STAMPED/SIGNED E.A.P. PLANS AND STRUCTURAL CALCULATIONS TO BE SUBMITTED FOR THE BUILDING PERMIT.

THE E.A.P. SUPPLIER IS REQUIRED TO DESIGN THE E.A.P. SYSTEM AS INDICATED IN THE SPECIFICATIONS, TO PROVIDE A SYSTEM THAT WILL SUPPORT THE SERVICE LEVEL LOADING INDICATED IN THE FOUNDATION PLANS/SCHEDULES, WITH THE FOLLOWING MINIMUM ALLOWABLE DESIGN PARAMETERS UNLESS INDICATED OTHERWISE:

-MINIMUM ALLOWABLE BEARING PRESSURE (SERVICE LEVEL) FOR STATIC/GRAVITY LOADING = 5500 PSF
-COEFFICIENT OF FRICTION = 0.45
-MAXIMUM SETTLEMENT = 1.0"
-MAXIMUM DIFFERENTIAL SETTLEMENT = 0.5"

THE EAP LENGTHS SHALL BE DESIGNED TO TERMINATE WITHIN THE DENSE POORLY GRADED GRAVEL BEARING LAYER ENCOUNTERED AT DEPTHS RANGING FROM APPROXIMATELY XX TO XX FEET BELOW EXISTING GROUND SURFACE AS INDICATED ON THE BORING LOGS OF THE GEOTECHNICAL REPORT.

THE E.A.P. SUPPLIER/DESIGNER SHALL SUBMIT A QUALITY CONTROL/ASSURANCE PLAN IN ACCORDANCE WITH THE SPECIFICATIONS PRIOR TO MOBILIZING ON THE SITE.

CONCRETE:

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

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

CONCRETE PROPERTIES

USE	EXPOSURE	MIN COMPRESSIVE STRENGTH	TEST AGE DAYS	AIR CONTENT	MAX WATER TO CEMENT RATIO	MAX AGGERGATE SIZE
EXTERIOR FOOTINGS AND WALLS	F2	4,500 PSI	28	6% +/- 1.5%	0.45	1"
PRECAST CONC. TUNNEL SECTIONS	F1	5,000 PSI	28	REF. PCI MNL 116	0.40	1"
INTERIOR SLAB ON METAL DECK	N/A	3,500 PSI	28	N/A	0.50	3/4"
MAT FOUNDATIONS	N/A	5,000 PSI	28	N/A	0.45	1"
		6,250 PSI	90			

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

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

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

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

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

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

PROVIDE TOOLED OR SAW-CUT CONTROL JOINTS IN SLABS ON GRADE COMPLYING WITH THE FOLLOWING CRITERIA. THE CONTRACTOR SHALL SUBMIT CONTROL JOINT PLAN PRIOR TO POURING THE SLABS.
- JOINT SPACING SHALL NOT EXCEED 30 TIMES THE SLAB THICKNESS
- ASPECT RATIO OF SLAB PANELS SHALL BE MAXIMUM OF 1.5 TO 1.0; HOWEVER A RATIO OF 1.0 TO 1.0 IS PREFERRABLE
- JOINTS SHALL BE CONTINUOUS ACROSS INTERSECTING JOINTS, NOT STAGGERED OR OFFSET
- JOINTS SHALL EXTEND FROM ISOLATION JOINT AROUND COLUMNS AND WALLS

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

REINFORCEMENT STEEL PROPERTIES

USE	REINFORCEMENT SIZE	SPECIFICATION
GENERAL USE	#7 & SMALLER	ASTM A615, GRADE 60
BEAMS AND COLUMNS	#8 & LARGER	ASTM A706
LONGITUDINAL FLEXURAL REINFORCEMENT IN BEAMS, COLUMNS AND SHEARWALLS	ALL	ASTM A706
REINFORCEMENT TO BE WELDED	ALL	ASTM A706
WELDED WIRE REINFORCEMENT	ALL	ASTM A1064

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

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

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

GRADE 60 REINFORCING STEEL LAP SPLICE LENGTH AND DEVELOPMENT LENGTH

BAR SIZE	f'c = 3,000 PSI					f'c = 4,000 PSI					f'c = 5,000 PSI				
	MISC BARS		TOP BARS (SEE NOTE 3)		HOOK BARS	MISC BARS		TOP BARS (SEE NOTE 3)		HOOK BARS	MISC BARS		TOP BARS (SEE NOTE 3)		HOOK BARS
	Ld	LAP	Ld	LAP	Ldh	Ld	LAP	Ld	LAP	Ldh	Ld	LAP	Ld	LAP	Ldh
#3	17	22	22	28	9	15	19	29	25	8	13	17	17	22	7
#4	22	29	29	38	11	19	25	25	33	10	17	23	23	29	9
#5	28	36	36	47	14	24	31	31	41	12	22	28	28	36	11
#6	33	43	43	56	17	29	37	37	49	15	26	34	34	44	13
#7	48	63	63	81	20	42	54	54	71	17	38	49	49	63	15
#8	55	72	72	93	22	48	62	62	81	19	43	56	56	72	17
#9	62	81	81	105	25	54	70	70	91	22	48	63	63	81	20
#10	70	91	91	118	28	61	79	79	102	25	54	71	71	92	22
#11	78	101	101	131	31	67	87	87	114	27	60	78	78	102	24

1. ALL TABULATED VALUES ARE IN INCHES, FOR GRADE 60, UNCOATED REINFORING, NORMAL WEIGHT CONCRETE WITH CLEAR SPACING AND CLEAR COVER GREATER THAN THE BAR DIAMETER.
2. IT SHALL BE PERMITTED TO INTERPOLATE BETWEEN CONCRETE STRENGTHS OR USE THE NEXT LOWER CONCRETE STRENGTH.
3. TOP BARS ARE ANY HORIZ BAR PLACED SUCH THAT MORE THAN 12" OF FRESH CONCRETE IS CAST IN THE MEMBER BELOW THE BAR IN ANY SINGLE POUR. HORIZ WALL BARS ARE CONSIDERED TOP BARS.
4. LAP SPLICES ARE FOR NON-LATERAL LOAD RESISTING ELEMENTS. FOR REBAR LAPS SPLICES AT LATERAL LOAD RESISTING ELEMENTS, REFERENCE PLANS AND ELEVATIONS.
5. Ld = DEVELOPMENT LENGTH IN TENSION OF DEFORMED BAR
   Ldh = DEVELOPMENT LENGTH IN TENSION OF DEFORMED BAR OR DEFORMED WIRE WITH A STANDARD...
   LAP = LAP SPLICE LENGTH OF DEFORMED BAR OR DEFORMED WIRE

STRUCTURAL CONCRETE (CONTINUED):

REINFORCING STEEL SHALL BE PROTECTED BY PLACING BARS WITH A MINIMUM COVER, UNLESS NOTED OTHERWISE.

