CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

WATER AND SEWER STANDARD TECHNICAL SPECIFICATIONS AND DRAWINGS

Updated April 2007

EXPIRES 6-30-08
SIGNED 8-28-07

The Confederated Tribes of the Umatilla Indian Reservation have reviewed these Water and Sewer Standard Technical Specifications and Drawings and accepted them for use within the Mission Community.

Sandra Alexander Public Utility Manager — Signature and Title

10/24/07 — Date

ANDERSON·PERRY & ASSOCIATES, INC.

Civil Engineers

La Grande, Oregon
Walla Walla, Washington

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Job No. 152-62

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2007

RESPONSIBILITY STATEMENT FOR USE OF STANDARDS

These CTUIR Water and Sewer Standard Technical Specifications and Drawings have been prepared by Anderson·Perry & Associates, Inc., for exclusive use by the CTUIR on water and sewer projects within the CTUIR's jurisdiction. The standards are intended to be general in nature and set minimum guidance for projects. Use of these Technical Specifications and Standard Drawings or any portion thereof on projects outside of the CTUIR's jurisdiction is strictly prohibited without written approval of the CTUIR and Anderson·Perry & Associates, Inc.

Electronic copies of these Drawings will be provided to third party licensed Civil Engineers only upon receipt of a certification from the third party that these materials will be utilized only on projects within the CTUIR's jurisdiction.

All users of these documents on projects within the CTUIR's jurisdiction shall modify and edit these documents as needed to adapt their use for the specific project for which they will be used. The use of the CTUIR's Water and Sewer Standard Technical Specifications and Drawings, or modifications thereto, shall be stamped and signed by the responsible Engineer and shall be submitted to the CTUIR for review prior to their use on a project within the CTUIR's jurisdiction.

All third party users agree to indemnify, defend, and hold the CTUIR and Anderson·Perry & Associates, Inc., its partners, agents, and employees harmless from and against any and all claims, suits, demands, losses, and expenses including attorneys' fees accruing or resulting to any and all persons, firms, or any other legal entity on account of any damage or loss to property or persons, including death, arising out of the result of utilizing these standard Technical Specifications and Standard Drawings.

These CTUIR Water and Sewer Standard Specifications and Drawings were updated in April 2007 and need to be updated by April 30, 2010.

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WATER AND SEWER
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2007

USE AGREEMENT

I hereby acknowledge and assume complete responsibility related to the use of the CTUIR's Water and Sewer Standard Technical Specifications and Drawings, in regard to the _____ project. The undersigned third party user hereby certifies and agrees to use these Public Works Standards on projects only within the jurisdiction of the CTUIR. It is agreed that these standards will not be used in any form on projects outside the jurisdiction of the CTUIR and will not make these standards available to any other outside party or user.

Supplemental conditions will be provided to identify modifications and edits to these Technical Specifications needed to meet the specific requirements of said project. If supplemental conditions are not prepared, I hereby take full responsibility for the applicability of these Technical Specifications for the project.

The undersigned hereby agrees to modify and edit the Standard Drawings as needed to adapt their use for the specific project for which they will be used. All use of these standards shall be under the direction of a licensed Civil Engineer in the State of Oregon, and all Drawings used shall be stamped by the Engineer.

The undersigned agrees to indemnify, defend, and hold the CTUIR, and Anderson·Perry & Associates, Inc., its partners, agents, and employees harmless from and against any and all claims, suits, demands, losses, and expenses including attorneys' fees accruing or resulting to any and all persons, firms, or any other legal entity on account of any damage or loss to property or persons, including death, arising out of the result of utilizing these Standard Technical Specifications and Drawings.

CONTRACTOR:

By: _____

Print Name: _____

Representing: _____

Responsible Engineer: _____

License Number: _____

License Expiration Date: _____

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
WATER AND SEWER STANDARD
TECHNICAL SPECIFICATIONS AND DRAWINGS
GENERAL REQUIREMENTS

A. DEFINITIONS

1. **CTUIR Water/Sewer Department** - The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Water/Sewer Department, a division of the Public Works Department, and authorized personnel representing the Water/Sewer Department.

2. **CTUIR Public Works Director** - The Public Works Director and/or his/her representative, authorized by the CTUIR to act as the CTUIR Water/Sewer Department's representative in matters as they relate to improvements to the CTUIR's infrastructure or construction of new infrastructure to be built by developers and then dedicated to the CTUIR.

3. **Contractor** - The person, firm, or corporation that has contracted to construct CTUIR infrastructure improvements for which the CTUIR will ultimately have ownership; or a developer, and including the developer's engineer, construction inspector, etc.

4. **Drawings** - The Project Plans prepared by a Professional Engineer licensed in the State of Oregon that depict the detailed characteristics and scope of work for a particular infrastructure improvement project; and the CTUIR Standard Drawings.

5. **Specifications** - The detailed project specifications prepared by a Professional Engineer licensed in the State of Oregon that consist of written descriptions of a technical nature of materials, equipment, construction systems, standards, and workmanship for a particular infrastructure improvement project; and the CTUIR Standard Technical Specifications.

6. **Contract Documents** - Documents developed for a specific improvement project that include Contract forms, Drawings, and Specifications.

B. CTUIR PUBLIC WORKS DIRECTOR'S AUTHORITY

1. The CTUIR Public Works Director shall act as the CTUIR's representative during the construction period. He/She shall decide questions that may arise as to quality and acceptability of materials furnished and work performed. The CTUIR Public Works Director will make visits to the site and determine if the work is proceeding in accordance with the Standard Specifications.

2. The CTUIR Public Works Director will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

3. The CTUIR Public Works Director shall promptly make decisions relative to interpretation of the Standard Specifications.

4. The CTUIR Public Works Director may provide a full time resident Project Representative to monitor the progress of the work. The CTUIR Public Works Director, however, does not guarantee the performance of the Contractor by the CTUIR Public Works Director's providing of such Project Representative. The CTUIR Public Works Director's undertaking hereunder shall not relieve the Contractor of his/her obligation to perform the work in conformity with the Standard Specifications and in a workmanlike manner; shall not make the CTUIR Public Works Director an insurer of the Contractor's performance; shall not impose upon the CTUIR Public Works Director any obligations to see that the work is performed in a safe manner; and shall not relieve the Contractor from his/her responsibility to adequately supervise the work.

C. ABBREVIATIONS

The following abbreviations of Associations, units of measurement, and miscellaneous items are defined as they may be used in these Standard Specifications or on the Drawings.

Associations

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGC	Associated General Contractors of America
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APA	American Plywood Association
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society

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AWWA	American Water Works Association
BIA	Bureau of Indian Affairs
CRSI	Concrete Reinforcing Steel Institute
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
DIPRA	Ductile Iron Pipe Research Association
DWP	Oregon Department of Human Services Drinking Water Program
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IPCEA	Insulated Power Cable Engineers Associations
ITE	Institute of Transportation Engineers
MUTCD	Manual on Uniform Traffic Control Devices
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
ODOT	Oregon Department of Transportation.
OSHA	Occupational Safety and Health Administration
RCW	Revised Code of Washington (Laws of the State)
SAE	Society of Automotive Engineers
SEPA	State Environmental Policy Act
SSPC	Steel Structures Painting Council
UBC	Uniform Building Code
UL	Underwriter Laboratory
UPC	Uniform Plumbing Code
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Administration
WSDOT	Washington State Department of Transportation
WWPA	Western Wood Products Association

Units of Measurement and Abbreviation
(Partial Listing)

AC	Asbestos Cement or Asphalt Concrete
ACP	Asphalt Concrete Pavement
BST	Bituminous Surface Treatment
C.I.	Cast Iron
℄	Centerline
C.O.	Clean Out

Cl.	Class
Conc.	Concrete
Culv.	Culvert
CY or Cu.Yd.	Cubic Yard(s)
DI	Ductile Iron
Dia.	Diameter
Ea.	Each
Elev.	Elevation
EL or El.	Elevation
Est.	Estimate or Estimated
Extg.	Existing
F	Fahrenheit
F.F.	Finished Floor
FLG	Flange
fps	Feet Per Second
Ft.	Foot or Feet
gpm	Gallons Per Minute
HDPE	High Density Polyethylene
Hp	Horsepower
I.D.	Inside Diameter
I/I	Infiltration/Inflow
In.	Inch or Inches
Incl.	Including
Inv.El.	Invert Elevation
Irr	Irrigation
L	Liter
Lb.	Pound(s)
L.F. or Lin.Ft.	Linear Foot (Feet)
LS or L.S.	Lump Sum
Max.	Maximum
MH	Manhole
MJ	Mechanical Joint
Min.	Minimum
MPH	Miles Per Hour
N.T.S.	Not to Scale
O.C.	On Center
O.D.	Outside Diameter
PL	Plate
PVC	Polyvinyl Chloride
psi	Pounds Per Square Inch

Q	Flow Rate
R	Radius
REQD.	Required
RPM	Revolutions Per Minute
R/W	Right of Way
S	Sanitary Sewer
SCH	Schedule
SD	Storm Drain
Sht.	Sheet
Stl.	Steel
SWL	Static Water Level
SY or Sq.Yd.	Square Yard
TDH	Total Dynamic Head
TM	Test Method
Typ.	Typical
W	Water
WS	Wood Stave

D. PROJECT SAFETY

The Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work, including excavation safety. The Contractor shall comply with all applicable laws, ordinances, rules, regulations, and orders of any public body having jurisdiction as it relates to project and work safety.

The Contractor shall maintain local access to area residents and emergency traffic throughout the life of the project and coordinate construction activities closely with area residents to keep them informed of operations that may impact their use of any streets or roadways.

All signs, barricades, barriers, lights, cones, trench boxes, shoring/bracing, and other such "devices" required to warn, protect, or direct the public and workmen during the life of the Contract shall be furnished, installed, moved, and removed by the Contractor. When conditions warrant their use, flagpersons shall also be provided by the Contractor. The determination of what measures are required, in addition to those specifically called for by the Drawings and Specifications, shall be solely the responsibility of the Contractor.

The CTUIR and CTUIR Public Works Director are not responsible for determining whether proper safety precautions, etc., are being utilized. Should the Contractor fail to furnish the necessary protective measures, the CTUIR or CTUIR Public Works Director may, but shall not be required to, bring to the Contractor's attention by written notice of such failure and the Contractor shall undertake such corrective measures as is proper.

All construction work shall be performed in accordance with the provisions of the Occupational Safety and Health Regulations of the federal Occupational Safety and Health Administration, and other applicable regulations.

The materials used for and the installation of all warning and traffic control devices shall conform to the applicable provisions of the Oregon Standard Specifications for Construction - 2002 edition, Sections 00220 and 00225, and the Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, Federal Highway Administration, current edition.

It shall be the Contractor's sole responsibility to provide a "competent person" as defined in the regulations to be on the project site during all trenching operations. The "competent person" appointed by the Contractor shall fulfill all requirements of the regulations.

Prior to opening an excavation, the Contractor shall arrange for field location of utility installations such as sewer, telephone, fuel, electric, gas, water lines, or any other underground installations that reasonably may be expected to be encountered during the excavation work. When excavation operations approach the estimated location of underground installations, the Contractor shall determine the exact location of the installations by safe and acceptable means. While the excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard workers.

The Contractor shall ensure that structural ramps that are used by workers as a means of access or egress from an excavation shall be designed by a competent person, in accordance with all requirements of the regulations.

Workers exposed to public vehicular traffic shall be provided with and shall wear warning vests or other suitable garments marked with, or made of, reflectorized or highly visible material. No worker shall be permitted underneath loads handled by lifting or digging equipment. Workers shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.

Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped in accordance with the regulations to provide adequate protection for the operator during loading and unloading operations.

The Contractor shall take adequate precautions, in accordance with the regulations, to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions. These precautions include providing proper respiratory protection or ventilation and, when controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, the Contractor shall provide testing as often as necessary to ensure that the atmosphere remains safe. The Contractor shall provide emergency rescue equipment, such as breathing apparatus, safety harness, etc., where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.

The Contractor shall not allow work in excavations in which there is accumulated water or in excavations where water is accumulating, unless adequate precautions have been taken to protect workers against the hazards posed by water accumulations. The precautions necessary to protect workers adequately vary with each situation, but include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and life line. If the Contractor is controlling water or preventing it from accumulating by the use of water removal equipment, the water removal equipment and operation shall be monitored by a competent person to ensure proper operation. If excavation work interrupts the natural drainage of surface water, such as streams, then diversion ditches, dikes or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.

In situations where the Contractor feels his trench operations pose a risk to the stability of adjoining buildings, walls, or other structures, he shall notify the CTUIR Public Works Director and shall provide adequate support systems per the requirements of the regulations. Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to workers shall not be permitted except when the Contractor has retained a Registered Professional Engineer and he has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity, or said Registered Professional Engineer has approved the determination that such excavation will not pose a hazard to workers.

Sidewalks, pavements, and appurtenant structures shall not be undermined unless a support system or other method of protection is provided to protect workers from the possible collapse of such structures. The Contractor shall provide adequate protection to all persons from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. The Contractor shall also provide protection by placing and keeping excavated materials or equipment at least two feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations or by a combination of both, if necessary.

The Contractor shall ensure that daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person appointed by the Contractor for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspection shall also be made after every rain storm or other hazard increasing occurrence. These inspections are only required when worker exposure can be reasonably anticipated. Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, the Contractor shall remove workers from the hazardous area until the necessary precautions have been taken to ensure their safety.

It shall be the Contractor's responsibility to provide all physical barrier protection at all excavations. All wells, pits, shafts, etc., shall be barricaded or covered. Further, no trenches shall be left open at any time unless guarded with adequate barricades, warning lamps, and signs. Proper traffic and pedestrian control shall be provided by the Contractor.

The Contractor shall ensure that each worker in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with the regulations.

It shall be the Contractor's responsibility to design the sloping and benching systems for trench excavation in accordance with the requirements of the regulations stated herein. Where the Contractor takes the option to not utilize one of the standard tables or trench excavation designs contained in Oregon Administrative Rules Chapter 437, then it is the Contractor's responsibility to retain a Registered Professional Engineer to design said sloping and benching system. When the Contractor chooses this

option, the design shall be in written form and shall include at least the following information:

1. The magnitude of the slopes that were determined to be safe for the particular project.

2. The configurations that would determine to be safe for the particular project.

3. The stamp and signature of the Registered Professional Engineer approving the design.

At least one copy of the design shall be maintained at the job site while the slope is being constructed. After that time the design need not be at the job site, but a copy shall be made available to the CTUIR upon request.

Where the design of a support system, shield system, or other protective system is required, it shall be the Contractor's responsibility to meet all requirements of the regulations. It shall be the Contractor's responsibility to have on-site at least one copy of the manufacturer's tabulated data which identifies the Registered Professional Engineer who approved the data or, when a support system or shield system or other protective system is not a standard manufactured item but is designed by a Registered Professional Engineer, at least one copy of the design shall be maintained at the job site during construction of the protective system. After that time, the design may be stored off the job site, but a copy of the design shall be made available upon request.

E. OVERTIME WORK

Should the Contractor work more than ten hours in any one day, or fifty hours in any one week, or on Saturdays, Sundays, or legal holidays, except in emergencies, the Contractor shall notify the CTUIR Public Works Director two days in advance of any such overtime. The CTUIR will require the Contractor to pay all overtime costs of engineering and project observation services, and any direct cost incurred by the CTUIR, required during these periods, except in cases of emergencies beyond the control of the Contractor.

F. PROTECTION OF EXISTING FACILITIES AND CONTRACTOR'S WORK

The Contractor shall exercise care during construction to avoid damaging existing pipes, valves, manholes and other underground and above ground structures. This applies especially to heavy equipment used during street excavations, and base rock

operations. The Contractor shall exercise care when operating compaction equipment over pipes. Any piping and structures damaged shall be replaced or repaired by the Contractor, as specified by the utility owner, at no additional cost.

The Contractor shall take reasonable precautions to protect the work in progress from damage by vandalism, and shall, where reasonably possible, secure the premises where work is being performed from entry by unauthorized persons. The CTUIR is not responsible for damage due to vandalism.

G. EXISTING SURVEY MONUMENTATION

The Contractor shall be responsible for the protection and perpetuation of existing land survey, property, or construction monuments shown on the Drawings, which are marked or are clearly visible on the ground. The Contractor shall give the CTUIR Public Works Director a minimum of 48 hours notice prior to working in the vicinity of any such monument that he/she may disturb so the CTUIR can arrange for such monuments to be referenced. When proper notice is provided, the CTUIR shall have any disturbed monuments restored following construction. Should the Contractor fail to provide adequate notice to the CTUIR Public Works Director, he/she shall be responsible for the expense of having the disturbed monument restored by a qualified surveyor.

H. EXISTING UTILITIES

1. The following utilities may be affected by the Contractor's Work:

   a. Power Contact No. 1
   Name: Pacific Power
   Contact Person: Larry Hurst
   Telephone No.: 541-278-2957
   E-mail: Lawrencehurst@pacificorp.com

   b. Power Contact No. 2
   Name: Umatilla Electric Cooperative
   Telephone No.: 541-567-6414

c. Telephone/Fiber

Name:	Qwest
Contact Person:	Herb Sumner or Rob Tooley
Telephone No.:	541-278-3174
E-mail:	hsumner@qwest.com, Robert.Tolley@qwest.com

d. Cable TV

Name:	Charter Communications
Contact Person:	Curt McDougall
Telephone No.:	541-969-7938

e. Gas

Name:	Cascade Natural Gas Corporation
Contact Person:	Dan Harris
Telephone No.:	541-969-6877
E-mail:	dharris@cngc.com

f. Water/Sewer

Name:	CTUIR Water/Sewer Department
Contact Person:	Rob Quaempts, Public Works Director
Telephone No.:	541-966-2775
E-mail:	RobQuaempts@ctuir.com

2. Known utilities and structures expected to be adjacent to or encountered in the Work should be shown on the project Drawings. Information on existing utilities may be provided by others and existing records may not be complete or accurate. It is expected there may be discrepancies and omissions in the location, size, and quantities of utilities and structures shown. The Contractor shall work closely with the owner of any utilities or structures affected by the Work to avoid any damage.

3. The Contractor shall be responsible for the actual locating and protecting of existing utilities. The Contractor, prior to commencement of work, shall contact existing Utility Companies such as water, sewer, power, telephone, gas, etc., to have the Utility Companies locate all utilities which will be affected by the work to be performed. The Contractor shall give 48-hour notification. The "call before you dig" number is 1-800-332-2344 (Oregon). The Contractor shall perform all necessary coordination work with the Utility Companies in performing the work and shall be fully responsible for any damage to existing utilities caused by the Contractor's operations. The Contractor shall make any advance exploration necessary to protect all existing

utilities and to properly plan the installation of pipelines or other work to the design line and grade.

4. If a conflict develops between the design line and grade of a pipeline or project improvement and an existing utility, the CTUIR Public Works Director may adjust the pipeline grade or have the existing utility relocated. The existing utility may be relocated by the owner of the utility or its designated representative or by the Contractor upon the approval of the utility owner and the CTUIR Public Works Director. The Contractor shall perform all relocation work required by the CTUIR Public Works Director. If the Contractor performs the relocation work, a Change Order shall be negotiated prior to any actual work unless payment for the work is specified otherwise.

5. The owner of the utilities shall normally be responsible for taking the utility out of service if necessary for the performance of the work; i.e., shutting valves, etc. In the case of water valves, the owner of the water system may operate the valves or request the Contractor to do so. When the Contractor is requested to do so, the Contractor shall operate water valves as a normal part of the work at no additional cost to the CTUIR. All water valves shall be operated as instructed by the owner of the valves. It can be expected that some valves may not fully operate properly which may require that additional valves be operated. This situation shall be considered a normal requirement of the work.

6. The Contractor shall receive prior approval from the appropriate authority or utility owner before any public or private utility service is interrupted. The Contractor shall give a minimum of 4 hours notice to all utility customers who will be affected by the Contractor's operations. No utility service shall be disconnected or interrupted for more than 9 hours or as required by the utility owner, whichever is less, in any 24-hour period. When disruption of service will be longer than 9 hours in any one day, the Contractor shall provide safe and appropriate temporary service. All temporary service shall be coordinated with the utility owner. When regular utility service interruption is required during the course of the work, the Contractor shall submit a written plan to the CTUIR Public Works Director and utility owner which details proposed work plan notification procedures, and estimated extent of service interruption. The Contractor must obtain written approval of his plan from the utility owner prior to interrupting the utility service. As a minimum, notification shall include door hangers and public notification in the newspaper and radio, as appropriate. Personal contact shall be made where practical. The Contractor shall make every effort possible to provide continuous utility service to all utility customers. When special conditions exist where an interruption of utility service would create an extra hardship on the utility customer or create a hazardous condition, the Contractor shall provide continuous service.

Particular care and planning must be arranged to provide continuous service of existing services or temporary services as approved by the utility owner and the CTUIR Public Works Director. If the Contractor inadvertently damages or interrupts an existing utility, the Contractor shall immediately notify affected utility users and make arrangements to provide temporary service to the parties affected and shall repair said utility as required by the utility owner and the CTUIR Public Works Director at no cost to the CTUIR. If the Contractor fails to make immediate repairs and provide service as required, the CTUIR may have said work performed by others and deduct the cost of said work from payment to the Contractor.

7. The Contractor shall support and otherwise protect all pipes, conduits, cables, poles, and other existing services where they cross the trench or are otherwise undermined or affected by his work. The Contractor shall restore the support of an undermined existing utility using select backfill compacted to 95 percent maximum density as determined by ASTM D-698.

I. SUPERVISION BY CONTRACTOR

1. The Contractor shall supervise and direct the work. He/She shall be solely responsible for the means, methods, techniques, quality, sequences and procedures of construction. The Contractor shall employ and maintain on the work site a qualified supervisor or superintendent who shall have been designated in writing by the Contractor to the CTUIR as the Contractor's representative at the site. The supervisor shall have full authority to act on behalf of the Contractor and all communications given to the supervisor shall be as binding as if given to the Contractor. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the work.

   If the Contractor does not have any personnel on site under his/her direct employ, but there are personnel under subcontract to the Contractor working on site, then the Contractor shall have either his/her designated Supervisor on site or the Contractor shall authorize, in writing, the Subcontractor to act as the Contractor's representative. All communications given to the Supervisor or Contractor's representative shall be as binding as if given to the Contractor.

2. The Contractor shall at all times enforce strict discipline and good order among his/her employees, and shall not employ on the job any unfit person or anyone not skilled in the work assigned to him. Any employee found to be incompetent, or to act in a disorderly or improper manner, shall be removed from the project.

J. LOCAL LAWS AND PERMITS AFFECTING THE WORK

The Contractor shall at all times observe and comply with all Tribal Ordinances, Laws and Regulations which in any manner affect the conduct of the work.

K. TRIBAL EMPLOYMENT RIGHTS ORDINANCE (TERO)

The Contractor shall comply with the Tribal Employment Rights Ordinance and shall contact the Tribal Employment Rights Office, P.O. Box 638, Pendleton, Oregon 97801, telephone (541) 276-3570, fax (541) 276-9060, prior to performing any work to work out an agreement for compliance with the TERO ordinance.

L. CORRECTION OF WORK

The Contractor shall promptly remove from the premises or correct all work rejected by the CTUIR Public Works Director for failure to comply with the Standard Specifications, whether incorporated into the construction or not, and the Contractor shall promptly replace, correct, and re-execute the work in accordance with the Standard Specifications and without expense to the CTUIR and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement.

M. QUALITY CONTROL AND ACCESS TO THE WORK

The Contractor shall perform all quality control testing during the construction of the work to ensure the work performed is in accordance with the Specifications. The Contractor shall also perform all tests required by laws, ordinances, regulations, and orders of public authorities. Copies of all test results shall be provided to the CTUIR for review. Materials, equipment, or work which fails to meet the Contract requirements shall not be used in the Work.

The CTUIR will at all times have access to the Work. In addition, authorized representatives and agents of any participating federal or state agency shall be permitted to review all Work, materials, invoices of materials, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the Work and also for any review or testing thereof. The Contractor shall notify testing personnel, including testing personnel provided by the CTUIR, at least 48 hours in advance of operations to allow for personnel assignments and test scheduling. All materials to be tested shall be provided by the Contractor at his/her expense. After tests are completed, the Contractor shall be responsible for repairing

test areas to match original conditions. The Contractor shall pay for all additional reviews and retesting required because of defective work or ill-timed notices.

The Contractor shall submit samples of the material to be utilized on the project to the CTUIR Public Works Director for review. The CTUIR may take additional samples and provide check tests on material being incorporated into the work to verify compliance with the requirements of the Specifications. Materials or workmanship found to be outside of the specification limits shall be replaced with suitable material at no expense to the CTUIR.

Tests or reviews by the CTUIR or others shall not relieve the Contractor from his/her obligations to perform the Work in accordance with the requirements of the Specifications and does not make the CTUIR, or others, an insurer of the Contractor's Work.

The Contractor shall be responsible for providing his/her own construction monitoring and quality control program. The Contractor shall provide and maintain a quality control program that will ensure the quality of the work and materials incorporated into the project. The Contractor shall provide appropriate quality control personnel and testing facilities and certified testing personnel to perform the Work. A written quality control program shall be provided to the CTUIR Public Works Director for review prior to any Work being performed. The plan shall describe testing facilities, qualifications of quality control and testing personnel, testing frequency, and reporting schedule.

Following are the minimum required tests and testing frequency that shall be included in the Contractor's quality control program for the materials listed. See the Technical Specifications for other testing and quality control requirements. If the Contractor fails to provide all or any part of the required quality control for the project after the CTUIR has requested him to do so in writing, the CTUIR may elect to have the quality control work performed and bill the Contractor the actual cost of quality work plus $100 for each test.

1. **Trench Backfill Materials**. A minimum of one ASTM D-1557 laboratory density test will be performed for each testable material used as trench backfill, providing the maximum theoretical density and optimum moisture content of the material. A minimum of one nuclear gauge density test (ASTM D-2922) will be performed every 300 feet along the trench line on each lift of material to show required density is being achieved. Once an acceptable compaction method is established and verified with field density tests, the testing interval can be reduced to 600 feet along the trench line. If backfill material or compaction equipment changes,

compaction testing shall immediately be performed to verify that density is being achieved and shall continue at 300-foot intervals until a new compaction method is verified.

2. **Earthwork**. A minimum of one ASTM D-1557 laboratory density test will be performed for each testable material used as embankment material, providing the maximum theoretical density and optimum moisture content of the material can be determined. A minimum of one nuclear gauge density test (ASTM D-2922) will be performed every 800 square yards on each lift of material to show required density is being achieved. Once an acceptable compaction method is established and verified with field density tests, the testing interval can be reduced to one test each 1,600 square yards on each lift. If backfill material or compaction equipment changes, compaction testing shall immediately be performed to verify that density is being achieved and shall continue at 800 square yard intervals until a new compaction method is verified.

3. **Base Rock and Surface Rock**. Testing required to qualify material source prior to production consists of the following (ODOT certification of the material source can be substituted for this testing):

Abrasion	AASHTO T-96
Degradation	ODOT TM T-208

Quality control testing required during production consists of the following:

Gradation	AASHTO T-27	Start of production and 1 test every 1,000 tons (3 tests minimum)
Fracture Face	WAQCT TM-1	Start of production and 1 test every 3,000 tons (3 tests minimum)
Sand Equivalent	AASHTO T-176	Start of production and 1 test every 3,000 tons (3 tests minimum)

Compliance of aggregates produced and stockpiled before the Award Date or Notice to Proceed of this Contract will be determined by the following:

Continuing production records meeting the requirements set forth in these Specification for stockpiled material or furnish records of testing for the entire stockpile, changing sampling frequency to the following:

a. Start of production means "One Set of Tests Per Stockpile."

b. One per 1,000 tons means "One Set of Tests Per 1,000 Tons of Material in the Stockpile" with a minimum of 3 sets of gradation tests per project.

c. One per 3,000 tons means "One Set of Tests Per 3,000 Tons of Material in the Stockpile."

A minimum of one ASTM D-1557 laboratory density test will be performed on base rock material, providing the maximum theoretical density and optimum moisture content of the material. A minimum of one nuclear gauge density test (ASTM D-2922) will be performed every 800 square yards on each lift of base rock to show required density is being achieved. Once an acceptable compaction method is established and verified with field density tests, the testing interval can be reduced to one test each 1,600 square yards on each lift. If base rock material or compaction equipment changes, compaction testing shall immediately be performed to verify that density is being achieved and shall continue at 800 square yard intervals until a new compaction method is verified.

4. **Hot-Mix Asphalt Concrete Pavement (HMAP)**. Testing required to qualify HMAP aggregate material source prior to production consists of the following (ODOT certification of the material source can be substituted for this testing):

Soundness	AASHTO T-104
Abrasion	AASHTO T-96
Degradation	ODOT TM T-208
Lightweight Pieces	AASHTO T-113
Plastic Index	AASHTO T-103
Friable Particles	AASHTO T-112

Quality control testing required on HMAP aggregate during production consists of the following:

Gradation	AASHTO T-27	3 test minimum, start of production and 1 test every 1,000 tons
Sand Equivalent	AASHTO T-176	3 test minimum, start of production and 1 test every 1,000 tons
Fracture Face	WAQCT TM-1	3 test minimum, start of production and 1 test every 3,000 tons
Wood Particles	ODOT TM T-225	3 test minimum, start of production and 1 test every 3,000 tons
Elongated Pieces	ODOT TM T-229	3 test minimum, start of production and 1 test every 3,000 tons
Dust or Clay Coating	ODOT TM T-226	3 test minimum, start of production and 1 test every 3,000 tons

Compliance of HMAP aggregates produced and stockpiled before the Award Date or Notice to Proceed of this Contract will be determined by the following:

Continuing production records meeting the requirements set forth in these Specifications for stockpiled material or furnish records of testing for the entire stockpile, changing sampling frequency to the following:

a. Start of production means "One Set of Tests Per Stockpile."

b. One per 1,000 tons means "One Set of Tests Per 1,000 Tons of Material in the Stockpile" with a minimum of 3 sets of gradation tests per project.

c. One per 3,000 tons means "One Set of Tests Per 3,000 Tons of Material in the Stockpile."

Quality control testing of hot-mix asphalt concrete pavement mixture required during placement is as follows:

Asphalt Content	AASHTO T-308	1 test every 1,000 tons, 1 test per day minimum
Gradation	(Residual Agg. from AASHTO T-308)	1 test every 1,000 tons, 1 test per day minimum
Maximum Specific Gravity	AASHTO T-209	1 test every 1,000 tons, 1 test per day minimum
Compaction	WAQCT TM-8	5 tests every 1,000 tons
Percent Hydrated Lime	ODOT TM T-321	1 test every 1,000 tons

Asphalt content, gradation, and maximum specific gravity testing will be performed at the start of production to verify the hot-mix asphalt mix design.

5. **Portland Cement Concrete (PCC)**. Aggregate testing is required to be completed with the mix design. Should additional testing of aggregate for PCC be deemed necessary by the CTUIR Public Works Director, testing shall be performed by the Contractor as specified by ASTM C-33. Samples shall be selected at random from the stockpile and tested for conformance with the Specifications. The decision to perform aggregate testing and testing frequencies shall be left to the CTUIR Public Works Director.

Quality control testing of PCC during and following placement is as follows:

Air Content	AASHTO T-152 or ASTM C-231	1 test per each set of cylinders 1 test per each truck
Slump	AASHTO T-119 or ASTM C-143	1 test per each set of cylinders 1 test per each truck
Concrete Temperature	AASHTO T-309 or ASTM C-1064	1 test per each set of cylinders 1 test per each truck
Strength	AASHTO T-22 and AASHTO T-23 or ASTM C-31 and ASTM C-39	1 set of three cylinders (minimum 1 set per 25 cubic yards per day)

N. CONSTRUCTION STAKING

All construction staking required for the work shall be performed by the Contractor as reviewed by the CTUIR Public Works Director. Adequate staking shall be provided to install the improvements to the lines and grade called for on the Drawings.

O. COOPERATION WITH OTHER CONTRACTORS

The Contractor shall be aware that work may be performed in the area by other Contractors. Site grading work, building construction, roadway work, utility work, etc. The Contractor shall coordinate, as may be required with other Contractors, the work and scheduling of work so conflicts can be kept to a minimum. Scheduling and coordinating construction work is the responsibility of the Contractor.

P. COOPERATION WITH AFFECTED PARTIES

The Contractor shall cooperate with the residents, landowners, farmers, and business owners in the area to minimize disruption of normal operations. Provide access to private property whenever possible. Sidewalks shall be kept clear at all times of any construction materials. Barricades, traffic cones, blinkers, and signing shall be used to direct the public through the work area safely. See Technical Specifications - "Temporary Protection and Direction of Traffic/Project Safety."

The Contractor shall develop a formal work plan to provide advance public notification of water utility service interruption caused by the Contractor's operations. Two weeks prior to any area-wide water service interruption, the Contractor will, through public media, announce the general date and times the work will be performed and estimate the times water will be shut off, by location. The dissemination of this information will be made so that the community and individual users of water will have sufficient notice to prepare for water outages. The information will be distributed to, but is not limited to, newspaper and radio advertisements and notices posted in public places such as post offices, civic centers and government facilities. If the projected work plan schedule changes, appropriate public notification shall be made. Again, within 48 hours prior to any water outage, the Contractor will notify individual users of the water as to the date and time span of the anticipated outage. Door knob leaflets containing key information are strongly encouraged.

Q. PRIOR APPROVAL OF ALTERNATE EQUIPMENT OR MATERIALS

The Contractor or Equipment Supplier may submit to the CTUIR Public Works Director any request for approval of alternate and equal equipment or materials. Such submittals shall contain sufficient information to allow the CTUIR Public Works Director to fully evaluate the equipment. Any substitutions without prior approval will be rejected.

R. SHOP DRAWINGS

1. When required by the CTUIR Public Works Director, and after checking and verifying all field measurements, the Contractor shall furnish to the CTUIR Public Works Director for review prints of each shop drawing for each item, material, component, process, etc., necessary to perform the work. A minimum of four (4) copies shall be submitted unless otherwise noted in the Technical Specifications. The term "shop drawing" as used herein shall be understood to include detailed design calculations, fabrication, and installation drawings, lists, graphs, operating instructions, manufacturer's data, etc. Unless otherwise required, said drawings shall be submitted at a time sufficiently early to allow review of same by the CTUIR Public Works Director, and to accommodate the rate of construction progress required. All shop drawings shall have been checked by and stamped with the approval of the Contractor prior to submitting to the CTUIR Public Works Director for review. The data shown on the shop drawings will be complete with respect to dimensions, design criteria, materials of construction and like information to enable the CTUIR Public Works Director to review the information.

2. The Contractor shall also submit to the CTUIR Public Works Director for review and approval with such promptness as to cause no delay in work, all samples required by the Standard Specifications. All samples will have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.

3. At the time of each submission, the Contractor shall in writing call the CTUIR Public Works Director's attention to any deviations that the shop drawings or samples may have from the requirements of the Standard Specifications. Manufacturer's data that is not applicable shall be lined out and applicable data shall be highlighted.

4. The CTUIR Public Works Director will review with reasonable promptness shop drawings and samples, but the CTUIR Public Works Director's review shall be only

for general conformance with the design concept of the project and for compliance with the information given in the Standard Specifications and shall not extend to means, methods, sequences, techniques or procedures of construction, or to safety precautions or programs incidental thereto. The review of a separate item as such will not indicate approval of the assembly in which the item functions.

5. The CTUIR Public Works Director will return two prints of each shop drawing to the Contractor, with comments noted thereon, within 15 calendar days following their receipt at his/her office. The Contractor shall make any corrections required by the CTUIR Public Works Director and shall return the required number of corrected copies of shop drawings and resubmit new samples for review. The Contractor shall direct specific attention in writing to revisions other than the corrections called for by the CTUIR Public Works Director on previous submittals. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the CTUIR Public Works Director by the second submission of the drawing.

   - If Shop Drawings are returned to the Contractor marked "NO EXCEPTIONS NOTED," formal revision and resubmittal of said Shop Drawings will not be required.

   - If Shop Drawings are returned to the Contractor marked "NO EXCEPTIONS, PROVIDED THE FOLLOWING CONDITIONS ARE MET," formal revision and resubmittal of said Shop Drawings will not be required.

   - If Shop Drawings are returned to the Contractor marked "MAKE CORRECTIONS NOTED," formal revision and resubmittal of said Shop Drawings will not be required.

   - If Shop Drawings are returned to the Contractor marked "REVISE AND RESUBMIT," the Contractor shall revise said Shop Drawings and shall resubmit 4 copies of said revised Shop Drawings to the CTUIR Public Works Director.

   - If Shop Drawings are returned to the Contractor marked "REJECTED," the Contractor shall revise said Shop Drawings and resubmit 4 copies of said revised Shop Drawings to the CTUIR Public Works Director.

   - If Shop Drawings are returned to the Contractor marked "SUBMIT SPECIFIED ITEM," the Contractor shall submit material requested but shall not be required to resubmit all previous material.

For each resubmittal necessary, an additional 15 calendar days shall be allowed for review. The Contractor shall include copies of all approved submittal information in the Contractor's Record Drawings and Operation and Maintenance Manual.

6. The Contractor's stamp of approval on any shop drawing or sample shall constitute a representation to the CTUIR and the CTUIR Public Works Director that the Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that the Contractor has reviewed or coordinated each shop drawing or sample with the requirements of the work and the Standard Specifications. The CTUIR Public Works Director's review of shop drawings or samples shall not relieve the Contractor from responsibility for any deviations from the Standard Specifications unless the Contractor has in writing called the CTUIR Public Works Director's attention to such deviation at the time of submission and the CTUIR Public Works Director has given written concurrence and approval to the specific deviation, nor shall any concurrence or review by the CTUIR Public Works Director relieve the Contractor from responsibility for errors or omissions in the shop drawings.

7. Fabrication of an item shall not be commenced before the CTUIR Public Works Director has reviewed the pertinent shop drawings and returned copies to the Contractor marked either "NO EXCEPTIONS NOTED," or "MAKE CORRECTIONS NOTED." Revisions indicated on the shop drawings shall be considered as changes necessary to meet the requirements of the Contract Drawings and Specifications and shall not be taken as the basis of claims for extra work. The Contractor shall have no claim for damages or extension of time due to any delay resulting from the Contractor's having to make the required revisions to shop drawings.

8. A copy of each shop drawing and sample shall be kept in good order by the Contractor at the job site and shall be available to the CTUIR Public Works Director.

All submittals or resubmittals shall be accompanied by and furnished in accordance with the Submittal Review Form provided at the end of this section.

The purpose for material submittals is to provide the Contractor and CTUIR Public Works Director the opportunity to agree on materials that comply with the

specifications prior to purchase. All materials listed above shall be submitted and reviewed prior to their arrival on-site. Materials purchased by the Contractor prior to such review shall be solely at the Contractor's risk.

S. PERMITS, EASEMENTS, AND LICENSES

Permits and licenses of a temporary nature necessary for the prosecution of the work including building, electrical and plumbing permits, NPDES Permit 1200-C for erosion and sedimentation control, etc., shall be secured and paid for by the Contractor unless otherwise stated in the Standard Specifications. The Contractor shall comply with all requirements of these permits and licenses as they relate to the work, i.e., insurance, traffic control, scheduling, etc. The Contractor shall pay all inspection fees, flagging costs, etc., if any, required by the permit or license. Typical permits and licenses may include but are not limited to State Highway Permits, Railroad Crossing Permits, County Permits, etc.

The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the Standard Specifications are at variance therewith, he/she shall promptly notify the CTUIR Public Works Director in writing.

T. ARCHAEOLOGICAL RESOURCES PROTECTION

Pursuant to the policies of the CTUIR, and to provisions of Section 106 of the National Historic Preservation Act, the National Environmental Policy Act, the Archaeological Resources Protection Act and Executive Order 11593, cultural resource investigations may be conducted for the subject project.

The Contractor shall notify the Tribal Historic Preservation Office at a minimum of 72 hours prior to excavation to make certain that a cultural resource monitor is available to be on site during ground disturbing activities. To ensure that section 106 of the National Historic Preservation Act is complied with, as well as tribal cultural resource management concerns, a monitor must be present for any ground disturbing work greater than 12 inches in depth. If the Contractor does not follow this procedure, all ground-disturbing activities will be shut down until the CTUIR can evaluate the situation.

The CTUIR's Department of Natural Resources (DNR) Cultural Resources Protection Program needs to be contacted prior to ground disturbing activities to contract for a

cultural resource monitor (541-276-3629). The Contractor shall pay all costs associated with the cultural resource monitor.

If cultural material is unearthed during ground disturbing activities, work must immediately stop at that specific location until the DNR Cultural Resources Protection Program Manager has an opportunity to assess the find. A plan to avoid or mitigate any adverse impacts will need to be developed if the find is considered to be significant.

Under state (SB 61), federal (ARPA and NAGPRA), and CTUIR laws, it is illegal to knowingly adversely impact or destroy significant cultural material.

U. UTILITIES COST DURING CONSTRUCTION

The Contractor shall pay all utility bills, i.e., power, phone, gas, etc., that are associated with the work until the work has been accepted by the CTUIR or the work is placed into service by the CTUIR. When only a portion of the work is placed into service, the CTUIR will only be responsible for the utility bills for the utilities being used by the CTUIR.

V. PROGRESS OF THE WORK - CLEANUP

The Contractor shall arrange his/her work schedule such that all phases of Work, once started, shall be diligently pursued until completed. The intent is that the work area shall not be disturbed for undue periods of time. Work shall not be left uncompleted. If the CTUIR Public Works Director determines that Work is not being diligently completed, he/she shall request the Contractor to complete said Work.

Cleaning up shall be a continuing process from the start of the Work to final acceptance of the project. The Contractor shall, at all times, at his/her own expense and without further order, keep property on which Work is in progress free from accumulations of waste material or rubbish caused by employees or by the Work, and at all times during the construction period shall maintain structure sites, rights-of-way, easements, adjacent property, and the surfaces of streets and roads on which Work is being done in a safe condition for the Contractor's workers and the public. Accumulations of waste materials that might constitute a fire hazard will not be permitted. Spillage from the Contractor's hauling vehicles on traveled public or private roads shall be promptly cleaned up. The Contractor shall take appropriate action to control dust caused by his/her operations. This shall include, but not be limited to, watering of exposed areas, cleaning of roadways, etc. This is considered a normal

part of the construction project. Upon completion of the Work, the Contractor shall, at his/her own expense, remove all temporary structures, rubbish, waste material, equipment, and supplies resulting from his/her operations. He/she shall leave such lands in a neat and orderly condition that is at least as good as the condition in which he/she found them prior to his/her operations. Should the Contractor fail to provide said cleanup upon 24-hour written notice, the CTUIR shall have the right to perform such Work at the expense of the Contractor and withhold the cost from the Contractor's payments.

The Contractor shall replace or restore, equivalent to their original condition, all surfaces or existing facilities disturbed by his work, whether within or outside of the work areas. Restoration work will include, but is not limited to, roadways, utilities, structures, landscaping, etc.

W. EXISTING EQUIPMENT REMOVAL AND SALVAGE

Existing equipment or materials removed by the Contractor during the course of the Work, which the CTUIR requests to be salvaged, shall remain the property of the CTUIR. The equipment and materials shall be removed with care to prevent unnecessary damage and shall be neatly stored at a location directed by the CTUIR Public Works Director. Equipment or materials not to be salvaged as requested by the CTUIR shall be salvaged or recycled by the Contractor in accordance with local regulations if feasible and cost effective.

X. PRECONSTRUCTION CONFERENCE

A preconstruction conference generally shall be held prior to the Work commencing on the project. The Contractor, CTUIR, CTUIR Public Works Director, and other appropriate agencies, utilities, etc., shall attend. The meeting shall be held to discuss general contracting procedures, communications, roles and responsibilities, quality control, project work schedule, agency requirements, and other topics that relate to the Work as appropriate.

Y. PROJECT WORK MEETINGS

The Contractor and/or his superintendent shall meet with the CTUIR Public Works Director on a regular basis to review the progress of the work, work schedule, project concerns etc., as may be appropriate. The intent of this meeting will be to keep communication channels open and to keep all parties informed as to the status of the

work. Generally, the meeting shall be held weekly, however, it may be scheduled at other times if needed. These meetings will also be used to review Record Drawings being kept on the project by the Contractor.

Z. USE OF EXPLOSIVES

If explosives are used for rock excavation, all work shall be performed in accordance with applicable code rules and regulations, and in a way not to damage any adjacent improvements or equipment.

AA. INSURANCE

1. The Contractor shall purchase at his/her own expense, and maintain during the contract period, such insurance as necessary to provide financial protection against claims that may arise out of or result from the Contractor's execution of the contract, whether such execution be by himself or by any subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. Such insurance is to include but not be limited to that hereinafter specified. All such insurance shall remain in effect until acceptance of the work by the CTUIR and at all times thereafter when Contractor may be correcting, removing or replacing defective work. CTUIR and Contractor intend that any policies provided in response to this Section shall protect all of the parties insured and provide primary coverage for all losses and damages caused by the perils covered thereby. Accordingly, all such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any of the parties named as insureds or additional insureds. If the Contractor does not provide coverage for subcontractor(s), then the subcontractor(s) shall also provide the coverage and certifications as specified herein. Subcontractor(s) certification shall be given to the Contractor and shall be made available to the CTUIR when requested by the CTUIR.

2. The Contractor shall procure and maintain Worker's Compensation and Employer's Liability insurance as designated below:

   (a) Coverage for injuries that are compensable under Worker's Compensation Acts and for diseases under Occupational Disease Acts and/or against liability imposed by law for injuries to employees that are not compensable, including any class of employees engaged in hazardous work under this contract not otherwise protected.

(b) Worker's Compensation insurance shall meet all Federal and Tribal requirements.

3. Contractor shall purchase and maintain such comprehensive form general liability insurance including underground, explosion, and collapse hazard and other insurance as is appropriate for the work being performed and furnished and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance and furnishing of the work and Contractor's other obligations under the Standard Specifications, whether it is to be performed or furnished by Contractor, by any subcontractor, by anyone directly or indirectly employed by any of them to perform or furnish any of the work, or by anyone for whose acts any of them may be liable:

(a) Claims under Workers' or Workmen's Compensation, disability benefits, and other similar employee benefit acts.

(b) Claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees.

(c) Claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.

(d) Claims for damages insured by personal injury liability coverage that are sustained by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or by any other person for any other reason.

(e) Claims for damages, other than to the work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

(f) Claims arising out of operation of laws or regulations for damages because of bodily injury or death of any person or for damage to property.

(g) Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

(h) The comprehensive form general liability insurance required shall include coverage for not less than the limits listed in the following table, or required by law, whichever is greater.

General Liability Coverage

Table

Type of Coverage	Limits
Comprehensive General - Aggregate	$2,000,000
Products and Completed Operation Aggregate	$2,000,000
Personal Injury	$1,000,000
Each Occurrence	$1,000,000

(i) The comprehensive form general liability insurance policy shall include as named insureds, or additional insureds, the CTUIR and officers, agents and employees of the CTUIR, and the CTUIR Public Works Director and officers and employees of the CTUIR Public Works Director as their interest may appear.

