

Tunnels

Tunnel Tool Kit

U of M Project Number: P000xxxxx

Building Number: 3010030

University Of Michigan Ann Arbor, MI

UNIVERSITY OF MICHIGAN
ARCHITECTURE, ENGINEERING AND CONSTRUCTION
326 East Hoover, Mail Stop E
Ann Arbor, MI 48109-1002
Phone: 734-764-3414
Fax: 734-936-3334

Tool Kit Overview

THIS TOOL KIT IS INTENDED TO INDICATE DETAILS THAT WERE SUCCESSFUL IN PAST PROJECTS AND TO INDICATE LEVEL OF DETAIL REQUIRED IN THE BID DOCUMENTS. THESE DETAILS ARE NOT 'CUT AND PASTE' FOR ALL PROJECTS.

EACH SUPPORT SHOULD HAVE A CONSTRUCTION REFERENCE NOTE REFERRING TO A SECTION DETAIL. SUPPORTS THAT ARE IDENTICAL MAY USE THE SAME NOTE AND SECTION DETAIL (AS IN CONSTRUCTION REFERENCE NOTES 5 AND 6). NOT ALL SUPPORTS HAVE BEEN DETAILED FOR THIS EXAMPLE.

TUNNEL PROJECTS DESIGN REQUIREMENTS

REFER TO:
UM DESIGN GUIDELINES SECTION - "SPECIAL BUILDING AREAS - H TUNNELS"
LOCATED:
<https://umaec.umich.edu/for-vendors/design-guidelines/5-0-special-building-areas/>
AND
UM DESIGN GUIDELINES SECTION - 4.6 "UTILITIES FOR UNIVERSITY BUILDINGS"
LOCATED:
<https://umaec.umich.edu/desguide/4.0-SID/SID4.6.pdf/>

CONTRACTOR TO CONSULT WITH A STRUCTURAL ENGINEER TO DESIGN ALL TEMPORARY PIPING SUPPORTS. SUBMIT DETAILS FOR OWNER REVIEW AND APPROVAL.

TUNNEL PROJECT SPECIFICATIONS ARE LOCATED:
[HTTPS://UMAEC.UMICH.EDU/FOR-VENDORS/DESIGN-GUIDELINES/7-0-MASTER-SPECIFICATIONS/](https://umaec.umich.edu/for-vendors/design-guidelines/7-0-MASTER-SPECIFICATIONS/):

- DIVISION 03 CONCRETE**
SECTION 037300 TUNNEL CONCRETE RESTORATION (INCLUDE FOR INTERIOR TUNNEL REPAIRS)
- DIVISION 07 THERMAL AND MOISTURE PROTECTION**
SECTION 071025 UTILITY TUNNEL WATERPROOFING (INCLUDE FOR EXTERIOR TUNNEL WATERPROOFING)
- DIVISION 33 UTILITIES**
SECTION 336200 PROJECT QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) FOR TUNNEL PROJECTS (INCLUDE WITH SECTION 336313 AND/OR SECTION 336330 WORK)
- SECTION 336313 - UNDERGROUND STEAM AND CONDENSATE DISTRIBUTION PIPING
- SECTION 336320 - UTILITY TUNNELS - DOMESTIC HOT WATER DISTRIBUTION SYSTEMS
- SECTION 336330 - UTILITY TUNNELS - STEAM & CONDENSATE DISTRIBUTION SYSTEMS
- SECTION 336340 - UTILITY TUNNELS - COMPRESSED AIR DISTRIBUTION SYSTEMS (IN DEVELOPMENT - USE DIVISION 22 AND 23 FOR COMPRESSED AIR PIPING, VALVES AND SPECIALTIES)

TUNNEL ENTRY PROTOCOL:

SEE WEBSITE FOR TUNNEL ACCESS PROCEDURES AND REQUIREMENTS. SIGNED FORMS SHALL BE PROVIDED TO U-M UTILITIES TUNNEL SYSTEM MANAGER PRIOR TO REQUESTING ACCESS.

WELDING REQUIREMENTS:

SPECIFIC WELDER QUALIFICATIONS, WELD PROCEDURES, AND ASSOCIATED SUBMITTALS ARE AS DESCRIBED IN THE CUSTOM PIPING SPECIFICATION, OBTAINED FROM UTILITIES.

