



**Purchasing and Contract Services**

Klamath Falls: 541.885.1133 (office)  
 541.885.1215 (fax)  
 3201 Campus Drive  
 Snell Hall 112  
 Klamath Falls, OR 97601

Wilsonville: 503.821.1277 (office)  
 503.218.1126 (fax)  
 27500 SW Parkway Ave.  
 Wilsonville, OR 97070

**REQUEST FOR QUOTES (RFQ) #2015-13**

Issue Date: June 1, 2015

Project Name:	Construction Testing and Inspection Services		
Quote Due Date/Time:	Monday, June 8, 2015, 1:00 PM		
Project Coordinator:	Scott Pigman	Phone:	541-885-1225
		Email:	<a href="mailto:Scott.Pigman@oit.edu">Scott.Pigman@oit.edu</a>
Contract Coordinator:	George Marlton	Phone:	503-821-1277
		Email:	<a href="mailto:George.Marlton@oit.edu">George.Marlton@oit.edu</a>

**SUBMIT QUOTES VIA EMAIL TO [PURCHASING@OIT.EDU](mailto:PURCHASING@OIT.EDU) OR MAIL/HAND DELIVERY TO THE ABOVE WILSONVILLE ADDRESS TO GEORGE MARLTON**

**PLEASE NOTE: EMAIL SUBMISSIONS SHOULD HAVE "2015-13" IN THE SUBJECT LINE**

**1. ANNOUNCEMENT AND SPECIAL INFORMATION**

Quoters are required to read and understand and comply with all information contained within this RFQ. All quotes are binding upon Quoter for thirty (30) days from the RFQ Due Date/Time. All payments for services will be paid in accordance to OAR 580-061-0050. Quotes received after the RFQ Due Date/Time may not be considered. If authorized in the RFQ and resulting contract, travel and other expense reimbursement will only be reimbursed in accordance with the Oregon Tech Contractor's Travel Reimbursement Policy at the time the expense is incurred.

It will be the responsibility of potential Quoters to refer daily to the OUS Procurement Gateway website (<https://secure.ous.edu/bid/>) to check for any available addenda, response to clarifying questions, cancellations or other information pertaining to this Request for Quotes.

**2. SCOPE**

The purpose of this RFQ is to obtain professional construction inspection and testing services for the Oregon Tech Utility Tunnel Lid Replacement Project ("Project"). The Project is to remove and replace the existing concrete tunnel lid and also includes replacement of slab on grade, concrete walkways, stairways and asphalt paving. The successful firm shall perform all inspections and testing as specified below.

Specific requirements and tasks shall include the following:

**LABORATORY QUALIFICATIONS**

- Meet ASTM E-329 latest edition, "Standards of Recommended Practice for Inspection and Testing agencies for Concrete and Steel as used in Construction".
- Independent Laboratory acceptable to Engineer, Owner, and Building Official.

**LABORATORY DUTIES**

- Provide qualified Personnel for specified inspections, sampling, and testing.
- Ascertain and certify compliance with Contract Documents.
- When requested by Engineer or Owner, provide interpretation of Test results.

- Promptly submit written Inspection and Test Reports to:
  - Owner's Representative
  - Building Official
  - Contractor
  - Engineer
- Include the following in Each Report:
  - Date issued
  - Project title, location, and Building Permit number.
  - Testing Laboratory name and address
  - Inspector's name
  - Date of inspection or sampling
  - Record of temperature and weather
  - Date of test
  - Identification of Product tested
  - Test location in Project
  - Type of inspection or test
  - Observations regarding compliance with Contract Documents

The specific minimum required testing services, performed in accordance with the Construction Documents, current OSSC chapter 17 and the applicable ASTM Standards, laws, codes, and regulations, are as follows:

#### EARTHWORK DENSITY

- Moisture-maximum density relationship
  - Method: standard proctor ASTM D698
  - Perform (1) test aggregate sample
- In place density test
  - Method: Nuclear Gauge
  - Provide Tests for each layer of Fill and Backfill Placed in any 1 day, for Pavement Beds and for any Earthwork Construction which will support Finished Surfaces or Structures.

#### ASPHALT PAVEMENT

- Conduct 1 test for each 20,000 sq. ft., or less, of Pavement placed in any 1 day as follows:
  - Compacted Base Rock field-density using Nuclear Gauge.
  - Placement Tests to determine Asphalt-Cement content, gradation of Aggregate, Voids, Temperature, and Marshall Stability of Mix.

#### CAST IN PLACE CONCRETE TESTING

- General
  - Verify use of approved mix
  - Test Samples shall be taken at the following locations:
    - At Pumped Concrete, if any: At Pump Hose discharge end
    - At Rotary Mixer: At Mixer Chute discharge end
- Test Concrete Slump as follows:
  - Follow ASTM C-143 and C-172.
  - Prepare tests from same batch as that employed in preparing Strength-test Specimens, unless otherwise directed.
  - If Measured Slump falls outside specified limits retest immediately from another portion of same load. In event of second failure Concrete shall be considered as failing Specification requirements.
- Test Concrete Compressive Strength as follows:
  - Follow ASTM C-31, C-39, and C-172.

- Prepare not less than 5 Test Cylinders for each 50 cu. yds. or less for each strength of Concrete cast in any 1 day.
- Test-break 2 Cylinders at 7 days of age, 2 at 28 days, and remaining Cylinder if and when directed to do so.
- If any set of 2 Cylinders does not develop full design strength at 28 days of age, Cores and Load-testing may be called for. All Coring and Load-testing costs shall be paid by Contractor.
- Test Concrete Air-content as follows:
  - Follow ASTM C-231.
  - Test each Cylinder containing Air-Entrainment.

**SPECIAL INSPECTIONS**

- Concrete Reinforcement and Placement.
  - Inspect reinforcing steel in-place prior to concrete placement
  - Continuous inspection of concrete placement required.
- Epoxy dowel installation.
  - Continuous inspection of epoxy dowel installation required.

Note that Oregon Tech intends to utilize a convenient contracting method with the selected firm including Oregon Tech design contract templates.

**3. Quote**

Quotes should be short and concise with the following information:

- A. Company and proposed lead staff with experience in these types of projects;
- B. Completed Price Matrix (see below). Prices should be inclusive of all fees and expenses to complete the service.
- C. References; and
- D. Any additional information that Oregon Tech should take into consideration for the project or qualifications.

Price Matrix		
Test/Inspection Item	Unit	Unit Price
Earthwork Density		
Moisture-maximum Density Relationship Test	Per Test	
In Place Density	Per Test	
Asphalt Pavement	Per Test	
Concrete Slump Test	Per Test	
Concrete Compressive Strength Sample & Test	Per Test	
Concrete Air Content Test	Per Test	
Concrete Reinforcement & Placement Inspection	Per Hour	
Epoxy Dowel Continuous Inspection	Per Hour	

**4. Evaluation**

Quotes will be evaluated based on subjective factors including, but not limited to: Company experience, staff experience, fees, & references.

**OREGON INSTITUTE OF TECHNOLOGY  
CERTIFICATIONS  
RFQ #2015-13**

Each Quoter must read, complete and submit a copy of this Oregon Institute of Technology Certification with their Quote. Failure to do so may result in rejection of Quote. By signature on this Certification the undersigned certifies that they are authorized to act on behalf of the Quoter and that under penalty of perjury the undersigned will comply with the following:

**SECTION I. OREGON TAX LAWS**

As required in ORS 305.385(6) the undersigned hereby certifies that to the best of the undersigned's knowledge, the Entity is not in violation of any Oregon Tax Laws. For purposes of this certification, "Oregon Tax Laws" means a state tax imposed by ORS 401.792 to 401.816 and ORS chapters 118, 314, 316, 317, 318, 320, 321 and 323; the elderly rental assistance program under ORS 310.630 to 310.706; and local taxes administered by the Department of Revenue under ORS 305.620. If a Contract is executed, this information will be reported to the Internal Revenue Service. Information not matching IRS records could subject Contractor to 31% backup withholding.

**SECTION II. AFFIRMATIVE ACTION**

The undersigned hereby certifies that they have not discriminated against Minority, Women or Emerging Small Business Enterprises in obtaining any required subcontracts, pursuant to OAR 580-061-0030(3).

**SECTION III. COMPLIANCE WITH SOLICITATION**

The undersigned further agrees and certifies that they:

1. Have read, understand and agree to be bound by and comply with all requirements, instructions, specifications, terms and conditions of the RFQ (including any attachments); and
2. Are an authorized representative of the Quoter, that the information provided is true and accurate, and that providing incorrect or incomplete information may be cause for rejection of the Quote or contract termination; and
3. Will furnish the designated item(s) and/or service(s) in accordance with the RFQ and Quote.

Firm Name: \_\_\_\_\_ Date: \_\_\_\_\_  
Signature: \_\_\_\_\_ Title: \_\_\_\_\_  
Name (Type or Print): \_\_\_\_\_ Telephone: \_\_\_\_\_  
Email: \_\_\_\_\_ OR CCB # (if applicable): \_\_\_\_\_

Business Designation (check one):

Corporation  Partnership  Sole Proprietorship  Non-Profit  Limited Liability Company

Oregon Certified Minority, Women, or Emerging Small Business: (Mark if applicable and certification #)

Minority: \_\_\_\_\_  Women: \_\_\_\_\_  ESB: \_\_\_\_\_

Self-Reported Minority, Women, or Emerging Small Business: (Mark if applicable)

Minority: \_\_\_\_\_  Women: \_\_\_\_\_  ESB: \_\_\_\_\_



## OREGON INSTITUTE OF TECHNOLOGY INSTRUCTIONS TO QUOTERS

Quotes are subject to the applicable provisions and requirements of the Oregon Administrative Rules and Oregon Revised Statutes.

### QUOTE PREPARATION

1. **QUOTE FORMAT:** Quotes must be submitted as indicated in the RFQ. Quotes may be submitted in writing to Oregon Tech office via e-mail, mail or in person.
2. **CONFORMANCE TO RFQ REQUIREMENTS:** Quotes must conform to the requirements of the RFQ. Unless otherwise specified, all items quoted are to be new, unused and not remanufactured in any way. Any requested attachments must be submitted with the quote and in the required format. Quote prices must be for the unit indicated on the quote. Failure to comply with all requirements may result in quote rejection.
3. **ADDENDA:** Only documents issued as addenda by Oregon Tech serve to change the RFQ in any way. No other directions received by the Quoter, written or verbal, serve to change the RFQ document. NOTE: IF YOU HAVE RECEIVED A COPY OF THE RFQ, YOU SHOULD CONSULT THE UNIVERSITY PROCUREMENT GATEWAY WEBSITE (<https://secure.ous.edu/bid/>) TO ENSURE THAT YOU HAVE NOT MISSED ANY ADDENDA OR ANNOUNCEMENTS. QUOTERS ARE NOT REQUIRED TO RETURN ADDENDUMS WITH THEIR QUOTE. HOWEVER, QUOTERS ARE RESPONSIBLE TO MAKE THEMSELVES AWARE OF, OBTAIN AND INCORPORATE ANY CHANGES MADE IN ANY ADDENDUMS ISSUED, AND TO INCORPORATE ANY CHANGES MADE BY ADDENDUM INTO THEIR FINAL QUOTE. FAILURE TO DO SO MAY, IN EFFECT, MAKE THE QUOTER'S QUOTE NON-RESPONSIVE, WHICH MAY CAUSE THE QUOTE TO BE REJECTED.
4. **USE of BRAND or TRADE NAMES:** Any brand or trade names used by Oregon Tech in RFQ specifications are for the purpose of describing and establishing the standard of quality, performance and characteristics desired and are not intended to limit or restrict competition. Quoters may submit quotes for substantially equivalent products to those designated unless the RFQ provides that a specific brand is necessary because of compatibility requirements, etc. All such brand substitutions shall be subject to approval by Oregon Tech.
5. **PRODUCT IDENTIFICATION:** Quoters must clearly identify all products quoted. Brand name and model or number must be shown. Oregon Tech reserves the right to reject any quote when the product information submitted with the quote is incomplete.
6. **FOB DESTINATION:** Unless specifically allowed in the RFQ, ***QUOTE PRICE MUST BE F.O.B. DESTINATION with all transportation and handling charges paid by the Quoter.***
7. **DELIVERY:** Delivery time must be shown in number of calendar days after receipt of purchase order.
8. **EXCEPTIONS:** Any deviation from quote specifications, or the Oregon Institute of Technology Professional Services Contract may result in quote rejection.
9. **SIGNATURE ON QUOTE:** Quotes must be signed by an authorized representative of the Quoter. Signature on a quote certifies that the quote is made without connection with any person, firm or corporation making a quote for the same goods and/or services and is in all respects fair and without collusion or fraud. Signature on a quote also certifies that the Quoter has read and fully understands all quote specifications, and the Oregon Institute of Technology Professional Services Contract (including insurance requirements). No consideration will be given to any claim resulting from quoting without comprehending all requirements of the RFQ.
10. **QUOTE MODIFICATION:** Quotes, once submitted, may be modified in writing before the time and date set for quote closing. Any modifications should be signed by an authorized representative, and state that the new document supersedes or modifies the prior quote. Quoters may not modify quotes after quote closing time.
11. **QUOTE WITHDRAWALS:** Quotes may be withdrawn by request in writing signed by an authorized representative and received by Oregon Tech prior to quote closing time. Quotes may

also be withdrawn in person before quote closing time upon presentation of appropriate identification.

- 12. QUOTE SUBMISSION:** Quotes may be submitted by returning to Oregon Tech Purchasing and Contract Services Office in the location designated in the introduction of the RFQ via e-mail, mail or in person but no oral or telephone quotes will be accepted. Envelopes, or e-mails containing Quotes should contain the RFQ Number and RFQ Title.

### **QUOTE EVALUATION AND AWARD**

- 1. PRIOR ACCEPTANCE OF DEFECTIVE PROPOSALS:** Due to limited resources, Oregon Tech generally will not completely review or analyze quotes which fail to comply with the requirements of the RFQ or which clearly are not the best quotes, nor will Oregon Tech generally investigate the references or qualifications of those who submit such quotes. Therefore, neither the return of a quote, nor acknowledgment that the selection is complete shall operate as a representation by Oregon Tech that an unsuccessful quote was complete, sufficient, or lawful in any respect.
- 2. DELIVERY:** Significant delays in delivery may be considered in determining award if early delivery is required.
- 3. CASH DISCOUNTS:** Cash discounts will not be considered for award purposes unless stated in the RFQ.
- 4. PAYMENT:** Quotes which require payment in less than 30 days after receipt of invoice or delivery of goods, whichever is later, may be rejected.
- 5. INVESTIGATION OF REFERENCES:** Oregon Tech reserves the right to investigate references and or the past performance of any Quoter with respect to its successful performance of similar services, compliance with specifications and contractual obligations, and its lawful payment of suppliers, sub-contractors, and workers. Oregon Tech may postpone the award or execution of the contract after the announcement of the apparent successful Quoter in order to complete its investigation. Oregon Tech reserves the right to reject any quote or to reject all quotes at any time prior to Oregon Tech's execution of a contract if it is determined to be in the best interest of Oregon Tech to do so.
- 6. METHOD OF AWARD:** Oregon Tech reserves the right to make the award by item, groups of items or entire quote, whichever is in the best interest of Oregon Tech.
- 7. QUOTE REJECTION:** Oregon Tech reserves the right to reject any and all quotes.
- 8. QUOTE RESULTS:** Quoters who submit a quote will be notified of the RFQ results. Awarded quote files are public records and available for review by appointment.

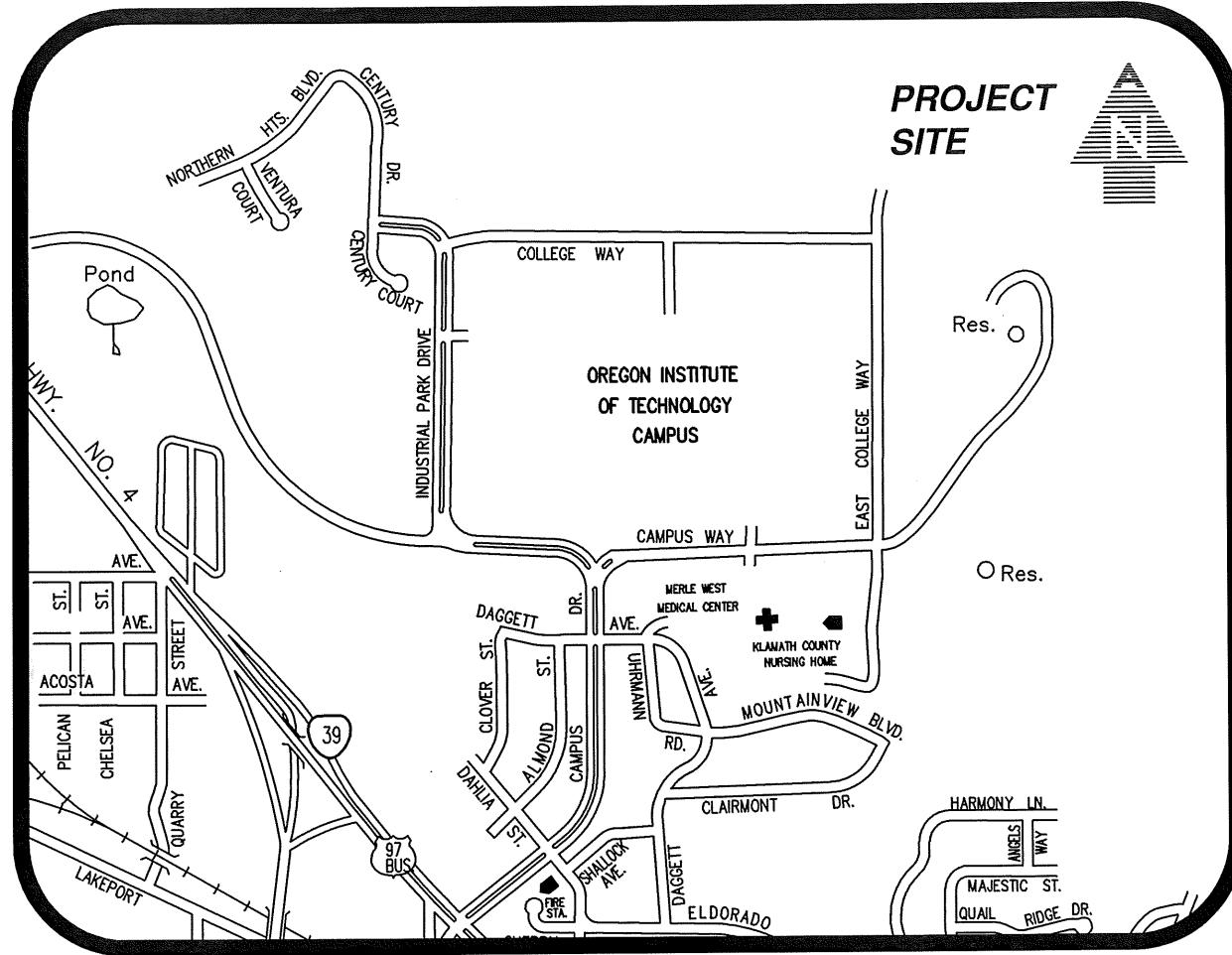
**Exhibit 1**  
**Project Description**

- 1) Plans and specifications for the construction of this project are included as Exhibit 2
- 2) This Project is expected to take approximately 4 months with Substantial Completion by September 25, 2015
- 3) The Prime Contractor for the construction of this project is Diversified Contractors, Inc. of Klamath Falls, Oregon.

# TUNNEL LID REPLACEMENT PROJECT FOR OREGON INSTITUTE OF TECHNOLOGY KLAMATH FALLS, OREGON

**LEGEND**

EXISTING	
	SEWER MANHOLE
	STORM MANHOLE
	BUILDING EDGE/OVERHANG
	STORM - AREA DRAIN
	SIDEWALK
	STAIRS/SIDEWALK/ASPHALT TO BE REMOVED
	TREE
	SHRUB
	LANDSCAPING
	STAIRS
	CURB
PROPOSED	
	STAIRS
	SIDEWALK
	ASPHALT
	SNOWMELT MANIFOLD BOX
	SIDEWALK ELEVATION
	CURB



**VICINITY MAP**  
N.T.S.

**SHEET INDEX**

SHEET CS	- COVER SHEET
SHEET C1	- KEY PLAN/SHEET INDEX
SHEET C2-2.C	- OWENS WEST TUNNEL
SHEET C3-3.B	- SNELL HALL/COLLEGE UNION TUNNEL
SHEET C4-4.A	- COLLEGE UNION (SE) TUNNEL
SHEET C5-5.A	- COLLEGE UNION (NE) TUNNEL & STAIRS
SHEET C6	- COLLEGE UNION (S) COURTYARD
SHEET C7	- CONCRETE STAIR DETAILS
SHEET C8	- CONCRETE & ASPHALT DETAILS
SHEET C9	- ADDITIVE AND ALTERNATE DETAILS

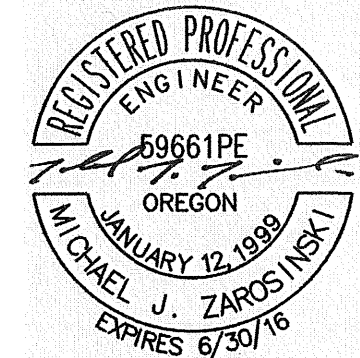
**PROJECT TEAM**

**OWNER**  
OREGON INSTITUTE OF TECHNOLOGY  
3201 CAMPUS DRIVE  
KLAMATH FALLS, OREGON 97601  
(541) 885-1600

**PROJECT ENGINEER & SURVEYOR**  
ADKINS CONSULTING ENGINEERING, LLP  
2950 SHASTA WAY  
KLAMATH FALLS, OR 97603  
(541) 884-4666

**NOTES**

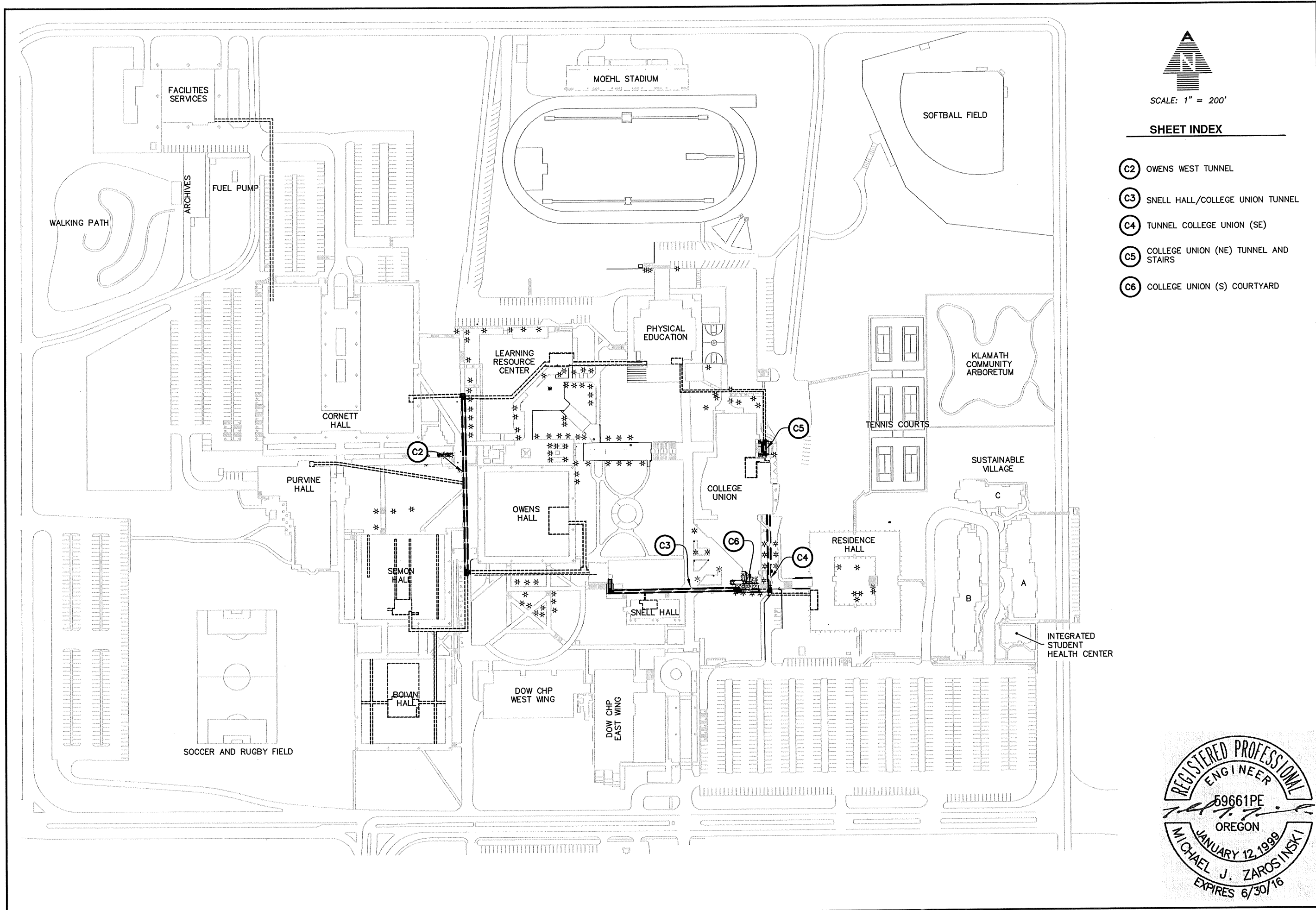
1. CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UNDERGROUND UTILITIES & STRUCTURES BY ANY MEANS AVAILABLE WITHIN THE CONSTRUCTION AREA. CONTRACTOR TO COORDINATE WITH OIT FACILITIES / MAINTENANCE STAFF.
2. PROJECT DIMENSIONS ARE APPROXIMATE ONLY AND SHALL BE FIELD VERIFIED BY CONTRACTOR. MINOR ADJUSTMENTS TO WIDTHS, ETC. SHALL BE ANTICIPATED BY THE CONTRACTOR AND ARE INCIDENTAL TO THE BID ITEM WORK.
3. CONTRACTOR TO CONSTRUCT ALL AREAS ADJACENT TO WORK AREA WITH COMPACTED NATIVE BACKFILL MATERIAL AND 12" OF TOPSOIL. THE CONTRACTOR SHALL PERFORM ALL SURFACE RESTORATION WORK AS REQUIRED TO PROVIDE SMOOTH TRANSITIONS FROM THE NEW SIDEWALKS AND STAIRS TO EXISTING GROUND WITH SLOPES 1V:4H OR FLATTER. SEED GRASS AREAS DISTURBED DURING CONSTRUCTION. CONTRACTOR SHALL KEEP DISTURBED AREA TO A MINIMUM.
4. CONTRACTOR SHALL REPAIR UNDERGROUND IRRIGATION IF DISTURBED DURING CONSTRUCTION. THIS WORK SHALL BE CONSIDERED INCIDENTAL.
5. TUNNEL AREAS EXPOSED SHALL BE SECURED DURING CONSTRUCTION TO PREVENT INTRUSION INTO TUNNEL AND BUILDING FACILITIES



TUNNEL LID REPLACEMENT PROJECT FOR OREGON INSTITUTE OF TECHNOLOGY KLAMATH FALLS, OREGON	COVER SHEET
DATE: 05-05-14 PROJECT: 1090-30 FILE: CS-C8.dwg DESIGNED BY: MJZ DRAWN BY: SJM CHECKED BY: MJZ SURVEYED BY: ACE SCALE: AS SHOWN SHEET: 1 OF 17	
CS	

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SCALE: 1" = 200'

**SHEET INDEX**

- (C2) OWENS WEST TUNNEL
- (C3) SNELL HALL/COLLEGE UNION TUNNEL
- (C4) TUNNEL COLLEGE UNION (SE)
- (C5) COLLEGE UNION (NE) TUNNEL AND STAIRS
- (C6) COLLEGE UNION (S) COURTYARD

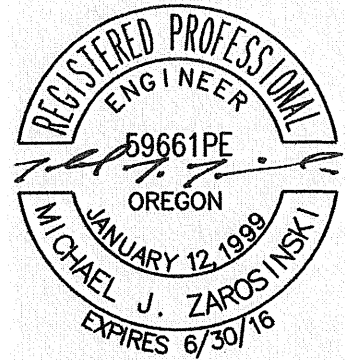
No.	REVISION	DATE	BY

TUNNEL LID REPLACEMENT PROJECT  
FOR  
OREGON INSTITUTE OF TECHNOLOGY  
KLAMATH FALLS, OREGON

**ADKINS**  
CONSULTING ENGINEERING, LLP  
2950 Sheeta Way · Klamath Falls, Oregon 97603 · (541) 884-4686 · FAX (541) 884-5335  
Oregon · California

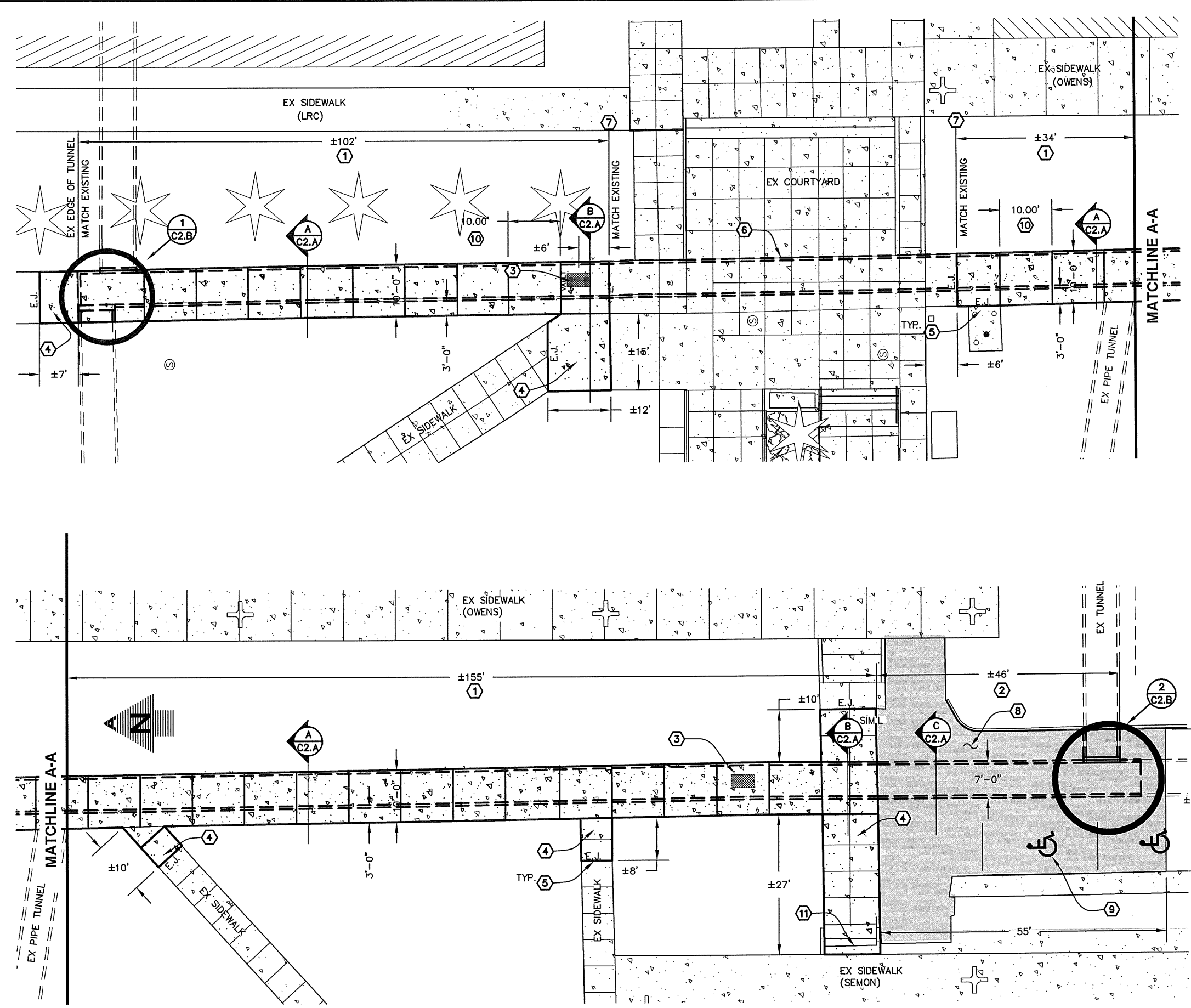
Engineers ▲ Planners ▲ Surveyors  
© 2015 ADKINS CONSULTING ENGINEERS, LLP

DATE: 05-05-14  
PROJECT: 1090-30  
FILE: CS-C8.dwg  
DESIGNED BY: JMM  
DRAWN BY: SJM  
CHECKED BY: MJZ  
SURVEYED BY: ACE  
SCALE: AS SHOWN  
SHEET: 2 OF 17



C1

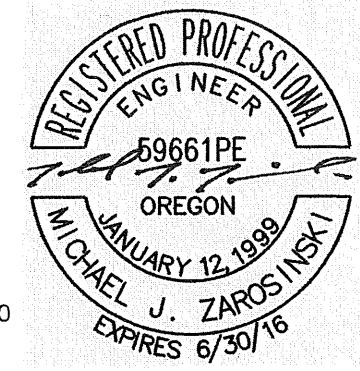
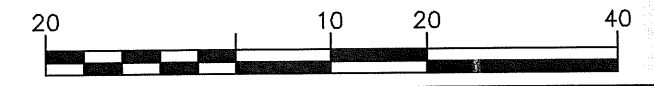
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**CONSTRUCTION NOTES**

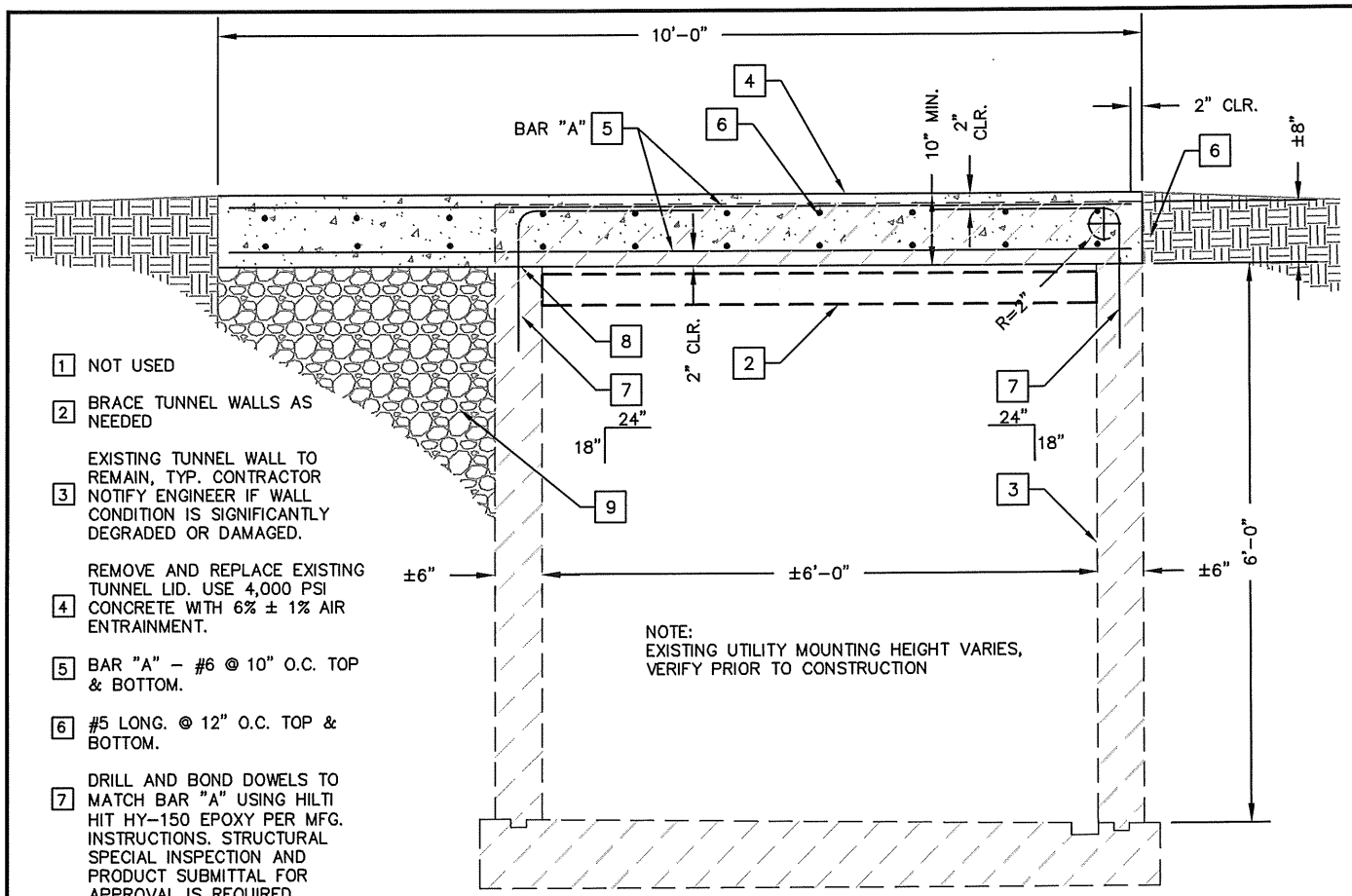
- ① REMOVE EXISTING SIDEWALK & REPLACE TUNNEL LID. PROVIDE 1" DEEP TRANSVERSE SAWCUT CONTRACTION JOINTS 10' O.C. SIMILAR TO 3/C8. FILL JOINTS WITH SEMI-RIGID SEALANT
  - ② SAWCUT AC AND REMOVE AND REPLACE EXISTING TUNNEL LID. PAVE WITH FULL-DEPTH ASPHALT TO MATCH EXISTING GRADES
  - ③ INSTALL ACCESS HATCH PER DETAIL 3/C2.B
  - ④ REMOVE AND REPLACE EXISTING SIDEWALK (SAWCUT AT EXISTING PANEL JOINTS). MODIFY GRADES AS NEEDED TO MATCH RAISED TUNNEL LID, 2% MAX SLOPE. SEE C8 FOR SIDEWALK CONSTRUCTION DETAILS (CONNECT TO EXISTING GEOTHERMAL SYSTEM). PROTECT EXISTING HANDRAIL IN PLACE (WHERE OCCURS).
  - ⑤ EXPANSION JOINT (E.J.) BETWEEN NEW AND EXISTING SIDEWALK PER DETAIL 3/C8.
  - ⑥ PROTECT EXISTING TUNNEL IN-PLACE
  - ⑦ CONNECT PROPOSED LID TO EXISTING WITH #5x2'-0" DOWELS @ 12" O.C.. EPOXY 12" INTO EXST'G SLAB, DEVELOP 12" INTO PROPOSED (SEE C2.B FOR SIMILAR DETAIL)
  - ⑧ RE-CONSTRUCT EXISTING ASPHALT PAVEMENT WITH 3" AC OVER 8" 3/4"-0" CRUSHED ROCK OVER GEOTEXTILE OVER FIRM, UNYIELDING SUBGRADE
  - ⑨ RE-STRIPE SPACES TO EXISTING CONFIGURATION WITH 4" WHITE PAINTED STRIPE AND STANDARD HANDICAP SYMBOL
  - ⑩ TRANSITION TO MATCH EXISTING TOP OF TUNNEL LID ELEVATION (REDUCE INTERIOR TUNNEL HEIGHT 2")
  - ⑪ REMOVE AND REPLACE EXISTING STAIRS, SEE SHEET C2.C
- \* - ELEVATION OF NEW LID ±2" HIGHER THAN EXISTING (U.N.O.). BACKFILL AND BLEND AS NEEDED TO MATCH EXISTING AND MAINTAIN EXISTING DRAINAGE PATTERNS. RE-SEED/VEGETATE TO RESTORE SURFACING TO EXISTING CONDITIONS.