(j) The Contractor shall purchase and maintain an excess liability umbrella-form policy that provides excess limits of insurance for claims to which the underlying policies are applicable. The excess liability umbrella coverage shall be written for not less than the limits listed in the following table:

Excess Liability

Type of Coverage		Limits
Umbrella Form -	Each Occurrence	$1,000,000
-	Aggregate	$1,000,000

4. The Contractor shall procure and maintain business automobile liability insurance as designated below:

(a) Coverage for bodily injury and property damage arising out of the ownership, maintenance or use of any automobile, including owned, hired, and non-owned automobiles. Coverage is also to be provided for other liabilities specified under statutory requirements.

(b) Business automobile liability insurance limits shall be written for the limits of $1,000,000 combined single limit.

5. When the work is to be accomplished within the right-of-way of the State Highway or Transportation Department or on lands over which they have direct or indirect control, the Contractor's liability insurance policy shall contain endorsements as required by the respective agency.

6. When the work is to be accomplished within the right-of-way of any railroad facility or on lands over which they have direct or indirect control, the Contractor shall provide Railroad Protective liability insurance in accordance with the railroad requirements as stated in construction permits or otherwise required by railroad company.

BB. INDEMNIFICATION

1. To the fullest extent permitted by laws and regulations, the Contractor shall indemnify and hold harmless and defend at the Contractor's expense, including attorney's fees, the CTUIR and the CTUIR Public Works Director and their officers, agents, and employees from and against all claims, liabilities, damages, losses and expenses, direct, indirect or consequential (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs) arising out of or resulting from the performance of the work. Provided that any such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom, and is caused in whole or in part by any alleged negligent act or omission of the Contractor, any subcontractor, any person or organization directly or indirectly employed by any of them to perform or furnish any of the work or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder or arises by or is imposed by law and regulations regardless of the negligence of any such party. Indemnification shall also include, but not be limited, to:

   (a) Liability or claims resulting directly or indirectly from the alleged negligence or carelessness of the Contractor or his/her agents in the performance of the work, or in guarding or maintaining the same, or from any improper materials implements, or appliances used in its construction, or by or on account of any act or omission of the Contractor or his/her agents;

(b) Liability or claims arising directly or indirectly from or based on the violation of any law, ordinance, regulation, order, or decree, whether by the Contractor or his/her agents;

(c) Liability or claims arising directly or indirectly from the use or manufacture by the Contractor, his/her agents, or the CTUIR in the performance of this contract of any copyrighted or uncopyrighted composition, secret process, patented or unpatented invention, article, or appliance, unless otherwise specifically stipulated in this contract;

(d) Liability or claims arising directly or indirectly from the breach of any warranties, whether express or implied, made to the CTUIR or any other parties by the Contractor or his/her agents;

(e) Liabilities or claims arising directly or indirectly from the willful misconduct of the Contractor or his/her agents; and

(f) Liabilities or claims arising directly or indirectly from any breach of the obligations assumed herein by the Contractor.

(g) Liabilities or claims arising directly or indirectly from the Contractor's failure, or his/her agents, to follow and enforce required safety plans, trench excavation plans, etc., regardless of whether there was any negligence or failure in any review of such plans by the CTUIR, CTUIR Public Works Director, or their agents. The CTUIR, CTUIR Public Works Director, and their agents accept no liability whatsoever as a result of their review of the Contractor's safety and trench excavation plans.

2. In any and all claims against the CTUIR or CTUIR Public Works Director or any of their consultants, agents, or employees by any employee of the Contractor, any subcontractor, any person or organization directly or indirectly employed by any of them to perform or furnish any of the work or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any such subcontractor or other person or organization under Workers' or Workmen's Compensation Acts, disability benefit acts or other employee benefit acts.

CC. STARTUP AND TRAINING

It shall be the Contractor's responsibility to install all system components in accordance with the Manufacturer's recommendations. All equipment shall be lubricated and adjusted as components prior to testing the system as a whole. The Contractor shall arrange with the CTUIR Public Works Director to witness a test of the system and equipment after installation is completed. The Contractor shall provide the services of Manufacturers' representatives to assist with the startup of major components and to provide training to the CTUIR's personnel. These tests shall demonstrate the complete facility operates in accordance with the Drawings and Specifications and the required functions. It is anticipated that minor adjustments may occur after the system has been started up. The Contractor shall make adjustments and correct deficiencies as required so the system can be kept in operation once it is placed into service. These adjustments, etc., shall be completed before final acceptance. The Contractor shall pay all costs associated with Manufacturer's representatives and startup work.

As part of this Work, the Contractor shall provide startup training to the CTUIR and CTUIR Public Works Director in sufficient detail so the CTUIR and CTUIR Public Works Director are fully familiar with the proper operation and maintenance of project components and systems. The startup training shall occur after the construction work is complete and properly functioning.

DD. RECORD DRAWINGS

The Contractor shall maintain on the job site an up-to-date, complete, and accurate set of Record Drawings. These drawings shall include all work performed by the Contractor and shall note any changes or deviations made from the details shown on the Construction Drawings. Such deviations would include, but not be limited to, dimensional changes, location, grade changes, elevation changes, material type, configuration, etc. All changes shall be neatly and accurately shown on the Record Drawings. The Contractor shall use one full-sized set of prints in preparing the Record Drawings.

The Contractor shall provide ties to all buried service line taps from an above-ground reference point such as a valve, manhole, etc. At least two swing tie references shall be provided for all service line stubouts which will not be connected to an active service. Swing tie measurements shall be from some permanent reference point, i.e., house corner, fire hydrant, power pole, etc. All ties shall be provided in such a way so that the buried service line can be accurately located after construction work is

complete. All buried improvements shall be described in detail including location, type, size, depth, brand name, model numbers, etc. Buried improvements shall include valves, fittings, repair clamps, connections to existing lines, etc. All offsets shall be appropriately noted on the Record Drawings.

A clear color reproducible labeled photograph shall be taken of each improvement that would be permanently buried, such as connections to existing lines, fittings, and/or valve configurations, etc. A surveying rod shall be included in the photo to provide a scaling reference. Labels shall indicate the location and date of the photograph plus any appropriate information relative to what is shown. The photographs shall be mounted and indexed in a 3-ring looseleaf notebook. Two laser color copies of the notebook shall be provided in addition to the original color photo notebook. The intent is that items that may require future maintenance by the CTUIR be photographed so that accurate information concerning buried improvements will be known.

The Contractor shall also note the locations, types, size, depth, etc., of any existing utilities which are encountered during the performance of the work. The Record Drawings shall be available for inspection during the project by the CTUIR and CTUIR Public Works Director. The Contractor shall keep the Record Drawings current each day to avoid loss of critical or important information. Upon completion of the work, the Contractor shall give the Record Drawings and photographs to the CTUIR Public Works Director. Failure by the Contractor to keep Record Drawings will result in withholding of project acceptance. The project will not be accepted until such time as the complete Record Drawings have been provided.

IT IS INTENDED THAT THE RECORD DRAWINGS BE <u>COMPLETE</u> AND <u>DETAILED</u>. EXAMPLES OF ACCEPTABLE RECORD DRAWINGS ARE AVAILABLE FOR INSPECTION AT THE CTUIR's WATER/SEWER DEPARTMENT OFFICE. CONSIDERABLE EFFORT SHALL BE EXPENDED IN PREPARING THE RECORD DRAWINGS.

EE. OPERATION AND MAINTENANCE MANUAL

For projects that involve the construction of electrical or mechanical systems, or as requested by the CTUIR Public Works Director, two copies of an Operation and Maintenance Manual shall be submitted to the CTUIR Public Works Director prior to the final project completion date. The material shall be bound in a 3-ring looseleaf notebook with the project name, CTUIR's name, CTUIR Public Works Director's name and Contractor's name printed on the cover. The material shall also be clearly indexed and grouped by the various systems in the project. This data shall be supplied for all

materials, equipment, and devices and components which will require maintenance, replacement of parts and knowledge of operation. The information furnished shall pertain specifically to the materials and equipment furnished. Manufacturers' O&M manuals which deal with more than one product line shall have the non-relevant information crossed or blocked out. Also, in addition to the two bound copies due prior to final completion of the project, the Contractor shall furnish one copy of O&M material to the CTUIR Public Works Director for all major equipment when it arrives on the job site. The Contractor shall furnish a complete listing of all equipment supplied and each respective supplier's name, address and telephone number. The O&M data furnished shall include detailed manufacturer's operation and maintenance information on each component, function description of operation, a complete parts list and a separate parts list for parts not readily available.

IT IS INTENDED THAT THE O&M MANUAL BE COMPLETE AND DETAILED. EXAMPLES OF ACCEPTABLE O&M MANUALS ARE AVAILABLE FOR INSPECTION AT THE CTUIR's WATER/SEWER DEPARTMENT OFFICE. CONSIDERABLE EFFORT SHALL BE EXPENDED IN PREPARING THE O&M MANUAL.

FF. WORK ACCEPTANCE

Upon receipt of the "Contractor's Notice of Construction Completion" (contained at the end of the General Requirements section), the CTUIR Public Works Director shall determine whether or not the work is sufficiently complete to warrant a final project review. If the work is not complete, the Contractor shall complete the work prior to requesting final project review. If the work is complete and no items are left undone to the knowledge of the CTUIR Public Works Director and the Contractor, the CTUIR Public Works Director shall, within ten (10) days of receipt of said notice, make a final project review with the Contractor and will notify the Contractor, in writing, of any particulars in which this review reveals that the work is defective. The Contractor shall make such corrections as are necessary to remedy such defects. The completion of items identified in the final project review shall not relieve the Contractor from completing or correcting work that is subsequently found to be incomplete or defective.

After the Contractor has completed any such corrections to the satisfaction of the CTUIR Public Works Director and delivered all operations and maintenance manuals, guarantees, certificates of review and other documents, all as required by the plans and specifications, shall submit to the CTUIR Public Works Director the "Contractor's Project Completion Certification". Upon receipt, completion, and approval of the above listed items, the CTUIR Public Works Director will issue a "Final Acceptance Report"

stating that to the CTUIR Public Works Director's knowledge, information, and belief, the work has been completed by the Contractor and that the CTUIR Public Works Director recommends acceptance by the CTUIR.

Final completion shall be that date designated in the Final Acceptance Report stating that the work is complete and the work has been accepted by the CTUIR under the conditions of the plans and specifications.

GG. GUARANTEE

The Contractor shall guarantee all materials and equipment furnished and work performed for a period of one (1) year, unless provided otherwise in the Technical Specifications, from the date of Final Completion. The Contractor warrants and guarantees for a period of one (1) year from the date of Final Completion of the system that the completed system is free from all defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The CTUIR will give notice of observed defects with reasonable promptness. In the event the Contractor should fail to make such repairs, adjustments, or other work that may be made necessary by such defects, the CTUIR may do so and charge the Contractor the cost thereby incurred.

If any corrections of the work are performed during the one-year guarantee period that requires monitoring by a Project Representative, the services of such Project Representative and the CTUIR Public Works Director shall be paid for by the Contractor.

Prior to completion, the CTUIR, with approval of the Contractor, may use any completed or substantially completed portions of the work. Such use shall not constitute an acceptance of such portions of the work and shall not cancel or lapse any insurance provided by the Contractor for this portion of the work.

CONTRACTOR'S PROJECT COMPLETION CERTIFICATION

_____ hereby certifies that the project known as
(Contractor)

_____
(Name of Project)

has been completed in accordance with all requirements of the project plans and specifications. The Contractor further certifies that information contained in the Record Drawings and Operation and Maintenance Manual is complete, accurate, and properly described equipment, materials, and system installed as a part of the project. The Contractor further certifies that proper training has been given to the CTUIR's designated representative as to proper operation and service of the project system and components.

_____
(Signature)

_____
(Name)

_____
(Title)

_____
(Date)

Instructions: This form shall be completed by the Contractor when the project is complete; i.e., construction, paperwork, etc.

CONTRACTOR'S NOTICE OF CONSTRUCTION COMPLETION

_____ hereby certifies that all construction work
(Contractor)
on the project _____
(Name of Project)
has been completed in accordance with all requirements of the project plans and specifications. The Contractor further certifies that all system components have been properly installed, serviced and lubricated where appropriate, checked and tested for proper operation, all as recommended by the product manufacturer and as required by the Contract Documents.

By:_____
(Signature)

_____
(Name)

_____
(Title)

_____
(Date)

(All items below the dotted line shall be completed by the CTUIR Public Works Director.)

Review by CTUIR Water and Sewer Department:

☐ Construction work appears to be complete and a final project review has been scheduled for _____.
(Date and Time)

☐ The Date of Construction Completion has been set as _____. No further construction time will be charged to the Contractor.
(Date)

☐ Construction work is not complete. The Contractor shall complete the necessary work and resubmit a new "Contractor's Notice of Construction Completion".

By:_____
(Signature)

_____
(Name)

_____
(Title)

_____
(Date)

FINAL ACCEPTANCE REPORT
Confederated Tribes of the Umatilla Indian Reservation

PROJECT: _____

DATE: _____

PROJECT ENGINEER: _____

CONTRACTOR: _____

CONTRACT DATE: _____

RECITAL: The work performed under this Contract was reviewed for the purpose of determining acceptability of construction. All corrective work shown in the CTUIR Public Works Director's Final Project Review Report was completed and reviewed by the CTUIR Public Works Director on _____(Date). To the best knowledge and belief of the CTUIR Public Works Director, the work performed by the Contractor has been completed in accordance with the intent of the Contract Documents.

CTUIR Water and Sewer Department

By:_____
(Name)

Title:_____

Date:_____

The CTUIR hereby accepts the work on the above-referenced project and sets the date of Final Completion as _____(Date).

Confederated Tribes of the Umatilla
Indian Reservation

By:_____

Title:_____

Date:_____

The Contractor, _____, agrees that the date of Final Completion is also the date of commencement of project warranties. The Contractor has released all liens on the project, including materialmen and mechanics liens.

_____
(Contractor)

By:_____

Title:_____

Date:_____

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE				DATE	NO.
SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS *(This section will be initiated by the Contractor.)*					
TO:		FROM CONTRACTOR:		PROJECT:	CHECK ONE: ☐ THIS IS A NEW TRANSMITTAL ☐ THIS IS A RESUBMITTAL OF TRANSMITTAL
ITEM NO.	DESCRIPTION OF ITEM SUBMITTED *(Type, size, model number, etc.)*	MRG. OR CONTR. CAT. CURVE DRAWING OR BROCHURE NO. *(See Instruction No. 8)*	NO. OF COPIES	CONTRACT REFERENCE DOCUMENT	COMMENTS
				SPEC. SECTION NO. / DRAWING SHEET NO.	
REMARKS				I certify that the above-submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated. NAME AND SIGNATURE OF CONTRACTOR	
ACTION: ( ) No Exceptions Noted ( ) Make Corrections Noted ( ) Rejected ( ) Revise and Resubmit ( ) Submit Specified Item OWNER: CTUIR Water/Sewer Department BY: DATE:					

Send four copies of all submitted forms and all submittals to: CTUIR Water/Sewer Department, Contract Submittals, P.O. Box 638, Pendleton, Oregon 97801

WATER LINES

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
STANDARD TECHNICAL SPECIFICATIONS
SECTION 1
WATER LINES

A. GENERAL

1. Scope. These specifications cover the furnishing and installation of potable water lines, valves, fittings, and related appurtenances. This work includes, unless otherwise specified, furnishing all labor, materials, tools, equipment, and incidentals required to construct a complete water line ready for service as outlined on the Drawings and in the specifications. Requirements for excavation and backfill of trenches, surface restoration, traffic control, and special valves, fittings, appurtenances, etc. are specified under other Technical Specifications, when applicable.

Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of work to be constructed. All applicable sections, as determined by the CTUIR Public Works Director, shall control the work outlined in the Contract Documents.

2. Specifications References. Specification references made herein for manufactured materials such as pipe, valves, fittings, refer to designations for the American Water Works Association (AWWA), American National Standards Institute, Inc. (ANSI) or to the American Society for Testing and Materials (ASTM) as they are effective on the date of call for bids.

3. Catalog Information. Catalog information on all equipment and materials to be installed shall be submitted to the CTUIR Public Works Director for review prior to purchase and installation of the items.

4. Interruption of Utility Service. See Technical Specifications - "Excavation and Backfill of Trenches".

5. Care and Handling of Pipe and Valves. Adequate precautions shall be taken to prevent damage to piping and protective coatings. During transporting, pipe and other materials shall be secured individually by use of wood spacer blocks, wood crates, or otherwise protected to prevent collision of individual pieces and accompanying damage. Where possible, all materials furnished by the Contractor shall be delivered and distributed at the site by the Contractor so that each piece is unloaded opposite or near the place where it is to be placed in the trench. All pipe, fittings, valves, hydrants, and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. During freezing weather, valves shall be stored to prevent accumulation of water in housing which could freeze and damage valves. Under no circumstances shall such materials be dropped. All pipes, valves, fittings and all other materials used in the construction of the water lines shall be

carefully inspected by the Contractor prior to installation. All defective materials shall be rejected.

Proper materials, tools and equipment shall be used by the Contractor to provide safe and convenient prosecution of the work.

6. Materials Furnished by CTUIR. The Contractor's responsibility for material furnished by the CTUIR shall begin at the point of delivery to the Contractor. Materials already on the site shall become the Contractor's responsibility on the day of the award of the Contract. The Contractor shall examine all material furnished by the CTUIR at the time and place of delivery to him and shall separate all defective material. Any material furnished by the CTUIR that becomes damaged by the Contractor shall be replaced by the Contractor at his own expense. The Contractor shall assume full responsibility for materials furnished by the CTUIR once they are received by the Contractor.

7. Certification by Manufacturer. If requested to do so, the Contractor shall furnish to the CTUIR Public Works Director a sworn statement from the product manufacturer, stating that inspection and all specified tests have been made on the supplied material and that the results thereof comply with all appropriate specifications. The statement shall also state that all materials furnished are in accordance with these Contract Documents and that all materials are new.

8. Restoration, Finishing, and Cleanup. The Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, sidewalks, trees, shrubbery, lawns, pastures, fences, and other existing facilities equal to their original condition. All surplus material and temporary structures as well as excess excavation shall be removed and the entire site of Contractor operations shall be left in a neat and clean condition as outlined in the General Conditions. Also see Technical Specifications - "Excavation and Backfill of Trenches" and Technical Specifications - "Surface Restoration" for specific requirements.

B. MATERIALS

1. General. The Contractor shall furnish and install water lines and valves of the size, type, class and material called for on the Drawings and as specified. Where no specific type of pipe is called for, the Contractor may select any type listed herein. Once a particular type and manufacturer is selected, the Contractor shall use that type for the entire project unless other types are specifically called for on the Drawings.

Materials and products which come into contact with drinking water supplied by public water systems or which come into contact with drinking water treatment chemicals used by public water systems shall meet the requirements of National Sanitation Foundation Standard 61 Drinking Water System Components - Health Effects (current edition) or equivalent. These materials and products include, but are not limited to, process media, protective materials, joining and sealing materials, pipes and related products, and mechanical devices used in treatment, transmission, and distribution systems.

2. **Pipe**.

a. Class 150 PVC Pipe. PVC pipe for water lines shall conform to AWWA C900, DR 18 (150 psi pipe). The pipe shall have flexible rubber gasketed joints. This pipe shall be used for all water lines except where D.I. pipe is required. Ductile iron pipe shall be used for all water main larger than 12-inch diameter and where shown on the plans.

b. Ductile Iron Pipe. Ductile iron pipe and fittings shall conform to AWWA C150, AWWA C115, AWWA C151, AWWA C153, and AWWA C110 and shall be minimum pressure Class 350 unless specified otherwise. All ductile iron pipe shall have a bituminous sealed cement mortar lining conforming to AWWA C104 on the interior. All joints unless otherwise specified shall be push-on rubber gasket joints conforming to AWWA C111. Flanges for couplings and fittings shall conform to ANSI B16.1, 125-pound bolt hole template. Mechanical joints shall conform to AWWA C111.

When flanged pipe is required, the Contractor shall provide the D.I. pipe class required by the flange manufacturer to ensure the pipe and flange units are compatible. This data shall be provided to the CTUIR Public Works Director for review prior to ordering these materials.

c. Fittings for Iron and PVC Pipe. Unless specified otherwise, all fittings such as elbows, tees, crosses, etc., shall be mechanical joint short-bodied compact ductile iron fittings conforming to AWWA C153, Class 350. When called for, flanged cast iron fittings shall conform to AWWA C110 with ANSI B16.1, 125-pound bolt hole template. All fittings shall be cement mortar lined in accordance with AWWA C104. Gaskets shall be either ring or full faced, 1/8-inch thick conforming to AWWA C111, Appendix B.

d. Restrained Pipe Joints and Fittings. Restrained pipe joints shall be used only on mechanical joint ductile iron pipe. "MEGALUG" field-installed restraint devices as manufactured by Ebaa Iron, Inc., or approved equal, shall be used when called for on the Drawings or required by the CTUIR Public Works Director.

e. Water Main Couplings. Water main couplings shall be fabricated steel "Dresser" style couplings, or approved equal conforming to AWWA C219. The Contractor shall provide the appropriate coupling and gaskets as required to match the water lines types and sizes being utilized. Couplings shall be rated for the working pressure of the pipe main for which they will be utilized.

f. High Density Polyethylene Pipe for Service Lines. High density polyethylene pipe (HDPE) for service lines shall be iron pipe size (IPS) meeting the requirements of AWWA C901 and ASTM 2239, SIDR7 (PE3408) and shall be rated for 200 psi working pressure. Stainless steel inserts shall be installed at all compression fittings.

g. Galvanized Pipe. Galvanized iron pipe, when required, shall conform to ASTM A120, Schedule 40.

h. Copper Pipe for Service Lines. All copper pipe, when required by plumbing code, shall be type K, seamless, soft, annealed conforming to ASTM D88.

3. Valves.

a. Ball Valves. Ball valves 2 inches and smaller shall be bronze conforming to Federal Specification WW-V-35, Type II, Class A, Style 3 rated for a minimum working pressure of 125 psi.

b. Gate Valves. Gate valves 2 inches and smaller shall be all bronze, non-rising stem, conforming to Federal Specification WW-V-54, Type I, Class A and MSS SP-80. Class A rated for a minimum working pressure of 125 psi. No valves smaller than 2-1/2 inches shall be buried.

Gate valves 2-1/2-inch to 12-inch shall conform to AWWA C509 or C515. Valves shall be designed for 200 psi minimum working pressure and shall be of iron body, resilient seat, non-rising stem construction. Valves shall be equipped with O-ring type packing. The valve shall have a 2-inch AWWA operating nut for buried service or as called for on the Drawings. The valve ends shall be of the type required to match the pipe to which they will be connected, or as shown on the

Drawings. Valves shall have mechanical joint connections, unless otherwise called for on the Drawings. Valves shall be resilient wedge Kennedy KSRW or KSFW, M&H Style 4067 or 7000, Clow, or equal. All buried valves shall be a minimum size of 2-1/2-inch.

c. Butterfly Valves. All valves 14 inches and larger shall be butterfly valve type. All butterfly valves shall be of the rubber-seated tight-closing type. They shall meet or exceed the requirements of AWWA C504. All valves shall be M&H 4500 butterfly valves, or equal. The valve shall be for buried service with a sealed gear operator having 2-inch AWWA operating nut and shall open counter-clockwise. The valve ends shall be of type required to match the pipe to which they will be connected as required in the Bid Schedule or as shown on the Drawings.

d. Cast Iron Valve Box. Each valve shall be equipped with an adjustable cast iron box of the sliding type with a base large enough to cover the top casting of the valve. The diameter of the valve box shall be not less than 5-1/4 inches, and shall be of such length so as to provide the depth of cover over the pipe without full extension. All valve box lids shall be vandal proof with 7/8-inch point-to-point brass pentagon head locking bolt threading into a lug on the lid. The word "water" shall be cast into the lid. Spreader-type locking devices shall not be used. Valve boxes shall be in accordance with AWWA C600, Section 10.3. The valve box shall be Tyler 6855 Series Valve Boxes with 5-1/4-inch locking lid as manufactured by Tyler Pipe/Utilities Division, P.O. Box 2027, Tyler, Texas 75710 (903) 882-5511. Substitution for these valve boxes will not be permitted. The bottom section used shall be of proper length and diameter to allow the top section to fit over it and be placed at finish grade.

4. Fire Hydrants. Fire hydrants shall conform to AWWA C502 and shall have 5-1/4-inch main valve opening, two 2-1/2-inch NST nozzles and one 4-1/2-inch NST pumper nozzle. Operating nut shall be 1-1/2-inch pentagon. Fire hydrants shall be M&H Model 929 Traffic or Clow Medallion with no exceptions. All hydrants shall have a minimum depth of bury of 48 inches. Where conditions require, hydrant extensions shall be provided and installed to provide the proper placement and installation of the hydrant. No additional payment will be made for hydrant extensions when required. Hydrants shall receive factory coats of yellow enamel paint and shall also receive an additional field coat after installation. All hydrants shall be of the traffic model type.

5. Service Saddles. Service saddles shall have a ductile iron body, wide stainless steel band, and stainless steel bolts and nuts. Service saddles shall be Ford FS-101, or approved equal, with AWWA tapered outlet threads for 1-inch taps and Ford FS-202, or approved equal, with AWWA tapered outlet threads for taps larger than 1-inch

but smaller than 3-inch. For larger taps, the service saddles shall be Ford FS-202 with iron pipe size thread outlet, or approved equal.

6. **Corporation Stops**. Corporation stops shall be brass ball valve stops complying with AWWA C-800. Corporation stops for 1-inch and 1-1/2-inch service lines shall be Ford FB1001 Series, or approved equal, with AWWA thread inlet and pack joint for iron pipe size HDPE pipe.

7. **Curb Stop and Curb Stop Box**. Curb stops for service lines shall be Ford Ball Valve Curb Stop B61 Series with ends of pack joint for PE pipe by female iron pipe thread. Each curb stop shall be equipped with an adjustable cast iron box of the sliding type and shall be of such length so as to provide the depth of cover over the pipe without full extension. The curb stop box shall be equal to Ford Arch Pattern Curb Boxes with 1-inch upper section and stationary rod and Type PS plug style lid with pentagon bolt, or approved equal. For service curb stops larger than 1-inch a curb box base, Ford CB-7 shall also be provided.

8. **Meter Setters**. Meter setters for 3/4-inch to 1-inch water meters shall be Ford VBHC 270 Series, or approved equal, with angle ball inlet valve with padlock wings and cartridge dual check valve as the outlet valve. End connections shall be compression joint assembly for connection to PE pipe.

Meter setters for 1-1/2-inch and 2-inch positive displacement meters shall be Ford VBHH76HB and VBHH77HB Series, or approved equal, equipped with angle ball inlet valve with padlock wings, angle dual check valve outlet, high bypass option, and 1-1/2 female iron pipe ends for connection to appropriate couplings. Brace pipes of 1-inch diameter Schedule 40 galvanized steel shall also be installed in the setter pipe eyelets to increase the stability of the meter setting.

Meter setters for 2-inch and larger compound meters shall be SRF Sensus Compound Meter Pre Fab Pak Assembly. The assembly shall come fully assembled from the factory with bypass piping and lockable test riser option. These assemblies are manufactured by Sensus Technologies, Uniontown, Pennsylvania 15401, (800) 638-3748. No substitution will be permitted for these items. Riser heights shall allow for proper placement of all setters as shown on the Drawings.

9. **Service Line Couplings**. Service line couplings shall be Ford pack joint couplings or approved equal. Provide appropriate coupling as required to match water service line types and sizes being utilized. Appropriate stainless steel insert stiffeners shall be used for all polyethylene pipe. Where metal pipe of dissimilar type are being connected, an insulating adaptor gasket such as Dresser Style 65, or approved equal,

shall be utilized to prevent galvanic corrosion. Couplings used for joining polyethylene pipe to building water line shall be Ford or Mueller brass compression couplings, when required.

10. Water Meters. Water meters for 3/4-inch and 1-inch sizes shall be positive displacement Sensus SRII Series meters. Meters for 1-1/2-inch to 2-inch sizes shall be positive displacement Sensus Sealed Register (SR) Series. All meters shall read in cubic feet with an electronics communications register and either a touch read pit lid module or radio read meter transceiver unit (MXU), as required. All meters shall be 3/4-inch size and positive displacement meters unless specifically called for otherwise on the Drawings or required by the CTUIR Public Works Director. No substitutions allowed.

11. Water Meter Box and Cover. Water meter box for 3/4-inch and smaller meters shall be 12-inch x 20-inch; for non-traffic areas, it shall be rotocast polyethylene material with polymer concrete frame; for light traffic areas, it shall be polymer concrete "RPM" body and frame; all as manufactured by Armorcast, or equal. The box shall not be equipped with mouse holes. The lid shall be 12-inch x 20-inch Armorcast cover. Provide pre-drilled cover for touch read pad. Where required by the CTUIR Public Works Director, the lid shall be upgraded to the 20K traffic rated cover. In heavy traffic areas, the Contractor shall submit an appropriate traffic rated meter box for review and approval by the CTUIR Public Works Director.

For 1-inch meters, the box shall be 17-inch x 30-inch; for non-traffic areas, it shall be rotocast polyethylene material with polymer concrete frame; for light traffic areas, it shall be polymer concrete "RPM" body and frame; all as manufactured by Armorcast, or equal. The box shall not be equipped with mouse holes. The lid shall be 17-inch x 30-inch Armorcast cover. Provide pre-drilled cover for touch read pad. Where required by the CTUIR Public Works Director, the lid shall be upgraded to the 20K traffic rated cover. In heavy traffic areas, the Contractor shall submit an appropriate traffic rated meter box for review and approval by the CTUIR Public Works Director.

Meter boxes and covers for 1-1/2-inch and 2-inch positive displacement meters shall be Utility Vault Co. Model 233-LA with pentagon bolt lockable diamond plate lid and Model No. 23R6 6-inch riser or No. 23R12 12-inch riser as necessary to match final grade, all as specified for use by the CTUIR Water and Sewer Department with Utility Vault Co. The specified vaults are available from Utility Vault Co., Wilsonville, Oregon 97070, (503) 682-2844. The completed installation shall be capable of withstanding H20 traffic loads. The Contractor shall drill the lid near the hinge side for installation of the touch read module. Approved equals will be considered.

12. Locating Wire. Locating wire shall be a minimum of 12 awg UF solid copper with blue colored insulation. The use of THHN wire will not be acceptable. At all splices the connecting ends of the wires shall be overlapped and tied. The ends shall be stripped and connected with a wire nut to ensure an electrical connection and made waterproof with an approved silicone splice kit. The splice kit shall be King Technology Model 50-566 or approved equal. Where location wire is to be secured to the exterior of fire hydrants, valve boxes, posts, etc.

13. Thrust and Anchor Blocks and Concrete Collars. Concrete used for thrust and anchor blocks, and concrete collars shall be Portland Cement concrete with a 28-day compressive strength of 2500 psi. Anchor rods shall be 3/4-inch diameter galvanized steel or epoxy coated reinforcement bar conforming to AASHTO M284, embedded a minimum of 18 inches in the concrete.

14. Pressure Gauges. Pressure gauges and switches shall have stainless steel bourdon tube and movement with stainless steel bodies and polycarbonate lenses. Pressure gauges shall be glycerine-filled 500 series as manufactured by NoShok or approved equal. Graduation intervals shall be the smallest available for the pressure range required. Pressure gauges shall have a minimum 4-inch diameter dial face and be provided with a pressure snubber and isolation valve.

15. Combination Air-Vacuum Relief Valves for Domestic Water Service. Air-vacuum relief valves shall be cast iron construction with bronze and stainless steel internal parts. Valve shall have a large orifice to relieve large quantities of air on filling or draining a line, and a small orifice capable of relieving small quantities of air in the pipe during operation. Valve shall be 1-inch size APCO No. 143C or equal, unless a larger size is otherwise shown on the Drawings.

16. Backflow Prevention Valves.

a. **Double-Check Type.** The double-check type valve shall be a complete unit consisting of two independently acting spring-loaded toggle lever check valves, two shutoff valves and four test cocks arranged so that a test of each check valve can be made. The spring loading of the check valves shall be sufficient to hold at least 1 psi in the direction of flow. The head loss across the entire unit shall not exceed 10 psi at the rated flow. All valves shall conform to AWWA C510 and shall be approved and listed by the University of Southern California and installed according to requirements of the Oregon Department of Human Services Drinking Water Program (DWP). The double

check assembly shall be Watts Regulator Series 709S, or equal, for sizes 3/4-inch to 10-inch.

b. **Reduced-Pressure Type.** The reduced pressure type shall be Cla-Val RP-2 for 3/4-inch to 1-1/2-inch sizes and RP-4 for 2-inch to 10-inch sizes or equal. All valves shall conform to AWWA C511. Reduced pressure type assemblies shall be installed above ground in accordance with requirements of the DWP.

Prior to putting the water system into use, the backflow preventer shall be tested by a state certified backflow device tester and the test results provided to the CTUIR Water and Sewer Department. A tag shall be left on the backflow preventer showing the valve has been tested, the date, and the inspector's name.

Vaults and/or meter boxes for backflow prevention valves shall be as shown on the Drawings or previously specified in this section.

C. CONSTRUCTION

1. Trench Excavation and Backfill. Trench excavation and backfill shall be performed as specified in the Technical Specifications for "Excavation and Backfill of Trenches."

2. Record Drawings. The requirements for record drawings, etc., as required in the General Requirements shall be carefully complied with.

3. Installation of Pipe. Water pipe shall be installed in accordance with best current practices as required by the manufacturer and as specified herein. PVC pipe installation shall conform to the Uni-Bell Plastic Pipe Association, "Guide for Installation of PVC Pressure Pipe for Municipal Water Main Distribution Systems" and also AWWA M23 "PVC Pipe - Design and Installation." Ductile iron pipe installation shall conform to the requirements of AWWA C600.

Water pipe shall be installed with bell ends laid facing in the direction of laying unless directed otherwise by the CTUIR Public Works Director. Each pipe shall be properly bedded so as to be supported for the full length of the pipe. A suitable foundation shall be achieved by a slight excavation under the bell at each joint. All rubber ring joints shall be lubricated and installed in accordance with the installation instructions of the pipe manufacturer, taking particular care to avoid pinching or otherwise causing damage to the rubber ring. All joints shall be free of dirt and other foreign matter prior

to the joining of the next pipe. All joints shall be restrained to prevent creep and misalignment of joints.

Water lines shall be installed to the minimum depths called for on the Drawings and to the lines and grades when shown. It shall be recognized that water line depths may vary from the minimum depths shown when adjustment of grade is required to avoid conflict with existing utilities. Additional fittings may also be required when a grade adjustment is required. Grade adjustments to accommodate existing utilities shall be considered a normal part of the work.

No pipe shall be installed in water or when conditions exist that, in the opinion of the CTUIR Public Works Director, are unsuitable for the laying of the pipe. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other approved means. This provision applies during the noon hour as well as overnight. If there is water in the trench, the seal should remain in place until the trench is dewatered sufficiently to prevent groundwater from entering the pipe. Adequate provisions shall be made by the Contractor for final disposal of the groundwater pumped from trenches. No backfill shall occur until the work has been observed by the CTUIR Public Works Director.

When water mains will not be extended under the work being performed, a water main stub, as shown on the Drawings, shall be installed.

When called for on the Drawings or approved by the CTUIR Public Works Director, the Contractor may install a pipeline on a curve. For rubber gasketed ductile iron pipe installed on a curve, the pipe shall be joined in a straight alignment and then deflected. The amount of deflection shall not exceed 80 percent of the recommended maximum deflection specified in AWWA C600. For PVC pipe installed on a curve, deflection of the pipe shall be achieved by bending the pipe within the limitations specified by the pipe manufacturer. Joint deflection of PVC pipe is **not** allowed.

Thrust and anchor blocks shall be constructed as shown on the Drawings and placed at all changes in direction, all changes in the diameter of the pipe, all dead-ends, and as required by the CTUIR Public Works Director. All thrust blocks shall be placed between the undisturbed ground and the fitting to be anchored. Plastic sheeting shall be used to provide a bonding barrier between the fittings and the concrete. The quantity of concrete and the area of bearing on the soil shall be as shown on the Drawings or as approved by the CTUIR Public Works Director. All thrust blocks shall be placed so that the entire pipe and fitting joints will be accessible for repairs. Bolts for mechanical and flange fittings and fire hydrant weep holes shall not be covered with concrete. All bolts shall be accessible and removable without interference from the

thrust block. Thrust blocks may not be required where approved restraint joint pipe and fittings are utilized. No backfill of thrust blocks shall occur until the work has been observed by the CTUIR Public Works Director.

4. Locating Wire. A continuous solid copper tracer or locating wire shall be taped along the top of all water pipe, including service lines. This wire shall be secured to the top of the pipe at maximum 10-foot intervals using 6-inch strips of 2-inch wide duct tape. All splices shall be tied, electrically continuous, and made waterproof. Access to terminal ends of the locating wire shall be made at all valve boxes, meter boxes, fire hydrants, vaults, etc. The result of this installation shall be a continuous wire circuit electrically isolated from ground. The Contractor shall be responsible for testing continuity and for testing isolation from ground in the wire after all work has been completed on the test section. The Contractor is advised to do intermediate testing on his own after backfilling operations and prior to surface restoration work to be sure continuity is maintained. If there is a break or defect in the wire, it shall be the Contractor's responsibility to locate and repair the defect. The continuity of the location wire for water mains shall be tested from one test load point to the next by use of a temporary wire laid between test points in-line with an ohmmeter. Resistance shall be measured with an approved ohmmeter that has been properly calibrated. The continuity of a test section will be accepted if the resistance of the test section does not exceed 2 ohms per 500 feet of location wire being tested. Isolation from ground shall be measured with a megohmmeter and shall be a minimum of 20 megohms for any section of location wire tested. The continuity of location wire for service lines shall be checked using a pipe locator to verify that a signal can be obtained along the full length of the service line. The CTUIR Public Works Director shall witness the acceptance test.

5. Service Connections. The Contractor shall connect service lines to new or existing water mains as shown on the Drawings. This work includes the installation of a saddle and corporation stop, and making the connection. The work will include potholing to locate any existing pipeline or service lines as required so the service connection can be performed.

6. Service Lines. The installation of new service lines and the connecting of existing service lines shall be performed in accordance with the Drawings, manufacturer requirements, and as specified herein. Water service lines shall be laid by placing the pipe on the trench bottom with sufficient slack to prevent pulling apart of the joints when the backfill is placed. Splices shall be kept to an absolute minimum. If required, they shall be made using brass compression joint couplings equal to Ford Pack-joint. When constructing a new water line to replace an existing line, the existing water line shall remain in service until the new water line has been tested, disinfected and approved by the CTUIR Public Works Director. When possible, the existing line and

new line shall both be in operation during the transfer of service lines. The transfer shall be made so that the interruption of water service to the utility customer is held to a minimum. All service lines shall be thoroughly flushed and disinfected before connecting to existing lines or meters. The locations of existing service lines as determined by the CTUIR are shown on the Drawings. The locations of service lines shown on the Drawings are approximate and may vary from the locations shown. The CTUIR will assist the Contractor in locating service lines; however, the primary responsibility for performing excavation work to locate existing lines will be the Contractor's. The work includes potholing to locate any existing pipelines or service lines as may be required so the service lines can be installed. The work also includes connecting to the existing service lines when required.

When the plans indicate that existing service lines will be utilized, and if the Contractor encounters an existing service line which appears to be in poor or unserviceable condition, he shall contact the CTUIR Public Works Director. If the CTUIR Public Works Director determines that a portion of the existing service line needs replacement, the Contractor shall install a new service line.

It is the general intent, where required by the CTUIR, to try and install service lines under paved streets by boring where possible. A pneumatic boring tool or other approved method will be used to install service lines under all paved streets. There may be areas where it is not possible to bore due to ground conditions which interfere in the operation. Where requested by the CTUIR Public Works Director, the Contractor shall attempt to bore under paved streets. In areas where it appears that boring will be difficult as determined by the CTUIR Public Works Director and the Contractor, the service lines shall be installed by the open trench method. The Contractor shall take care to not damage other utilities which might exist in the area. Prior to boring, the Contractor shall pothole to locate existing utilities. "Blind-boring" is not allowed. Repairs for damage to other utilities shall be the responsibility of the Contractor. Service lines to be installed in other areas may be installed by either open trenching or boring as the Contractor may elect. All service lines shall be thoroughly flushed before connecting to existing lines or meters.

7. Valves and Valve Boxes. Valves and valve boxes shall be installed as shown in the Drawings. All valves and valve boxes shall be set plumb. The valve box shall be centered over the valve operator and free of any obstruction which would prevent operation of the valve nut. If the bury depth of the valve is greater than 4-1/2 feet, a valve operator extension shall be provided to within 1-foot of finish grade. The extension shall be permanently attached to the valve operator and a self-centering device shall be provided near the top of the valve operator extension. The box cover shall be flush with the finished grade. A concrete collar shall be installed.

8. Fire Hydrants. Hydrant installation shall conform with AWWA Manual M17 and AWWA C600, and as shown on the Drawings. Extensions required for hydrant adjustment shall be installed to the manufacturer's specifications. Hydrants may be installed on new water mains installed as part of the work, or on existing mains. Special attention shall be given when installing hydrants on existing mains to ensure that adequate thrust restraint is being achieved as the hydrants can be placed in service before normal cast-in-place thrust blocks can achieve the required strength. The block and plug shall be held securely by temporary thrust block or other approved method, such as precast thrust blocks, restraining rods, etc. The newly installed hydrants shall be covered in a manner acceptable to the CTUIR Public Works Director until they are placed into permanent service. Where required on the Drawings or by the CTUIR Public Works Director, barricades shall be installed as detailed on the Drawings.

9. Connections to Existing Lines. Information shown on the Drawings indicating the size, type, class, and location of existing lines and associated fittings has been obtained from as-built drawings and other municipal records. It is expected that there may be some discrepancies and omissions in the information shown on the Drawings. Therefore, it shall be the responsibility of the Contractor to excavate and inspect existing water lines requiring a connection in order to determine the exact fittings needed. In connecting to existing lines, the Contractor may select the combination of fittings he wishes to use, subject to approval of the CTUIR Public Works Director. Approved Ford or Dresser couplings, repair bands, transition couplings, or tapping sleeves are among the options available to the Contractor. The Contractor shall submit to the CTUIR Public Works Director information on the type of couplings he proposes to use. Proper disinfection, as described hereafter, shall always be accomplished. The Contractor shall provide watertight plugs and thrust restraints, as required, to cap old lines after they are disconnected.

The Contractor shall provide special attention in providing thrust restraint for fittings installed as part of a connection to an existing line, when such connection will be placed into service before normal cast-in-place thrust blocks can achieve required strength. In such cases thrust restrained joints, precast thrust blocks, etc., must be utilized to provide thrust restraint. Methods used by the Contractor shall be approved by the CTUIR Public Works Director.

The Contractor shall not interrupt service for the purpose of connecting to an existing line until he has excavated the required location, visually inspected and measured the connection point, and verified with the CTUIR that he has available on the site all fittings required for completion of the connection or connections. Isolation of a section of line to be modified will be accomplished by the Contractor only after consultation

with the CTUIR for the purpose of determining the proper valves to close to effect the isolation. The Contractor shall cooperate with the CTUIR in accomplishing this isolation. When work is started on a connection, it shall proceed continuously without interruption, and as rapidly as possible until completed. If the connection involves turning off the water, the Contractor shall be responsible for notifying the residents affected by the shutoff. See Technical Specifications - "Excavation and Backfill of Trenches."

10. Water Meter Installation. The Contractor shall furnish all other materials required and shall install the water meters as shown on the Drawings and described herein. Water meter installations shall include appropriate meter box and cover, copper setter, yokes and prefabricated assemblies, and fittings, and shall include the water meter. The CTUIR Public Works Director will mark the location for the meter. There are several conditions under which the meter will be connected to service lines on the customer side of the meter. The meter may be connected to an existing service line, or the meter may be stubbed out for a future connection by others. In large meter settings, the Contractor shall position the vault ladder and lid to avoid stepping on the meter or pipe. In all cases the meters shall be positioned directly under the meter lid to allow meter reading from above the lid opening.

11. Water-Sewer Line Crossings. Wherever possible, the bottom of the new water line shall be 1.5 feet or more above the top of any sanitary sewer line. One full length of water line shall be centered at all sewer crossings when the vertical separation is less than 1.5 feet. Where the water line crosses over an existing sanitary sewer line but with a clearance of less than 1.5 feet, the sewer line shall be exposed to the sewer line joints on both sides of the crossing to permit examination of the sewer pipe. If the sewer pipe is in good condition and there is no evidence of leakage from the sewer line as observed by the CTUIR Public Works Director, the 1.5-foot separation may be reduced. When the vertical separation is less than 1.5 feet, the Contractor shall center one full length of the new water pipe over the sewer line. If the CTUIR Public Works Director determines that the conditions are not favorable or finds evidence of leakage from the sewer line, the sewer line shall be replaced with a full length of PVC pressure pipe (AWWA C900, DR 18, 150 psi pipe) centered at the crossing point. When new sewer pipelines are installed as a part of the project, it will not be necessary to expose the new sewer pipe to verify the pipe's condition.

Where the water line crosses under the sanitary sewer line, the Contractor shall expose the existing sewer line and examine it as indicated above. If conditions are favorable and there is no evidence of leakage from the sewer line, the sewer line may be left in place. In this situation, the Contractor shall center one length of the new water line at the crossing. If the CTUIR Public Works Director determines conditions

are not favorable or finds evidence of leakage from the sewer line, the CTUIR Public Works Director may either request that (1) the existing sewer line be supported with a steel beam, reinforced concrete beam, or other means of preventing settlement when it spans the water line trench, and special precautions be taken to assure the backfill material over the water line in the vicinity of the crossing is thoroughly compacted in order to prevent settlement which could result in the leakage of sewage, or (2) the sewer line at the crossing be replaced as detailed on the Drawings.

When constructing water service lines, the CTUIR Public Works Director may require the depth of the service line to be revised in order to eliminate the need for a water-sewer line crossing.

12. Capping Existing Water Mains and Services. When required, the Contractor shall cap an existing water main or service tap when an existing main or service is to be taken out of service. Each location will require different types of fittings, etc., to accomplish the work. All caps are to be permanent and watertight. When required, thrust restraints shall be provided. Corporation stops on service taps shall be in "off" position and an approved watertight cap installed. Unless specified otherwise, the capping shall be performed at the connection to the water main which is to remain in service. No stubbed water mains or service lines shall be left in the ground unless approved otherwise by the CTUIR Public Works Director. The Contractor shall excavate and expose the piping to be capped, perform the work, and backfill as required.