REINFORCING STEEL CONCRETE COVER

USE	CLEAR COVER
SLABS	3/4"
BEAMS AND COLUMNS	1-1/2" (TO STIRRUPS OR TIES)
WALLS (INTERIOR FACES)	3/4"
CONCRETE CAST AGAINST EARTH	3"
CONCRETE EXPOSED TO WEATHER OR EARTH	1-1/2" (FOR #5 OR SMALLER), 2" (FOR #6 AND LARGER)

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

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

CONCRETE CONNECTORS:
STEEL HEADED STUD ANCHORS SHALL BE NELSON GRANULAR FLUX-FILLED HEADED STUDS OR PRIOR APPROVED EQUAL AND BE MANUFACTURED FROM ASTM A29-12 / A108, GRADES 1010-1020 COLD ROLLED CARBON STEEL WITH A MINIMUM TENSILE STRENGTH OF 60,000 PSI. DEFORMED BAR ANCHORS SHALL BE NELSON, TYPE D2L. STUDS AND DEFORMED BAR SHALL BE AUTOMATICALLY END WELDED WITH A STUD WELDING GUN TO FULLY DEVELOP THE CONNECTOR.

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

POST INSTALLED CONCRETE ANCHORS

TYPE	PRODUCT	REPORT #
ADHESIVE ANCHORS & DOWELS	SIMPSON SET-XP	ICC-ES ESR-2508
	SIMPSON AT-XP	IAPMO-UES ER-263
	HILTI HIT-HY 200	ICC-ES ESR-3187
EXPANSION ANCHOR	SIMPSON STRONG-BOLT 2	ICC-ES ESR-3037
	HILTI KWIK BOLT TZ	ICC-ES ESR-1917
SCREW ANCHOR	SIMPSON TITEN HD	ICC-ES ESR-2713
	HILTI KWIK HUS-EZ	ICC-ES ESR-3027

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

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

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

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

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

SPECIAL INSPECTION OF ANCHOR INSTALLATION IS REQUIRED UNLESS SPECIFICALLY NOTED OTHERWISE IN DRAWINGS.

STRUCTURAL PRECAST CONCRETE:

PRECAST/PRE-STRESSED CONCRETE SHALL BE A DEFERRED SUBMITTAL DESIGNED BY A PROFESSIONAL ENGINEER LEGALLY AUTHORIZED TO PRACTICE IN THE JURISDICTION WHERE THE PROJECT IS LOCATED AND EXPERIENCED IN PROVIDING ENGINEERING SERVICES OF THE KIND INDICATED THAT HAVE RESULTED IN THE INSTALLATION AND SUCCESSFUL IN-SERVICE PERFORMANCE OF PRECAST CONCRETE UNITS SIMILAR TO THIS PROJECT IN MATERIAL, DESIGN, AND EXTENT. PROVIDE STRUCTURAL ANALYSIS DATA SEALED AND SIGNED BY THE QUALIFIED PROFESSIONAL ENGINEER RESPONSIBLE FOR THEIR PREPARATION FOR PRECAST AND/OR PRE-STRESSED CONCRETE UNITS INDICATED TO COMPLY WITH DESIGN LOADINGS, DEFLECTION LIMITS, AND/OR CALCULATED FIRE-RESISTANCE REQUIREMENTS. SHOP DRAWINGS SHALL BE PREPARED BY OR UNDER THE SUPERVISION OF A QUALIFIED PROFESSIONAL ENGINEER DETAILING FABRICATION AND INSTALLATION OF PRECAST CONCRETE UNITS AND SHALL BE SEALED AND SIGNED BY THE QUALIFIED PROFESSIONAL ENGINEER.

THE PRECAST/PRE-STRESSED CONCRETE PROFESSIONAL ENGINEER SHALL DESIGN THE PRECAST/PRE-STRESSED MEMBERS IN ACCORDANCE WITH THE REFERENCED DESIGN CODES FOR THE LIVE AND DEAD LOADS SHOWN ON THE PLANS IN ADDITION TO THE MEMBER DEAD LOAD AND ANY APPLICABLE COLLATERAL LOADS. THE ENGINEER OR SUPPLIER SHALL PROVIDE ALL MILD STEEL REINFORCING, PRE-STRESSING, AND CONNECTION DETAILS NECESSARY FOR HANDLING, SHIPPING, AND ERECTION LOADS.

FABRICATOR MUST PARTICIPATE IN THE PRECAST/PRE-STRESSED CONCRETE INSTITUTE'S (PCI) PLANT CERTIFICATION PROGRAM AND BE DESIGNATED A PCI CERTIFIED PLANT FOR APPLICABLE PRECAST CONCRETE CATEGORY OF PRODUCT GROUP C AND/OR CA.

COMPLY WITH RECOMMENDATIONS OF PCI MNL-120 "PCI DESIGN HANDBOOK--PRECAST AND PRE-STRESSED CONCRETE" AND PCI MNL-123 “DESIGN AND TYPICAL DETAILS OF CONNECTIONS FOR PRECAST AND PRE-STRESSED CONCRETE” APPLICABLE TO TYPES OF STRUCTURAL PRECAST CONCRETE UNITS INDICATED. COMPLY WITH REQUIREMENTS OF PCI MNL-116 "MANUAL FOR QUALITY CONTROL FOR PLANTS AND PRODUCTION OF PRECAST AND PRE-STRESSED CONCRETE PRODUCTS," INCLUDING MANUFACTURING AND TESTING PROCEDURES, QUALITY CONTROL RECOMMENDATIONS, AND CAMBER AND DIMENSIONAL TOLERANCES FOR TYPES OF UNITS REQUIRED.

OPENINGS IN STRUCTURAL PRECAST ELEMENTS FOR GROUTING ANCHOR BOLTS, REINFORCING STEEL AND EMBEDS SHALL BE PROVIDED BY THE PRECAST/PRE-STRESSED CONCRETE FABRICATOR. PRE-STRESSED MEMBERS MAY BE DRILLED OR "SHOT" PROVIDED NO CONTACT IS MADE WITH PRE-STRESSING STEEL AND IT IS ACCOMPLISHED IN SUCH A MANNER THAT NO OBJECTIONABLE SPALLING OCCURS. SUCH DRILLING SHALL BE COORDINATED WITH THE PRECAST/PRE-STRESSED CONCRETE MANUFACTURER. AT NO TIME SHALL ANY AREA CONTAINING PRE-STRESSING STEEL BE DRILLED WITHOUT THE PRECAST/PRE-STRESSED CONCRETE MANUFACTURER'S PRIOR APPROVAL.

OPENINGS IN STRUCTURAL PRECAST ELEMENTS LARGER THAN OR EQUAL TO 4" IN DIAMETER AND ALL OPENINGS SHOWN ON THE DRAWINGS SHALL BE CAST BY PRECAST/PRE-STRESSED CONCRETE MANUFACTURER. OPENINGS IN STRUCTURAL PRECAST ELEMENTS NOT SHOWN ON THE DRAWINGS AND LESS THAN 4" IN DIAMETER MAY BE CORE DRILLED OR SAW CUT NEATLY. DO NOT CUT REINFORCEMENT WITHOUT THE MANUFACTURER'S APPROVAL.