**OWENS WEST TUNNEL LID REPLACEMENT**



<p><b>TUNNEL LID REPLACEMENT PROJECT FOR OREGON INSTITUTE OF TECHNOLOGY KLAMATH FALLS, OREGON</b></p> <p><b>OWENS WEST TUNNEL PLAN</b></p>							
<p><b>ADKINS CONSULTING ENGINEERS, LLP</b>                  2950 Shasta Way · Klamath Falls, Oregon 97603 · (541) 884-4666 · FAX (541) 884-5335                  Oregon · California</p> <p>PLANNERS ▲ SURVEYORS ENGINEERS ▲</p> <p>COPYRIGHT © 2015 ADKINS CONSULTING ENGINEERS, LLP</p>							
<p>DATE: 05-05-14                  PROJECT: 1090-30                  FILE: CS-C8DWG                  DESIGNED BY: MJZ                  DRAWN BY: MJZ                  CHECKED BY: MJZ                  SURVEYED BY: ACE                  SCALE: AS SHOWN                  SHEET: 3 OF 17</p>							
<p style="font-size: 2em; font-weight: bold;">C2</p>							

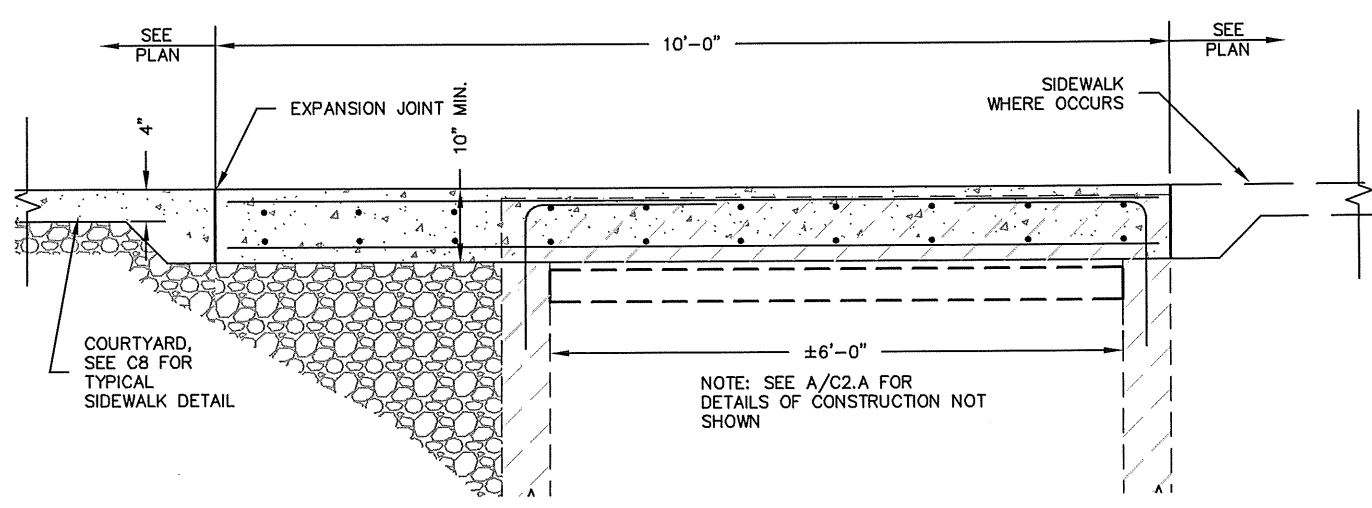




- 1 NOT USED
- 2 BRACE TUNNEL WALLS AS NEEDED
- 3 EXISTING TUNNEL WALL TO REMAIN, TYP. CONTRACTOR NOTIFY ENGINEER IF WALL CONDITION IS SIGNIFICANTLY DEGRADED OR DAMAGED.
- 4 REMOVE AND REPLACE EXISTING TUNNEL LID. USE 4,000 PSI CONCRETE WITH 6% ± 1% AIR ENTRAINMENT.
- 5 BAR "A" - #6 @ 10" O.C. TOP & BOTTOM.
- 6 #5 LONG. @ 12" O.C. TOP & BOTTOM.
- 7 DRILL AND BOND DOWELS TO MATCH BAR "A" USING HILTI HIT HY-150 EPOXY PER MFG. INSTRUCTIONS. STRUCTURAL SPECIAL INSPECTION AND PRODUCT SUBMITTAL FOR APPROVAL IS REQUIRED.
- 8 3" CONTINUOUS BEAD OF HYDROPHILIC CAULK. (SUBMIT PRODUCT FOR APPROVAL PRIOR TO CONSTRUCTION), OR EXTERIOR MOISTURE PROTECTION EXTENDING 8" BOTH SIDES OF JOINT
- 9 12" OF 3/4"-0" CRUSHED ROCK COMPACTED TO 98% OF MAX DENSITY PER ASTM D698 OVER COMPACTED, UNYIELDING SUBGRADE (USE LIGHT-WEIGHT COMPACTION EQUIPMENT ADJACENT TO STRUCTURE)

NOTE:  
EXISTING UTILITY MOUNTING HEIGHT VARIES,  
VERIFY PRIOR TO CONSTRUCTION

**A**  
TYPICAL TUNNEL SECTION OWENS WEST  
1" = 2'



**B**  
TUNNEL SECTION OWENS WEST @ SIDEWALK RE-CONSTRUCTION  
1" = 2'

**STRUCTURAL GENERAL NOTES**

**DESIGN CRITERIA**

- ALL DESIGN SHALL BE IN ACCORDANCE WITH THE 2014 OREGON STRUCTURAL SPECIALTY CODE. TUNNEL LIDS DESIGNED FOR A VEHICLE LOAD OF 80,000 LB G.V.W.
- SEISMIC DESIGN BASED ON  $S_1=0.44g$  AND  $S_{ds}=0.81g$  (SDC D), WIND DESIGN VELOCITY (3 SEC GUST) = 95 MPH EXPOSURE B

**TESTS & INSPECTIONS**

1. SPECIAL INSPECTION SHALL BE PROVIDED BY THE OWNER BASED ON THE REQUIREMENTS OF THE 2014 OREGON STRUCTURAL SPECIALTY CODE AS SUMMARIZED IN THE TABLE BELOW. THE CONTRACTOR SHALL PROVIDE A MINIMUM OF 24 HOURS NOTICE AND ACCESS FOR THE SPECIAL INSPECTOR TO PERFORM THESE INSPECTIONS.

- |  |  |
|--|--|
| <p><b>TESTS:</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> FILL COMPACTION</li> <li><input type="checkbox"/> REINFORCING STEEL</li> <li><input checked="" type="checkbox"/> CONCRETE</li> <li><input type="checkbox"/> STRUCTURAL STEEL</li> <li><input type="checkbox"/> MASONRY</li> <li><input type="checkbox"/> GROUT AND MORTAR</li> <li><input type="checkbox"/> EPOXY &amp; EXPANSION ANCHORS</li> <li><input type="checkbox"/> SHOTCRETE</li> </ul> | <p><b>INSPECTIONS:</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> GRADING, EXCAVATION, AND FILLING</li> <li><input type="checkbox"/> PILE/PIER INSTALLATION</li> <li><input checked="" type="checkbox"/> REINFORCING STEEL</li> <li><input checked="" type="checkbox"/> CONCRETE PLACEMENT</li> <li><input type="checkbox"/> SPECIAL MOMENT RESISTING CONCRETE FRAME</li> <li><input type="checkbox"/> STRUCTURAL WELDING</li> <li><input type="checkbox"/> HIGH STRENGTH BOLTING</li> <li><input type="checkbox"/> STRUCTURAL MASONRY</li> <li><input checked="" type="checkbox"/> EPOXY &amp; EXPANSION ANCHORS</li> </ul> |
|--|--|

**FOUNDATIONS**

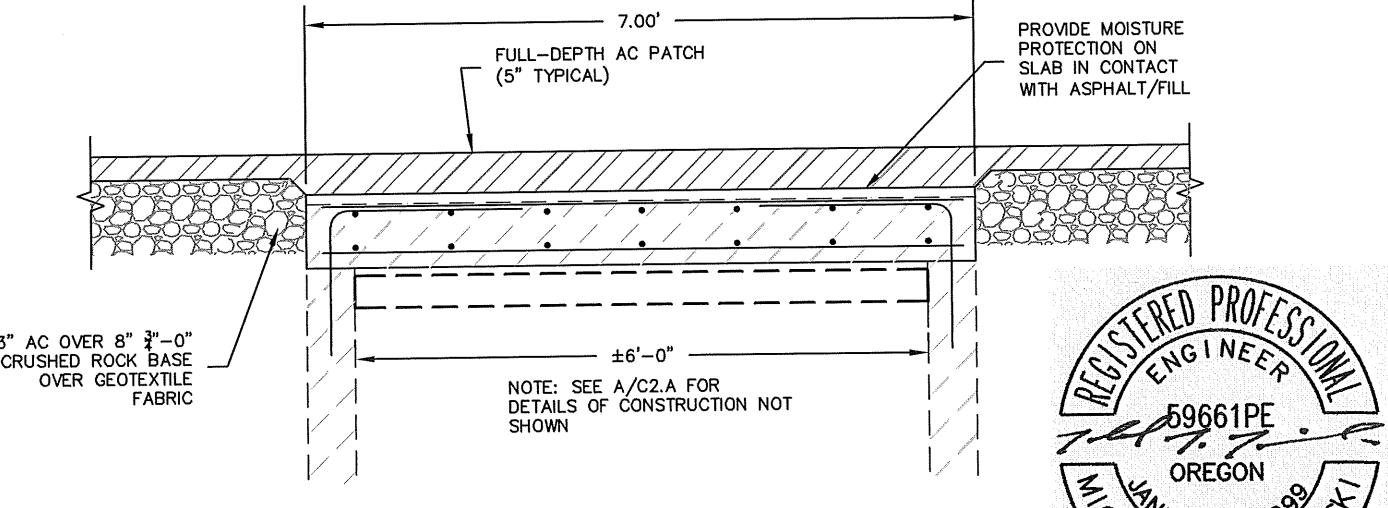
1. FOUNDATION DESIGN WAS BASED UPON A MINIMUM ALLOWABLE SOIL BEARING PRESSURE OF 1500 PSF. CONTACT ENGINEER IF SOFT AND UNSUITABLE MATERIALS ARE ENCOUNTERED.

**CONCRETE**

- ALL CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 5000 P.S.I. AT 28 DAYS. CEMENT SHALL CONFORM TO ASTM C 150 (TYPE I OR II), MAX AGGREGATE SIZE SHALL BE 3/4", MAX W/C RATIO SHALL BE 0.45, AND AIR CONTENT OF MIX SHALL BE 6%.
- ALL SAW CUTTING SHALL BE DONE AFTER INITIAL SET HAS OCCURRED TO AVOID TEARING OR DAMAGE BY THE SAWBLADE, BUT BEFORE INITIAL SHRINKAGE HAS OCCURRED.
- BOND NEW CONCRETE TO OLD BY ROUGHENING EXISTING SURFACE AND TREATING W/"WELD-CRETE" (O.A.E.)

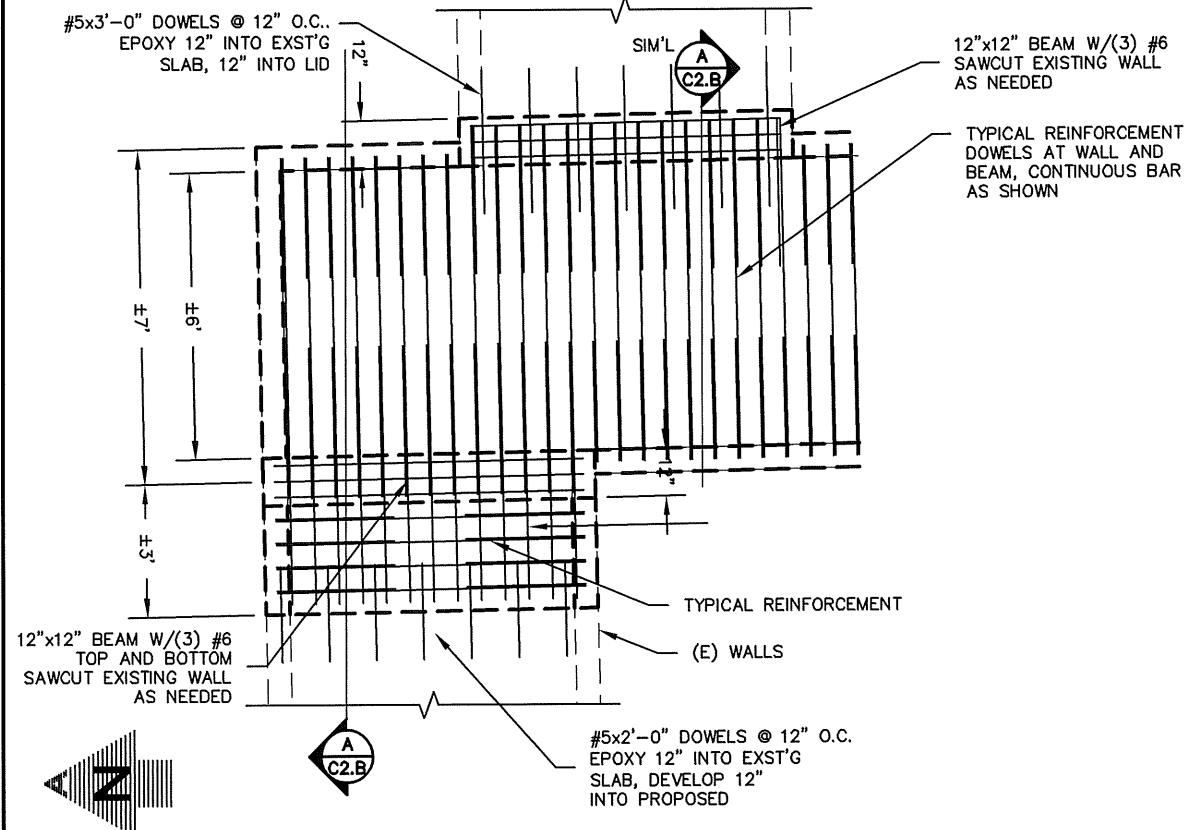
**REINFORCING STEEL**

- REINFORCEMENT SHALL CONSIST OF GRADE 60 BARS, CONFORMING TO THE REQUIREMENTS OF ASTM A 615. PRIOR TO PLACEMENT, REINFORCEMENT SHALL BE FREE FROM LOOSE OR FLAKY RUST AND MILL SCALE, EXCEPT TIGHT MILL SCALE, OR ANY OTHER COATING WHICH MIGHT REDUCE THE BOND TO CONCRETE.
- ALL REINFORCING STEEL TO BE PREHEATED OR WELDED SHALL CONFORM TO ASTM A 706 & AWS D1.4 LATEST EDITION GRADE 60 AND SHALL BE CONTINUOUSLY INSPECTED BY A QUALIFIED LABORATORY. CONTRACTOR SHALL FURNISH TO THE LABORATORY, REBAR MILL CERTIFICATES.
- REINFORCING STEEL SHALL BE FABRICATED ACCORDING TO "MANUAL OF STANDARD PRACTICE FOR REINFORCED CONCRETE CONSTRUCTION".
- DIMENSIONS SHOWN FOR LOCATION OF REINFORCING ARE TO THE FACE OF MAIN BARS AND DENOTE CLEAR COVERAGE. CONCRETE COVERAGE SHALL BE 3" FROM SOIL, 2" TYPICAL UNLESS OTHERWISE NOTED ON PLANS

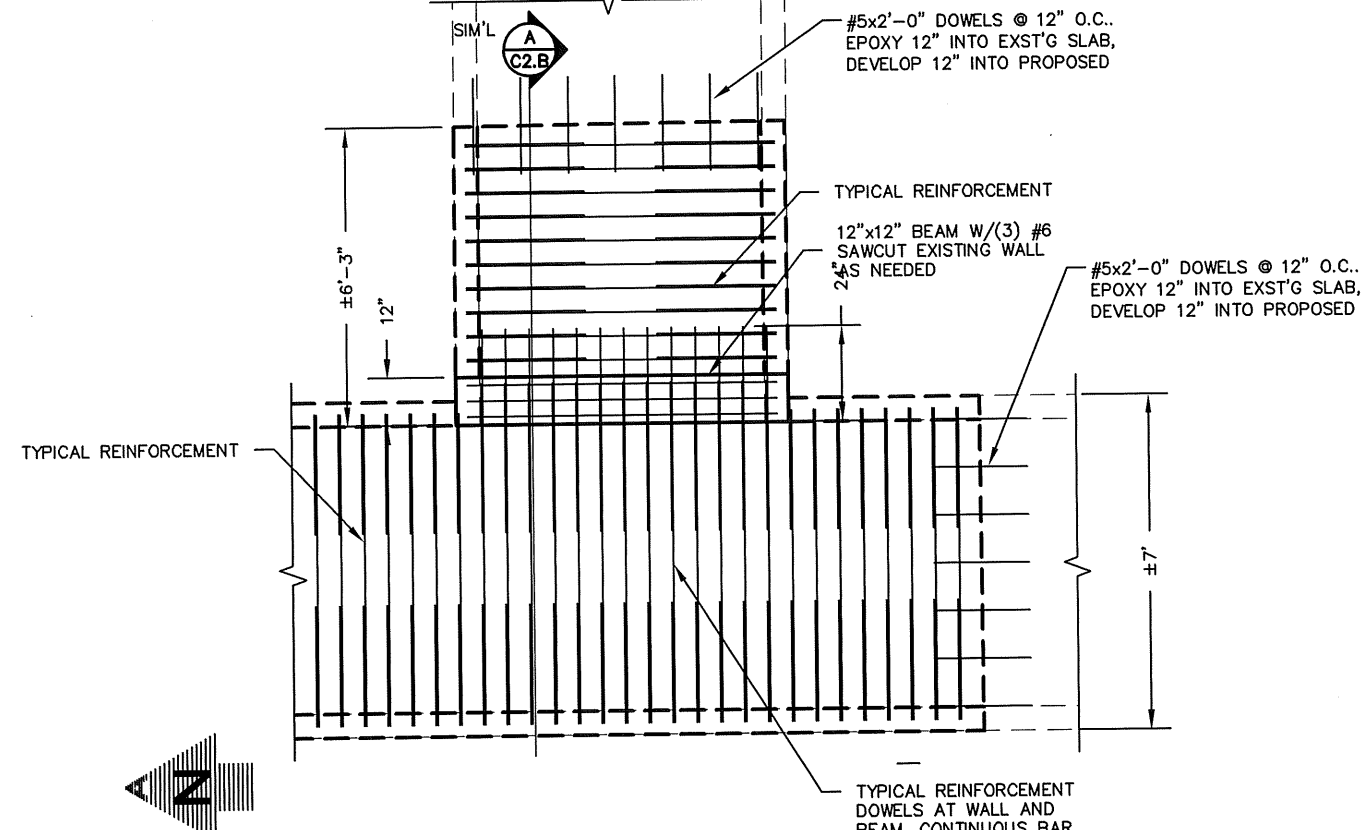


**C**  
TUNNEL SECTION OWENS WEST @ AC PAVING  
1" = 2'

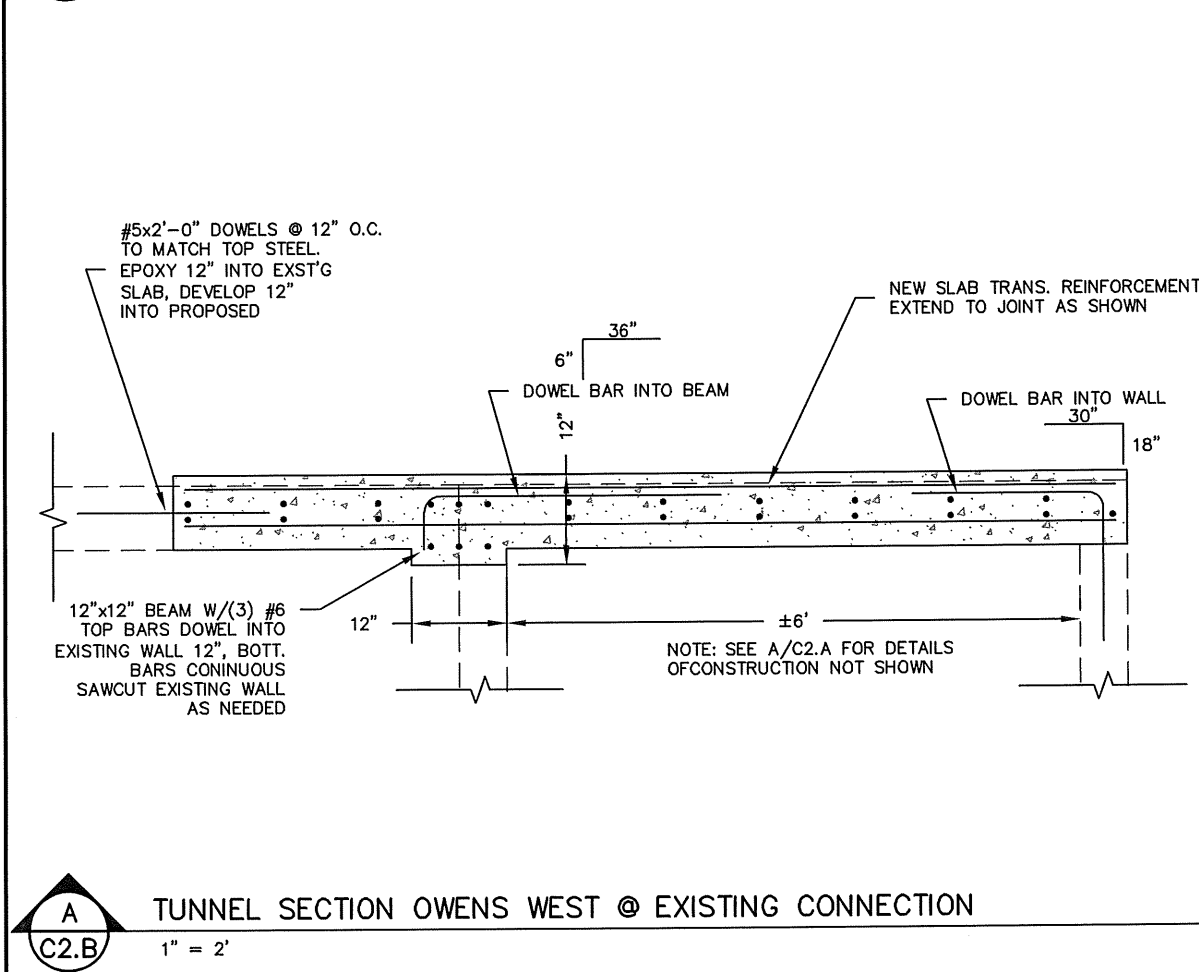
<p>TUNNEL LID REPLACEMENT PROJECT FOR OREGON INSTITUTE OF TECHNOLOGY KLAMATH FALLS, OREGON</p>	<p>OWENS WEST TUNNEL SECTIONS</p>
<p><b>ADKINS</b> CONSULTING ENGINEERING, LLP 2850 Shasta Way - Klamath Falls, Oregon 97603 · (541) 884-4686 · FAX (541) 884-5335 Oregon · California</p>	
<p>Engineers ▲ Planners ▲ Surveyors © 2015 ADKINS CONSULTING ENGINEERS, LLP</p>	
<p>DATE: 05-05-14 PROJECT: 1090-30 FILE: CS-C8.DWG DESIGNED BY: MJZ DRAWN BY: MJZ CHECKED BY: MJZ SURVEYED BY: ACE SCALE: AS SHOWN SHEET: 4 OF 17</p>	
<p>REGISTERED PROFESSIONAL ENGINEER 59661PE OREGON MICHAEL J. ZAROSINSKI JANUARY 12, 1999 EXPIRES 6/30/16</p>	
<p>C2.A</p>	



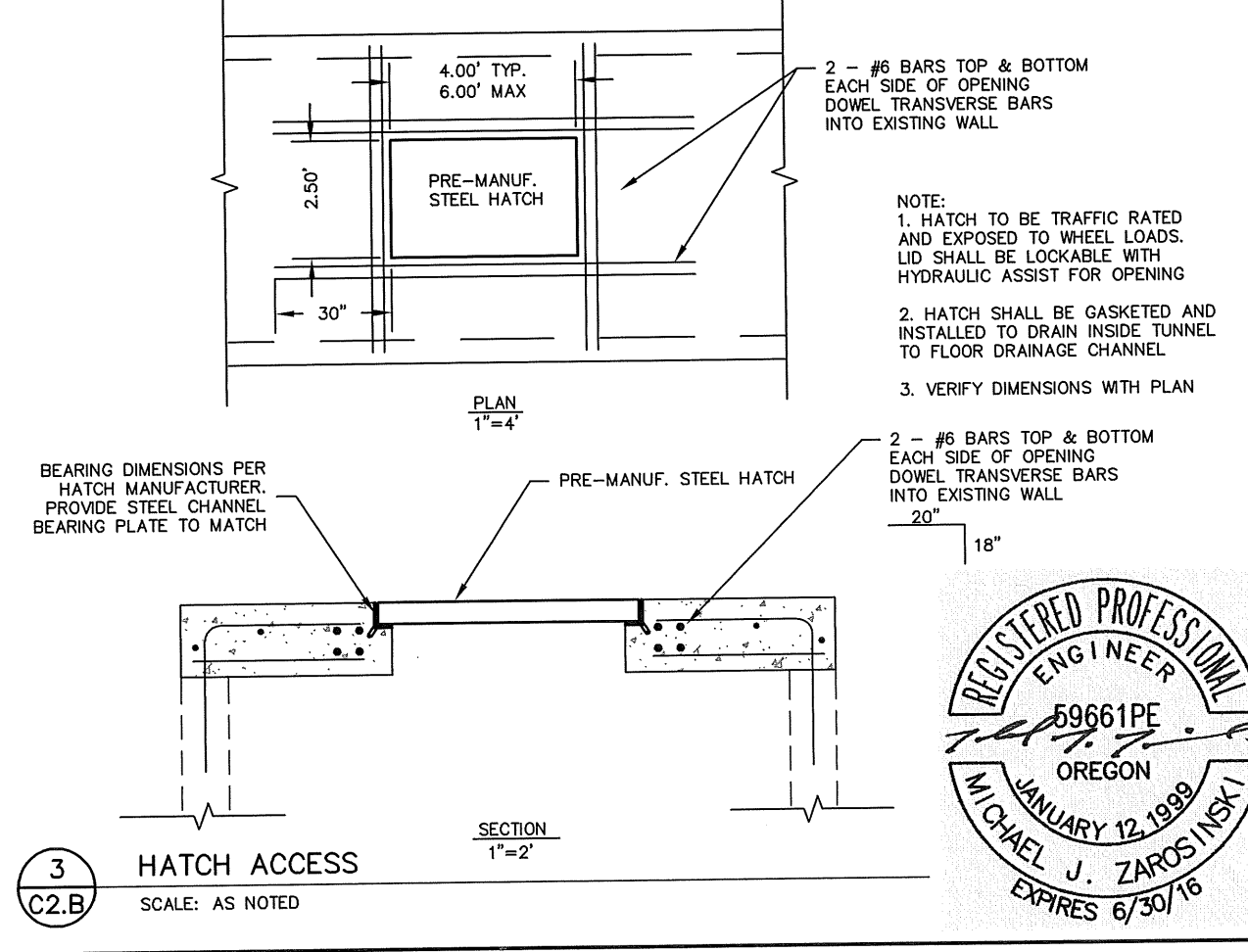
**1**  
C2.B NORTH END TUNNEL CONNECTION (PLAN)  
1" = 4'



**2**  
C2.B SOUTH END TUNNEL CONNECTION (PLAN)  
1" = 4'



**A**  
C2.B TUNNEL SECTION OWENS WEST @ EXISTING CONNECTION  
1" = 2'



**3**  
C2.B HATCH ACCESS  
SCALE: AS NOTED

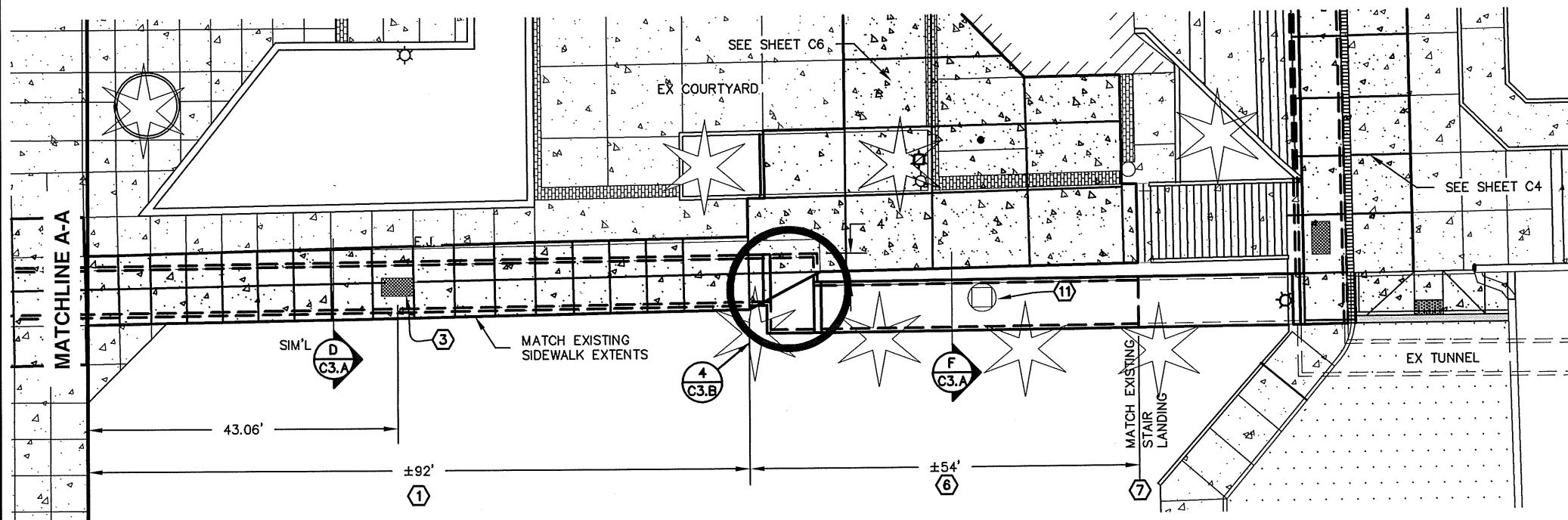
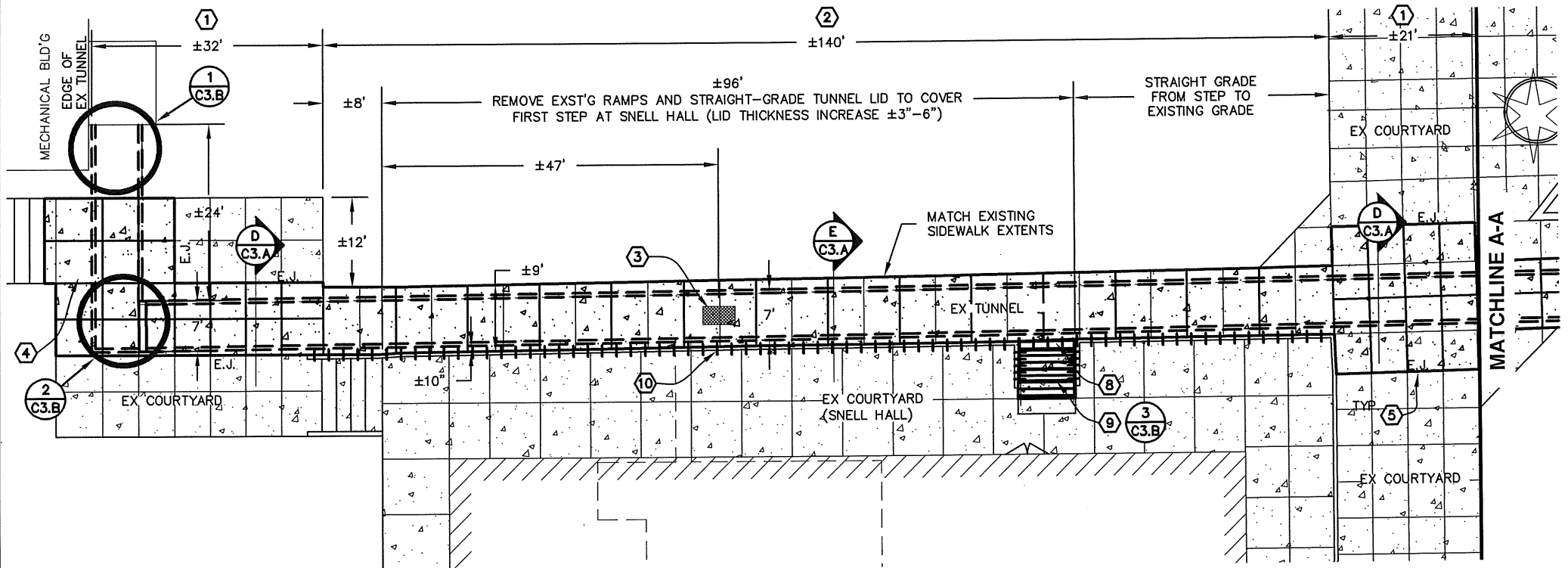
TUNNEL LID REPLACEMENT PROJECT FOR OREGON INSTITUTE OF TECHNOLOGY KLAMATH FALLS, OREGON		REVISION	DATE	BY
OWENS WEST TUNNEL DETAILS		No.		
<b>ADKINS</b> CONSULTING ENGINEERING, LLP Engineers Planners Surveyors 2950 Sheeta Way - Klamath Falls, Oregon 97603 - (541) 884-4686 - FAX (541) 884-5335 Oregon California		COPYRIGHT © 2015 ADKINS CONSULTING ENGINEERS, LLP		
DATE: 05-05-14 PROJECT: 1090-30 FILE: CS-C8.DWG DESIGNED BY: MJZ DRAWN BY: MJZ CHECKED BY: MJZ SURVEYED BY: ACE SCALE: AS SHOWN SHEET: 5 OF 17		<b>REGISTERED PROFESSIONAL ENGINEER</b> 59661PE OREGON MICHAEL J. ZAROSINSKI JANUARY 12, 1999 EXPIRES 6/30/16		
<b>C2.B</b>				

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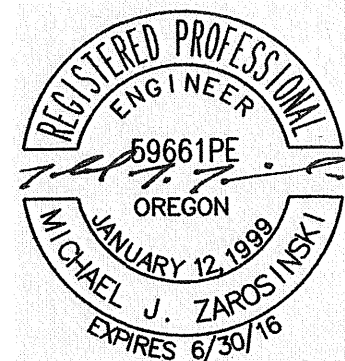
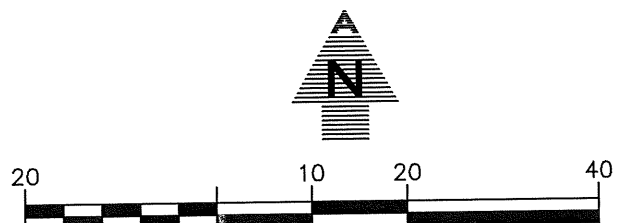


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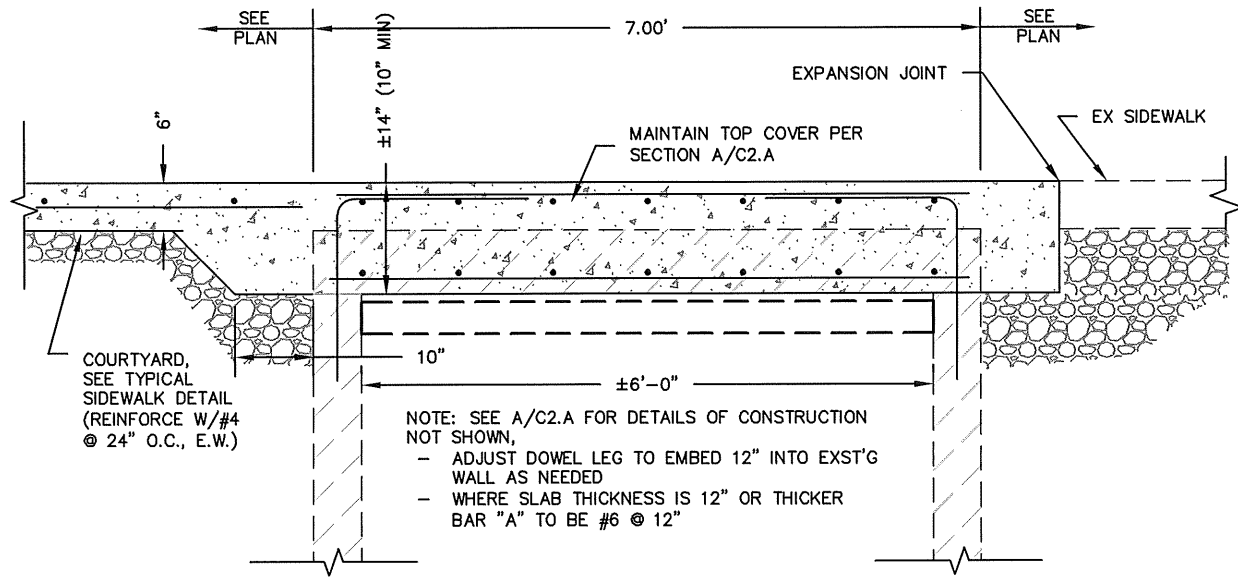
- CONSTRUCTION NOTES**
- ① REMOVE EXISTING COURTYARD & REPLACE TUNNEL LID. PROVIDED THICKENED TUNNEL LID TO MATCH EXISTING GRADES. PROVIDE CONTRACTION JOINTS IN LID TO MATCH EXISTING PATTERN, SIMILAR TO 3/C8. FILL JOINTS WITH SEMI-RIGID SEALANT
  - ② REMOVE EXISTING SIDEWALK & REPLACE TUNNEL LID. PROVIDED THICKENED TUNNEL LID TO MATCH PROPOSED GRADES. PROVIDE CONTRACTION JOINTS IN LID TO MATCH EXISTING PATTERN, SIMILAR TO 3/C8. FILL JOINTS WITH SEMI-RIGID SEALANT. PROTECT EXISTING RETAINING WALL IN-PLACE.
  - ③ INSTALL ACCESS HATCH PER DETAIL 3/C2.B
  - ④ REMOVE AND REPLACE EXISTING SIDEWALK (SAWCUT AT EXISTING PANEL JOINTS). MODIFY GRADES AS NEEDED TO MATCH RAISED TUNNEL LID, 2% MAX SLOPE. SEE C8 FOR SIDEWALK CONSTRUCTION DETAILS (CONNECT TO EXISTING GEOTHERMAL SYSTEM)
  - ⑤ EXPANSION JOINT (E.J.) BETWEEN NEW AND EXISTING SIDEWALK PER DETAIL 3/C8.
  - ⑥ REPLACE TUNNEL LID (RESTORE SURFACE CONDITIONS TO EXISTING). PROTECT EXISTING TREES IN-PLACE
  - ⑦ CONNECT PROPOSED LID TO EXISTING WITH #5x2'-0" DOWELS @ 12" O.C. EPOXY 12" INTO EXST'G SLAB, DEVELOP 12" INTO PROPOSED (SEE C2.B FOR SIMILAR DETAIL)
  - ⑧ FINAL GRADE AT STAIRS RAISED TO MATCH FIRST EXISTING STEP HEIGHT
  - ⑨ REMOVE AND REPLACE EXISTING STAIRS (SEE 3/C3.B). PROTECT EXISTING WALL AND GUARD RAIL IN-PLACE
  - ⑩ DOWEL TUNNEL TO RETAINING WALL, SEE SECTIONS
  - ⑪ REMOVE EXISTING STORM DRAIN (DO NOT REPLACE)
- NOTE:  
COORDINATE EXTENTS OF OF SIDEWALK/COURTYARD REMOVAL AND REPLACEMENT IN FIELD WITH ENGINEER AND OIT STAFF. GRIND EXISTING PANEL EDGES AS NEEDED TO BE FLUSH WITH NEW CONSTRUCTION.