DESIGNED BY:

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ARCHITECTURE & ENGINEERING
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Ann Arbor, MI 48109-1002
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NOTES TO DESIGNER:

- TOOL KIT PLANS ARE INTENDED TO CONVEY THE LEVEL OF DETAILS EXPECTED IN THE CONSTRUCTION DOCUMENTS FOR TUNNEL PROJECTS.
- ALL SUPPORTS PRESENTED IN THE BID PACKAGE DRAWING SET SHALL BE NUMBERED. SUPPORTS WILL BE TAGGED/LABELED IN FIELD BY OWNER.
- PROVIDE TYPICAL TUNNEL SECTION IN EACH PLAN SHEET.
- ALWAYS LOCATE WATER LINES (VICTAULIC COUPLING) ON THE AISLE. PROVIDE ALUMINUM JACKET, IF SUBJECTED TO DAMAGE.
- PROVIDE A SCHEDULE FOR VALVES AND EXPANSION JOINTS. OBTAIN TAG NUMBER FROM OWNER, REPLACEMENT VALVES AND JOINTS SHALL ADOPT EXISTING TAG NUMBER. VALVES AND JOINTS WILL BE TAGGED/LABELED IN FIELD BY OWNER. CONTACT UTILITIES (REFER TO CONTACTS ON THIS SHEET).
- IN NEW TUNNELS PROVIDE ADEQUATE AISLE WIDTH FOR EASY TRANSPORTATION OF THE LARGEST EXPANSION JOINT. IN EXISTING TUNNELS, MAKE SURE EXPANSION JOINT CAN BE TRANSPORTED. IF AISLE SPACE IS NOT ADEQUATE, ADDRESS THE PROBLEM AND PROVIDE A METHOD OF TRANSPORTATION OR A NEW HATCH.
- FOR ADDITIONAL KEY DESIGN CONSIDERATIONS FOR TUNNEL PROJECTS, REFER TO UM DESIGN GUIDELINES SECTION "SPECIAL BUILDING AREAS - H TUNNELS" (<http://www.plantext.bf.umich.edu/desguide/sba.html>)
- PRIMARY GUIDE AND SECONDARY GUIDE SPACING SHALL BE PER EXPANSION JOINT MANUFACTURERS RECOMMENDATIONS. GUIDE INTEGRAL TO EXPANSION JOINTS, IF ANY, SHALL NOT BE CONSIDERED AS PRIMARY GUIDE.
- PIPE SUPPORT SPACING REQUIREMENTS ARE INDICATED IN PIPE HANGER SPACING SCHEDULE, THIS SHEET.
- THE INSULATION FOR CALCIUM SILICATE INSERT AT ALL SUPPORTS, ANCHORS, GUIDES, ROLLERS, SLIDES AND HANGERS SHALL MATCH PIPE INSULATION FOR ALL SERVICES.
- SURVEY PROPOSED SLIP JOINT LOCATION FOR INTERFERENCE BETWEEN PACKING PORTS AND ADJACENT PIPES. CUSTOMIZE PORT LOCATIONS IF JOINT CAN NOT BE RE-POSITIONED.
- CONSULT TUNNEL MAP TO IDENTIFY CONDENSATE TIE-IN LOCATION AS PUMPED OR GRAVITY DRAIN; VERIFY EXISTING HEADER SLOPE IS CORRECT OR ADD CORRECTIONS TO PROJECT WORK SCOPE.
- COORDINATION WITH CITY AND OR MDOT RIGHT-OF-WAY REQUIRES CLOSE COORDINATION, LONG LEAD TIME FOR APPROVAL. ALL CORRESPONDENCE SHALL BE THROUGH UoM.
- COORDINATION WITH CITY AND UoM EVENTS, REQUIRED PROJECT SHUTDOWNS SHALL BE CLEARLY IDENTIFIED.