PRECAST CONCRETE MATERIALS, CONCRETE STRENGTH AND MIX DESIGN, ADMIXTURES AGGREGATES, AND OTHER SIMILAR ITEMS SHALL BE DETERMINED BY THE PRECAST FABRICATOR, WITHIN THE CONSTRAINTS AS APPROPRIATE FOR PROJECT DESIGN REQUIREMENTS AND PCI MNL-116.

ALL REINFORCING AND CONNECTION DETAILS SHOWN ARE FOR SERVICE LOADS ONLY. THE PRECAST CONCRETE SUPPLIER SHALL DESIGN AND PROVIDE ALL MILD STEEL REINFORCING AND CONNECTION DETAILS NECESSARY FOR HANDLING, SHIPPING, AND ERECTION LOADS. SUBMIT SHOP DRAWINGS AND DESIGN CALCULATIONS TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS AND CALCULATIONS SHALL BEAR THE STAMP OF A REGISTERED CIVIL ENGINEER IN THE STATE OF MONTANA.

STRUCTURAL STEEL (METAL FABRICATIONS):

DETAILING, FABRICATION, AND ERECTION SHALL BE IN ACCORDANCE WITH AISC SPECIFICATIONS AND AISC CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES.

MATERIAL SPECIFICATIONS:
- WIDE FLANGE "W" SHAPES: ASTM A992
- ANGLES, CHANNELS, PLATES: ASTM A36 (UNLESS NOTED AS "GR. 50" THEN
- PROVIDE ASTM A572, GR. 50)
- STRUCTURAL STEEL TUBES: ASTM 500, GR. B
- FRAMING BOLTS: ASTM A325-SC, SLIP CRITICAL TYPE (UNLESS NOTED OTHERWISE)
- ANCHOR RODS: ASTM F1554, Fy=36 ksi UNLESS NOTED OTHERWISE
- HEADED ANCHOR STUDS: ASTM A108
- WELDING: COMPLY W/ AWS D1.1 . USE E70xx ELECTRODES FOR SMAW
- WELDING PROCESS, E71TX WIRE FOR FCAW WELDING PROCESS

ERECTION AIDS ARE TO BE DETERMINED AND PROVIDED BY CONTRACTOR. THE CONTRACTOR'S ERECTOR AND FABRICATOR SHALL COORDINATE THE TYPE AND QUANTITY OF ERECTION AIDS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ERECTION SEQUENCING, TEMPORARY BRACING, SAFETY OF WORKERS, AND OVERALL COMPLIANCE WITH APPLICABLE OSHA REQUIREMENTS.

STRUCTURAL ABBREVIATIONS

@	- AT
ABUT.	- ABUTMENT
A.B.	- ANCHOR BOLT
A.C.I.	- AMERICAN CONCRETE INSTITUTE
A.F.F.	- ABOVE FINISHED FLOOR
A.I.S.C.	- AMERICAN INSTITUTE OF STEEL CONSTRUCTION
A.N.S.I.	- AMERICAN NATIONAL STANDARDS INSTITUTE
ARCH.	- ARCHITECTURAL
A.S.T.M.	- AMERICAN SOCIETY OF TESTING AND MATERIALS
A.W.S.	- AMERICAN WELDING SOCIETY
B.B.	- BACK TO BACK
BLDG.	- BUILDING
BLKG.	- BLOCKING
BM.	- BEAM
BOT.	- BOTTOM
BRG.	- BEARING
BRKT.	- BRACKET
BSMT.	- BASEMENT
BETW.	- BETWEEN
B.U.	- BUILT-UP
C/C	- CENTER TO CENTER
CU.FT.	- CUBIC FEET
C.I.	- CAST IRON
C-I-P	- CAST IN PLACE
C.I.P.	- CAST IRON PIPE
CCJ	- CONCRETE CONTROL JOINT
CEJ	- CONCRETE EXPANSION JOINT
CRJ	- CONCRETE CONSTRUCTION JOINT
CIJ	- CONCRETE ISOLATION JOINT
CH.FL.PL.	- CHECKERED FLOOR PLATE
C.L.	- CENTER LINE
CLG.	- CEILING
CLR.	- CLEAR
C.M.P.	- CORRUGATED METAL PIPE
C.M.U.	- CONCRETE MASONRY UNIT
COL.	- COLUMN
CONC.	- CONCRETE
CONN.	- CONNECTION
CONSTR.	- CONSTRUCTION
CONT.	- CONTINUOUS OR CONTINUED
CONTR.	- CONTRACTOR
COORD.	- COORDINATE
CTSK	- COUNTERSINK
CTR.	- CENTER
CTRD.	- CENTERED
C.Y.	- CUBIC YARD
D.I.	- DUCTILE IRON
DIA.	- DIAMETER
DIAG.	- DIAGONAL
DIM.	- DIMENSION
DWG.	- DRAWING
DET.	- DETAIL
DWL	- DOWEL
D.O.	- DOOR OPENING
E.	- EAST
EA.	- EACH
E.F.	- EACH FACE
ELEV.	- ELEVATION
EXC.	- EXCAVATION
EXIST.	- EXISTING
EXP.	- EXPANSION
EXT	- EXTERIOR
E.W.	- EACH WAY
F.D.	- FLOOR DRAIN (SEE ARCH.)
FDN.	- FOUNDATION
FIN.	- FINISH
FLG.	- FLANGE
FLR.	- FLOOR
FTG.	- FOOTING
GA.	- GAUGE
GALV.	- GALVANIZED
GL.	- GLUE LAMINATED
G.L.B.	- GLUE LAMINATED BEAM
GND.	- GROUND
GR.	- GRADE
G.W.	- GROUND WATER
H.A.S.	- HEADED ANCHOR STUD
HDR.	- HEADER
H.C.M.	- HOLLOW CLAY MASONRY
HK.	- HOOK
HORIZ.	- HORIZONTAL
HT.	- HEIGHT
I.B.C.	- INTERNATIONAL BUILDING CODE
I.C.B.O.	- INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS
I.D.	- INSIDE DIAMETER
I.F.	- INSIDE FACE
INSUL.	- INSULATED
INT.	- INTERIOR
INV.	- INVERT
JT.	- JOINT
JST.	- JOIST
KIP	- 1000 POUNDS
LAM.	- LAMINATED
LBS.	- POUND
L.L.V.	- LONG LEG VERTICAL
L.L.H.	- LONG LEG HORIZONTAL
LT.	- LEFT
L.V.L.	- LAMINATED VENEER LUMBER
M.B.	- MACHINE BOLT
MATL.	- MATERIAL
MAX.	- MAXIMUM
MFD.	- MANUFACTURED
MFR.	- MANUFACTURER
MECH.	- MECHANICAL
MIN.	- MINIMUM
MK.	- MARK
M.O.	- MASONRY OPENING
MTD.	- MOUNTED
MTL.	- METAL
N.	- NORTH
N.I.C.	- NOT IN CONTRACT
NOM.	- NOMINAL
NO.	- NUMBER
N.T.S.	- NOT TO SCALE
O.C.	- ON CENTER
O.D.	- OUTSIDE DIAMETER
O.F.	- OUTSIDE FACE
OPNG	- OPENING
OPP.	- OPPOSITE
O.W.J.	- OPEN WEB JOIST
P.A.F.	- POWDER ACTUATED FASTENERS
PCS.	- PIECES
P.E.M.B.	- PRE-ENGINEERED METAL BUILDING
PERP.	- PERPENDICULAR
PJF	- PREMOLDED JOINT FILLER
PL.	- PLATE
PLYWD	- PLYWOOD
PSF	- POUNDS PER SQ. FT
PSI	- POUNDS PER SQ. INCH
P.T.	- PRESSURE TREATED
R.	- RISER
RAD.	- RADIUS
RD.	- ROUND
REBAR	- REINFORCEMENT BAR
REINF.	- REINFORCING
REQ'D	- REQUIRED
RM.	- ROOM
R.O.	- ROUGH OPENING
RT.	- RIGHT
S.	- SOUTH
SCHED.	- SCHEDULE
S.F.	- SQUARE FEET
SFC.	- SURFACE
S.G.T.	- STRUCTURAL GLAZED TILE
SHT.	- SHEET
SHT'G.	- SHEATHING
S.I.	- SQUARE INCHES
SIM.	- SIMILAR
S.I.P.	- STRUCTURAL INSULATED PANEL
S.L.V.	- SHORT LEG VERTICAL
SPA.	- SPACES
SPECS.	- SPECIFICATIONS
SQ.	- SQUARE
SST	- STAINLESS STEEL
SHT.	- SHEET
STIFF.	- STIFFENER
STIRR.	- STIRRUP
STL.	- STEEL
STR.	- STRAIGHT
S.Y.	- SQUARE YARD
SYM.	- SYMMETRICAL
T.	- TREAD OR TON
T&B	- TOP AND BOTTOM
THD	- THREAD
THK	- THICK
TJI	- TRUSS JOIST
TMBR.	- TIMBER
T.O.C.	- TOP OF CONCRETE
T.O.D.	- TOP OF DECK/SHEATHING
T.O.F.	- TOP OF FOOTING
T.O.GR.	- TOP OF GRATING
T.O.S.	- TOP OF STEEL
T.O.SL.	- TOP OF SLAB
T.O.W.	- TOP OF WALL
TYP.	- TYPICAL
U.B.C.	- UNIFORM BUILDING CODE
U.N.O.	- UNLESS NOTED OTHERWISE
VERT.	- VERTICAL
W	- WEST
W/	- WITH
W/O	- WITHOUT
WD.	- WOOD
W.I.	- WROUGHT IRON
W.P.	- WORKING POINT
WT.	- WEIGHT
WWF	- WELDED WIRE FABRIC