**SNELL HALL/COLLEGE UNION TUNNEL LID REPLACEMENT**

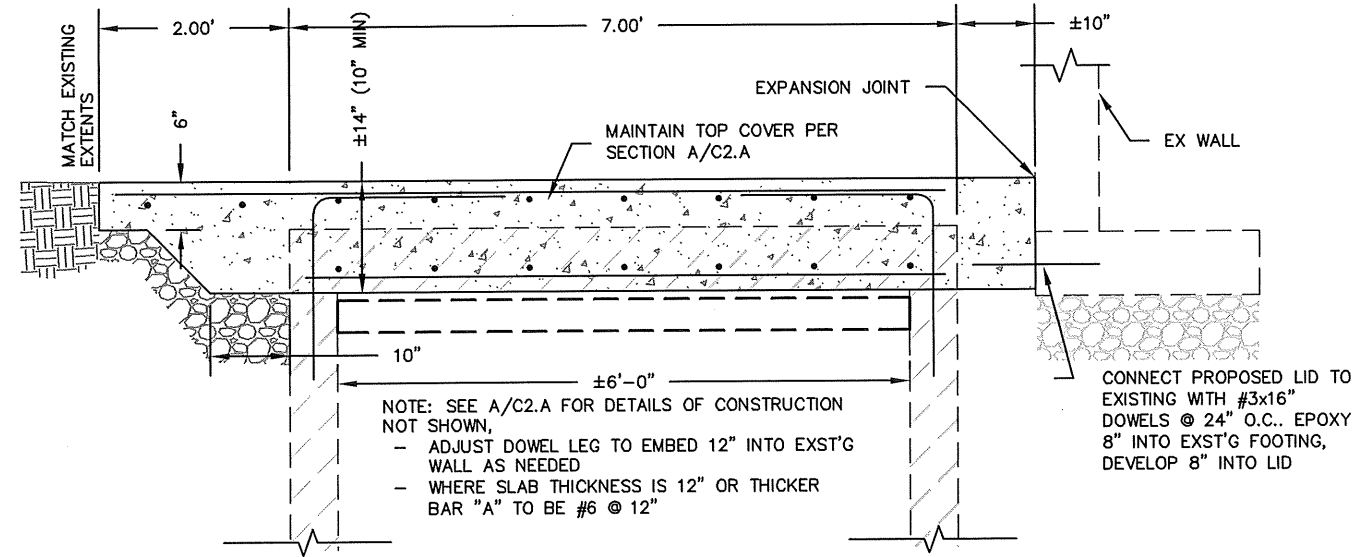


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TUNNEL LID REPLACEMENT PROJECT FOR OREGON INSTITUTE OF TECHNOLOGY KLAMATH FALLS, OREGON		SNELL HALL/C.U. TUNNEL PLAN	
DATE:	05-05-14	PROJECT:	1090-30
FILE:	CS-C8.DWG	DESIGNED BY:	MJZ
DRAWN BY:	MJZ	CHECKED BY:	MJZ
SURVEYED BY:	ACE	SCALE:	AS SHOWN
SHEET:	7 OF 17		

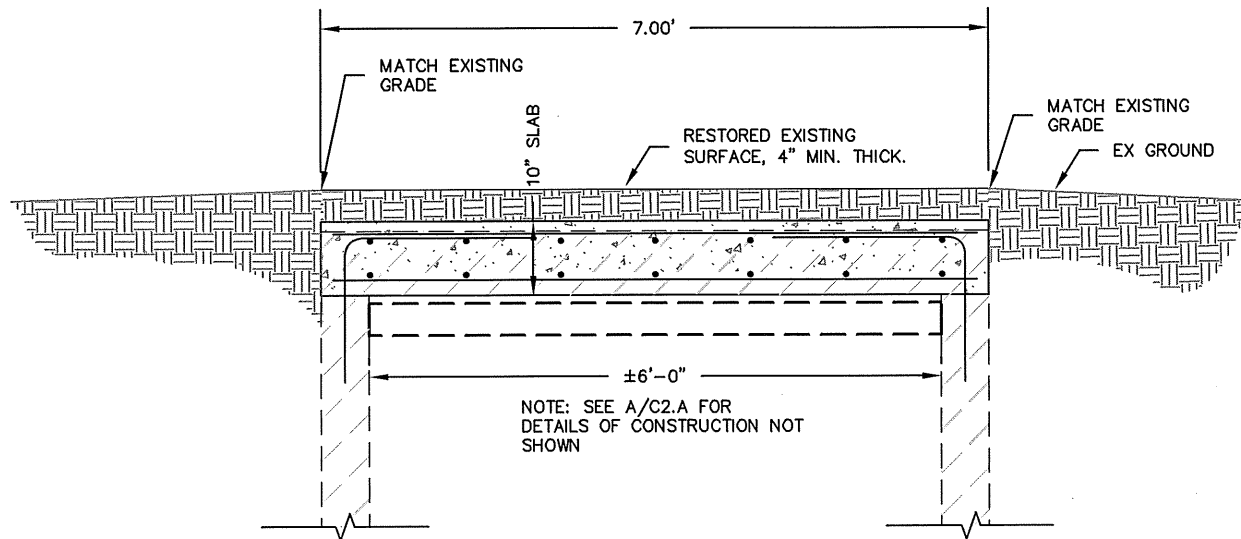
**C3**



**D** TUNNEL SECTION AT COURTYARD  
 C3.A 1" = 2'



**E** TUNNEL SECTION AT SNELL HALL  
 C3.A 1" = 2'



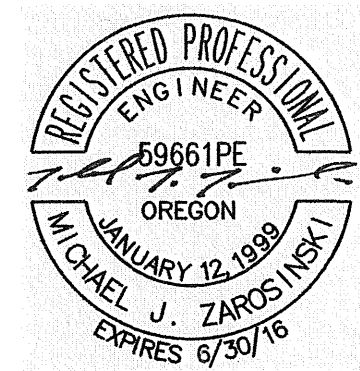
**F** TUNNEL SECTION AT LANDSCAPING  
 C3.A 1" = 2'

No.	REVISION	DATE	BY

TUNNEL LID REPLACEMENT PROJECT  
 FOR  
 OREGON INSTITUTE OF TECHNOLOGY  
 KLAMATH FALLS, OREGON  
**SNELL HALL/C.U. TUNNEL SECTIONS**

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SHEET:	8 OF 17



**C3.A**

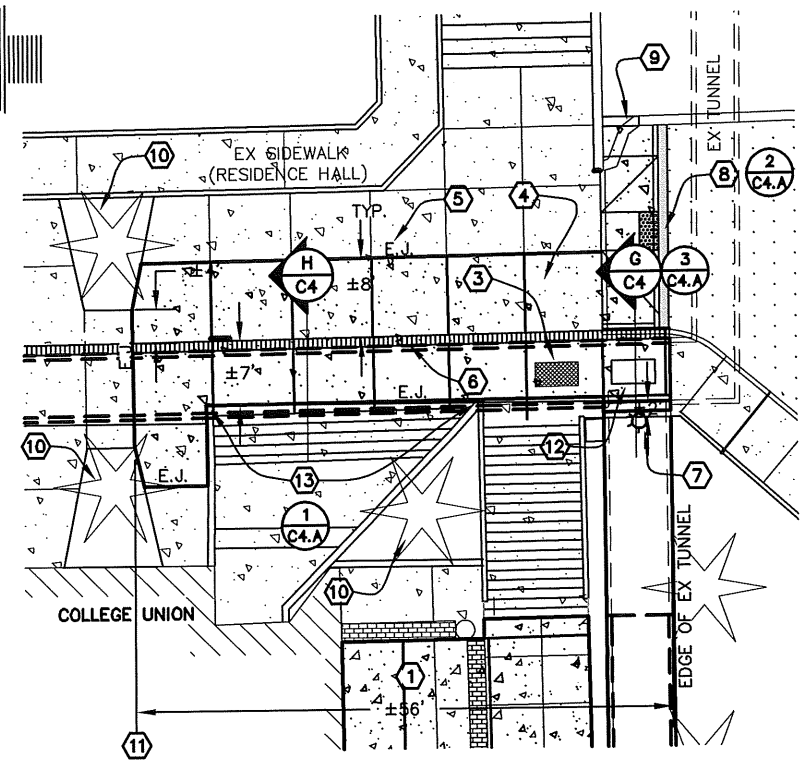
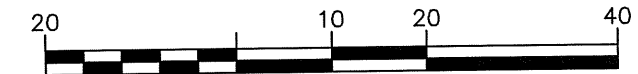
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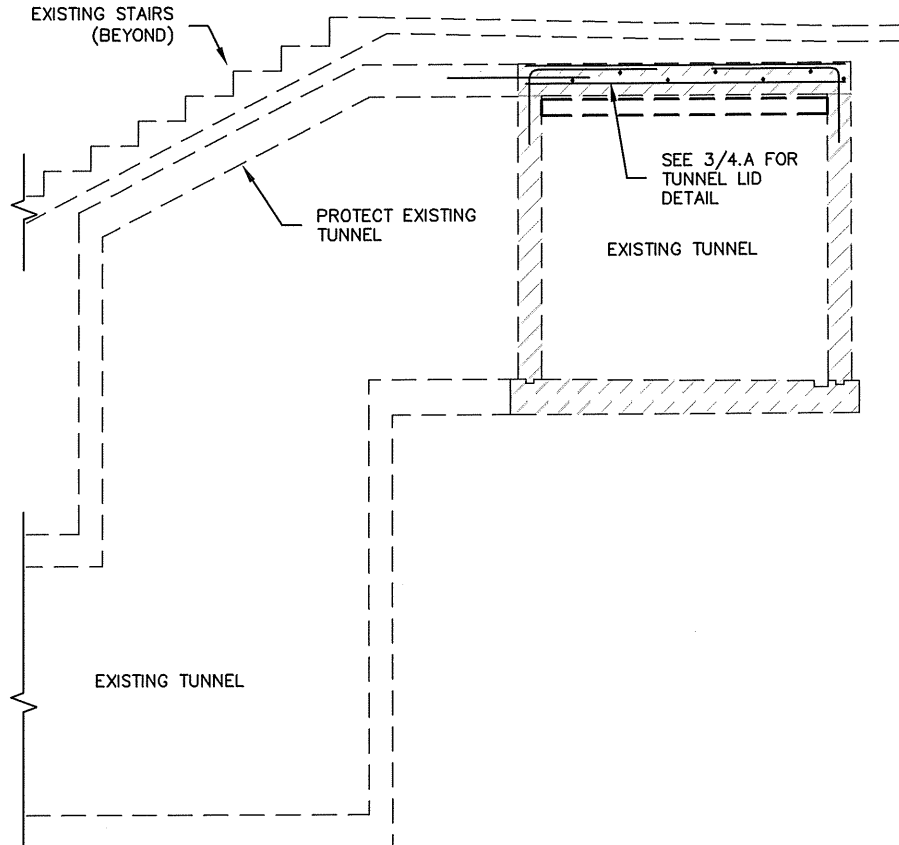
**CONSTRUCTION NOTES**

- 1 REMOVE EXISTING COURTYARD & REPLACE TUNNEL LID. PROVIDED THICKENED TUNNEL LID TO MATCH EXISTING GRADES. PROVIDE CONTRACTION JOINTS IN LID TO MATCH EXISTING PATTERN, SIMILAR TO 3/C8. FILL JOINTS WITH SEMI-RIGID SEALANT
- 2 NOT USED
- 3 INSTALL ACCESS HATCH PER DETAIL 3/C2.B
- 4 REMOVE AND REPLACE EXISTING SIDEWALK (SAWCUT AT EXISTING PANEL JOINTS). MODIFY GRADES AS NEEDED TO MATCH RAISED TUNNEL LID, 2% MAX SLOPE. SEE C8 FOR SIDEWALK CONSTRUCTION DETAILS (CONNECT TO EXISTING GEOTHERMAL SYSTEM AT STAIR JUNCTION BOX)
- 5 EXPANSION JOINT (E.J.) BETWEEN NEW AND EXISTING SIDEWALK PER DETAIL 3/C8.
- 6 REMOVE AND REPLACE TRENCH DRAIN PER (SEE H/C.4). MATCH EXISTING GRADES, PROTECT EXISTING SUMP & ALL OTHER DRAINAGE FEATURES)
- 7 PROTECT EXISTING LIGHT IN-PLACE
- 8 CONSTRUCT SIDEWALK, H/C RAMP, C&G, PAVEMENT PATCH AND ALL OTHER INCIDENTAL ITEMS AS SHOWN
- 9 RE-CONSTRUCT EX CONCRETE SEGMENTAL RETAINING WALL AS SHOWN
- 10 PROTECT EXISTING TREE
- CONNECT PROPOSED LID TO EXISTING WITH #5x2'-0" DOWELS @ 12" O.C.. EPOXY 12" INTO EXST'G SLAB, DEVELOP 12" INTO PROPOSED (SEE C2.B FOR SIMILAR DETAIL)
- 12 EXISTING HATCH TO BE RELOCATED
- 13 COORDINATE REMOVAL OF EXISTING FOOTINGS THRU TUNNEL IN FIELD W/ENGINEER (RE-CONSTRUCT FIRST STEP AS NEEDED)

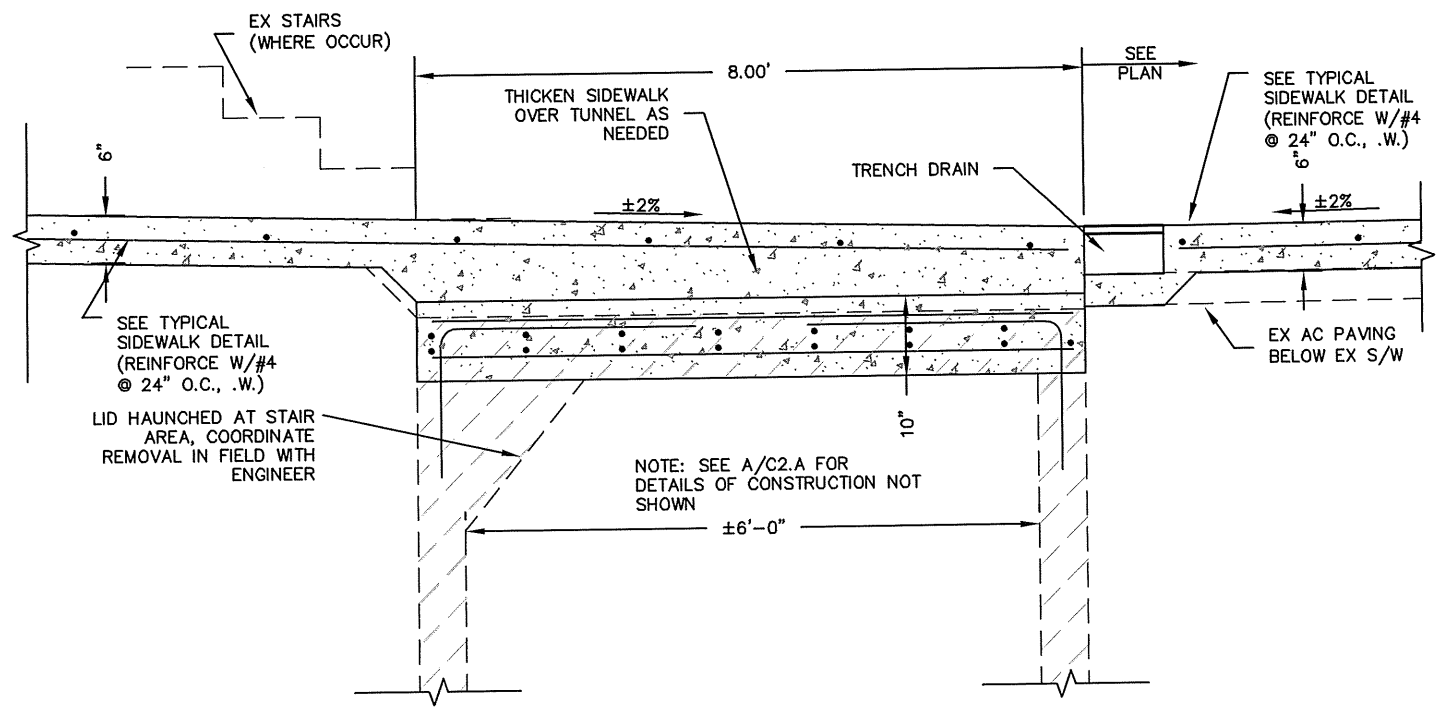
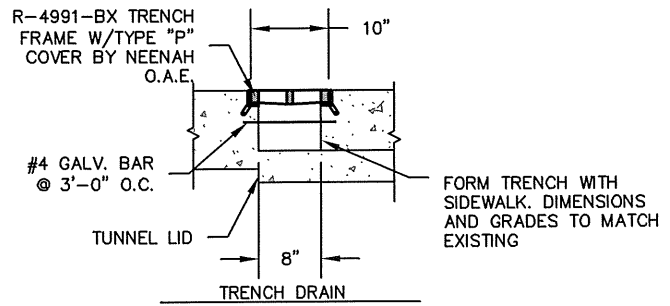
NOTE: PROVIDE PROTECTED ACCESS FOR PEDESTRIAN ACCESS FROM RESIDENCE HALL TO SIDEWALK DURING CONSTRUCTION



**COLLEGE UNION TUNNEL (SE) LID REPLACEMENT**



**G SECTION AT STAIRS**  
1" = 4'



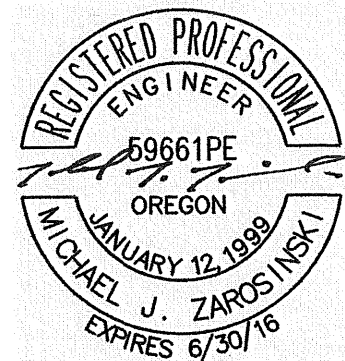
**H TYPICAL TUNNEL SECTION AT STAIRS**  
1" = 2'

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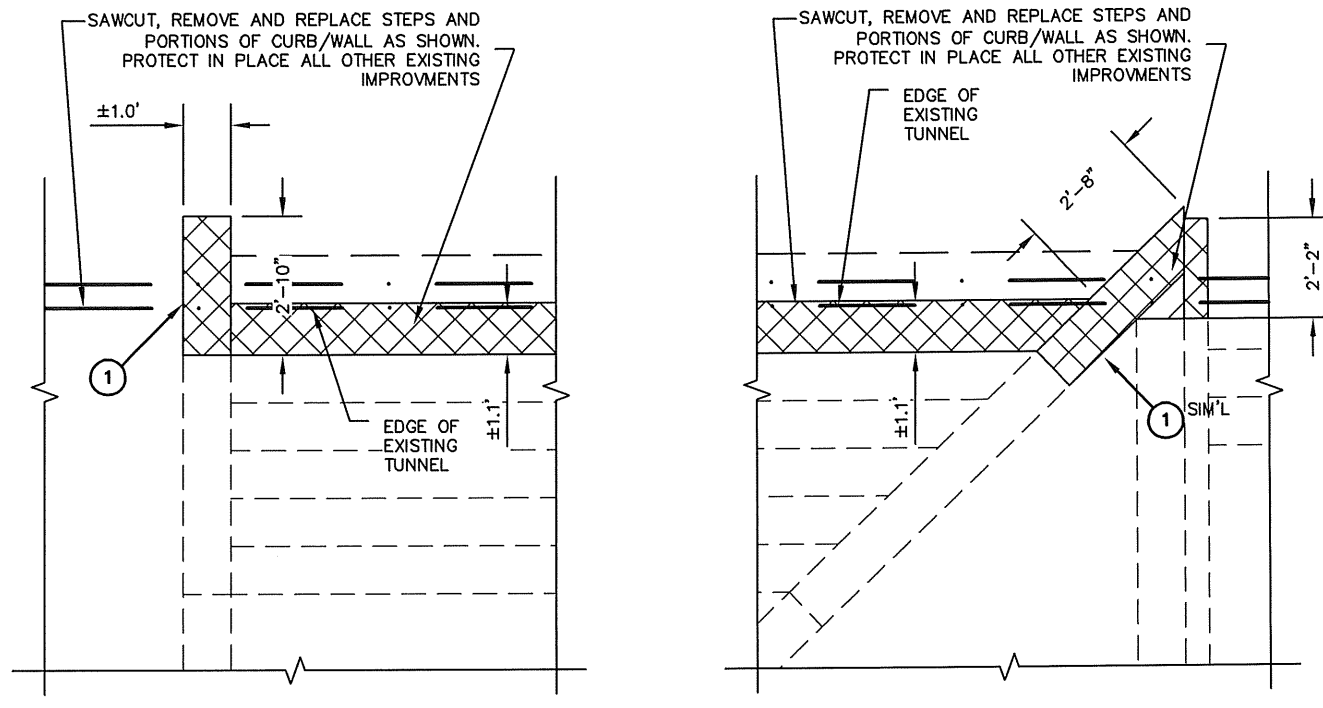
TUNNEL LID REPLACEMENT PROJECT FOR  
OREGON INSTITUTE OF TECHNOLOGY  
KLAMATH FALLS, OREGON  
**COLLEGE UNION (SE) TUNNEL PLAN**

**ADKINS**  
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Oregon California  
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SHEET: 10 OF 17

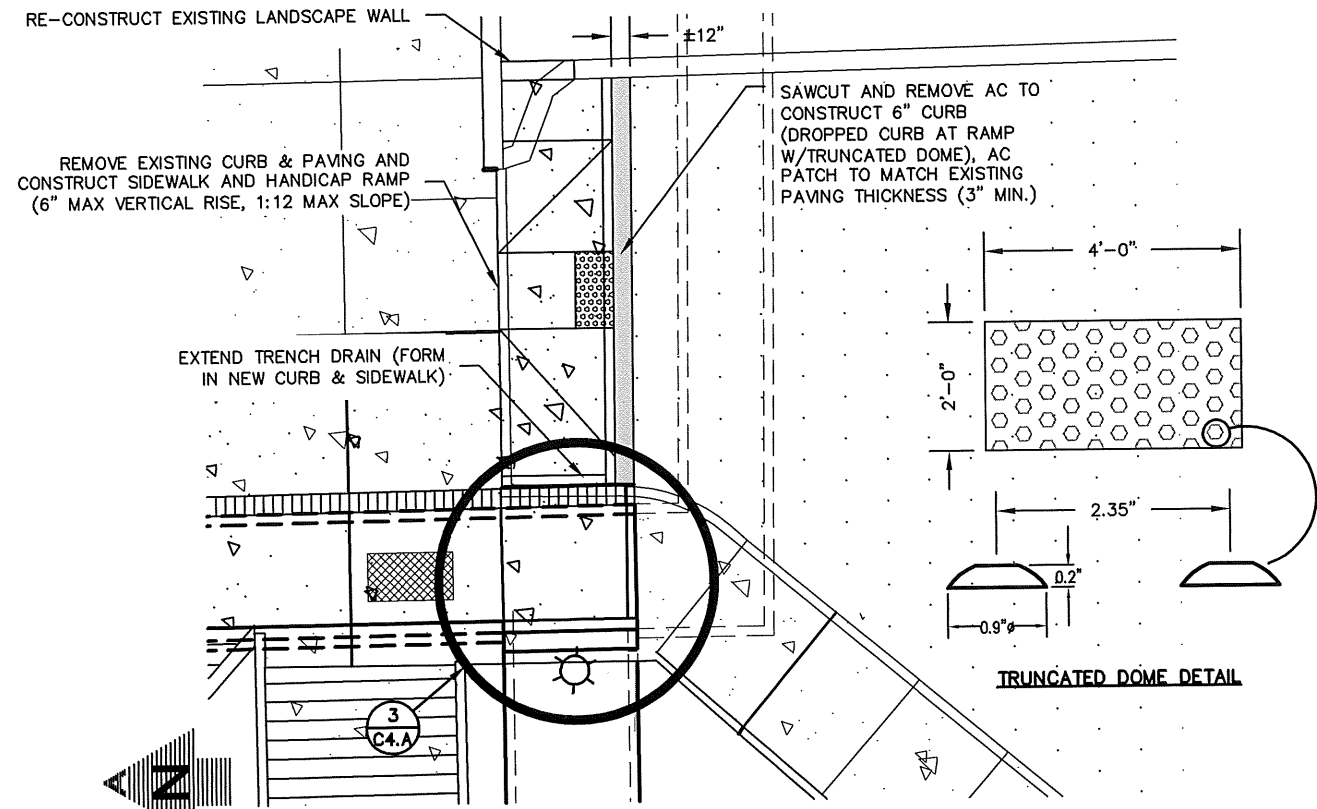


**C4**



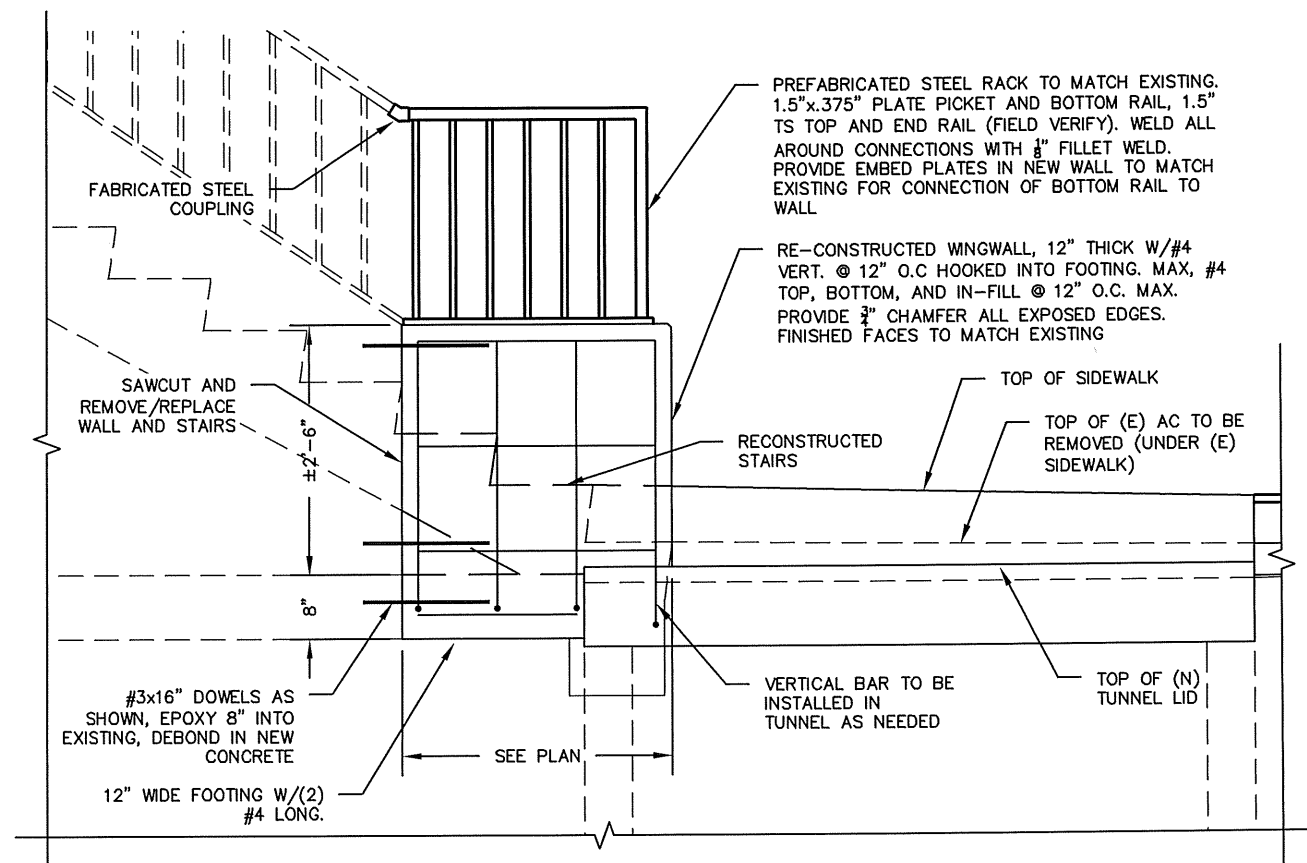
PLAN (PART.)

1" = 4'



2 SIDEWALK IMPROVEMENTS (PLAN)

1" = 10'

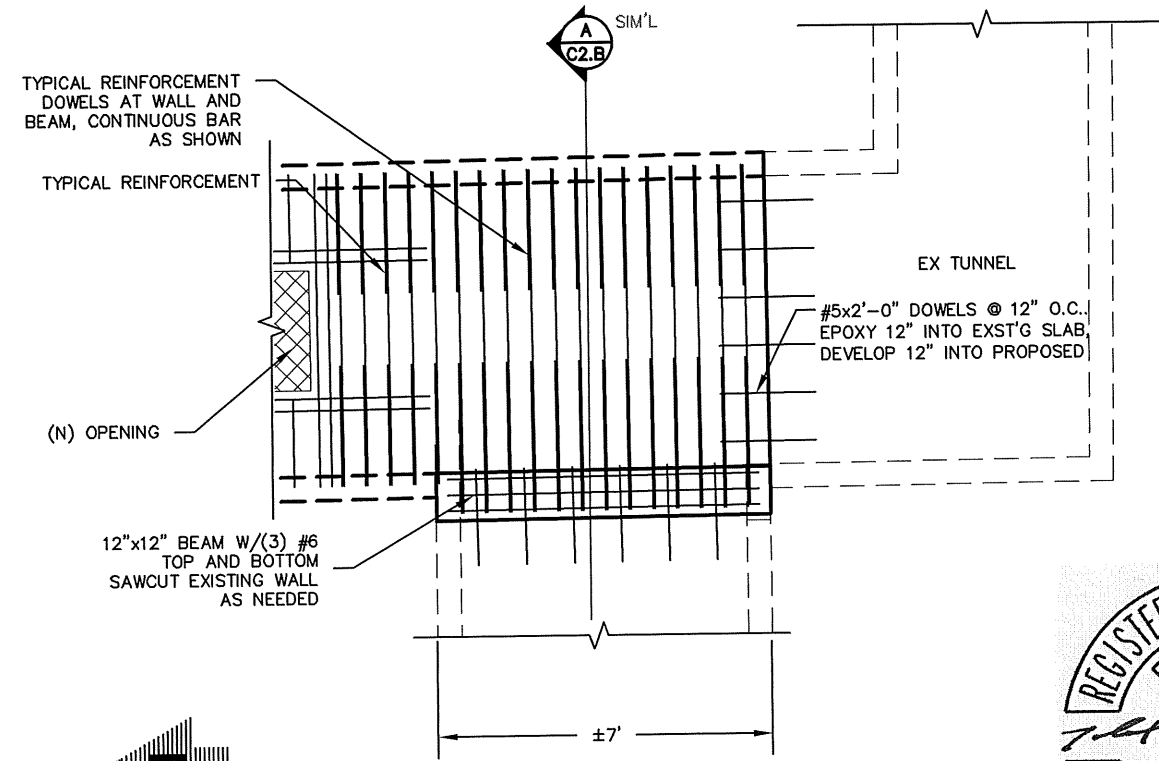


1 WALL ELEVATION

1" = 2'

1 PARTIAL STAIR RECONSTRUCTION

1" = 4'



3 SIDEWALK IMPROVEMENTS (PLAN)

1" = 4'

No.	REVISION	DATE	BY

TUNNEL LID REPLACEMENT PROJECT  
FOR  
OREGON INSTITUTE OF TECHNOLOGY  
KLAMATH FALLS, OREGON  
C.U. (SE) TUNNEL DETAILS

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SHEET:	11 OF 17

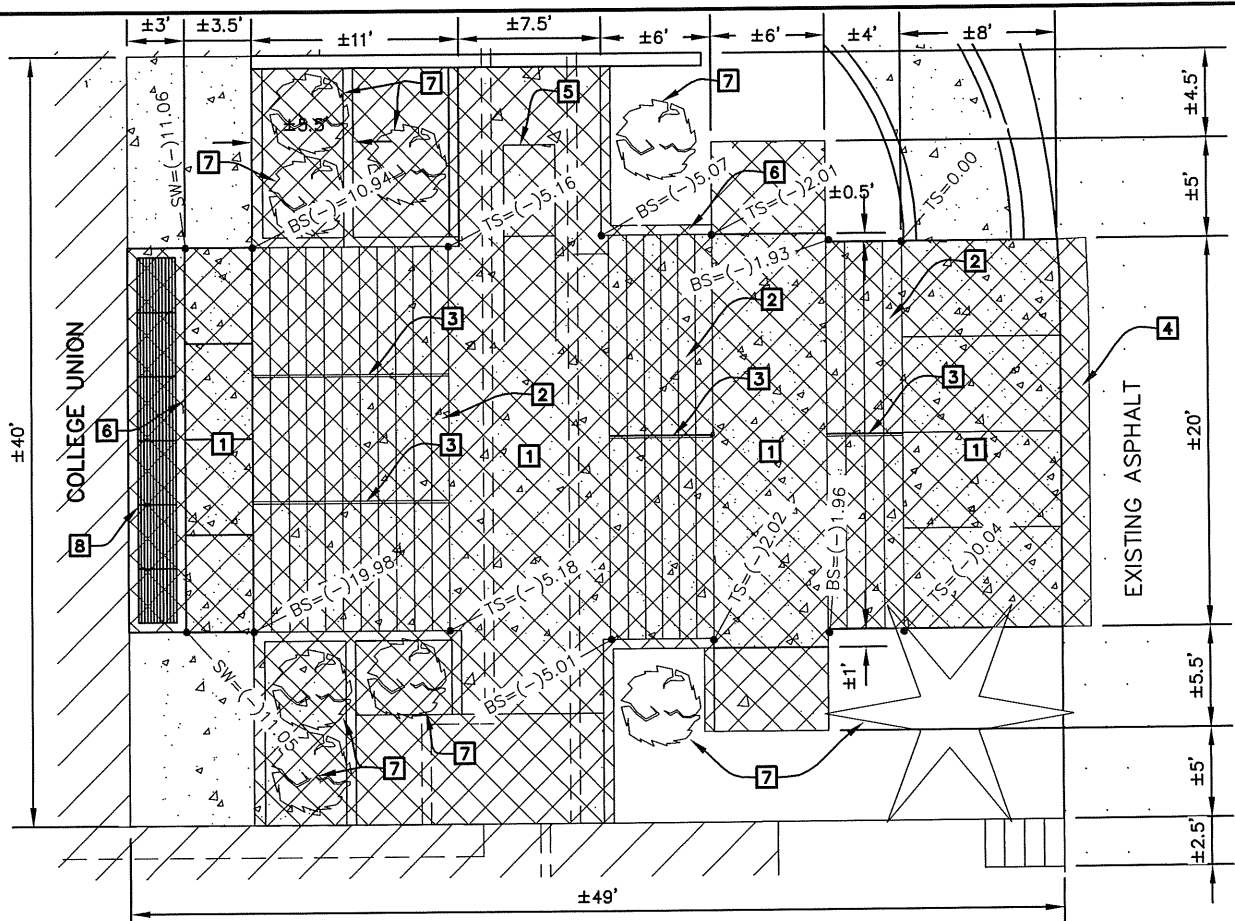


C4.A

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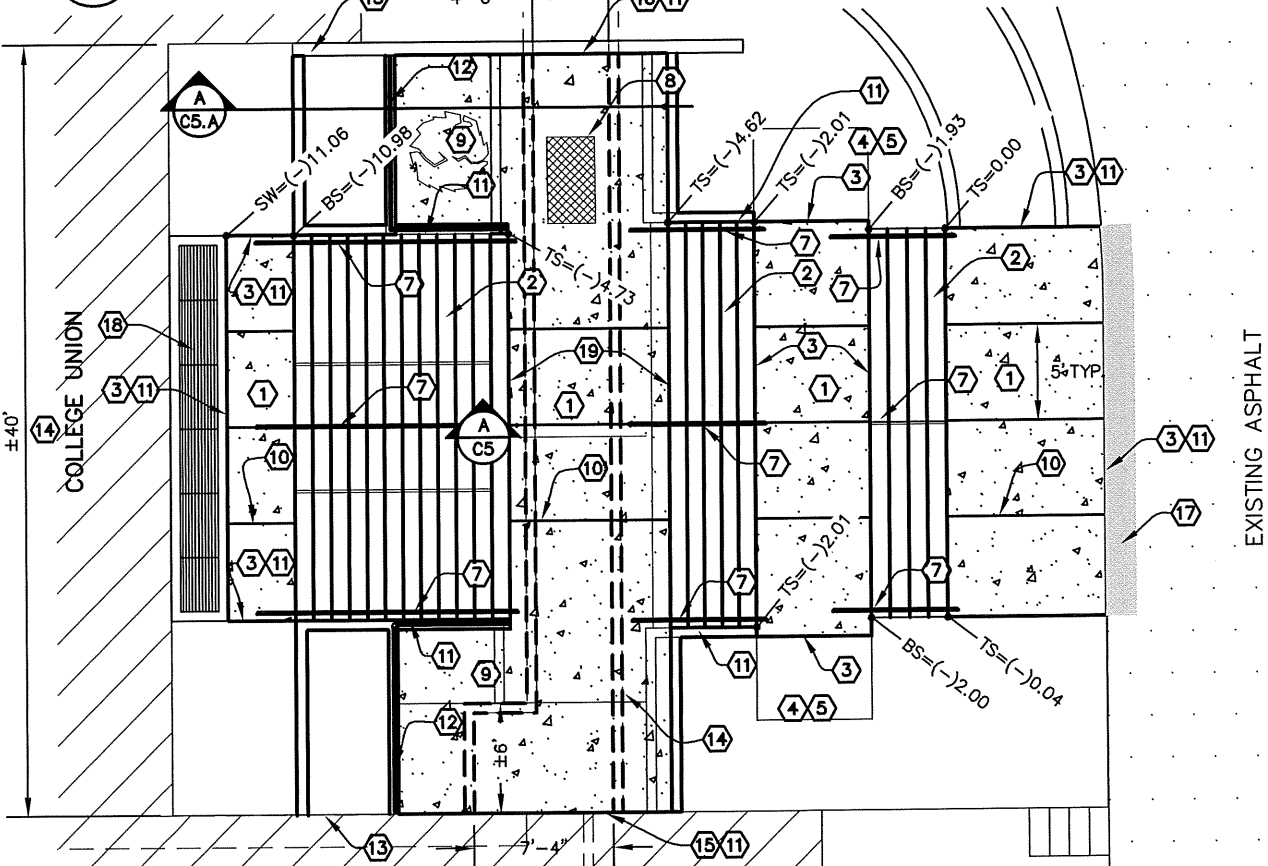
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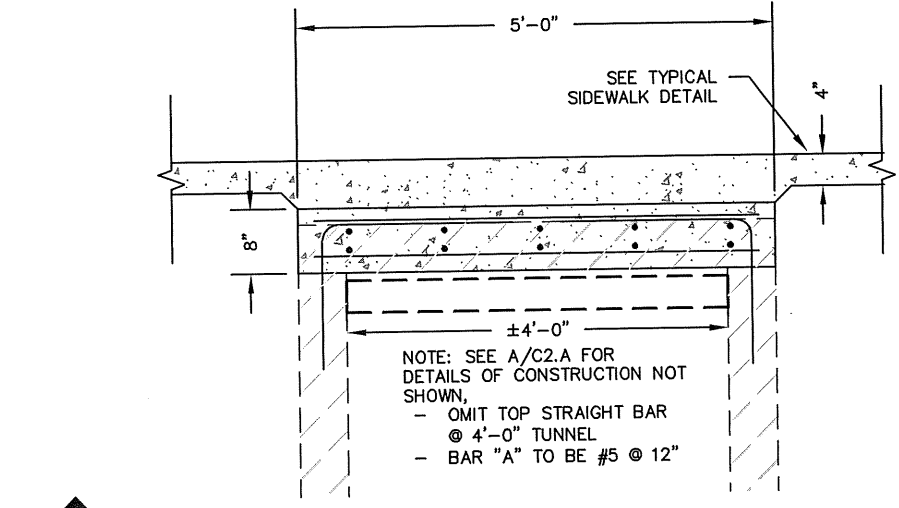
1 STAIRS EAST OF THE COLLEGE UNION (DEMOLITION)  
1" = 2'

- ### DEMOLITION NOTES
- 1 SAWCUT & REMOVE EXISTING SIDEWALK TO DIMENSIONS SHOWN.
  - 2 REMOVE EXISTING STAIRS.
  - 3 REMOVE EXISTING HANDRAIL.
  - 4 SAWCUT (12" WIDTH) AND REMOVE EXISTING ASPHALT
  - 5 REMOVE EXISTING GEOTHERMAL TUNNEL VAULT LID & FRAME.
  - 6 SAWCUT SIDEWALK ADJACENT TO GRATE. CONTRACTOR TO REMOVE ANY EXCESS CONCRETE TO PROVIDE SMOOTH SURFACE FOR CONSTRUCTION. SEE DETAIL 4, SHEET C8.
  - 7 REMOVE ALL EXISTING VEGETATION.
  - 8 REMOVE EXISTING GRATE.