13. Abandoned Water Lines. All existing water lines to be taken out of service shall be marked on the Drawings. These lines are to remain in service until the new lines are properly installed and tested, and water services have been connected. Approval from the CTUIR Public Works Director shall be obtained before any line is abandoned. The existing lines shall then be abandoned and their actual location and abandoned designation recorded on all Record Drawings. Unless called for otherwise, the abandoned lines will remain in the ground. The ends of all pipes which are abandoned shall be plugged with concrete or other methods approved by the CTUIR Public Works Director. There shall be no separate measurement and payment for this work.

14. Other Installations. Installations of valves and valve boxes shall be in accordance with the manufacturer requirements and the Drawings. Air release valves shall be installed as shown on the Drawings, and as required by the manufacturer.

15. Existing Equipment Removal and Salvage. The Contractor shall remove all existing valves, hydrants, and fittings as required to properly perform the work, or as shown in the Drawings. All such materials shall be transported to an area designated

by the CTUIR and stockpiled. Materials shall be removed and handled in such a manner which will prevent damage.

All other existing valves and hydrants not used in the new system or specified for removal will be removed by the CTUIR after the new system is in operation. Salvaged material shall remain the property of the CTUIR. The abandoned existing pipe is to remain in the ground, unless otherwise specified. The Contractor shall apply black paint the same day to all existing hydrants when permanently disconnected from service.

16. Work with Existing Asbestos Cement Pipe. When working with A/C pipe, the Contractor shall take all precautions necessary to reduce airborne asbestos during construction. All work with A/C pipe shall conform with American Water Works Association Publication "Work Practices for Asbestos-Cement Pipe." The Contractor shall cut asbestos cement pipe by using snap cutters only. The use of carbide tipped cutting blades or high-speed, abrasive disks shall not be permitted as a means of cutting A/C pipe. Machining of this pipe shall be done with a manual or power driven lathe. Hole cutting shall be accomplished with a tapping machine. Use of shell cutters, rasps, chisels, electric drills, right angle sanders, or other high speed abrasive tools shall not be permitted. Dust and cuttings from all work shall be removed by wet mopping. All waste material shall be collected in a covered container and disposed at a landfill certified by the state or EPA to accept demolition waste.

17. Repair of Unmarked Water Lines. In general, the specific location, pipe size, type and bury depth of existing water mains and services is unknown. Prior to construction, the Contractor shall have the CTUIR Water and Sewer Department mark the location of known water lines with paint. Water lines damaged by the Contractor, which are unmarked or further than four feet away on either side of the mark, shall be paid for under the "Repair of Unmarked Water Service Lines" bid item or by change order if no bid item is available. There shall be no payment for damaged water lines marked by the CTUIR Water and Sewer Department within the four feet specified.

18. Remove and Salvage Existing Fire Hydrant. The Contractor shall remove and salvage the existing fire hydrants called for on the Drawings including auxiliary valves when valve is within 10 feet of the hydrant. The work shall be performed so as not to damage the hydrant or valve. The existing water line shall be plugged as required for abandonment of existing water lines. The salvaged materials shall be delivered to the CTUIR Water and Sewer Department at a location specified by the CTUIR Water and Sewer Department.

19. Relocation/Reinstall Existing Fire Hydrant. The Contractor shall remove, and reinstall hydrants called for on the Drawings. Hydrant extensions and fittings, as may be required, shall be provided as part of the work. Installation shall be as required for new hydrants.

D. MARKER POSTS AND BARRICADES

The Contractor shall furnish and place 4"x4" pressure treated wood posts or barricades at locations shown on the Drawings and as directed by the CTUIR Public Works Director to mark the locations of certain valves and other appurtenances. Posts shall be set as shown on the Drawings. All posts improperly set shall be reset.

E. WATER LINE CAUTION SIGN

The Contractor shall furnish and install the water line caution signs with post as detailed on the Drawings. The number of signs and post required to be furnished shall be as shown on the Drawings or listed in the Bid Schedule. The Contractor shall install the signs at the locations shown on the Drawings and as directed by the CTUIR Public Works Director. All remaining signs and posts not required to be installed shall be delivered unassembled to the CTUIR Water and Sewer Department.

F. TESTING AND DISINFECTION

1. General. The Contractor shall furnish all labor, necessary equipment, and other apparatus including, but not limited to, gauges, service saddles, corporation stops, and water hose, necessary to properly perform the testing and disinfection of water lines as specified. The Contractor shall also coordinate with the CTUIR Water and Sewer Department to provide backflow protection to their system when filling the installed lines. Lines to be tested include mains and service lines. Each section of the lines before being tested and placed into service shall be isolated and slowly filled with water. Air should be expelled from the line through hydrants or taps made at the high points.

2. Acceptance Test. The Contractor shall perform all preliminary testing required to determine that the lines to be tested are acceptable and comply with the requirements of this section of the Specifications. After the Contractor has determined that the lines will pass the required test, the Contractor shall arrange for an acceptance test to be witnessed by the CTUIR Public Works Director. The Contractor shall coordinate the timing of this acceptance test with the CTUIR Public Works Director's representative. Twenty-four hour notice shall be provided. The lines will not be

accepted until the acceptance test has been witnessed and documented as passing. Forms for performing the various tests are included at the end of this Technical Specification for use and reference by the Contractor. If the acceptance test fails to pass the required testing, the CTUIR may deduct from the Contractor's payments the travel time and all additional time of the CTUIR Public Works Director (or designated representative) for witnessing any additional tests.

3. Hydrostatic Testing of Pressure Lines. All lines shall be pressure tested at 150 psi gauge or 1.5 times the actual working pressure, whichever is greater, for one hour. Any cracked or defective pipe, joints, or fittings shall be removed and replaced.

4. Leakage Test. Each section of the line, after all backfill and compaction work has been completed and before being placed into service, shall be tested for leakage for a period of two hours at a minimum average gauge pressure of 100 psi. The allowable leakage is defined as:

PVC Pipe: $L = \frac{ND\sqrt{P}}{7{,}400}$ DI Pipe: $L = \frac{SD\sqrt{P}}{133{,}200}$

In which:

L = Allowable Leakage Gal/Hr
S = Length of Pipe Tested in Ft.
N = Number of Joints or Connections
D = Nominal Diameter in Inches
P = Gage Pressure in P.S.I.

Should any test disclose leakage greater than that specified, the Contractor shall locate and repair the defective joints or pipe until the leakage is within the specified allowance.

5. Disinfection of Potable Water Mains. The Contractor shall coordinate with the CTUIR Water and Sewer Department to ensure that proper backflow prevention protection is provided when filling any new water mains from the existing community water system. Each section of the line, before being placed into service, shall be thoroughly flushed and disinfected as follows:

(a) Following completion of new facilities and repairs to existing facilities, these portions of the facilities which will be in contact with the water delivered to users shall be disinfected with chlorine before they are placed into service. Other disinfectants may be used if it is demonstrated that they can also achieve the same result as chlorine;

(b) Prior to disinfection, the facilities shall be cleaned and flushed with potable water;

(c) For wells, valves, pumps, water mains and service connections, a chlorine solution with a free chlorine residual of 25 mg/L shall be introduced into the system in a manner which will result in a thorough wetting of all surfaces and the discharge of all trapped air. The solution shall remain in place for 24 hours. After the 24-hour period, the free chlorine residual shall be checked, and if it is found to be 10 mg/L or more, the chlorine solution shall be drained, the facility flushed with potable water and a minimum of one sample shall be collected from the facility for microbiological analysis. If the results of the analysis indicate that the water is free of coliform organisms, the facility may be put into service. If the check measurement taken after the 24-hour contact period indicates a free chlorine residual of less than 10 mg/L, the facilities shall be flushed, rechlorinated and rechecked until a final residual of 10 mg/L or more is achieved. Likewise, if the microbiological analysis indicates the presence of coliform organisms, the flushing and disinfection must be repeated until a sample free of coliform organisms is obtained;

(d) A water line may be returned to service, following repairs or routine maintenance, prior to receiving a report on the microbiological analysis if the following procedures have been completed. The trench shall be liberally treated with hypochlorites, the interior of all pipes and fittings shall be swabbed or sprayed with a 1 percent hypochlorite solution, and the line shall be thoroughly flushed. Where practical, the repaired line shall be disinfected with a 100 mg/L chlorine solution for 3 hours or a 300 mg/L chlorine solution for 15 minutes then the line shall be flushed thoroughly.

When water service lines are not disinfected in conjunction with water mains, the Contractor shall disinfect all fittings and service lines using a 300 mg/L minimum chlorine solution. All fittings shall be flushed with the chlorine solution prior to connection with the new service line. The new service line shall be flushed slowly with a 300 mg/L minimum chlorine solution in a manner which will result in a thorough wetting of all surfaces on the inside of the service line. The service line shall have at least 15 minutes contact time prior to flushing and putting it into service.

After disinfection, the Contractor shall collect bacteriological samples for testing in the presence of the CTUIR Public Works Director. A minimum of one sample shall be taken every 1,000 feet of water line to be tested. The CTUIR Public Works Director may require additional samples to be taken if the section to be tested is complex and proper disinfection could be difficult. The analysis shall be performed by a laboratory

certified by the DWP or the EPA. The cost of the bacteriological testing(s) is to be paid by the Contractor. If positive results are obtained, the system shall be disinfected again by the Contractor, at his own expense. Bacteriological samples will again be collected in the presence of the CTUIR Public Works Director and resubmitted for testing. This shall be repeated until negative results are obtained. The method of disinfecting and the chlorination materials used are subject to the approval of the CTUIR Public Works Director. Disinfection by introducing granular or tablet chlorine compounds in each pipe length is not an acceptable method of disinfection.

The results of all bacteriological tests shall be submitted to the CTUIR Public Works Director and placed in the Operation Manual. No section of pipe shall be placed into service until acceptable bacteriological tests have been obtained.

All wastewater shall be properly disposed of in accordance with appropriate regulatory requirements. Arrangements for disposal in sanitary sewer must be made with City of Pendleton Wastewater Treatment Plant Superintendent (541-276-3372). Any chlorinated water discharged to open stream channels must be dechlorinated prior to discharge.

TEST WORK SHEET FOR THE WATER LINES - HYDROSTATIC AND LEAKAGE TEST

Project Name _____

Date _____ **Job No.** _____

Location of Test/Stationing _____

_____

Hydrostatic Test

Test pressure _____

Time Test Started _____

Time Test Completed _____

TOTAL TIME _____ minutes

Test Passed ☐ Yes ☐ No

Leakage Test

Min. test pressure 100 psi

PVC Pipe: $L = \frac{ND\sqrt{P}}{7{,}400}$ DI Pipe: $L = \frac{SD\sqrt{P}}{133{,}200}$

L = Allowable Leakage Gal/Hr
S = Length of Pipe Tested in Ft.
N = Number of Joints or Connections
D = Nominal Diameter in Inches
P = Gage Pressure in P.S.I.

Allowable Leakage

Pipe Section	Nominal Diameter	Number of Joints or Connections	Length of Pipe	Allowable Leakage

Total Allowable Leakage _____ gal/hr

Time Test Started _____ Total Leakage Measured _____ gal.

Time Test Completed _____ Total Leakage Measured/Gal = _____ gal/hr

TOTAL TIME _____ mins. Time (hr.)

Test Passed ☐ Yes ☐ No

Contractor's Firm Name: _____

Contractor's Representative Signature: _____

CTUIR Public Works Director's Representative Signature: _____

_____

Note: See Technical Specifications for directions of use.

SANITARY SEWER LINES

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

STANDARD TECHNICAL SPECIFICATIONS

SECTION 2

SANITARY SEWER LINES

A. GENERAL

1. Scope. These specifications cover the furnishing and installation of gravity sewer lines, service lines, manholes, cleanouts, and miscellaneous appurtenances. The work includes, unless otherwise specified, furnishing all labor, materials, tools, equipment, and incidentals required to construct a complete sewer system ready for service as outlined in the Drawings and Specifications. Requirements for excavation and backfill of trenches, surface restoration, traffic control, and special appurtenances are specified under separate sections. The term "gravity sewer lines" shall also mean drain lines.

Items included in this Technical Specification are intended to be broad in scope and may not always apply to all items of work to be constructed. All applicable sections, as determined by the CTUIR Public Works Director, shall control the work outlined in the Contract Documents.

2. Specifications References. Specification references made herein for manufactured materials such as pipe, fittings, and manhole rings and covers refer to designations for the American Water Works Association (AWWA), or the American Society for Testing and Materials (ASTM) as they are effective on the date of call for bids.

3. Catalog Information. Catalog information on all materials and/or equipment to be installed shall be submitted to the CTUIR Public Works Director for review prior to installation.

4. Care and Handling of Materials. Adequate precautions shall be taken to prevent damage to pipes, fittings, manhole components, and all other materials used in construction of a sewerage system. Pipe and other materials during transport shall be secured individually by use of wood spacer blocks or wood crates, or otherwise protected to prevent collision of individual pieces and the possible subsequent damage.

All pipe, fittings, manhole components, and valves shall be loaded and unloaded in a manner to prevent shock or damage. Under no circumstances shall such material be dropped. All materials on the ground shall be protected from damage. All pipes, fittings, manhole components, valves, and all other materials used in the construction of the sewerage system shall be carefully inspected by the Contractor prior to installation. All defective materials shall be rejected. All materials which are delivered considerably in advance of their installation shall be stored in a

satisfactory manner. The Contractor will receive no payment for materials on hand that are not so protected.

Proper materials, tools and equipment shall be used by the Contractor for safe and convenient prosecution of the work. All pipes, fittings, etc. shall be carefully lowered into the trench piece by piece in such a manner to prevent any damage to the materials. Under no circumstances shall sewage system materials be dropped or dumped into the trenches.

5. Materials Furnished by CTUIR. The Contractor's responsibility for material furnished by the CTUIR shall begin at the point of delivery to the Contractor. Materials already on the site shall become the Contractor's responsibility on the day of the award of the Contract. The Contractor shall examine all material furnished by the CTUIR at the time and place of delivery to him and shall reject all defective material. Any material furnished by the CTUIR that becomes damaged by the Contractor shall be replaced by the Contractor at his own expense. The Contractor shall assume full responsibility for materials furnished by the CTUIR once they are received by the Contractor.

6. Certification by Manufacturer. The Contractor shall furnish to the CTUIR Public Works Director, when required by the CTUIR Public Works Director, a sworn statement from the manufacturer, stating that inspection and all specified tests have been made on the supplied material and that the results thereof comply with appropriate specifications. The statement shall also state that all materials furnished are in accordance with these Contract Documents and that all materials are new. Final payment will not be made until proper certifications are submitted to the CTUIR Public Works Director.

7. Restoration, Finishing, and Cleanup. The Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, sidewalks, trees and shrubbery, lawns, pastures, fences and other existing facilities to their original condition. See Technical Specifications - "Excavation and Backfill of Trenches" and Technical Specifications - "Surface Restoration" for specific requirements.

8. Work With Existing Asbestos Cement Pipe. When working with A/C pipe, the Contractor shall take all precautions necessary to reduce airborne asbestos during construction. All work with A/C pipe shall conform with American Water Works Association Publication "Work Practices for Asbestos-Cement Pipe." The Contractor shall cut asbestos cement pipe by using snap cutters only. The use of carbide tipped cutting blades or high-speed, abrasive disks shall not be permitted as a means of cutting A/C pipe. Machining of this pipe shall be done with a manual

or power driven lathe. Hole cutting shall be accomplished with a tapping machine. Use of shell cutters, rasps, chisels, electric drills, right angle sanders, or other high speed abrasive tools shall not be permitted. Dust and cuttings from all work shall be removed by wet mopping. All waste material shall be collected in a covered container and disposed at a landfill certified by the state or EPA to accept demolition waste.

9. Alternate Materials. Alternate materials will be considered in accordance with the requirements of the General Requirements.

B. GRAVITY SEWERS

1. General. Where no specific type of pipe is called for on the Drawings, the Contractor may select any type listed herein. Once a particular type of pipe is selected, the Contractor shall use that type for all pipe of the same diameter. Where a specific type of pipe is specified on the Drawings, the Contractor shall conform to those requirements. Such pipe shall also conform to the appropriate pipe specifications.

2. Materials.

a. PVC Pipe. PVC gravity sewer pipe and fittings 15 inches and smaller shall conform to ASTM D-3034, SDR 35 unless called for otherwise on the Drawings. The joints shall be flexible joint with rubber ring gasket. When called for on the Drawings, AWWA C900, DR 18 (150 psi pipe) shall be used. This pipe shall have flexible rubber gasketed joints conforming to ASTM D-3139.

b. ABS Pipe. ABS pipe for sewer service lines shall be Schedule 40D conforming to ASTM D2661. ABS pipe and fittings shall comply with the Uniform Plumbing Code.

c. Couplings. Mainline couplings shall be as manufactured by Fernco with stainless steel shear rings of the size and style required to match the pipe size and type being utilized, or approved equal.

d. Fittings for Sewer Service Connection. Mainline fitting for sewer service connections when installing new gravity sewer pipe shall be a gasketed wye suitable for ASTM D-3034 or ASTM F-679 sewer pipe. When service connections are required on existing sewer lines, a sewer tapping saddle shall

be used, such as "Geneco Sealtite," of the type and model required to match the sewer main line and service line pipe materials, or approved equal.

e. Locating Wire. Locating wire shall be a minimum of 12 awg UF solid copper with green colored insulation. The use of THHN wire will not be acceptable. At all splices the connecting ends of the wires shall be overlapped and tied. The ends shall be stripped and connected with a wire nut to ensure an electrical connection and made waterproof with an approved silicone splice kit. The splice kit shall be King Technology Model 50-566 (1637 N. Warson Road, St. Louis, MO 63132, 1-800-633-0232) or approved equal. Where location wire is to be secured to the exterior of cleanouts, post, etc., stainless steel pipe straps shall be used.

3. **Construction**.

a. Trench Excavation and Backfill. Trench excavation and backfill shall be performed as specified in the Technical Specifications - "Excavation and Backfill of Trenches."

b. Installation of Pipe. Gravity sewer pipe shall be installed in accordance with the best current practices and as required by the manufacturer. Gravity sewer pipe, unless otherwise approved by the CTUIR Public Works Director, shall be laid by progressing up grade from the existing or newly constructed sewer; the sewer pipe shall be installed with bell ends laid upgrade unless otherwise approved. Each pipe shall be properly bedded so as to be supported along the full length of the pipe. A suitable foundation shall be achieved by a slight excavation for the bell at each joint.

All rubber ring joints shall be lubricated and installed in accordance with the installation instructions of the pipe manufacturer, taking particular care to avoid pinching or otherwise causing damage to the rubber ring. All joints shall be free of dirt and other foreign matter prior to the joining of the next pipe. All joints shall be restrained to prevent creep and misalignment of joints. All pipe shall have a ring painted around the spigot ends in such a manner as to allow field checking of setting depth of pipe in socket.

Gravity sewer main lines shall be installed with the use of a laser beam and target. Unless the work involves deep excavations, traffic problem, water problem or approved by the CTUIR Public Works Director, the trench for the first 100 feet shall not be backfilled until the sewer grade has been checked. The Contractor shall set and aim the laser as controlled by the required

"depths" and "slopes." Careful attention shall be given to the setting up of the laser and the periodic checking of its aim, etc. All grade checking of laser shall be the responsibility of the Contractor. All pipe shall be installed true to line and grade. A tolerance of plus or minus 1/4-inch deviation from true grade at each joint will be allowed. Extra care shall be given to the installation of sewer lines at minimum slopes to avoid flat slopes in the line. All pipe shall be installed true to line except when approved otherwise by the CTUIR Public Works Director or shown on the Drawings. When approved or specified, the Contractor may install a pipeline on a curve, but deflections shall not exceed the pipe manufacturer's recommended maximum deflection. For PVC pipe, deflections shall be achieved by bending the pipe. No joint deflections shall be allowed.

All foreign matter and gravel shall be removed from the inside of the pipe and fittings before being installed and the pipe and fittings shall be kept clean during placement. No pipe shall be laid in water or when conditions exist that in the opinion of the CTUIR Public Works Director are unsuitable for the placing of pipe. All pipe and manholes shall be covered or plugged at night.

The Contractor may elect, at his own option, to drain or pump groundwater from the trenches into previously placed new sewer lines as long as adequate disposal is provided. The Contractor shall not discharge any groundwater into existing live sewer lines. Adequate provisions shall be made by the Contractor for final disposal of the groundwater from trenches as approved by the CTUIR Public Works Director. Any water discharged into new sewer lines shall be properly screened to prevent the entrance of debris and gravel. At the termination of dewatering operations the Contractor shall thoroughly clean the sewer lines that were used. No sewer lines will be accepted as completed until being cleaned as approved by the CTUIR Public Works Director.

4. Gravity Service Lines. Gravity service lines shall be constructed in accordance with the Drawings, Specifications, and applicable provisions of the Uniform Plumbing Code as amended by the State of Oregon. The minimum slope of service lines shall be 1/4-inch per foot unless otherwise approved by the CTUIR Public Works Director. The pipe size of gravity service lines shall be a minimum 4-inch diameter unless otherwise specified. The Contractor shall end gravity service lines at the location as per the Drawings and at the invert elevation as shown on the Drawings or as set by the CTUIR Public Works Director. Dead ends of service lines shall be marked with steel fence posts installed in the ground as shown on the Drawings.

Connection of service lines to new or existing gravity sewer collector lines shall be as per the Drawings and shall be inspected and accepted by the CTUIR Public Works Director prior to backfilling. All sewer service connections shall be watertight utilizing appropriate sewer service saddles or wyes. An approved wye fitting shall be used when new sewer mains are being installed. All holes and taps into an existing sewer main shall be cut using an approved tapping machine.

In the construction of new sewage collection systems, connection of new services allowing sewage into the system shall not be made until approval for connections has been given by the CTUIR Public Works Director. No existing sewer service shall be interrupted without the approval of the CTUIR Public Works Director and service owner. Connections of new service lines to existing service lines shall be by the proper adaptor coupling.

The Contractor shall obtain all necessary permits required to construct service lines from the CTUIR and the City of Pendleton prior to performing any work.

5. Locating Wire. A continuous solid copper tracer or locating wire shall be taped along the top of all sewer service lines. This wire shall be secured to the top of the pipe at maximum 10-foot intervals using 6-inch strips of 2-inch wide duct tape. All splices shall be tied, electrically continuous, and made waterproof. Access to terminal ends of the locating wire shall be made at cleanouts, terminal line marker posts, and as shown on the plans, etc. The Contractor shall be responsible for testing continuity in the wire after all work has been completed. The Contractor is advised to do intermediate testing on his own after backfilling operations and prior to surface restoration work to be sure continuity is maintained. If there is a break or defect in the wire, it shall be the Contractor's responsibility to locate and repair the defect. The continuity of the location wire shall be tested by utilizing a pipe locator to verify that a signal can be received along the full length of the service line. The CTUIR Public Works Director shall witness the acceptance test.

6. Testing.

a. General. The Contractor shall furnish all labor, necessary equipment, and other apparatus including, but not limited to, gauges, mechanical or pneumatic plugs, and air hose, necessary to properly perform the testing of sewer lines as specified. New sewer service lines connected to existing sewer lines will not be tested, but new service lines on new sewer lines shall be tested. The Contractor may low pressure test sections of sewer lines before backfilling at his own option; but the acceptance test shall be performed only after backfilling, cleaning, and flushing has been completed.

b. Acceptance Test. The Contractor shall perform all preliminary testing required to determine that the lines to be tested are acceptable and comply with the requirements of this section of the Specifications. After the Contractor has determined that the lines will pass the required test, the Contractor shall arrange for an acceptance test to be witnessed by the CTUIR Public Works Director. The Contractor shall coordinate the timing of this acceptance test with the CTUIR Public Works Director. Twenty-four hour notice shall be provided. The lines will not be accepted until the acceptance test has been witnessed and documented as passing. If the acceptance test fails to pass the required testing, the CTUIR may bill the Contractor the travel time and all additional time of the CTUIR Public Works Director for witnessing any additional tests.

c. Test Procedure. The method of testing follows the procedures outlined in "Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe" published by Uni-Bell PVC Pipe Association, May 1990. Specific questions concerning test procedures may be referred to this publication. To facilitate test verification by the CTUIR Public Works Director, all air used shall pass through a single, above-ground control panel. The CTUIR Public Works Director shall have the option of requiring the use of his own gauge. Test procedures are summarized below:

1. The Contractor may wet the lines prior to testing.

2. Determine the average height of the groundwater over the line. The test pressures required shall be increased 0.433 psi for each foot of average water depth over the exterior crown of the pipe.

3. Add air slowly to the section of system being tested until the internal air pressure is raised to 4.0 psig greater than the average back pressure due to groundwater, but no greater than 9.0 psig.

4. After the test pressure is reached, allow at least two minutes for the air temperature to stabilize adding only the amount of air required to maintain pressure.

5. After the temperature stabilization period, disconnect the air supply.

6. Record the time in seconds that is required for the internal air pressure to drop 0.5 psig from 3.5 psig to 3.0 psig greater than the average back pressure due to groundwater.

7. If the time shown in Table I (attached at the end of this Technical Specification), for the designated pipe size and length, elapses before the air pressure drops 0.5 psig, the section undergoing test shall have passed and shall be presumed to be free of defects. The test may be discontinued once the prescribed time has elapsed even though the 0.5 psig drop has not occurred.

8. If the pressure drops 0.5 psig before the appropriate time shown in Table I has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.

9. A Q value of 0.0015 cubic feet per minute per square foot shall be utilized to assure the CTUIR of quality pipe materials, good workmanship and tight joints.

Use the Test Work Sheet at the end of this Technical Specification for reporting test results for each section of sewer line tested.

d. Infiltration Allowance. Groundwater infiltration to the collection system, including manholes, shall not exceed 50 gallons/inch diameter of pipe/mile/day. Any infiltration in excess of this amount shall be corrected at the Contractor's expense.

e. Deflection Test for PVC Pipe. All sanitary sewers constructed of PVC pipe shall be able to pass a deflection test. The test shall be conducted by pulling a go-nogo solid pointed mandrel or sewer ball through the completed pipeline. The diameter of the mandrel or ball shall not be less than 95 percent of the base inside pipe diameter as defined by ASTM D-3034, SDR 35 and ASTM F679, T-1 pipe. The base inside pipe diameter and minimum mandrel diameter are as follows:

Nominal Pipe Size, In.	Minimum Mandrel Dia. In.	Base Inside Pipe Dia., In.
6"	5.46	5.742
8"	7.28	7.665
10"	9.08	9.563
12"	10.79	11.361
15"	13.20	13.898
18"	16.13	16.970

All lines shall be tested unless determined otherwise by the CTUIR Public Works Director based upon his observations during pipeline installation and visual inspection of the pipeline. Testing shall be conducted on a manhole to manhole basis and shall be done after the line has been completely cleaned and flushed with water. The Contractor shall, at his own expense, locate and repair any sections failing to pass the deflection test. All areas failing the deflection test shall be retested after corrective action has been taken.

f. Equipment. The Contractor shall perform all work and furnish all materials and equipment as required to perform all required tests.

C. PRESSURE SEWERS

1. General. The Contractor shall furnish and install pressure sewer lines of the size, type, and class called for on the Drawings. Pipe shall meet the following specifications.

2. Materials.

a. General. The Contractor shall furnish and install pressure sewer pipe of the size, type, class, and material called for on the Drawings. Where no specific type of pipe is called for, the Contractor may select any type listed herein. Once a particular type and manufacturer is selected, the Contractor shall use that type for the entire project unless other types are specifically called for on the Drawings.

b. PVC Pipe. PVC pipe for pressure sewer lines shall conform to AWWA C900, DR 18 (150 psi pipe), or as otherwise specified. The pipe shall have flexible rubber gasketed joints conforming to ASTM D-3139.

c. High Density Polyethylene Pipe. High density polyethylene pipe shall conform to AWWA C906 and shall have the SDR requirements called for on the Drawings. All joints shall be by the heat fusion method in accordance with the manufacturer's requirements. Fittings shall be standard commercial products manufactured by injection molding or by extrusion and machining or fabricated from AWWA C906 pipe. The Contractor shall provide detailed shop drawings for all joints and connections, including provisions for expansion and contraction as recommended by the pipe manufacturer.

d. Fittings for PVC Pipe. Unless specified otherwise, all fittings such as elbows, tees, crosses, etc. shall be mechanical joint short-bodied compact ductile iron fittings conforming to AWWA C153, Class 350. All fittings shall be cement mortar lined in accordance with AWWA C104. Gaskets shall be either ring or full faced, 1/8-inch thick conforming to AWWA C111, Appendix B.

e. Restrained Pipe Joints and Fittings. Where called for on the Drawings, restrained pipe joints shall be mechanical joint ductile iron with "MEGALUG" field-installed restraint devices as manufactured by Ebaa Iron, Inc., or approved equal.

f. Valves and Valve Boxes. Gate valves 2 inches and larger shall conform to AWWA C509 or C515. Valves shall be designed for 200 psi minimum working pressure and shall be of iron body, resilient seat, non-rising stem construction. Valves shall be equipped with O-ring type packing. The valve shall have a 2-inch AWWA operating nut for buried service or as called for on the Drawings. The valve ends shall be of the type required to match the pipe to which they will be connected, as required in the Bid Schedule or as shown on the Drawings. Valves shall be resilient wedge Kennedy Ken-Seal II or equal.

Each valve shall be equipped with an adjustable cast iron box of the sliding type with a base large enough to cover the top casting of the valve. The diameter of the valve box shall be not less than five (5) inches, and shall be of such length so as to provide the depth of cover over the pipe without full extension. Materials and installation workmanship for valve boxes shall be in accordance with AWWA C600, Section 10.3.

g. Plug Valves. All plug valves shall conform to AWWA C504. The valve body shall be constructed of cast iron (semi-steel) conforming to ASTM A126 Class B and shall be protected with a factory-applied fusion-bonded coating meeting AWWA C550. The shaft and plug shall be integrally constructed of cast iron (semi-steel) and shall be 100 percent encapsulated with Buna N rubber. The stem seals shall be Buna N multiple "V" ring stem packing seals. The valve seat surface shall be raised welded-in overlay of not less than 90 percent nickel. Flange dimensions, facing, and drilling shall conform to ANSI B16.1, Class 125. Mechanical joints shall meet the requirements of AWWA C111/ANSI A21.11. The valve shall have a 2-inch AWWA operator not for buried services and handwheel operator for non-buried services or as called for on the Drawings. Worm gear operators shall be furnished for all 4-inch or

larger valves. Valves shall be M&H 1820 eccentric plug valves, Pratt Ballcentric plug valves, or approved equal.

Each valve shall be equipped with an adjustable cast iron box of the sliding type with a base large enough to cover the top casting of the valve or underground actuator. The diameter of the valve box will be not less than 5 inches, and shall be of such length so as to provide the depth of cover over the pipe without full extension. Materials and installation workmanship for valve boxes shall be in accordance with AWWA C600, Section 10.3.

h. Thrust and Anchor Blocks. Thrust and anchor blocks shall be located and sized as shown on the Drawings, and at all changes in direction, or as required by the CTUIR Public Works Director. Concrete used for the blocks shall be Portland Cement concrete with a minimum 28-day strength of 2,500 psi. All concrete shall be placed so that pipe joints and fittings will be accessible for repair. Concrete shall be placed against undisturbed material. Anchor rods shall be 3/4-inch diameter galvanized steel, embedded a minimum of 18 inches in concrete.

i. Locating Wire. Locating wire shall be a minimum of 12 awg UF solid copper with green colored insulation. The use of THHN wire will not be acceptable. At all splices the connecting ends of the wires shall be overlapped and tied. The ends shall be stripped and connected with a wire nut to ensure an electrical connection and made waterproof with an approved silicone splice kit. The splice kit shall be King Technology Model 50-566 (1637 N. Warson Road, St. Louis, MO 63132, 1-800-633-0232) or equal. Where location wire is to be secured to exterior of cleanouts, valve boxes, etc., stainless steel pipe straps shall be used.

3. Construction. The Contractor shall construct pressure sewer lines of the size, type, and class specified on the Drawings. Pipe shall meet the material specifications contained herein. All work performed in the installation of pressure sewer lines shall be performed as per the Drawings, the applicable portions of subsection "Gravity Sewers-Construction" contained herein, and as required by the manufacturer. When it is necessary to deflect pipe joints to conform to the profile and alignment of the sewage forcemain, the amount of deflection per joint shall not exceed 70 percent of the deflection recommended by the Manufacturer. All pressure sewer lines shall be installed to grade as shown on the Drawings.

Sewage air release valves shall be provided where required and designed for the intended use.

Installation of service line pipe shall be in accordance with the applicable requirements contained herein. The Contractor shall end pressure service lines at the location as per the Drawings and at the invert elevation as shown on the Drawings or as set by the CTUIR Public Works Director. Dead ends of service lines shall be marked with steel fence posts installed in the ground as shown on the Drawings.

In the construction of new sewage collection systems, connection of new services allowing sewage into the system shall not be made until connections have been approved by the CTUIR Public Works Director. No existing sewer service shall be interrupted without the approval of the CTUIR Public Works Director and service owner.

The Contractor shall obtain all necessary permits required to construct service lines on private property.

4. Locating Wire. A continuous solid copper tracer or locating wire shall be taped along the top of all pressure sewer lines, including service lines. This wire shall be secured to the top of the pipe at maximum 10-foot intervals using 6-inch strips of 2-inch wide duct tape. The location wire shall be brought to the surface at all valve boxes, cleanouts, and terminal line marker fence posts. The wire shall be secured to valve boxes, cleanouts, and posts with stainless steel pipe clamps. All splices shall be tied, electrically continuous, and made waterproof. Access to terminal ends of the locating wire shall be made at all manholes, cleanouts, valve boxes, terminal line marker fence posts, and as shown on the plans, etc. The result of this installation shall be a continuous wire circuit electrically isolated from ground. The Contractor shall be responsible for testing continuity and for testing isolation from ground in the wire after all work has been completed on the test section. The Contractor is advised to do intermediate testing on his own after backfilling operations and prior to surface restoration work to be sure continuity is maintained. If there is a break or defect in the wire, it shall be the Contractor's responsibility to locate and repair the defect. The continuity of the location wire shall be tested from one test load point to the next by use of a temporary wire laid between test points in-line with an ohmmeter. Resistance shall be measured with an approved ohmmeter that has been properly calibrated. The continuity of a test section will be accepted if the resistance of the test section does not exceed 5 ohms per 500 feet of location wire being tested. Isolation from ground shall be measured with a megohmmeter and shall be a minimum of 20 megohms for any section of location wire tested. The CTUIR Public Works Director shall witness the acceptance test.

5. **Testing**.

a. General. The Contractor shall be responsible for determining the length of any given section of line to be tested. It is recommended that the length of line to be tested not be excessive so that the identification of any problem areas can be readily made. It is also recommended that testing follow closely after the pipe installation and backfill.

b. Hydrostatic Testing of Pressure Sewer Lines. Each section of the lines before being placed into service shall be isolated and slowly filled with water. Air should be expelled from the lines through taps made at the high points. The Contractor shall be responsible for making any necessary taps in addition to those shown on the Drawings, and such additional taps shall be at no additional cost to the CTUIR.

All lines shall be pressure tested by the Contractor at 100 psi pressure for one hour. Any cracked or defective pipe or fitting shall be removed and replaced.

c. Leakage Test. Each section of the line before being placed into service shall be tested by the Contractor for leakage for a period of two hours at an average gage pressure of 60 psi. The pressure during the test shall not fall below 40 psi. The allowable leakage is defined by the following equation: $L=ND\ (P)^{0.5}/7400$ in which L = allowable leakage (gal/hr), N = number of joints or connections, D = nominal diameter in inches, P = average gage pressure during the test in psi. Leakage is defined as the quantity of water supplied into the section of line being tested, during and at the end of the test, that quantity being such that the pressure at the end of the test is equal to the pressure at the beginning of the test. Should any test disclose leakage greater than that specified, the Contractor shall locate and repair the defective joints until the leakage is within the specified allowance.

d. Equipment. The Contractor shall perform and provide all equipment and materials necessary to perform the required test.

D. MANHOLES

1. **Material.**

a. Cast-in-place Concrete Base Sections. Cast-in-place concrete base sections for manhole construction shall have a minimum 28-day strength of

3,000 psi, unless approved otherwise by the CTUIR Public Works Director, and shall not be less than 6 inches in thickness in any section. Required "U" shaped channels shall be constructed by the use of properly shaped forms. Intersecting flow channels shall have smooth uniform transitions. All channels shall have smooth troweled finishes. All shelf area shall be uniformly shaped, have a rough float finish and shall slightly slope towards the channel. The shelf shall be above the top of the sewer pipe. The Contractor shall be responsible for the determination of pipe hole orientation and grade. Cast-in-place concrete base sections will only be used where called for specifically on the Drawings or where approved by the CTUIR Public Works Director.

b. Precast Concrete Base Sections. Precast concrete base sections shall be approved by the CTUIR Public Works Director. Concrete shall be consolidated by mechanical vibration and shall have a minimum strength of 3,000 psi at 28 days. Reinforcing shall be provided in the base and walls. Minimum concrete thickness shall be 6 inches. Required "U" shaped channels shall be constructed by the use of properly shaped forms. Intersecting flow channels shall have smooth uniform transitions. All channels shall have smooth troweled finishes. All shelf area shall be uniformly shaped, have a rough float finish and shall slightly slope towards the channel. The shelf shall be above the top of the sewer pipe. The Contractor shall be responsible for the determination of pipe hole orientation and grade. Precast concrete base sections shall not be used unless specifically called for otherwise on the Drawings or approved by the CTUIR Public Works Director.

c. Precast Concrete Manhole Sections. Precast concrete manhole sections shall conform to ASTM C-478 and consist of circular sections in the standard 48-inch diameter. No more than two lift holes shall be cast into each section. Holes shall be located as to not damage reinforcing or expose it to corrosion. At the manufacturer's option, steel loops may be provided for handling, in lieu of lift holes. All lift holes shall be patched to prevent water seepage into the manhole. Precast manhole cones shall be eccentric unless otherwise specified and shall meet ASTM C-478. Flat slab covers for manholes shall conform to ASTM C-478. Slabs, cones and ring sections shall be free from fractures, cracks, rock pockets, or exposed reinforcement. Joint seal material shall be "Kent seal" mastic acrylic polymeric sealant, O-ring rubber gasket, or approved equal.

Manholes which have a depth of 5-1/2 feet or less, from the top of the manhole cover to the pipe invert, shall utilize a 48-inch diameter section and flat slab cover. Cone sections shall not be used for manholes less than 5-1/2 feet in

depth, unless approved by the Engineer, or called for on the Drawings. Manholes with a flat slab cover may be required for depths greater than 5-1/2 feet when called for on the Drawings.

d. Pipe Connection to Manholes. All pipe connections to manholes shall be constructed as shown on the Drawings, shall be flexible, and shall allow movement of the sewer pipe in all directions. Manhole pipe couplings shall be suitable for the sewer pipe type connecting to the manhole. A/C sewer couplings with an appropriate adaptor gasket by Romac Industries, or approved equal, may be used for cast-in-place manhole bases. When precast base sections are used, an A-Lok pipe connector as manufactured by A-Lok Products, Inc., PSX Flexible Connector as manufactured by Press Seal Gasket Corporation, Kor-N-Seal as manufactured by Core and Seal Company, or approved equal shall be used. All pipe/manhole connections shall be watertight. The manhole pipe couplings shall be installed in accordance with all manufacturer instructions. All connections shall match the grade and alignment of the pipe entering and exiting each manhole. Manhole pipe connections shall be constructed so that the wastewater flow through the manhole is not restricted in any way. Fittings for drop manholes shall be of the same material as the attached sewer pipe.

e. Manhole Rings and Covers. Manhole rings and covers shall be Inland Foundry Co., Inc., No. 802 Suburban or 822 with no hole cover, Style 1 Blind Pickhole, or approved equal. Castings shall be tough, close-grained, gray iron free from blow holes, shrinkage and cold sheets. They shall conform to ASTM A-48 and shall be smooth, sound, clean and free from blisters and defects. Castings and covers shall be planed and ground when necessary to insure flat and true surfaces. Covers shall be true and shall seat within the ring at all points. When watertight cover is called for on the Drawings or in the General Requirements, an Inland Foundry No. 804 **OR** 823 frame with watertight cover shall be provided, or equal. Provide 2 extra gaskets for each watertight cover furnished.

f. Manhole Inflow Protectors. The watertight manhole inflow protectors shall be manufactured of a plastic polymer that will not corrode, cannot be damaged by sewer gases or road oils, and will not become brittle in subfreezing temperatures. They shall have a spring-loaded gas relief valve automatically activated at approximately 1/2 psi and a vacuum relief valve automatically activated when the differential pressure reaches approximately 2-1/4 psi. The bowl shall be deep enough that the valves or the protector are not damaged during the removal of the lid. The gasket shall be a heat welded type that

conforms to the irregularities in the frame. The watertight manhole insert shall be "Sewer Guard" by Fosroc-Preco Industries, Ltd., or approved equal. Manhole inflow protectors shall be installed where shown on the Drawings or where required by the CTUIR Public Works Director.

The Contractor shall be responsible for measurement of manhole openings, the dimension of which is required for ordering of watertight manhole inserts. New covers to have manhole inserts shall be factory machined to accept the insert.

g. Manhole Stubouts. Manhole stubouts shall be constructed as called for on the Drawings or as directed by the CTUIR Public Works Director. The stubouts shall have the appropriate flexible connection at the manhole. The outside end of the stubout shall be secured, sealed watertight with a block and plug with rubber ring seal. All stubouts shall be 8-inch diameter and 5-foot minimum length unless otherwise approved or shown.

2. Construction. Manholes shall be constructed to the line, grade, and detail as shown on the Drawings and as approved by the CTUIR Public Works Director. Excavation and backfill of the manhole shall be performed in the same manner as specified in Technical Specifications -"Excavation and Backfill of Trenches," where applicable. The base section shall be carefully placed on the prepared bedding of 6" minimum base of crushed rock so as to be fully and uniformly supported in true alignment, and making sure that all entering pipes can be inserted on proper grade. All connections and joints made at manholes shall be watertight. All manholes are to be watertight and any leakage shall be corrected in an approved manner. Backfill shall be brought up evenly on all sides of the manhole.

3. Testing. The Contractor shall be responsible for providing all equipment, labor, and materials necessary for performing manhole testing.

All manholes shall be individually tested to verify their watertightness. Each manhole shall be tested for acceptance after all work has been completed including restoration work. Preliminary testing prior to final acceptance is advised.

The testing shall be by a vacuum test in conformance with ASTM C1244 "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test." All manholes must be watertight. Any points of leakage must be repaired by the Contractor, even if the manhole passed the vacuum test.

The vacuum test shall generally follow the following procedures:

a. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.

b. The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.

c. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury.

d. The manhole shall pass if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the values indicated in Table 1.

e. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall then be retested until a satisfactory test is obtained.

f. The results of the manhole test shall be reported on the "Attachment B - Manhole Test Record" form, a copy of which is located at the end of this section. The Contractor shall complete this form and provide it to the CTUIR Public Works Director prior to Substantial Completion.

TABLE 1 - Minimum Test Times for Various Manhole Diameters

Depth (ft.)	Diameter, inches								
	30	33	36	42	48	54	60	66	72
	Time, seconds								
≤8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	39	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

4. Connection to Existing Manhole. Connections to existing manholes when required on the Drawings shall be made by the Contractor. All connections shall be made in such a manner as to leave the existing manhole watertight. All flow lines shall be properly shaped, and all new concrete shall be placed against a clean and sound surface. An approved epoxy bonding agent shall be used on all existing surfaces to be bonded to new concrete or mortar. All applicable conditions for new manholes described previously shall apply.

E. CLEANOUTS

1. Materials.

a. Cast Iron Rings and Covers. Main line cleanouts shall have cast iron rings and covers such as Inland Foundry Co., Inc., No. 240, for 8-inch riser pipes, and No. 241 for 6-inch riser pipes, or approved equal. Service line cleanouts shall have cast iron rings and covers such as Inland Foundry Co., Inc., No. 274, or approved equal.

b. Pipe. Pipe used in the construction of cleanouts shall be consistent with type of sewer pipe to which it is connected.

2. **Construction**.

a. Main Line Cleanouts. Main line cleanouts shall be constructed as shown on the Drawings. The select backfill shall be carefully compacted around the cleanout riser pipe to prevent damage or displacement of the pipe.

b. Service Line Cleanouts. Service line cleanouts in public rights-of-way shall be constructed as per the Drawings and approved by the Engineer. Service line cleanouts on private property shall be constructed in accordance with the Uniform Plumbing Code.

3. Testing. Cleanouts shall be tested as a part of the lines to which they are connected.

F. WATER-SEWER CROSSING

Wherever possible, the bottom of new or existing water lines shall be 1.5 feet or more above the top of the sanitary sewer line. Where the water line crosses over the sanitary sewer line but with a clearance of less than 1.5 feet, the Contractor shall center one full length of the new sewer pipe at the crossing point. Use PVC pressure pipe, ASTM D-2241, SDR 32.5, (125 psi) at the crossing point. Where the water line crosses under the sanitary sewer line, the Contractor shall center one full length of the new sewer pipe at the crossing point.

If the CTUIR Public Works Director determines that conditions are not favorable or finds evidence of poor water line condition, the water line shall be replaced with a full length of water pipe centered at the crossing point.

When constructing sewer service lines, the CTUIR Public Works Director may require the depth of the service lines to be revised in order to eliminate the need for a water-sewer line crossing.

G. MARKER POSTS

The Contractor shall furnish and place 4"x4" pressure treated wood posts at locations shown on the Drawings and as directed by the CTUIR Public Works Director to mark the locations of certain manholes and other appurtenances. Posts shall be set solidly in the ground. All posts improperly set shall be reset.

H. CLEANING AND FLUSHING OF COMPLETED AND TESTED SEWERS

Prior to final inspection of the sewer system by the CTUIR Public Works Director, the Contractor shall flush and clean all parts of the system. All accumulated construction debris, rocks, gravel, sand, silt, and other foreign material shall be removed from the sewer system at or near the closest downstream manhole. If necessary, mechanical rodding or bucketing equipment shall be used.

All sewer pipes including gravity sewers, pressure sewer lines, service lines, etc., installed shall be flushed, as thoroughly as possible with the water pressure and outlets available. Flushing shall be done after the pressure test has been made. It must be understood that flushing removes only the lighter solids and cannot be relied upon to remove heavy material allowed to get into the sewers during construction. The Contractor shall provide sufficient water and appropriately sized taps at either end of the line to develop a velocity in the sewers during flushing of at least 2.5 fps.

I. SEWER LINE INSPECTION

1. Television Inspection. The gravity sewer lines and drain lines shall be visually inspected by means of closed circuit television. The intent of the television inspection option is to enable the CTUIR to inspect the interior of select runs of gravity sewer line to determine the general quality of pipeline installation. The CTUIR may require the TV inspection to be performed up to one year after completion and acceptance of the work.