FOR PRECAST CONC. BIDDING ONLY

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engineers • surveyors • planners • scientists

DRAWN BY: BDA		
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REV.	DESCRIPTION	DATE

MONTANA
BRIAN D. ASCHIM
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REGISTERED
PROFESSIONAL ENGINEER

PPA#22-0006
A & E #: 22059.30
MMI #: 1552.013

SHEET TITLE
GENERAL STRUCTURAL NOTES

SHEET
TS-1

DATE
3/03/23

STATEMENT OF SPECIAL INSPECTION AND TESTING NOTES:

SPECIAL INSPECTIONS SHALL CONFORM TO CHAPTER 17 OF THE INTERNATIONAL BUILDING CODE (IBC), CONTRACT DOCUMENTS, AND APPROVED SUBMITTALS. THE OWNER SHALL EMPLOY ONE OR MORE APPROVED AGENCIES TO PERFORM INSPECTIONS AND TESTING DESCRIBED HEREIN.

SPECIAL INSPECTIONS AND ASSOCIATED TESTING SHALL BE PERFORMED BY AN APPROVED AND ACCREDITED INDEPENDENT AGENCY MEETING THE REQUIREMENTS OF ASTM E329 (GENERAL), ASTM D3740 (SOILS), ASTM C1077 (CONCRETE), ASTM A880 (STEEL), AND ASTM E543 (NON-DESTRUCTIVE). THE INSPECTION AND TESTING AGENCY SHALL FURNISH TO THE ARCHITECT AND ENGINEER A COPY OF THEIR SCOPE OF ACCREDITATION. SPECIAL INSPECTORS SHALL BE APPROVED BY THE BUILDING OFFICIAL. WELDING INSPECTORS SHALL BE QUALIFIED PER AWS D1.1.

THE CONSTRUCTION OR WORK FOR WHICH SPECIAL INSPECTION IS REQUIRED SHALL REMAIN ACCESSIBLE AND EXPOSED FOR SPECIAL INSPECTION PURPOSES UNTIL COMPLETION OF THE REQUIRED SPECIAL INSPECTIONS.

THE SPECIAL INSPECTOR SHALL OBSERVE THE INDICATED WORK FOR COMPLIANCE WITH THE APPROVED CONTRACT DOCUMENTS. ALL DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE CONTRACTOR FOR CORRECTION AND NOTED IN THE INSPECTION REPORTS. ISSUES REQUIRING IMMEDIATE CORRECTIVE ACTIONS OR ENGINEERING INPUT ARE TO BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY UPON DISCOVERY.

THE SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS FOR EACH INSPECTION TO THE BUILDING OFFICIAL, ARCHITECT, ENGINEER, CONTRACTOR, AND OWNER. THE SPECIAL INSPECTION AGENCY SHALL SUBMIT A FINAL REPORT STATING THAT THE WORK REQUIRING SPECIAL INSPECTION WAS INSPECTED, IS IN CONFORMANCE WITH THE APPROVED CONTRACT DOCUMENTS, AND THAT ALL DISCREPANCIES NOTED IN THE REPORTS HAVE BEEN CORRECTED.

EACH CONTRACTOR RESPONSIBLE FOR THE CONSTRUCTION OF A MAIN WIND- OR SEISMIC FORCE-RESISTING SYSTEM, DESIGNATED SEISMIC SYSTEM, OR A WIND- OR SEISMIC-RESISTING COMPONENT LISTED SHALL SUBMIT A WRITTEN STATEMENT OF RESPONSIBILITY TO THE BUILDING OFFICIAL AND THE OWNER PRIOR TO COMMENCEMENT OF WORK ON THE SYSTEM OF COMPONENT. THE CONTRACTOR'S STATEMENT OF RESPONSIBILITY SHALL CONTAIN ACKNOWLEDGEMENT OF AWARENESS OF THE SPECIAL REQUIREMENTS CONTAINED HEREIN.