- ### CONSTRUCTION NOTES
- 1 CONSTRUCT SIDEWALK WITH CROSS SLOPE NOT EXCEEDING 2%. SEE DETAIL 1, SHEET C8.
  - 2 CONSTRUCT STAIRS AND HANDRAILS. SEE DETAILS 1 & 2, SHEET C7.
  - 3 MATCH EXISTING GRADE AND/OR LOCATION OF EXISTING IMPROVEMENTS
  - 4 CONTRACTOR TO CONSTRUCT ALL AREAS ADJACENT TO WORK AREA WITH COMPACTED NATIVE BACKFILL MATERIAL AND 12" OF TOPSOIL. THE CONTRACTOR SHALL PERFORM ALL SURFACE RESTORATION WORK AS REQUIRED TO PROVIDE SMOOTH TRANSITIONS FROM THE NEW SIDEWALKS AND STAIRS TO EXISTING GROUND WITH SLOPES 1V:4H OR FLATTER. SEED GRASS AREAS DISTURBED DURING CONSTRUCTION. CONTRACTOR SHALL KEEP DISTURBED AREA TO A MINIMUM.
  - 5 CONTRACTOR SHALL REPAIR UNDERGROUND IRRIGATION IF DISTURBED DURING CONSTRUCTION. THIS WORK SHALL BE CONSIDERED INCIDENTAL TO SIDEWALK/STAIR CONSTRUCTION.
  - 6 CONTRACTOR TO PENETRATE CEILING OF GEOTHERMAL TUNNEL WITH SCHEDULE 40 PVC CONDUIT SLEEVES SIZED TO ALLOW GEOTHERMAL TUBING INSTALLATION FROM STAIRS/SIDEWALK TO MANIFOLD(S). MANIFOLD(S) SHALL BE SECURELY ATTACHED TO INSIDE WALL OF TUNNEL WITH UNI-STRUT METAL CHANNEL. SEAL ALL TUNNEL PENETRATIONS WITH SPRAY FOAM.
  - 7 CONSTRUCT HANDRAIL. SEE SHEET C7.
  - 8 INSTALL ACCESS HATCH PER DETAIL 3/C2.B. PROVIDE 2'-6"x6'-0" HATCH RATED FOR SIDEWALK LOADING (300 PSF).
  - 9 CONTRACTOR TO CAP EXISTING IRRIGATION LINE AS REQUIRED IN REMOVED PLANTER AREA.
  - 10 CONTRACTION JOINT. SEE DETAIL 3, SHEET C8.
  - 11 EXPANSION JOINT. SEE DETAIL 3, SHEET C8.
  - 12 CONSTRUCT GUARDRAIL. SEE DETAIL 5, SHEET C7 (OMIT HANDRAIL).
  - 13 PROTECT EXISTING RETAINING WALL IN-PLACE
  - 14 REMOVE AND REPLACE EXISTING TUNNEL LID.  
CONNECT PROPOSED TUNNEL LID TO EXISTING BUILDING WITH #3x16" DOWELS @ 12" O.C.. EPOXY 4" INTO EXST'G BUILDING, DEVELOP 12" INTO LID
  - 15 CONNECT PROPOSED LID TO EXISTING WITH #5x2'-0" DOWELS @ 12" O.C.. EPOXY 12" INTO EXST'G TUNNEL LID, DEVELOP 12" INTO PROPOSED (SEE C2.B FOR SIMILAR DETAIL)
  - 16 SAWCUT AND REMOVE AC TO CONSTRUCT CONCRETE, AC PATCH TO MATCH EXISTING PAVING THICKNESS (3" MIN.)
  - 17 REPLACE REMOVABLE GRATING TO MATCH EXISTING (1.5"x1.875" BEARING BARS, .75"x1.875" GRATING)
  - 18 ADJUST NUMBER OF RISERS IN STAIR FLIGHT FROM EXISTING AS SHOWN



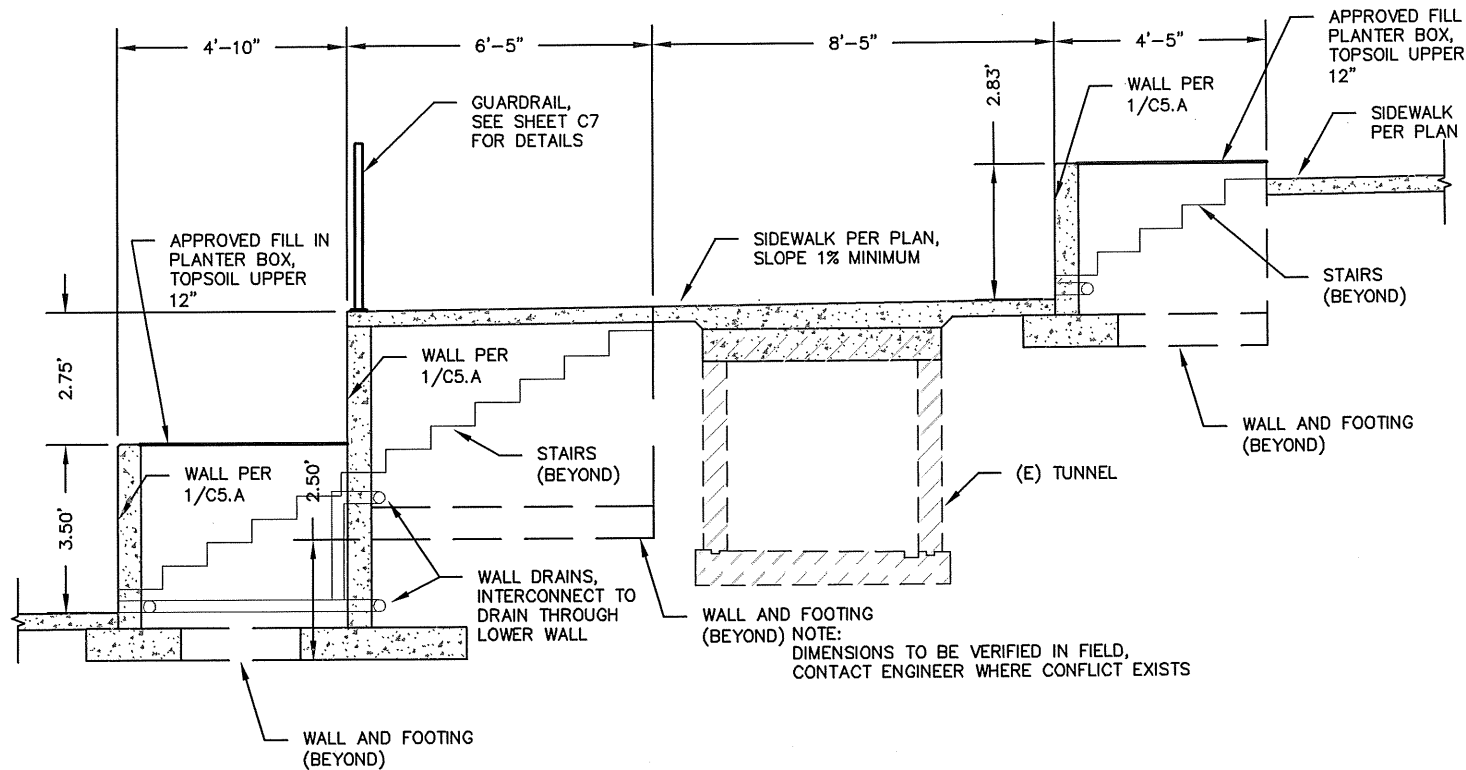
2 STAIRS EAST OF THE COLLEGE UNION (PROPOSED)  
1" = 2'



A TYPICAL TUNNEL SECTION  
1" = 2'

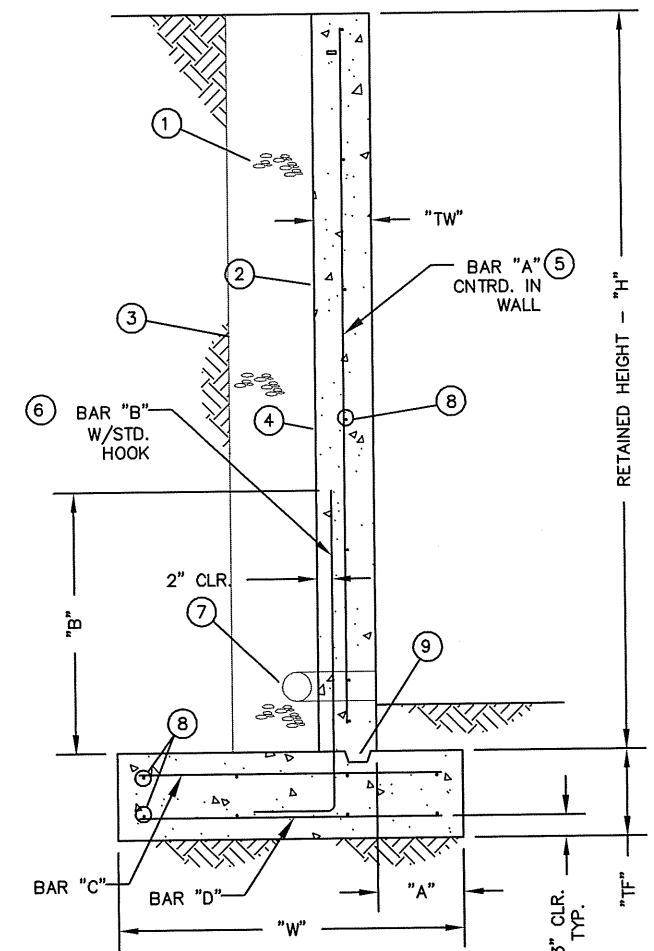
TUNNEL LID REPLACEMENT PROJECT FOR OREGON INSTITUTE OF TECHNOLOGY KLAMATH FALLS, OREGON		REVISION	DATE	BY
C.U. (NE) TUNNEL AND STAIRS		No.		
<p>ADKINS CONSULTING ENGINEERS, LLP 2950 Sheeta Way · Klamath Falls, Oregon 97603 · (541) 884-4666 · FAX (541) 884-5335 Oregon · California</p>		DATE: 05-05-14		
		PROJECT: 1090-30		
		FILE: CS-C8.DWG		
		DESIGNED BY: JMM		
		DRAWN BY: SJM		
		CHECKED BY: MJZ		
		SURVEYED BY: ACE		
		SCALE: AS SHOWN		
		SHEET: 12 OF 17		
		<p>C5</p>		

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**A**  
**C5.A** SECTION: PLANTER BOX REPLACEMENT  
SCALE: 1"=4'

- ① CLEAN 1"-1" WASHED DRAIN ROCK, EXTEND FROM FACE OF WALL MIN. 12"
  - ② MOISTURE PROTECTION, PROVIDE BITUMINUS MEMBRANE W/ PROTECTION BOARD CONT. OVER FOOTING (OWNER'S DISCRETION)
  - ③ NON-WOVEN GEOTEXTILE FABRIC (AMOCO 4546 O.A.E.)
  - ④ CAST IN PLACE WALL
  - ⑤ BAR "A" TO PLACED FULL HEIGHT (SEE SCHED.) WHERE BAR "B" NOT REQUIRED PROVIDE STANDARD HOOK INTO FOOTING
  - ⑥ BAR "B" TO LAP DIST. "B" (SEE SCHED.) PROVIDE STANDARD HOOK INTO FOOTING. CENTER DOWEL @ 4' AND LESS RETAINED HEIGHT
  - ⑦ 3" PERFORATED PVC/HDPE PIPE W/ DRAIN ROCK MIN. 6" AROUND PIPE. DAYLIGHT THROUGH WEEP HOLES IN WALL @ 4'-0" O.C. MAX
  - ⑧ #4 LONGITUDINAL @ 16" O.C., NOT REQUIRED WHERE TRANSVERSE BAR NOT REQUIRED
  - ⑨ 2x4 KEYWAY (NOMINAL) BEVEL FOR REMOVAL AND SHAPE AS NEEDED FOR REBAR PLACEMENT (ONLY APPLIES AT 7' WALLS, ROUGHEN SURFACE AT SHORTER)
- NOTE: PROVIDE 1/4" CHAMFER ON ALL EXPOSED EDGES



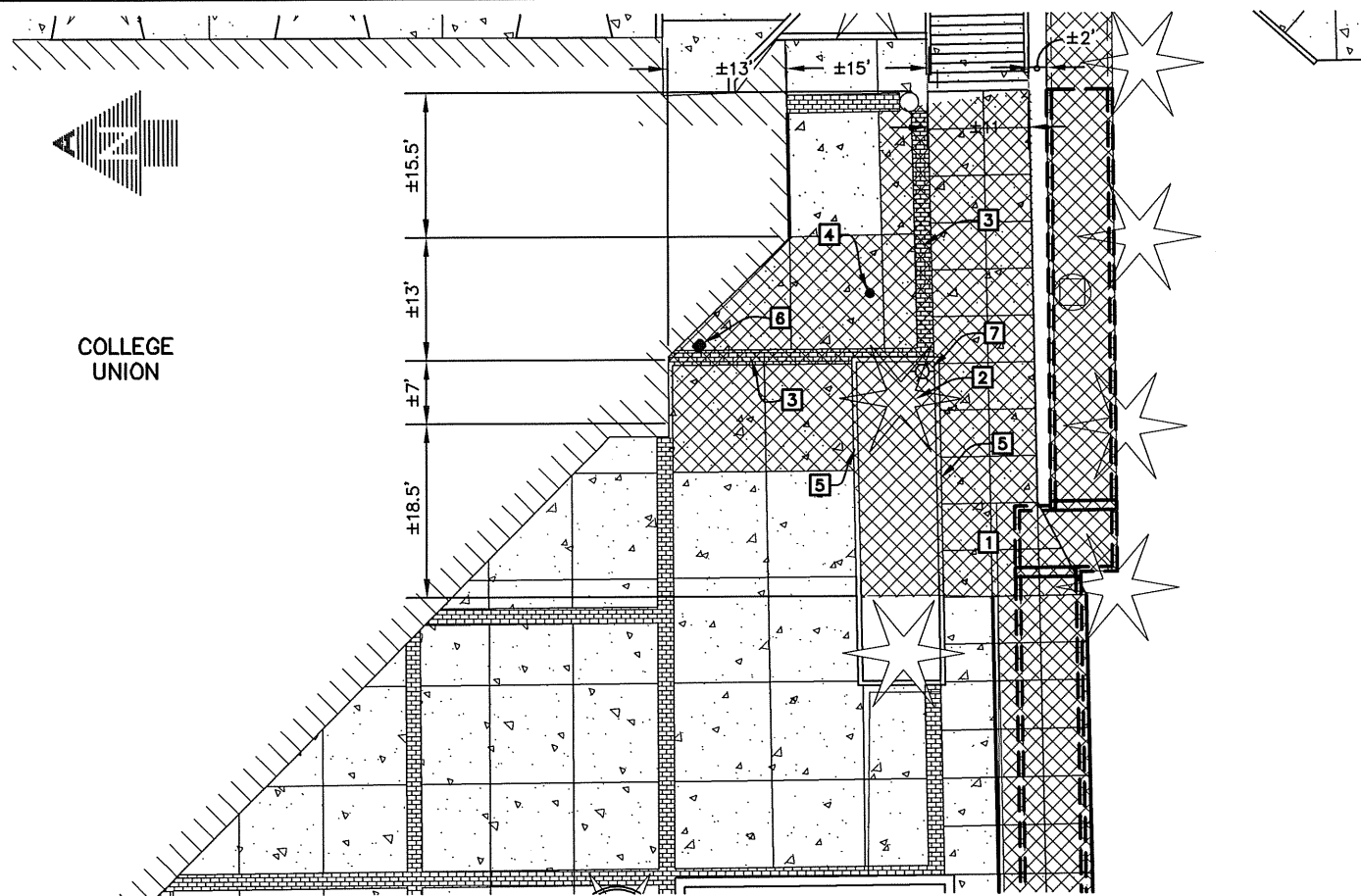
REINFORCEMENT & DIMENSIONS									
"H"	"TW"	"W"	"A"	"TF"	"B"	BAR "A"	BAR "B"	BAR "C"	BAR "D"
4'	6"	2'-0"	8"	12"	N/A	#4 @ 16"	N/A	#4 @ 16"	N/A
7'	6"	3'-6"	12"	12"	36"	#4 @ 16"	#4 @ 8"	#4 @ 16"	#4 @ 16"

**1**  
**C5.A** DETAIL: RETAINING WALL  
SCALE: 3/4"=1'

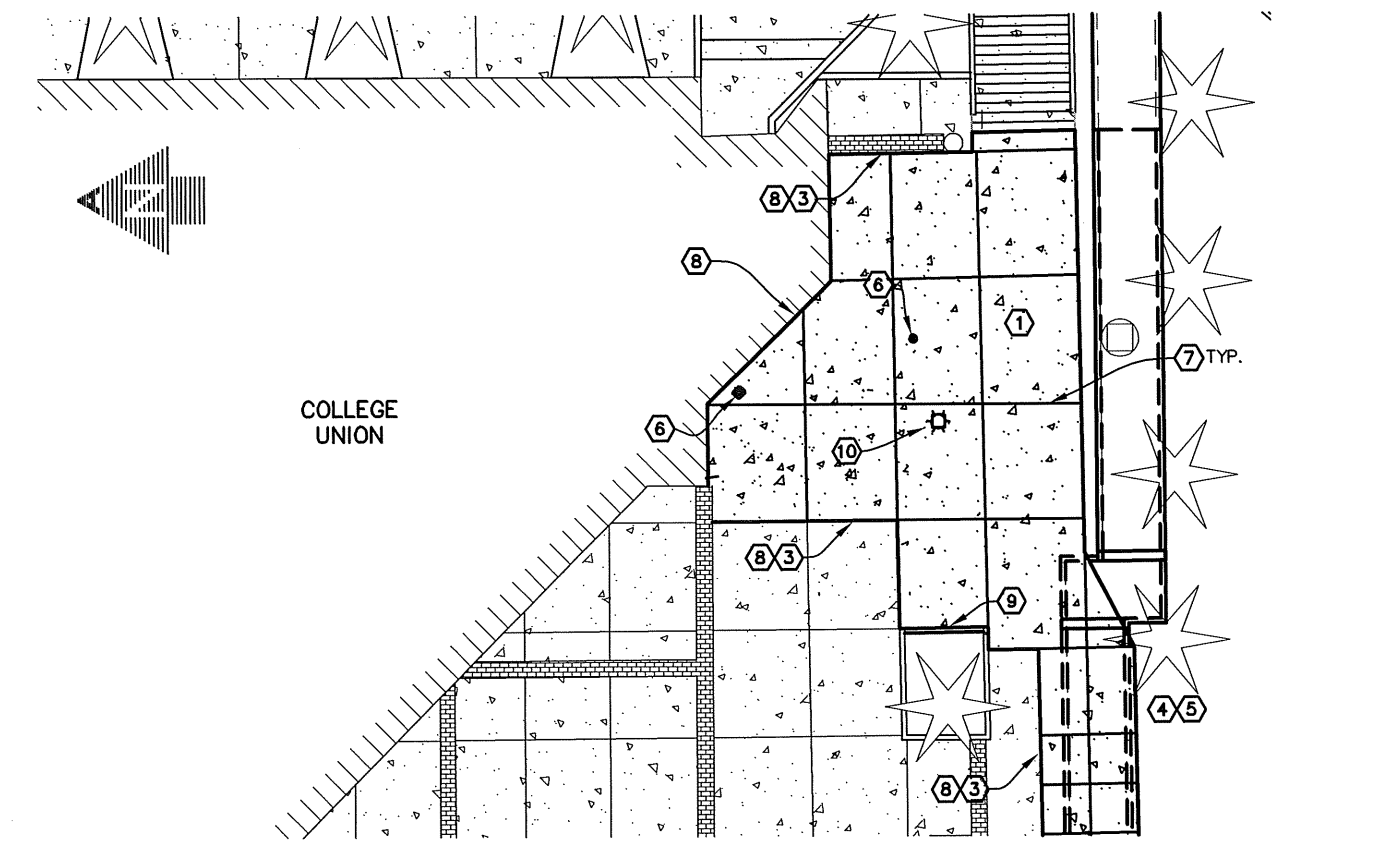


<b>TUNNEL LID REPLACEMENT PROJECT</b> FOR <b>OREGON INSTITUTE OF TECHNOLOGY</b> KLAMATH FALLS, OREGON	<b>C.U. (NE) TUNNEL AND STAIRS</b>
<b>ADKINS CONSULTING ENGINEERS, LLP</b> Engineers Planners Surveyors 2950 Sheeta Way - Klamath Falls, Oregon 97603 - (541) 884-4666 - FAX (541) 884-5335 Oregon California	
DATE: 05-05-14 PROJECT: 1090-30 FILE: CS-C8.DWG DESIGNED BY: JMM DRAWN BY: SJM CHECKED BY: MJZ SURVEYED BY: ACE SCALE: AS SHOWN SHEET: 13 OF 17	
<b>C5.A</b>	





1 SIDEWALK SOUTHEAST OF COLLEGE UNION (DEMOLITION)  
C6 1" = 20'



2 SIDEWALK SOUTHEAST OF COLLEGE UNION (PROPOSED)  
C6 1" = 20'

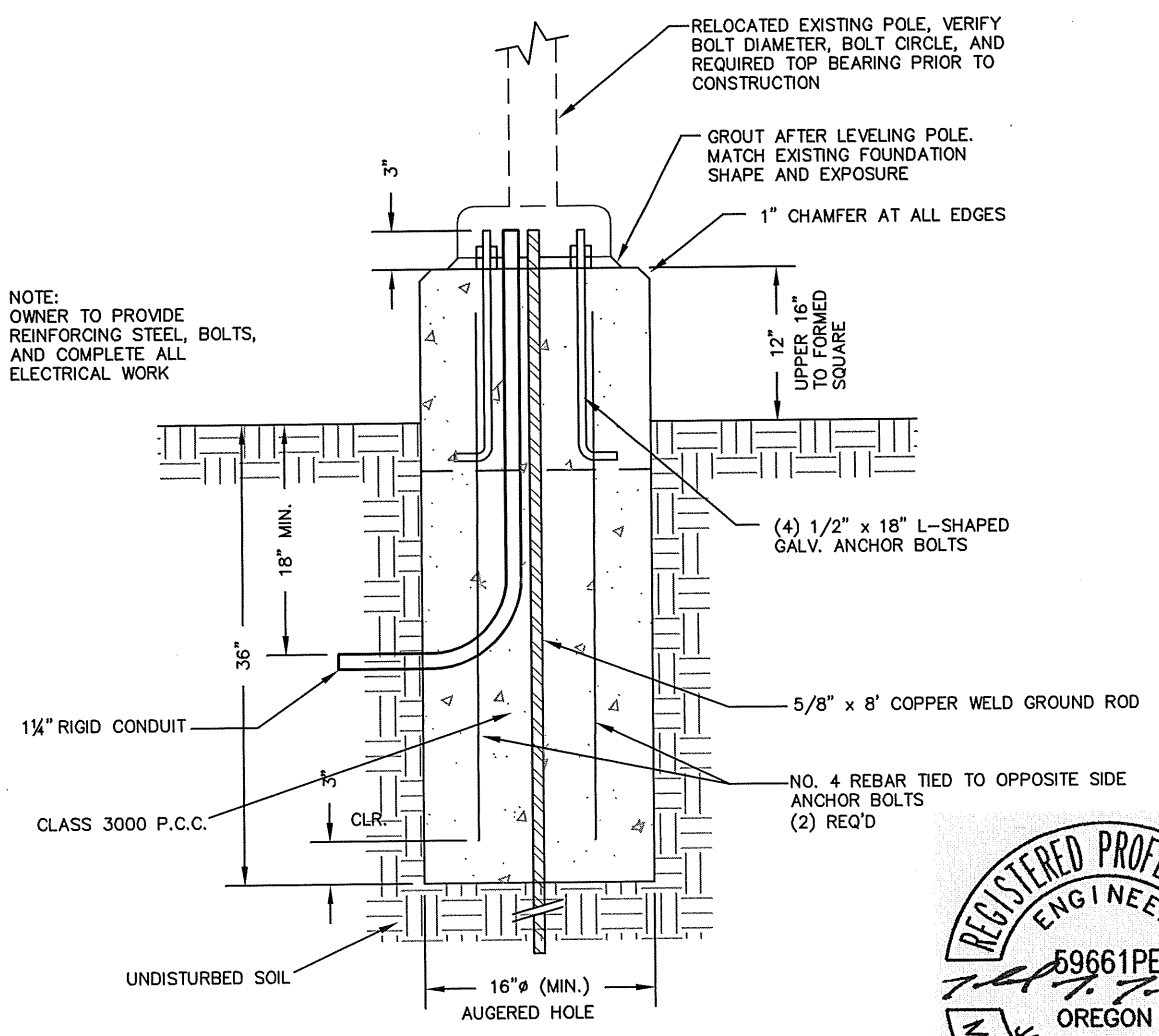
**DEMOLITION NOTES**

- 1 SAWCUT & REMOVE EXISTING SIDEWALK TO DIMENSIONS SHOWN.
- 2 REMOVE EXISTING TREE.
- 3 REMOVE EXISTING BRICK BORDER.
- 4 PROTECT EXISTING CLEANOUT.
- 5 SAWCUT AND REMOVE EXISTING CURB TO DIMENSIONS SHOWN.
- 6 PROTECT EXISTING CONTROL BOX.
- 7 SALVAGE EXISTING LIGHT POLE, PROTECT EXISTING WIRING, REMOVE FOUNDATION AS NEEDED

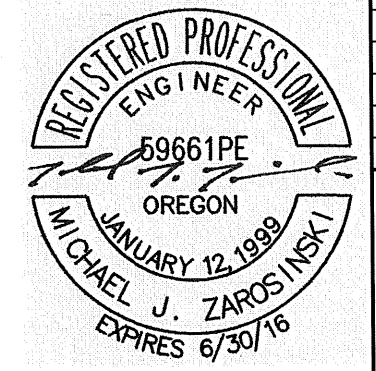
**CONSTRUCTION NOTES**

- 1 CONSTRUCT SIDEWALK WITH CROSS SLOPE NOT EXCEEDING 2%. SEE DETAIL 1, SHEET C8.
- 2 NOT USED
- 3 MATCH EXISTING GRADE AND/OR LOCATION OF EXISTING IMPROVEMENTS
- 4 CONTRACTOR TO CONSTRUCT ALL AREAS ADJACENT TO WORK AREA WITH COMPACTED NATIVE BACKFILL MATERIAL AND 12" OF TOPSOIL. THE CONTRACTOR SHALL PERFORM ALL SURFACE RESTORATION WORK AS REQUIRED TO PROVIDE SMOOTH TRANSITIONS FROM THE NEW SIDEWALKS AND STAIRS TO EXISTING GROUND WITH SLOPES 1V:4H OR FLATTER. SEED GRASS AREAS DISTURBED DURING CONSTRUCTION. CONTRACTOR SHALL KEEP DISTURBED AREA TO A MINIMUM.
- 5 CONTRACTOR SHALL REPAIR UNDERGROUND IRRIGATION IF DISTURBED DURING CONSTRUCTION. THIS WORK SHALL BE CONSIDERED INCIDENTAL TO SIDEWALK/STAIR CONSTRUCTION.
- 6 MATCH EXISTING GRADE AROUND EXISTING UTILITIES.
- 7 CONTRACTION JOINT. SEE DETAIL 3, SHEET C8.
- 8 EXPANSION JOINT. SEE DETAIL 3, SHEET C8.
- 9 CONSTRUCT CURB. SEE DETAIL 5, SHEET C8.
- 10 RELOCATE EXISTING LIGHT ON NEW FOUNDATION, SEE DETAIL THIS SHEET. COORDINATE LOCATION IN FIELD WITH OIT STAFF

NOTE:  
OWNER TO PROVIDE REINFORCING STEEL, BOLTS, AND COMPLETE ALL ELECTRICAL WORK



3 LIGHT POLE FOUNDATION  
C6 NTS



TUNNEL LID REPLACEMENT PROJECT FOR OREGON INSTITUTE OF TECHNOLOGY KLAMATH FALLS, OREGON		REVISION	DATE	BY
DEMOLITION & REPLACEMENT PLAN		No.		
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SHEET: 14 OF 17		C6		

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TUNNEL LID REPLACEMENT PROJECT  
 FOR  
 OREGON INSTITUTE OF TECHNOLOGY  
 KLAMATH FALLS, OREGON  
**CONCRETE STAIR DETAILS**

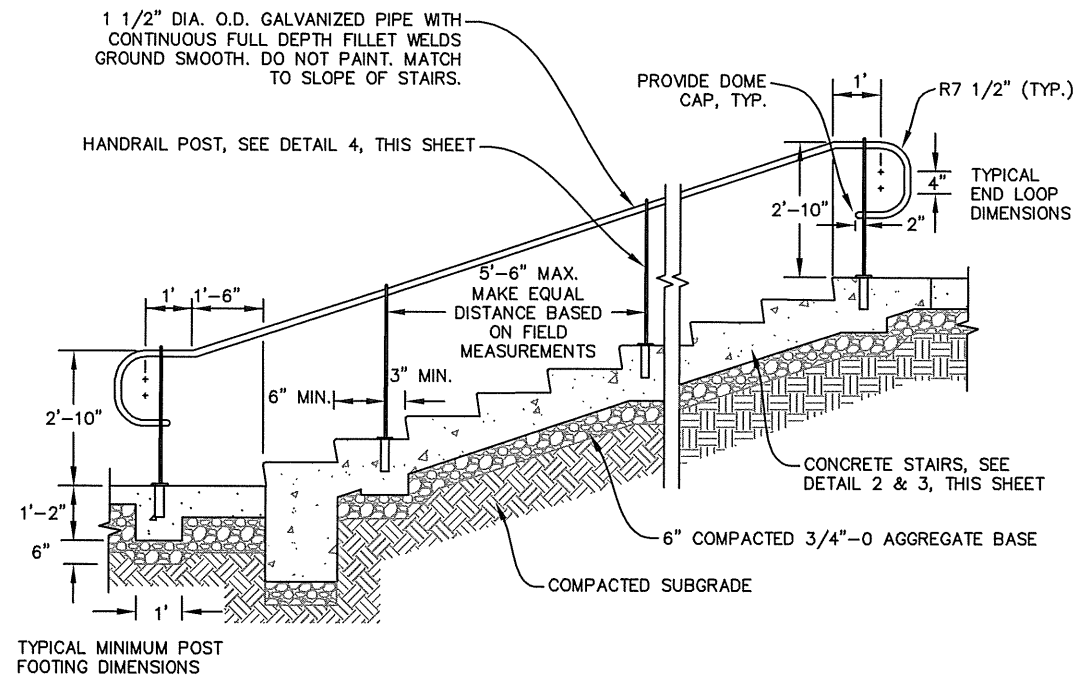
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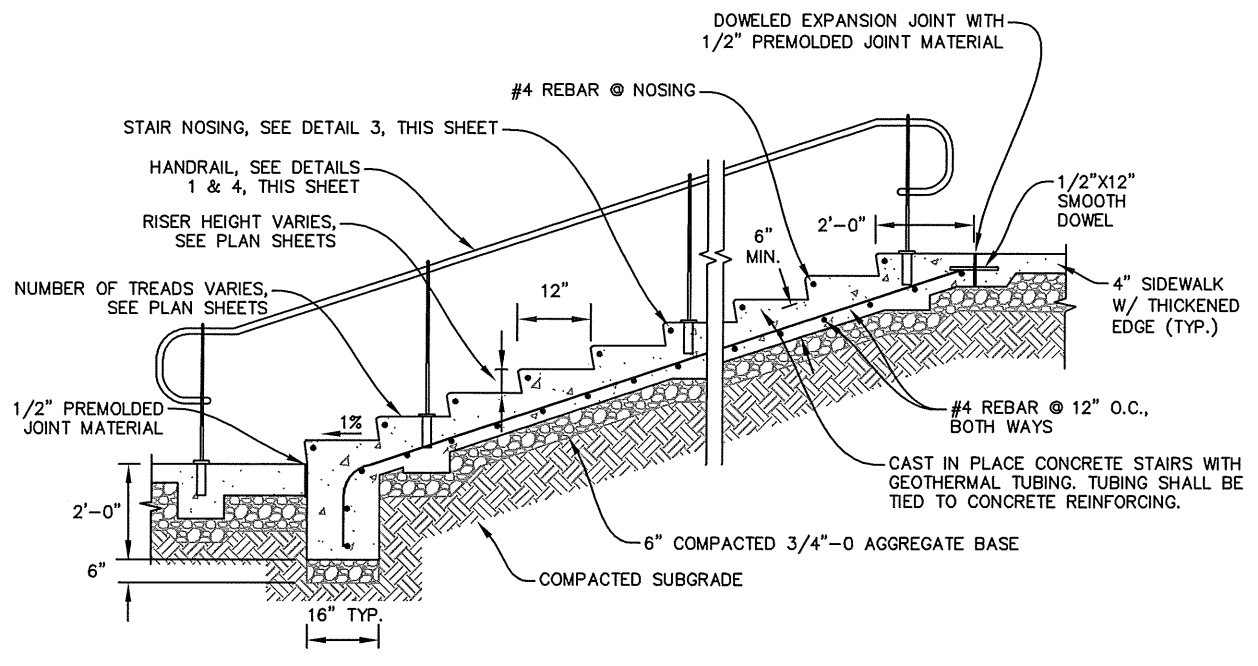


**STAIR HANDRAIL/STEEL POST NOTES:**

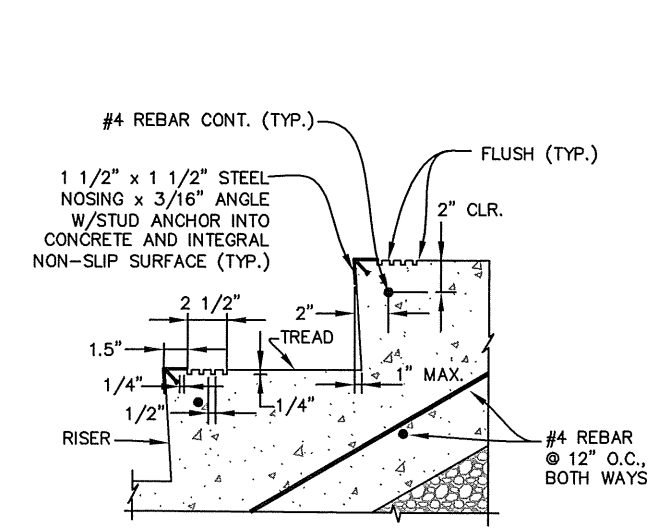
1. SHOP DRAWINGS SHALL BE SUBMITTED FOR APPROVAL SHOWING COMPLETE DIMENSIONS AND DETAILS OF FABRICATION AND INCLUDING AN INSTALLATION DIAGRAM AND RAIL JOINT DETAILS. MATERIAL BEING USED SHALL BE SPECIFIED IN THE SHOP DRAWINGS.
2. THE RAILING, POSTS, AND PLATES SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION.
3. RAILING SHALL BE ADEQUATELY WRAPPED TO ENSURE SURFACE PROTECTION DURING HANDLING AND TRANSPORTATION TO THE JOB SITE.
4. WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1. CONTINUOUS WELD AND GRIND SMOOTH ALL JOINTS.
5. RAILING MAY BE HEATED TO FACILITATE FORMING OR BENDING.
6. THE CONTRACTOR SHALL REPAIR ALL SURFACES DAMAGED BY FIELD OPERATIONS.
7. RAILINGS SHALL BE CONTINUOUS AROUND CORNERS.
8. FIELD WELDS SHALL BE GALVANIZED TO MATCH HOT DIP GALVANIZING AND PROVIDE CORROSION PROTECTION.
9. PIPE MATERIAL SHALL BE ASTM A53. POSTS/PLATES MATERIAL SHALL BE ASTM A36.