All sections designated by the CTUIR Public Works Director to be TV inspected shall be cleaned sufficiently to allow passage of TV equipment and so that cracked joints and breaks can best be observed. Cleaning shall be by high pressure flushing or as approved by the CTUIR Public Works Director. During the TV inspection the contractor shall maintain a small flow of water in the pipeline in order to observe high or low areas in the grade of the pipe.

The television camera used for the inspection shall be one specifically designed and constructed for such inspections. The camera shall be self-propelled with a remote control rotating head capable of "looking up" service line connections and also capable of 360° scanning of pipeline joints. It shall be operative in 100 percent humidity conditions. Lighting and camera quality shall be suitable to allow a clear, in-focus picture of a minimum of 6 lineal feet of the entire inside periphery of the sewer pipe. The camera shall be color with standard broadcast quality or better. The Contractor shall submit a video tape which demonstrates the camera picture

quality prior to performing the work. The camera picture quality shall be approved by the CTUIR Public Works Director. To ensure peak picture quality throughout all conditions encountered during the survey, a variable intensity control of the camera lights and remote control adjustments for focus and iris shall be located at the monitoring station. Focal distance shall be adjustable through a range of from 6 inches to infinity. Camera monitors shall be located within a temperature controlled studio which will allow seating of two authorized viewing personnel in addition to the operating technician. There shall be available within the studio two or more viewing monitors operating simultaneously and of a proper size to allow all persons in the studio to have a satisfactory and comfortable view of the video presentation. Monitors shall have good quality resolution. Continuously displayed on the monitors as part of the video presentation shall be the date of the survey, number designation of the manhole section being surveyed, and a continuous forward and reverse readout of the camera distance in feet from the manhole of reference. The ability to change the location of this readout on the picture is a desirable feature.

The operating technician shall have control of the movement of the television camera at all times. This may be accomplished by means of remote control winches or by telephone or other suitable means of communications between the winches at either end of the manhole section being surveyed. The travel speed of the camera shall be uniform and shall not exceed 30 feet per minute. Any means of propelling the camera through the sewer which would exceed this rate of speed or produce non-uniform or jerky movements shall not be acceptable. At the Contractor's discretion or at the direction of the CTUIR Public Works Director, the camera shall be stopped and backed up to view and analyze conditions that appear unusual or uncommon to a good sound sewer. The operating technician shall at all times be able to move the camera through the line in either direction without loss of quality in the video presentation on the monitor. The picture at all times shall be free of electrical interference and provide a clear, stable image of the resolutions specified.

Video tape recording of all sewer line inspections shall be made on 1/2-inch VHS video cassettes recorded on "SP" speed and shall be enclosed in vinyl plastic boxes. The composite video and audio tape recordings of the sewer line inspections shall be compatible for replay on current VHS Video Recorders. The replay of the recorded video information, when reviewed on a monitor receiver, shall be free of electrical interference and provide a clear, stable image. The audio portion of the composite signal shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of the oral report. Audio reports shall be recorded by the operating technician on the video tapes as they are being produced and shall include the location of the sewer, the names or numbers

of the manholes involved, a manhole-to-manhole direction of travel, and a detailed description of the conditions in the sewer line as they are encountered.

In no case will dubbing of the audio portion be allowed after the survey. The video taping and the monitoring equipment shall have the capability to instantly review both video and audio quality of the video tape productions at all times during the television survey. The purpose of the video tape recording shall be to supply a permanent visual and audio record of the manhole section surveyed, and the video tapes shall become the property of the CTUIR Public Works Director upon completion of the project.

Detailed printed location records shall be made by the operating technician and shall clearly show the exact location in relation to the adjacent manholes of each infiltration point, building sewer connections, all joints which are infiltrating or exhibit other unusual conditions, roots, storm sewer connections, collapsed sections of pipe, joints sealed, presence of scale or corrosion and other discernible features. Handwritten reports shall be submitted to the CTUIR Public Works Director daily. Within 20 days of completion of the initial TV inspection work, the inspection report forms shall be typewritten and submitted to the CTUIR Public Works Director. The video tape shall be properly indexed to the written reports using real time and an index to the written reports shall be provided which indexes each sewer line section (between manholes) to the reports. The intent is to enable a user of the report to easily find any given section of the sewer system in the reports and on the video tapes. Prior to commencing work, the Contractor shall provide the CTUIR Public Works Director a sample of the proposed report format to be used by the Contractor. The CTUIR Public Works Director and Contractor shall agree on the report format before work proceeds. All reports shall be complete and accurate.

2. **Necessary Repairs**. If in the opinion of the CTUIR Public Works Director, after TV inspection, the sewer lines in question require repair and/or replacement to meet the original contract specifications, the contractor shall be required to perform all necessary repairs and replacement at no cost to the CTUIR. It shall be understood that any necessary repairs required will have been the result of poor construction or defective materials.

3. **Inspection of Lines**. Supplemental to TV inspection shall be the inspection of lines by excavation at suspected joints, etc. If, in the opinion of the CTUIR Public Works Director, a line is suspected to have excess infiltration, the CTUIR Public Works Director may require the Contractor to excavate down to the joint(s) in question. The Contractor is responsible only for those lines or parts thereof he actually constructed. If any joints or pipes are found to be defective in that portion

the Contractor constructed, the Contractor alone shall bear the cost of locating, excavation, and replacing or repairing the defective pipe or joints in a line. If no defects are found in a suspect line, the CTUIR shall bear the justifiable costs incurred in the search for infiltration defects.

TABLE I

MINIMUM SPECIFIED TIME REQUIRED FOR A 0.5 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015

1 Pipe Diameter (in.)	2 Minimum Time (min: sec)	3 Length for Minimum Time (ft.)	4 Time for Longer Length (sec.)	Specification Time for Length (L) Shown (min:sec)							
				100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.	450 ft.
4	1:53	597	.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	46:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23

TEST WORK SHEET FOR THE GRAVITY SEWER LINE LOW PRESSURE AIR TEST BY THE TIME PRESSURE DROP METHOD

Project Name_____

Date _____ **Job No.** _____

Location of Test/Stationing _____

1. Wetted Line: Yes _____ No _____
2. Average height of groundwater over crown of sewer line _____ ft.
3. Internal Air Pressure (P_1):
   P_1=4.0 psig + Groundwater Ht. x 0.433 psi = 4.0 + (___' x .433)= ____ psig
4. Initial Starting Test Air Pressure (P_2):
   $P_2 = P_1 - 0.5$ psig = _____ - 0.5 = _____ psig
5. Ending Test Air Pressure (P_3)
   $P_3 = P_2 - 1.0$ psig = _____ - 1.0 = _____ psig
6. Time of test from P_2 to P_3 (in seconds)
   Start Time T_1 _____
   End Time T_2 _____
   $T_2 - T_1$ = _____ seconds
7. Test Pipe Data

Pipe Diameter (inches)	Length of Pipe	Minimum Time Required (from Table I)	Actual Time ($T_2 - T_1$)	Actual Time Greater Than Min. Required? Yes/No*

* If actual time is greater than minimum required, then the pipe passes the pressure test.

Test Passed: ____ Yes ____ No
Corrective Measures: _____
_____
_____.

Contractor's Firm Name:_____

Contractor's Representative Signature:_____ Title: _____

Public Works Director's Representative's Signature:_____
Title:_____

ATTACHMENT B

MANHOLE TEST RECORD

Project: _____ Project No. _____

Contractor: _____ Testing Company: _____

Witnessed By: _____ (Inspector)

Date	MH No.	Paved? (P or U)	MH Depth	VACUUM				HYDROSTATIC						COMMENTS
				MH Diam.	Time Req.	Vac. Start	Vac. End	Time Start	Time End	Total Time	Volume Change	Loss (gph)	PASS FAIL	

NOTE:

All Adjacent surface restoration will be completed before conducting a sanitary manhole acceptance test, including finish paving and final adjustment to grade. Any test conducted beforehand shall be considered informal and will not count for acceptance.

Vacuum test will be conducted in accordance with latest applicable standards, such as established procedures based on ASTM C1244-93, starting at 10" Hg of vacuum.

Manholes shall be filled to a mark on the iron frame at the start of the test, or to the rim of the frame.

STORM DRAINAGE SYSTEM

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
STANDARD TECHNICAL SPECIFICATIONS
SECTION 3
STORM DRAINAGE SYSTEM

A. GENERAL

1. Scope. These specifications cover the furnishing and installation of gravity storm drain lines, catch basins, manholes, and miscellaneous appurtenances. The work includes, unless otherwise specified, furnishing all labor, materials, tools, equipment and incidentals required to construct a complete storm drainage system ready for service as outlined in the Drawings and Specifications.

2. Specifications, References. Specification references made herein for manufactured materials such as pipe, fittings, and manhole rings and covers refer to designations for the American Water Works Association (AWWA), or the American Society for Testing and Materials (ASTM) as they are effective on the date of call for bids.

3. Catalog Information. Catalog information on all equipment to be installed shall be submitted to the Engineer for approval prior to installation.

4. Care and Handling of Materials. Adequate precautions shall be taken to prevent damage to pipes, fittings, manhole components, and all other materials used in construction of the storm drainage system. Pipe and other materials during transport shall be secured individually by use of wood spacer blocks or wood crates, or otherwise protected to prevent collision of individual pieces and the possible subsequent damage.

All pipe, fittings and manhole components shall be loaded and unloaded in a manner to prevent shock or damage. Under no circumstances shall such material be dropped. All materials on the ground shall be protected from damage. All pipes, fittings, manhole components, and all other materials used in the construction of the drainage system shall be carefully inspected by the Contractor prior to installation. All defective materials shall be rejected. All materials which are delivered considerably in advance of their installation shall be stored in a satisfactory manner.

Proper materials, tools and equipment shall be used by the Contractor for safe and convenient prosecution of the work. All pipes, fittings, etc. shall be carefully lowered into the trench piece by piece in such a manner to prevent any damage to the materials. Under no circumstances shall materials be dropped or dumped into the trenches.

5. Certification by Manufacturer. At the CTUIR Public Works Director's request, the Contractor shall furnish a sworn statement from the manufacturer, stating that

inspection and all specified tests have been made on the supplied material and that the results thereof comply with appropriate specifications. The statement shall also state that all materials furnished are in accordance with these Contract Documents and that all materials are new.

6. **Restoration, Finishing, and Cleanup**. The Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, sidewalks, trees and shrubbery, lawns, pastures, fences and other existing facilities to their original condition. See Technical Specifications - "Excavation and Backfill of Trenches" and Technical Specifications - "Surface Restoration" for specific requirements.

7. **Alternate Materials**. Alternate materials will be considered in accordance with the General Requirements.

B. GRAVITY STORM DRAINS

1. Materials.

a. Solid Wall PVC Pipe. Solid wall PVC pipe shall be solid wall construction and shall conform to the requirements of ASTM D-3034, SDR 35 for pipe up to 15-inch diameter and ASTM F-679, Type 1 only, for pipe sizes 18- to 27-inch diameter. Joints for solid wall PVC pipe shall conform to ASTM D-3212 using elastomeric gaskets conforming to ASTM F-477.

b. Profile Wall PVC Pipe. Profile wall PVC culvert pipe and profile wall PVC storm sewer pipe shall be Johns-Manville "Perma-Loc," or equal, meeting the requirements of AASHTO M-304 or ASTM F-794 Series 46. Joints for profile wall PVC pipe shall conform to ASTM D-3212 using elastomeric gaskets conforming to ASTM F-477.

c. Ductile Iron Pipe. Ductile iron pipe and fittings shall conform to AWWA C150, AWWA C115, AWWA C151, and AWWA C110 and shall be minimum pressure Class 150 unless specified otherwise. All ductile iron pipe shall have a bituminous sealed cement mortar lining conforming to AWWA C104. All joints, unless otherwise specified, shall be push-on rubber gasket joints conforming to AWWA C111.

d. HDPE Pipe. Corrugated high density polyethylene pipe and fittings 48 inches and smaller shall conform to AASHTO M-252 and AASHTO M-294 accordingly. Corrugated high density polyethylene pipe and fittings shall have watertight joints

and shall be either Hancor "Blue-Seal," Advance Drainage System "N-12," or equal. All joints for corrugated polyethylene pipe shall be made with a bell/bell or bell and spigot coupling and shall conform to ASTM D-3212 using elastomeric gaskets conforming to ASTM F-477. All gaskets shall be factory installed on the pipe in accordance with the manufacturer's recommendations.

2. **Construction**.

a. Trench Excavation and Backfill. Trench excavation and backfill shall be performed as specified in the Technical Specifications - "Excavation and Backfill of Trenches." When the installation involves the replacement of an existing line, the trench excavation and backfill shall include the removal of existing curbs, sidewalks, paving and base rock, and the existing line, etc., as may be required.

b. Installation of Pipe. Gravity storm drain pipe shall be installed in accordance with the best current practices and as required by the manufacturer. Gravity storm drain pipe, unless otherwise approved by the CTUIR Public Works Director, shall be laid by progressing upgrade from the existing or newly constructed storm drain; the pipe shall be installed with bell ends laid upgrade unless otherwise approved. Each pipe shall be properly bedded so as to be supported along the full length of the pipe. A suitable foundation shall be achieved by a slight excavation for the bell at each joint.

All rubber ring joints shall be lubricated, except when using rolling rubber gaskets with concrete pipe, and installed in accordance with the installation instructions of the pipe manufacturer, taking particular care to avoid pinching or otherwise causing damage to the rubber ring. All joints shall be free of dirt and other foreign matter prior to the joining of the next pipe. All joints shall be restrained to prevent creep and misalignment of joints. All pipe shall have a ring painted around the spigot ends in such a manner as to allow field checking of setting depth of pipe in socket.

All pipe shall be installed true to line and grade as shown on the Drawings. A tolerance of plus or minus 1/4-inch deviation from true grade at each joint will be allowed. Extra care shall be given to the installation of storm drain lines at minimum slopes to avoid flat slopes in the line.

All foreign matter and gravel shall be removed from the inside of the pipe and fittings before being installed and the pipe and fittings shall be kept clean during placement. No pipe shall be laid when conditions exist that in the opinion of the

CTUIR Public Works Director are unsuitable for the placing of pipe. All pipe and manholes shall be covered or plugged at night.

The Contractor may elect, at his own option, to drain or pump groundwater from the trenches into previously placed new storm drain lines as long as adequate disposal is provided. Adequate provisions shall be made by the Contractor for final disposal of the groundwater from trenches as approved by the CTUIR Public Works Director. Discharge water into new storm drain lines shall be properly screened to prevent the entrance of debris and gravel. At the termination of dewatering operations the Contractor shall thoroughly clean the storm drain lines that were used. No storm drain lines will be accepted as completed until being cleaned as approved by the CTUIR Public Works Director.

3. **Testing**.

a. Testing Procedure. All gravity storm drain lines shall be thoroughly cleaned by flushing with water. All storm drains constructed of PVC pipe shall be deflection tested not less than 30 days after the trench backfill and compaction has been completed. The test shall be conducted by pulling a go-nogo solid pointed mandrel or sewer ball through the completed pipeline. The diameter of the mandrel or ball shall be 95 percent of the inside pipe diameter. Testing shall be conducted on a manhole to manhole basis and shall be done after the line has been completely cleaned and flushed with water. The Contractor shall, at his own expense, locate and repair any sections failing to pass the deflection test and retest the section. The Contractor shall perform all work and furnish all materials and equipment as required to perform all required tests.

b. Equipment. The Contractor shall perform all work and furnish all materials and equipment required to perform all tests.

C. MANHOLES

1. **Material**.

a. Cast-in-place Concrete Base Sections. Cast-in-place concrete base sections for manhole construction shall have a minimum 28-day strength of 3,000 psi, unless approved otherwise, and shall not be less than 6 inches in thickness in any section. Required "U" shaped channels shall be constructed by the use of properly shaped forms. Intersecting flow channels shall have smooth uniform transitions. All channels shall have smooth troweled finishes. All shelf area shall

be uniformly shaped, have a rough float finish and shall slightly slope towards the channel. The shelf shall be above the top of the sewer pipe. The Contractor shall be responsible for the determination of pipe hole orientation and grade. Cast-in-place base sections will only be used where called for specifically on the Drawings or where required by the CTUIR Public Works Director.

b. Precast Concrete Base Sections. Precast concrete base sections shall conform to ASTM C-479 and be approved by the CTUIR Public Works Director. Concrete shall be consolidated by mechanical vibration and shall have a minimum strength of 3,000 psi at 28 days. Reinforcing shall be provided in the base and walls. Minimum concrete thickness shall be 5 inches. Required "U" shaped channels shall be constructed by the use of properly shaped forms. Intersecting flow channels shall have smooth uniform transitions. All channels shall have smooth troweled finishes. All shelf area shall be uniformly shaped, have a rough float finish and shall slightly slope towards the channel. The shelf shall be above the top of the sewer pipe. The Contractor shall be responsible for the determination of pipe hole orientation and grade. Precast base sections shall be used unless specifically called for otherwise on the Drawings or by the CTUIR Public Works Director.

c. Precast Concrete Manhole Sections. Precast concrete manhole sections shall conform to ASTM C-478 and consist of circular sections in the standard 48-inch diameter. No more than two lift holes shall be cast into each section. Holes shall be located as to not damage reinforcing or expose it to corrosion. At the manufacturer's option, steel loops may be provided for handling in lieu of lift holes. All lift holes shall be patched after installation. Precast manhole cones shall be eccentric unless otherwise specified and shall meet ASTM C-478. Flat slab covers for Type "B" manholes shall conform to ASTM C-478. Slabs, cones, and ring sections shall be free from fractures, cracks, rock pockets, or exposed reinforcement.

d. Pipe Connections to Manholes. All pipe connections to manholes shall be constructed as shown on the Drawings. All pipe-to-manhole connections shall be watertight. For solid wall PVC and ductile iron pipe, an A-Lok pipe connector as manufactured by A-Lok Products, Inc., PSC Flexible Connector as manufactured by Press Seal Gasket Corporation, Kor-N-Seal as manufactured by Core and Seal Company, or approved equal shall be used when precast base sections are used. Profile wall PVC and HDPE pipe to manhole connections shall utilize gaskets or fittings in combination with a non-shrink grout to provide a watertight seal and shall be approved by the CTUIR Public Works Director. The Contractor shall submit information on proposed profile wall PVC and HDPE pipe connections to

manholes to the CTUIR Public Works Director for approval. All connections shall match the grade and alignment of the pipe entering and exiting each manhole. Manhole pipe connections shall be constructed so flow through the manhole is not restricted in any way.

e. Manhole Rings and Covers. Manhole rings and covers shall be Inland Foundry Co., Inc., No. 802 Suburban or 822, 16 hole cover, Style 2 Pickhole, Style B raised surface skid, or approved equal. Castings shall be tough, close-grained, gray iron free from blow holes, shrinkage, and cold sheets. They shall conform to ASTM A-48 and shall be smooth, sound, clean, and free from blisters and defects. Castings and covers shall be planed and ground when necessary to ensure flat and true surfaces. Covers shall be true and shall seat within the ring at all points.

2. Construction. Manholes shall be constructed to the line, grade and detail as shown on the Drawings and as approved by the CTUIR Public Works Director. Excavation and backfill of the manhole shall be performed in the same manner as specified in Technical Specifications - "Excavation and Backfill of Trenches," where applicable. Backfill shall be brought up evenly on all sides of the manhole.

3. Connection to Existing Manhole. Connections to existing manholes, when required on the Drawings, shall be made by the Contractor. All flow lines shall be properly shaped, and all new concrete shall be placed against a clean and sound surface. An approved epoxy bonding agent shall be used on all existing surfaces to be bonded to new concrete or mortar. All applicable conditions for new manholes described previously shall apply.

D. CATCH BASINS/CURB INLETS

1. Materials.

a. Catch Basins/Curb Inlets. Catch basins/curb inlets shall be precast units manufactured in accordance with ASTM C-139 and C-913. Basin type shall be as shown on the Drawings. Concrete shall have a compressive strength of 3,000 psi. Reinforcement in precast structures shall be rebar meeting ASTM A-615 Grade 60 or welded wire meeting ASTM A-497. Reinforcement shall not be required for cast-in-place structures. Precast bases shall be furnished with cutouts or knockouts. Knockouts for pipes shall have a wall thickness of 2 inches minimum and may be located on all four sides.

b. Curb Inlet Tops. Curb inlet tops shall be precast top, CC Model 2-1/2A storm drain inlet as manufactured by Walt's Concrete, or equivalent with cast iron ring and cover. Walt's Concrete (541) 746-3673.

c. Catch Basin Frames and Grates. Catch basin grates shall be metal castings conforming to the requirements of ASTM A48, Class 30. Castings shall be tough, close-grained, gray iron free from blow holes, shrinkage and cold sheets. They shall be smooth, sound, clean, and free from blisters and defects. Castings shall be planed and ground when necessary to ensure flat and true surfaces. Catch basin frames shall be hot dip galvanized A36 steel.

d. Oil-Water Separators. Oil-water separators shall be The Snout by Best Management Products, Inc. (800-504-8008), or approved equal. Oil-water separators shall be constructed of a corrosion resistant material and be equipped with a watertight access port, a mounting flange, and a means to prevent siphons. The size and position of the oil-water separator shall accommodate the outlet pipe size and allow the bottom of the device to be located 6 inches below the pipe invert elevation. The oil-water separator shall be securely attached to the structure wall with an oil-resistant gasket, corrosion resistant hardware, couplings, etc., for a complete installation.

e. Pipe Connection to Catch Basins/Curb Inlets. All pipe connections to precast units shall be watertight. For solid wall PVC and ductile iron pipe, a 1/2-inch pipe gasket stretched over the pipe shall be used in combination with a non-shrink grout to provide a watertight seal. The profile wall PVC and HDPE pipe connection shall utilize gaskets or fittings in combination with a non-shrink grout to provide a watertight seal and shall be approved by the Engineer. The Contractor shall submit shop drawings for proposed pipe connections to catch basins, area drains, and field inlets. All connections shall match the grade and alignment of the pipe entering and exiting each unit. Pipe connections shall be constructed so flow is not restricted in any way.

All holes shall be located to provide the design flow line and direction of any pipe entering the catch basin, area drain, or field inlet. After the pipe connection is made and set to grade, the annular space between the pre-cast unit and the pipe shall be cement grouted to permanently set the flow line of the pipe. Non-shrink cement grout shall be used.

2. Construction. Catch basins/curb inlets shall be constructed to the line, grade, and detail as shown on the Drawings and as approved by the CTUIR Public Works

Director. Excavation and backfill of the manhole shall be performed in the same manner as specified in Technical Specifications - "Excavation and Backfill of Trenches," where applicable. All connections and joints made at catch basins/curb inlets shall be watertight. All catch basins/curb inlets are to be watertight and any leakage shall be corrected in an approved manner. Backfill shall be brought up evenly on all sides of the units.

3. Connection to Existing Catch Basins/Curb Inlets. Connections to existing catch basins/curb inlets when required on the Drawings shall be made by the Contractor. All connections shall be made in such a manner as to leave the existing catch basin/curb inlets watertight. All flow lines shall be properly shaped, and all new concrete shall be placed against a clean and sound surface. An approved epoxy bonding agent shall be used on all existing surfaces to be bonded to new concrete or mortar. All applicable conditions for new catch basins described previously shall apply.

E. CULVERTS

1. General. Culverts shall be installed in the location as shown on the Drawings, in accordance with the details and as specified herein.

Culverts shall be Type 2 corrugated steel pipe and shall be a minimum 14-gauge with 2-2/3-inch x 1/2-inch corrugations. Fabrication of pipe shall conform to AASHTO M-274 and AASHTO M-36 Specifications. Joints shall be made with corrugated steel culvert bands over 3/8-inch neoprene gaskets. Culvert bands shall be 12 inches wide.

2. Installation. Culverts shall be bedded and backfilled uniformly on both sides of the pipe at the same time to prevent displacement or buckling of the pipe. Bedding material shall be worked carefully under the pipe haunches and then compacted. Bedding and backfill material shall consist of select native material free of particle sizes greater than 1-1/2-inch in diameter.

F. HEADWALLS AND CONTROL STRUCTURES

1. General. Headwalls and other drainage structures shall be constructed in accordance with the drawings and applicable technical specifications. Construction shall be to the lines, grades, and dimensions called for.

2. **Materials.**

a. Portland Cement Concrete. The Portland Cement concrete used for this work shall be an approved commercial transit mix having a minimum 28-day compressive strength of 3,000 psi.

b. Reinforcing. Mild steel reinforcing bars shall be furnished, cut, bent, and placed as indicated on the Drawings and to the latest methods of practice approved by the Concrete Reinforcing Steel Institute. At the time of placing concrete, all reinforcement shall be free from loose mill scale, rust, grease, or other coating which might destroy or reduce its bond with concrete. Steel reinforcement not placed in the work shall be stored under cover to prevent rusting, and shall be placed on blocking such that no steel touches any ground surfaces.

Reinforcing steel shall be in position before concrete placement is begun. All reinforcing steel shall be tied together and supported in such a manner that displacement during placing of concrete will not occur.

G. DRAINAGE CHANNEL AND DITCHES

Drainage channels and ditches shall be constructed to the lines, grades, and locations shown on the Drawings. Restoration shall be as called for on the Drawings and according to applicable technical specifications.

H. EROSION AND STORMWATER POLLUTION CONTROL

The Contractor shall install such devices as may be required to prevent erosion from the site during the construction operations and to prevent and mitigate stormwater pollution. Where necessary, the Contractor shall install silt fences, sand bags, straw/hay bales, matting, bio filter bags, etc., to prevent soil erosion and stormwater pollution. The Contractor shall protect and maintain all new swales and detention basins from construction surface water and silt which would damage these facilities until the project is completed.

I. CLEANING AND FLUSHING OF COMPLETED STORM DRAINS

Prior to final inspection of the drainage system by the CTUIR Public Works Director, the Contractor shall flush and clean all parts of the system. All accumulated construction debris, rocks, gravel, sand, silt, and other foreign material shall be

removed from the system at or near the downstream manhole or outlet. If necessary, mechanical rodding or bucketing equipment shall be used.

All drain pipes shall be flushed, as thoroughly as possible, with the water pressure and outlets available. It must be understood that flushing removes only the lighter solids and cannot be relied upon to remove heavy material allowed to get into the drainage system during construction. Where practical, the Contractor shall provide sufficient water at the upper end of the line to develop a velocity in the storm drain line during flushing of at least 2.5 fps.

EXCAVATION AND BACKFILL OF TRENCHES

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
STANDARD TECHNICAL SPECIFICATIONS
SECTION 4
EXCAVATION AND BACKFILL OF TRENCHES

A. GENERAL

These specifications cover excavation and backfill of trenches for the installation of sanitary sewers, water lines, service lines, underground utility conduits, storm drain facilities, and other underground utilities.

Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of work to be constructed. All applicable sections, as determined by the CTUIR Public Works Director, shall control the work outlined in the Contract Documents.

B. SAFETY

See requirements for project safety in the General Requirements.

C. EXISTING UTILITIES

See the General Requirements for contract requirements for existing utilities and for preservation of survey monumentation.

D. CUTTING OF ASPHALT PAVEMENT, AND CONCRETE SIDEWALKS, CURBS AND DRIVEWAYS

Where the excavation is made in a paved street, the asphalt surface shall be cut on each side of the trench prior to excavation, to provide a vertical joint in the surface. Cutting of the asphalt will be made with a saw designed for the cutting of asphalt.

Prior to excavating across a concrete structure such as a curb, sidewalk, or driveway, the Contractor shall cut and remove a section of the structure in order to provide for his excavation. The dimensions of the removed section shall be such that the Contractor's excavation will not result in undermining of the remaining structure. The Contractor shall cut the concrete structure with a diamond saw or other equipment designed for that purpose such that a neat, straight, vertical edge is left on the remaining concrete structure. The Contractor shall similarly cut and remove any such concrete structure undermined or damaged by his construction work.

Following proper backfill and compaction of his excavation, as specified herein, the Contractor shall repair streets, replace the curbs, sidewalks, or driveways in conformance with the Drawings, or, if no Drawing is provided, equal to the condition prior to removal.

E. CLEARING AND GRUBBING

Contractor shall do all clearing and grubbing and removal of structures, etc. necessary to permit proper installation of the pipeline and to eliminate the possibility of stumps, logs, brush, or rubbish being mixed with the backfill material. A sufficient amount of all stumps and stump roots shall be removed so that any future removal of any remaining parts of the stumps and/or roots will not damage the pipeline. All stumps, roots, logs, brush and rubbish shall be removed and disposed of in conformance with the requirements of local authorities controlling air pollution, and solid waste disposal.

Should the area in which construction takes place be served by rural mail carrier service, the Contractor shall cooperate with the mail service and re-install, in a convenient location, any rural mail boxes which will have to be removed or be blocked by construction operations. As soon as the work is completed, all mail boxes removed shall be replaced undamaged in their original location.

As soon as the work is completed, all signs, guardrails, utility poles, fences, etc., which were moved for the construction operation shall be replaced undamaged in their original location. Damaged items shall be replaced by the Contractor with new items of equal quality.

F. DUST AND MUD CONTROL

The Contractor shall take appropriate action to control dust and mud caused by his operations. This shall include, but not be limited to, watering of exposed areas, cleaning of roadways, etc. This is considered a normal part of the construction project. If the Contractor fails to properly control the dust and mud, the CTUIR Public Works Director may request him to do so in writing. If, after 24 hours from this request, the Contractor has not corrected the dust or mud problem, the CTUIR may elect to have the corrective work performed and the Contractor will be billed for the cost of the work. Water for dust control can be obtained from the CTUIR Water/Sewer Department.

G. TRENCH EXCAVATION

1. General Trench Excavation. General trench excavation shall include whatever materials that are encountered (except solid rock) to the depths shown on the Drawings or as required to properly install the pipe.

2. Rock Excavation. When solid rock is encountered in trench excavation, the CTUIR Public Works Director shall be notified. Solid rock is defined as being rock formations other than cemented gravels that require hard ripping, jack hammering,

blasting, or other extra work beyond the capability of heavy duty trench excavating equipment such as a Caterpillar 235 or 345B Excavator. Cemented gravel excavation may be included as "Rock Excavation" when said excavation requires hard ripping, jack hammering or blasting and ONLY when in the opinion of the CTUIR Public Works Director such conditions were unforeseen and are beyond the capability of heavy duty trench excavating equipment such as a Caterpillar 235 or 345B Excavator.

3. Trench Width. The maximum trench width in the pipe zone, unless shown otherwise on the Drawings and except where a trencher is used, shall be 2 feet plus the O.D. of the pipe and the minimum trench width in the pipe zone shall be 1 foot plus the O.D. of the pipe. This width shall be maintained to the top of the pipe. The maximum clear width above the top of the pipe will not be limited except in cases where excess width of excavation would cause damage to adjacent structures or utilities. The Contractor should note the pay limits of gravel and asphalt restoration listed under Technical Specifications - "Surface Restoration." The determination of the safe trench width is the sole responsibility of the Contractor.

4. Unsuitable Material. When natural soil conditions exist in the bottom of the trench that are unsuitable for proper pipe installation, the Contractor shall immediately notify the CTUIR Public Works Director. The Contractor shall then over-excavate the trench below the design grade to a depth specified by the CTUIR Public Works Director. Such over- excavation shall be to provide for foundation material as specified herein. This provision applies also to manhole and vault foundations. No additional payment will be made to the Contractor for additional excavation without prior approval of the CTUIR.

As an alternative to over-excavation and placement of foundation material, a geotextile fabric may be used if field use proves acceptable. The fabric material shall be placed on the bottom of the trench and the bedding material placed over the fabric to proper pipe grade. The fabric width shall be one foot wider than the trench bottom. Fabric material shall be Mirafi 500X or approved equal.

5. Shoring, Sheeting, and Bracing of Trenches. The Contractor shall adequately sheet and brace the trench during excavation whenever necessary to satisfy trench safety standards, prevent cave-ins, or to protect adjacent structures or property. Where sheeting and bracing are used, the Contractor shall increase trench widths for the bracing material accordingly. The sheeting must be kept in place until the pipe has been placed, backfilled at the pipe zone, tested for defects, and repaired if necessary. All sheeting, shoring, and bracing of trenches shall conform to the requirements of the public agency having jurisdiction.

H. DEWATERING EXCAVATION AREA

All groundwater, seepage, or stormwater that may occur or accumulate in the excavation during the progress of the work shall be removed. In areas where the nature of soil and hydrostatic pressures are of such a character as to develop a quick condition in the earth mass of the trench, the dewatering operation shall be conducted so that the hydrostatic pressure will be reduced to or near zero in the immediate vicinity of the trench. All excavations shall be kept free of water during the construction or until otherwise requested by the CTUIR Public Works Director. The Contractor shall dispose of all waste and water removed from the trench. Disposal shall be in accordance with all federal and local regulations.

I. LOCATION OF EXCAVATED MATERIALS

During trench excavation, the excavated material shall be located within the construction easement or right-of-way so that the excavated material will not obstruct any private or public traveled roadways or streets, or cause undue damage to the streets. The Contractor shall provide means of containing overly saturated soils, i.e., muck, or remove the muck from the work area as it is excavated, if such soils are encountered in the excavation. The intent is to prevent excessive damage or disruption to street rights-of-way or easement beyond what would normally occur during such work. Pile and maintain material from trenches so that the toe of the slope of the material excavated is at least two feet from the edge of the trench. It shall be the Contractor's responsibility, however, to determine the safe loading of all trenches.

J. DISPOSAL OF MATERIALS

The Contractor shall dispose of all excavated material, which is not required for, or is unsuitable for, backfill. The Contractor's method of disposal shall comply with regulations of the governing body having jurisdiction.

K. SOIL AND GROUNDWATER CONDITIONS

The Contractor is responsible for making such additional investigations as he may deem necessary to acquaint himself with actual conditions to be encountered in performing the work. Groundwater conditions in particular should be carefully considered and are subject to change.

L. TRENCH BACKFILL

1. General. The term backfill, as hereafter used, is the filling of the trench to the natural ground level or the finish grade line shown on the Drawings. All backfill material shall be placed into the trench so that free fall of the materials into the trench is prevented until at least two feet of cover is provided over the pipe. Under no circumstances shall sharp or heavy pieces of material be allowed to drop directly onto the pipe. Methods of backfilling, other than as specified herein, shall be used only upon the approval of the CTUIR Public Works Director.

2. Foundation Material/Trench Stabilization Fabric. Foundation material or stabilization fabric, as shown on the Drawings, shall be provided by the Contractor only when specifically called for on the Drawings or in these Specifications or when required by the CTUIR Public Works Director. Foundation material or stabilization fabric will only be required when standard bedding requirements will not adequately support the pipe. Foundation material shall be well-graded 2-1/2"-0 or 1-1/2"-0 crushed rock.

3. Bedding and Select Backfill. Bedding and select backfill materials shall be subject to the approval of the CTUIR Public Works Director. Unless trench conditions dictate otherwise, acceptable materials include well-graded 1"-0' or 3/4"-0 crushed rock.

A minimum 4-inch depth of bedding, unless shown otherwise on the Drawings, shall be placed on the trench bottom, compacted to 85 percent of the maximum density as determined by ASTM D-698 and smoothed to provide uniform bedding so the pipe is supported along its full length and not by the bells. It shall be understood that the 4-inch depth is a minimum depth only, not an average depth and does not preclude the Contractor at his option from placing additional depth of bedding to facilitate his work. Once the pipe is properly installed, the bedding material shall be brought up to the spring line of the pipe in 4-inch lifts and compacted to 85 percent density. Care shall be used to ensure that the bedding material is properly worked under the haunch of the pipe for its full length. No additional payment will be made to the Contractor should he elect to use additional bedding material for his convenience. Payment for any additional bedding material used as foundation material must be approved by the CTUIR prior to any work being performed.

Select backfill shall be installed as called for on the Drawings above the top of the pipe, and leveled and compacted to 85 percent of ASTM D-698 density. Compaction of the bedding and select backfill by hand tamping will be allowed if the 85 percent density is achieved; otherwise, mechanical tamping will be required.

When an open graded material is used for bedding or foundation material to facilitate trench dewatering, the open graded material shall be placed to the spring line of the pipe. The Contractor shall make provisions to insure that fines from the select backfill do not migrate into the open graded bedding or foundation material. To prevent soil migration the Contractor may use any of the following: 1) Provide a properly graded select backfill approved by the CTUIR Public Works Director; 2) Provide a fiber/fabric such a Mirafi 140 Fabric or approved equal, between the open graded bedding material and select backfill; 3) Hydraulically jet select backfill fines into open graded bedding material after dewatering is complete and before general backfill is placed; 4) Provide an alternative approved by the CTUIR Public Works Director.

4. Anti-Flotation Fabric. When called for on the Drawings or called for by the Engineer, the Contractor shall place geotextile fabric over the select backfill material prior to placing general backfill. This fabric will help reduce the exposure to pipeline flotation. The fabric shall be placed in accordance with the requirements shown on the Drawings.

5. General Backfill. General backfill will consist of material excavated from the trench, or material imported by the Contractor. General backfill material shall be free of vegetative matter, boulders (10-inch plus), frozen material and any other unsuitable material, shall have a moisture content that will allow for the required compaction of the general backfill material, unless approved otherwise by the CTUIR Public Works Director. Use of backfill material containing consolidated masses 10-inch in diameter or greater is prohibited. When necessary, the Contractor shall selectively separate suitable general backfill material from unsuitable general backfill material. When the CTUIR Public Works Director determines that the native material excavated from the trench is unsuitable or unacceptable for use as general backfill, the CTUIR Public Works Director may require the Contractor to remove the unsuitable material from the project site and import suitable general backfill material. Suitable material shall be similar in nature to native soils as approved by the CTUIR Public Works Director. When imported general backfill must be placed in or below the groundwater, the imported general backfill shall be free draining granular material with less than 20 percent passing a No. 4 sieve and less than 3 percent passing a No. 200 sieve.

All general backfill material shall be pushed first onto the slope of the backfill previously placed and allowed to roll down into the trench. The Contractor shall not push the backfill material directly into the trench until at least two feet of cover is provided over the pipe.

6. Compaction. In roadways, driveways, under curbs and sidewalks, as shown on the Drawings, or as required by the CTUIR Public Works Director, general backfill shall

be placed in horizontal lifts and compacted to 90 percent of the laboratory density as determined by ASTM D-1557. The method of compaction shall be selected by the Contractor. The Contractor shall exercise extreme care to avoid damage to the pipe during compaction of the trench. Where materials consist of cobbles and coarse gravels, compaction of each lift shall be accomplished by at least five passes of an appropriate vibrating type compactor. When materials are such that meaningful in-place density test cannot be run, then the Contractor and CTUIR Public Works Director will agree on a method of compaction which will provide adequate compaction.

In sections where specific compaction requirements are not specified or required by the CTUIR Public Works Director, general backfill shall be compacted, as a minimum, to a density equal to that of the natural ground adjacent to the trench. All trenches shall be maintained for a period of one year after final acceptance of the project. **Any settlement of the trenches during the one-year guarantee period shall be remedied promptly at the request of the CTUIR Public Works Director and at no additional cost to the CTUIR.**

7. Controlled Density Fill (flyable fill or lean mix backfill). When called for on the Drawings, the Contractor shall backfill trenches with controlled density fill. The controlled density fill shall be placed in the trench in such a manner to ensure the trench is completely filled to the lines and grades called for on the Drawings. Controlled density fill shall not be placed within the pipe bedding or select backfill zone of any pipe conduit. The controlled density fill shall be protected from traffic loads for a three-hour period after which required surface restoration work may be performed.

Controlled density fill material shall be a flyable cement, sand, and Fly Ash Pozzolanic, or other approved materials, mixture that contains 75 to 120 pounds of Type II cement per cubic yard. The sand and other aggregates shall generally conform with the requirements of ASTM C-33. Air-entraining agent shall be added at the rate of 3 to 5 oz. per cubic yard. The material shall have a 28-day compressive strength of 100-200 psi and a slump of 7 inches plus or minus 1-1/2 inches at the time of placement. The low compressive strength of the material will facilitate future removal, if needed. The Contractor shall provide a mix design and data on the controlled density fill material he proposes to use along with current compression test results.

8. Canal or Irrigation Ditch Crossing. Where the trench crosses a canal, irrigation ditch, or culvert, the backfill shall be compacted the entire trench depth with mechanical tampers to 90 percent of the laboratory density as determined by ASTM D-1557. All backfill material in the canal or ditch liner and in the trench cut-off wall shall be imported clay or a soil/bentonite mixture as approved by the CTUIR Public Works Director. Unless required otherwise, the soil/bentonite mixture shall be one part

bentonite to 10 parts soil by weight. A high grade bentonite material shall be used. The ditch lining, conduit, or pipe shall be restored to its original condition. The crossing shall be water tight and free of any leakage or seepage. The Contractor shall be fully responsible for repairing canal or ditch banks at no cost to the CTUIR should leakage occur at the crossing.

M. RESTORATION, FINISHING, AND CLEANUP

The Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, sidewalks, trees and shrubbery, lawns, pastures and fences, or other existing facilities disturbed by his work unless otherwise specified. Restoration and cleanup shall be a continuing operation and shall be diligently pursued until completed. All surplus material and temporary structures as well as excess excavation shall be removed by the Contractor and the entire site of Contractor operations shall be left in a neat and clean condition as outlined in the General Requirements. Surface restoration shall be performed in accordance with Technical Specifications - "Surface Restoration." All other existing facilities shall be replaced or restored equal to their original condition.

SURFACE RESTORATION

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
STANDARD TECHNICAL SPECIFICATIONS
SECTION 5
SURFACE RESTORATION

A. GENERAL

Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of work to be constructed. All applicable sections, as determined by the CTUIR Public Works Director, shall control the work outlined in the Contract Documents.

The Contractor shall perform all work and furnish all materials to restore the work area including any gravel, asphalt, concrete, lawn, fences, or any other surfaces or items damaged or disturbed by his construction operation. Surface restoration shall follow as closely as possible the backfill and compaction of excavations.

Cleaning up shall be a continuing process from the start of the work to final acceptance of the project. The Contractor shall, at all times, keep the area on which work is in progress free from accumulations of waste material or rubbish.

Spillage from the Contractor's hauling vehicles on traveled public or private roads shall be promptly cleaned up. Upon completion of the work the Contractor shall remove all temporary structures, rubbish, and waste material, equipment and supplies, resulting from the Contractor's operations. The Contractor shall leave such lands in a neat and orderly condition which is at least as good as the condition in which the Contractor found them prior to the Contractor's operations. See specific requirements in the General Conditions.

In roadways and traffic areas, the Contractor shall be responsible for maintaining a road surface suitable for travel by the public from the time of excavation until the road surface has been restored. Such work includes dust control, temporary patching, signing, grading, and filling of potholes on temporary street surfaces, etc. The Contractor shall be responsible for all claims and damages resulting from his failure to maintain a suitable surface.

Any deficiencies found during the one-year guarantee period, such as settlement, potholes, or the breaking up of pavement, etc., including the failure to maintain a suitable temporary road surface, shall be promptly remedied by the Contractor upon the receipt of a written notice from the CTUIR Public Works Director. If the Contractor fails to perform any required repairs within 10 days of the written notice, the CTUIR may have the work performed by others and bill the Contractor for the costs incurred. During the project, if the Contractor fails to perform any temporary work as specified herein within 24 hours of the written notice, the CTUIR may have the work performed by others and deduct the cost from payments due the Contractor.

B. MATERIALS

1. Base Rock. Base rock shall substantially conform to current Oregon Standard Specifications for Construction for base aggregate materials, or as otherwise approved by the CTUIR Public Works Director. The intent is to specify a base rock which is suitable for use in the restoration of areas disturbed by the Contractor's work. Base rock required shall generally be 1"-0, or 3/4"-0 unless otherwise specified or approved. The Contractor shall submit to the CTUIR Public Works Director samples of the base rock he plans to use on the project.

2. Asphalt Concrete. Asphalt concrete shall be an approved commercial mix generally conforming to the applicable provisions of the current Oregon Standard Specifications for Construction for asphalt concrete pavement. Unless approved otherwise, the gradation of the mix shall generally conform to a 1/2-inch dense mix. The Contractor shall submit for review by the CTUIR Public Works Director data on the asphalt concrete mix to be used. Data shall include aggregates, gradation and tolerances, aggregate suitability, asphalt concrete, mix proportions and tolerances, etc.

Installation shall conform to the applicable provisions of the current Oregon Standard Specifications for Construction, Sections 00495 and 00744. Asphalt Concrete for temporary patches shall conform to Section 00745.50 of the Oregon Standard Specifications for Construction.

3. Cold-Mix Asphalt Concrete. Cold-mix asphalt concrete shall consist of a mixture of asphalt cement cut back with No. 2 fuel oil, and well-graded aggregate, plant mixed, and laid on a prepared foundation and compacted with a minimum 8-ton steel wheel roller. The aggregate shall meet the quality and gradation requirements for a standard ODOT 1/2-inch dense mix. The liquid fraction of the mix shall be 6-1/2 to 7 percent content by weight and shall consist of 70 percent PBA-2 or PBA-5 asphalt cement, and 30 percent No. 2 fuel oil. The cold-mix asphalt concrete shall remain alive in the stockpile until it is placed and compacted. After the No. 2 fuel oil evaporates, the remaining asphalt and aggregate mix shall remain stable and durable under traffic. The cold-mix asphalt concrete delivered to the project shall be fresh and workable. The Contractor shall deliver to the project a sample load of cold-mix asphalt concrete he proposes to use on the project. The mix shall be placed at locations which will be typical to its use on the project. The CTUIR Public Works Director and Contractor shall review its performance in the field. If its performance appears satisfactory, the mix may be used on the project. If its performance is not satisfactory, a revised mix shall be provided until a satisfactory mix is determined. Quality control of the mix will be based upon field performance. It will take some time to evaluate field

performance. Therefore, the same mix shall be delivered to the project early in the work.

4. Portland Cement Concrete. The Portland Cement concrete used for this work shall be an approved commercial transit mix. The exact proportions of all the materials entering into the concrete shall be as established by an approved laboratory mix design and shall be changed only as directed by the CTUIR Public Works Director or laboratory when necessary to obtain the specified strength, desired density, uniformity, or workability. Previously prepared mix designs will be allowed provided adequate test data is available to document the suitability of the mix and the Contractor can document that the same materials are being used.

The mix shall have a maximum water-cement ratio of 0.45, a minimum 28-day compressive strength of 4,000 psi, a minimum of 564 pounds of cement per cubic yard of mix, and an air content of 4-7 percent. The maximum allowable slump shall be 4 inches for all structures covered under this section of the specifications.

5. Lawn Seed. Lawn seed shall be a blend typically used in the area and of the type to match existing lawn areas, and must be approved by the CTUIR prior to use.

6. Pasture Seed. Pasture seed shall be a mixture of orchard grass, rye grass, and fescue, native to the area and must be approved by the CTUIR prior to use.

7. Fertilizer. Inorganic fertilizer shall be commercially available 22-16-8 with 22 percent nitrogen, 16 percent available phosphoric acid, 8 percent soluble potash, and a minimum of 2 percent sulfur.