INSPECTION FREQUENCY:

- A. CONTINUOUS INSPECTION: THE SPECIAL INSPECTOR SHALL BE PRESENT WHEN AND WHERE THE WORK IS BEING PERFORMED AT ALL TIMES.
- B. PERIODIC INSPECTION: THE SPECIAL INSPECTOR SHALL BE INTERMITTENTLY PRESENT WHEN AND WHERE THE WORK IS BEING PERFORMED. THE INSPECTOR SHALL OBSERVE THE WORK AT ITS COMMENCEMENT, AT PERIODIC INTERVALS THEREAFTER, AND WHEN THE WORK IS COMPLETED.
- C. OBSERVE: THE INSPECTOR SHALL OBSERVE THESE FUNCTIONS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING OBSERVATIONS (REFERENCE AISC 360 AND AISC 341 FOR ADDITIONAL INFORMATION).
- D. PERFORM: THESE INSPECTIONS SHALL BE PERFORMED PRIOR TO FINAL ACCEPTANCE OF THE ITEM (REFERENCE AISC 360 AND AISC 341 FOR ADDITIONAL INFORMATION).
- E. DOCUMENT: THE INSPECTOR SHALL PREPARE REPORTS INDICATING THAT THE WORK HAS BEEN PERFORMED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS (REFERENCE AISC 360 AND AISC 341 FOR ADDITIONAL INFORMATION).

SPECIAL INSPECTIONS ARE NOT REQUIRED WHERE THE WORK IS DONE ON THE PREMISES OF A FABRICATOR REGISTERED AND APPROVED TO PERFORM SUCH WORK WITHOUT SPECIAL INSPECTION. APPROVAL SHALL BE BASED UPON REVIEW OF THE FABRICATOR'S WRITTEN PROCEDURAL AND QUALITY CONTROL MANUALS AND PERIODIC AUDITING OF FABRICATION PRACTICES BY AN APPROVED SPECIAL INSPECTION AGENCY. AT COMPLETION OF FABRICATION, THE APPROVED FABRICATOR SHALL SUBMIT A CERTIFICATE OF COMPLIANCE TO THE BUILDING OFFICIAL STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS.

- A. STEEL FABRICATORS AND INSTALLERS CERTIFIED THROUGH AISC COMPLY WITH THIS PROVISION. THE FABRICATOR AND OR INSTALLER MUST STILL COMPLETE AND DOCUMENT THE QUALITY CONTROL TASKS AND NON-DESTRUCTIVE TESTING OUTLINED IN AISC 360 AND AISC 341, AS APPLICABLE.

REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

TASK	IBC REFERENCE	REFERENCE STANDARD	FREQUENCY	REMARKS
VERIFY MATERIALS BELOW SHALLOW FOUNDATION ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY	TABLE 1705.6	GEOTECHNICAL REPORT	PERIODIC	BY THE GEOTECHNICAL ENGINEER
VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL			PERIODIC	
VERIFY USE OF PROPER MATERIALS, DENSITIES, AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF COMPACTED FILL			CONTINUOUS	
PRIOR TO PLACEMENT OF COMPACTED FILL, OBSERVE SUBGRADE AND VERIFY THAT THE SITE HAS BEEN PREPARED PROPERLY			PERIODIC	

REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

TASK	IBC REFERENCE	REFERENCE STANDARD	FREQUENCY	REMARKS
INSPECTION OF REINFORCING STEEL AND PLACEMENT	TABLE 1705.3	ACI 318: Ch. 20, 25.2, 25.3, 26.6.1-26.6.3	PERIODIC	
INSPECTION OF PRESTRESSING TENDONS AND PLACEMENT			PERIODIC	
WELDING REINFORCING: VERIFICATION OF WELDABILITY OF REINFORCING STEEL OTHER THAN ASTM A706	TABLE 1705.3	AWS D1.4 ACI 318: 26.6.4	PERIODIC	
WELDING REINFORCING: LONGITUDINAL REINFORCING IN BEAMS AND COLUMNS OF INTERMEDIATE AND SPECIAL MOMENT FRAMES			CONTINUOUS	
WELDING REINFORCING: LONGITUDINAL AND TRANSVERSE REINFORCING IN BOUNDARY ELEMENTS OF SPECIAL STRUCTURAL WALLS			CONTINUOUS	
WELDING REINFORCING: TRANSVERSE REINFORCING IN BEAMS AND COLUMNS			CONTINUOUS	
WELDING REINFORCING: OTHER STEEL NOT PREVIOUSLY LISTED			PERIODIC	
INSPECTION OF ANCHORS CAST-IN CONCRETE	TABLE 1705.3	ACI 318: 17.8.2	PERIODIC	
INSPECTION OF ANCHORS POST-INSTALLED IN HARDENED CONCRETE: VERIFY ANCHOR PRODUCT NAME, TYPE, AND DIMENSIONS, HOLE DIMENSIONS, COMPLIANCE WITH DRILL BIT REQUIREMENTS, CLEANLINESS OF THE HOLE AND ANCHOR, PRODUCT EXPIRATION DATE (IF APPLICABLE), COMPLIANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS, ANCHOR EMBEDMENT, AND TIGHTENING TORQUE (IF APPLICABLE) FOR: a) ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS		ACI 318: 17.8.2.4 PRODUCT EVALUATION REPORT	CONTINUOUS	
INSPECTION OF ANCHORS POST-INSTALLED IN HARDENED CONCRETE: VERIFY ANCHOR PRODUCT NAME, TYPE, AND DIMENSIONS, HOLE DIMENSIONS, COMPLIANCE WITH DRILL BIT REQUIREMENTS, CLEANLINESS OF THE HOLE AND ANCHOR, PRODUCT EXPIRATION DATE (IF APPLICABLE), COMPLIANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS, ANCHOR EMBEDMENT, AND TIGHTENING TORQUE (IF APPLICABLE) FOR: b) MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN a)		ACI 318: 17.8.2 PRODUCT EVALUATION REPORT	PERIODIC	
VERIFY USE OF REQUIRED MIX DESIGN		ACI 318: CH. 19, 26.4.3, 26.4.4	PERIODIC	
INSPECTION OF CONCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES		ACI 318: 26.5, 26.12	CONTINUOUS	
INSPECTION OF SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES			CONTINUOUS	
INSPECTION FOR MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES		ACI 318: 26.5.3-25.5.5	PERIODIC	
PRESTRESSED CONCRETE: APPLICATION OF PRESTRESSING FORCE		ACI 318: 26.10	CONTINUOUS	
PRESTRESSED CONCRETE: GROUTING OF BONDED PRESTRESSING TENDONS IN THE SEISMIC FORCE RESISTING SYSTEM			CONTINUOUS	
ERECTION OF PRECAST CONCRETE MEMBERS		ACI 318: 26.9	PERIODIC	
VERIFICATION OF IN-SITU CONCRETE STRENGTH PRIOR TO STRESSING TENDONS IN POST-TENSIONED CONCRETE		ACI 318: 26.11.2	PERIODIC	
VERIFICATION OF IN-SITU CONCRETE STRENGTH PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS			PERIODIC	
INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED		ACI 318: 26.11.1.2(b)	PERIODIC	