1 HANDRAIL AT STAIRS  
 C7 1/4"=1'

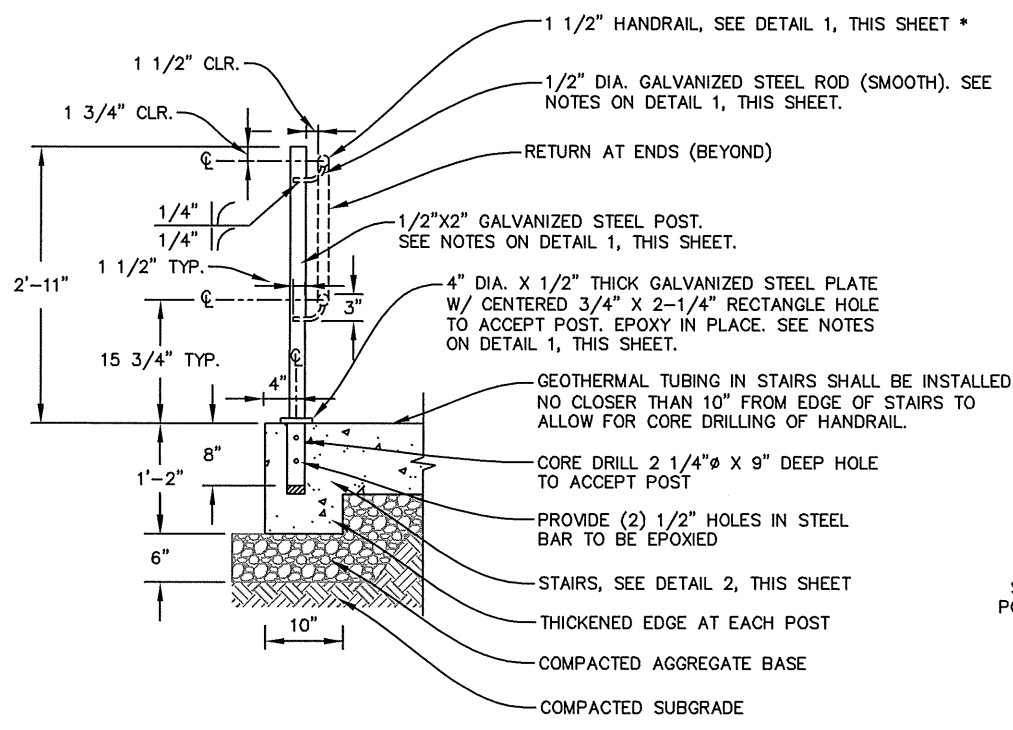


2 CONCRETE STAIRS  
 C7 1/4"=1'



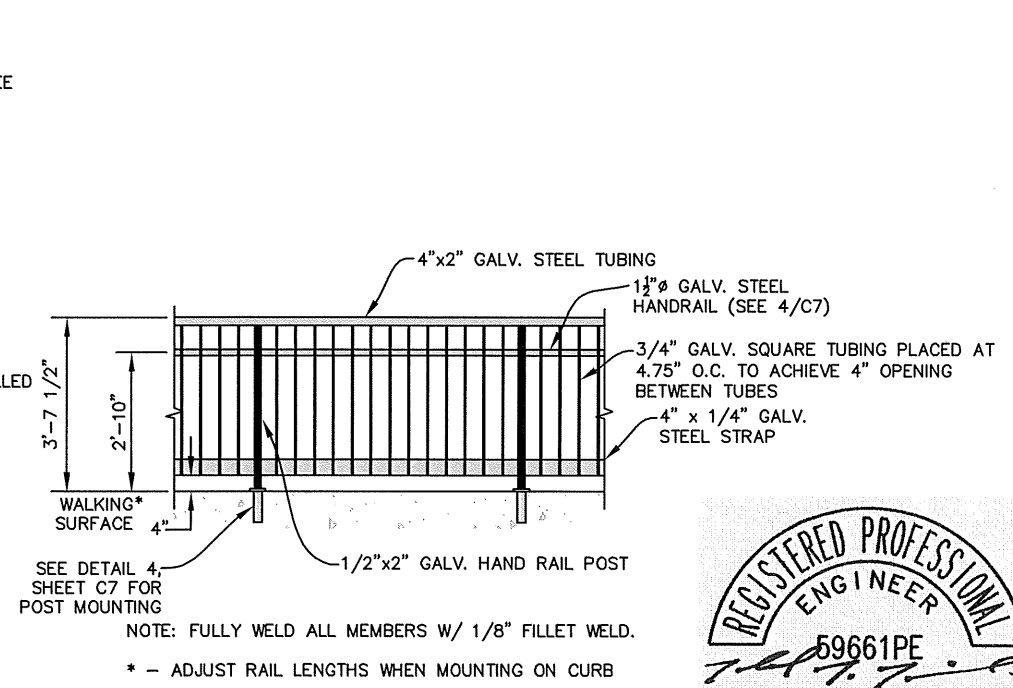
- NOTES:
1. REMOVE TOOL MARKS AND APPLY MEDIUM BROOM FINISH TO STAIR TREAD.
  2. 1/2" RADIUS, TYPICAL ON ALL EXPOSED EDGES OF STAIR TREADS.
  3. GROOVES ON TREAD TO BE PAINTED WITH SAFETY YELLOW PAINT

3 STAIR NOSING  
 C7 1"=1'



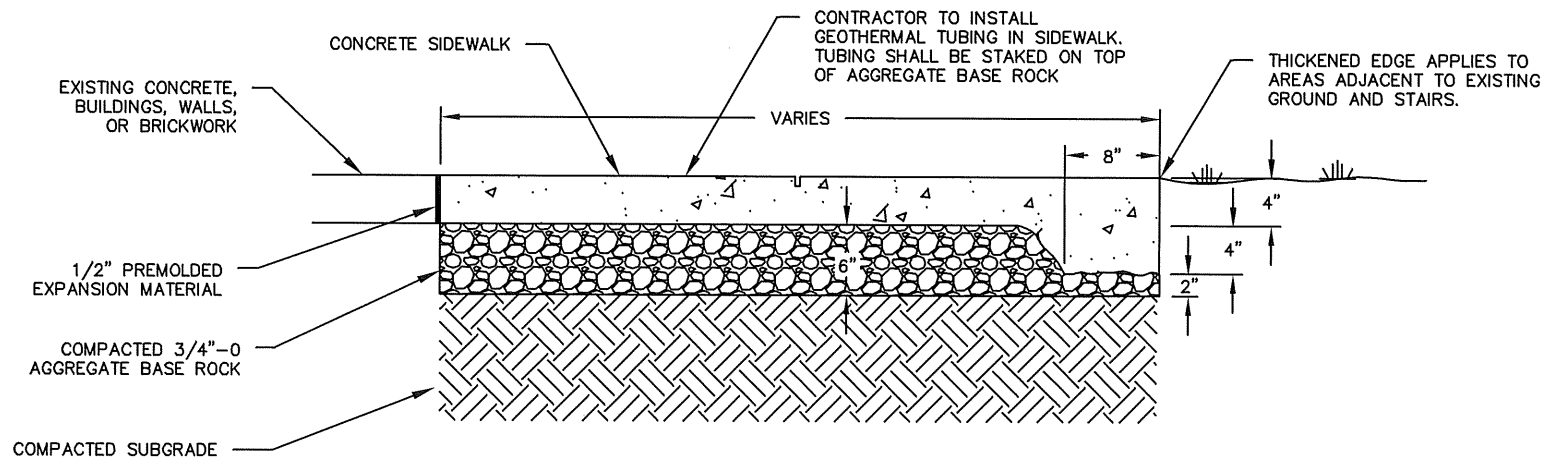
\* PROVIDE HANDRAILS ON BOTH SIDES OF POST FOR CENTER STAIR POSTS.

4 HANDRAIL POST  
 C7 1/2"=1'

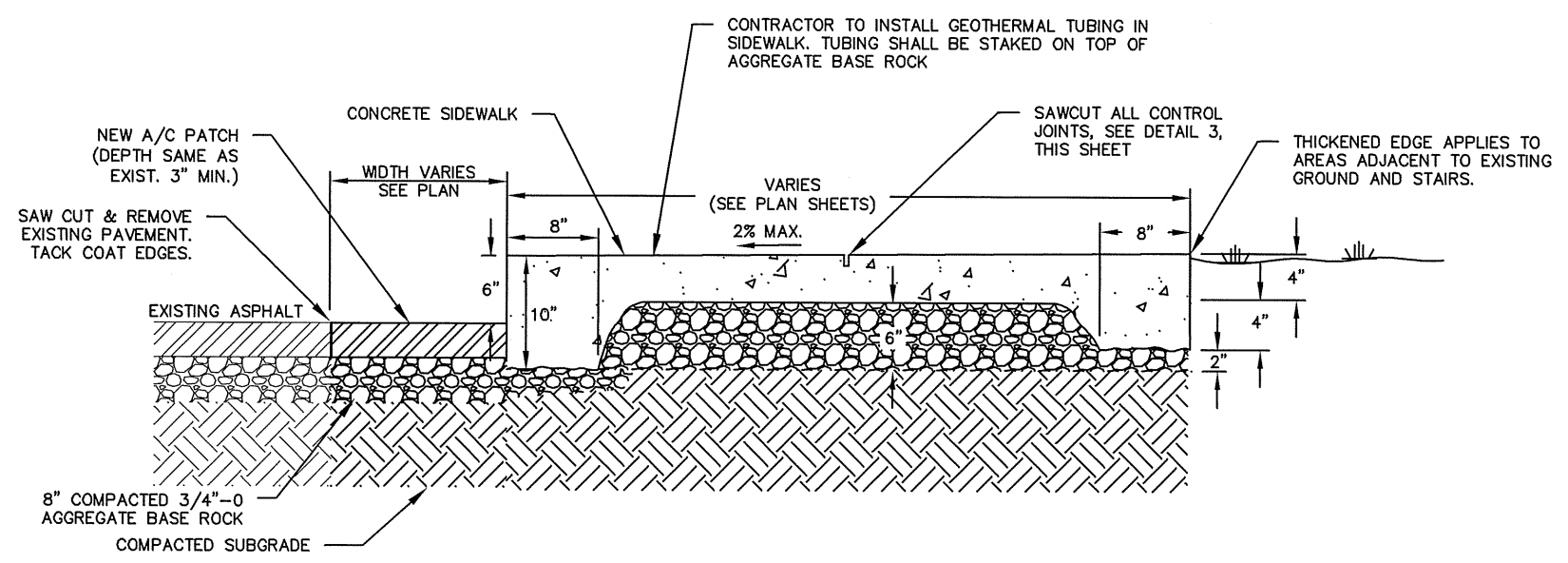


NOTE: FULLY WELD ALL MEMBERS W/ 1/8" FILLET WELD.  
 \* - ADJUST RAIL LENGTHS WHEN MOUNTING ON CURB

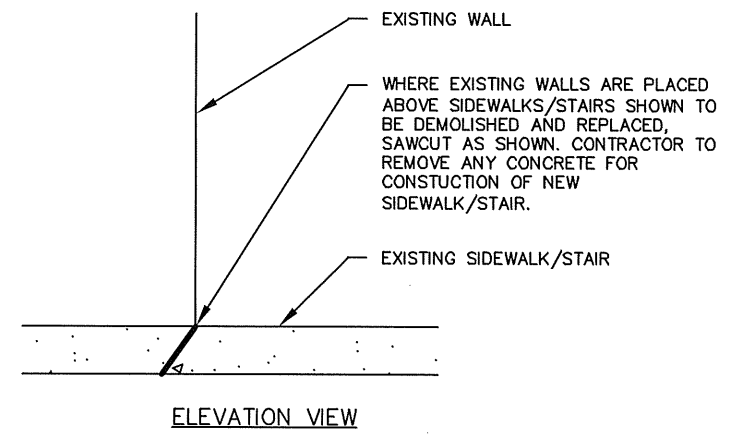
5 GUARDRAIL DETAIL  
 C7 1"=1'



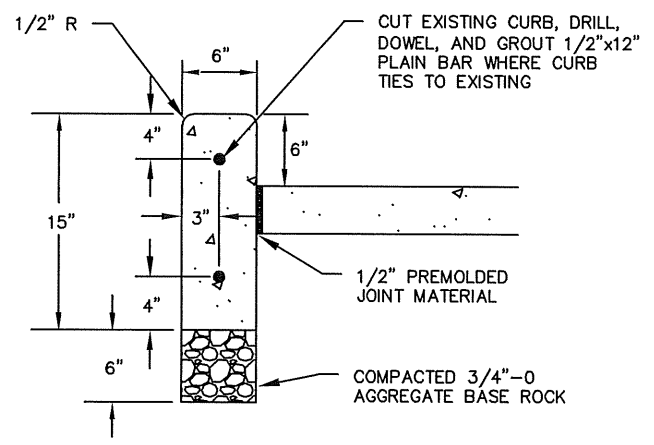
1 TYPICAL SIDEWALK DETAIL  
C8 3/4" = 1'



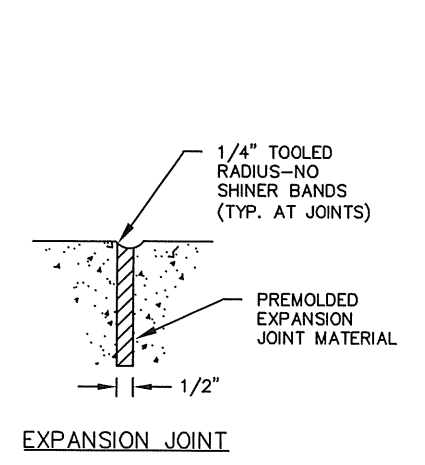
2 TYPICAL SIDEWALK ABUTTING ASPHALT DETAIL  
C8 3/4" = 1'



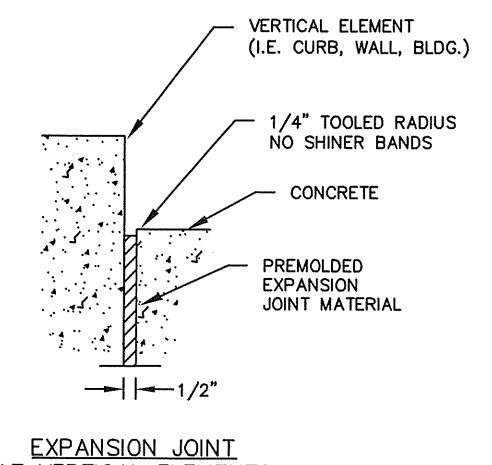
4 SAW CUT AT WALL (TYPICAL)  
C8 N.T.S.



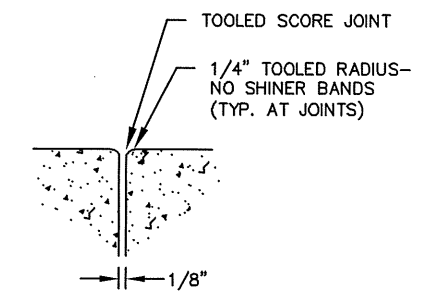
5 CURB DETAIL  
C8 N.T.S.



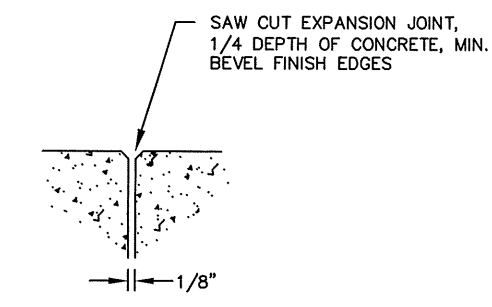
EXPANSION JOINT



EXPANSION JOINT AT VERTICAL ELEMENTS



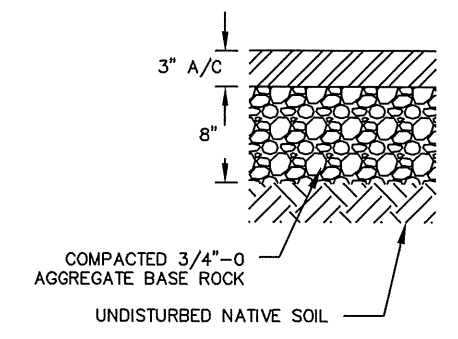
TOOLED CONTRACTION JOINT



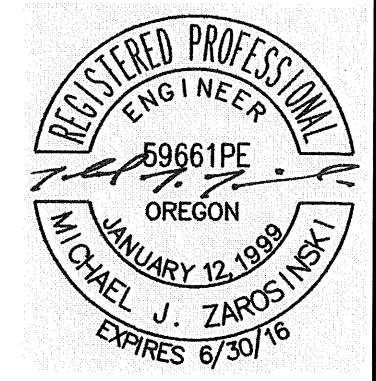
SAW CUT CONTRACTION JOINT

NOTE: EXPANSION JOINTS TO BE FULL DEPTH OF SLAB, CONTRACTION JOINTS 1/3 SLAB DEPTH

3 CONTROL JOINT DETAILS  
C8 N.T.S.



6 TYPICAL ASPHALT REPLACEMENT DETAIL  
C8 N.T.S.



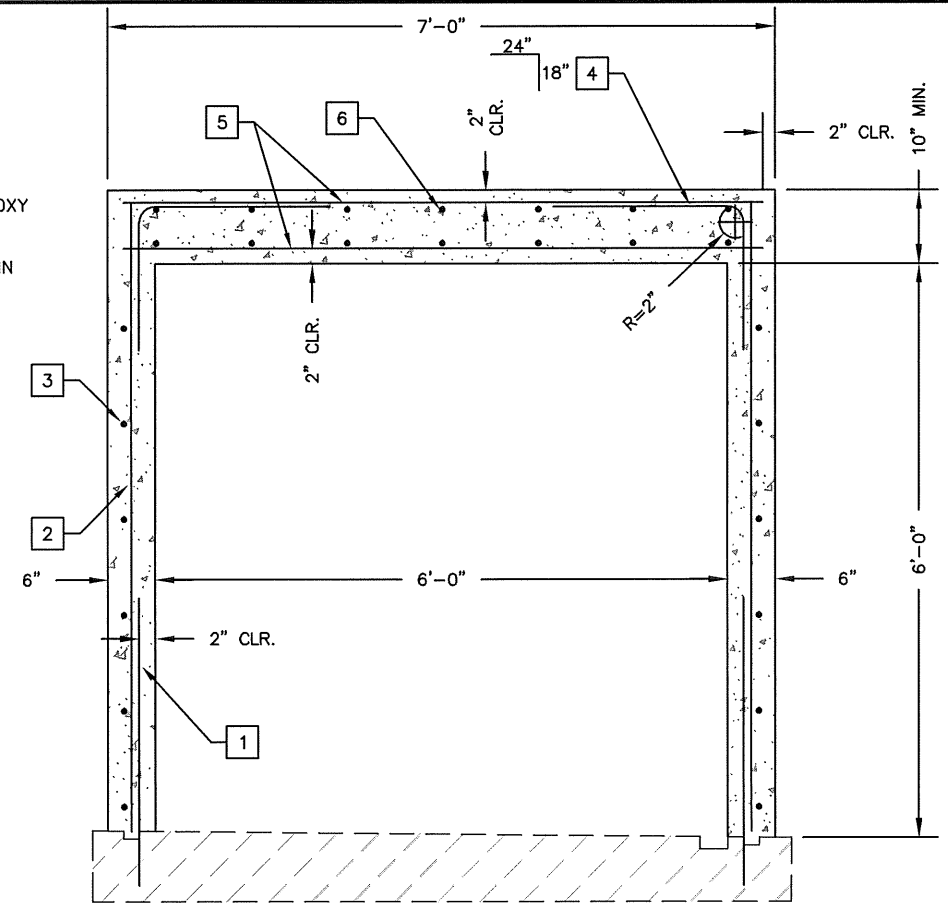
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CONCRETE & ASPHALT DETAILS		No.	BY
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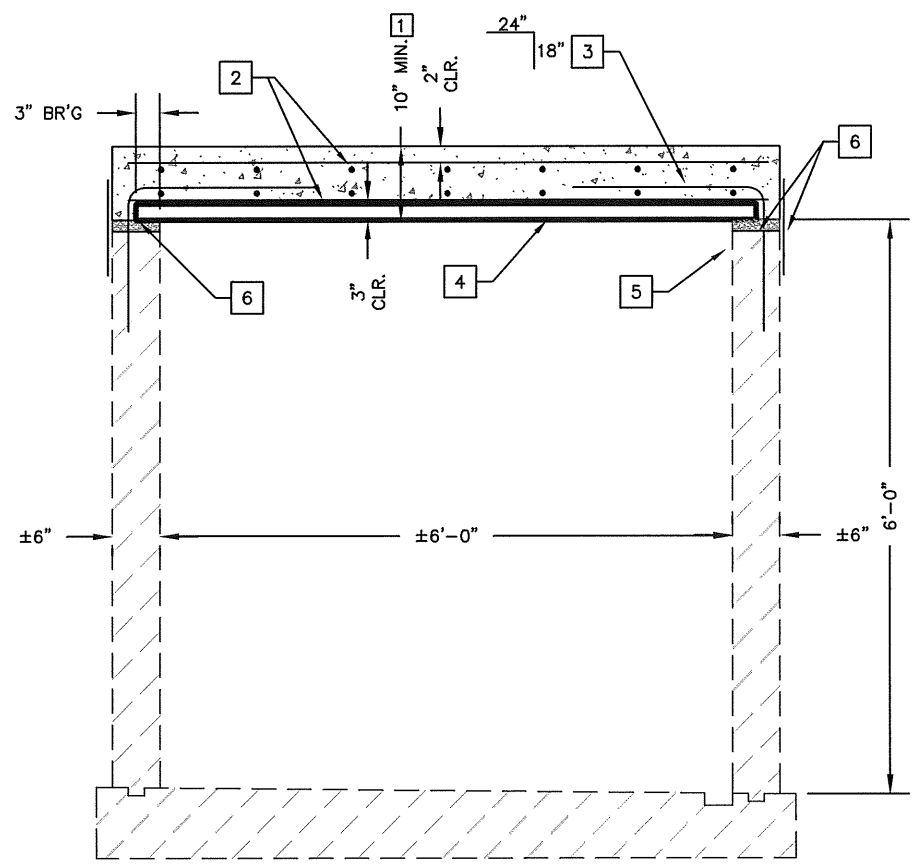
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- 1 #5x3'-0" DOWEL @ 10" O.C., EPOXY 6" INTO EXISTING SLAB
- 2 #5 @ 10" O.C. VERT. CENTERED IN WALL
- 3 #4 @ 12" O.C. HORIZ.
- 4 #6 @ 10" O.C. DOWELS
- 5 #6 @ 10" O.C. TOP & BOTTOM.
- 6 #5 LONG. @ 12" O.C. TOP & BOTTOM.

NOTE:  
 1. LOCATIONS FOR FULL REPLACEMENT TO BE DETERMINED IN FIELD BY OWNER AND ENGINEER. UTILITY RELOCATION TO BE COORDINATED AS NEEDED WITH OWNER.  
 2. PROVIDE MOISTURE PROTECTION ON ALL WALLS, SLAB ONLY WHERE OTHERWISE NOTED IN PLANS



**1**  
**C9** **DETAIL: LID AND WALL REPLACEMENT OPTION**  
 SCALE: 1"=2'



**2**  
**C9** **DETAIL: STEEL DECK SYSTEM ALTERNATE**  
 SCALE: 1"=2'

- 1 OVERALL DEPTH OF SLAB TO BE USED FOR STEEL DECK SYSTEM DESIGN. DEPTH VARIES, SEE PLAN
- 2 SLAB REINFORCEMENT, #4 @ 12" O.C. EACH WAY, TOP & BOTT. MINIMUM
- 3 DOWELS TO MATCH TOP SLAB STEEL. DRILL AND EPOXY INTO EXISTING WALL AS SHOWN
- 4 STEEL DECK. PROVIDE 5/8" PUDDLE WELDS @ 2' O.C. AT ALL SIDELAPS (MIN.). DECK TO BEAR 3" OVER (E) WALL.
- 5 DEMOLITION EXISTING FOR FULL EVEN BEARING, OVERE-CUT WALLS AND USE 1" MIN. NON-SHRINK GROUT LEVELING PAD AS NEEDED.
- 6 3/8" CONTINUOUS BEAD OF HYDROPHILIC CAULK. (SUBMIT PRODUCT FOR APPROVAL PRIOR TO CONSTRUCTION), OR EXTERIOR MOISTURE PROTECTION EXTENDING 8" BOTH SDES OF JOINT

NOTE: DETAIL DOES NOT REFLECT ALL CONDITIONS OF USE AND WORK TO BE COMPLETED, SEE OTHER PLANS AND DETAILS PROVIDED FOR ADDITIONAL INFORMATION.

- COMPRESSIVE STRENGTH OF CONCRETE TO BE 4000 PSI
- CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND CALCULATIONS OF STEEL DECK SYSTEM TO ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION.
- STEEL DECK SYSTEM SHALL BE A STRUCTURAL MEMBER AND INTEGRAL TO THE STRUCTURAL INTEGRITY OF THE SLAB. STAY-IN-PLACE FORMWORK IS NOT ALLOWED.
- LL CONSIDERED SHALL BE A 24k AXLE LOAD (12k WHEEL LOAD), AND 300 PSF UNIFORM LOAD (NOT CONCURRENT)
- BEARING SUPPORTS SHALL BE CONSIDERED AS PINNED

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TUNNEL LID REPLACEMENT PROJECT  
 FOR  
 OREGON INSTITUTE OF TECHNOLOGY  
 KLAMATH FALLS, OREGON  
**ADDITIVE & ALTERNATE DETAILS**

**ADKINS**  
 CONSULTING  
 ENGINEERING, LLP  
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**C9**

**TECHNICAL SPECIFICATIONS**

**OREGON INSTITUTE OF TECHNOLOGY**  
**Tunnel Lid Replacement Project**

**KLAMATH FALLS, OREGON**



Project No. 1090-30  
March 2015



Engineers ▲ Planners ▲ Surveyors

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2950 Shasta Way • Klamath Falls, OR 97603 • (541) 884-4666 • FAX (541) 884-5335

**TECHNICAL SPECIFICATIONS  
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## SUMMARY OF WORK

### SECTION 01110

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Adkins Consulting Engineering, LLP has prepared Contract Documents for the Oregon Institute of Technology, Tunnel Lid Replacement Project. Work of the Contract can be summarized by reference to the Contract Documents which include the Agreement, Contract Conditions, Project Manual (General Requirements and Specifications), Drawings, documents referenced by any of these, and addenda and modifications issued in accordance with the Agreement.
- B. Time to Complete the Work: Contractor shall achieve Substantial Completion as certified by the Owner within the time stipulated in Article 4 of the Oregon University System Public Improvement Agreement Form.

##### 1.2 PROJECT CONDITIONS

- A. Premises Available to the Contractor: Work area is restricted to the immediate construction site locations indicated on the Drawings and as necessary to allow for Owner occupancy and use by the public. Areas outside of these will not be available without Owner's prior approval. Do not disturb portions of the premises outside the Work limit areas.
- B. Owner Occupancy: The Owner will occupy the Campus during the entire period of construction. Normal operation and occupancy of the Campus shall continue uninterrupted throughout all construction activities. Cooperate fully with the Owner and their representative during construction operations to minimize conflicts and to facilitate Owner use and occupancy. Perform the Work so as not to interfere with the Owner's operations. Allow convenient and unobstructed use of building facilities, including barrier free access and pedestrian and vehicular entrances, exits and parking areas.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION



## WORK RESTRICTIONS

### SECTION 01140

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes restriction on Contractor access and use of the premises for Work of the Contract. These requirements are in addition to requirements for Owner occupancy in Section 01110 and requirements contained in technical Sections of the Project Manual.

1. Do not disturb portions of the premises outside the Work Areas.
2. Do not encumber the site with materials or equipment. Stockpiling and storage of materials, recycling and debris shall be contained within the areas designated by Owner.

##### 1.2 CONTRACTOR USE OF PREMISES

- A. The Contractor shall include all expenses, fees and costs directly and indirectly associated with limitations on access and traffic routes, delivery, storage and loading areas, traffic planning and control, after-hours and premium time and off-site storage resulting from Contract requirements and restrictions.

1. Where Owner's facilities and services made available for the Contractor's use are not adequate to fulfill Contract requirements and facilitate efficient and timely execution of the Work the Contractor shall provide supplemental facilities and services as necessary to ensure efficient and timely execution of the Work at no change in Contract amount.

- B. Throughout the Contract time use and maintain the site in a safe condition, secured against damage due to weather exposure and other potential sources of damage. Damage occurring during construction operations shall be repaired at no additional cost to the Owner.

1. Keep public areas such as sidewalks and stairs free from accumulation of waste material, rubbish or construction debris.
2. Use of existing toilets by contractor personnel is not permitted. Provide temporary facilities.
3. Perform the Work without disruption to traffic routes, building exists and areas outside the Work Areas. Maintain barrier free routes.

- C. Work requiring access to areas outside of the Work Areas: Request access 7 days prior to date schedule for the work affected. Include in the request the exact location, general nature of the work and security and safety measures to be provided in association with the work.

Utility Services: Maintain continuity of service, and prevent damage due to the Work. Damages and loss occurring due to unscheduled service interruption resulting from the Work and failure of temporary service shall be the Contractor's responsibility. Service interruptions required for the Work shall be scheduled with the Owner in advance of the interruption.

1. Interruption: Advance scheduling and written authorization required.
2. Provide temporary services during interruptions to existing utilities as acceptable to Owner and governing authorities.



### 1.3 TRAFFIC, ACCESS AND PARKING

- A. Contractor's Access to Project: Limited to designated approaches and shall not interfere with the Owner's occupancy.
  - 1. Keep existing driveways, parking areas, public transportation stops, walkways and entrances clear and available to the Owner and the public at all times; do not use for parking or storage of materials.
  - 2. Conduct the Work to allow uninterrupted access for emergency vehicles and services to the Project, and all adjacent areas.
  - 3. Promptly clean up debris and construction material dropped on traffic and loading areas maintain service access ways and streets to the satisfaction of the Owner's Representative.
- B. When alternative routing and scheduling to avoid interference with routine street and sidewalk traffic would prevent proper performance of the Work, provide a satisfactory detour affording safe passage of traffic around or over the interference.
  - 1. Provide advance notice to the Owner where traffic interference and detours may impact Owner occupancy.
- C. Protect finished surfaces and assemblies and facilities on permanent access routes from damage due to Contractor activities.
- D. Parking For Contractor's Personnel: Contractor's responsibility, the Owner will not pay for Contractor parking. Parking on public streets, at public parking garages and public transportation may be available at the Contractor's expense.
  - 1. Unauthorized Parking in Owner-reserved spaces will result in towing or impoundment without prior notice at the Contractor's risk and expense.
- E. Do not park trucks, store materials or cross over landscaped areas. Any plant materials damaged as a result of the performance of this work will either be replaced with new plant materials equal in size to those damaged or by payment of an amount representing the value of the damaged material as determined by the Owner.
- F. Permission for access to the site may be revoked for any and all persons who violate the Owner's traffic regulations, including speed limits, parking restrictions and permit requirements.
  - 1. Compliance with Owner Vehicular Access Requirements: The Contractor's responsibility for Contractor personnel, operating forces and deliveries.
  - 2. Lock automotive type vehicles such as passenger cars and trucks and other mechanized and motorized construction equipment, when parked and unattended, prevent unauthorized use. Do not leave vehicles or equipment unattended with the motor running or the ignition key in place.

### 1.4 ADVANCE NOTICE REQUIREMENTS

- A. Provide advance notice to the Owner for activities that could affect the Owner's normal occupancy; scheduling of such activities is subject to Owner approval. The Owner shall have the right to require alternative scheduling or sequencing of Work with neither penalty nor modification to Contract Time and Sum when necessary to prevent disruption of Owner's

occupancy. All costs and damages incurred by the Owner due to Contractor's failure to comply with advance notice and scheduling requirements shall be the responsibility of the Contractor.

1. Access and Contractor operations outside of conventional business hours require advance approval by Owner and coordination with Owner's security program.
2. Access to areas outside of the Work Areas.

B. Interruption of Utilities Serving Owner Occupied Areas: Advance notice and Owner approval is required regardless of magnitude or duration. Schedule utility interruption for times that will minimize disruption to Owner occupancy. Submit completed SHUTDOWN REQUEST at least seven days prior to requested shutdown date.

1. Identify existing utilities whether indicated or not and protect from damage.

C. Traffic Interruption: Provide 7 days advance notice and obtain written authorization.

#### 1.5 DAMAGE AND RESTORATION

A. Restore or replace as directed by the Owner's Representative damage to existing and new Work including but not limited to landscaping, paving, roads and sidewalks damaged as a result of the performance of this work at no change in Contract amount.

B. Restoration: Equal to the physical and aesthetic characteristics of the original work. Finishes shall match the appearance of similar existing adjacent work. Comply with repair requirements for cutting and patching work.

C. Remove and replace unacceptable restoration work; where work cannot be acceptably restored as determined by the Owner's Representative provide new work as directed.

#### 1.6 SECURITY OF SITE

A. Contractor shall provide 24 hour per day measures to keep construction area secure and prevent unauthorized access into the tunnel, or any other campus facility.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

## UNIT PRICES

### SECTION 01270

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Definitions:
  - 1. Unit Price: Cost quoted by bidder and stated on the Bid Form or agreed to by the Contractor and Owner subsequent to signing of the Contract for a specified unit of work that may be added to or deducted from the Contract Amount by Change Order in the event the quantity of that work required by the Contract Documents is increased or decreased. Unit Price shall include all necessary material, labor, equipment, services, overhead (including subcontractor's mark-up, employee benefits, and Contractor's insurance and bond), profit and applicable taxes.
  - 2. Adjustment to the Contract Sum by Unit Prices: Limited to the quantity of work provided multiplied by the Unit Price, no further adjustment (including overhead, profit and similar charges) will be made.

#### PART 2 PRODUCTS - Not Used

#### PART 3 EXECUTION

##### 3.1 UNIT PRICE SCHEDULE

- A. Unit Prices Schedule: Generic name, unit of measurement, price per unit, related specification Sections, subcontractor name if other than General Contractor and whether the amount is additive or deductive. Refer to individual Sections for additional requirements. Unit price shall represent the complete cost of the work including Contractor's overhead and profit.

END OF SECTION

## SUBMITTALS

### SECTION 01330

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Procedural requirements for work-related, and administrative submittals.
  - 1. Administrative Submittals: Refer to Division-1 sections, conditions of the Contract and other contract documents for requirements for administrative, non-work-related submittals.

##### 1.2 DEFINITIONS

- A. Administrative Submittals: Include but not limited to the following:
  - 1. Permits.
  - 2. Payment applications.
  - 3. Performance and payment bonds.
  - 4. Insurance certificates
  - 5. Inspection and test reports.
  - 6. Schedule of values.
- B. Shop Drawings: Technical drawings and data specially prepared for this project, standard information prepared without specific reference to the Project will not be accepted as shop drawings. Shop drawings include but are not limited to the following items:
  - 1. Fabrication and installation drawings.
  - 2. Setting diagrams.
  - 3. Shopwork manufacturing instructions.
  - 4. Templates.
  - 5. Patterns.
  - 6. Contractor's Coordination documents.
  - 7. Schedules.
  - 8. Design mix formulas.
  - 9. Contractor's engineering calculations.
- C. Product Data: Demonstrate product complies with requirements; printed information, typically not specially-prepared for this project, includes but is not limited to the following:
  - 1. Manufacturer's specifications, installation, and catalogue cuts.
  - 2. Manufacturer's Safety Data Sheets.
  - 3. Color charts.
  - 4. Mill reports.
- D. Mock-up's: Provide the following finished product sample for approval prior to fabrications:
  - 1. Handrail with Galvanizing

E. Miscellaneous Submittals: Submittals that do not fit in the three previous categories, including, but not limited to the following:

1. Specially-prepared and standard printed warranties.
2. Testing and certification reports.
3. Record drawings.
4. Field measurement data.

### 1.3 SUBMITTAL PROCEDURES

- A. Preparation and Processing: Coordinated with the performance of the Work, other submittals, testing, purchasing, fabrication, delivery and similar sequential activities.
- B. Interrelated Work: Coordinated for Engineers review so that processing will not be delayed by the need to review submittals, concurrently; Engineer retains the right to withhold action on incomplete submittals pending receipt of related materials.
- C. Review Time: Sufficient in the Engineer's professional judgment for processing of each submittal and coordination with related work. Schedule submittals so as not to delay progress of the Work as a result of time required to properly process submittals, and resubmittals. Advise the Engineer on each submittal where processing time is critical.
1. Engineer acknowledges the limits of the Contract Time and will cooperate with the Contractor with timely and effective processing of submittals consistent with the Engineer's responsibilities and professional judgment.
  2. Engineer will promptly advise Contractor when submittal processing must be delayed for coordination with submittals not yet received.
  3. No extension of time will be authorized due to Contractor's failure to properly coordinate submittals and transmit them to the Engineer sufficiently in advance of the work.

### 1.4 SUBMITTAL FORMAT

- A. Comply with the following requirements for each type of submittal, unless otherwise required in individual technical Sections.
1. Deviations from Contract Documents: Noted on transmittal, and described on a separate attachment, and identified on the submittal.
  2. Approved Final Submittals: Maintain as returned by Engineer, distribute copies to subcontractors, governing authorities and others as required for proper performance of the work. Show distribution on transmittal forms. Keep record submittals on site for quality control comparisons, acceptance of Work, and incorporation into record documents.
  3. Unless otherwise required issue submittal and obtain Engineer's approval prior to ordering materials, and beginning fabrication.
- B. Labeling: For identification processing and recording of action taken
1. Project name.
  2. Date.
  3. Name and address of subcontractor, material supplier and manufacturer.

4. Reference information to Construction Documents, pertinent drawings and specifications.
  5. Contractor's signed review and approval markings
  6. 4 by 5 inch space for the Engineer's processing marking.
- C. Transmittal Form: Attached to all submittals. Submittals transmitted to the Engineer from sources other than the Contractor will be returned to sender without action. Provide places for the following information:
1. Project name.
  2. Date.
  3. To: / From:
  4. Names of subcontractor, manufacturer and supplier.
  5. Category and type of submittal.
  6. Submittal and transmittal distribution record.
  7. Signature of transmitter.
  8. Contractor's signed certification stating, that the information submitted complies with the requirements of the Contract Documents.
  9. Other pertinent information.
- D. Shop Drawings: To scale, and with dimensions. Identify specific products, materials, compliance with specified standards, coordination requirements, and field measurements.
1. Format: Between 8.5 by 11 inch, and 36 by 48 inch. Provide title block indicating Project, firm preparing drawing, drawing scale, date and revisions. Allow 4 by 5 inch space beside title block for processing marks.
  2. Do not reproduce contract documents or copy standard printed information as the basis of shop drawings.
  3. Submittal: One reproducible print, one reproducible copy of the processed document will be returned for the Contractor's reproduction and distribution as necessary. Maintain the processed copy as a "Record Document"
  4. Coordination Drawings: Prepared as necessary and required to show special requirements for integration of separate components and systems.
- E. Product Data: Manufacturer's standard printed recommendations for applications shown, compliance with Reference Standards, tests, labels and seals, performance and aesthetic characteristics, required to document conformity with the Contract Documents.
1. Format: Single submittal incorporating required information. Indicate choices and options; where data includes items not required for the Project identify products and information applicable to the Project.
  2. Nonstandard Product Data: Submit as Shop Drawings where standard printed data is not acceptable.
  3. Acceptable Submittal: Minimum 4 copies of required product data, one processed copy will be returned. Provide additional copies when the Contractor wishes to have more than one processed copy returned. Confirm product compliance with Contract Documents prior to submitting.
- F. Samples: Fabricated, cured and finished, physically identical to material or product to be incorporated in the Work. Where color, pattern, and texture variations are inherent show range of variation to be expected in the final Work, submit not-less-than three units. Match

Engineer's sample, where specified; when samples are required for Engineer's selection of color, texture and pattern submit complete range of available choices. Samples are for Engineer's visual review of generic kind, color, pattern, and texture, and coordination of these characteristics with related elements of the Work; compliance with other required characteristics is Contractor's responsibility.

1. Format: Description of sample, material or product name, manufacturer, source, limitations of availability, size and delivery time, and compliance with reference standards and regulatory requirements.
2. Special Procedures: Indicate on transmittal for disposition of samples that may be returned and incorporated into the Work in accordance with Section requirements.
3. Submittals: A minimum of three samples, provide additional samples when directed.

G. Miscellaneous Submittals:

1. Inspection and Test Reports: Process as Shop Drawing when specially prepared for the project, or as Product Data when a standard publication of workmanship control testing at the point of production.
2. Warranties, Documents, and Bonds: Comply with Section 01770 requirements.