MECHANICAL LEGEND

- DHWS — DOMESTIC HOT WATER SUPPLY
- DHWR — DOMESTIC HOT WATER RETURN
- HPA — HIGH PRESSURE AIR (15#)
- LPS — LOW PRESSURE STEAM (15#)
- LPC — LOW PRESSURE CONDENSATE (15#)
- HPS — HIGH PRESSURE STEAM (60#)
- HPC — HIGH PRESSURE CONDENSATE (60#)
- PC — PUMPED CONDENSATE
- FLOW DIRECTION
- VALVE
- STEAM TRAP
- FLEXIBLE CONNECTION
- ROLLER
- EXPANSION JOINT
- ANCHOR
- GUIDE
- PIPE CLAMP
- LINE STOP
- SLIDE
- REDUCER

PIPE HANGER SPACING SCHEDULE

PP	C W	PP	PP	C PP	PP	C PP	PP	P C	PP	PP
	F	F	F	F	F	F	F			
THRU 1"	3/8"	8'-0"	9'-0"	5'-0"	5'-0"	4'-0"				
1 1/4" - 2"	3/8"	10'-0"	11'-0"	7'-0"	7'-0"	5'-0"				
2 1/2" - 3"	1/2"	12'-0"	15'-0"	10'-0"	10'-0"	6'-0"				
4"	5/8"	16'-0" *	17'-0" *	10'-0"	12'-0"	6'-0"				
5" - 6"	3/4"	16'-0" *	20'-0" *	12'-0"	13'-0"	6'-0"				
8" - 12"	7/8"	20'-0" *	21'-0" *	---	---	8'-0"				
14" - 16"	1"	20'-0" *	21'-0" *	---	---	---				

* LIMIT HANGER SPACING TO 12'-0" FOR STEEL PIPE WHERE POSSIBLE. USE MAXIMUM SPACING VALUES ONLY WHERE LIMITED BY BUILDING STRUCTURAL ELEMENTS OR RESTRICTIONS.

** GROOVED PIPING MAY REQUIRE CLOSER SPACING BASED ON PIPE SIZE AND LENGTH. REFER TO MANUFACTURER'S TECHNICAL INSTALLATION DATA.

GENERAL MECHANICAL LEGEND

- NEW ITEM
- EXISTING ITEM
- NEW ITEM, HIDDEN
- EXISTING ITEM, HIDDEN
- EXISTING ITEM TO BE REMOVED
- NEW CONNECTION TO EXISTING WORK
- ↑ NORTH ARROW
- SECTION SYMBOL (DIRECTION OF CUT VIEW; TOP-UNIQUE SEQUENTIAL LETTER TITLE; BOTTOM-LOCATION OF SECTION DRAWING)
- SECTION TITLE (TOP-CORRESPONDING LETTER TITLE; BOTTOM-REFERENCE DRAWING LOCATION)
- MATCH LINE INDICATOR

General Notes

- ALL EXISTING PIPING AND EQUIPMENT LOCATIONS SHOWN ON THE DRAWINGS ARE GENERALLY ACCURATE, BUT CONSIDERED APPROXIMATE. THE CONTRACTOR SHALL VERIFY ALL SYSTEM INTERFACES AND TIE-IN POINTS PRIOR TO DEMOLITION AND PROJECT EXECUTION.
- DUE DILIGENCE AND CARE SHALL BE TAKEN TO AVOID DAMAGE TO EXISTING PLANT SYSTEMS AND EQUIPMENT THAT WILL REMAIN IN OPERATION THROUGHOUT THE PROJECT. CONTRACTOR SHALL PROTECT TO THE GREATEST EXTENT POSSIBLE ALL EXISTING PLANT FACILITIES LOCATED IN OR ADJACENT TO THE WORK AREAS. ANY INADVERTENT DAMAGE TO EXISTING FACILITIES SHALL BE CORRECTED AT THE CONTRACTOR'S EXPENSE, IN ACCORDANCE WITH, AND TO THE SATISFACTION OF THE OWNER'S REQUIREMENTS. DOCUMENT PRE-CONSTRUCTION CONDITIONS WITH PHOTOS.
- THE CONTRACTOR SHALL PROVIDE IMMEDIATE CLEAN-UP OF ALL CONSTRUCTION DEBRIS AND SPILLS. KEEP WORK AND STAGING AREAS CLEAN, NEAT, AND ORDERLY. CONTROL AND CONTAIN DUST WITH BARRIERS. FINAL CLEAN-UP REMOVAL OF ALL CONSTRUCTION-GENERATED WASTE AND DEBRIS, VACUUM DUST FROM PIPES, SUPPORTS AND FLOOR; WASH DOWN AND REMOVAL OF CONCRETE ACTIVITY SPILLS.
- CONTRACTOR SHALL PLAN ALL WORK ACTIVITIES ON WEEKDAYS, MONDAY THROUGH FRIDAY, BETWEEN THE HOURS OF 6 A.M. AND 5 P.M., UNLESS SPECIAL OFF HOUR ARRANGEMENTS ARE APPROVED BY THE PLANT REPRESENTATIVE. THE CONTRACTOR SHALL ARRANGE A MEETING WITH TUNNEL REPRESENTATIVE, UM PROJECT MANAGER, TO DISCUSS ACCESS PRIOR TO START OF CONSTRUCTION.
- CONTRACTOR SHALL PERFORM ALL NECESSARY WORK IN ENSURE EXISTING WATER MAINS IN CLOSE PROXIMITY OR IN TUNNEL PROJECT WORK AREAS ARE POSITIVELY ISOLATED OUT OF SERVICE, OR RE-LOCATED DURING CONSTRUCTION.
- CONTRACTOR SHALL INSTALL FULL-LENGTH LADDER, FROM TUNNEL FLOOR, EXTENDING ABOVE GRADE AND HATCH, MEETING MIOSHA STANDARDS. INSTALL REQUIRED FALL PROTECTION.