INSPECTION OF MECHANICAL AND ELECTRICAL COMPONENTS FOR SEISMIC RESISTANCE

TASK	IBC REFERENCE	REFERENCE STANDARD	FREQUENCY	REMARKS
ANCHORAGE OF ELECTRICAL EQUIPMENT FOR EMERGENCY OR STANDBY POWER SYSTEMS IN STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORY C, D, E OR F	1705.12.6.1		PERIODIC	
ANCHORAGE OF OTHER ELECTRICAL EQUIPMENT IN STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORY E OR F	1705.12.6.2		PERIODIC	
INSTALLATION AND ANCHORAGE OF PIPING SYSTEMS DESIGNED TO CARRY HAZARDOUS MATERIALS AND THEIR ASSOCIATED MECHANICAL UNITS IN STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORY C, D, E OR F	1705.12.6.3		PERIODIC	
INSTALLATION AND ANCHORAGE OF DUCTWORK DESIGNED TO CARRY HAZARDOUS MATERIALS IN STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORY C, D, E OR F	1705.12.6.4		PERIODIC	
INSTALLATION AND ANCHORAGE OF VIBRATION ISOLATION SYSTEMS IN STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORY C, D, E OR F WHERE THE CONSTRUCTION DOCUMENTS REQUIRE A NOMINAL CLEARANCE OF 1/4 INCH OR LESS BETWEEN THE EQUIPMENT SUPPORT FRAME AND RESTRAINT	1705.12.6.5		PERIODIC	
INSTALLATION OF MECHANICAL AND ELECTRICAL EQUIPMNENT, INCLUDING DUCT WORK, PIPING SYSTEMS AND THEIR STRUCTURAL SUPPORTS, WHERE AUTOMATIC FIRE SPRINKER LYSTEMS ARE INSTALLED IN STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORY C, D, E OR F TO VERIFY ONE OF THE FOLLOWING: MINIMUM CLEARANCES HAVE BEEN PROVIDED AS REQUIRED BY SECTION 13.2.3 ASCE/SEI 7 OR A NOMINAL CLEARANCE OF NOT LESS THAN 3 INCHES (76 MM) HAS BEEN PROVIDED BETWEEN FIRE PROTECTION SPRINKER SYSTEM DROPS AND SPRIGS AND: STRUCTURAL MEMBERS NOT USED COLLECTIVELY OR INDEPENDENTLY TO SUPPORT THE SPRINKLERS; EQUIPMENT ATTACHED TO THE BUILDING STRUCTURE; AND OTHER SYSTEMS' PIPING	1705.12.6.6	ASCE 7-16 SECTION 13.2.3	PERIODIC	WHERE FLEXIBLE SPRINKLER HOSE FITTINGS ARE USED, SPECIAL INSPECTION OF MINIMUM CLEARANCES IS NOT REQUIRED.

TESTING OF SOILS AND FOUNDATIONS

TASK	IBC REFERENCE	REFERENCE STANDARD	FREQUENCY
PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS	TABLE 1705.6	PROJECT GEOTECHNICAL REPORT	PERIODIC
PROOF TESTING OF DEEP FOUNDATION ELEMENTS		PROJECT GEOTECHNICAL REPORT	

TESTING OF CONCRETE CONSTRUCTION

TASK	IBC REFERENCE	REFERENCE STANDARD	FREQUENCY
CONCRETE STRENGTH TEST SPECIMENS	TABLE 1705.3	ASTM C31 AND C39	FOR EACH CLASS OF CONCRETE (E.G. FOOTINGS, WALLS, OR SLAB ON GRADE), ONE SET OF SPECIMENS EACH DAY OR LESSER OF: ONE SET FOR EACH 150 YDS OF CONCRETE OR ONE SET FOR EACH 5,000 SQUARE FEET OF SLABS OR WALL
AT THE TIME FRESH CONCRETE IS SAMPLED TO FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE TEMPERATURE OF CONCRETE		ASTM C172 ACI 318-14: 26.4 AND 26.12	FOR EACH SPECIMEN

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MMI #: 1552.013

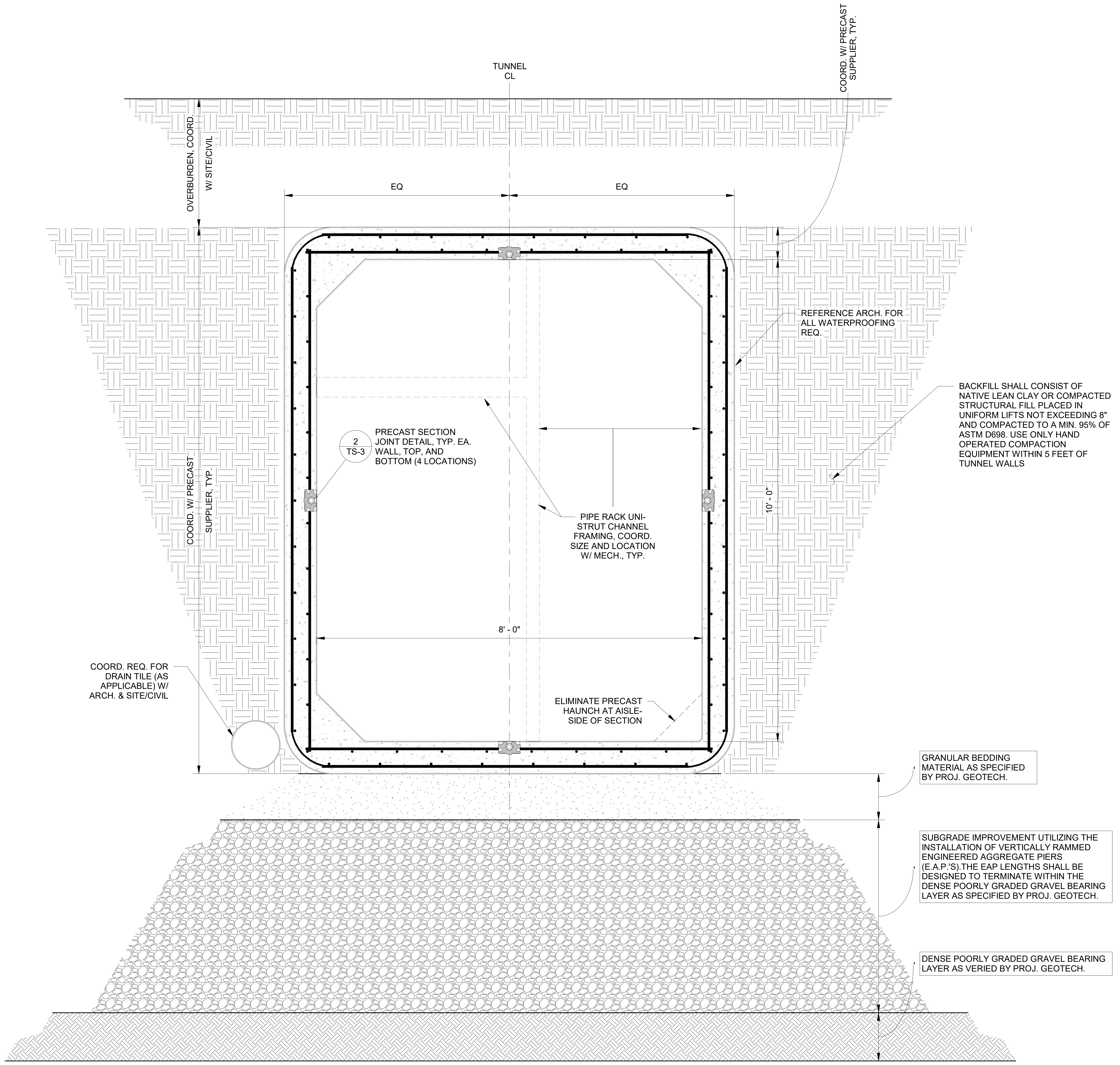
SHEET TITLE
STATEMENT OF SPECIAL INSPECTIONS