1.5 ENGINEER'S ACTION

- A. Processing of Contractor submittals by attached memorandum or mark-up with comments and affix a stamp to indicate status of review as follows: "Reviewed", "No Exceptions Taken", "Make Corrections Noted", "Rejected", or "Revise and Resubmit". "Checking is for general conformance with design concepts and compliance with Contract Document information. Corrections or comments made do not relieve contractor from complying with contract requirements. Contractor responsible for: confirmed correlated site dimensions, fabrication process, techniques of construction, and coordination of his work with all other trades."
- B. The Engineer shall be permitted sufficient time in their professional judgment for review and processing of each Contractor submittal without claim for delay to the progress of the Work, generally not less than 7 days. Engineer will endeavor to accelerate review upon written notification attached to the submittal stating that processing time is critical, detailing the nature of the critical timing and the period within which processing is requested to be completed; this request shall not be binding on the Engineer. Expedited review will not be provided when requested due to Contractor delay in making an acceptable submittal. Do not proceed with Work without Engineer's approval as required for submittal, Engineer's approval does not relieve Contractor of responsibility to perform the Work in accordance with Contract Documents.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

## SPECIAL PROCEDURES

### SECTION 01350

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes special administrative and procedural requirements for the Work.

##### 1.2 SPECIAL ADMINISTRATIVE SUBMITTALS

- A. Request for Information (RFI): Process to be used for clarification of Contract Requirements and assist the Contractor in gathering information needed for proper execution of the Work. The Contractor and Owner understand and agree that the Contract Documents are complete and sufficiently thorough to document the Engineer's design intent, and to establish Contract requirements, Contract Time, and Contract Sum. The Contractor and Owner also understand and agree that the Contract Documents do not provide all of the information that will be necessary to complete the Work. This information will be provided by the Contractor as work of the Contract. Occasionally the Contractor may have need of clarification of Contract requirements, design intent, resolution of on-site concerns or other collaboration with the Engineer that cannot be adequately resolved by required administrative and work-related submittals such as shop drawings, and coordination drawings.
  - 1. Prior to submitting to Engineer, Contractor shall date and sign RFI's, ensure that information is complete, and advise when cost or schedule impacts may occur.
  - 2. Engineer's Processing of RFI: Sufficient in the Engineer's professional judgment for the information requested. Engineer will stamp for date received, review the Contract Documents and respond on the RFI or attachments thereto as may be convenient. Engineer will not process RFI's lacking complete information, including necessary reference documents.
  - 3. Cost of processing RFI's resulting from Contractor's failure to make timely submittals, provide required coordination of the Work, and lack of familiarity with the Construction Documents will be the Contractor's responsibility at no change in Contract Amount.
- B. Special Reports: Submit directly to Owner within one day of an occurrence; copy the Engineer and other effected entities.
  - 1. Unusual Events: List chain of events, persons participating, response by the Contractor's personnel, an evaluation of the results or effects and similar pertinent information. Advise the Owner in advance when such events are known or predictable.
    - a. Unusual Events include but are not limited to enforcement actions of regulatory agencies and authorities, other than regular inspections by building officials.
- C. Accident Reports: Provide for accidents where personal injury is sustained, property loss of substance occurs, and where the event posed a significant threat of loss or personal injury. Include accidents on and off-site where work for the Project is in progress. Record and document data and actions.
- D. Monthly Written Reports, Daily Log, Cost Control System and other documentation required in the Oregon University System Contract shall be provided as required by the Contract.



PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

## DEFINITIONS AND STANDARDS

### SECTION 01425

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Definitions, description of specification format and content, and utilization of reference and industry standards.

##### 1.2 DEFINITIONS

- A. Certain terms used in the Contract Documents are defined in this article. Definitions and explanations contained in this Section are general for the Work to the extent that they are not stated more explicitly in another element of the contract documents. Basic Contract definitions are included in the General Conditions.
- B. Regulations: Laws, statutes, ordinances and lawful orders issued by governing authorities, requirements of private entities such as utility company serving the Project, and conventions and agreements within the construction industry that effectively control the performance of the Work regardless of whether they are imposed by government authority or not.
- C. Indicated: A cross-reference to graphic representations, notes and schedules on the drawings, and shall be read to mean "as indicated on the drawings". Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for the purpose of helping the reader locate the cross-reference, and no limitation of location is intended except as specifically noted.
- D. Directed, Requested and Similar Terms: Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by the Engineer", "requested by the Engineer", and similar phrases. However, no such implied meaning will be interpreted to extend the Engineer's responsibility into the Contractor's area of construction supervision.
- E. Approve: Where used in conjunction with the Engineer's response to submittals, requests, applications, inquiries, reports and claims by the Contractor, the meaning of the term "approved" will be held to limitations of the Engineer's responsibilities and duties as specified in General and Supplementary Conditions. In no case will the Engineer's approval be interpreted as a release of the Contractor from responsibilities to fulfill requirements of contract documents.
- F. Project Site: The term, "Project site", is defined as the space available to the Contractor for performance of the Work, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the drawings, and may or may not be identical with the description of the land upon which the Project is to be built.
  - 1. Work Area: Enclose the area or areas available to the Contractor for execution of the Work or a portion thereof.
- G. Furnish: Interpreted to mean supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations as applicable in each instance.

- H. Install: Used to describe operations at Project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing protecting, cleaning and similar operations, as applicable in each instance for the Work to be complete and ready for intended use.
- I. Provide: Interpreted to mean furnish and install, complete and ready for intended use, as applicable in each instance.
- J. Replace: When used in the context of "Remove and replace", referring to elimination of unapproved and unacceptable equipment, material and other Work from the Project, the term "Replace" means "Replace with new material, equipment and Work".
- K. Installer: The term "installer" is defined as "the entity" (person or firm) engaged by the Contractor, and subcontractors of any tier for performance of a particular unit of work at the Project site, including installation, erection, application and similar required operations. It is a requirement that installers are experienced in the operations they are engaged to perform.
- L. Necessary: Needed or essential for complete and proper performance of the Work as required and as demonstrated by conventional practices of the Trade or discipline in question and common sense.
- M. Required: Directive in the Contract Documents, and a charge of the Engineer which must be fulfilled for the Work to conform to the intent of the Contract Documents.
- N. Testing Laboratories: The term "testing laboratory" is defined as an independent entity engaged to perform specific inspections or tests of the work, either at the project site or elsewhere, and to report, and (if required) interpret results of those inspections or tests.
- O. Shop Work: Designates work not performed at the Project Site and is intended to signify that controlled conditions will be provided within tighter tolerances than might be achievable in the field. Such conditions include but are not limited to, environmental control, cleanliness, and sequence of assembly and finishing.
- P. Premium Time: Overtime and similar terms shall be defined as any period during which labor or a service is provided for which an elevated cost is assessed (by statute, labor agreement or other reason) due to time of day, calendar day, accumulated hours or other factors.
- Q. Tolerance: Dimensional deviations in the Work specified in individual Sections and reference standards are the maximum total acceptable deviation and shall not be additive to tolerances for other work.

### 1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These specifications are organized into Divisions and Sections based upon the Construction Specifications Institute's 16-Division MasterFormat System.
  - 1. Divisions are standard categories of construction information.
  - 2. Sections: Considered as basic units of work, Section title is descriptive only and not intended to limit the meaning or content of a Section or to be completely descriptive of requirements specified therein.

3. Part: An organizational device dividing a Section into three distinct groups of related information.
- B. Sections are placed in the Project Manual in numeric sequence to facilitate cross-referencing. The Project Manual "Table of Contents" lists the numbers and names of specification Sections in the Contract Documents.
- C. Project Identification: The project name is recorded at the bottom left corner of each page of the specifications.
- D. Page Numbering: Pages are numbered independently for each Section, The Section number is shown together with the page number at the bottom of each page to facilitate the location of text in the Project Manual.
- E. Specification Text: Dependent upon other text to the extent described in individual Sections, and as follows.
  1. Text: Subordinate to Titles.
  2. Indented Text: Subordinate to preceding text that is not indented.
- F. Specification Language: Imperative and addressed to the Contractor except where other parties are specifically identified. Singular and plural meanings will be interpreted based upon the full context of the Contract Documents.
  1. The words "shall be" are included by reference wherever a colon (:) is used within a sentence or phrase.
  2. Effort has been made to employ gender neutral language throughout the documents; however, occasional gender based references may be used. Such terminology as workmanship, craftsmanship and other gender based terms shall be interpreted to be gender neutral.
  3. The terms "installer", "manufacturer and similar words shall be interpreted to mean the entity the Contractor has chosen to perform certain portions of the Work. The use of these terms shall neither be construed to shift responsibility for performance of the Work away from the Contractor nor alter their responsibility to comply with Project requirements.
- G. Method of Specifying one element of the Work has no bearing on requirements for another element of the Work, and may vary throughout the text, and include any combination of the following:
  1. Open generic-descriptive.
  2. Performance.
  3. Proprietary.
  4. Compliance with reference standards.
- H. Work Required to be Designed and Engineered by the Contractor: Comply with performance and design requirements established in the specifications. The Contract Documents do not include all prescriptive requirements nor details for Contractor designed work. In general, the documents will establish certain design and performance requirements for such work. If the information provided is not sufficient to perform services or certification required, submit a written request for additional information to Engineer. As a variety of solutions complying

with the Contract requirements may be available, it shall be the Contractor's responsibility to determine the finite scope of Contractor designed work.

- I. Conflicting, and Ambiguous Requirements: Interpreted to provide the highest quality, greatest quantity, and more costly, time consuming scope of Work; request Engineer's resolution before proceeding.
  - 1. Quantity and Quality of Work Specified: Minimum for the Work to be provided, and shall not otherwise be interpreted as establishing required limits.
- J. Assignment of Specialists: Required when levels of experience and qualifications are specified for entities performing specific parts of the Work. These special requirements, over which the Contractor has no choice or option, establish who may be qualified to perform the Work. The ultimate responsibility to fulfill Contract requirements remains with the Contractor.
  - 1. These Requirements: Interpreted so as not to conflict with the enforcement of building codes and similar regulations governing the work not to interfere with local trade union jurisdictional settlements and similar conventions.
  - 2. No Allowance: Made by Engineer in accepting and rejecting Work due to lack of experience and craftsmanship on the part of workers.
- K. Use of certain titles such as "carpentry" in the specification text, is not intended to imply that the Work must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter, and does not imply that the requirements specified apply exclusively to work by tradespersons of that corresponding generic name.

#### 1.4 INDUSTRY STANDARDS

- A. Standards: Incorporated into the Contract by reference and shall have the same force and effect as if bound into the document. Maintain copies of codes and standards at the Project as necessary to understand and communicate the requirements for the Work. Contractor's responsibility to provide Work complying with Contract requirements shall not be diminished by statements made in referenced standards and documents. Comply with reference standards except where more stringent requirements obtain.
  - 1. Standards referenced directly in the Contract documents take precedence over standards not referenced.
  - 2. Standards not referenced, but applicable to the Work will be enforced as a general requirement that the Work conform to superior levels of quality typically recognized in the industry.
- B. Publication Dates: Date of the reference standard in effect as of the date of Contract Documents.
  - 1. Updated Standards: At the request of the Engineer, Contractor or governing authority, submit a change order proposal where an applicable industry code or standard has been revised and reissued after the date of the contract documents and before the performance of the work affected. The Engineer will decide whether to issue the change order to proceed with the updated standard.

- C. Familiarity With Standards and Issuing Bodies/Organizations: Responsibility of the entity performing the Work. The Contractor shall obtain copies of Standards from the publication source as necessary and required to comply with the intent of the Contract Documents.

#### 1.5 ABBREVIATIONS AND NAMES

- A. Trade association names and title of general standards are frequently abbreviated. The acronyms and abbreviations referenced in contract documents are defined to mean the associated names. Both names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of contract documents. The Contract Documents may use only the acronym or the abbreviation for a given trade association or reference standard without stating the associated name in full. Request clarification from the Engineer where the intended reference or association is ambiguous or unclear.

#### 1.6 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

## QUALITY ASSURANCE

### SECTION 01450

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes, requirements for inspections, tests, reports, and related actions performed by the Owner's agent and others as necessary to evaluate whether the Work conforms to the requirements of the Contract Documents.
  - 1. Contractor: Responsible for conformity of the Work with the Contract Documents.
  - 2. Engineer's Administration of the Contract: Not included in Quality Control Services.
- B. Specific Quality Control Requirements: As indicated and as specified in each Section to cover manufacture and installation of standard and custom materials and products, and shall not be limited by the provisions of this Section.
- C. The Owner will provide an agent for Special Inspections and Testing to comply with IBC Section 1701 and directives of regulatory agencies having jurisdiction over the Work. Unless otherwise specifically required the Contractor shall have responsibility for all other Quality Control Services and assistance to the Owner's agent as required by this Section.
  - 1. Contractor shall provide an approved independent testing laboratory to perform quality control services not provided by the Owner's agent.
  - 2. Cost associated with the Contractor's quality control services and with assistance to the Owner's agent shall be included in the actual Cost of the Work.
- D. Retest Responsibility: Contractor's where results of quality control services do not indicate that Work complies with contract requirements, regardless of responsibility for initial tests.
  - 1. Work the Engineer determines may be defective: Tested by the Contractor as directed, including selection of testing agency.
  - 2. Owner will reimburse Contractor for costs of testing and retesting where results indicate the work complies with Contract requirements.
- E. Responsibility For Testing of Replaced and Remedial Work: Contractor's, regardless of responsibility for initial tests.
- F. Contractor shall cooperate with agency performing quality control services without regard to responsibility for quality control services; provide auxiliary services as directed, including, but not limited to:
  - 1. Access to the Work.
  - 2. Incidental labor, facilities and equipment to assist and take samples.
  - 3. Delivery of samples to test laboratories.
  - 4. Storage and protection of samples and equipment at Project.
- G. Contractor shall coordinate the Work with quality control activities regardless of responsibility for them, schedule times for inspections, tests and taking of samples; maintain progress of the Work

and avoid cutting and patching to accommodate inspections and tests.

1. Notify the testing agency in advance of operations to permit assignment of personnel.
2. Notify testing agency in advance of special inspections and tests required by building officials.

### 1.3 SUBMITTALS

- A. Quality Control Activities Schedule: Submit a tabular schedule within 14 days of the date of the Notice to Proceed, but in no case less than 7 days prior to the scheduled date for initiation of quality control activities. Schedule shall include the following as a minimum.
  1. Reference to specification section number and unit of work.
  2. Identification of activities to be performed and the party responsible for performing each.
  3. Time schedule and duration of each activity.
  4. Unique characteristics or requirements for each activity.
- B. Certified Written Report: Submit in duplicate, to Engineer each inspection, test and similar service performed by the Owner's agent.
- C. Reports shall include, but not be limited to the following:
  1. Name of testing agency and individuals performing services.
  2. Designation of the work and test method.
  3. Dates and locations of samples and tests and inspections.
  4. Ambient conditions when samples taken and tests performed.
  5. Inspection and test data and results.
  6. Interpretations of test results.
  7. Evaluation of Work compliance with Contract Documents.
  8. Recommendations on retesting, if applicable.

### 1.4 QUALITY ASSURANCE

- A. Regulatory Requirements for Special Inspections: Owner will engage a qualified agent to perform tests and inspections required by authorities having jurisdiction and as required by the Contract Documents, and will also be responsible for the following.
  1. Notifying the Engineer of results within 24 hours of performing tests or inspections.
  2. Submitting a certified written report of each test, inspection, and similar quality-control service to Engineer with copy to authorities having jurisdiction.
  3. Submitting a final report of special tests and inspections at Substantial Completion, including a list of unresolved deficiencies (if any).
  4. Interpret tests and inspections and affirm compliance or deviation from the Contract Documents.
  5. Retesting and re-inspection of corrected work.



PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 INSTALLATION

- A. Protect Work exposed for quality control service activities.
- B. Repair and Protection: Contractor's responsibility, regardless of entity responsible for quality control services.

END OF SECTION

## TREE AND PLANT PROTECTION

### SECTION 01565

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes requirements for work processes and temporary measures to protect trees, plants, and groundcovers from damage both above and below grade.
- B. Definitions:
  - 1. Dripline: Outer perimeter of branches of any tree or plant.
  - 2. Groundcover: Includes but not limited to plants and grass.
- C. Performance Requirements: Contractor shall provide complete measures to prevent damage due to construction activities and fulfill the following requirements regardless of whether the measures are completely documented by the Contract Documents or not.
  - 1. Soil contamination, erosion, compaction and unauthorized alteration of grade.
  - 2. Excessive wetting, and ponding due to storm water, and construction run-off.
  - 3. Prevent within drip-line of tree, construction traffic, stockpiling of soil, debris, and materials.
  - 4. Damage to soil, ground covers, roots, bark, trunk, limbs, branches, and foliage.
  - 5. Prevent unauthorized cutting, breaking, skinning and bruising of roots, branches, and bark.

##### 1.2 SUBMITTALS

- A. Procedural proposal for work processes within tree and plant protection zones. Describe work methods, supplemental protection, and other measures provided to prevent damaged and deterioration due to the Work.
- B. Mitigation Measures: Where Work activities have caused or contributed to damage or deterioration of ground covers, trees or soil propose means and methods of mitigating the damage or deterioration and restore the prior condition of the plant materials and soils.
  - 1. Arborist's Maintenance Recommendations: Recommended care and procedures for trees affected by construction during and after completing the Work.
  - 2. Arborist's Irrigation Schedule: Means and sequence for watering to maintain wet soil conditions within tree protection zones.

##### 1.3 SEQUENCE

- A. Install protection during initial mobilization at the site, and maintain until substantial completion.

## PART 2 PRODUCTS

### 2.1 MANUFACTURED COMPONENTS

- A. Open Web Plastic Barrier Fence: 48 inches tall, safety orange; Amoco HiVu Barrier Fence or approved.
  - 1. Posts: Rigid metal, plastic or wood minimum 6 ft. length adequate strength to support fencing and resist wind and moderate live loads.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Inspect trees, plants, and groundcovers, document existing conditions prior to installation of protection.
- B. Water trees and plants as necessary to maintain existing condition throughout the Contract period until Substantial Completion.

### 3.2 PREPARATION

- A. Provide temporary fence for protection of trees to remain use fence type appropriate for the hazardous to be protected against; provide chain link fencing complying with ASTM F 567 to protect from vehicles, and plastic barrier fencing in areas where traffic is limited to pedestrians. Extend fencing ten feet beyond dripline, unless greater distance is required for protection of selected species.
  - 1. Prevent entry into protected areas except as authorized in writing by the Owner's Landscape maintenance personnel.
  - 2. Driving and Parking: Not permitted on grass, nor within dripline.
  - 3. Storage of Materials and Debris: Not permitted within dripline.

### 3.3 EXECUTION

- A. Carefully and cleanly cut roots and branches of trees indicated to be left standing where such roots and branches obstruct new construction. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover, or pack with peat moss and wrap with burlap. Water and maintain in moist condition and temporarily support and protect from damage until permanently relocated and covered with backfill
  - 1. Coat cut faces using an approved coating specifically formulated for use on damaged plant tissue.
  - 2. Protect exposed roots with wet burlap until they can be covered with soil.
- B. Structural support (cabling) in accordance with National Arborist Association Standards may be required on specific trees within the project limits and where required for construction clearance, as identified by the Consulting Arborist.
- C. Excavation and Trenching Within Drip Lines: Generally limited to hand work. Permitted where indicated, and at other specifically approved locations per the Contractor's approved submittals.

1. Tunnel under or around roots by hand digging or boring. Do not cut main lateral roots and tap roots over one inch diameter; cut smaller roots which interfere with installation of new work.

D. Existing Grading: Maintained within drip line of trees and plants unless otherwise indicated on the drawing and approved by the Engineer.

### 3.4 TREE AND PLANT REPAIR AND REPLACEMENT

A. The Contractor shall pay the Owner the value of existing trees, that were to remain, which were damaged in the course of the Work and existing trees within plant protection zones that die

within one year of Substantial Completion due to failure to comply with requirements of this Section.

1. Liquidated Damages: Assessed according to the formula and standards adopted by the *Council of Tree and Landscape Appraisers* and the evaluation formula set forth in *The Council of Tree and Landscape Evaluation Guide for Plant Appraisers*, current edition at rates per square inch of trunk area for conifers and deciduous trees.

B. Wound and partial injury will be calculated by percentage, estimated by the Consulting Arborist, of the total value of the damaged tree. Liquidated damages for partial injuries will include the cost to the Owner for loss appraisal by the Consulting Arborist plus the cost for necessary damage repair. Wound or damage to an existing tree due to the Work includes but is not limited to the following.

1. Damage to cambium tissue.
2. Unauthorized and improper cutting, breaking or removing of branches and roots.
3. Soil compaction and other soil damage including contamination.

C. Damaged Trees and Groundcover: Replace where Engineer determines restoration to normal growth pattern is not possible. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees.

1. Replacement Trees: Plant and maintain as directed.
2. Replacement Groundcovers: Same size and quality as damaged, species selected by Owner.

END OF SECTION

## PRODUCT REQUIREMENTS

### SECTION 01600

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes requirements for general control of product, material, equipment, and substitution requests.

##### 1.2 DEFINITIONS

- A. Products: Includes the terms "material", "system" and terms of similar intent. Purchased for incorporation in the Work, regardless of whether specifically purchased for the Project or taken from the Contractor's stock.
- B. Named Products: Identified by use of the manufacturer's name, make, or model designation, current as of the date of the Contract Documents.
- C. Materials: Products that must be substantially cut, shaped, worked, mixed, finished and otherwise processed for incorporation into the Work.
- D. Method: Specific entity (including installers and subcontractors), technique, or sequence required by the Contract Documents.
- E. Substitutions: Contractor's requests for changes in the products, materials, and methods of construction required by the Contract Documents. Unless otherwise required the Contractor's determination of and compliance with governing regulations and orders by authorities are "substitutions" and are not a basis for change orders.
  - 1. The following are not considered substitutions.
    - a. Revisions to the Contract requested by the Owner or Engineer.
    - b. Substitutions accepted prior to the Contract Date, and included in the contract documents by addendum.
    - c. Contractor Option where specific manufacturer and product are listed. Where only a manufacturer is listed provide a substitution request for the product of the listed manufacturer submitted in lieu of the specified product when requested by the Engineer.

##### 1.3 SUBMITTALS

- A. Substitution Request Submittal: Identify the product, fabrication, or method to be replaced by the substitution; include related specification section and drawing numbers. Include the following:
  - 1. Complete product data, drawings and descriptions of products, and fabrication and installation procedures.
  - 2. Samples where applicable or requested.
  - 3. Detailed comparison of the proposed substitution with the work originally specified, including size, weight, durability, performance and visual effect.

4. Complete coordination information, and changes required in the Work to accommodate the substitution, including work performed by the Owner and separate prime Contractors.
5. Indicate effect substitution will have on the work schedule in comparison to the schedule without approval of the proposed substitution.
6. Provide complete cost information, including a proposal of the net change, if any in the Contract Sum.
7. Contractor certification that the proposed substitution will result in work that is equal-to or better than the work required by the Contract documents, and that it will perform adequately in the application indicated.
8. Contractor's waiver of rights to additional payment or time, which may subsequently be necessary because of the failure of the substitution to perform adequately.

B. Substitution Request Form:

1. Engineer's action: Post-bid substitutions; Within ten days of receipt of the Contractor's request for substitution, the Engineer will notify the Contractor of either the acceptance or rejection of the proposed substitution.
2. Acceptance of substitutions during bidding: By Addendum.
3. Acceptance of substitutions after contract is signed: By Change Order.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Provide products of the same generic kind, from a single source, for each unit of work.
- B. Assembled Products and Constituent Components: Current production by manufacturers regularly engaged in the manufacture of such items. When two or more of the same units are required, they shall be products of one manufacturer. Manufacturer of equipment assemblies, which includes components made by others, shall assume complete responsibility for the final assembled unit.
  1. Constituent Parts: Compatible with each other and with the total assembly for the intended service. Like parts shall be product of a single manufacturer.
- C. Compatibility of Products and Materials: Essential requirement for every product and material incorporated in to the Work. Each product and material selected for use in the Work must be compatible with other products and materials previously selected. Universal compatibility between specified products and materials and alternative and substituted products and materials is not assured by the Contract documents, but must be provided by the Contractor.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products in accordance with manufacturer's recommendations, and standards referenced in individual Sections. Maintain fitness for intended application; prevent loss, theft, damage, contamination, deterioration, and overcrowding of Project. Minimize onsite storage period, especially for items known or recognized to be flammable, hazardous, and easily damaged.
  1. Ferrous and Galvanized Metal Products: Keep dry, off of the ground, covered with tarpaulins; provide for ventilation and escape of water vapor. Prevent wet storage stain.

- B. Deliver products to the site in the manufacturer's sealed container or other protective packaging complete with labels, tags, and instructions for handling, storing, unpacking, protecting and installing.
- C. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units. Avoid concentrated loads that could endanger supporting construction. Avoid extremes of temperature and humidity.

## PART 2 PRODUCTS

### 2.1 MATERIALS AND MANUFACTURED UNITS

- A. Products: New, Undamaged, comply with Contract requirements, and complete with all accessories, trim, finish, safety guards, devices and details necessary for a complete installation.
  - 1. Provide products used successfully in similar conditions of service on other projects.
  - 2. Replacement Parts and Product: Certified by Manufacturer as being readily available to Owner at a later date.
- B. Individual Requirements for Products and Manufacturers: Included in the Contract Documents, when conflicting requirements are discovered, obtain Engineer's clarification before proceeding.
  - 1. Visual Matching: Determined by the Engineer; request substitution where product is not available that matches the sample satisfactorily and complies with other requirements.
- C. Product Options: Controlled by Contract requirements only.
  - 1. Except as denoted by the term "or approved" requests for substitution will be accepted only during the bidding period, comply with requirements for substitutions to obtain approval of unnamed product, and manufacturer.
  - 2. Single Product, and Manufacturer Name: No options, provide as listed.
  - 3. Multiple Product, and Manufacturer Names: Contractor's option, provide one from list
  - 4. No Product, and Manufacturer Name: Contractor's option, provided choice complies with specified properties and performance characteristics, and is recommended in writing by manufacturer for conditions of service shown. General product performance is implied where express performances are specified.
- D. Manufacturer's Nameplate and Trademarks, do not attach or imprint on surfaces of products exposed to view in occupied spaces nor on the exterior of the completed project, except as required for labels and operating data.
  - 1. Required Labels: Where required for observation after installation, locate on inconspicuous, accessible surface or otherwise conceal.

### 2.2 SUBSTITUTIONS

- A. Contractor submittal of and the Engineer's acceptance of shop drawings, product data or samples which relate to work not complying with requirements of the contract documents, does not constitute an acceptable request, nor approval, for a substitution.

Conditions: Contractor's request for substitution will be received and considered when extensive revisions to the contract documents are not required, when the proposed changes are in keeping with the general intent of the contract documents, when the request is timely, fully documented and properly submitted, and when one or more of the following conditions is satisfied, all as judged by the Engineer; otherwise the requests will be returned without action except to record non-compliance with these requirements.

1. Request is received 7 days prior to bid opening, except as otherwise permitted in this Section.
2. Specified product or method cannot be provided within the Contract time except as a result of the Contractor's failure to pursue the work promptly and to coordinate the various activities properly.
3. Specified product or method cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
4. Substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear, including additional compensation to the Engineer for redesign and evaluation services, increased cost of other work by the Owner or separate Contractors, and similar considerations.
5. Specified product or method cannot be provided, and coordinated in a manner which is compatible with other materials of the work, and where the Contractor certifies that the substitution will overcome the incompatibility.
6. The Engineer will consider a request for substitution when the specified product or method is not available with the special warranty required for the Project and where the Contractor certifies that their proposed substitution will be warranted as required.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Except as otherwise indicated in individual sections of these specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at time of acceptance.
  1. Protect installed Work, including Owner furnished Contractor installed components and Owner installed work, from damage due to construction activities.
- B. Installer's Inspection of Conditions: Require the Installer of each major unit of work to inspect the substrate to receive work and conditions under which the work is to be performed. The Installer shall report all unsatisfactory conditions in writing to the Contractor. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- C. Inspect each item of materials immediately prior to installation and ensure that conditions are appropriate for installation to proceed. Reject damaged and defective items.

END OF SECTION



# DEMOLITION, SALVAGE AND ABANDONMENT

## SECTION 02221

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Demolition, salvage and abandonment of existing facilities.

#### 1.2 REFERENCED SECTIONS

- A. The following Sections are referenced in this Section
  - 1. Section 01330 – Submittals
  - 2. Section 02300 – Earthwork

#### 1.3 SUBMITTALS

- A. Comply with Section 01330.
- B. Description of removal procedures for careful removal of materials and equipment and the protection of facilities which are to remain undisturbed.
- C. Time schedule for demolition work. Show demolition in relation to new construction, including any temporary facilities.

#### 1.4 EXISTING CONDITIONS

- A. Prior to the submittal of Bids, Contractor shall visit the site and inspect all facilities to become familiar with existing conditions and utilities.

#### 1.5 REGULATORY REQUIREMENTS

- A. Dispose of debris in accordance with the requirements of jurisdictional agencies.
- B. Comply with applicable air quality control regulations.
- C. Obtain necessary permits for building demolition, transportation of debris to disposal site(s) and dust control.
- D. Erect appropriate safety devices to protect the general public, Owner's operations personnel, and workers from the hazards of demolition activities. Install barriers, guard rails and fences, and provide appropriate warning signs.

#### 1.6 BURNING

- A. The use of burning at the project site for the disposal of refuse, debris, and waste materials will not be permitted.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.1 GENERAL

- A. The Drawings identify the major equipment and facilities to be demolished, salvaged or abandoned. Auxiliary utilities such as water, air, drainage, lubrication oil, electrical wiring, controls, and instrumentation are not necessarily shown.
- B. Unless indicated otherwise on the Drawings, protect in-place auxiliary utilities, as well as equipment and pipe supports and associated instrumentation devices pertaining to piping or equipment..

### 3.2 PROTECTION OF EXISTING FACILITIES

- A. Before beginning any cutting, trenching, or demolition work, carefully survey the existing work and examine the Contract Documents to determine the extent of the Work.
- B. Take precautions to prevent damage to facilities which are to remain in place or are to be salvaged, and be responsible for any damages to these facilities resulting from this work. Repair or replace damages to such work to return the facilities to its pre-existing condition at no additional cost to the Owner.

### 3.3 DEMOLITION

- A. Demolish structures and equipment in an orderly and safe manner.
- B. Dispose of material not identified for salvage or re-installation at a new location.
- C. Minimize dust by sprinkling with water.
- D. Backfill excavations caused by demolition in accordance with Section 02300.

### 3.4 BURIED PIPELINES

- A. Where buried pipelines are shown to be removed on the Drawings, they may be abandoned in place if there is no conflict with proposed construction and they are not located under or within 10 feet of any proposed structure.
- B. Pipelines abandoned in place shall be plugged at each end with 12 inches of six-sack concrete.
- C. Pipes that are shown to be demolished and cannot be abandoned in place shall be removed along with all fittings, valves, CLSM and related incidentals and disposed of as described below

### 3.5 ASBESTOS CEMENT PIPE

- A. Not used.

### 3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Concrete, site debris, rubbish, and other materials resulting from demolition operations, as well as mechanical and electrical equipment designated to be demolished, shall be the property of the Contractor and shall be legally disposed of at the Contractor's expense.

3.7 CLEANING

- A. During and upon completion of the demolition operations, promptly remove unused tools and equipment, surplus materials, rubbish, debris, and dust and shall leave work areas in a clean condition.
- B. Do not sweep, grade, or flush surplus materials, rubbish, or debris into storm drains, channels, lakes, or streams.

**END OF SECTION**

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## **EARTHWORK**

### **SECTION 02300**

#### **PART 1 GENERAL**

##### **1.1 SUMMARY**

- A. Section includes requirements for excavation, backfill and grading, as required for construction of concrete tunnel lids, footings, stairs, and sidewalks.

##### **1.2 DEFINITIONS**

- A. Excavation: Consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.
- B. Subgrade: Previously undisturbed material to be prepared, and compacted to required density and elevation to support improvements.
- C. Earth Excavation: Materials not otherwise defined as rock excavation including removal and disposal of pavements, visible on grade obstructions, underground structures, utilities and other items indicated to be removed.
- D. Unauthorized Excavation: Includes removal and disposal of material beyond subgrade elevations, and dimensions indicated without prior approval of the Engineer.

##### **1.4 SUBMITTALS**

- A. Product Data: Document compliance with locally available materials for each product.
  - 1. Aggregate

##### **1.5 QUALITY ASSURANCE**

- A. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.
- B. Testing and Inspection Service: Owner will engage soil testing and inspection service, for quality control testing during earthwork operations.

##### **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Stockpile satisfactory excavated materials in approved location, until required for backfill or fill. Place, grade, and shape soil stockpile for proper drainage.
  - 1. Do not store soil within drip line of trees indicated to remain.
  - 2. Dispose of excess soil material as waste material.

##### **1.7 PROJECT CONDITIONS**

- A. Location of existing underground utilities in areas of Work is Contractor's responsibility regardless

of whether indicated on the Contract Documents or not. Consult utility owner for directions immediately upon discovery of uncharted and incorrectly charted utilities.

- B. Interruption of Utility Service : Scheduled in advance with Owner as required. Provide supplemental service for each utility affected.
  - 1. Coordinate service interruption with utility companies effected.
  - 2. Repair damaged utilities to satisfaction of utility owner.

## 1.8 SEQUENCE

- A. Schedule and sequence the Work using means and methods that will prevent disturbance of subgrade soils due to earthwork, construction traffic and other Contractor activity.

## 1.9 MAINTENANCE

- A. Repair settlement at excavated areas for a period of one year following final acceptance at no additional cost to Owner. Remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment; restore appearance, quality, and condition of surface and finish to match adjacent work, and eliminate evidence of restoration.
- B. Topsoil and Imported Soil: Maintain free of regenerative weeds for one year following Final Acceptance.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Backfill and Fill Materials: Salvaged topsoil, native soil and excavated material are not acceptable for use as fill. Do not use water saturated soil material, contaminated material, and material that is frozen or contains frost or ice.
  - 1. Acceptable soil material shall contain neither organic material nor other material deleterious to structural performance.
- B. Aggregate Fill: Well graded mixture of crushed gravel.
  - 1. Aggregate Base Beneath Tunnel Lids, Footings, Stairs, and Sidewalks: 3/4 inch minus base rock complying with ODOT Specifications.
  - 2. Paving Base: 3/4 inch minus base rock complying with ODOT Specifications.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Protection: Prevent damage to structures, utilities, pavements, vegetation and improvements due to earthwork. Provide barricades, fences, warning lights, and other protection for public safety and access to occupied portions of the Project.
  - 1. Barricade open excavations. Post warning lights as recommended by authorities having jurisdiction.

2. Excavate by hand within drip-line of trees to remain. Do not damage trees or roots, prevent dehydration of exposed roots. Refer to Section 01565 for additional requirements.

B. Surfaces to receive fill and soils to be compacted shall be free of ice, frost, and standing water, and shall not be saturated with water.

1. Subgrade Supporting Tunnel Lids, Footings, Stairs, Sidewalks and Pavement: Undisturbed native soil or approved granular fill placed and compacted as required.

### 3.2 EXCAVATION

A. Unauthorized excavation as-well-as remedial work directed by the Engineer shall be provided at no change to Contract amount.

1. Excavation beyond outside dimension of unformed concrete, more than one foot outside of footing perimeter and two feet outside of concrete requiring formwork, and more than 6 inches below bottom of slabs on grade is unauthorized excavation.

B. Perform the following remedial work at areas of unauthorized excavation.

1. Under footings, foundation bases, and retaining walls, extend bottom elevation of footing or base to excavation bottom, do not alter required top elevation.
2. Unless otherwise directed backfill and compact unauthorized excavations as specified for authorized excavations of same classifications. Provide imported aggregate fill to establish required elevations unless otherwise acceptable.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Engineer, who will inspect conditions. When unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed.

D. Stability of Excavations: Comply with limitations of the Building Code and Oregon Occupational Health and Safety regulations. Except as necessary due to soil conditions or work sequence and where more gentle slopes are required; cut and fill slopes shall not exceed 2H : 1V. Provide shoring and bracing where 2:1 slope cannot be maintained.

E. Dewatering: Prevent water from flowing into and accumulating in excavations and from flooding project site and surrounding area. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations.

1. Provide and maintain pumps, well points, sumps, suction and discharge lines, and dewatering system components necessary to convey water away from excavations.
2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas.

F. Excavation for Structures: Conform to elevations and dimensions shown. Extend excavation a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of service, other construction, and for inspection.

1. Do not disturb bottom of excavation for footings and foundations.
2. Excavate by hand to final grade just before concrete reinforcement is placed.

3. Trim bottoms to required lines and grades to leave solid base to receive other work.
- G. Excavation for Pavements: Coordinate with Section 02741 for asphalt concrete, as necessary to comply with cross-sections, elevations and grades required.
1. Provide for minimum paving base thickness of 9 inches in areas subject to automobile traffic.
- H. Trenches: Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill with clean sand or pea gravel to indicated level. Do not backfill trench until required inspections and tests have been completed.
1. Trench Bottom: Smooth, firm, stable, and rock-free foundation, throughout the length of the pipe of elevation required. Configure trench bottom for pipe. Excavate bell holes at each pipe joint so that bells are relieved of all loads and continuous bearing of the pipe barrel on the foundation is achieved.
  2. Place bedding material in the pipe zone to minimum 6 inches depth for plastic pipe. Compact bedding material to 95 percent relative dry density and provide required pipe elevations and gradients in configuration indicated with full-height bedding and effective support of pipe wall.
  3. Identification Tape: One continuous layers 12 inches below finish grade. Place identification tape over the center of the utility. Tape shall be visible at valve boxes, cleanouts, manholes and similar structures.
- I. Coordinate excavation, preparation and backfill with Work of related Sections for irrigation systems.

### 3.3 BACKFILL AND FILL

- A. Place approved soil material in layers to required subgrade elevations, for each area classification listed below. Do not use water saturated soil material, contaminated material, and material that is frozen or contains frost or ice.
1. Use only material approved for each class of fill and backfill required.
  2. Under grassed areas, use approved excavated or borrow material.
  3. Under stairs, sidewalks and pavements, use granular fill material.
- B. Backfill excavation as promptly as work permits, but not until completion of the following:
1. Inspection, testing, approval, and recording locations of underground utilities.
  2. Removal of concrete formwork, shoring and bracing. Prevent settling due to removal of materials from below structures.
  3. Backfilling of voids with satisfactory materials.
  4. Removal of trash and debris from excavation.
  5. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
- C. Place backfill and fill materials in uniform lifts not to exceed the following loose depth, and compact each lift as required. Prevent wedging action of backfill against structures and displacement of piping and conduit.
1. Granular Fill Beneath Tunnel Lids, Footings, Stairs, and Sidewalks: 6 inch lifts.



### 3.4 COMPACTION

- A. Percentage of Maximum Density Requirements: Following percentage of maximum density as measured using ASTM D 698 for soil material with optimum moisture content.
  - 1. Stairs, Sidewalks and Pavements: Compact each lift of backfill or fill material to 95 percent relative density.
  - 2. Lawn and Unpaved Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent relative density.
  - 3. Trench Bottom: Compact top 6 inches of subgrade and each layer of backfill or fill material to 95 percent relative density.
- B. Moisture Control: Condition fill, backfill and subgrade material for each lift to within plus or minus 2 percent of optimum moisture as determined by ASTM D 1557; aerate or moisten soils to be compacted with uniform application of water as necessary. Do not over moisten soil, and prevent appearance of free water during compaction.
- C. Compacted Fill Surfaces: Firm and yield only slightly beneath rubber tired construction equipment. Fills which rut, pump or weave as determined by the Engineer are not acceptable. Remove and replace unacceptable fills with acceptable material compacted as required at no change in Contract amount.