8. Topsoil. Topsoil shall be native to the area and shall be approved by the CTUIR Public Works Director prior to use.

9. Mulch. All mulch shall be straw that has been air dried and seasoned before baling or loading. It shall be free of noxious weeds and other materials detrimental to grass growth.

10. Sod. Sod shall be 100 percent Kentucky Blue Grass or other types as approved by the CTUIR.

The sod shall be grown on agricultural land that is cultivated specifically for turf sod. The sod shall be free of weeds diseases, nematodes, and insects. All sod shall be

mature and not less than 10 months old. All sod shall be machine cut to a uniform thickness of 5/8-inch or more, excluding top growth and thatch. The seed mixture must be approved by the CTUIR prior to use on this project.

11. Soil Conditioners. Soil conditions shall be manufactured from composted sewage sludge, amended with organic and inorganic materials. They shall be as manufactured by EKO Systems, Inc. of Lewiston, Idaho, or equal.

12. Hydro Seed. The hydro seed shall be a specifically designed hydro mulch consisting of cellulose fiber, fertilizers, seed, tackifier, etc.

The hydro mulch shall be specifically processed cellulose fiber containing no growth or germination inhibiting factors. It shall be manufactured in such a manner that, after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended to form a homogenous slurry. When sprayed on the ground, the material shall allow absorption and percolation of moisture. Each package of cellulose fiber shall be marked by the manufacturer to show the air dry weight and content. The mulch shall be applied at a rate of 2,000 pounds per acre.

The fertilizer shall be a complete plant food containing slow release nitrogen, phosphoric acid, and potash in the amounts of 16-16-16+1.5 FE. It shall be delivered in uniform composition and be dry and free flowing and delivered in the original unopened containers bearing the manufacturer's guaranteed analysis. The fertilizer shall be applied at a rate of 430 pounds per acre in lawn areas and 50 pounds per acre in dryland grass areas. The tackifier shall be applied at a rate of 20 pounds per acre. The hydro seed mix shall be reviewed by the CTUIR Public Works Director prior to application.

The grass seed shall be certified, blue tagged, cleaned, and delivered in original unopened packages bearing an analysis of the contents. It shall be guaranteed 95 percent pure and have a minimum germination rate of 85 percent within 1 year of test. The seed shall be as agreed upon by the CTUIR. The seed shall be applied at a minimum rate of 4 pounds per 1,000 square feet.

13. Erosion Control Matting. Erosion control matting shall be seed and curlex blanket as supplied by American Excelsior Co., of Yakima, Washington, or approved equal.

14. Slope Stabilization Rock. Slope stabilization rock shall be pit run, a well-graded 4"-0 material with the approximate gradation:

Sieve	Percent Passing
4"	100
2"	35-50
1/2"	10-20
Less 1/4"	0-5

The 4"-0 slope stabilization rock shall be hard, durable, and resistant to weathering. The rock shall be angular in shape with an apparent specific gravity of 2.5 minimum. The Contractor shall develop a test pile of 4"-0 slope stabilization rock for approval by the CTUIR Public Works Director. Once the test pile has been approved by the CTUIR Public Works Director, all other 4"-0 rock shall be visually the same as the test pile.

C. CONSTRUCTION

1. Gravel Surface Restoration. During trench and general excavation, the Contractor shall minimize the disturbance of adjacent gravel surfaces. Backfill of trenches and other work area shall be in accordance with Technical Specifications - "Excavation and Backfill of Trenches," or other applicable requirements. In gravel streets, shoulders, parking areas or driveways disturbed by the work, the Contractor shall resurface the areas with "Base Rock" as required on the Drawings or equal to the existing depth of gravel plus the depth of granular subbase, if any, whichever is greater, unless otherwise specified on the Drawings or in these Specifications. The resurfacing aggregate shall be compacted to 95 percent of laboratory density as determined by ASTM D-1557.

2. Asphalt Street Restoration and Asphalt Parking - Driveway Restoration. Existing asphalt surfaces shall be cut on each side of the trench prior to excavation to provide a vertical, neat, straight-line joint in the surface. Should any asphalt surface be undermined or damaged during construction, the undermined or damages asphalt shall be similarly cut and removed prior to backfill. This work shall be performed along neat, continuously straight lines to provide a pleasing finished appearance. Irregular lines will not be allowed. Backfill shall be made in accordance with Technical Specifications - "Excavation and Backfill of Trenches." The base rock under the asphalt pavement shall be replaced to a compacted depth equal to the existing base rock depth plus the depth of granular subbase, if any, or as shown on the Drawings, whichever is greater. The base rock shall be compacted to 95 percent of the laboratory density as determined by ASTM D-1557.

Immediately following backfill and compaction of the trench, and until the asphalt concrete is replaced, the base rock course shall be placed and compacted flush with the existing asphalt surface and maintained in a good condition. In areas of heavy traffic, highway crossings, etc., a temporary cold-mix patch shall be placed and maintained until asphalt surface restoration is accomplished. Just prior to placing the asphalt concrete, the base rock course and any temporary patch shall be excavated to the depth equal to that of the asphalt concrete to be placed. Asphalt concrete shall be equal to the existing pavement or as shown on the Drawings, whichever is greater.

The restoration of asphalt concrete pavement in the state highway shall be performed as described on appropriate state highway crossing permits.

Asphalt concrete shall be compacted with an 8-ton minimum steel-wheeled roller and compacted to a minimum of 91 percent of the maximum density as determined by ASTM D-2041. Prior to placing the asphalt concrete, an asphalt tack coat shall be applied to the edges of the existing asphalt. An asphalt tack coat shall also be used between lifts should the Contractor elect to patch with multiple lifts. The Contractor shall utilize a paving machine, spreader box, or other approved mechanical equipment to place the asphalt concrete material. No lift of asphalt placed shall have a compacted thickness of less than 1/2 inch or greater than 3 inches. The finished asphalt surface shall be flush with the existing surface, uniform in appearance and shall provide a smooth ride equal to or better than the existing pavement.

3. Asphalt Concrete Joint Sealing. After a minimum of 30 days following completion of asphalt concrete restoration, the Contractor shall rout and clean joints between new asphalt concrete and the existing pavement. Routed joints shall be 1/2-inch wide x 3/4-inch to 1-inch deep. A hot asphalt-rubber joint sealant shall be placed in the joint flush with the surface to make a watertight seal. Sealant shall be Roadsaver 221 as manufactured by Crafco, Inc., or equal.

4. Concrete Sidewalk and Curb Restoration. Existing concrete surfaces shall be saw cut on each side of the trench prior to excavation to provide a vertical, straight-line joint in the surface. Should any concrete surface be undermined or damaged during construction, the undermined or damaged concrete shall be similar cut and removed prior to backfill. This work shall be performed along neat lines to provide a pleasing finished appearance. Irregular lines will not be allowed. Backfill shall be made in accordance with Technical Specifications - "Excavation and Backfill of Trenches."

A 2-inch compacted depth leveling course of base rock shall be placed on the prepared subgrade. The base rock shall be compacted to 95 percent of the laboratory density as determined by ASTM D-698.

Any forms used shall be wood or metal and shall be straight. They shall be suitably braced to prevent movement during placement. Joints shall be placed to match existing or as directed by the CTUIR Public Works Director. The placement and curing of the concrete shall follow good concrete placement practices. The concrete thickness, section, finish, configuration, etc. shall match the existing structure as closely as possible.

5. General Surface Restoration.

a. General. The Contractor shall replace or restore, equal to their original condition, all surfaces, trees and shrubbery, lawns, agriculture area, pastures and fences, or other existing facilities disturbed by his work unless otherwise specified. Restoration and cleanup shall be a continuing operation and shall be diligently pursued until completed. Surface restoration shall be completed as soon as possible after the underground work is complete. Particular attention shall be given to work areas outside of public rights-of-way. All surplus material, rock and debris, and temporary structures, as well as excess excavation, shall be removed by the Contractor and the entire site of Contractor's operations shall be left in a neat and clean condition. Lawns and pastures in private easement shall be restored to a smooth condition and reseeded with a like mixture of grass unless specified otherwise on the Drawings, in the Specifications, or in the easement documents. When backfilling trenches in private easements, unless otherwise specified, Contractor shall replace topsoil to minimum 1-foot depth or to a depth equal to the original depth, whichever is less. Lawn sod shall be utilized where called for on the Drawings or where required by the CTUIR Public Works Director.

b. Agricultural Areas. Where called for on the Drawings, the existing top soils in the excavation area shall be removed and stockpiled at a separate location from the general trench excavation material. This topsoil shall not be mixed or contaminated with any other materials. Upon completion of the trench backfill and after all rocks and unsuitable material have been removed from the work area, the stockpiled topsoil shall be replaced and graded to match the existing ground. The depth of topsoil restoration shall be as shown on the Drawings.

c. Seeding. All areas to be seeded shall have a minimum of 6 inches of topsoil. After the backfilling and compaction have been completed, the top 2

inches of the topsoil shall be scarified to provide a good seed bed and the area seeded, fertilized, compacted with a weighted roller, a straw mulch applied, and the initial watering completed. All additional watering of the grass seed shall be the responsibility of the property owners. Unless required otherwise, the seed shall be applied at a minimum rate of 4 pounds per 1,000 square feet, the fertilizer at 1 pound per 100 square feet, and the mulch at a rate needed to provide a minimum mulch thickness of 1 inch.

6. **Lawn Sod Restoration**.

a. General. Lawn sod restoration is required in those areas required by the CTUIR Public Works Director. Areas not receiving lawn sod restoration will be seeded.

b. Preparation of Areas. Cultivate the existing ground so the soil is loose and friable for at least a 6-inch depth and suitable for fine grading. Remove vegetative matter, rocks, clods, roots, sticks, debris, and other matter detrimental to the germination and growth of sod from the areas to be sodded. Spread soil amendments and fertilizers evenly over the sod bed at the rates specified below, then thoroughly rototill into the upper 4 inches of the soil. After tilling, fine-grade and roll the area to provide a fine-textured, smooth, firm surface, free of any undulations or irregularities. The finish grade of the sod bed shall be 1-inch below the finish grade of the walks. Rates of applications shall be as follows:

Material	Rate Per 1,000 Sq. Ft.
Soil Conditioner	6 Cu. Yds. (2" Depth)
Fertilizer: 22-16-8	10 Lbs.

c. Planting Season. Perform the work only when local weather and other conditions are favorable to bed preparation and placing of sod. Do not place sod before March 15 or after September 30.

d. Placing Sod. Do not place sod until it has been approved. Immediately before placing sod, water the bed to prevent drying of grass roots. Lay the first row in a straight line and place subsequent rows parallel to and tightly against each other. Stagger lateral joints. Do not stretch or overlap the sod. Tightly butt all joints. Do not use sod segments containing less than 2 square feet of

surface area, broken, torn, or uneven pieces. After placing sod, diagonally roll and thoroughly water. Apply a second application of fertilizer (22-16-8) at the rate of 10 lbs per 1,000 square feet and thoroughly water.

e. **Sod Lawn Establishment**. The establishment period for sod lawn begins after placing of sod in an area is completed. The establishment period will be at least two weeks and ends when accepted by the CTUIR. During the established period, adequately water all lawn areas. Keep mowed to a height of 1-1/2 to 2 inches. Do not attempt the first mowing until the sod is firmly rooted and secure in place. Remove no more than 1/3 of the grass leaf during initial or subsequent cuttings. Acceptance of sod lawn will be contingent on the grass being uniform in color, density, and height.

7. **Hydro Seeding**. Seeding shall not be done during windy weather or when the ground is excessively wet or otherwise untillable. Seed shall be placed at the rate and mix specified below. Seed will be placed with an approved hydro seeder which utilizes water as the carrying agent, and maintains continuous agitation through paddle blades. It shall have an operating capacity sufficient to agitate, suspend and mix into a homogenous slurry, and the specified amount of seed and water or other material. Distribution and discharge lines shall be large enough to prevent stoppage and shall be equipped with a set of hydraulic spray nozzles which will provide a uniform distribution of the slurry.

Seed and fertilizer may be applied in one application provided the fertilizer is placed in the hydro seeder tank no more than 30 minutes prior to application. The seed shall have a tracer added to aid uniform application. This tracer shall not be harmful to plant and animal life. If wood cellulose fiber is used as a tracer, the application rate shall not exceed 250 pounds per acre.

The Contractor shall remove mulch material which falls on plants, roadways, gravel shoulders, structures, areas where mulching is not specified, or which collects at the ends of culverts or accumulates to excessive depths, as directed.

8. **Erosion Control Matting**. Place matting as called for on the Drawings or as required by the CTUIR Public Works Director. Prepare site as specified for permanent seeding area preparation. Immediately following the establishment of the finished grade, matting shall be placed parallel to the flow of water. Where more than one strip of matting is required to cover the given area, it shall overlap the adjacent mat a minimum of 4 inches. The ends of the matting shall overlap at least 6 inches with the upgrade section on top. The upslope end of matting shall be staked and buried in a 6-inch deep trench with the soil firmly tamped against the

mat. Three stakes per width of matting (one stake at each overlap) shall be driven below the finish ground line prior to backfilling of the trench. The Engineer may require that any other edge exposed to more than normal flow of water or strong prevailing winds be staked and buried in a similar manner.

The edges of matting shall be buried around the edges of catch basins and other structures. Matting must be spread evenly and smoothly and in contact with the soil at all points.

Matting shall be held in place by approved wire staples, pins, spikes, or wooden stakes driven vertically into the soil. The matting shall be fastened at intervals not more than 3 feet apart in three rows for each strip of the matting, with one row along each edge and one row alternately spaced in the middle. All ends of the matting and check slots shall be fastened at 6-inch intervals across their width. Length of fastening devices shall be sufficient to securely anchor the matting against the soil and driven flush with the finished grade.

9. Mulch. Place mulch approximately 1-1/2 inches deep in a loose condition at a rate of 2 to 2.5 tons/acre. Place grass straw mulch so that it is loose enough for sunlight to penetrate and air to circulate; but dense enough to shade the ground, reduce water evaporation, and materially reduce soil erosion. Anchor using a crimping disc, an approved tackifier, or approved modified sheepsfoot roller, or another method approved by the CTUIR Public Works Director.

HIGHWAY AND ROADWAY CROSSINGS

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
STANDARD TECHNICAL SPECIFICATIONS
SECTION 6
HIGHWAY AND ROADWAY CROSSINGS

A. GENERAL

The work covered by these specifications includes the installation of water lines, sewer lines, sewer service lines, and appurtenances within state highway, Umatilla County roadways, BIA, and tribal roads. All of the main line installations will be installed by the methods shown on the Drawings. The Contractor is responsible for obtaining any required state, county, BIA, and tribal road construction permits governing the work.

When required by the specific permit, the Contractor shall include all the cost of other liability insurance in addition to the requirements of this contract, and special flagging and inspection required by and provided by the permitting jurisdiction, in the bid item(s) for this work when applicable.

B. TRAFFIC CONTROL

When trenching across any road or street, no more than half of the road or street is to be opened at any one time. The opened half shall be completely backfilled and suitable for traffic before opening the other half. Detours may be made when approved by the CTUIR. If the trench cannot be backfilled and opened to traffic, then the Contractor shall provide steel running plates, planks, or other satisfactory methods to allow traffic to enter or leave the highway, road, or street.

All other traffic control and safety shall be as provided for in the Technical Specifications - "Temporary Protection and Direction of Traffic/Project Safety" and as required in the applicable road construction permits.

C. INSURANCE

The Contractor will need to provide proof of insurance to the Oregon Department of Transportation (ODOT) which names the State of Oregon as "also insured" for all construction activities which occur within state highway rights-of-way. Refer to the state highway permit for specific requirements.

No additional insurance beyond that specified in the General Requirements will be required for work within county or tribal rights-of-way.

D. NOTIFICATION

The Contractor shall notify ODOT, the Umatilla County Road Department, Tribal Roads, or BIA no less than 48 hours before beginning any work within their rights-of-way.

TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC/ PROJECT SAFETY

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

STANDARD TECHNICAL SPECIFICATIONS

SECTION 7

TEMPORARY PROTECTION AND DIRECTION OF TRAFFIC/PROJECT SAFETY

A. GENERAL

Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of work to be constructed. All applicable sections, as determined by the CTUIR Public Works Director, shall control the work outlined in the Contract Documents.

The Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work, including excavation safety. The Contractor shall comply with all applicable laws, ordinances, rules, regulations, and orders of any public body having jurisdiction as it relates to project and work safety. See applicable provisions in the General Requirements, as well as all other provisions of the contract relative to project work safety. The Contractor shall maintain local access to area residents and emergency traffic throughout the life of the project, and coordinate construction activities closely with area residents to keep them informed of operation that may impact their use of any streets or roadways.

All signs, barricades, barriers, lights, cones, trench boxes, shoring/bracing, and other such "devices" required to warn, protect or direct the public and workmen during the life of the Contract shall be furnished, installed, moved, and removed by the Contractor. When conditions warrant their use, flagpersons shall also be provided by the Contractor. The determination of what measures are required, in addition to those specifically called for by the Drawings and Specifications, shall be solely the responsibility of the Contractor.

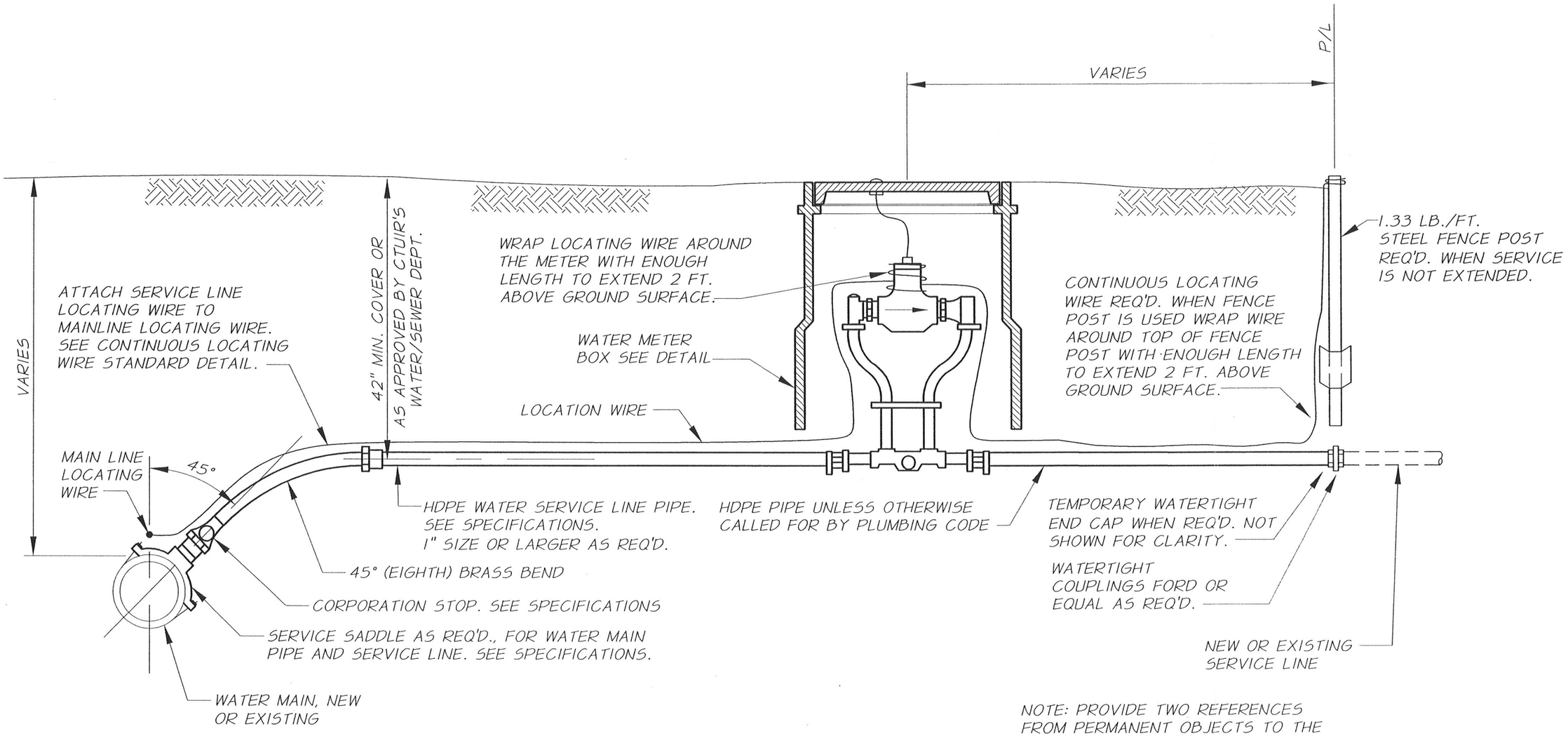
The CTUIR Public Works Director and CTUIR are not responsible for determining whether proper safety precautions, etc., are being utilized. Should the Contractor fail to furnish the necessary protective measures, the CTUIR or CTUIR Public Works Director may, but shall not be required to, bring to the Contractor's attention by written notice to such failure and the Contractor shall undertake such corrective measures as is proper.

B. TRAFFIC CONTROL PLAN (TCP)

The Contractor shall prepare a written Traffic Control Plan and submit it to the CTUIR Public Works Director a minimum five days before the pre-construction conference for review by the CTUIR Public Works Director. The TCP shall show all Traffic Control Measures and all Traffic Control Devices to be used on the project. The Contractor shall describe the order and duration of Traffic Control Measures for all phases of the construction work.

C. MATERIALS AND CONSTRUCTION

The materials used for and the installation of all devices shall conform to the applicable provisions of the Manual of Uniform Traffic Control Devices for Streets and Highways, U.S. Department of Transportation, Federal Highway Administration, latest edition. All materials shall be subject to review by the CTUIR Public Works Director.



NOTE: PROVIDE TWO REFERENCES FROM PERMANENT OBJECTS TO THE END OF WATER SERVICE LINE. THESE TIES SHALL BE SHOWN AND DIMENSIONED ON THE "RECORD DRAWINGS"

TYPICAL WATER SERVICE LINE SECTION

NTS

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W1
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	TYPICAL WATER SERVICE LINE SECTION	

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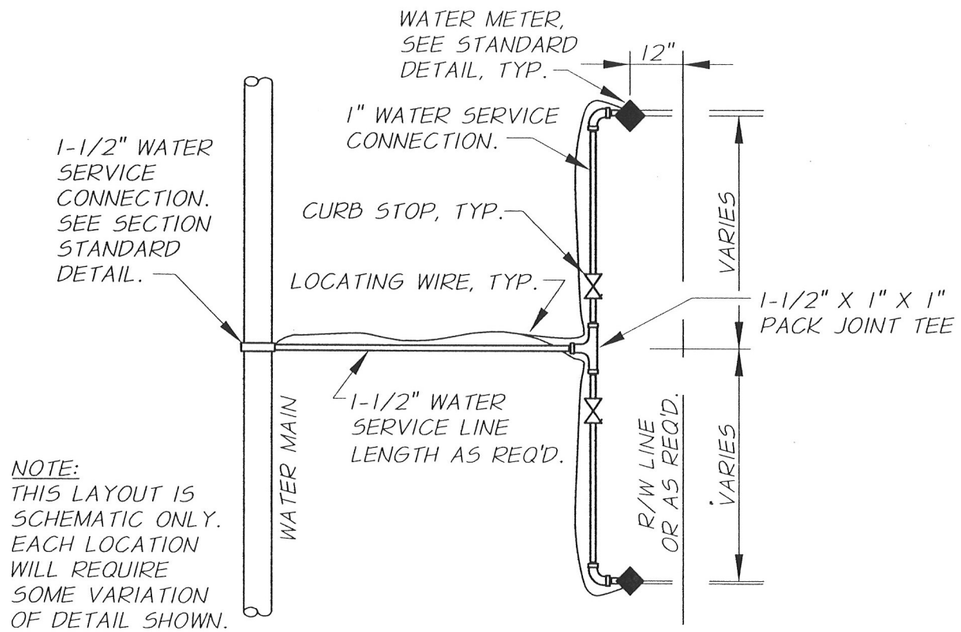


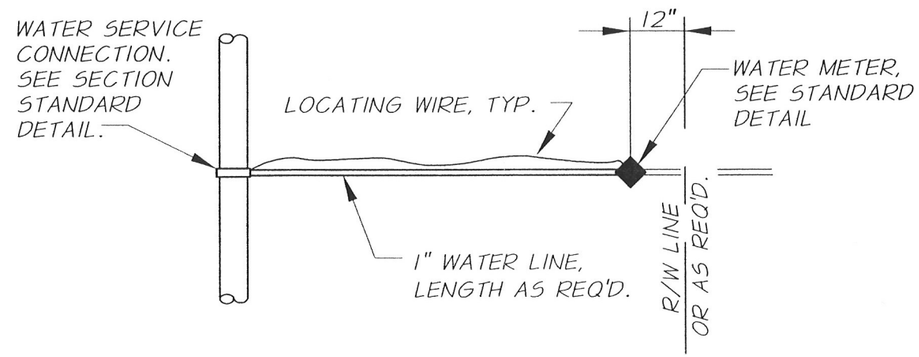
NOTE:
THIS LAYOUT IS SCHEMATIC ONLY. EACH LOCATION WILL REQUIRE SOME VARIATION OF DETAIL SHOWN.

PLAN

MULTIPLE WATER SERVICES

N.T.S.

NOTE:
THIS LAYOUT IS SCHEMATIC ONLY. EACH LOCATION WILL REQUIRE SOME VARIATION OF DETAIL SHOWN.



PLAN

SINGLE WATER SERVICE LINE

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Alexander CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	WATER LINE DETAILS TYPICAL WATER SERVICE LINE PLAN DETAILS	W2

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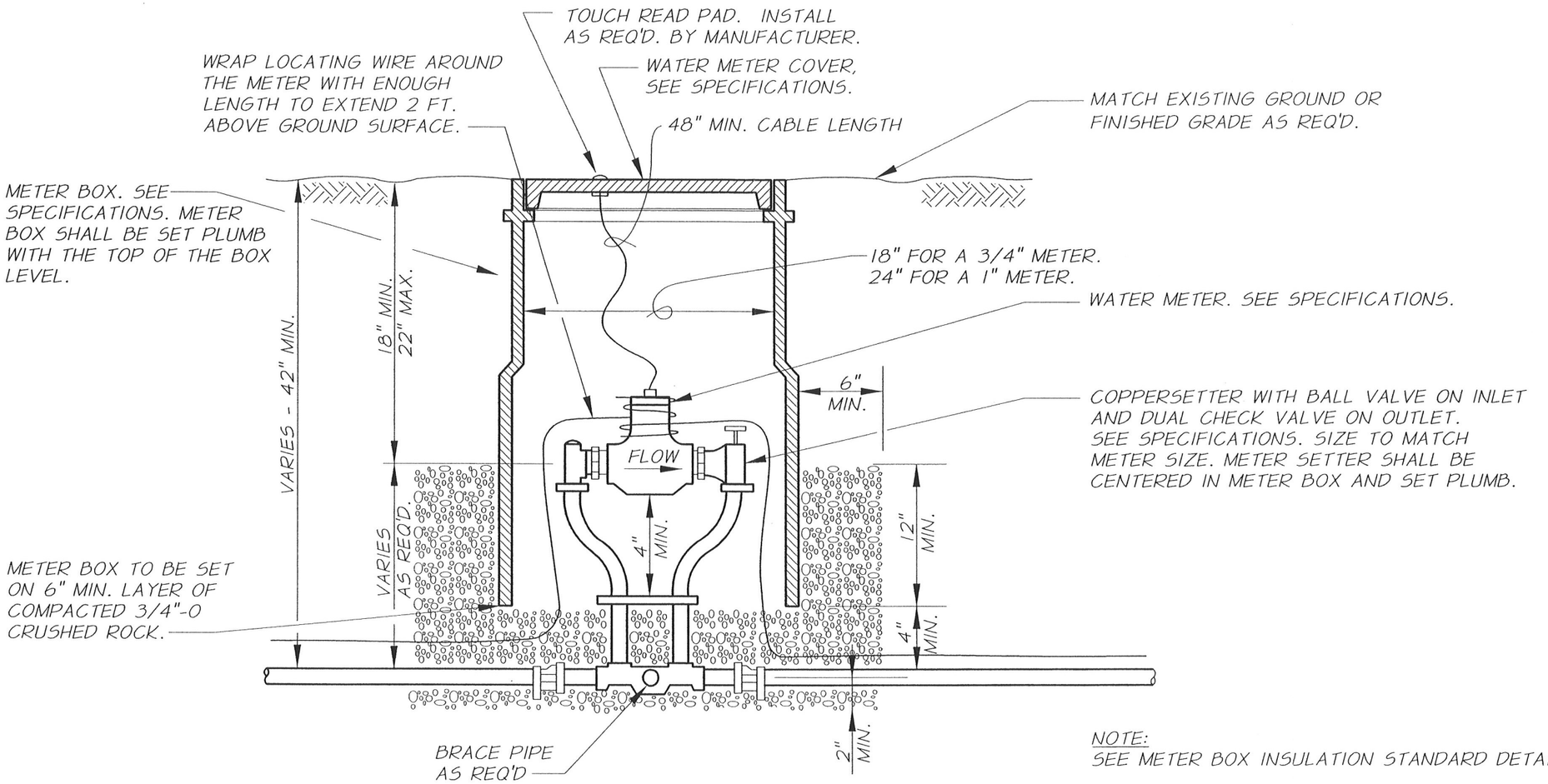

NOTE:
SEE METER BOX INSULATION STANDARD DETAIL.

TYPICAL 3/4" OR 1" WATER METER INSTALLATION

NTS

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W3
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	TYPICAL 3/4" OR 1" WATER METER INSTALLATION	

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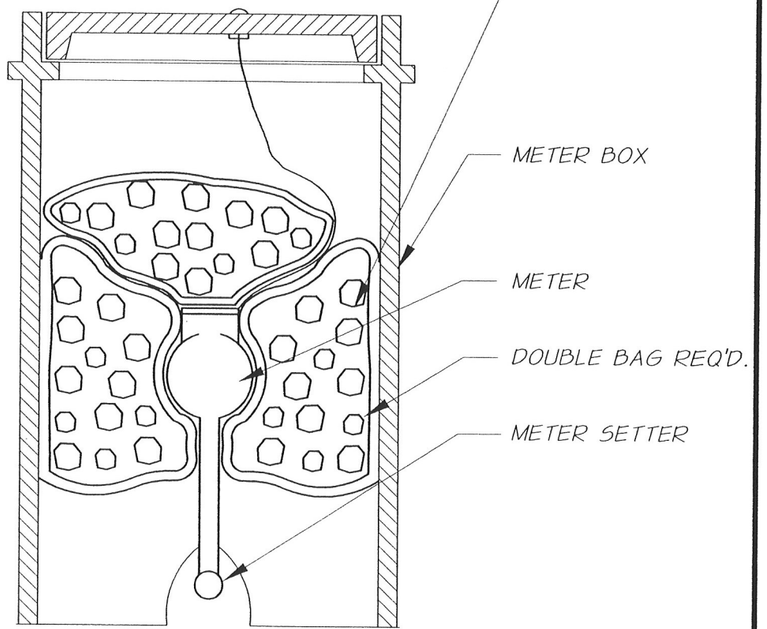
INSTALL THREE BAGS MIN. OR MORE IF REQ'D. BAGS SHALL BE FILLED WITH POLYURETHANE FOAM "PEANUTS". SECURELY HEAT SEAL OR TAPE EACH END OF EACH BAG. DOUBLE BAG EACH BAG UNIT. PLACE BAGS AROUND THE METER SO METER CAN BE READ. PROVIDE A PROTOTYPE OF INSULATING BAG FOR APPROVAL BY CTUIR WATER/SEWER DEPARTMENT BEFORE PROVIDING BAGS FOR PROJECT. CONSOLIDATED PLASTIC CO. INC. (1-800-362-1000) #90349KA 4-MIL. 18"X20" POLY BAGS OR APPROVED EQUAL.



METER BOX INSULATION DETAIL

NTS

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Aby and. CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	WATER LINE DETAILS METER BOX INSULATION DETAIL	W4

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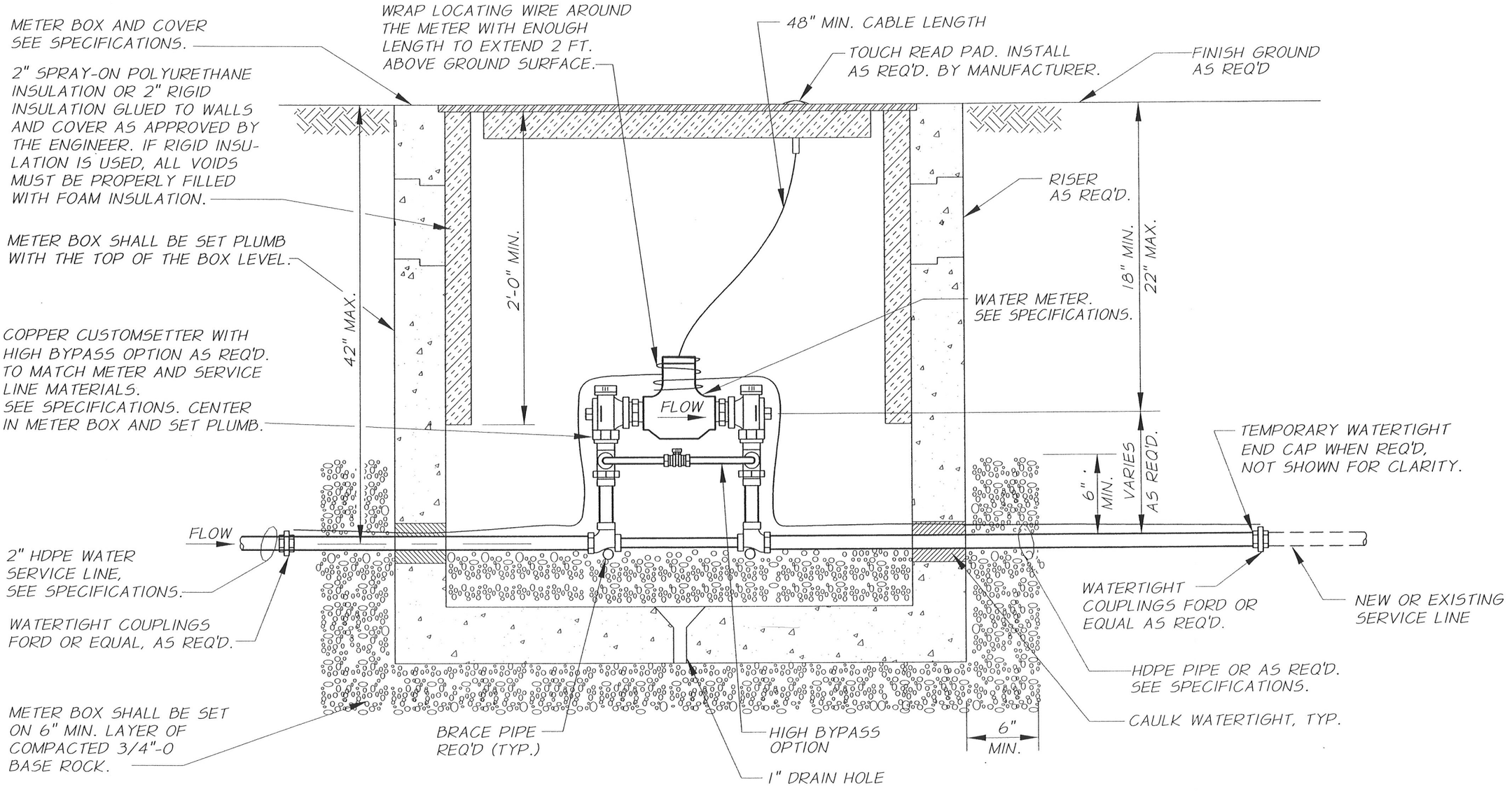

TYPICAL 1-1/2" & 2" WATER METER INSTALLATION

(USING COPPER CUSTOMSETTER W/ HIGH BYPASS OPTION)

N.T.S

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W5
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	TYPICAL 1-1/2" AND 2" WATER METER INSTALLATION	

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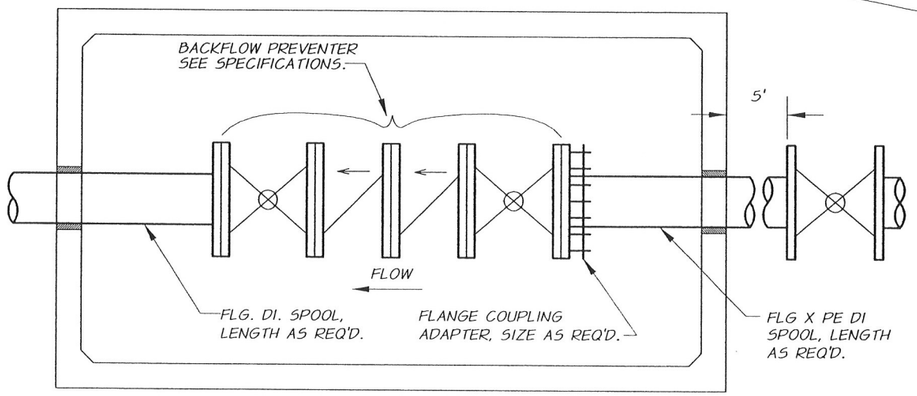
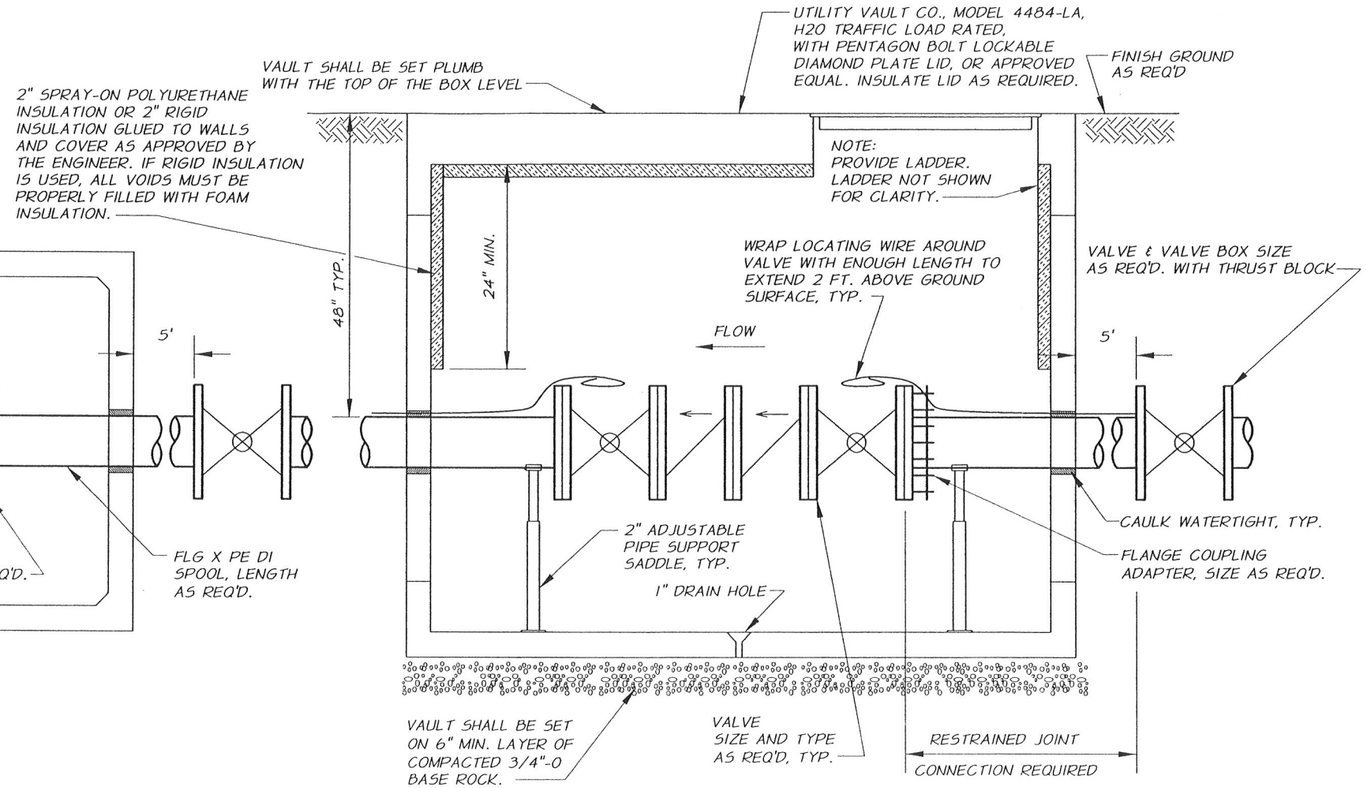


PLAN



SECTION

BACKFLOW PREVENTION VALVE

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W6
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	BACKFLOW PREVENTION VALVE	

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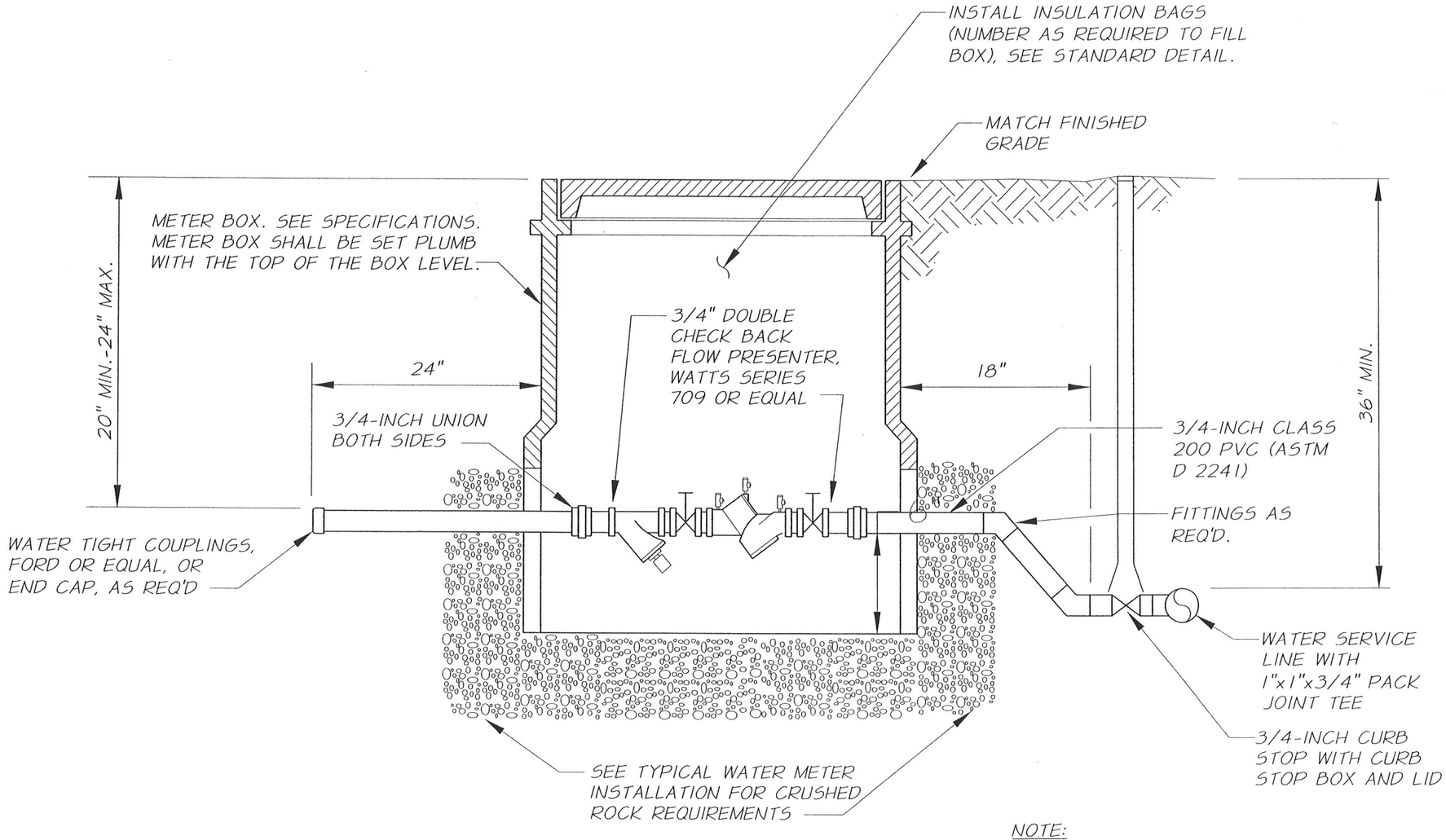

NOTE:
CONTRACTOR SHALL DRAIN PIPING AND CHECK VALVE AFTER TESTING HAS BEEN COMPLETED AND ACCEPTED.