SHEET
TS-2

DATE
3/03/23

SHEET NOTES

1. EXISTING BUILDING/SITE DIMENSIONS AND ASSUMED CONDITIONS ARE TO BE VERIFIED IN THE FIELD AND ARE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER OF ALL DISCREPANCIES WHICH REQUIRE A SIGNIFICANT CHANGE IN THE DESIGN AND/OR CONSTRUCTION.
2. ARCHITECT RESPONSIBLE FOR ALL UTILITY TUNNEL WATER-PROOFING AND JOINT SEALING REQUIREMENTS.
3. REFERENCE SITE/CIVIL DRAWINGS FOR UTILITY TUNNEL SITE DRAINAGE REQUIREMENTS.
4. COORDINATE ALL OPENINGS IN TUNNEL WALLS WITH ARCH., MECH., ELECT., AND PLUMBING. REFERENCE GENERAL STRUCTURAL NOTES FOR OPENING REQUIREMENTS IN PRECAST CONCRETE TUNNEL SECTIONS.
5. PRECAST CONCRETE TUNNEL SECTION ENDS SHALL TERMINATE IN EITHER A MALE/FEMALE TONGUE AND GROOVE PROFILE, OR A SQUARE BUTT END PROFILE. REFERENCE DETAIL 1/TS-3 FOR TUNNEL SECTION ORIENTATION CONVENTION, AND CIVIL SHEET C1.0 FOR TUNNEL SECTION GENERAL ARRANGEMENT AND LAYOUT.
6. SEE GENERAL STRUCTURAL NOTES ON SHT. TS-1 FOR ADDITIONAL REQUIREMENTS.



PRECAST SECTION JOINT DETAIL, TYP. EA. WALL, TOP, AND BOTTOM (4 LOCATIONS)

PIPE RACK UNI-STRUT CHANNEL FRAMING, COORD. SIZE AND LOCATION W/ MECH., TYP.

BACKFILL SHALL CONSIST OF NATIVE LEAN CLAY OR COMPACTED STRUCTURAL FILL PLACED IN UNIFORM LIFTS NOT EXCEEDING 8" AND COMPACTED TO A MIN. 95% OF ASTM D698. USE ONLY HAND OPERATED COMPACTION EQUIPMENT WITHIN 5 FEET OF TUNNEL WALLS

COORD. REQ. FOR DRAIN TILE (AS APPLICABLE) W/ ARCH. & SITE/CIVIL

ELIMINATE PRECAST HAUNCH AT AISLE-SIDE OF SECTION

GRANULAR BEDDING MATERIAL AS SPECIFIED BY PROJ. GEOTECH.

SUBGRADE IMPROVEMENT UTILIZING THE INSTALLATION OF VERTICALLY RAMMED ENGINEERED AGGREGATE PIERS (E.A.P.'S).THE EAP LENGTHS SHALL BE DESIGNED TO TERMINATE WITHIN THE DENSE POORLY GRADED GRAVEL BEARING LAYER AS SPECIFIED BY PROJ. GEOTECH.

DENSE POORLY GRADED GRAVEL BEARING LAYER AS VERIED BY PROJ. GEOTECH.

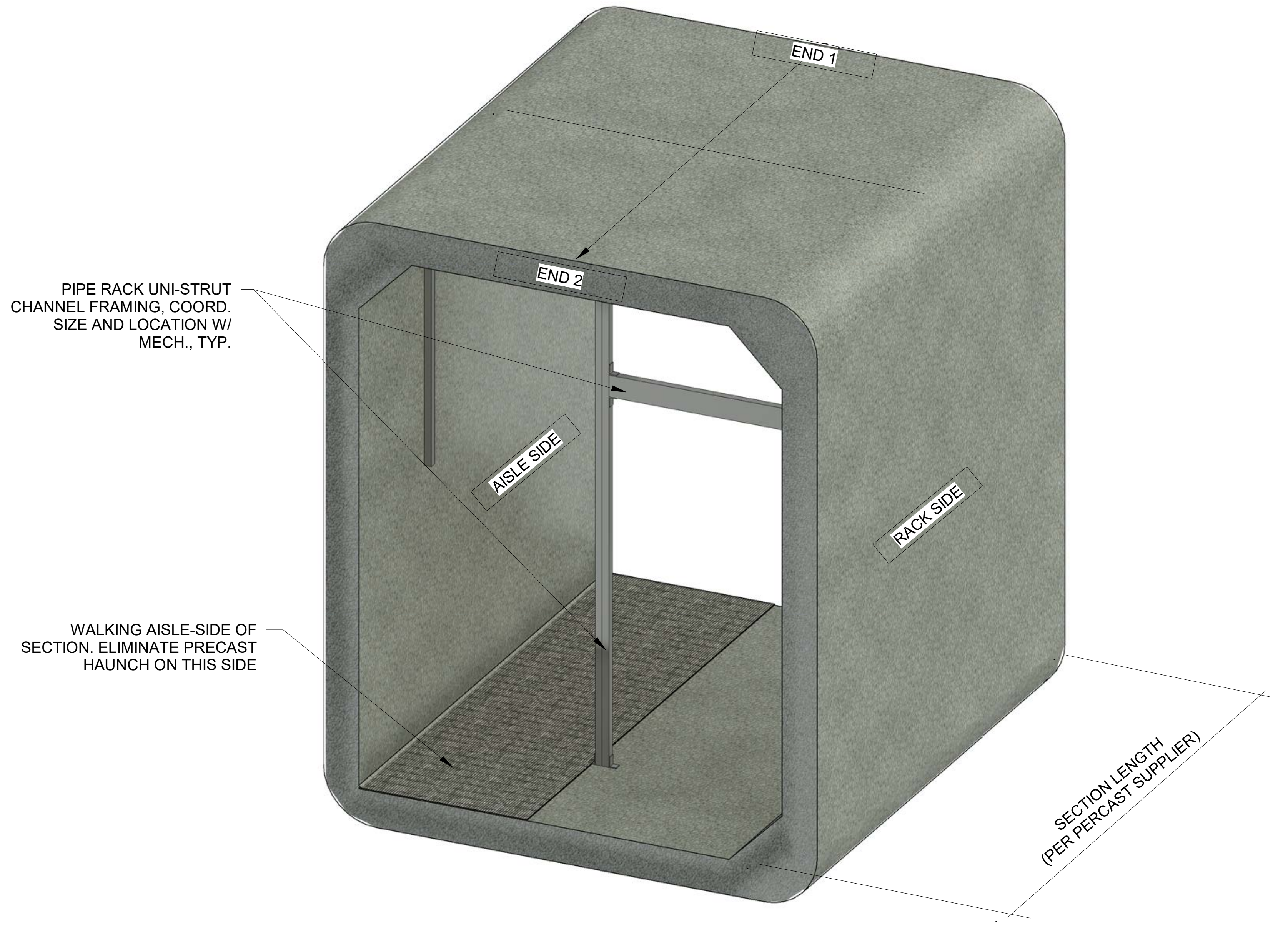
A TYP PRECAST CONC UTILITY TUNNEL SECTION