### 3.5 GRADING

- A. Provide smooth finished surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.
- B. Grade areas to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes.
- C. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

### 3.6 FIELD QUALITY CONTROL

- A. Tests: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.
  - 1. Field Density Tests: In accordance with one or more of the following ASTM methodologies as necessary to evaluate the character of the Work.
    - a. D 1556 Soil Density by Sand Cone Method, D2922 Soil Density by Nuclear Methods, D 2167 Soil Density by Rubber Balloon Method, or D 3017 Water Content by Nuclear Method .
  - 2. Perform one field density test of subgrade for each location of sidewalks to be replaced.
- B. If in opinion of Engineer, based on testing service reports and inspection, subgrade or fill that has been placed are below specified density, provide additional compaction and testing at no change in contract amount.

### 3.7 RESOURCE RECOVERY AND WASTE MATERIAL DISPOSAL

- A. Transport approved excess excavated material to designated soil storage areas on Owner's property and stockpile soil or spread as directed by Engineer.
- B. Transport waste material, including unacceptable excavated material, surplus excavated material exceeding capacity of Owner's soil storage area, trash, and debris, and dispose of it off the Owner's property. Comply with Contract requirements to maximize resource recovery, and recycling, and minimize material disposed of as waste. Provide submittals documenting recovery and disposal procedures and materials quantities as necessary for compliance with environmental certification requirements.

### 3.8 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Remove waste materials, including unacceptable excavated material, trash and debris, and dispose off Owner's property.
- B. Remove excess excavated material, trash, debris and waste materials, and dispose of it off the Owner's property.

### 3.9 PROTECTION

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F.
- C. Repair and re-establish grades in where settlement, erosion, and compaction have occurred to conform to specified tolerances.
- D. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction. Remove and replace material that cannot be acceptably restored to the required condition.

END OF SECTION

## MINOR HOT MIXED ASPHALT CONCRETE

### SECTION 02741

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Construction of asphaltic concrete repair.
- B. Related Sections:
  - 1. Section 02300: Earthwork

##### 1.2 REFERENCES

- A. Oregon Department of Transportation, "Standard Specifications for Highway Construction" current manual, hereinafter called "Standard Specifications".
- B. Oregon Department of Transportation, "Supplemental Standard Specifications". Section 00744 QA - Minor Hot Mixed Asphalt Concrete (MHMAC) January 2008.
- C. American Society for testing and Materials:
  - 1. ASTM D 698, Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb (2.49.kg) Rammer and 12-in (305-mm) Drop.
  - 2. ASTM D 2041, Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.

##### 1.3 QUALITY ASSURANCE

- A. Perform work in accordance with Standard Specifications.
- B. Mixing Plant: Conform to Standard Specifications. Company with experience in mixing asphaltic concrete for a period of 5 years minimum.
- C. Applicator: Company with experience in applying asphaltic concrete pavement for a period of 2 years minimum.
- D. Obtain materials from same source throughout.

##### 1.4 TESTS

- A. Testing and inspection services during asphaltic concrete paving operations to include testing and inspection of aggregate base course, paving operations and testing of materials, temperature, compaction, thickness and surface smoothness as specified in Division 1: Quality Assurance.
- B. The in-place density of compacted asphaltic concrete paving will be tested in accordance with ASTM D 2041 (Rice gravity).

- C. Submit proposed mix design for review prior to commencement of work.

## 1.5 SUBMITTALS

- A. Submit all test results as required by the ODOT Standard Specifications.
- B. Design Mixes: For each asphalt pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Written proposal for each asphalt mix and strength is required. Submit 15 days prior to start of Work.
- C. Material Certificates: Signed by supplier and Contractor certifying that each of the following materials complies with requirements. Submit with laboratory test reports.
  - 1. Aggregates:
    - a. Indicate materials sources for principal constituents. Document Reclaimed Asphalt Pavement (R.A.P.) content expressed as percentage by weight of total mix. Document post consumer materials as well as post industrial materials.
    - b. Reclaimed Asphalt Pavement: Not to exceed 15 percent.
  - 2. Liquid Asphalt Prime and Tack Coats
    - a. Indicate materials sources for principal constituents. Document VOC components shall comply with Section 1600 limitations on chemical compounds for maximum VOC content of 250 grams per liter.

## 1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when base surface temperature is less than 40 degrees Fahrenheit.
- B. Do not place asphalt when base surface is wet or frozen.
- C. Do not apply prime or tack coats when ambient temperature is below 50 degrees Fahrenheit or when temperature has been below 35 degrees Fahrenheit in previous 12 hours.
- D. Do not apply prime or tack coats when base surface is wet or contains dust or debris.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Asphaltic Concrete: ODOT Level 2 mix design conforming to the Standard Specifications.
- B. Asphalt Cement: PG 64-28, conform to the Standard Specifications.
- C. Liquid Asphalt Tack Coat: Conform to the Standard Specifications.
- D. Emulsified Asphalt: CQS-1h, type II Conform to the Standard Specifications.
- E. Joint Sealant: ASTM D 3405, hot-applied, single-component, polymer-modified bituminous sealant.

- F. All aggregates used in the preparation of asphaltic concrete pavement shall conform to the ODOT Standard Specifications. Post industrial reclaimed aggregates may be used as accepted by ODOT standards.
- G. Reclaimed Asphalt Product, (R.A.P.): Conform to the Standard Specifications. Not to be less than 14 percent or exceed 15 percent as percentage by weight of total mix.

## 2.2 EQUIPMENT

- A. Paving Equipment: Spreading, self-propelled machine capable of maintaining line, grade and course thickness indicated. Spreader box or manual methods may be used only in small areas.
- B. Compacting Equipment: Steel wheel roller. Use hand operated mechanical vibrators in small areas.

## PART 3 EXECUTION

### 3.1 INSPECTION

- A. Inspect base conditions. Report any soft areas or contaminated areas as detected by the geotechnical engineer to Architect prior to proceeding with work.
- B. Verify compacted aggregate base is dry and ready to support paving and imposed loads.
- C. Verify gradients and elevations of aggregate base are correct and all paved areas will properly drain.
- D. Field inspection shall be done to ensure that the material, grades, compaction, and installation of the asphaltic concrete pavement meet the specifications.
- E. Notify Engineer of conditions detrimental to proper and timely completion of work.
- F. Beginning work means acceptance of existing base conditions.

### 3.2 PREPARATION

- A. Coat surfaces of catch basin frames with oil to prevent bond with asphalt paving.
- B. Protect existing site improvements from damage by paving work.
- C. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
  - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

### 3.3 PATCHING EXISTING PAVEMENT

- A. Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement,

unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade. Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.

### 3.4 APPLICATION OF TACK COAT

- A. Apply tack coat at rate of 0.05 to 0.15 gal. per sq. yd. to cleaned contact surfaces of previously placed asphaltic concrete, Portland Cement Concrete, and other similar surfaces abutting or projecting into asphaltic concrete paving.

### 3.5 PLACING ASPHALT PAVEMENT

- A. Pavement Wearing Course: Install paths, driveway and parking lot asphalt concrete pavement wearing course surfacing in one or two lifts to a minimum total compacted thickness as indicated on Drawings.
  - 1. Apply tack coat between lifts of asphalt.
- B. Spread and strike-off asphaltic concrete mixture using self-propelled paving machine except that inaccessible and small areas may be placed by hand. Spread mixture at a minimum temperature of 270 degrees Fahrenheit, measured in the hopper at the time of placement.
- C. Ensure joints made during asphaltic concrete paving operations are straight, vertical, tightly bonded free of broken or loose material and have same texture, density and smoothness as adjacent paving. Joints shall be crack sealed upon completion of asphaltic concrete paving operations.
- D. Compact each asphaltic concrete paving course with self-propelled rolling equipment. Start compaction as soon as paving will bear equipment without checking or undue displacement.
- E. Carry out compaction in three operations (breakdown or initial rolling, second rolling and finish rolling) in pass sequence to produce smooth surfaces of uniform texture, free from depressions (bird baths), and roller marks.
- F. Compact with hand tampers in areas not accessible to rolling equipment.
- G. Compact asphaltic concrete paving to 91 percent of ASTM D2041.

### 3.6 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Compacted Scheduled Thickness: Within 1/4 inch of design thickness.
- C. Variation from True Elevation: Within 1/2 inch.

### 3.7 CLEANING

- A. Clean asphalt spatters from adjacent concrete surfaces.

B. Clean loose asphalt aggregate from concrete surfaces.

### 3.8 PROTECTION

A. Immediately after placement, protect pavement from vehicular traffic mechanical injury for minimum of three days.

END OF SECTION

## IRRIGATION SYSTEM

### SECTION 02810

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. This Section includes installing piping sleeves under sidewalks for future irrigation piping.
- B. Related Sections include the following:
  - 1. Section 01565: Tree Protection and Trimming.
  - 2. Section 02300: Earthwork.

##### 1.2 DEFINITIONS

- A. The following are industry abbreviations for plastic materials:
  - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
  - 2. FRP: Fiberglass-reinforced plastic.
  - 3. PA: Polyamide (nylon) plastic.
  - 4. PE: Polyethylene plastic.
  - 5. PP: Polypropylene plastic.
  - 6. PTFE: Polytetrafluoroethylene plastic.
  - 7. PVC: Polyvinyl chloride plastic.
  - 8. TFE: Tetrafluoroethylene plastic.
  - 9. HDPE: High Density Polyethylene

##### 1.3 SUBMITTALS

- A. Product Data: Include pressure ratings for the following:
  - 1. Piping sleeves.

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

- A. Deliver piping to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

##### 1.5 PROJECT CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Oregon Institute of Technology.

##### 1.6 RECORD DRAWINGS:

- A. Provide and keep up to date a record set of Record Drawings of where piping sleeves were installed.



- B. Before the date of the final observation of the project by the Owner's Representative Representative, the Contractor shall deliver the Record Drawings to the Owner's Representative.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### A. Sleeves:

1. Schedule 40, PVC 1120, Type 1, pipe under all sidewalks. All pipes shall be polyvinyl chloride, continuously bearing seal of the National Sanitation Foundation and complying with the requirements of ASTM D2246 and D1785. Pipe size shall be 4-inch as indicated on the Drawings.
2. All socket fittings for PVC Schedule 40 pipe to be Schedule 40, NSF approved and complying with ASTM D 2466.

#### B. Pipe Solvent Cement:

1. PVC Solvent Cement ASTM D-2564.

#### C. PVC Cleaner and Primer:

1. ASTM F-656, I.P.S. P-70.

#### D. Other Material:

1. Sand: Clean, suitable for backfilling and bedding pipe.
2. Detectable Tape: Minimum 3-inch wide, 5 mils thick inert plastic tape with continuous layer of aluminum foil encased in the plastic. Tape identification shall match the utility being marked..
  - a. Manufacturer: Terra Tape Detectable, or equal.

## PART 3 EXECUTION

### 3.1 TRENCHING

- A. Refer to Section 01565 Tree Protection and Trimming for excavating, trenching, and backfilling near existing trees.
- B. Refer to Section 02300 Earthwork for excavating, trenching, and backfilling.
- C. Install warning tape directly above piping sleeves, 12 inches above top of pipe.
- D. Install sleeves under sidewalks.
- E. Provide 24 inches minimum cover over top of piping sleeves.

### 3.2 PIPING INSTALLATION

- A. Location and Arrangement: Drawings indicate location and size of piping sleeves. Install piping as indicated unless deviations are approved by Owners Representative Representative. Install all piping in planting beds wherever possible.
- B. Install piping at minimum uniform slope of 0.5 percent down toward drain valves.
- C. Install piping free of sags and bends.
- D. Lay piping on solid subbase, uniformly sloped without humps or depressions.
- E. Install PVC piping in dry weather when temperature is above 40 degrees F.
- F. Install PVC cap on each end of sleeve.

### 3.3 JOINT CONSTRUCTION

- A. Construct pipe joints in accordance with the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

### 3.14 CLEANING

- A. Flush dirt and debris from piping before capping and backfilling.

END OF SECTION

## LAWN AND GRASSES

### SECTION 02920

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Furnish labor, material and equipment required for application of seed mixes, as specified, in areas disturbed during construction. Contractor has the option to manually seed or hydroseed, or a combination of the two methods. The following specification addresses both methods.
- B. Verify site conditions that will not adversely affect execution.
- C. University shall determine areas beyond those shown on Drawings disturbed by construction that are to be prepared and seeded at no additional cost to the University.

##### 1.2 SEASON

- A. Seeding shall take place in normal weather and temperatures that are appropriate and typical for such work between April 15 and September 30. Seeding on other dates or during adverse conditions is at the risk of the Contractor.

##### 1.3 PROTECTION

- A. Provide adequate measures to protect workers and passers-by the site. Execute all work in an orderly and careful manner with due consideration for any and all surrounding areas, plantings, or structures which are to remain. Protect all adjacent property and improvements from work damage, and replace any portions damaged.

##### 1.4 SUBMITTALS

- A. Dealer guarantee statements of analysis for Oregon Certified Seed. Deliver the seed bag tags to Owners Representative.
- B. Seed: Immediately following Contract award, submit for approval by the Owner's Representative a written statement of conformance or compliance with these specifications. Include the following information:
  - 1. Name and location of supplier.
  - 2. Supplier's certification of geographic origins of seeds.
  - 3. Purity and germination rates for each species.
  - 4. Percentage of pure live seed (PLS) for each species.
- C. Prior to beginning seeding operations, submit copies of all seed labels to Owner's Representative.
- D. Submit written documentation verifying compliance with native grass hay specification.
- E. At least 7 days prior to the seeding operations, submit a description of the seeding equipment and methods for approval by the University.

## 1.5 QUALITY ASSURANCE

- A. All native seed shall comply with botanical names provided in: Hitchcock, C.L. and A. Cronquist, "Flora of the Pacific Northwest", 1973.
- B. PLS is the amount of living, viable seed in the total amount of seed. The amount of seed to be applied is obtained by using the purity and germination rates from the label on the actual bag of seed to be used on the project. To calculate the amount of seed to be supplied for each species:
  - 1. Multiply the seed germination rate by the purity rate.
  - 2. Divide the specified PLS seeding rate by the result of subarticle No. 1. Round off the result to the nearest ounce.

## PART 2 - PRODUCTS

### 2.1 SEED: GENERAL REQUIREMENTS

- A. General: Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America.

### 2.2 SEED MIXES

- A. Low maintenance drought tolerant, dwarf type and formulated for the Klamath Basin Area based on the following seed types produced in Southern Oregon or Northern California or approved equal.
  - 1. Apply seed at the rate of 7.5 pounds per 1,000 square feet of area.
    - a. 70 percent Kentucky Bluegrass
    - b. 15 percent Fine Fescue
    - c. 15 percent Perennial Rye

### 2.3 MULCHES

- A. Straw for Lawn Area: Provide stalks from oats, wheat, rye, or barley that are free of weeds, mold or other deleterious material. Straw shall be in an air dry condition and suitable for placing with commercial mulch blowing equipment.

### 2.4 FERTILIZER

- A. Fertilizer (for Surface Applications): To be determined based upon topsoil analysis. For bidding purposes, assume: 16 (nitrogen)- 8 (phosphorous)- 8 (potassium), slow release, granular commercial fertilizer at 500 lbs./acre in all seeded areas.

### 2.5 HYDRO-SLURRY MIX

- A. The slurry mix shall consist of the following:
  - 1. Wood cellulose fiber, dyed green, at 2,000 lbs. per acre.
  - 2. Apply binder (tackifyer) at 50 lbs. per acre. Approved products: "M" binder (tackifyer), R-2400 (tackifyer), or approved equal.
  - 3. Fertilizer.

## 2.6 TEMPORARY BARRICADE MATERIALS

- A. Agricultural metal stakes, minimum 42-inch exposed height.
- B. Twine or wire.
- C. Plastic flagging tape, 12-inch lengths.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Sow seed during planting season specified in Part 1.
- B. Do not sow seed when weather conditions are unfavorable, such as during drought, heavy rain or high winds.

### 3.2 MANUAL SEEDING

- A. Immediately before seeding, scarify, loosen, float and drag all seed beds as necessary to bring them to proper condition. Remove foreign matter larger than one-inch in diameter. Establish raked seed bed and obtain approval prior to seeding.
- B. Broadcast seed at specified rates with a belly crank (for woody plant seeds and small areas), drill seeder or other application equipment capable of accurately distributing seed. Make two passes perpendicular to each other insuring even distribution. Apply broadcast fertilizer at specified rate.
- C. Rake seed very lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

### 3.3 HYDROSEEDING

- A. It is the Contractor's option to hydroseed any areas of the project requiring seeding.
- B. Immediately before seeding scarify, loosen, float and drag all seed beds as necessary to bring them to proper condition. Remove foreign matter larger than one-inch in diameter. Establish raked seed bed and obtain approval prior to seeding.
- C. Hydroseed seed at specified rates.
- D. Agitate as necessary the slurry to assure an even mix of ingredients.
- E. Hydroseed evenly over entire area.

### 3.4 MAINTENANCE

- A. Maintain seeded areas including mowing, fertilizing, re-seeding, watering, etc. and continue until final acceptance.
- B. Reseed unacceptable areas.

### 3.5 ACCEPTANCE

- A. Acceptance of all seeded areas will be based on growth of a uniform color and dense stand of grass, without bare spots of over 2 square inches. Contractor to ensure seed establishment of all areas prior to September 30.

### 3.6 CLEAN-UP

- A. Remove debris from surrounding areas; including all pavement, concrete, gravel, and planting areas. Remove germinated seed in planting areas without harming other plant material.

### 3.7 FINAL PROTECTION

- A. Install temporary barricade of agricultural metal stakes and 2 strands of twine or wire with strips of plastic flagging 36 inches apart separating finish seeded areas from foot and vehicular traffic. Remove barricade after seeded areas have been established and accepted.

END OF SECTION

# CONCRETE FORMWORK

## SECTION 03100

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section Includes requirements for formwork for cast-in-place concrete.
- B. Related Sections:
  - 1. Section 02300 Earthwork
  - 2. Section 03200 Concrete Reinforcement
  - 3. Section 03300 Cast-In-Place Concrete

#### 1.2 SYSTEM DESCRIPTION

- A. Design Requirements: Formwork, shoring and bracing shall provide completed concrete surfaces conforming to sizes, shapes, lines, grades and dimensions indicated, with openings, offsets, keyways, recesses, anchorages, inserts and other features as required. Formwork shall be removable without damage to concrete and adjacent surfaces.
  - 1. Design of forms, and shoring shall be the sole responsibility of the Contractor and shall comply with ACI 301 and 318.
  - 2. Forms: Impart a uniform surface and appearance free of variation due to exposure to moisture, and chemicals, undesirable surface characteristics and other defects.
- B. Performance Requirements: The Contractor shall determine construction loads and all other loads including safety factors that must be supported by formwork, shoring, re-shoring and related temporary supports throughout the course of the Work.
  - 1. Contractor shall ensure formwork, shoring and all related support work comply with regulatory requirements including but not limited to safety regulations.

#### 1.3 SUBMITTALS

- A. Product Data: Include specifications and installation instructions for proprietary materials and items as required, including form coatings, manufactured form systems, ties, and accessories.
- B. Shop Drawings: Indicate pertinent dimensions, materials, and arrangement of joints, ties and accessories for formwork and shores. Engineer's review is for general applications only. Structural stability and efficiency is Contractor's responsibility.
- C. Samples: When directed submit samples of formwork materials.

#### 1.4 QUALITY ASSURANCE

- A. Design, construct, erect, maintain and remove forms, shores and related structures for cast-in-place concrete work in compliance with requirements and tolerances of American Concrete Institute Standard ACI 347, *Recommended Practice for Concrete Formwork*. Formwork shall

produce as-cast surfaces complying with tolerance requirements of Section 03300.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Form Sheathing and Liners : Plywood, metal, metal-framed plywood faced and other acceptable panel-type materials, minimize number of joints and conform to join patterns where indicated. Contractor is encouraged to reduce materials consumption for the Work by utilizing form sheathing that may be reused. Consideration shall also be given to form liners where they will enable reuse of sheathing.
1. Exposed Concrete: Single use 0.75 inch Type I Concrete Form plywood B-B Medium Density Overlaid both sides, or multiple use 0.75 inch HDO Plyform High Density Overlaid Concrete Form, Class I.
  2. Concealed Concrete: Comply with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
  3. Chamfer Strips: Prefabricated rigid wood or PVC chamfer strips to produce 0.75 inch radius unless otherwise indicated.
  4. Lumber: Dressed on two edges and one side.
- B. Form Ties: Prefabricated, adjustable length, removable or snap-off metal ties; minimum 1 inch concrete coverage of embedded remnants and maximum 1 inch diameter hole from removed tie.
1. Site fabricated and wire ties are not acceptable.
- C. Form Coatings: Water-based, VOC content 100 grams per liter or less, commercial formulation form-coating compounds compatible with forming materials and subsequent coatings, adhesives and treatments that will not stain, bond to nor adversely affect concrete.
1. Cast-In-place Concrete: WR Meadows Duogard II, ChemMasters SafeSlip, Nox-Crete PCE, Symons Magic Kote E, or approved.
- D. Formwork Sealant: One-part silicone conforming to ASTM C 920, Grade NS, Class 25.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Protection: Support imposed loads until concrete has cured adequately to support them. Provide crush plates and other protection to prevent damage to concrete surfaces during stripping.
- B. Prevent movement and deformation of formwork and liners during concrete placement; shore, brace, block and support as necessary.
- C. Prevent leakage of cement paste at joints, openings and penetrations in formwork.
- D. Temporary Openings: At inconspicuous locations for cleanout and inspection of forms and placing of concrete.



- E. Form all concrete surfaces. Do not use earth forms without prior written approval.
- F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints. Kerf inserts for forming keyways, reglets, and recesses.
- G. Clean formwork and surfaces to receive concrete immediately prior to placement of concrete, remove debris and contaminants which might impair quality of completed work.
- H. Re-Used Forms and Liners: Re-use limited to materials intended for multiple use. Prepare as specified for new, single-use forms, remove concrete and coating residues and restore as necessary to provide acceptable surface condition; damaged and deteriorated forms shall not be used.
- I. Form Coatings: Apply to contact surfaces, comply with manufacturer's recommendations, prevent accumulation of coatings in formwork, and do not coat bond surfaces of existing concrete and embedded items.
  - 1. Coat forms and liners as necessary to prevent staining of concrete work.

### 3.2 JOINTS

- A. Construction Joints: Horizontal and vertical, locate as indicated, and as specified in ACI 301, Section 2.2.2.5. Impair neither the strength nor appearance of the Work, place perpendicular to main reinforcement and with keyways 1.5 inches deep minimum, keyed bulkheads may be used.
- B. Formwork Joints: Tight and regular, use minimum number of joints necessary for Work indicated.
  - 1. Form Ties: Provide a uniform pattern and appearance in concrete work exposed to view.

### 3.3 INSTALLATION OF EMBEDDED ITEMS

- A. Embedded Items and Built-ins: Position in forms as necessary to accommodate Work of other trades, ensure correct placement, size and location for openings, recesses, anchors, and items built into forms. Use setting diagrams, templates and directions provided by suppliers of items anchored to and cast into cast-in-place concrete.
- B. Edge Forms and Screed Strips for Slabs: Set to obtain required elevations and contours in finished surface, support screed strips with strike-off templates or accepted compacting type screeds.

### 3.4 SHORES AND SUPPORTS

- A. Arrange forms to allow stripping without removal of principal shores.
- B. Shore construction to ensure distribution of loads throughout structure. Do not impose loading conditions for which the structure was not designed nor has not achieved sufficient strength to carry.
- C. Remove shores and supports in a planned sequence, do not damage partially cured concrete. Prevent deflection and excessive loading of concrete.

### 3.5 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by stripping, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs and other structural elements, shall not be removed in less than 14 days or until concrete has attained design minimum compressive strength.
  - 1. Determine potential compressive strength of in place concrete by testing field-cured specimens representative of concrete location or members.
- C. Form facing material may be removed 4 days after placement, only if shores and other supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.
- D. Tolerances: Comply with ACI 117, except when specifically stated otherwise tolerances shall be total amount allowed; for example a tolerance of 0.75 inch shall be interpreted to mean plus 0.375 and minus 0.375 inch for a total of 0.75 inch.
  - 1. Work the Engineer determines has dimensional variations that adversely affect appearance and suitability for the purpose intended shall be replaced regardless of compliance with tolerance of ACI 117.
  - 2. To be acceptable Work must comply with tolerances when fully cured and temporary supports have been removed.

END OF SECTION

**CONCRETE REINFORCEMENT**  
**SECTION 03200**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. Section includes reinforcing bars, supports and accessories for cast-in-place concrete.
  - 1. See General Notes on C-series civil drawing sheets for additional information.
- B. Related Sections:
  - 1. Section 03100 Concrete Formwork
  - 2. Section 03300 Cast-In-Place Concrete

**1.2 REFERENCES**

- A. Comply with requirements of the following, including modification required by applicable Codes.
  - 1. American Concrete Institute, ACI 315 *Manual of Standard Practice for Detailing Reinforced Concrete Structures*.
  - 2. American Concrete Institute, ACI 318 *Building Code Requirements for Reinforced Concrete*.
  - 3. American Welding Society, AWS D1.4 *Structural Welding Code Reinforcing Steel*.
  - 4. Concrete Reinforcing Steel Institute (CRSI), *Manual of Standard Practice*.

**1.3 SUBMITTALS**

- A. Submit product data including specifications and installation instructions for all proprietary materials and reinforcement accessories.
- B. Shop Drawings: For fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 show bar schedules, stirrup spacing, diagrams of bent bars, arrangement and support of concrete reinforcement, and coordination with embedded and cast-in items.
- C. Mill Certificates: Submit steel producers certificates of mill tests for reinforcing steel.

**1.4 DELIVERY, STORAGE AND HANDLING**

- A. Store reinforcing steel blocked up off the ground and in orderly stacks.
- B. Each stack shall contain only bars with the same identifying label.

**PART 2 PRODUCTS**

**2.1 REINFORCING MATERIALS**

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed. Provide ASTM A 706 where reinforcement is to be welded and where indicated.

- B. Steel Wire: ASTM A 82, plain, cold-drawn, steel.
- C. Deformed Steel Wire: ASTM A 496.
- D. Welding Electrodes: AWS A5.1, low hydrogen, E70 series.
- E. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications, unless otherwise acceptable. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
  - 1. Exposed Concrete: Legs of supports in contact with forms, shall be plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
- F. Reinforcing Couplers: Type 1 ICC approved; capable of developing 125 percent of specified minimum yield strength of bar in tension or compression. Subject to compliance with requirements provide one of the following; Lenton Taper Threaded Connection, Erico Inc., Bar-Lock Standard Coupler, Bar-Lock Coupler Systems, or Bar Splice Bar splice Products Inc.
- G. Deformed Bar Anchors: Nelson, flux filled deformed bar anchors, type D2L, as manufactured by Nelson Stud Welding or equal (no known equal)
  - 1. Deformed Bar Anchor material shall be made from cold rolled, deformed steel reinforcing bars conforming to ASTM A496.
  - 2. Deformed Bar Anchor material shall have a yield strength,  $f_y$ , equal to 70,000 pounds per square inch.
  - 3. Deformed Bar Anchor material shall have a tensile strength,  $f_t$ , equal to 80,000 pounds per square inch.

## 2.2 FABRICATION

- A. Coordinate reinforcing with anchors, shear studs, block-outs, conduits, sleeves, and other items, to be cast in concrete. Fabricate reinforcing to eliminate conflicts with the placement of embedded and cast-in items.
- B. Field fabrication will be allowed only when the Contractor has demonstrated they have the capacity to properly fabricate the required reinforcing.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- B. Place reinforcement to obtain minimum concrete coverage acceptable to Engineer. Continue reinforcement across construction joints.

1. Allow observation by Engineer at completion of placement.
  2. Reinforcing partially embedded in concrete shall not be field bent except as indicated or specifically approved in advance.
  3. Spacing. As indicated, and to comply with ACI 318.
- C. Welding: Acceptable only where required on the drawings and shall comply with AWS D 1.4
1. Welding material, wire cuttings, and tramp metal shall be thoroughly cleaned from forms for exposed concrete before any concrete is placed.
  2. Do not use tack welds in welding processes.
  3. Welding is not permitted weld within two bar diameters of cold bends.
- D. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
- 3.2 FIELD QUALITY CONTROL
- A. As a minimum, the Owner's Quality Control Inspector will test and inspect the work to comply with the requirements of OSSC Chapter 17. In addition to other required inspections, the following are subject to Special Inspection.
1. Placement of reinforcing steel as required by Sec. 1701.5, Item 4.
  2. Welding of reinforcing steel as required by Sec 1701.5, Item 5.3. and 1701.6.1. Butt welds will be inspected using radiographic testing.
  3. The Owner's inspector shall be present during all field bending of reinforcement.
  4. Installation of deformed bar anchors to be tested in accordance with Section 7.1 of AWS D1.1
  5. Testing and inspection of mechanical splices and reinforcing couplers to conform to manufacturer's recommendations and ICC-ES report.

END OF SECTION

# CONCRETE ANCHORS

## SECTION 03251

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Requirements pertaining to post-installed and cast-in-place anchors for materials and equipment. This section pertains to all other sections of these specifications that require post-installed or cast-in-place anchors, unless specified otherwise.

#### 1.2 RELATED DOCUMENTS

- A. Division 1 General Requirements
- B. Division 3 Concrete
- C. Division 4 Masonry
- D. Division 5 Metals

#### 1.3 REFERENCES

- A. ACI 318 – Building Code Requirements for Structural Concrete
- B. ACI 355.2 – Qualification of Post-Installed Mechanical Anchors in Concrete
- C. ACI 355.4 – Qualification of Post-Installed Adhesive Anchors in Concrete
- D. ASTM A36 – Standard Specification for Carbon Structural Steel
- E. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- F. ASTM A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
- G. ASTM A510 – Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel
- H. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- I. ASTM A706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
- J. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- K. ASTM B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
- L. ASTM C881 – Standard Specification Epoxy-Resin-Based Bonding Systems for Concrete

#### 1.4 SUBMITTALS AND SUBSTITUTIONS

- A. Submittals are to be in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: The installer shall be experienced in installing anchors equal to type, and into the substrate material required for this project. See PART 3 EXECUTION.
- B. Evaluations Reports and Listings: Anchors and related materials shall be listed by one or more of the following agencies, as applicable:
  - 1. ICC Evaluation Service
    - a. Anchors shall be manufactured under an approved quality assurance program with follow-up inspections by an inspection agency under ISO/IEC 17020 by a recognized accreditation body conforming to the requirements of ISO/IEC 17011.
  - 2. IAPMO Uniform Evaluation Service
    - a. Anchors shall be manufactured under an approved quality assurance program with follow-up inspections by an inspection agency under ISO/IEC 17020 by a recognized accreditation body conforming to the requirements of ISO/IEC 17011.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to job site in manufacturer's or distributor's packaging undamaged, complete with installation instructions.
- B. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage or deterioration.

## 1.7 PROJECT CONDITIONS

- A. Adhesive anchors shall be installed in concrete having a minimum age of 21 days at time of anchor installation.
- B. Anchoring adhesives must be stored at temperatures prescribed by the manufacturer and must not be used beyond the expiration date.
- C. The anchor or fastener coating, plating or steel type must provide suitable corrosion resistance for the environment in which the anchor or fastener is installed.

## PART 2 PRODUCTS

### 2.1 EXPANSION ANCHORS FOR CRACKED AND UNCRACKED CONCRETE

- A. Anchors shall be designed in accordance with ACI 318 Appendix D, which requires post-installed mechanical anchors to be qualified according to ACI 355.2. Such anchors shall be imperial sized, threaded stud with an integral cone expander and three-segment expansion clip. The stud shall be manufactured from carbon steel or type 316 or 304 stainless steel.
- B. Expansion anchors for cracked and uncracked concrete shall be:
  - 1. Simpson Strong-Tie Strong-Bolt 2 Wedge Anchor
  - 2. Hilti USA Kwik Bolt
  - 3. Red Head Trubolt
  - 4. Approved Equal

## 2.2 SCREW ANCHORS FOR CRACKED AND UNCRACKED CONCRETE

- A. Anchors shall be designed in accordance with ACI 318 Appendix D as amended by the specific design provisions of ICC-ES AC193. Anchors shall be manufactured from carbon steel which is subsequently heat-treated. Anchors shall be zinc-plated in accordance with ASTM B633, Class SC1, Type III.
- B. Screw anchors for cracked and uncracked concrete shall be:
  - 1. Simpson Strong-Tie Titen HD Screw Anchor
  - 2. Hilti USA Kwik-Con II
  - 3. Red Head Large Diameter Tapcon
  - 4. Approved Equal

## 2.3 SELF-UNDERCUTTING ANCHORS FOR CRACKED AND UNCRACKED CONCRETE

- A. Anchors shall be designed in accordance with ACI 318 Appendix D, which requires post-installed mechanical undercut anchors to be qualified according to ACI 355.2. Self-undercutting anchors shall be imperial sized and have an expansion ring with undercutting teeth that expand over a cone upon tightening of the nut. Threaded rod, spacer sleeve, undercut expansion ring and expansion cone shall be manufactured from carbon steel and shall be zinc-plated in accordance with ASTM B633, Class SC1.
- B. Self-undercutting anchors for cracked and uncracked concrete shall be:
  - 1. Simpson Strong-Tie Torq-Cut
  - 2. Hilti USA HDA
  - 3. Liebig SuperPlus
  - 4. Approved Equal

## 2.4 ADHESIVE ANCHORS FOR CRACKED AND UNCRACKED CONCRETE

- A. An adhesive anchor shall consist of: 1) threaded rod or reinforcing bar insert; and 2) adhesive formula. Threaded rod inserts shall meet the minimum requirements of ASTM F1554 Grade 36, ASTM A193 Grade B7, ASTM A193 Grade B6 (Type 410 Stainless Steel) or ASTM A193 Grade B8 and B8M (Types 304 and 316 Stainless Steel). Reinforcing bar inserts shall meet the minimum requirements of ASTM A615 Grade 60 or ASTM A706 Grade 60. For exterior exposure the insert shall be stainless steel. Inserts in contact with preservative-treated and fire-retardant-treated wood shall be zinc coated in accordance with ASTM A153 Class C or D or stainless steel or demonstrated through tests to be equivalent to the coatings described. Adhesives shall be an epoxy resin bonding system that is injectable, two-component, cartridge-type systems dispensed and mixed through a static mixing nozzle supplied by the manufacturer. Acceptable installation and performance temperature ranges shall be verified with manufacturer's literature prior to installation.
  - 1. Adhesive anchors for cracked and uncracked concrete shall be:
    - a. Simpson Strong-Tie SET-XP Epoxy Adhesive
    - b. Hilti USA HY-150
    - c. Red Head EPCON G5
    - d. Approved Equal



2. Adhesive anchors for cracked and uncracked concrete and decreased installation temperature (14°F) shall be:
  - a. Simpson Strong-Tie AT-XP Acrylic Adhesive, IAPMO-UES ER-263
  - b. Approved Equal

## 2.5 GAS-ACTUATED FASTENERS AND ASSEMBLIES

- A. Gas-Actuated Fasteners are manufactured from steel complying with ASTM A510, Grade 1060 or 10B60, and austempered to a Rockwell “C” core hardness of 53-56. Fasteners shall be galvanized in accordance with ASTM B695, Class 5, Type I or zinc electroplated in accordance with ASTM B633 SC1, Type I.
- B. Gas-Actuated Fasteners and Assemblies attached to normal-weight and sand-lightweight concrete and steel deck with sand-lightweight concrete fill shall be:
  1. Simpson Strong-Tie Gas-Actuated Fasteners and Assemblies
  2. Ramset Gas-Actuated Fasteners and Assemblies
  3. Hilti USA Gas-Actuated Fasteners and Assemblies
  4. Approved Equal

## 2.6 POWDER-ACTUATED FASTENERS, THREADED STUDS AND ASSEMBLIES

- A. Fasteners and threaded studs are manufactured from steel complying with ASTM A510, Grades 1060 to 1065 or 10B60 to 10B65 and austempered to a Rockwell “C” core hardness of 51 to 56. Fasteners shall have a mechanically plated zinc finish complying with ASTM B695, Class 5, Type I.
- B. Powder-actuated fasteners, threaded studs and assemblies attached to normal-weight and sand-lightweight concrete or steel deck with sand-lightweight concrete fill shall be:
  1. Simpson Strong-Tie Powder-Actuated Fasteners
  2. Hilti USA Powder-Actuated Fasteners
  3. Ramset Powder-Actuated Fasteners
  4. Approved Equal

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting base materials and environmental conditions. Do not begin installation until base materials have been properly prepared.
- B. Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
- C. Install only if environmental conditions are in compliance with manufacturer’s recommendations for installation conditions.

### 3.2 INSTALLATION

- A. Adhesive anchors shall be installed in concrete having a minimum age of 21 days at time of anchor installation.

- B. Installation shall conform to the manufacturer's published installation instructions.
- C. Where holes are drilled in concrete or masonry, holes shall be accurately and squarely drilled, and the holes shall be cleaned in accordance with the manufacturer's recommendations.
- D. Unless otherwise noted, anchors shall be installed in holes drilled into base materials using carbide-tipped drill bits conforming to ANSI B212.15-1994.
- E. Where manufacturer recommends use of special tools for installation of anchors, such tools shall be used, unless otherwise permitted specifically by the Engineer or Architect of Record.
- F. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling.

### 3.3 FIELD QUALITY CONTROL

- A. Special Inspection
  - 1. Comply with Division 1 requirements
- B. Installer Certification
  - 1. The following installer certification requirements apply to adhesive anchors assessed by the acceptance testing under ACI 355.4:
    - a. Installation of adhesive anchors shall be performed by personnel trained to install adhesive anchors.
    - b. Adhesive anchors installed in horizontal or upwardly inclined orientations to resist sustained tension loads shall be continuously inspected during installation by an inspector specially approved for that purpose by the building official. The special inspector shall furnish a report to the licensed design professional and building official that the work covered by the report has been performed and that the materials used and the installation procedures used conform with the approved contract documents and the manufacturer's printed installation instructions.
    - c. Installation of adhesive anchors horizontally or upwardly inclined to support sustained tension loads shall be performed by personnel certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Anchor Installer Certification program, or equivalent.

**END OF SECTION**

## CAST-IN-PLACE CONCRETE

### SECTION 03300

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes materials, mixes, accessories, and Work necessary and required for cast-in-place concrete as indicated and specified herein.
- B. Related Sections:
  - 1. Section 03100 Concrete Formwork
  - 2. Section 03200 Concrete Reinforcing

##### 1.2 SUBMITTALS

- A. Product Data: Required for each material and product to be incorporated into the Work.
- B. Samples: Submit samples of materials as specified and as otherwise requested by Engineer, including names, sources and descriptions.
- C. Laboratory Test Reports: Required for concrete materials and mix design.
- D. Shop Drawings: Include details of steel reinforcement placement including material, grade, bar schedules, spacing, bent bar diagrams, arrangement, and supports.
- E. Material Certificates: Signed by manufacturer and Contractor; Submit in lieu of laboratory test reports as acceptable to Engineer, demonstrate compliance with requirements.
- F. Mix Design: Written proposal for each concrete mix and strength required submit 7 days prior to start of Work. See Structural General Notes Section H for tunnel lid mix design requirements. All mix design shall be appropriate for exterior concrete with severe exposure to freeze thaw / de-icing chemicals and list the following:
  - 1. All materials and admixtures and their proportions.
  - 2. Water-cement ratio, slump, and aggregate grading.
  - 3. Evidence that mix design meets the strength requirements: Compression test data (field experience method) or results of testing (trial batch method) used to establish mix proportions.
  - 4. Whether the mix is appropriate for pumping.
- G. Submit schedule of concrete placement operations before commencing Work, show on one or more plans or elevations, locations of construction, contraction and expansion joints.