TUNNEL QA/QC PROGRAM IN LIEU OF COMMISSIONING:

OBTAIN AND EDIT FROM UTILITIES QA/QC BOILER PLATE RFQ AND SUGGESTED BIDDER'S LIST, TO FIELD VERIFY PROPER WELDING, EXPANSION JOINT INSTALLATION, EXTERIOR CONCRETE WATER PROOFING, AND OTHER CRITICAL TUNNEL CONSTRUCTION REQUIREMENTS.

Contacts

UM UTIL. SERV. MANAGER	MIKE SWANSON	734-763-3011
UM TUNNEL SYSTEM MANAGER	MIKE RHODES	734-xxx-yyyy
UM PROJECT MANAGER	TBD	734-yyy-xxxx
UM CPP I&C	TBD	734-xxx-yyyy

Applicable Codes

HPS - ASME B31.1 POWER PIPING	
LPS - ASME B31.9 BUILDING SERVICES PIPING	
MICHIGAN BUILDING CODE	XXXX
MICHIGAN MECHANICAL CODE	XXXX
MICHIGAN PLUMBING CODE	XXXX
MICHIGAN ELECTRICAL CODE	XXXX
NATIONAL FIRE PROTECTION ASSOCIATION 101	XXXX

CONSULTANT TO VERIFY CURRENT CODE VERSION ADOPTED BY U-M AT TIME OF PROJECT

Sequencing Notes

CONSULTANT IS RESPONSIBLE TO IDENTIFY ALL BUILDINGS IMPACTED BY UTILITY OUTAGES NECESSARY TO PERFORM THE WORK. EACH IMPACTED BLDG REPRESENTATIVE SHALL BE CONTACTED TO ARRANGE FOR, AND DEFINE WHEN, AND FOR HOW LONG AN OUTAGE WILL BE ALLOWED. THE DETAILED OUTAGE WORK PLAN SHALL ADDRESS ALLOWABLE DATES, START AND COMPLETION TIMES, AND BLDG REP EMERGENCY CONTACT INFORMATION. OBTAIN PREVIOUS PROJECT EXAMPLE FROM UTILITIES.

Index Of Sheets

- New or Revised Sheet In This Issue
- Non-Revised Sheet In This Issue

Sheet	Sheet Title	Page	Date	Description	Issue
TK-CVRSHT	Cover Sheet		03/20/15	New Master	●
TK-01	Typical Tunnel Construction Plan		05/08/23	DRAFT Master for Review	●
TK-02	Anchors & Guides - Typical Supports, Sections & Details		10/19/23	Posted to Web	●
TK-03	Steel Supports - Typical Sections & Details				○
TK-04	Pipe Bends & Branch Anchors - Typical Supports, Sections & Details				○
TK-05	Rollers, Slides & Clamps - Typical Sections & Details New Construction				○
TK-06	Steam System Equipment - Accessories & Typical Details				○
TK-07	Existing Pipe Support Repair & Concrete Restoration - Typical Details				○
TK-08	Access Hatch and Accessories - Details & Sections				○
TK-09	NOT USED				○
TK-10	Steam & Condensate Metering - Typical Details - NOT POSTED ON WEB				○
TK-11	Tunnel Ventilation Details - NOT POST ON WEB (Previous Tunnel Ventilation Projects Available Upon Request)				○
TK-12	PROTOCOL - Tunnel Protection & Temporary Shoring Details				○