IRRIGATION BACKFLOW VALVE DETAIL

NTS

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W7
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	IRRIGATION BACKFLOW VALVE DETAIL	

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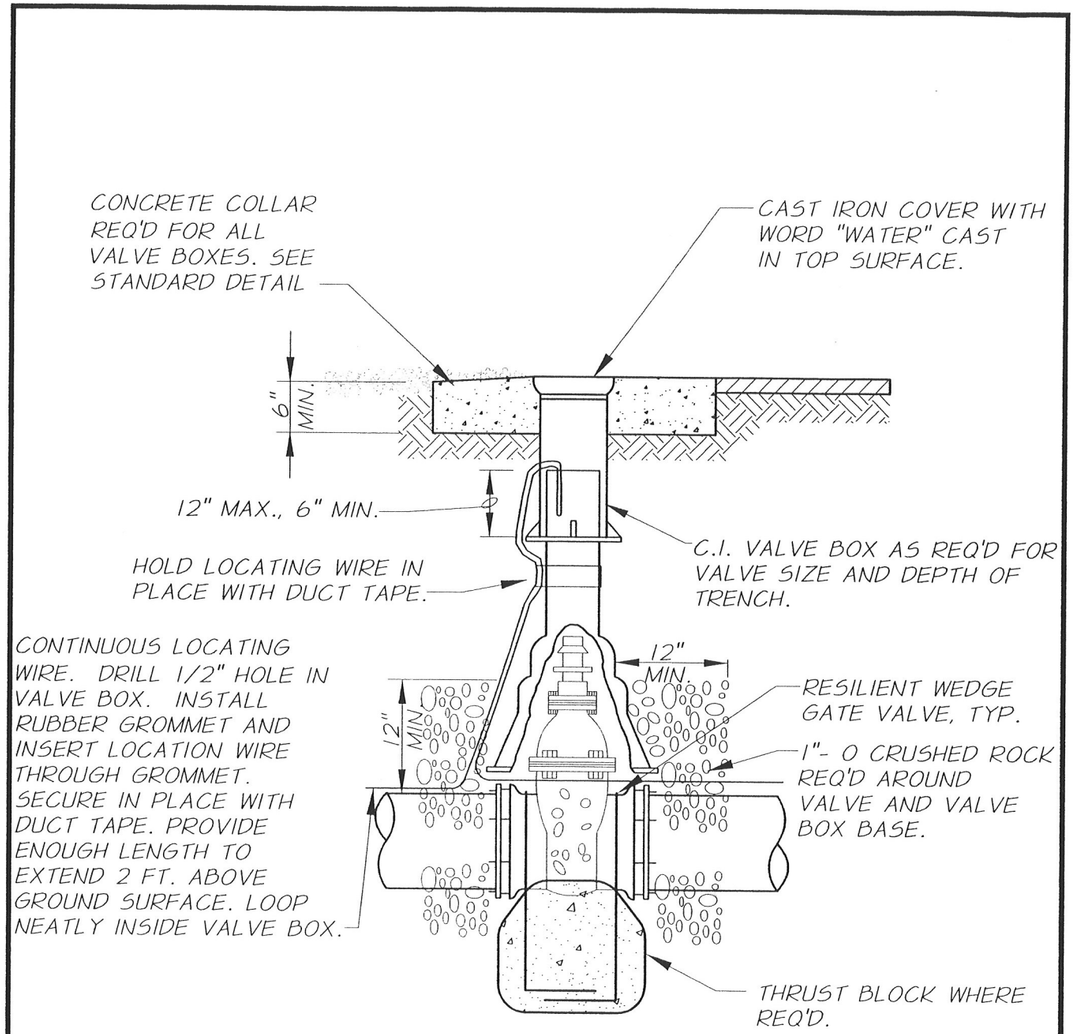

VALVE BOX DETAIL

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Alspach CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	WATER LINE DETAILS VALVE BOX DETAIL	W8

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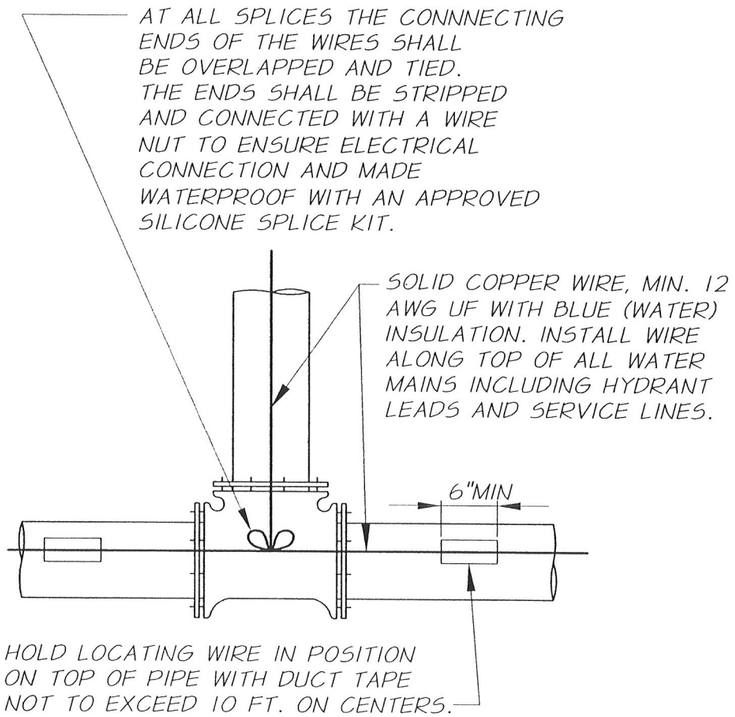

CONTINUOUS LOCATING WIRE DETAIL

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Alexander CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	WATER LINE DETAILS CONTINUOUS LOCATING WIRE DETAIL	W9

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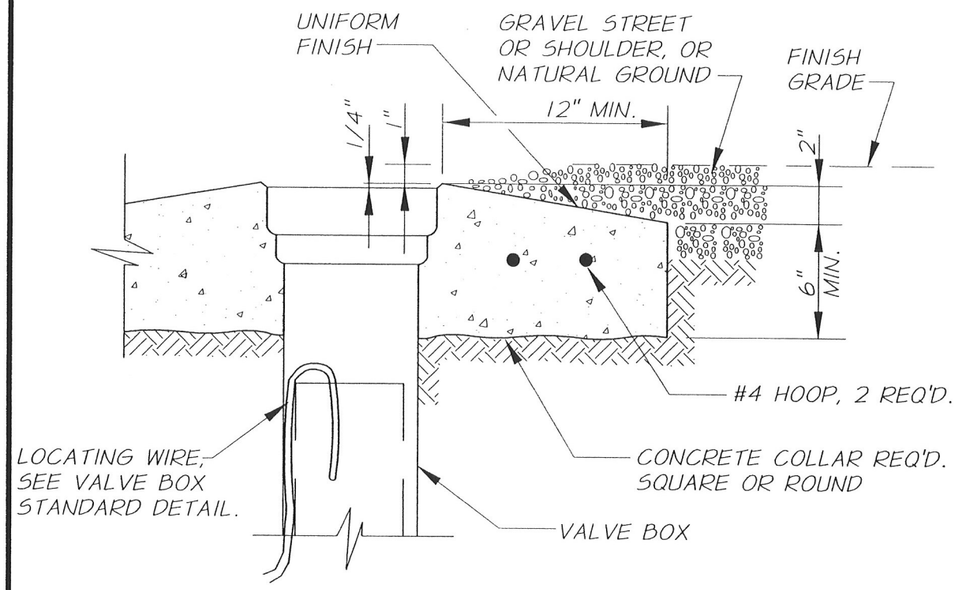

REQUIREMENTS FOR CONCRETE COLLARS:
1. CONCRETE : 3/4", 7 SACK, 4000 PSI@ 28 DAYS, 2" TO 4" SLUMP, 4-7% AIR.
2. COLLAR TO BE FORMED AND UNIFORMLY SHAPED.
3. SMOOTH BROOMED FINISH REQ'D.
4. APPLY CONCRETE CURING COMPOUND.
5. PROTECT FROM TRAFFIC FOR 4 DAYS MIN.

CONCRETE COLLAR DETAIL

IN GRAVEL STREETS OR NATURAL GROUND

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Alexander CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	WATER LINE DETAILS CONCRETE COLLAR DETAIL	W10

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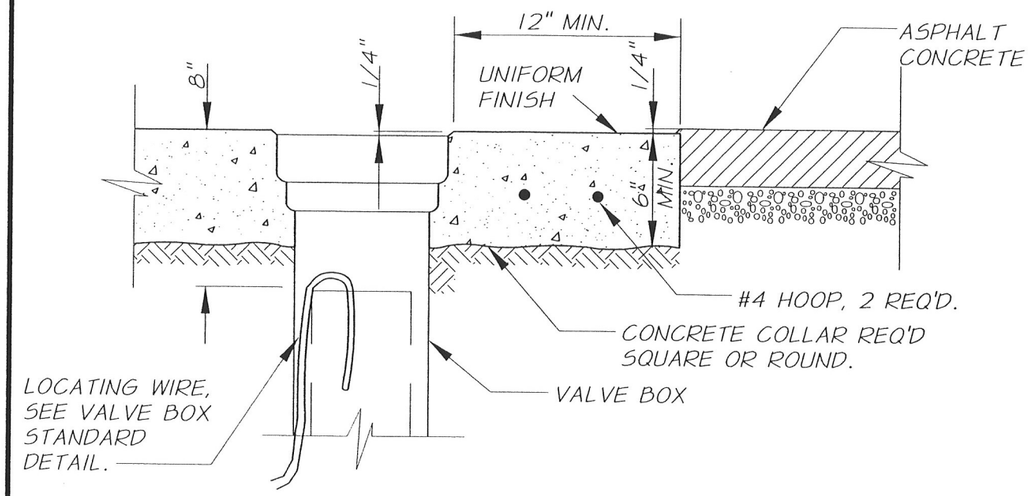

REQUIREMENTS FOR CONCRETE COLLARS:

1. CONCRETE : 3/4", 7 SACK, 4000 PSI @ 28 DAYS, 2" TO 4" SLUMP, 4-7% AIR.
2. COLLAR TO BE FORMED AND UNIFORMLY SHAPED.
3. SMOOTH BROOMED FINISH REQ'D.
4. APPLY CONCRETE CURING COMPOUND.
5. PROTECT FROM TRAFFIC FOR 4 DAYS MIN.

CONCRETE COLLAR DETAIL

IN ASPHALT PAVEMENT

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W11
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	CONCRETE COLLAR DETAIL	

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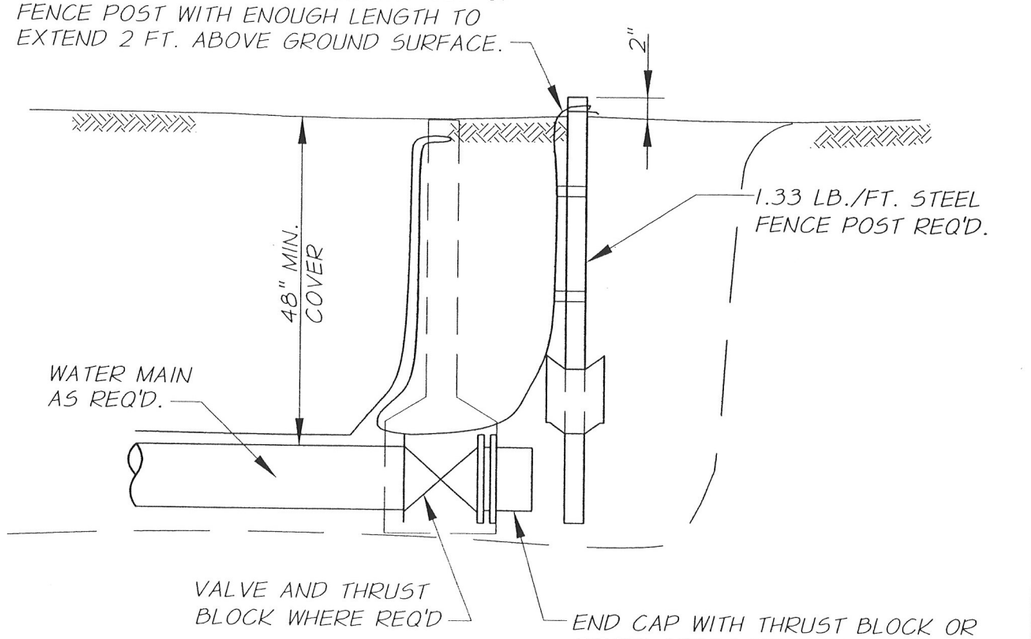

NOTE:
PROVIDE TWO REFERENCES FROM PERMANENT OBJECTS TO THE END OF WATER LINE. THESE TIES SHALL BE SHOWN AND DIMENSIONED ON THE "RECORD DRAWINGS".

SECTION

TYPICAL WATER MAIN STUB

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W12
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	TYPICAL WATER MAIN STUB	

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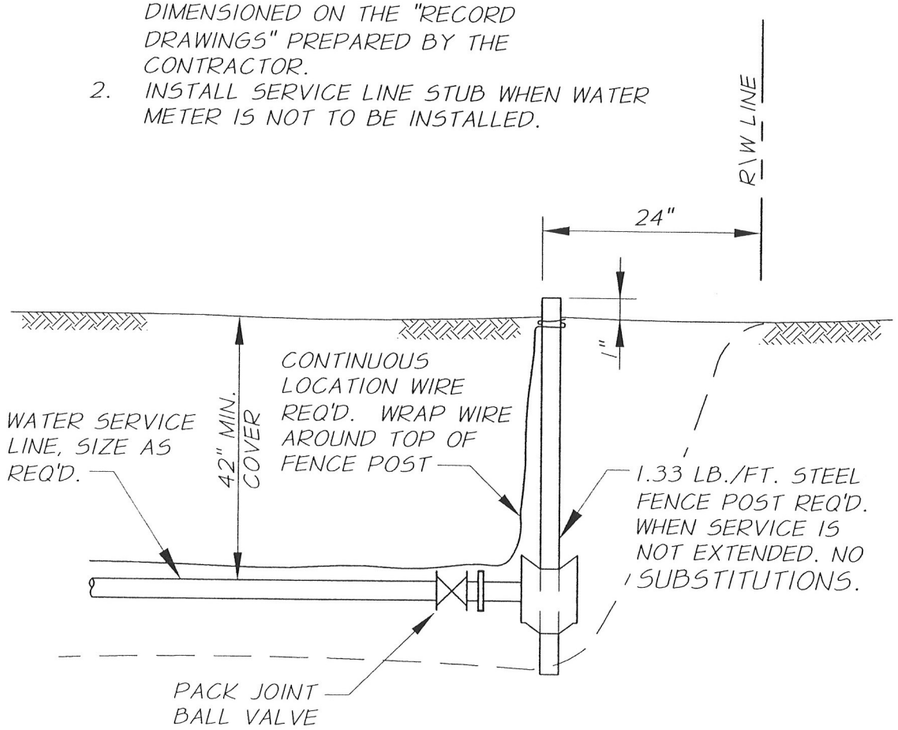
NOTES:

1. THE CONTRACTOR SHALL PROVIDE TWO REFERENCES FROM PERMANENT OBJECTS TO THE END OF WATER SERVICE LINE. THESE TIES SHALL BE SHOWN AND DIMENSIONED ON THE "RECORD DRAWINGS" PREPARED BY THE CONTRACTOR.
2. INSTALL SERVICE LINE STUB WHEN WATER METER IS NOT TO BE INSTALLED.



TYPICAL WATER SERVICE LINE STUB

(WHEN WATER METER IS NOT INSTALLED)

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Aboyand CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	WATER LINE DETAILS WATER SERVICE LINE STUB DETAIL	W13

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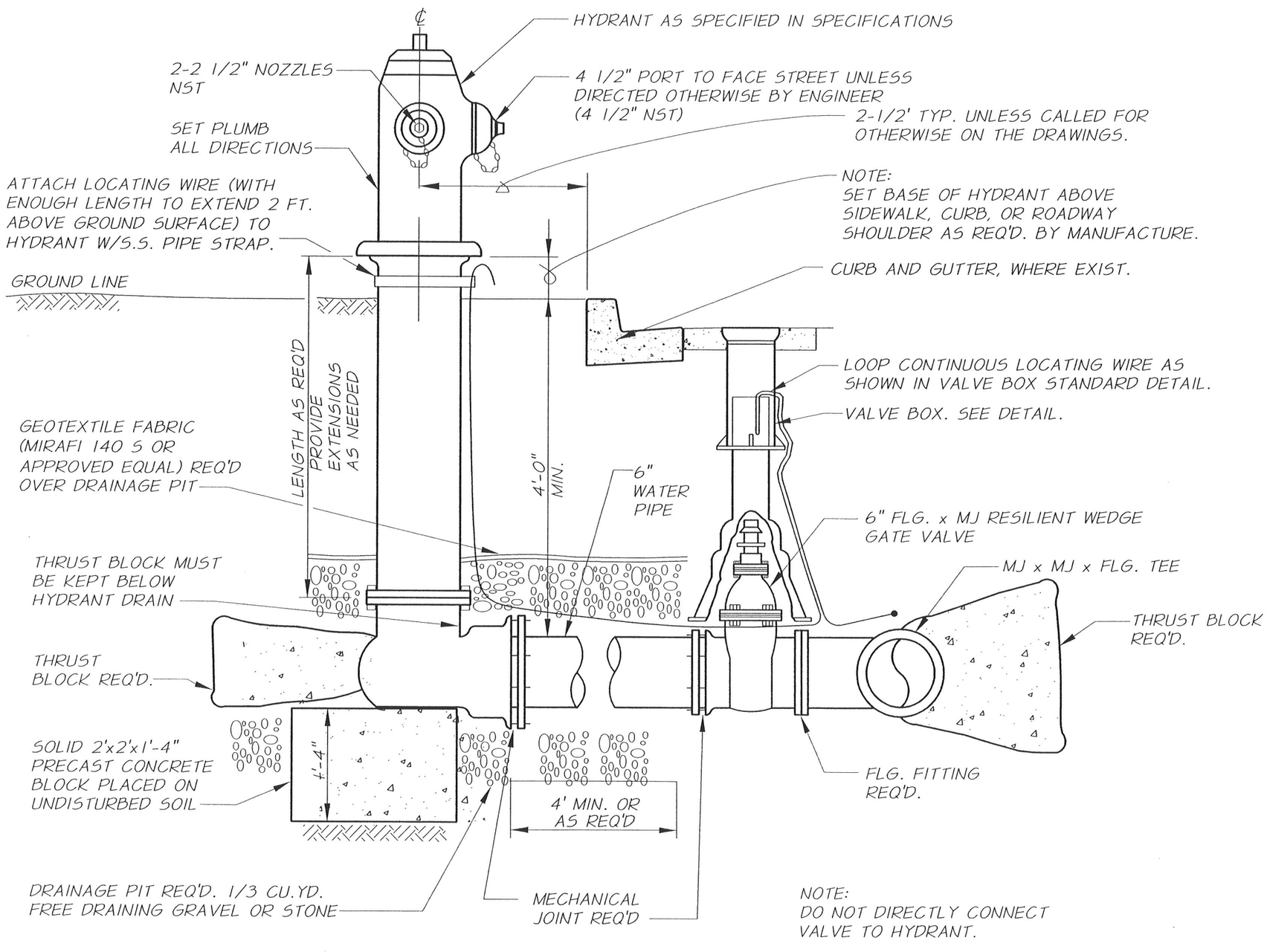

FIRE HYDRANT AND AUXILIARY VALVE DETAIL

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W14
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	FIRE HYDRANT AND AUXILIARY VALVE DETAIL	

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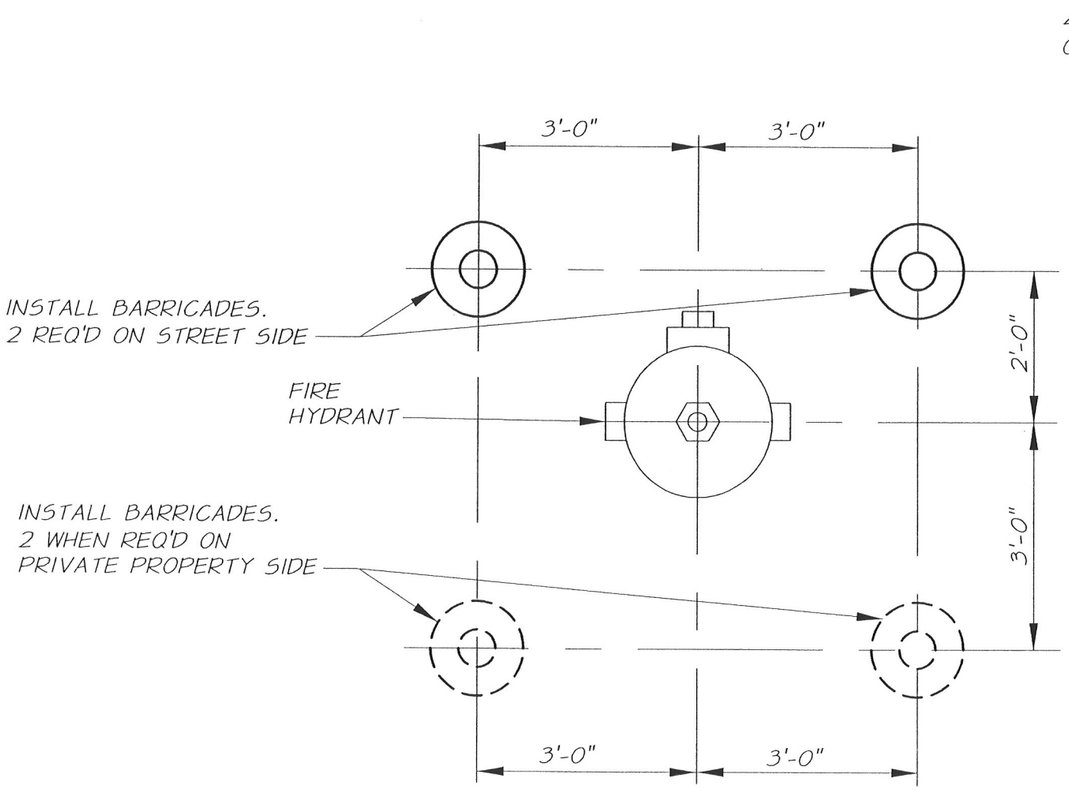
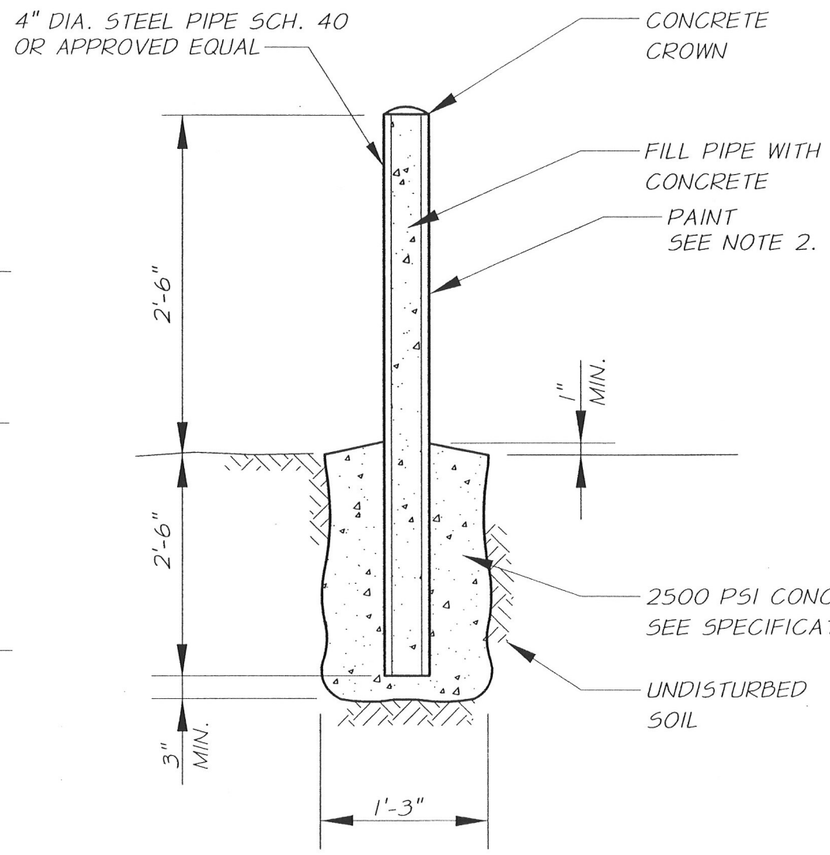


PLAN



SECTION

NOTES:

1. 4" DIA. STEEL PIPE SHALL BE PLUMB.
2. PAINTING SHALL BE DONE ONLY AFTER SURFACE IS FREE OF RUST, OIL, AND GREASE. THE METAL SHALL BE PRIMED AND TWO FINISH COATS, YELLOW IN COLOR APPLIED.

FIRE HYDRANT BARRICADE

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W15
Approved: Sandra Aleyander CTUIR PWD	Date: 10/24/07	FIRE HYDRANT BARRICADE	

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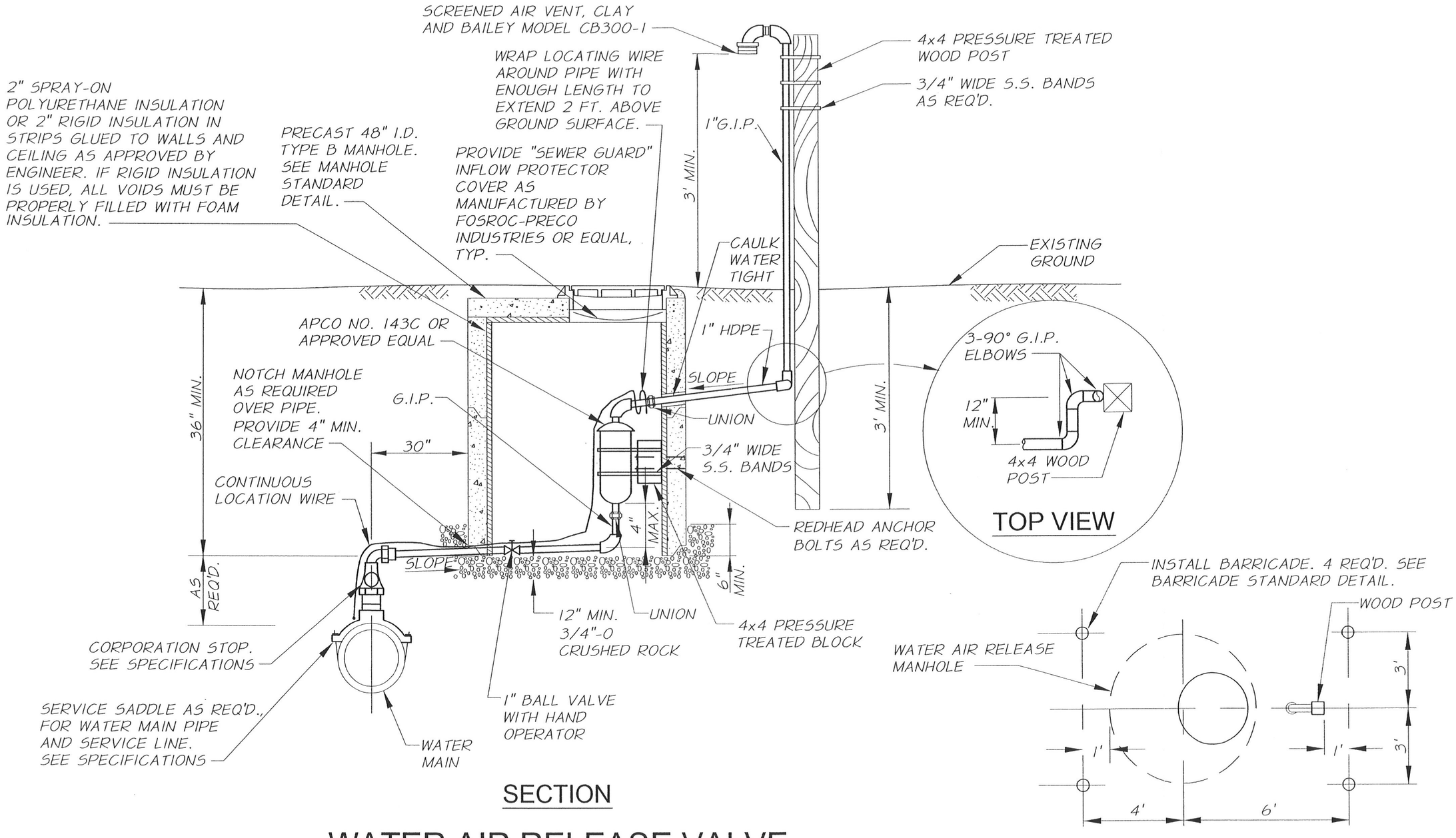

SECTION

PLAN DETAIL

WATER AIR RELEASE VALVE

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W16
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	WATER AIR RELEASE VALVE	

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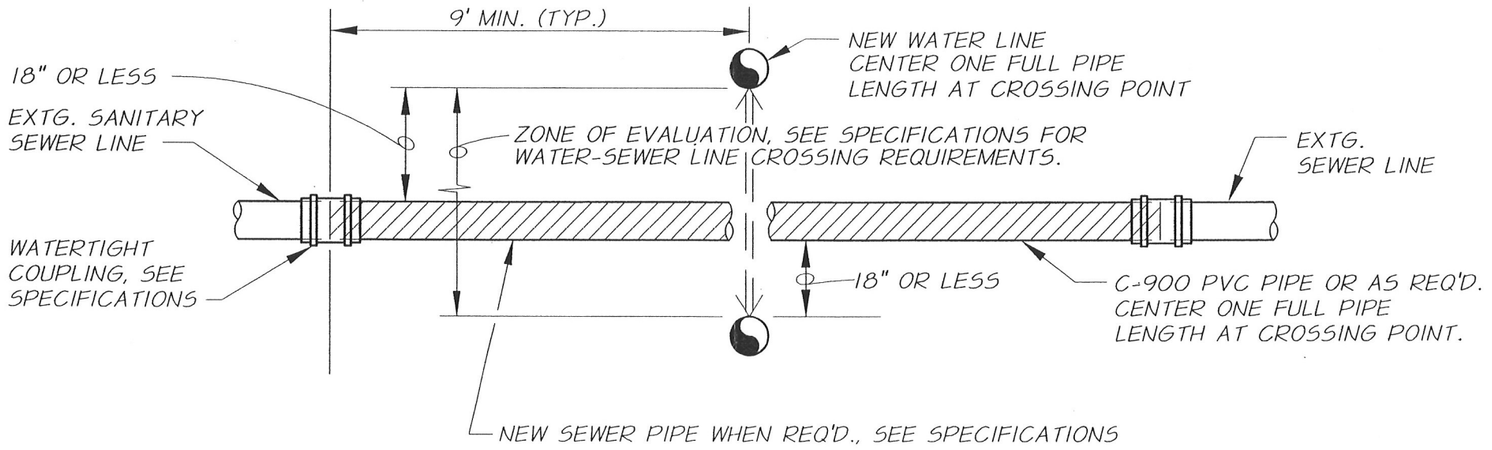

NOTES:

1. SEE SUPPORT BEAM STANDARD DETAIL WHEN SUPPORT BEAM IS REQUIRED.
2. ALL BACK FILL IN AREA OF WATER-SEWER CROSSING TO A DEPTH 12" ABOVE THE TOP OF THE HIGHEST PIPE SHALL BE 3/4"-0 BASE ROCK COMPACTED TO 95% OF ASTM D-698 LABORATORY DENSITY.

WATER-SEWER CROSSING

(NEW WATER LINE CONSTRUCTION)

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W17
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	WATER-SEWER CROSSING (NEW WATER LINE CONSTRUCTION)	

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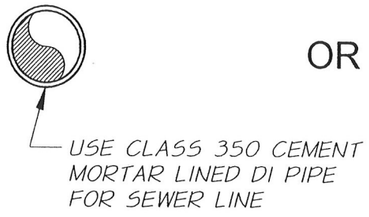

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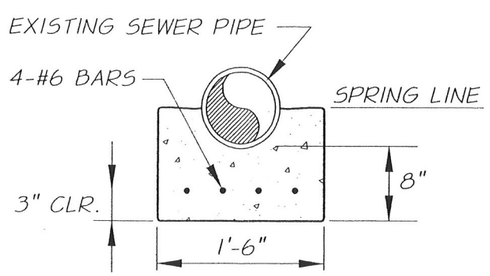

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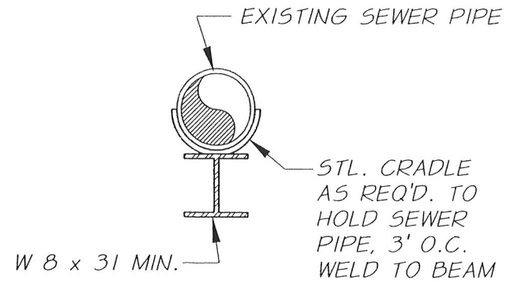
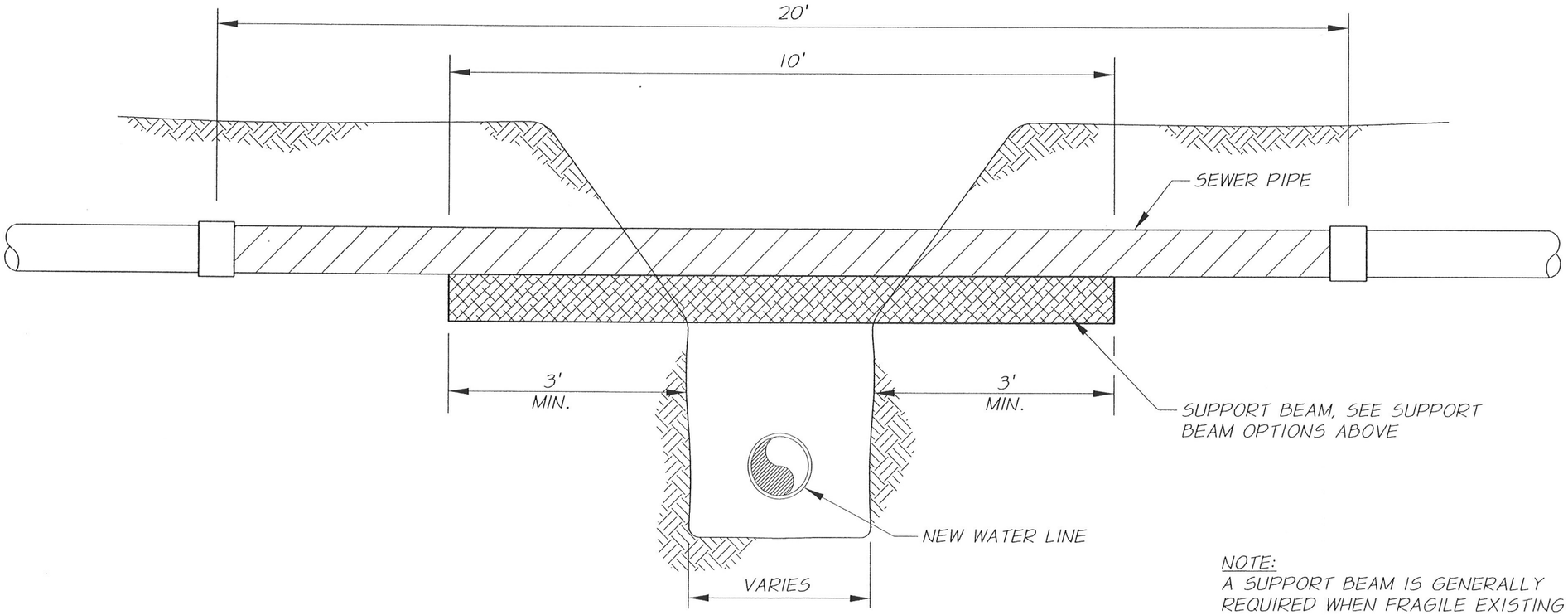


SUPPORT BEAM OPTIONS



SUPPORT BEAM

NOTE:
A SUPPORT BEAM IS GENERALLY REQUIRED WHEN FRAGILE EXISTING SEWER PIPE MATERIAL IS ENCOUNTERED, OR WHEN UNDERMINING OF THE EXISTING SEWER PIPE IS EXPECTED TO OCCUR.

WATER-SEWER CROSSING

NTS

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W18
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	WATER-SEWER CROSSING SUPPORT BEAM	

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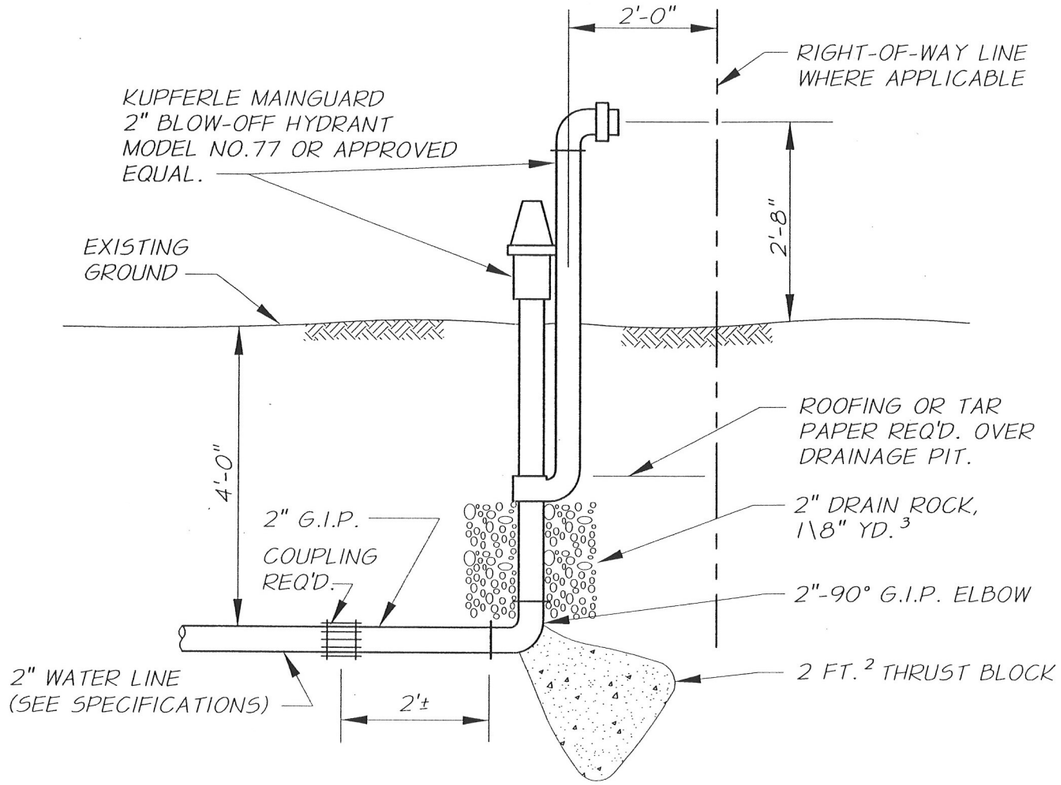

2" WATER LINE BLOW-OFF DETAIL

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W19
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	WATER LINE BLOW-OFF DETAIL	

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THRUST BLOCK NOTES

1. THRUST BLOCKS SHALL BE REQUIRED AT THE FOLLOWING LOCATIONS:
   - A. ALL CHANGES IN DIRECTION.
   - B. ALL DEAD-ENDS.
   - C. ALL VALVES 8-INCHES AND LARGER (SIZE FOR CLOSED CONDITION) EXCEPT THRUST BLOCKS FOR 8-INCH AND 10-INCH VALVES WHEN VALVES ARE FLANGED CONNECTED TO TO A TEE. THRUST BLOCKS ARE REQUIRED FOR ALL 12-INCH AND LARGER VALVES.
   - D. AT LOCATIONS SPECIFICALLY CALLED OUT ON THE DRAWINGS.
   - E. AT TEMPORARY DEAD ENDS DURING PIPE INSTALLATIONS AS REQUIRED FOR TEMPORARY PRESSURE TESTING.
   - F. AT OTHER LOCATIONS REQUIRED BY THE ENGINEER.
2. THRUST BLOCKS SHALL BE SIZED AS REQUIRED BY SOIL CONDITIONS AND DESIGN PRESSURE.
3. PLACE CONCRETE AGAINST UNDISTURBED TRENCH WALL.
4. CONCRETE SHALL BE 2,500 PSI MINIMUM.
5. ALL CONCRETE SHALL BE PLACED SO THAT PIPE, FITTING JOINTS, BOLTS AND NUTS, ETC., WILL BE ACCESSIBLE FOR REPAIRS.
6. PLACE ONE LAYER OF VISQUEEN BETWEEN FITTING AND CONCRETE TO FACILITATE FUTURE REMOVAL OF THRUST BLOCK IF REQUIRED.
7. ANCHOR RODS SHALL BE 3/4" DIAMETER GALVANIZED STEEL RODS OR #6 EPOXY COATED REINFORCEMENT BAR, AASHTO M284, HAVING AN 18" MINIMUM EMBEDMENT IN CONCRETE.
8. ALL THRUST BLOCKS SHALL BE SIZED FOR A 150 PSI WATER PRESSURE.
9. IF THE REQUIRED BEARING AREA IS LESS THAN 1 SQUARE FOOT, A THRUST BLOCK SHALL NOT BE REQUIRED.

DETERMINATION OF THRUST BLOCK BEARING AREA

NOTE: WHEN THRUST BLOCK BEARING AREA IS NOT SPECIFIED ON THE PLANS OR DETERMINED BY THE ENGINEER, THE FOLLOWING PROCEDURE SHALL BE USED TO DETERMINE REQUIRED BEARING AREA.

1. DETERMINE THRUST (T) FOR TYPE OF FITTING OR JOINT AND SIZE OF PIPE FROM TABLE NO. 1 OR TABLE NO. 3.
2. DETERMINE BEARING CAPACITY (B) OF SOIL FROM TABLE NO. 2.
3. DETERMINE REQUIRED BEARING AREA (A) AS FOLLOWS:

   $A = T \div B$

   EXAMPLE: DESIGN PRESSURE = 175 PSI
   PIPE = 12"
   FITTING = TEE
   SOIL - SANDY GRAVEL

   FROM TABLE NO. 1: T = 15,310 LB.
   FROM TABLE NO. 2: B = 3000 LB/FT^2

   $A = \frac{15{,}310 \times 1.75}{3{,}000} = 8.9\ FT^2$

TABLE NO.1

THRUST AT FITTINGS IN POUNDS AT 100 PSI OF WATER PRESSURE

PIPE SIZE	TEES AND DEAD ENDS	90°BEND	45°BEND	22 1/2° BEND	11 1/4° BEND
4"	1,850	2,610	1,420	720	394
6"	3,800	5,370	2,910	1,470	810
8"	6,580	9,300	5,040	2,550	1,372
10"	10,750	15,200	8,240	4,170	2,216
12"	15,310	21,640	11,720	5,940	3,128
14"	20,770	29,360	15,910	8,060	4,241
16"	26,880	38,010	20,590	10,430	5,468
18"	29,865	42,235	22,858	11,653	5,855

NOTE: FOR WATER PRESSURES DIFFERENT THAN 100 PSI, MULTIPLY THRUST FOUND IN TABLE NO. 1 BY REQUIRED PROPORTION.

EXAMPLE: DESIGN PRESSURE = 175 PSI. MULTIPLY VALUE IN TABLE BY 1.75

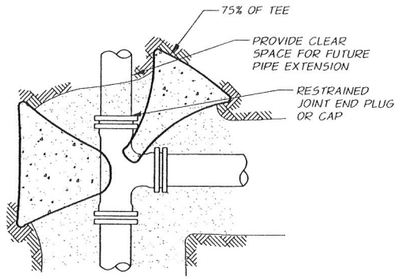
TABLE NO.2

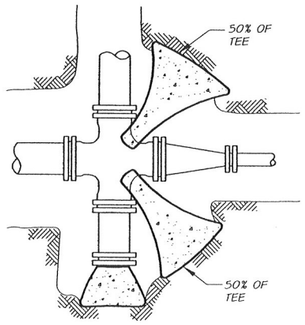
SOIL	SAFE BEARING LOAD LB/FT^2
SOFT CLAY	500
SILT	1,000
SAND	2,000
SAND AND GRAVEL	3,000
SAND AND GRAVEL CEMENTED WITH CLAY	4,000
HARD CLAY	4,000

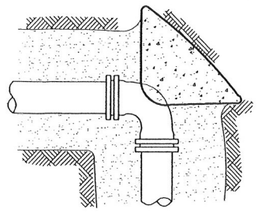
TABLE NO.3

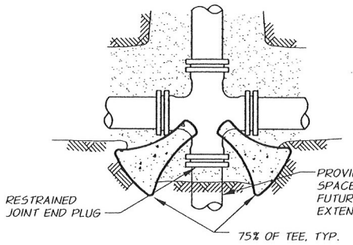
SIDE THRUST PER 100 LB./SQ.IN. PRESSURE PER DEGREE OF DEFLECTION			
PIPE SIZE	SIDE THRUST-LB	PIPE SIZE	SIDE THRUST-LB
4"	N/A	14	377
6"	N/A	16	486
8"	N/A	18	665
10"	197	20	790
12"	278	24	1,150

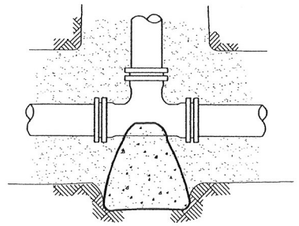
MULTIPLY THRUST BY DEGREE OF DEFLECTION TO OBTAIN TOTAL THRUST



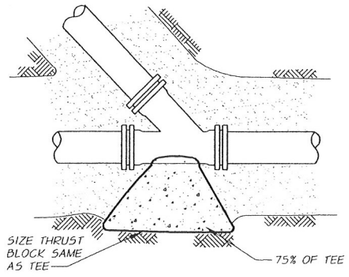


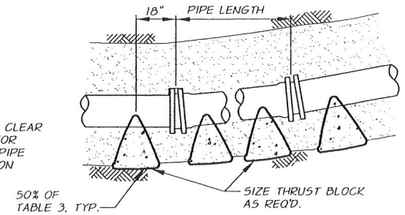


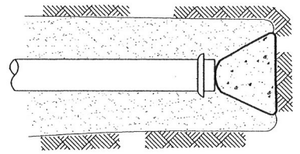


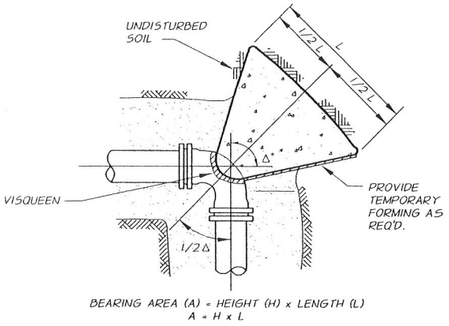


PLAN VIEWS



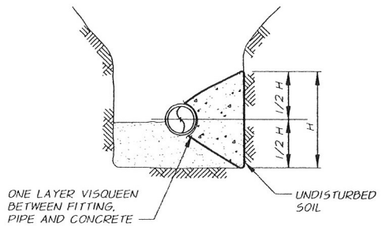






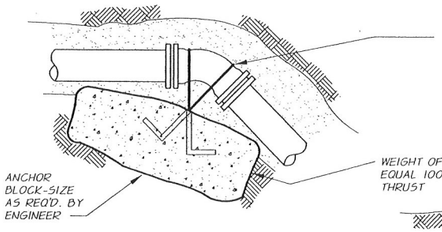
BEARING AREA (A) = HEIGHT (H) x LENGTH (L)
$A = H \times L$

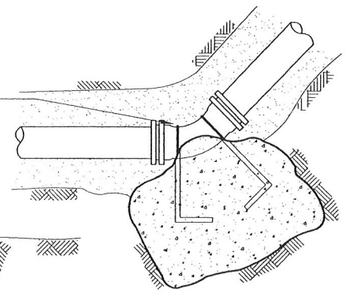
PLAN

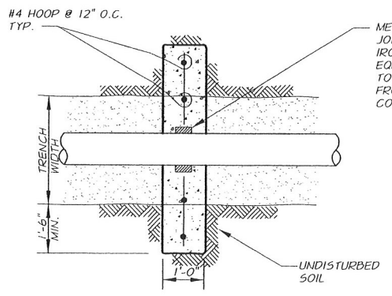


SECTION

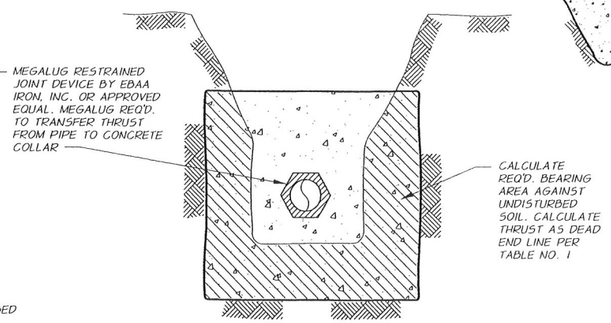
TYPICAL THRUST BLOCK DETAILS





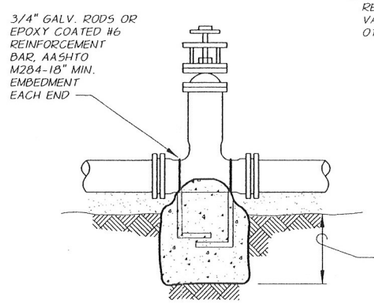


ANCHOR COLLAR



TYPICAL THRUST BLOCK LOCATIONS

SECTION VIEWS



NOTE:

1. THRUST BLOCK IS NOT REQ'D. WHEN VALVE IS CONNECTED BY A FLANGED OR RESTRAINED JOINT CONNECTION TO ADJACENT FITTING OR PIPE WHICH HAS THE REQ'D. THRUST RESTRAINT.
2. THRUST BLOCK IS NOT REQ'D ON 8" AND SMALLER VALVES UNLESS CALLED OUT OTHERWISE ON DRAWINGS.