3/4" = 1'-0"

PRECAST TUNNEL SECTION TYPES

SECTION TYPE	END 1	END 2
TYPE "A"	MALE END	FEMALE END
TYPE "B"	BUTT END	FEMALE END
TYPE "C"	MALE END	BUTT END

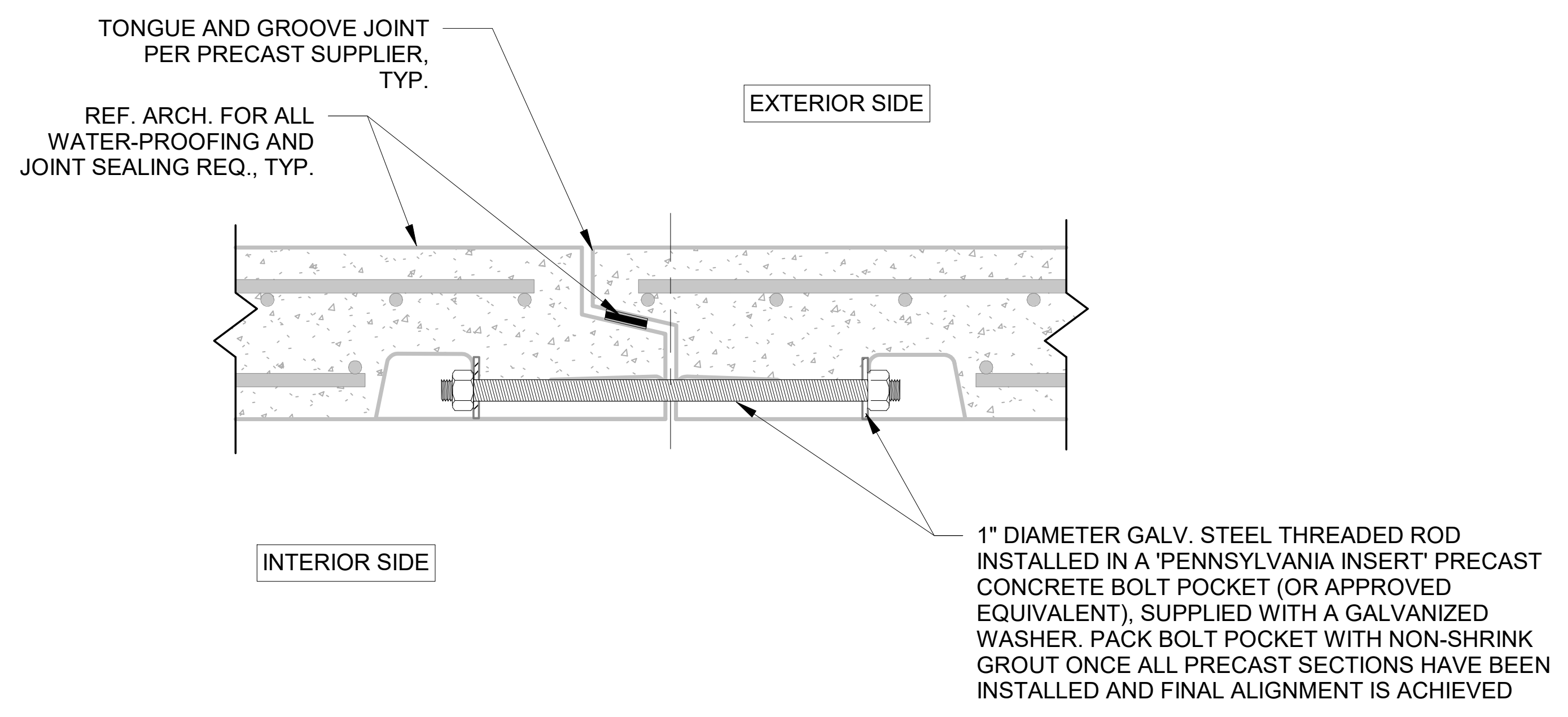
PRECAST CONCRETE TUNNEL SECTION ENDS SHALL TERMINATE IN EITHER A MALE/FEMALE TONGUE AND GROOVE PROFILE, OR A SQUARE BUTT END PROFILE. REFERENCE DETAIL 1/TS-3 FOR TUNNEL SECTION ORIENTATION CONVENTION, AND CIVIL SHEET C1.0 FOR TUNNEL SECTION GENERAL ARRANGEMENT AND LAYOUT.



PIPE RACK UNI-STRUT CHANNEL FRAMING, COORD. SIZE AND LOCATION W/ MECH., TYP.

WALKING AISLE-SIDE OF SECTION. ELIMINATE PRECAST HAUNCH ON THIS SIDE

1 TYP PRECAST CONC UTILITY TUNNEL SECTION



TONGUE AND GROOVE JOINT PER PRECAST SUPPLIER, TYP.

REF. ARCH. FOR ALL WATER-PROOFING AND JOINT SEALING REQ., TYP.

1" DIAMETER GALV. STEEL THREADED ROD INSTALLED IN A 'PENNSYLVANIA INSERT' PRECAST CONCRETE BOLT POCKET (OR APPROVED EQUIVALENT), SUPPLIED WITH A GALVANIZED WASHER. PACK BOLT POCKET WITH NON-SHRINK GROUT ONCE ALL PRECAST SECTIONS HAVE BEEN INSTALLED AND FINAL ALIGNMENT IS ACHIEVED

NOTE:
PRECAST CONCRETE BOLT POCKET ANCHORS SHALL BE CAPABLE OF RESISTING 15.0 KIPS (SERVICE LEVEL) OF AXIAL TENSION. LOCATE POCKET ANCHORS ON INTERIOR FACE OF BOTH SIDE WALLS, TUNNEL LID, AND TUNNEL FLOOR.

2 TYPICAL PRECAST SECTION JOINT DETAIL

(MALE/FEMALE ENDS REFERENCED IN DETAIL 1)

1 1/2" = 1'-0" REF: A/TS-3

FOR PRECAST CONC. BIDDING ONLY

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UTILITY TUNNEL EXTENSION
MONTANA STATE UNIVERSITY

Morrison Maierle
engineers · surveyors · planners · scientists

DRAWN BY: **BDA**
REVIEWED BY: **KDV**

REV.	DESCRIPTION	DATE

BRIAN D. ASCHIM
No.16224 PE
Brian D. Aschim

PPA#22-0006

A & E #: 22059.30

MMI #: 1552.013

SHEET TITLE
PRECAST UTILITY TUNNEL SECTION

SHEET
TS-3

DATE
3/03/23