##### 1.3 QUALITY ASSURANCE

- A. Contractor's responsibility to provide Work complying with contract requirements shall not be altered by statements in referenced standards and documents. Comply with the following except where otherwise indicated and where more stringent requirements apply.

1. ACI 301 Specifications for Structural Concrete.
  2. ACI 304 Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
  3. ACI 305 Hot Weather Concreting.
  4. ACI 306 Cold Weather Concreting.
  5. ACI 309 Recommended Practice for Consolidation of Concrete.
  6. ACI 318 Building Code requirements for Reinforced Concrete.
- B. Ready-Mix-Concrete Producer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Source Limitations: Obtain cement concrete pavement products and each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate through one source.
- D. Concrete Testing Service: Owner will engage a qualified testing agency to perform material evaluation tests.
- E. Formwork Observation: Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Notify Owner's Representative 48 hours minimum prior to placing concrete that formwork is in place and ready for observation. Do not proceed with concrete placement prior to obtaining Owner's Representative's approval that formwork meets the lines and grades intended on the Drawings. Concrete placed without the Owner's Representative's approval of formwork shall be removed and replaced at no additional cost to the Owner.

#### 1.4 PROJECT CONDITIONS

- A. Environmental Requirements: Do not place concrete when weather conditions may reduce performance characteristics, and prevent proper finishing, and curing.

### PART 2 PRODUCTS

#### 2.1 CONCRETE

- A. Portland Cement: ASTM C 150, Type IA. Use one brand of cement throughout project, unless otherwise acceptable to Engineer.
- B. Normal Weight Aggregates: From a single source, comply with ASTM C 33, and as herein specified. Do not use aggregates containing deleterious nor alkali reactive substances.
- C. Water: Plant-batched concrete shall include a minimum of 6 percent recovered wash-down water measured by volume of total mix. Recovered wash-down water shall be treated by settling, filtration and other acceptable means to remove deleterious materials prior to incorporation into mix.
- D. Water: ASTM C 94.

## 2.2 ADMIXTURES

- A. Subject to compliance with specified requirements, provide one of the listed products for each admixture used; submit substitution request prior to bid, and comply with requirements of Section 01330.
- B. Calcium chloride and admixtures containing more than 0.1 percent calcium chloride ions shall not be used.
- C. Coordinate admixtures to ensure compatibility. Prevent unpredictable and non-controlled side effects and reactions between mix components.
- D. Air-Entraining: ASTM C 260.
  - 1. Darex AEA; W.R. Grace.
  - 2. MB AE-90; Master Builders.
- E. Water Reducer: ASTM C 494, Type A.
  - 1. Darex WRDA-79; W.R. Grace.
  - 2. Pozzolith; Master Builders.
- F. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E.
  - 1. Darex WRDA Type III; W.R. Grace.
  - 2. Pozzutec 20; Master Builders.
- G. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.
  - 1. Daratard; W.R. Grace.
  - 2. Pozzolith 300-R; Master Builders.
- H. Fly Ash: ASTM C 618 (including Table 2A) Type F or Type C, subject to approval of mix design data.

## 2.3 ACCESSORIES

- A. Non-Shrink Base Plate Grout: Premixed compound using natural non-metallic aggregate, and conforming to Corps of Engineers' CRD-C621-81.
  - 1. Compressive Strength: 2,400 psi in 48 hours and 6,000 psi in 28 days.
  - 2. Five-Star Grout by US Grout Corporation; Masterflow 880 grout by MasterBuilders; or approved.
- B. High Strength Non-shrink Grout: Masterflow 928 grout by Master Builders; Sika Grout 212 by Sika Corporation or approved.
  - 1. Fluid Grout: CRD-C611-81, flow of 22 to 30 seconds, one hour after batching, at 40 to 100 degrees F.
  - 2. Strength: 2,500 psi at 24 hours, 4,500 psi at three days, and 7,000 psi at 28 days.

- C. Moisture-Retaining Cover: Complying with ASTM C 171. Waterproof paper, or polyethylene film.
- D. Curing Compound: ASTM C 309 Type 1, Class A content, liquid membrane forming compound for concrete; product shall be applied at a uniform rate of 100 ft<sup>2</sup>/gallon. Method of application is the Contractor's responsibility.
- E. Preformed Expansion Joint Filler: Bituminous type conforming to ASTM D994 or resin-bonded cork conforming to ASTM D1752, Type II
- F. Concrete Joint Sealant: Sealant shall conform to the requirements of ASTM C 920.

## 2.4 CONCRETE MIXTURES

- A. Mix Design: As specified in ACI 301 for each type of concrete required, use laboratory trial batch or field experience methods.
  - 1. Submit mix designs for the following:
    - a. Stairs and Sidewalks
    - b. Tunnel Lids
  - 2. Mix Design Proposal: Submit 7 days in advance of production to avoid delay in Work, do not begin concrete production prior to Engineer's review.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
  - 1. Sidewalks:
    - a. Compressive Strength (28 Days): 4,000 psi.
    - b. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
    - c. Slump Limit: 4 inches without Water-Reducing Admixtures; [5 inches with Water-Reducing Admixtures].
      - i. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: When a high-range water-reducing admixture is used, the maximum limit may be increased an additional 2 inches.
  - 2. Tunnel Slab:
    - a. Compressive Strength (28 Days): 5,000 psi.
    - b. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.40.
    - c. Slump Limit: 4 inches without Water-Reducing Admixtures; [5 inches with Water-Reducing Admixtures].
      - i. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: When a high-range water-reducing admixture is used, the maximum limit may be increased an additional 2 inches.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 5 to 7 percent.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
- F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:
  - 1. Fly Ash or Pozzolans: 25 percent.
  - 2. Ground Granulated Blast-Furnace Slag: 50 percent.
  - 3. Combined Fly Ash or Pozzolans, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or Pozzolans not exceeding 25 percent.
- G. Transit Mixed Concrete: Maximum time from batching to placement shall be 90 minutes; conform to ASTM C 94.
  - 1. Do not add water after leaving the concrete plant.
  - 2. Re-tampering of concrete at site is not permitted.
- H. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; Acceptable to Engineer and at no change in Contract amount.
  - 1. Submit laboratory test data for revised mix design and strength results for approval before using in work.

## 2.5 SOURCE QUALITY CONTROL

- A. Concrete Testing Service: Engage a testing laboratory acceptable to Engineer to perform material evaluation tests and design concrete mixes.
- B. Admixture manufacturer shall provide a knowledgeable representative trained as a concrete technician and acceptable to the Engineer to assist in proportioning concrete materials for optimal results, and advise on proper admixture use and mix adjustment to meet Project conditions, at no change in contract amount.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Prior to placing concrete inspect placement of reinforcing, verify that formwork is ready to receive concrete, and that items to be cast-in and embedded are in place. Coordinate the Work of other trades to permit setting and installation of their Work.

### 3.2 CONCRETE PLACEMENT

- A. Placing Concrete: Convey and deposit to ensure a continuous flow at delivery without separation of materials, limit drops to 60 inches for unexposed work and 36 inches for exposed work. Maintain reinforcing in proper position during placing.
  - 1. In Forms: Horizontal layers up to 24 inches deep, place each layer while preceding layer is still

- plastic, avoid cold joints between layers.
2. Slabs: Place and consolidate in a continuous operation to limits of construction joints and to elevation indicated; Surfaces smooth, level, free of humps, and hollows, for finish specified.
- B. Consolidation: During placing by mechanical vibrating equipment, provide even dense surfaces, prevent honeycomb, rock pockets and voids.
1. Do not use vibrator to transport concrete inside forms. Place at regular intervals within machine's visible effective range.
  2. Rapidly penetrate placed layer and at least 6-inches into preceding layer. Do not insert vibrator into lower layers of concrete that have begun to set.
  3. For exposed concrete keep vibrator on the unexposed side of reinforcing steel, or 2.5 inches away from form surface.
- C. Cold Weather Placing: Comply with ACI 306 and Section 5 of ACI 301. At ambient temperature below 40-degrees F, uniformly heat water and aggregates before mixing, provide a mixture temperature conforming to Table 1.4.1 of ACI 306. Maintain protection for minimum times as noted in Table 1.4.2 of ACI 306.
1. Do not use frozen materials, nor material containing ice. Do not place concrete on frozen subgrade.
- D. Hot Weather Placing: Comply with ACI 305. Cool water and aggregates before mixing, maintain concrete temperature at time of placement below 90 degrees F. Cool reinforcing with wet burlap, keep steel temperature at or below ambient air temperature until embedment in concrete.
1. Use specified water reducer to control concrete temperature rise during adverse placing conditions.
- E. Curing: Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Begin final curing immediately following initial curing and before concrete has dried, and continue for seven days. Conform to ACI 308 and the following.
1. Moist Cure: Prevent drying of concrete, keep formwork and concrete continuously wet with water by flooding, fog spray or saturated absorptive cover.
    - a. Absorptive Cover: Place contiguously over concrete surfaces in widest widths practical, with edges lapped 4 inches.
  2. Moisture Retaining Cover: Place contiguously over concrete surfaces in widest widths practical, with edges lapped 4 inches and sealed with tape. Repair holes as they occur throughout curing period.
  3. Membrane Curing Compound: Apply to optimize retention of water-of-hydration to ensure thorough cure for high quality concrete.
    - a. Application: Within one hour of completion of final finishing operation. Maintain continuity of coating throughout curing period, recoat areas subject to heavy rainfall within three hours of initial application.

### 3.3 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right



angles to centerline, unless otherwise indicated.

- B. Construction Joints: Set construction joints at side and end terminations of concrete.
1. Continue steel reinforcement across construction joints, unless otherwise indicated.
  2. Doweled Expansion Joints: Install dowel bars and support assemblies at expansion joints in concrete indicated on the Drawings. Lubricate, asphalt-coat, or provide proprietary plastic sleeve per manufacturer's directions, on one-half of dowel length to prevent concrete bonding to one side of joint.
  3. Doweled Joints: Install dowel bars where new concrete meets existing concrete. Drill and epoxy one-half of bar into existing concrete. Lubricate, asphalt-coat, or provide proprietary plastic sleeve per manufacturer's directions, on the half of dowel length embedded in new concrete to prevent concrete bonding to that side of joint.
- C. Expansion Joints: Form expansion/isolation joints of 1/2" preformed joint-filler strips abutting catch basins, manholes, inlets, light pole bases, structures, walks, other fixed objects, and where indicated on the Drawings.
1. Doweled Expansion Joints: Install dowel bars and support assemblies at joints where indicated on the Drawings. Lubricate, asphalt coat, or provide proprietary plastic sleeve per manufacturer's directions on one-half of dowel length to prevent concrete bonding to one side of joint.
  2. Locate expansion joints at intervals of 20 feet maximum, unless otherwise indicated on the Drawings.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated on the Drawings. Construct contraction joints for a depth equal to at least 1/4 of the concrete thickness, at intervals of 10 feet maximum, unless otherwise indicated on the Drawings, and as follows:
1. Score Joints: Form score joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4 inch radius. Repeat grooving of score joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
- E. Joints in Curbs: Space contraction joints in curbs and gutters at minimum 5-foot intervals with isolation joints at minimum 15-foot intervals or as shown on the Drawings. Isolation joints shall be struck vertically and full depth. Align joints in concrete curbs with joints in finish paving.
- F. Edging: Tool exposed edges of ramps, sidewalks, walkways and joints in concrete after initial floating with an edging tool to a 1/2 inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

### 3.4 FINISHING

- A. Formed Surfaces: As specified herein, and as defined in the referenced subsections of ACI 301 Chapter 5, apply at following locations.
1. Rough Form Finish: 5.3.3.3.a; surfaces concealed by other construction, unless otherwise indicated.
  2. Smooth Form Finish: 5.3.3.4.a; surfaces with directly applied waterproofing, finish coatings, and coverings.

3. Grout Cleaned Finish: 5.3.3.4.b; exterior concrete stem wall surfaces exposed to view.
4. Adjacent Unformed Surfaces: 5.3.3.5
5. Cure: Moist cure.

B. Tunnel Lids, Stairs, and Sidewalks:

1. Broom Finish: 5.3.4.2.d; ramps and elsewhere as indicated, provide a 4 inch smooth margin at all edges and joints. Coordinate final finish with Engineer before application.
2. Cure: Contractor option using one of three methods specified.

### 3.5 MISCELLANEOUS CONCRETE ITEMS

- A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Curbs: Monolithic finish, strip forms while concrete is still green, and steel-trowel to a hard, dense finish, radius corners, intersections and terminations one inch.
- C. Wash-Down of Concrete Supply Trucks and Related Equipment: Not permitted on Site except where Contractor demonstrates acceptable means for collection and containment of effluent for return to ready-mix plant by supply vehicle.

### 3.6 TOLERANCES

- A. Compliance With Tolerances: Determined after placement. Concrete that does not conform to tolerances will be determined to be non-compliant. The Contractor shall correct concrete work to eliminate defects and variations exceeding specified tolerances.
  1. General Tolerances : ACI 117 Section 4 except as otherwise required.
- B. Tunnel Lids and Sidewalks: Levelness requirements do not apply where sloped surface is required. Correct surfaces that do not conform to tolerance limitations shall be removed and replaced.
  1. Flatness and Level : ACI 117; Flat per Section 4.5.6 and ASTM E 1155.

### 3.7 REPAIRS AND PROTECTION

- A. Remove and replace concrete that is broken, damaged, or defective or that does not comply with requirements in this Section in complete sections from joint to joint, unless otherwise approved by Engineer at no additional cost to the Owner.
- B. Protect concrete from damage.
- C. Maintain concrete free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.
- D. Protect concrete from premature drying, temperature extremes, and mechanical injury. Comply

with Section 5.3.6.4 of ACI 301.

### 3.8 CLEANING

- A. Remove all excess material, debris, and equipment from site upon completion of work in this Section. Keep work area clean and in an orderly condition during the course of the Work.
- B. Do not dispose of waste concrete or wash out materials on the site unless otherwise directed by the Owner's Representative. Areas to be paved may be acceptable for concrete truck wash areas only as approved by the Owner's Representative.

### 3.9 FIELD QUALITY CONTROL

- A. The Owner will employ a testing laboratory to perform tests and to submit test reports.
- B. Sampling and testing for quality control during placement of concrete may include the following, as directed by Engineer.
  - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
  - 2. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
  - 3. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
  - 4. Concrete Temperature: Test hourly when air temperature is 40-degrees F and below, and when 80-degrees F and above; and each time a set of compression test specimens made.
  - 5. Compression Test Specimen: ASTM C 31; one set of 5 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
  - 6. Compressive Strength Tests: ASTM C 39; one set for each 30-cubic yards or fraction thereof of each concrete class placed in any one day; one specimen tested at 7-days, three specimen tested at 28-days, and one specimen retained in reserve for later testing if required.
    - a. When total quantity of a given class of concrete is less than 10-cubic yards, strength tests may be waived by Engineer if, in his judgment, adequate evidence of satisfactory strength is provided.
    - b. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
    - c. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive by more than 500 psi.
- C. Test results will be reported in writing to Engineer and Contractor within 24-hours that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28-days, concrete mix

proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

E. Additional Tests:

1. The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer.
2. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.
3. Contractor shall pay for such tests conducted, and any other additional testing as may be required; when unacceptable concrete is verified.

END OF SECTION

# STEEL DECKING

05310

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Composite steel deck.
- B. Related Sections include the following:
  - 1. Division 03 "Cast-In-Place Concrete" for concrete fill.
  - 2. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

### 1.3 SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- C. Design calculations for each condition of use. Live load considered shall be the worst effect of a 24,000 pound axle load (12,000 pound wheel load) or uniform loading of 300 pounds per square foot. Distribute axle/wheel load in accordance with the most current IBC or AASHTO design specifications.
- D. Product Certificates: For each type of steel deck, signed by product manufacturer.
- E. Welding certificates.
- F. Field quality-control test and inspection reports.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
  - 1. Power-actuated mechanical fasteners.
  - 2. Acoustical roof deck.
  - 3. Screw fasteners.
- H. Research/Evaluation Reports: For steel deck.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
  - 1. Member in good standing of Steel Deck Institute (SDI).
  - 2. ISO 9001:2000 accredited by ANSI Registrar Accreditation Board (ANSI-RAB).
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Steel Deck Institute - "Manual of Construction with Steel Deck" (SDI - MOC2).
- B. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- C. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
  - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Steel Deck:
    - a. ASC Profiles, Inc.
    - b. Canam Steel Corp.;The Canam Manac Group.
    - c. Consolidated Systems, Inc.
    - d. DACS, Inc.
    - e. D-Mac Industries Inc.
    - f. Epic Metals Corporation.

- g. Marlyn Steel Decks, Inc.
- h. New Millennium Building Systems, LLC.
- i. Nucor Corp.; Vulcraft Division.
- j. Roof Deck, Inc.
- k. United Steel Deck, Inc.
- l. Valley Joist; Division of EBSCO Industries, Inc.
- m. Verco Manufacturing Co.
- n. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

## 2.2 COMPOSITE STEEL DECK

- A. Composite Steel Deck: Fabricate panels, with integrally embossed or raised pattern ribs and nestible, interlocking, self-aligning with concealed fasteners, or full-depth positive registering side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:
  1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G90 zinc coating; cleaned, pretreated, and painted in accordance with the manufacturer's requirements.
  2. Profile Depth and Uncoated-Steel Thickness: Depth and thickness shall be as required for structural capacity for the conditions noted on plan. Minimum profile depth to be 2-inch, minimum thickness to be 0.0358-inch
  3. Span Condition: Simple span.

## 2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0358-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- E. Pour Stops and Girder Fillers: Galvanized G-60 (Z180) minimum steel sheet, minimum yield strength of 33,000 psi (230 MPa), of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Galvanized G-60 (Z180) minimum steel sheet, of same thickness as deck, unless otherwise indicated.
- G. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with steel deck.
- H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, [0.0598 inch (1.52 mm)] [0.0747 inch (1.90 mm)] thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.

- I. Galvanizing Repair Paint: ASTM A 780
- J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

### 3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
  - 1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

### 3.3 DECK INSTALLATION

- A. Fasten deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
  - 1. Weld Diameter: 5/8 inch (16 mm), nominal.



2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart.
  3. Weld Spacing: Space and locate welds as indicated.
  4. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 24 inches (910 mm), and as follows:
1. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 3-inches, with end joints as follows:
1. End Joints: Lapped.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
- E. Steel-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

### 3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

### 3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
  1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
  2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 09 Section "<Insert title of applicable field-painting Section>."

- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

## METAL FABRICATIONS

### SECTION 05500

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Section includes metal fabrications not part of structural steel or other metal systems specified elsewhere, as indicated and scheduled.

##### 1.2 SUBMITTALS

- A. Product Data: Manufacturer's specifications, and installation instructions for products used in Work of this Section.
- B. Shop Drawings: Plans, elevations, structural calculations, field measurements, and details of sections, anchorages and accessories.
  - 1. Engineer's Stamp: Required on shop drawings and calculations.
  - 2. Templates: Provide for installation of anchors and bolts.
- C. Certificate of welding operator qualification.

##### 1.3 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Engineer: Licensed professional in State where project is located.
  - 2. Welding Process and Operator: AWS D1.1, D1.2, and D1.3, AWS Code for manual shielded metal-arc welding, and remedial work.
- B. Certify welding operators have passed AWS qualification tests.

##### 1.4 PROJECT CONDITIONS

- A. Field Measurements: Made prior to preparation of shop drawings, verify dimensions indicated, coordinate fabrication and construction schedules to avoid delay.

##### 1.5 SEQUENCING AND SCHEDULING

- A. Prevent delays, coordinate with other trades delivery and installation of anchors, inserts, and finished Work. Provide setting drawings, templates, and instructions for installation of items built into other assemblies.

#### PART 2 PRODUCTS

##### 2.1 MATERIALS

- A. Steel: Smooth, free of surface blemishes, pitting, seam marks, roller marks, and rolled trade names, Class, Grade, coatings and finish as indicated, unless otherwise required. Comply with the following.
  - 1. Plates, Shapes and Bars: ASTM A 36.
  - 2. Structural Sheet: Hot-rolled, ASTM A 1011; cold-rolled ASTM A 1008, Grade A.

3. Pipe: ASTM A53
  4. Wire: ASTM A 510.
- B. Concrete and Grout: As specified in Section 03300.
- C. Fasteners: Type, grade and class required, same metal as material fastened, except provide stainless steel fasteners for aluminum connections. Provide ASTM B 633 Class Fe/Zn 5 fasteners for exterior use, and fasteners in exterior walls except where stainless steel is required.
1. Steel Bolts and Nuts: ASTM A 307, Grade A, hexagon head, ASTM A 563.
  2. Lag Bolts: ASME B18.2.1.
  3. Machine Screws: ASME B18.6.3
  4. Anchor Bolts: ASTM F 1554, Grade 36, galvanized where required.
  5. Threaded and Wedge Type Concrete Anchors: ASTM A 47 malleable iron, ASTM A 27 cast steel with bolts, washers, and shims as necessary; hot-dip galvanized all components per ASTM A 153.
  6. Expansion Anchors: Exterior applications provide ASTM F 593 stainless steel bolts and ASTM F 594 stainless steel nuts.
  7. Plain Washers: ASME 18.22.1, carbon steel, round.
  8. Lock Washers: ASME B18.21.1, carbon steel, helical spring.

## 2.2 FABRICATION

- A. Shop Assembly: Required, minimize field assembly, disassemble only as necessary due to limitations of shipping and handling; mark units for reassembly and installation.
- B. Material Size and Thickness: As indicated, and required for strength and durability in finished product for use intended. Use structural steel shapes, plates and bars, unless otherwise required.
- C. Form Work true to line and level with accurate angles and surfaces and straight sharp edges.
- D. Radius exposed edges approximately 1/32 inch unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Weld corners, joints, and seams continuously. Comply with AWS standards. Grind exposed welds smooth, and flush; match adjoining surfaces.
- F. Exposed Connections: Welded to greatest extent possible, otherwise, use concealed fasteners, and provide hairline joints, flush and smooth.
  1. Where exposed fasteners must be used and are approved, use phillips flat-head (countersunk) screws, unless otherwise indicated.
  2. Joints Exposed to Weather: Resistant to intrusion of water, weep locations where water could accumulate.
- G. Provide brackets, flanges, fittings, and anchors of type and spacing required, and as necessary; coordinate with supporting structure. Furnish inserts to be installed in concrete.

1. Sleeves For Work Set in Concrete: Galvanized steel pipe or tube, 6 inches long and 0.5 inch ID oversize; hold top of sleeve 0.5 inch below concrete surface, close bottom with 1 inch oversized plate.
  2. Cut, reinforce, drill and tap metal fabrications for penetrations, and to receive hardware, anchors, and attachments.
- H. Rough Hardware: Custom fabricated miscellaneous steel and iron shapes, bolts, plates anchors, hangers, and dowels; provide as indicated.
1. Washers: Malleable-iron for connections bearing on structural wood.
- I. Loose Bearing and Leveling Plates: Flat, thickness, bearing, and anchorage required, for steel items bearing on masonry, and concrete.

### 2.3 FINISHING

- A. Galvanizing: Required after fabrication for exposed assemblies, such as shelf angles and similar supports, items in contact with concrete as indicated. Coating thickness shall be 3.0 oz/square foot.
1. Iron and Steel Hardware: ASTM A 153.
  2. Steel Shapes, and Assembled Products: ASTM A 123.
  3. Structural Steel: ASTM A 123.
  4. Steel Pipes: ASTM A 123.
  5. Steel Sheet: ASTM A 653 G90 or equivalent.
- B. Shop Painting: Provide for items exposed to view in completed work, complying with SSPC-PAL Specification 1.
1. Surface Preparation: Galvanized components, provide pre-treatment for painting.
  2. Galvanizing Repair Paint: SSPC-Paint-20.

### 2.4 ACCESS HATCH

- A. Exterior type waterproof, aluminum 6061 T6, double-leaf over 3 feet in width and single-leaf 3 feet and under in width. Where traffic loads are not required the design live load shall be 300 pounds per square foot.
- B. Component Fabrication
1. Access Door Leaf(s): 1/4" minimum diamond pattern plate with reinforcing on underside
  2. Channel Frame: 3/8-inch with full anchor flange around perimeter.
  3. Equip door(s) with heavy forged brass or stainless steel hinges with stainless steel pins. Provide flush steel drop handle.
  4. Hinges: Through-bolt to cover with tamper-proof stainless steel bolts or "lock bolts" to resist vandalism, and through-bolted to frame with stainless steel bolts and fiber locknuts.
  5. Equip doors with fully enclosed and lubricated compression springs with lower enclosing telescopic tube locked into supporting "boot" firmly attached to frame to

retard downward motion of door leaves or corrosion-resistant stainless steel gas springs designed to limit to 17 pounds the lifting force required to open.

6. Equip doors with hold-open arm with positive locking device with conveniently positioned release handle for easy and controlled closing.
7. Furnish stainless steel snap lock mounted on bottom of leaf with removable topside handle and socket recessed in cover and provided with threaded plug for flush surface with handle removed.
8. Locate 1½-inch drainage coupling in one corner of channel frame.
9. Hardware: AISI Type 304 stainless steel.
10. Equip with recessed hasp for padlock that is covered by a hinged lid flush with the surface.
11. All access hatches shall be provided with underlying fiberglass safety grates to allow inspection of the vault while providing fall-through protection. Safety grates shall be designed to withstand a live load of 300 lb/ft<sup>2</sup> with a maximum deflection of 1/150 of the span. Grates shall be provided with a hinging system that will lock the grate in the 90° open position. Each grate shall be provided with an open arm with red vinyl grip. Safety grates shall be safety orange.

C. Manufacturers

1. Bilco Co., New Haven, CT.
2. USF Fabrication, Hialeah, Florida.
3. Thompson Fabricating Co., Birmingham, AL.
4. Or Equal.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Installer shall examine conditions for installation of Work, and notify Contractor of conditions detrimental to proper and timely completion. Do not proceed until unsatisfactory conditions are corrected. Start of installation interpreted as installer's acceptance of conditions.
  1. Coordinate work of this Section with field conditions to ensure proper fit with actual constructed assemblies. Provide clearances necessary for proper operation of moving parts and equipment and as necessary for servicing and maintenance of adjacent work.

### 3.2 INSTALLATION

- A. Set Work accurately in location, and elevation; align, plumb, level, true and free of rack, measured from established lines and levels. Cut, drill, and fit as necessary for required installation. Brace, support, and anchor Work during installation as necessary.
- B. Align connections accurately, form tight hairline joints. Unless otherwise required, weld connections which could not be shop welded due to shipping limitations. Grind exposed joints smooth and touch-up shop finish. Do not weld, cut or abrade units intended for bolted, and screwed field connections.

- C. Permanently secure work to in-place construction, use lead expansion shields for anchors in concrete walls. Provide flanges, collars, and sleeves to conceal joints, and as permanent obstructions.
- D. Install Work in accordance with product manufacturer's recommendations unless otherwise indicated. Fit rails, guards, and gratings around building structure, mechanical systems, and permanent obstructions.
- E. Grouting: Place in accordance with manufacturer's instructions. Remove bond-reducing contaminants from bearing surfaces, and roughen to improve bond. Support loose plates on wedges, or shims cut-off flush with plate edge before grouting. Pack grout solidly into annular spaces, and between bearing surfaces, ensure that no voids remain.
- F. Repair of Shop Applied Coatings: Immediately after erection, prepare field welds, and damaged areas of shop applied coatings, and recoat with material originally used.

END OF SECTION

## SELF-ADHERING SHEET WATERPROOFING

### SECTION 07131

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION OF WORK

A. Work Included: This Section specifies the following.

1. Rubberized-asphalt sheet waterproofing.
2. HDPE sheet waterproofing.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 01330 - Submittals
2. Section 03330 – Cast-in-Place Concrete

##### 1.2 PERFORMANCE REQUIREMENTS

A. Provide waterproofing that prevents the passage of water.

##### 1.3 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

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

C. Samples: For the following products:

1. 12-by-12-inch square of waterproofing and flashing sheet.
2. 12-by-12-inch square of insulation.
3. 4-by-4-inch square of drainage panel.

D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

E. Qualification Data: For Installer and for Testing and Inspection Agency.

F. Product Test Reports: From a qualified independent testing agency indicating and interpreting test results of waterproofing for compliance with requirements, based on comprehensive testing of current waterproofing formulations.

G. Test Reports: From Testing and Inspection Agency.



H. Sample Warranty: Copy of special waterproofing manufacturer's and Installer's warranty stating obligations, remedies, limitations, and exclusions before starting waterproofing.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is acceptable to waterproofing manufacturer to install manufacturer's products.
- B. Qualifications of Testing and Inspection Agency: Experienced testing and inspection agency acceptable to the Authority.
- C. Source Limitations: Obtain waterproofing materials, protection course, and molded-sheet drainage panels through one source from a single manufacturer.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1. Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
  - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

#### 1.7 WARRANTY

- A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer agreeing to replace waterproofing material that does not comply with requirements or that does not remain watertight during specified warranty period.

1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch in width.
2. Warranty Period: Five years after date of Substantial Completion.
3. Warranty includes removing and reinstalling protection board, drainage panels, and overburden materials.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Rubberized-Asphalt or HDPE Sheet Waterproofing:
  - a. American Hydrotech, Inc.; VM 75.
  - b. Carlisle Corporation, Carlisle Coatings & Waterproofing Div.; CCW 701.
  - c. Cetco; Envirosheet.
  - d. W. R. Grace & Co.; Bituthene.
  - e. W. R. Grace & Co.; Preprufe 160 for vertical surfaces and Preprufe 300 for horizontal surfaces.
  - f. W. R. Meadows, Inc.; Mel-Rol.

### 2.2 RUBBERIZED-ASPHALT SHEET WATERPROOFING

A. Rubberized-Asphalt Sheet: 60-mil-thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil-thick, polyethylene film with release liner on adhesive side.

1. Physical Properties: As follows, measured per standard test methods referenced:
  - a. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
  - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
  - c. Low-Temperature Flexibility: Pass at minus 20 deg F ASTM D 1970.
  - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (movement; ASTM C 836.
  - e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
  - f. Hydrostatic-Head Resistance: 150 feet (minimum; ASTM D 5385.
  - g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
  - h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

### 2.3 HDPE SHEET WATERPROOFING

A. HDPE Sheet for Vertical Applications: 42-mil-thick, uniform, flexible sheets consisting of 16-mil-thick, HDPE sheet coated with a pressure-sensitive rubber adhesive, a protective adhesive coating, and a release liner.

B. HDPE Sheet for Horizontal Applications: 56-mil-thick, uniform, flexible sheets consisting of 30-mil-thick, HDPE sheet coated with a pressure-sensitive rubber adhesive, a protective

adhesive coating, a detackifying surface treatment, an uncoated self-adhering side lap strip, and a release liner.

C. Physical Properties: As follows, measured per standard test methods referenced:

1. Tensile Strength, Film: 4000 psi minimum; ASTM D 412.
2. Low-Temperature Flexibility: Pass at minus 10 deg F; ASTM D 1970.
3. Peel Adhesion to Concrete: 5 lbf/in.; ASTM D 903, modified.
4. Lap Adhesion: 2.5 lbf/in.; ASTM D 1876, modified.
5. Hydrostatic-Head Resistance: 231 feet; ASTM D 5385, modified.
6. Vapor Permeance: 0.01 perms; ASTM E 96, Water Method.

## 2.4 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid primer recommended for substrate by manufacturer of sheet waterproofing material.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

D. Sheet Strips: Self-adhering, rubberized-asphalt composite sheet strips of same material and thickness as sheet waterproofing.

E. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.

F. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.

G. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.

H. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

I. Protection Course: Fan-folded, extruded-polystyrene board insulation, unfaced, nominal thickness 3/8 inch.

## 2.5 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with

an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to 1 side and a polymeric film bonded to the other side of a 3-dimensional, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Carlisle Sure-Drain V.
  - b. W. R. Grace Hydroduct 2 or HZ
  - c. Miradri Miradrain 6200 or 6200XL

## 2.6 INSULATION

A. Board Insulation: Extruded-polystyrene board insulation complying with ASTM C 578, square edged of type, density, and compressive strength indicated below:

1. For vertical applications, Type IV, 1.6-lb/cu. ft. minimum density and 25-psi minimum compressive strength.
2. For horizontal applications, pedestrian traffic, Type VII, 2.2-lb/cu. ft. minimum density and 60-psi minimum compressive strength.
3. For horizontal applications, vehicular traffic, Type V, 3-lb/cu. ft. minimum density and 100-psi minimum compressive strength.
4. Thickness: 2 inches unless indicated otherwise on the Drawings.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

1. For rubberized-asphalt membrane, verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
2. For HDPE sheet, verify that compacted subgrade is dry, smooth, and sound, ready to receive sheet.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints, bugholes and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
- F. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.
  - 1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.
- G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
  - 1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
    - a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.
    - b. At plaza deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.
- H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

### 3.3 RUBBERIZED-ASPHALT SHEET APPLICATION

- A. Install self-adhering sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.
- B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch-minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.
  - 1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, rubberized-asphalt sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
- D. Horizontal Application: Apply sheets from low point to high point of decks to ensure that side laps shed water.
- E. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

- F. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic or sealant.
- G. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing as applicable.
- H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheets extending 6 inches beyond repaired areas in all directions.
- I. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

### 3.4 HDPE SHEET APPLICATION

- A. Install HDPE sheets according to waterproofing manufacturer's written instructions.
- B. Vertical Applications: Install sheet membrane with HDPE face against substrate. Accurately align sheets and maintain uniform 3-inch-minimum lap widths and end laps. Overlap and seal seams and stagger and tape end laps to ensure watertight installation. Mechanically fasten to substrate.
  - 1. Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detailing tape.
- C. Horizontal Applications: Install sheet membrane with HDPE face against substrate. Accurately align sheets and maintain uniform 3-inch-minimum lap widths and end laps. Overlap and seal seams. Overlap, stagger, and seal end laps with detail tape to ensure watertight installation.
- D. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.
- E. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.
- F. Install sheet waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.
- G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches beyond repaired areas in all directions. Apply a patch of sheet membrane and firmly secure with detail tape.
- H. Correct deficiencies in or remove waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

### 3.5 PROTECTION COURSE INSTALLATION

- A. For sheet membrane, install protection course within 24 hours of waterproofing application, with butted joints over waterproofing membrane before starting subsequent construction operations.

1. Drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer.

### 3.6 INSULATION INSTALLATION

- A. Install insulation drainage panels over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.
- B. On vertical surfaces, set insulation units in adhesive or tape applied according to manufacturer's written instructions.
- C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

### 3.7 FIELD QUALITY CONTROL

- A. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
  1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
  2. Flood each area for 24 hours.
  3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight. Repair procedures shall be in strict accordance with manufacturer's recommendations.
- B. Engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

### 3.8 PROTECTION AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed insulation from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

## SNOW MELTING SYSTEM

### SECTION 15770

#### PART 1 GENERAL

##### 1.1 SCOPE

- A. Furnish and install tubing, manifolds, and valve boxes for a snow melting system to be connected to Owner's geothermal piping at a future date.

##### 1.2 WARRANTY

- A. Manufacturer shall warranty the tubing for twenty (20) years, and eighteen (18) months for other parts of the system from the date of substantial completion. If products are defective the manufacturer shall repair or replace the product as necessary to provide a complete and operational system.

#### PART 2 PRODUCTS

##### 2.1 GENERAL

- A. Furnish and install materials for the future connection of a snow melting system. Provide all materials as required. System shall include the system design, tubing, manifolds, pipe tie wires and valve boxes. Where indicated on the Drawings, tubing shall penetrate the existing geothermal tunnel located under the existing sidewalks. Contractor shall submit a design along with shop drawings for Owner approval. Contractor shall submit qualifications for design and installation of geothermal snow melt system. Pre-approved Contractors are Powley Plumbing Inc., Pacific Plumbers Corp., and Card Plumbing & Heating.

##### 2.2 TUBING

- A. Tubing buried in concrete sidewalks: ASTM F876, ASTM D3350 cross-linked polyethylene with an integral oxygen diffusion barrier to reduce the potential for system corrosion. Tubing shall be 5/8". Tubing shall be rated for a pressure of 100 psi at 180°F. Tubing shall have an oxygen diffusion barrier capable of limiting oxygen diffusion through the tube to no greater than 0.10 g/m<sup>3</sup>/day @ 104°F water temperature. The minimum bend radius for cold bending of the tube shall not be less than six (6) times the outside diameter. Bends with a radius less than stated shall require the use of a bend support as supplied by the tubing manufacturer. Manufactured by Wirsbo, or approved.
- B. Tubing not in concrete sidewalks:
  1. General: Prefabricated piping system consisting of carrier pipe, insulation, and outer jacket.
  2. Carrier Piping: ASTM F876, ASTM D3350 cross-linked polyethylene, continuous length, no couplings. or ASTM D3035 high density polyethylene piping with heat fusion welded joints.
  3. Insulation: Spray applied, two pound per cubic foot density, polyurethane foam, two inch thickness. Closed cell content - 90-95 % in accordance with MIL-I-24172 and ASTM C- 591. Completely fill annular space between carrier pipe and jacketing.
  4. Outer Jacket: Polyethylene.



## 2.3 MANIFOLDS

- A. Manifolds shall be of cast brass construction, manufactured of alloys to prevent dezincification, and shall have integral circuit balancing valves.
- B. Manufactured by Tour & Anderson or approved equal.

## 2.4 FITTINGS

- A. Fittings shall be manufactured of dezincification resistant brass. These fittings must be supplied by the tube manufacturer. The fittings shall consist of a barbed insert, a compression ring, and a compression nut.

## 2.5 MANIFOLD BOXES

- A. Manifold boxes shall be 12" deep rectangular HDPE plastic valve box with green colored locking lid. Minimum inside dimensions shall be 15" x 21".

# PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Verify that site is ready to receive tubing.

## 3.2 INSTALLATION

- A. Install all snow melt system components in strict accordance with manufacturer's instructions.
- B. Tubing shall be attached to woven wire fabric placed on top of the aggregate base rock (sidewalks) in accordance with manufacturer's instructions. Tubing shall be installed in a counterflow spiral layout pattern.
- C. Hydronic snow-melt tubing loops shall be installed in accordance with the manufacturer's recommendations.
- D. All fittings should be accessible for maintenance. Tubing loops shall be installed without splices, as a minimum, from the point at which the tubing enters the panel to the point at which it exits the panel.
- E. Installation shall follow the shop drawings for tubing layout, tube spacing, manifold configuration, manifold, and location. All notes on the drawing shall be followed.
- F. The tubing system shall be pressurized, with air, in accordance with applicable codes, or to a pressure of 60 psig 24 hours prior to encasement in the radiant panel. The tubing system shall remain at this pressure during the panel installation, and for a minimum of 24 hours thereafter to ensure system integrity. The contractor shall provide the air for the pressurization of the tubing system. The contractor assumes all liabilities for suitable safety precautions and testing, including the use of compressed air when applicable.

### 3.3 START-UP SERVICE

- A. A manufacturer's representative shall inspect the tubing installation and observe the testing of the tubing prior to installation of the concrete sidewalks.

END OF SECTION