CTUIR Public Works Department	Title & Description:	Figure
Date: 2007 Scale: N.T.S. Approved: Sandra Alexander Date: 10/24/07 CTUIR PWD	WATER LINE DETAILS TYPICAL THRUST BLOCK DETAILS	W20

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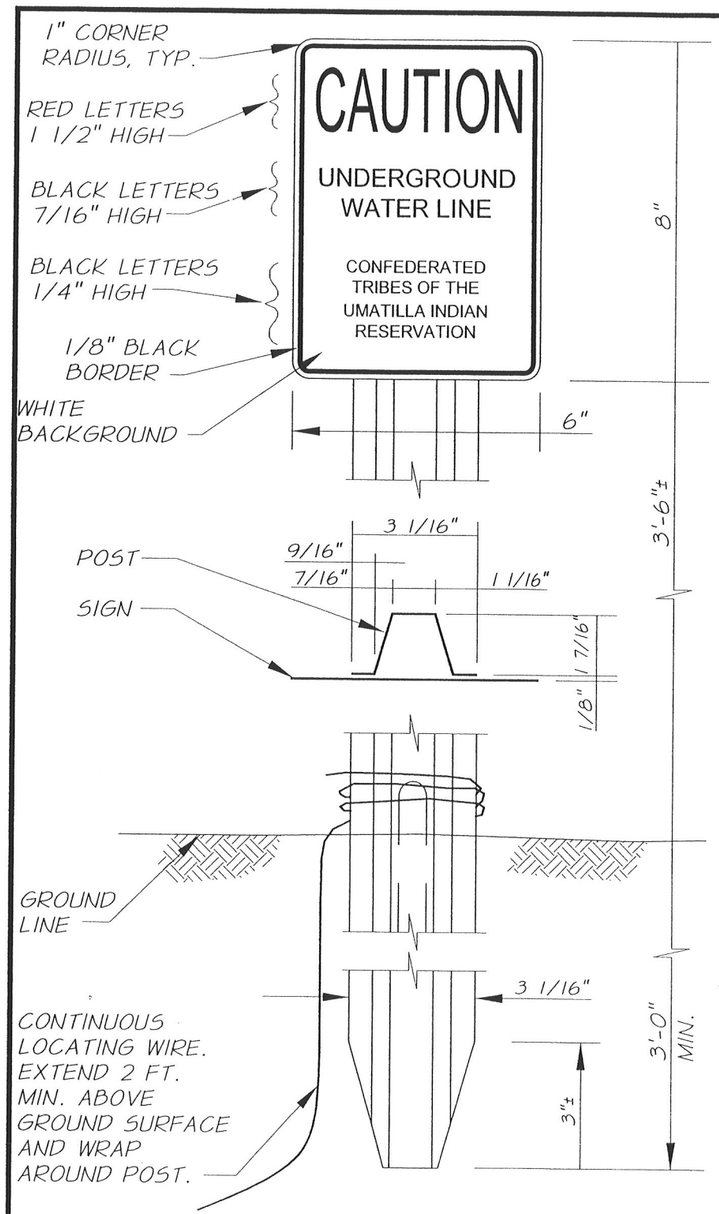

NOTES:

1. SIGNS SHALL BE HEAVY GAUGE ALUMINUM SHEET, NOMINAL THICKNESS 0.050" SIMILAR TO STANDARD HIGHWAY SIGNS.
2. POSTS SHALL BE GALV. STEEL WITH A NOMINAL WEIGHT OF 2 LBS PER LINEAL FOOT AS PER STATE OF OREGON HIGHWAY DIVISION DELINEATOR POST SPECIFICATIONS
3. SIGNS TO BE ATTACHED TO POST WITH 3/16" DIA. ALUMINUM BLIND RIVETS AND WASHERS INTO 7/32" DIA. HOLES.
4. SIGNS TO BE PAINTED WITH ENGINEERING GRADE REFLECTIVE SHEETING AS SUPPLIED BY TRAFFIC SAFETY SUPPLY, PORTLAND ORE. - (503-235-8531)
5. PRE-FABRICATED FIBERGLASS WATER LINE MARKER POSTS MAY BE SUBMITTED FOR APPROVAL BY CTUIR WATER/SEWER DEPT. IN LIEU OF CAUTION SIGN.

CAUTION SIGN DETAIL

WATER LINE

NTS

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	WATER LINE DETAILS	W21
Approved: Sandra Alfonsa CTUIR PWD	Date: 10/24/07	CAUTION SIGN DETAIL	

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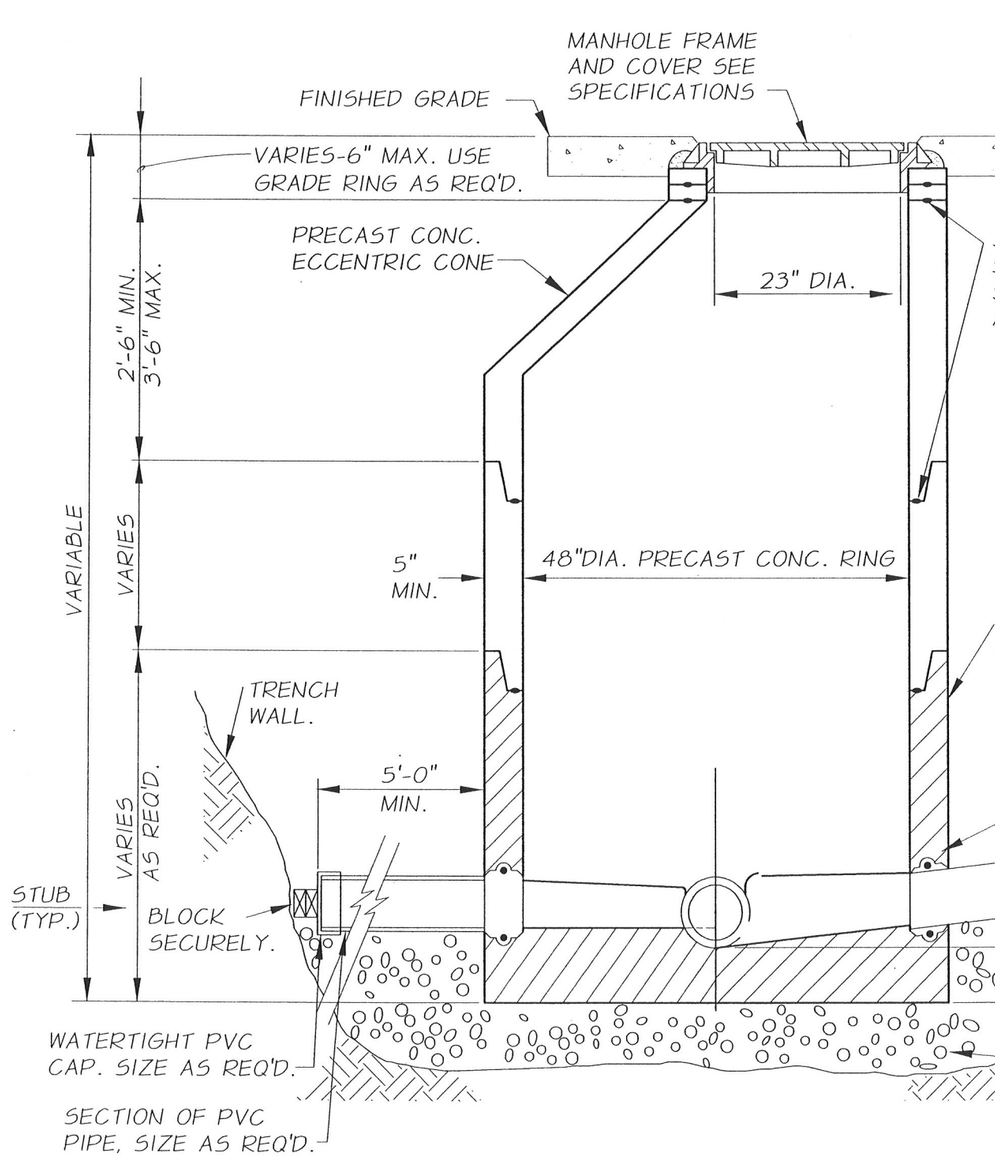

NOTE:
USE TYPE B MANHOLE WHEN MANHOLE DEPTH IS 5.5 FT. OR LESS UNLESS CALLED FOR OTHERWISE ON THE DRAWINGS.

SECTION

STANDARD PRECAST BASE MANHOLE

TYPE A

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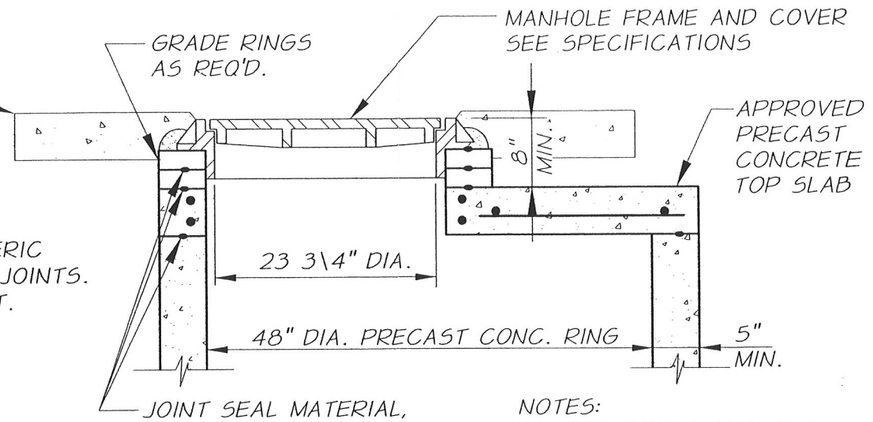

NOTES:
1. SEE TYPE A MANHOLE FOR BASE AND WALL DETAILS.
2. USE TYPE B MANHOLE WHEN MANHOLE DEPTH IS 5.5 FEET OR LESS UNLESS CALLED FOR OTHERWISE ON THE DRAWINGS.

PRECAST TOP SLAB MANHOLE

TYPE B

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	SEWER LINE DETAILS	S1
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	STANDARD PRECAST MANHOLE	

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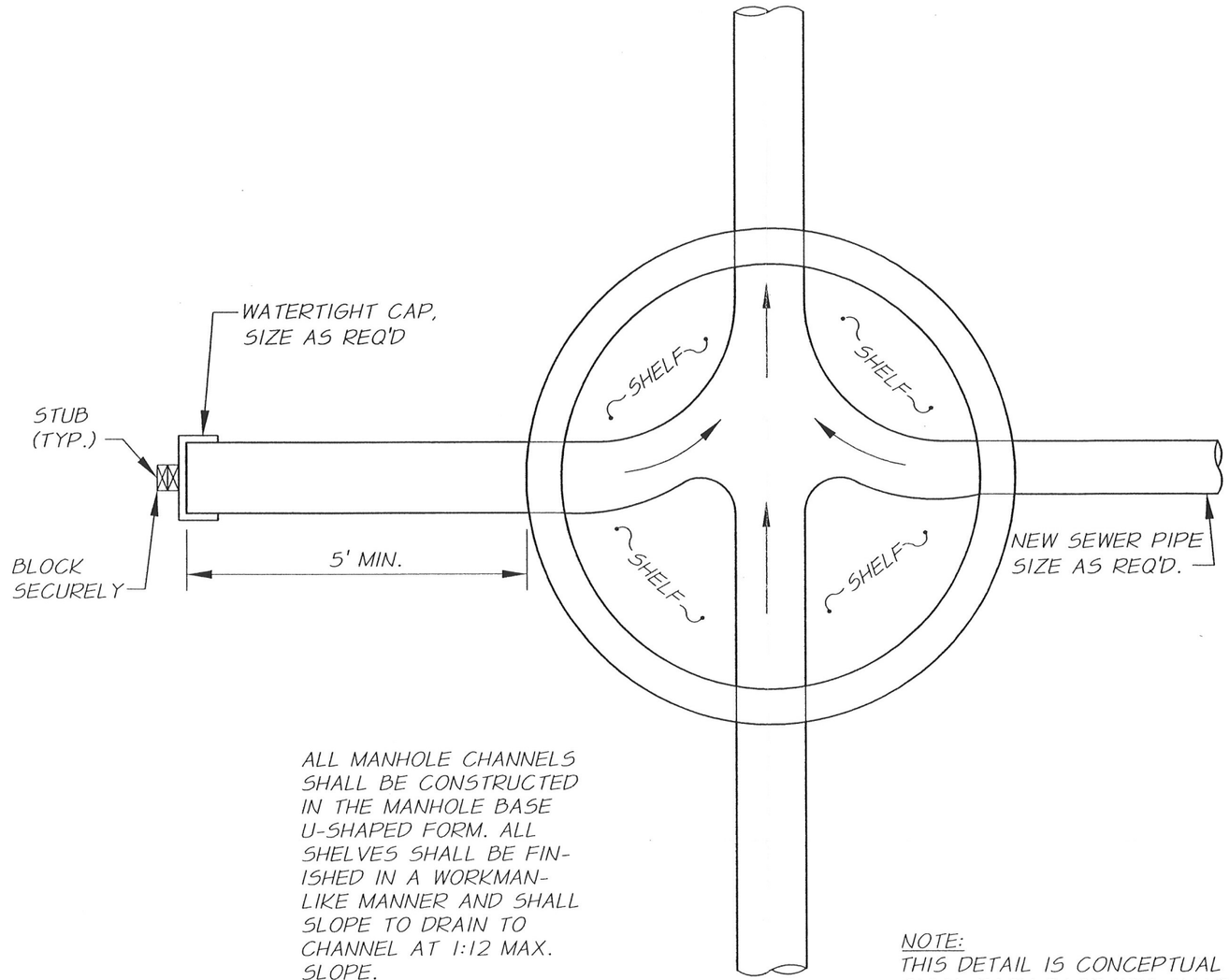
MANHOLE CONSTRUCTION NOTES

1. ALL MANHOLES SHALL BE PRECAST MANHOLE UNITS UNLESS OTHERWISE APPROVED.
2. ANY GAPS, HOLES, ROUGH SPOTS, ETC., IN THE CHANNELS SHALL BE FILLED OR REPAIRED IN THE FIELD.
3. THE MANHOLES SHALL BE SET 0 TO 6 INCHES BELOW FINISH GRADE AND THEN ADJUSTED TO GRADE WITH GRADE RINGS AS REQUIRED WHEN FINAL STREET WORK IS PERFORMED.
4. CONE SECTION SHALL BE ECCENTRIC.
5. SHOULD THE CTUIR WATER/SEWER DEPARTMENT DETERMINE THE NATIVE MATERIAL IS UNSUITABLE FOUNDATION, ADDITIONAL MATERIAL SHALL BE INSTALLED AS OUTLINED IN THE TECHNICAL SPECIFICATIONS.
6. DROP FLOW INVERTS ACROSS MANHOLE 0.2 FT. MIN. UNLESS OTHERWISE SHOWN.
7. ALL MANHOLES SHALL HAVE A BUILT-IN LADDER, SEE SPECIFICATIONS.
8. ALL MANHOLE COVERS, EXCEPT IN GRAVELED OR PAVED AREAS, SHALL BE SET 6-INCHES ABOVE FINISHED GRADE.
9. USE TYPE B MANHOLE IF DEPTH OF MANHOLE FROM FINISH GRADE TO PIPE INVERT IS LESS THAN 5.5 FEET.



ALL MANHOLE CHANNELS SHALL BE CONSTRUCTED IN THE MANHOLE BASE U-SHAPED FORM. ALL SHELVES SHALL BE FINISHED IN A WORKMAN-LIKE MANNER AND SHALL SLOPE TO DRAIN TO CHANNEL AT 1:12 MAX. SLOPE.

NOTE:
THIS DETAIL IS CONCEPTUAL ONLY. EACH BASE WILL HAVE ITS OWN UNIQUE LAYOUT.

PLAN

MANHOLE BASE

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	SEWER LINE DETAILS	S2
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	MANHOLE BASE AND CONSTRUCTION NOTES	

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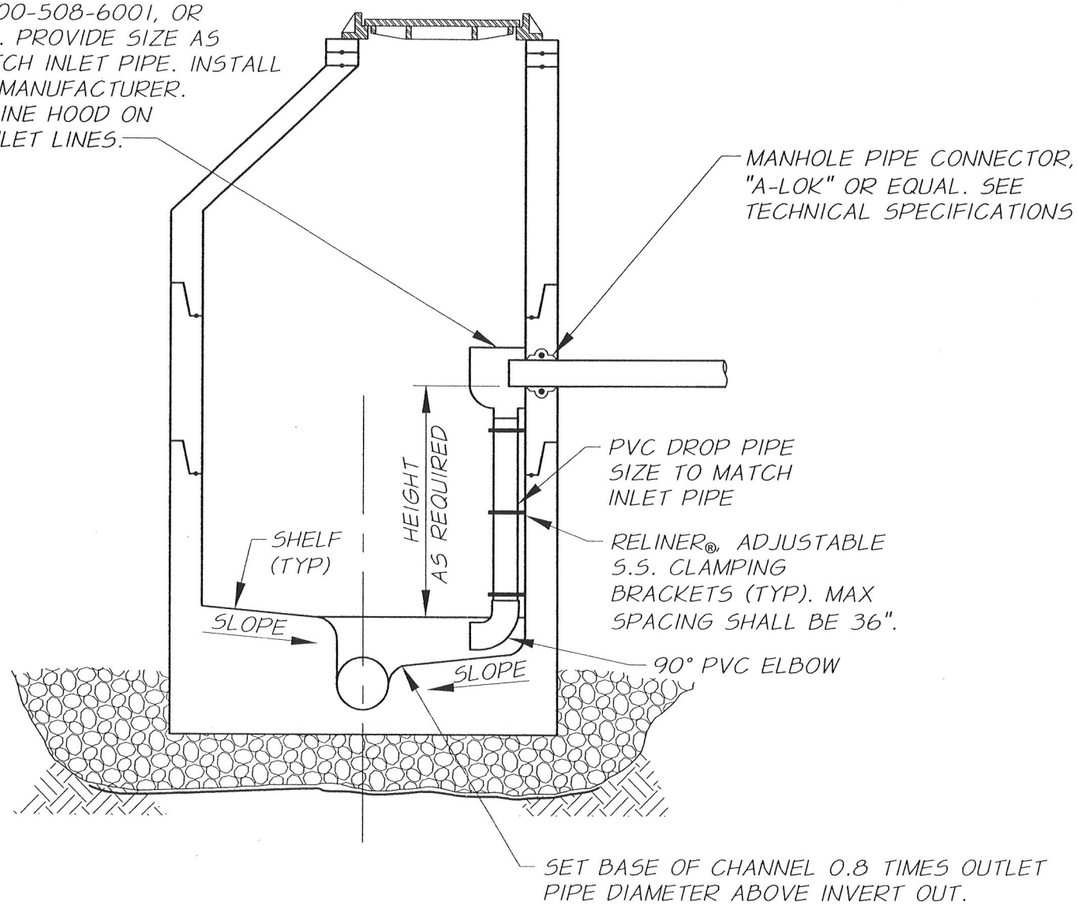
NOTE:
SEE APPROPRIATE MANHOLE STANDARD DETAIL FOR OTHER MANHOLE REQUIREMENTS.



DROP PRECAST MANHOLE

NTS

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	SEWER LINE DETAILS	S3
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	DROP PRECAST MANHOLE	

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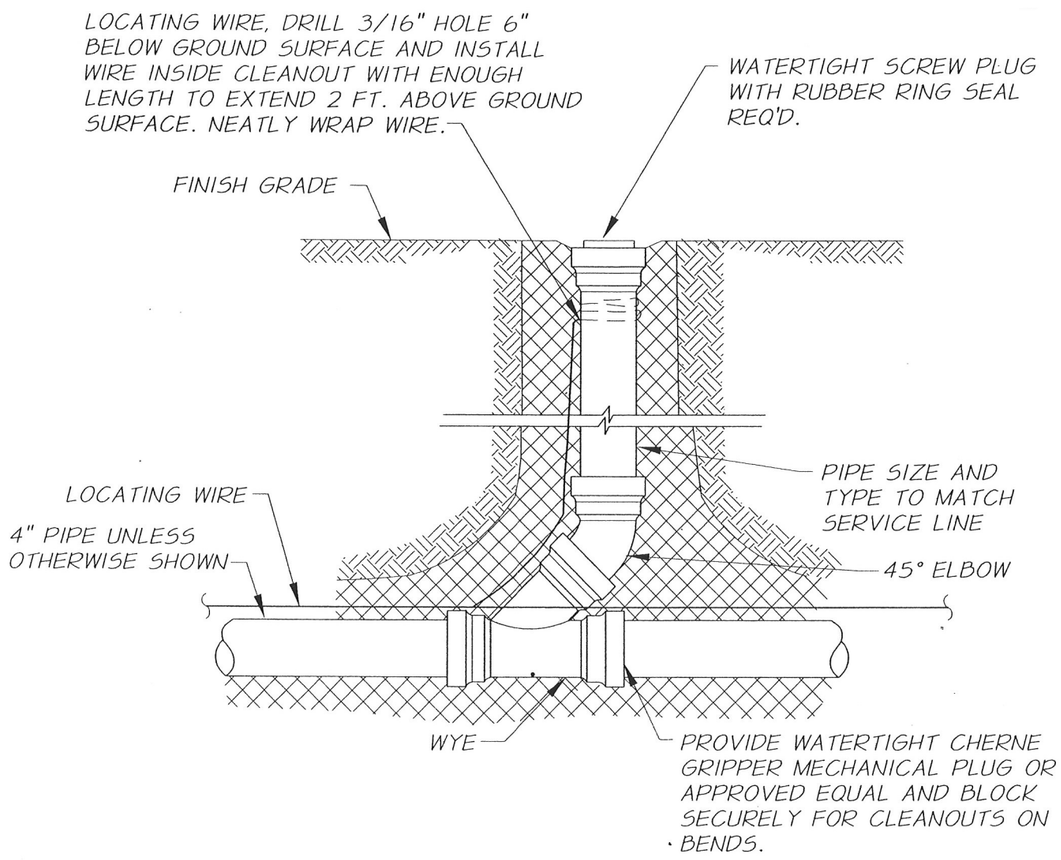

SEWER SERVICE LINE CLEANOUT

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	SEWER LINE DETAILS	S5
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	SEWER SERVICE LINE CLEANOUT	

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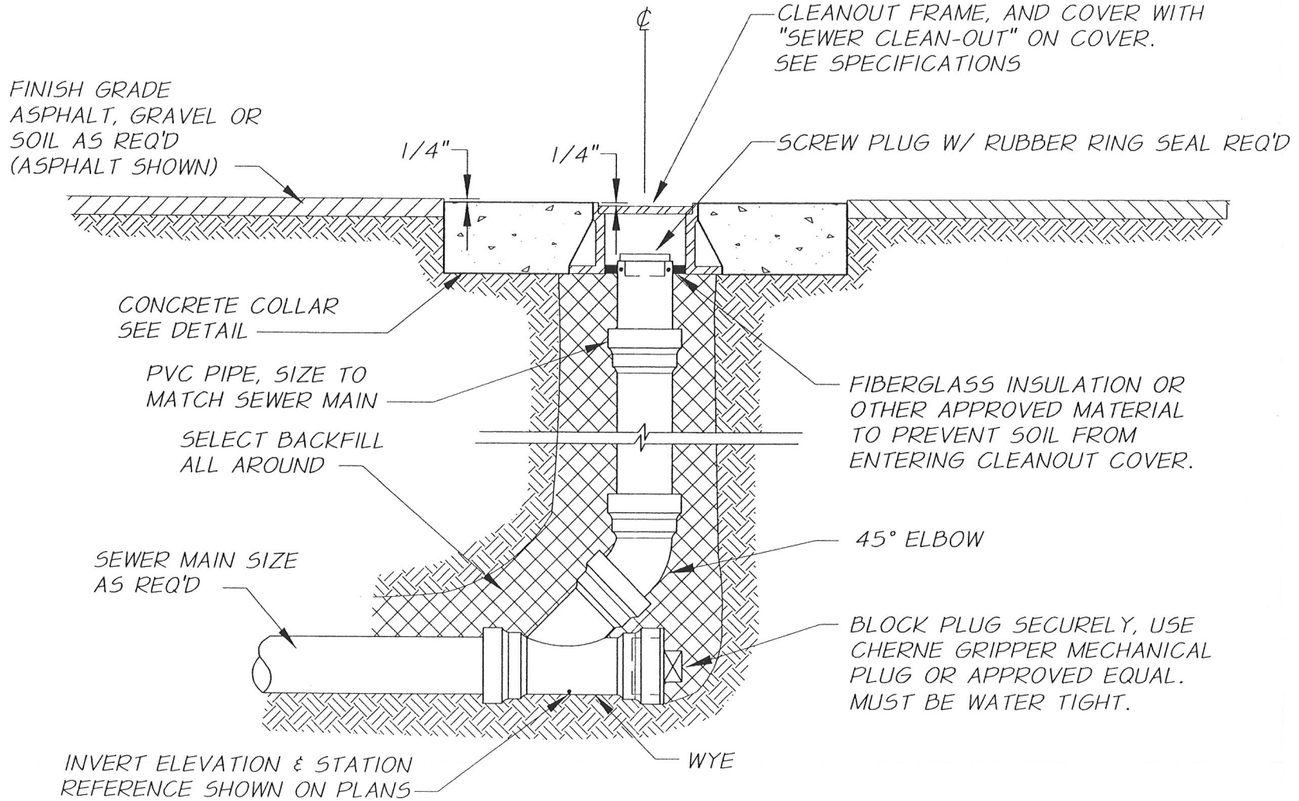

GRAVITY SEWER MAIN LINE CLEANOUT

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	SEWER LINE DETAILS	S4
Approved: Sandra Alspaugh CTUIR PWD	Date: 10/24/07	GRAVITY SEWER MAIN LINE CLEANOUT	

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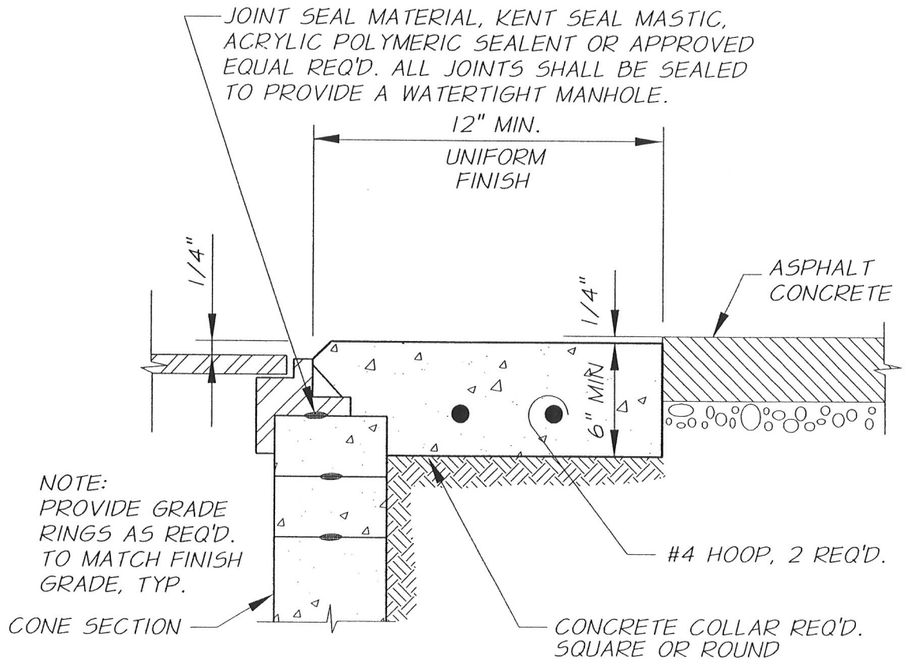
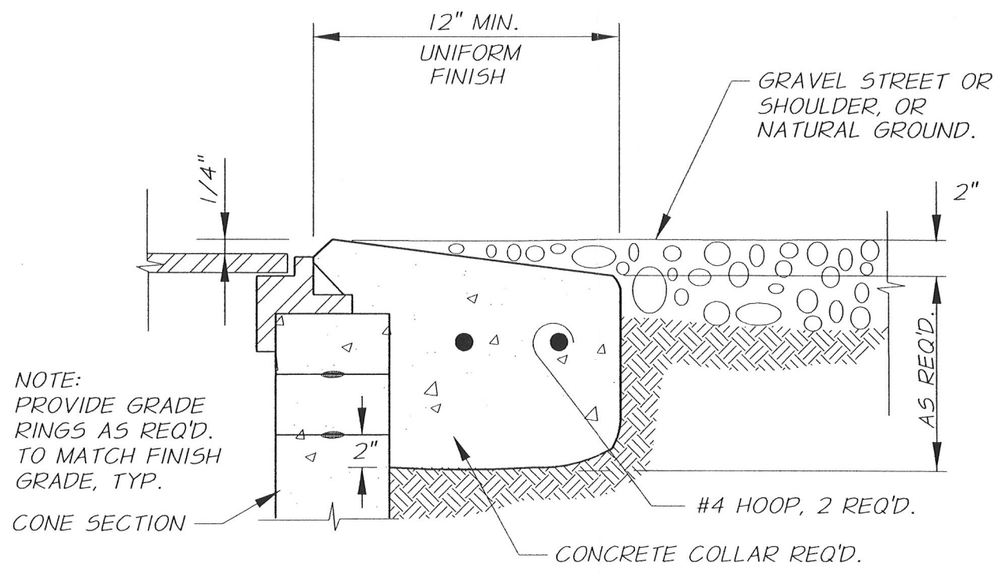


MANHOLE AND CLEANOUT CONCRETE COLLAR DETAIL

IN ASPHALT PAVEMENT

N.T.S.



MANHOLE AND CLEANOUT CONCRETE COLLAR DETAIL

IN GRAVEL STREETS OR NATURAL GROUND

N.T.S.

REQUIREMENTS FOR CONCRETE COLLARS:

1. CONCRETE: 3/4", 7 SACK, 4000 PSI @ 28 DAYS, 2" TO 4" SLUMP, 4-7% AIR.
2. COLLAR TO BE FORMED AND BE UNIFORMLY ROUND.
3. SMOOTH BROOMED FINISH REQ'D.
4. APPLY CONCRETE CURING COMPOUND
5. PROTECT FROM TRAFFIC FOR 4 DAYS MIN.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	SEWER LINE DETAILS	S6
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	MANHOLE AND CLEANOUT CONCRETE COLLAR DETAILS	

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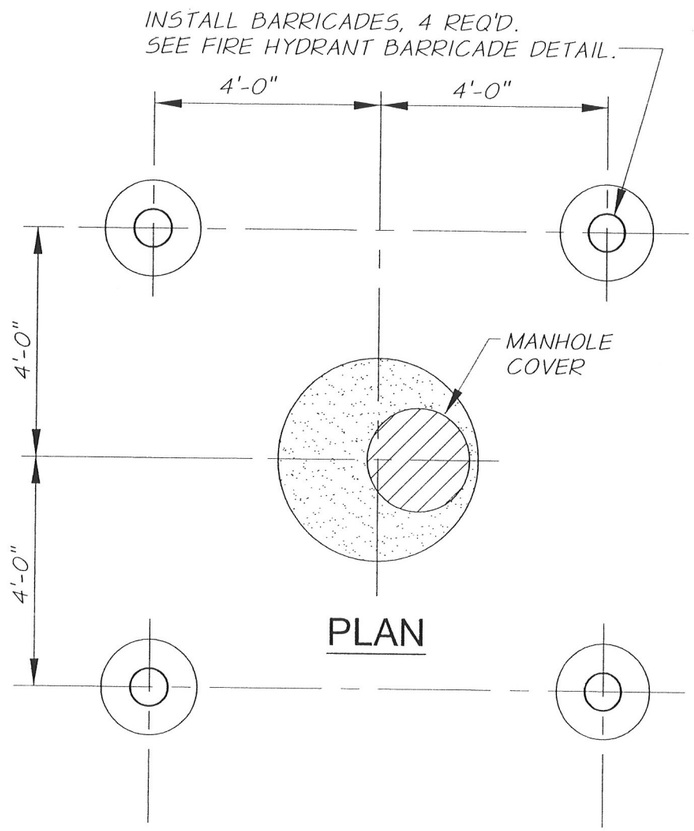

PLAN

NOTE:
MANHOLE BARRICADES TO BE PROVIDED WHEN
REQUIRED BY CTUIR WATER/SEWER DEPARTMENT.

MANHOLE BARRICADE

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	SEWER LINE DETAILS	S7
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	MANHOLE BARRICADE	

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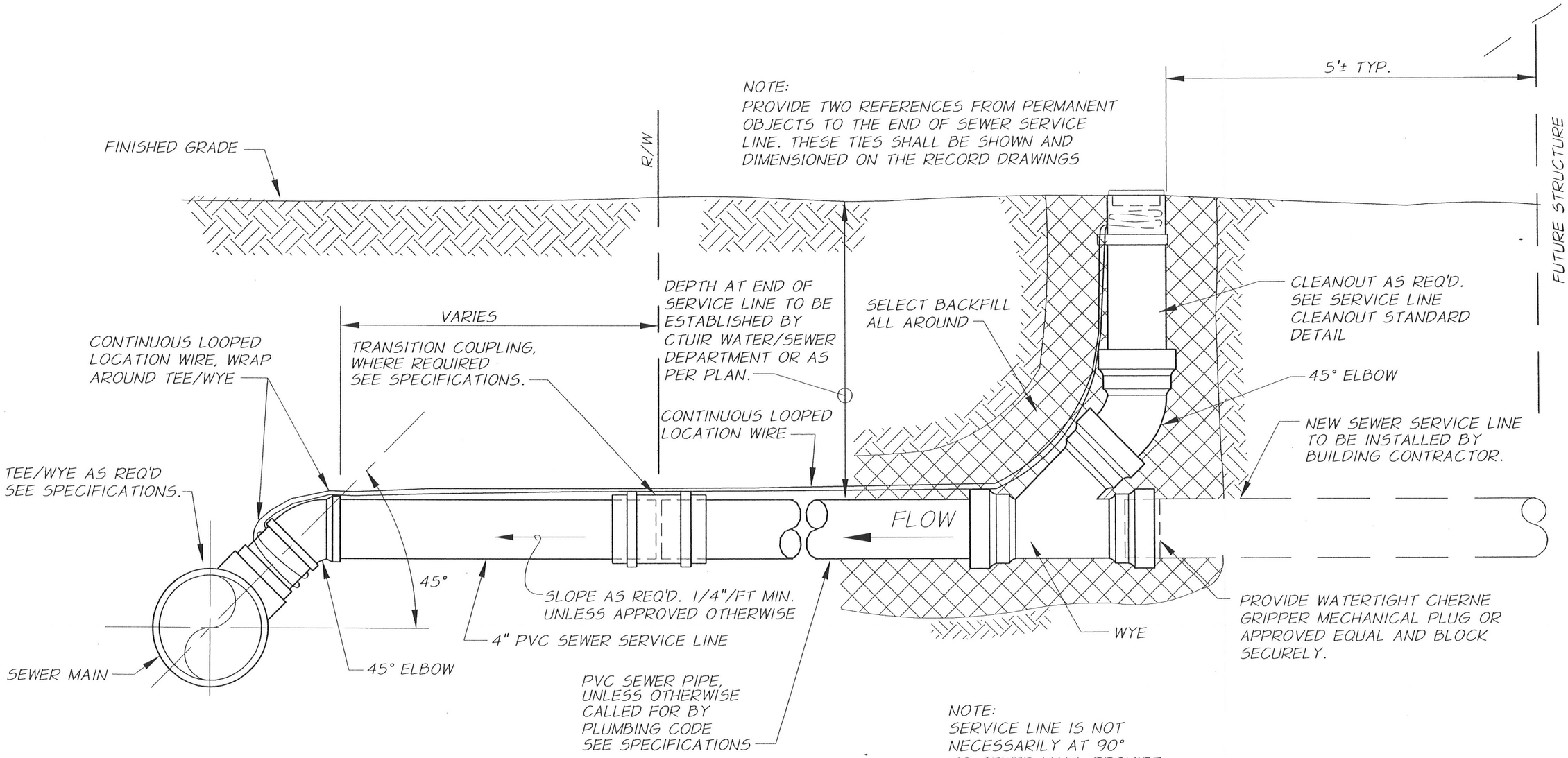

SEWER SERVICE LINE
(WITH CLEANOUT)

NTS

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	SEWER LINE DETAILS	S8
Approved: Sandra Allyn Arden CTUIR PWD	Date: 10/24/07	SEWER SERVICE LINE	

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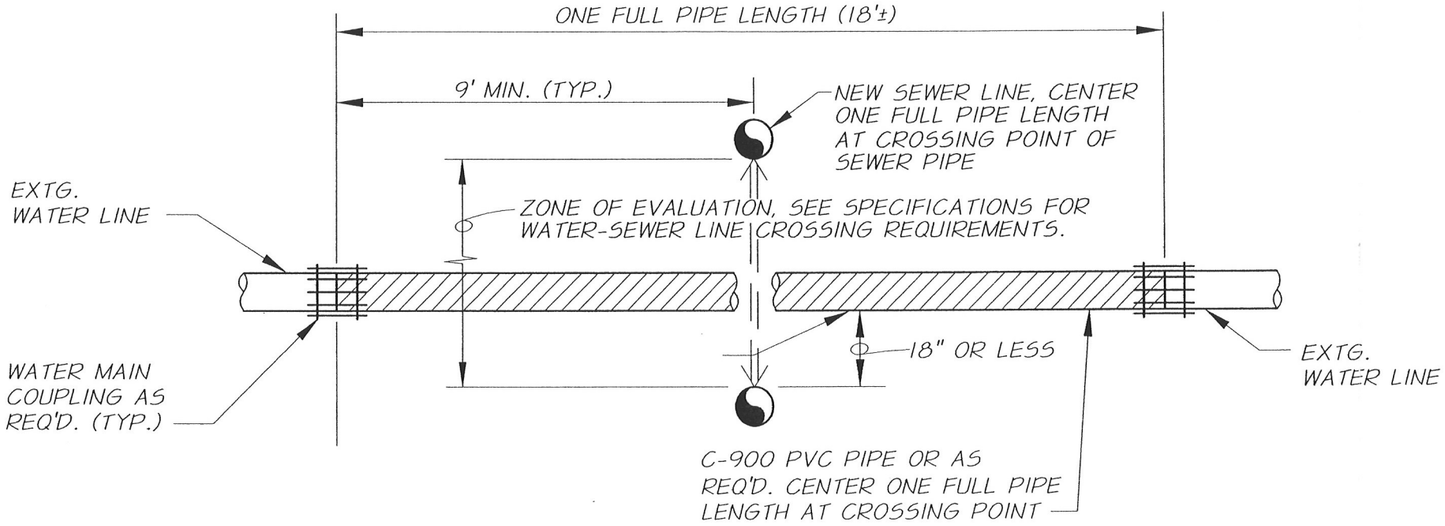

NOTE:

ALL BACK FILL IN AREA OF WATER-SEWER CROSSING TO A DEPTH 12" ABOVE THE TOP OF THE HIGHEST PIPE SHALL BE 3/4"-0 BASE ROCK COMPACTED TO 95% OF ASTM D-698 LABORATORY DENSITY.

WATER-SEWER CROSSING

(NEW SEWER LINE CONSTRUCTION)

NTS

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	SEWER LINE DETAILS	S9
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	WATER-SEWER CROSSING (NEW SEWER LINE CONSTRUCTION)	

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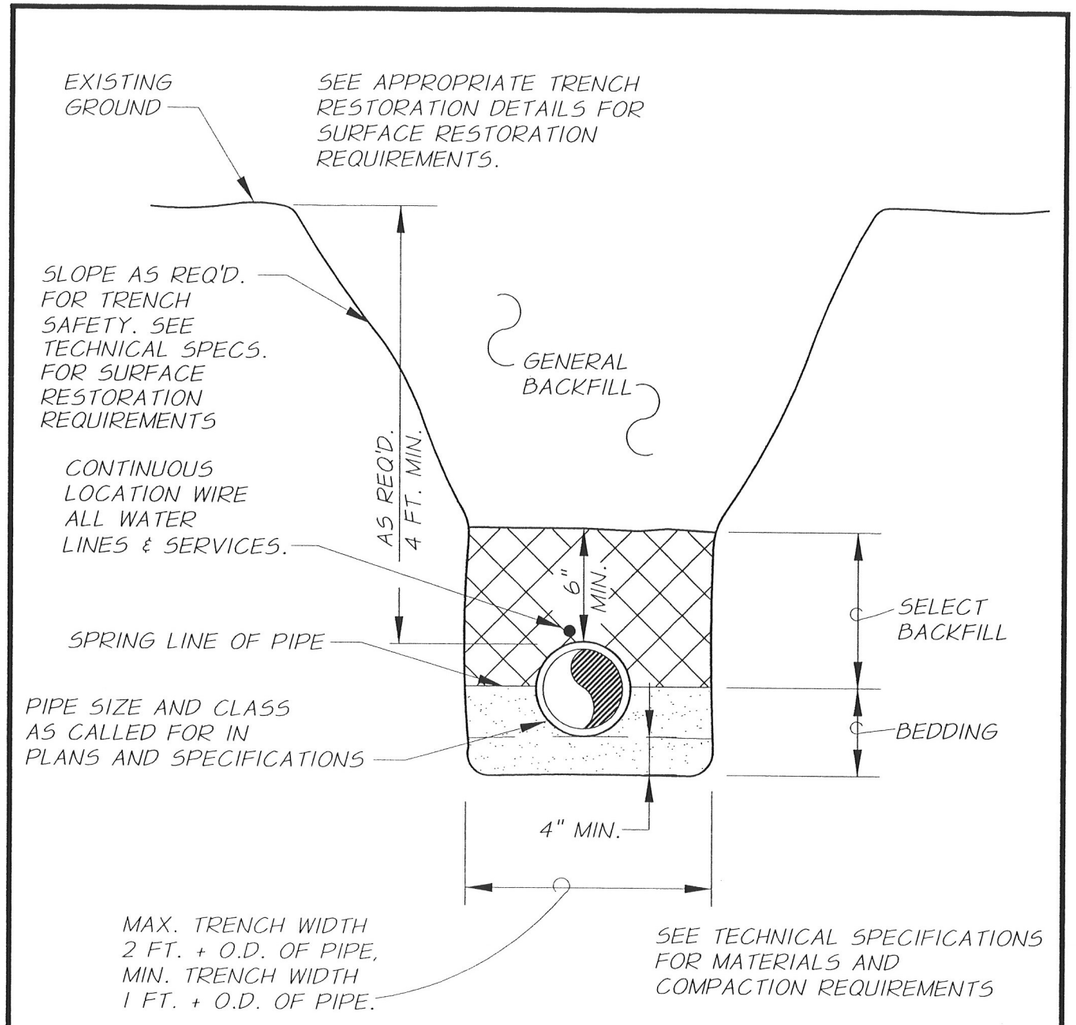

TRENCH EXCAVATION AND BACKFILL

(WATER MAIN LINES)

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Alexander CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	TRENCH DETAILS TRENCH EXCAVATION AND BACKFILL (WATER MAIN LINES)	T1

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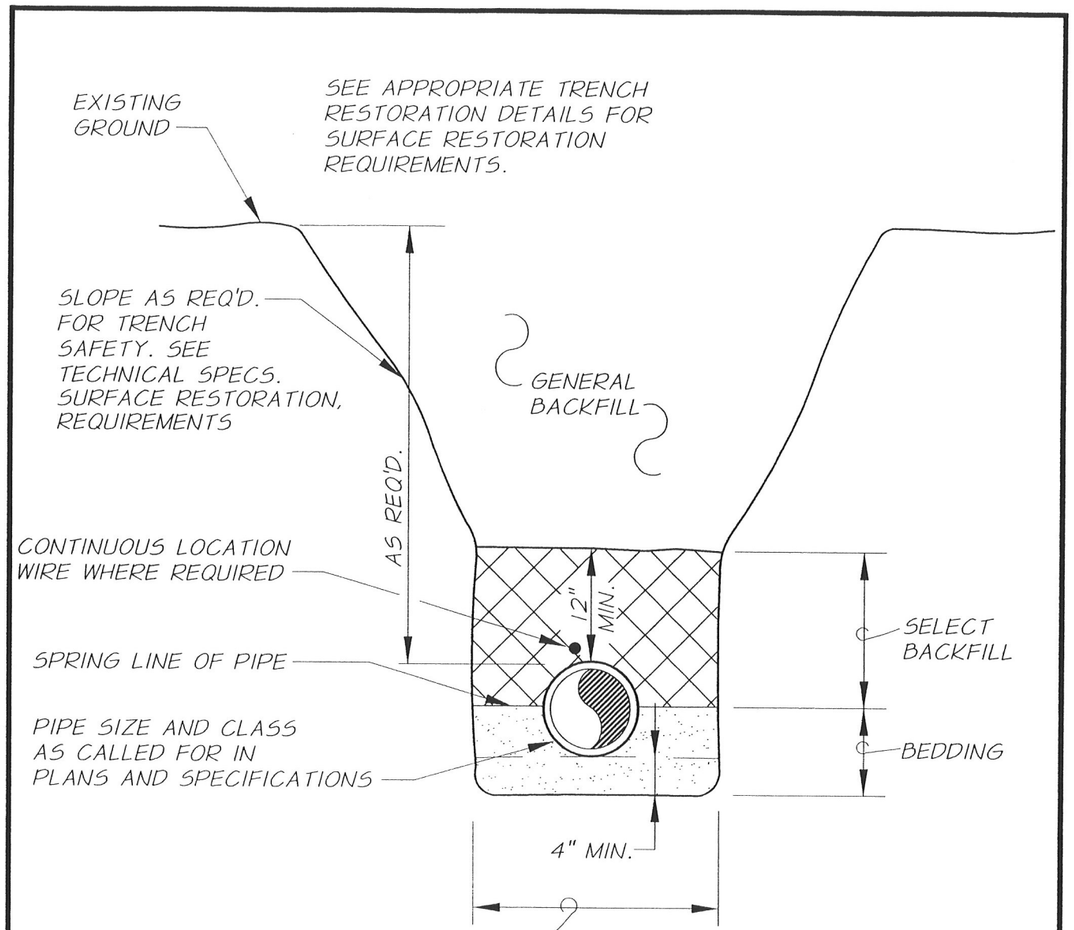

TRENCH EXCAVATION AND BACKFILL

(GRAVITY SEWER MAIN LINES)

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	TRENCH DETAILS	T2
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	TRENCH EXCAVATION AND BACKFILL (GRAVITY SEWER MAIN LINES)	

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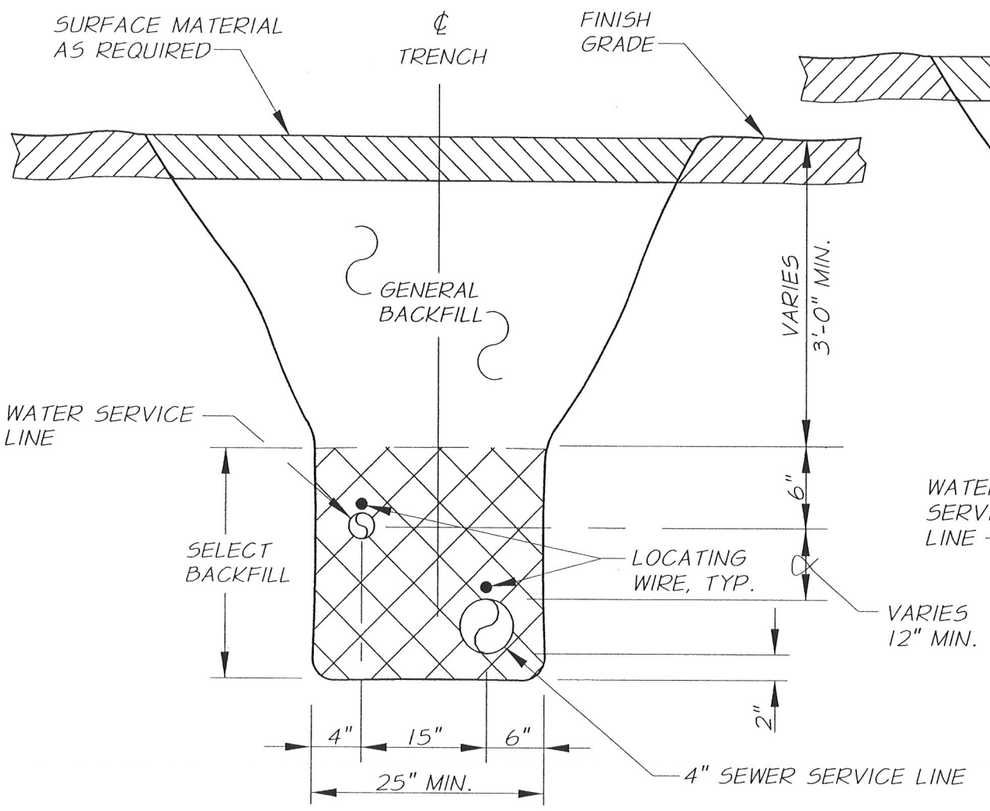
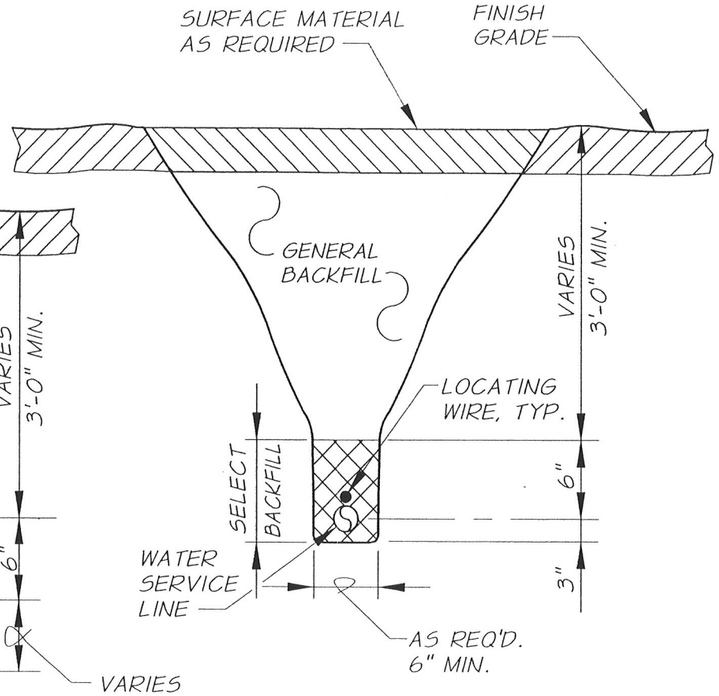


SEE TECHNICAL SPECIFICATIONS FOR MATERIALS AND COMPACTION REQUIREMENTS

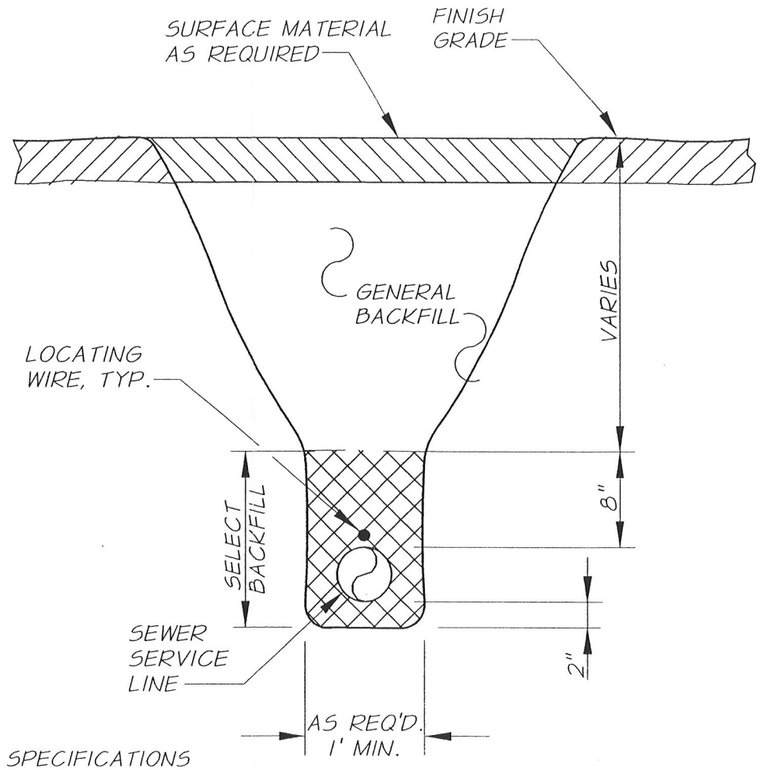
TYPICAL WATER / SEWER SERVICE LINE TRENCH

NTS



TYPICAL WATER SERVICE LINE TRENCH

NTS



SEE TECHNICAL SPECIFICATIONS FOR MATERIALS AND COMPACTION REQUIREMENTS

TYPICAL SEWER SERVICE LINE TRENCH

NTS

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	TRENCH DETAILS	T3
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	TYPICAL WATER/SEWER SERVICE LINE TRENCHES	

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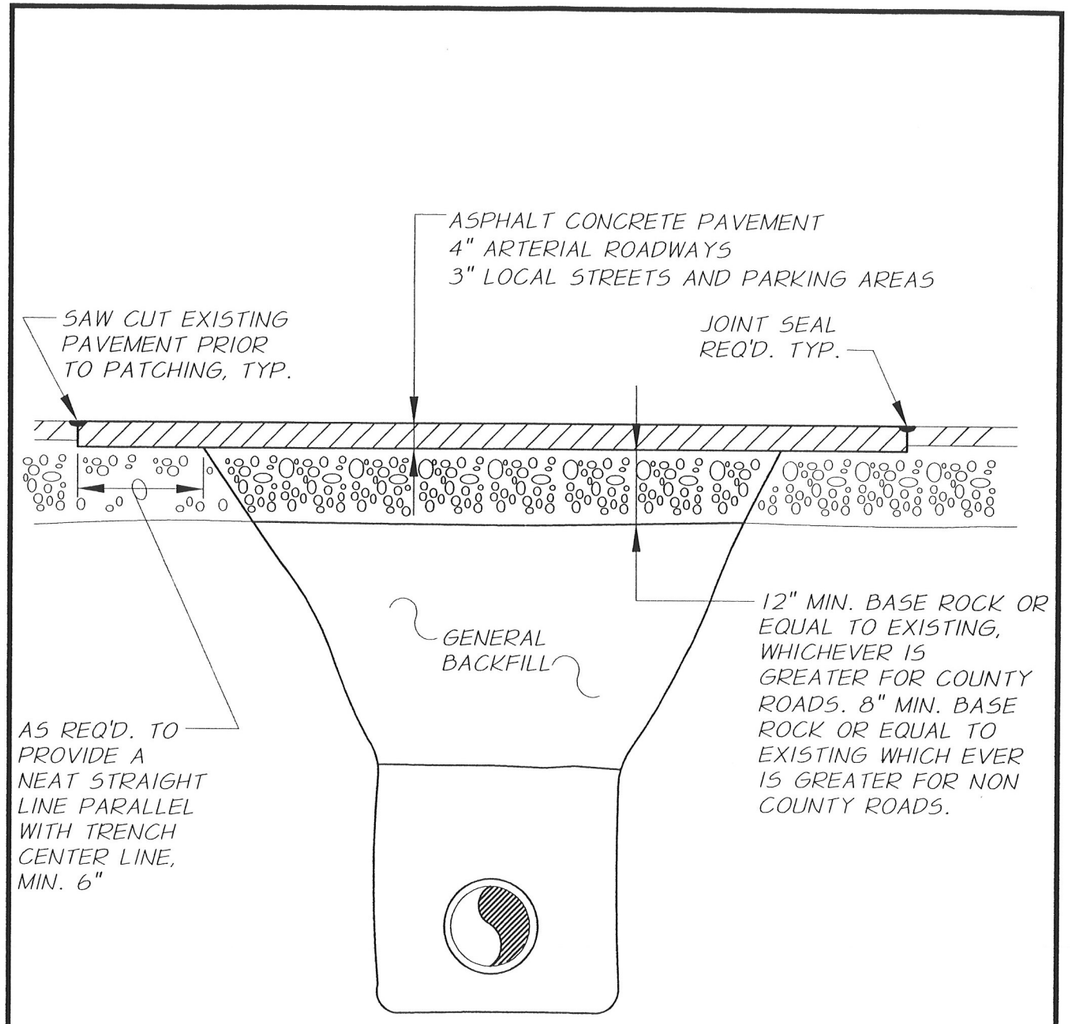

TRENCH RESTORATION

PAVED STREETS AND ROADWAYS

N.T.S.

NOTE:
FOR STATE HIGHWAY RESTORATION, REFER TO STATE HIGHWAY CROSSING PERMIT CONDITIONS.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	TRENCH DETAILS	T4
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	TRENCH RESTORATION (PAVED STREETS AND ROADWAYS)	

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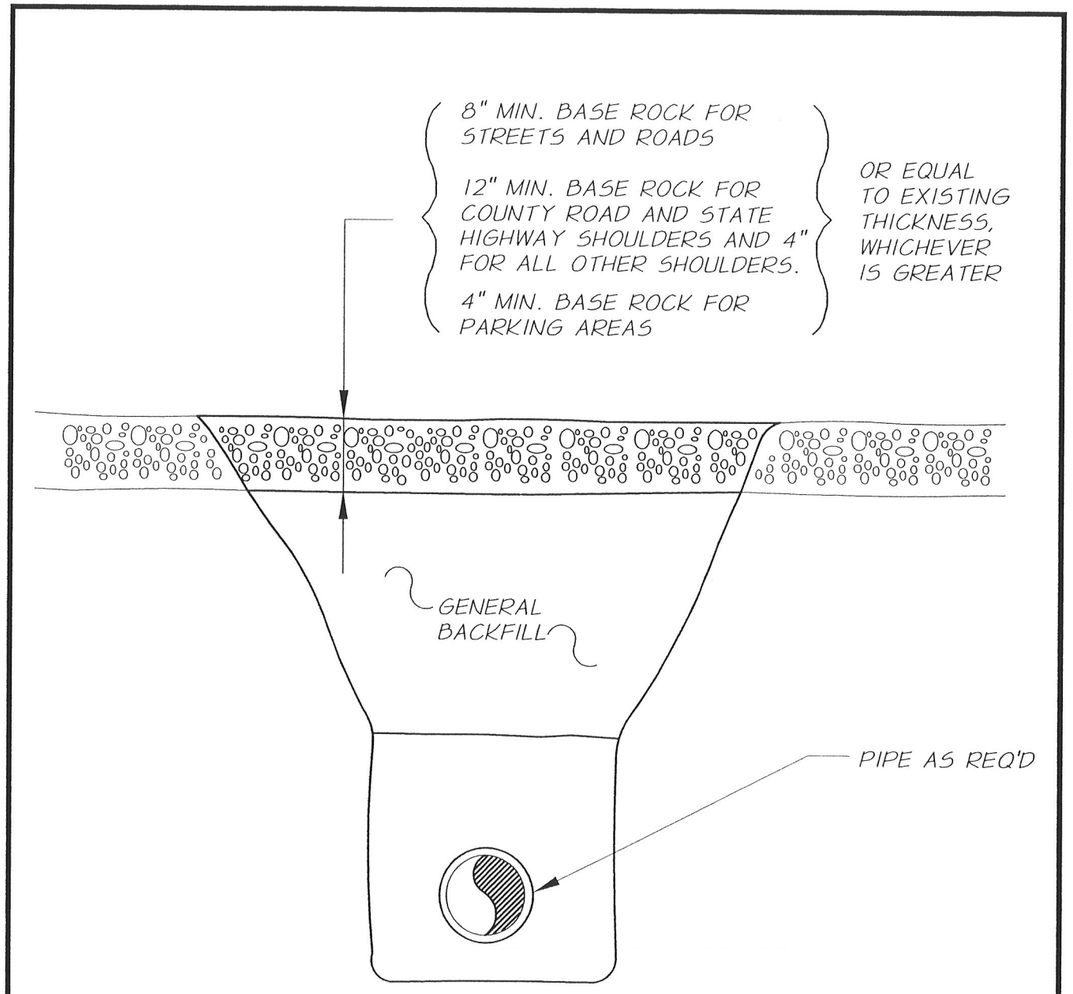

TRENCH RESTORATION

GRAVEL STREETS, ROADWAYS, SHOULDERS, AND PARKING AREAS

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Alexander CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	TRENCH DETAILS TRENCH RESTORATION (GRAVEL STREETS, ETC.)	T5

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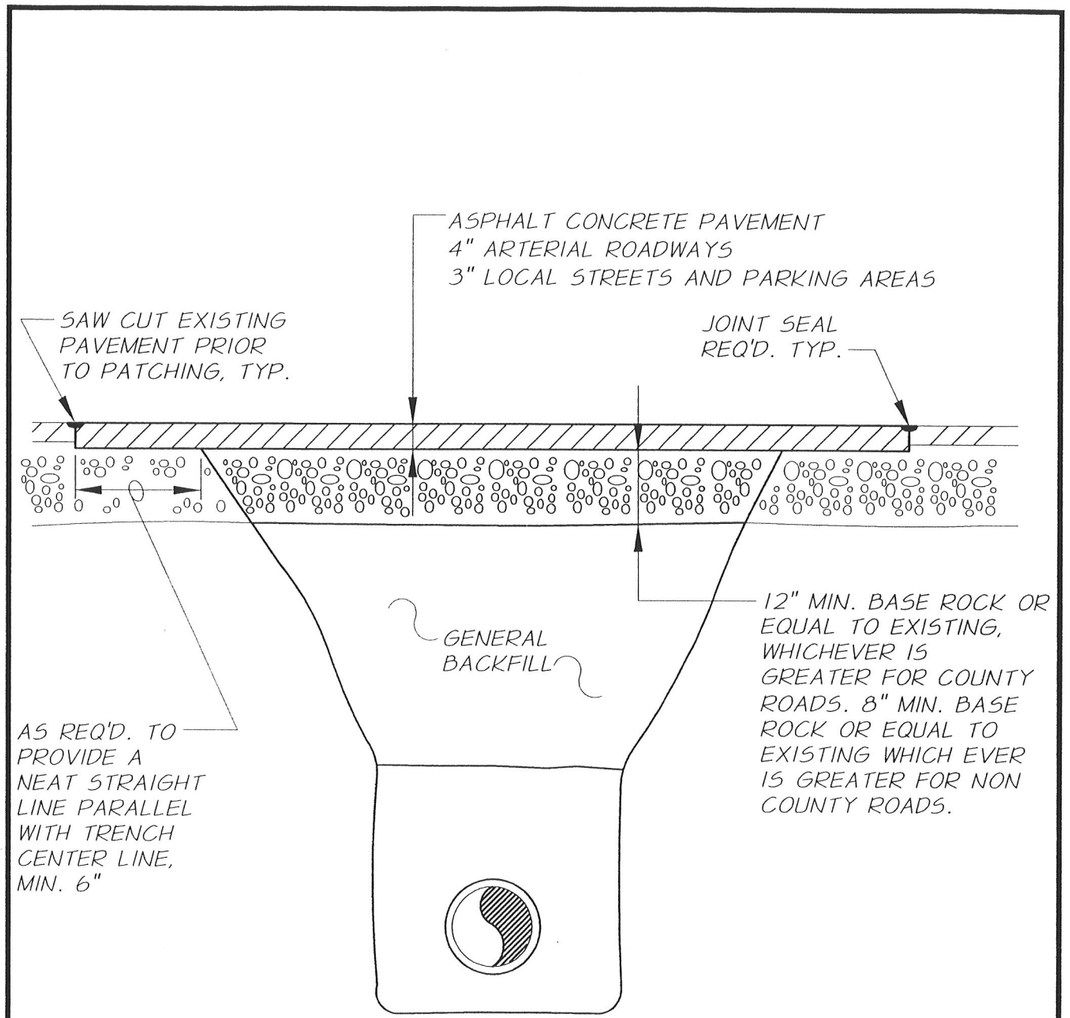

TRENCH RESTORATION

PAVED STREETS AND ROADWAYS

N.T.S.

NOTE:
FOR STATE HIGHWAY RESTORATION, REFER TO STATE HIGHWAY CROSSING PERMIT CONDITIONS.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	TRENCH DETAILS TRENCH RESTORATION (PAVED STREETS AND ROADWAYS)	T4
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07		

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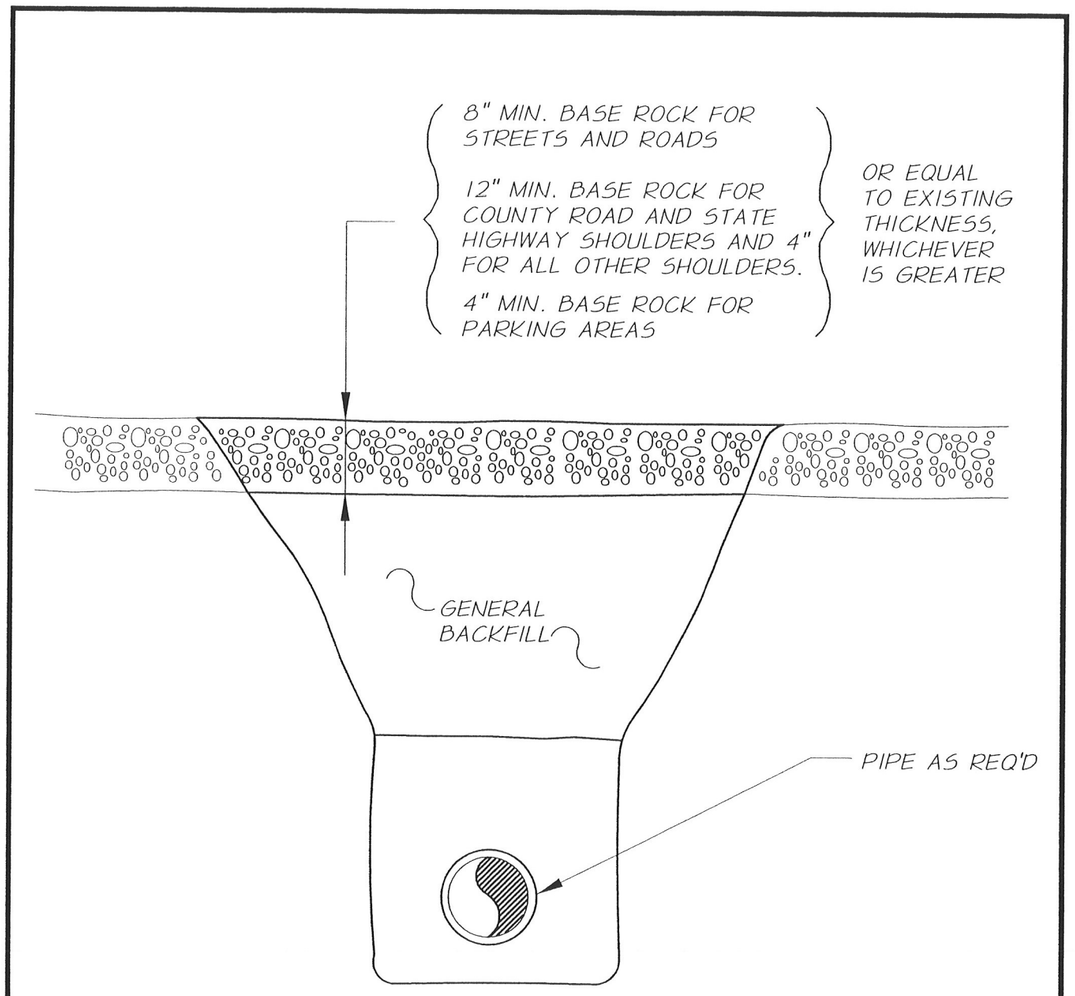

TRENCH RESTORATION

GRAVEL STREETS, ROADWAYS, SHOULDERS, AND PARKING AREAS

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Alexander CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	TRENCH DETAILS TRENCH RESTORATION (GRAVEL STREETS, ETC.)	T5

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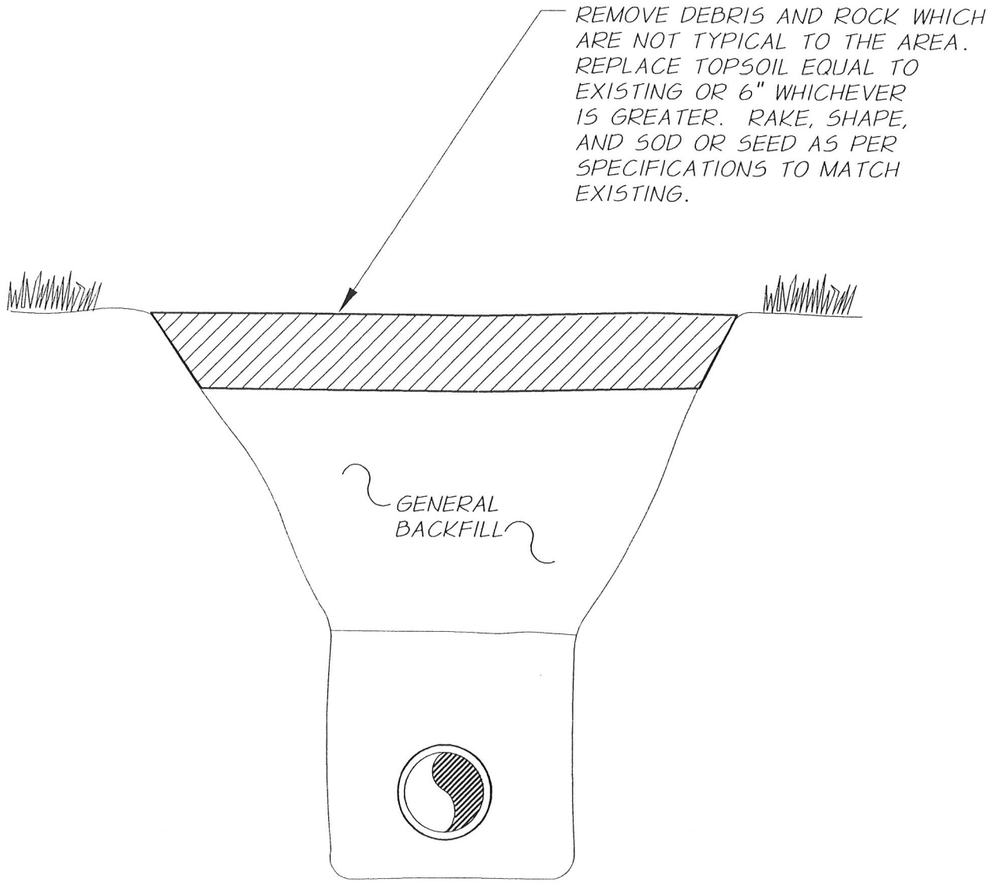

TRENCH RESTORATION

LAWNS & LANDSCAPED AREAS

NTS

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	TRENCH DETAILS	T6
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	TRENCH RESTORATION (LANDSCAPED AREAS)	

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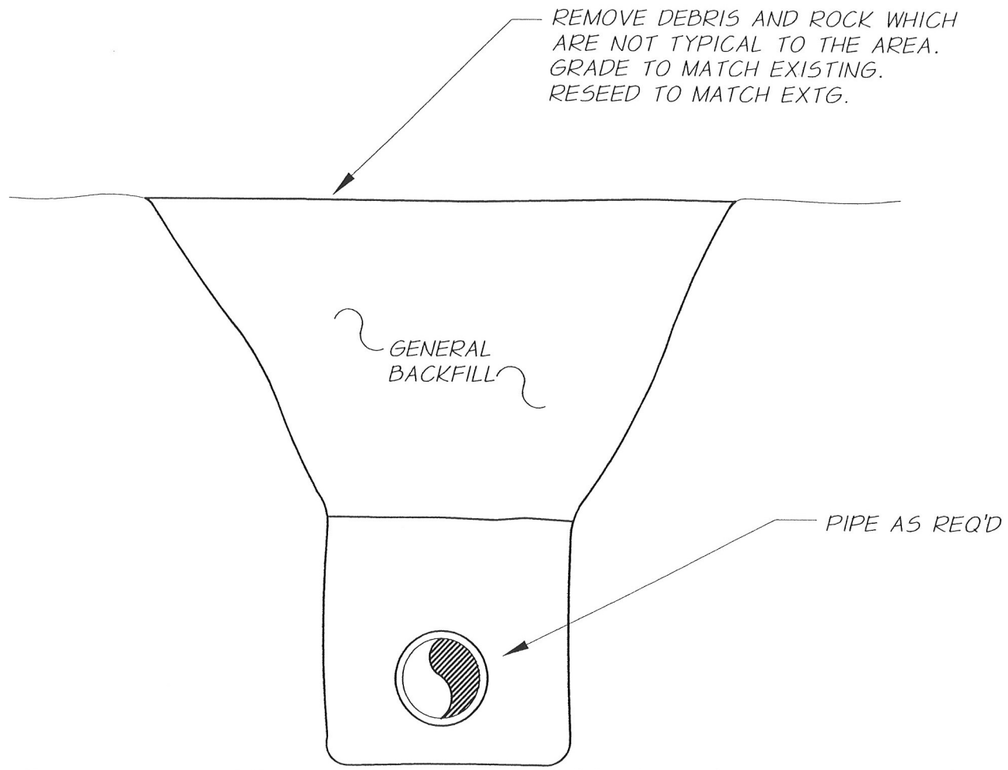

TRENCH RESTORATION

NATURAL AREAS

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Alexander CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	TRENCH DETAILS TRENCH RESTORATION (NATURAL AREAS)	T7

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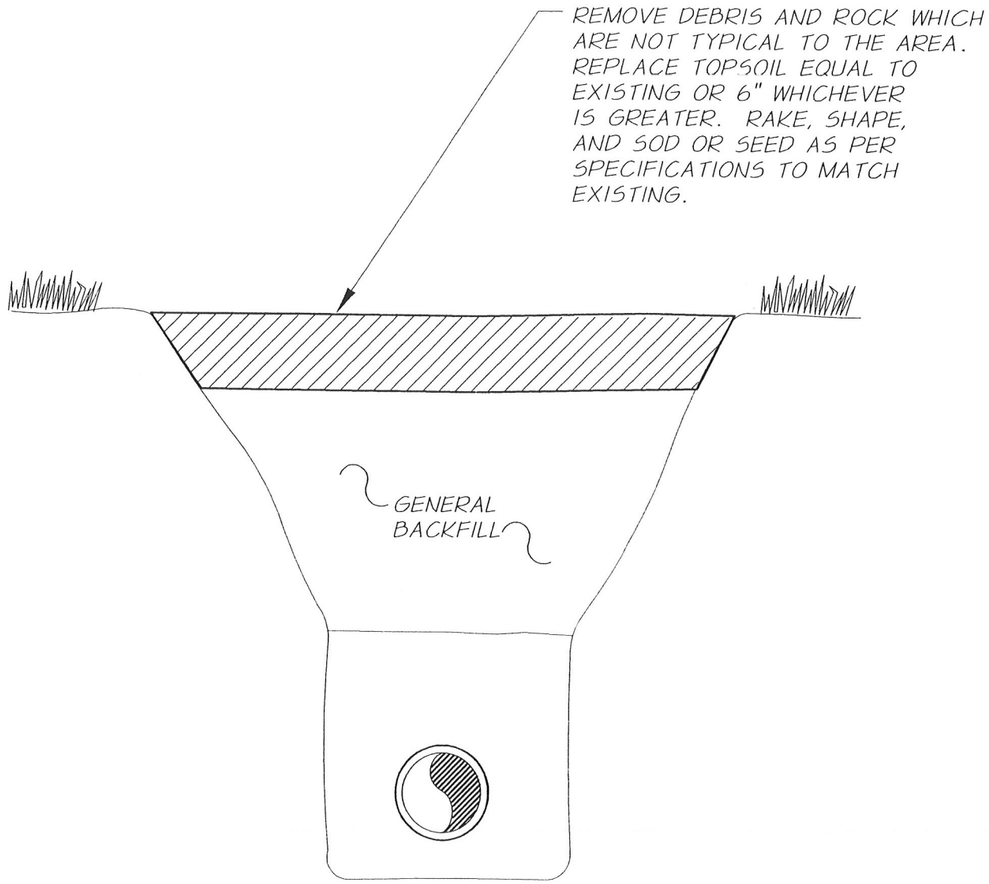

TRENCH RESTORATION

LAWNS & LANDSCAPED AREAS

NTS

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	TRENCH DETAILS	T6
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	TRENCH RESTORATION (LANDSCAPED AREAS)	

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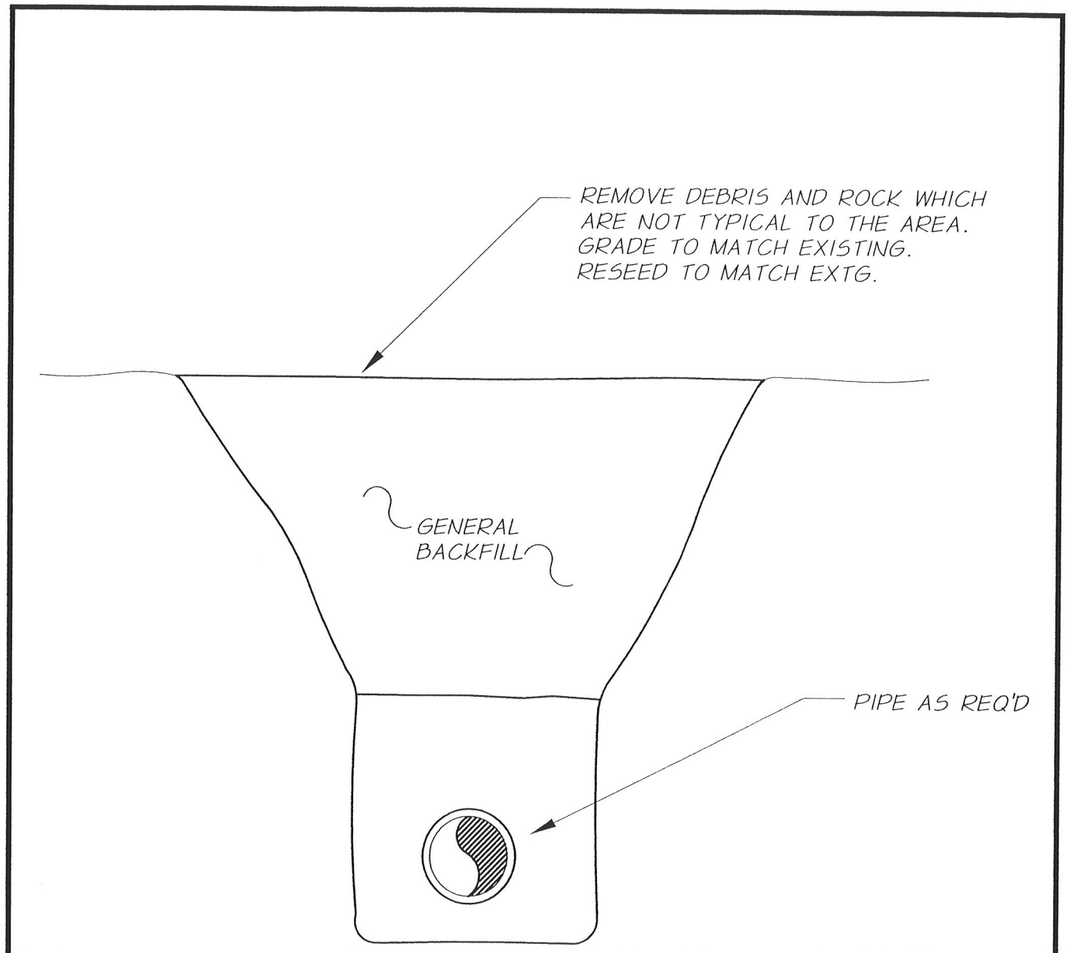

TRENCH RESTORATION

NATURAL AREAS

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Alexander CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	TRENCH DETAILS TRENCH RESTORATION (NATURAL AREAS)	T7

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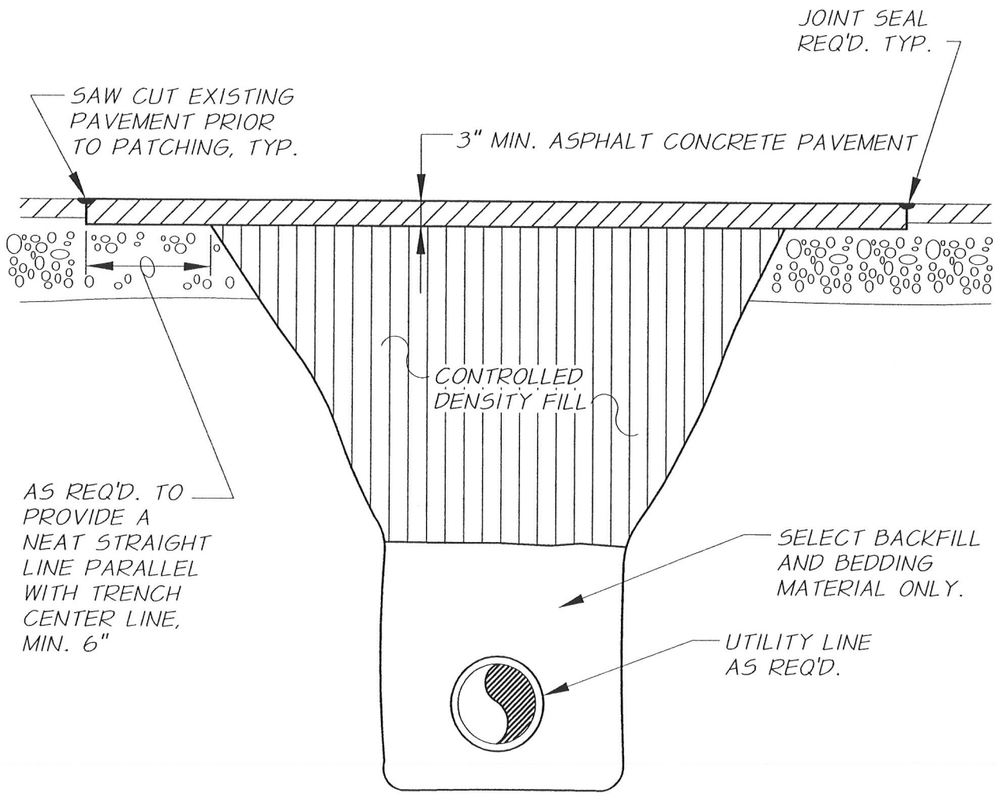

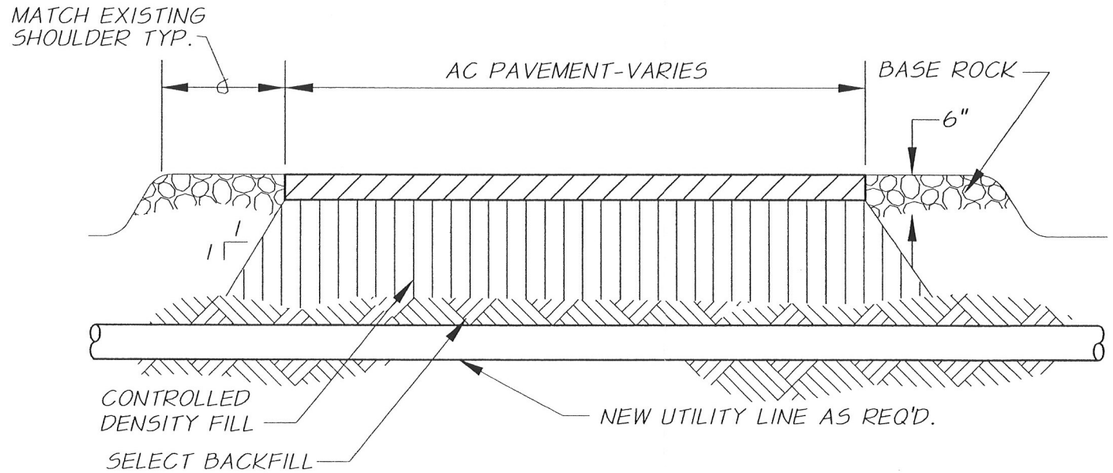

TRENCH RESTORATION

PAVED COUNTY ROADWAY CROSSINGS

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
Approved: Sandra Alexander CTUIR PWD	Date: 2007 Scale: N.T.S. Date: 10/24/07	TRENCH DETAILS TRENCH RESTORATION (COUNTY ROAD CROSSING)	T8

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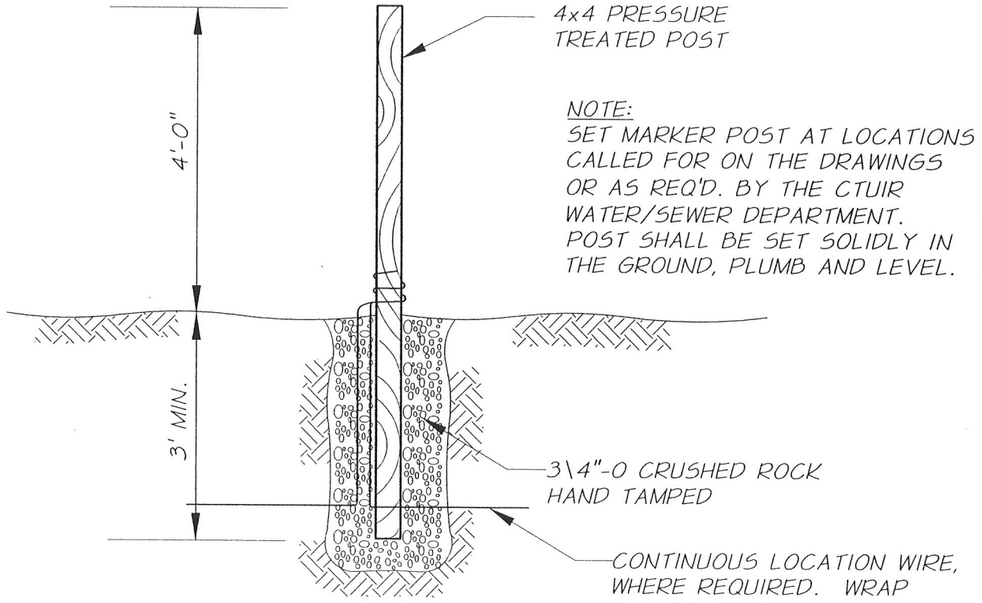

MARKER POST

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	GENERAL DETAILS	G1
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	MARKER POST	

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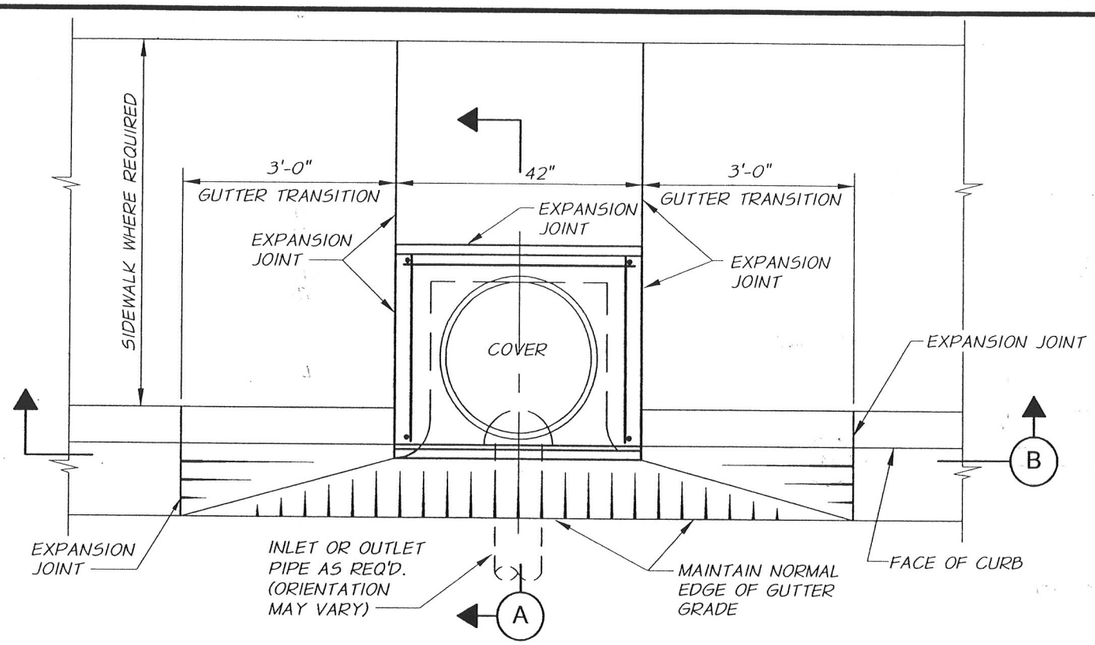
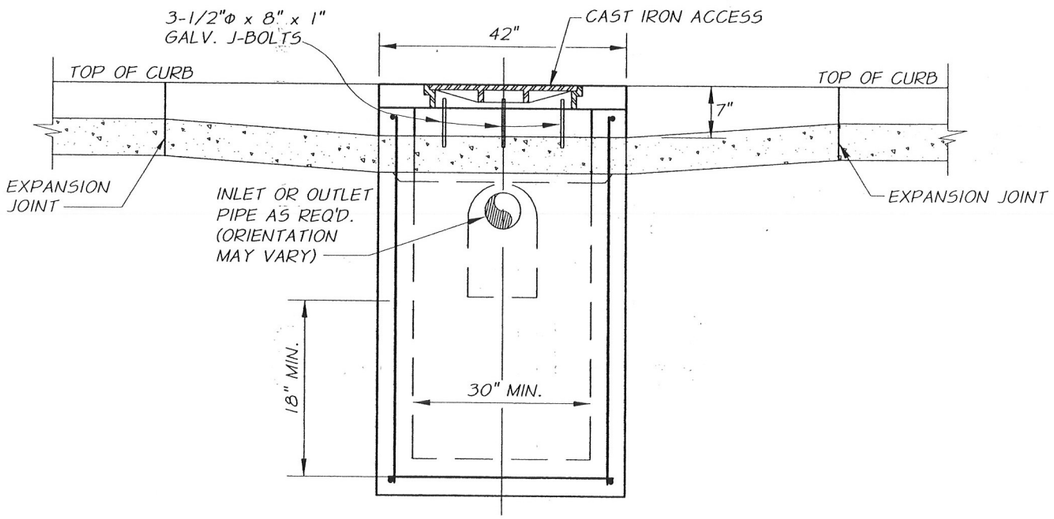


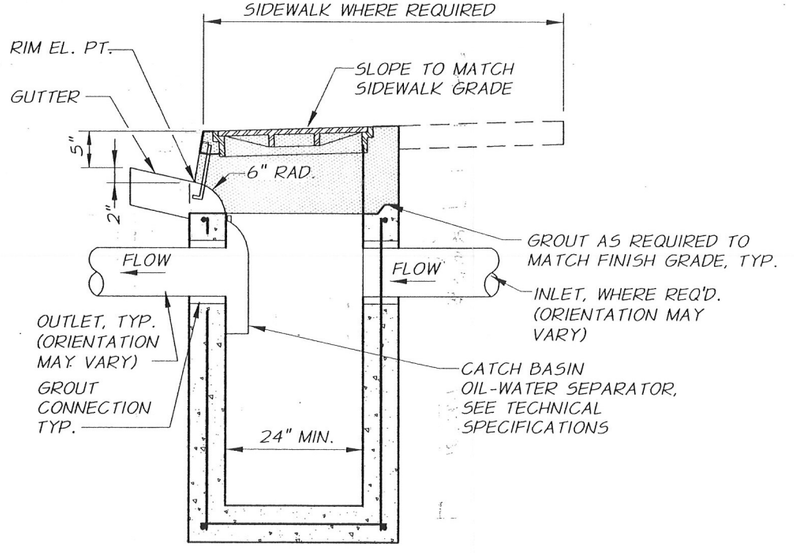
PLAN

NOTES:

1. CATCH BASIN TO BE CONSTRUCTED IN ACCORDANCE WITH ASTM C-139 AND C-913 (PRE-CAST).
2. REINFORCEMENT IN PRE-CAST CATCH BASIN TO BE REBAR MEETING ASTM A615 GRADE 60 OR WELDED WIRE MEETING ASTM A497.
3. CATCH BASIN TOP SECTION SHALL BE ODOT CG-3 INLET (SEE ODOT STANDARD DRAWING RD372) OR APPROVED EQUAL.



SECTION B



SECTION A

CURB INLET DETAIL

N.T.S.

CTUIR Public Works Department		Title & Description:	Figure
	Date: 2007 Scale: N.T.S.	SEWER LINE DETAILS	G2
Approved: Sandra Alexander CTUIR PWD	Date: 10/24/07	CURB INLET DETAILS	

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