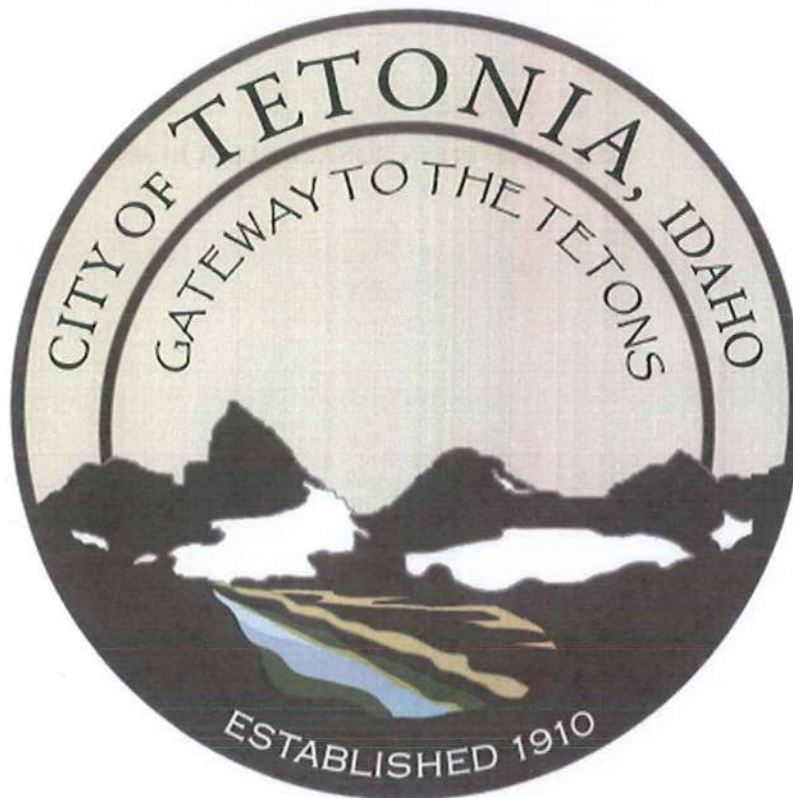


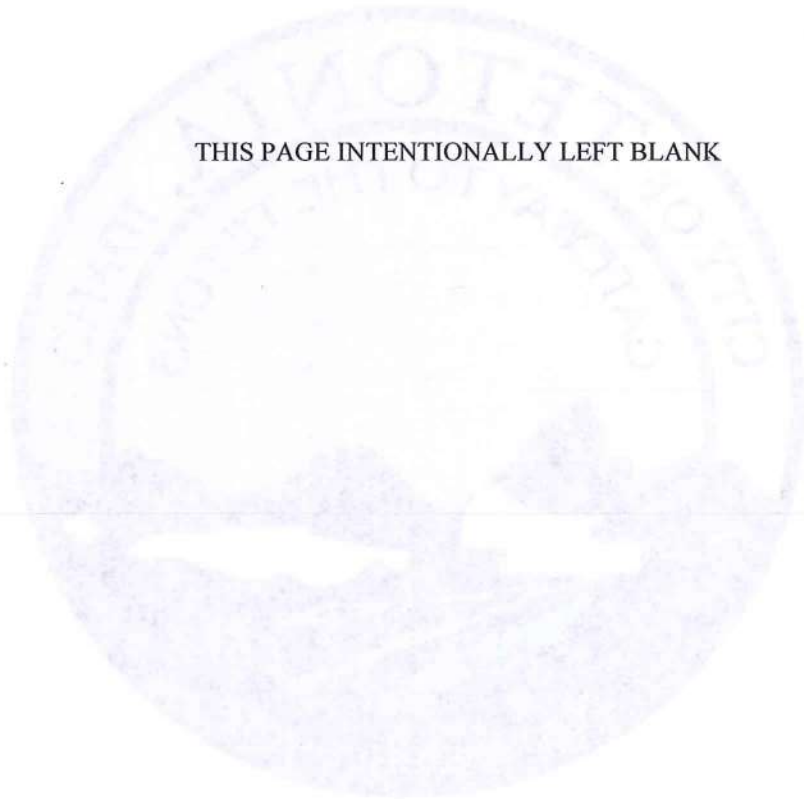
City of Teton

**Public Works Standards and
Technical Specifications**



May 2023

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City of Tetonia

Public Works Standards and Technical Specifications

Adopted June 2023

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CITY CLERK

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CITY ENGINEER

Aqua Engineering

City of Teton

Public Works Standards and Technical Specifications

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SECTION

DESCRIPTION

CITY COUNCIL

POSITION

NAME

DATE

OFFICE

PUBLIC WORKS DIRECTOR

NAME

CITY CLERK

NAME

CITY ENGINEER

NAME

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DIVISION 100

GENERAL INFORMATION

SECTION 101. GENERAL REQUIREMENTS

1. INTRODUCTION

These City of Tetonia "Public Works Standards and Technical Specifications" define the general requirements for improvements to be built by a Developer or Contractor working within the public right-of-way or for improvements that will be connected to public infrastructure or serviced and/or maintained by the city. In addition to these requirements, all other applicable City codes, ordinances, and policies remain in effect.

These City of Tetonia "Public Works Standards and Technical Specifications" are intended to supplement, augment, and complement the latest editions to the Idaho Standards for Public Works Construction (ISPWC), the "10 States Standards", and the Manual of Uniform Traffic Control Devices (MUTCD). Should a conflict arise between these standards and the ISPWC, 10 State Standards, or the MUTCD, these standards shall take precedence.

These standards and specifications are not intended to include all specifications for use on public improvement projects due to many specialized applications and situations. In such instances, deviations from the criteria may be allowed where justified, using the amendment process defined herein.

2. AMENDMENT PROCESS

Whenever, in the opinion of the City Public Works Department, Building Department, the City Engineer/Representative, or the Superintendent having jurisdiction, a literal enforcement of these standards and specifications may cause an undue hardship or a literal enforcement of the provisions may not be unnecessary to meet the goals and standards of the City, the City may modify those standards in the following manner. Modifications may be granted when there are practical difficulties involving carrying out the provisions of the "Public Works Standards and Technical Specifications", and a panel consisting of the City Engineer/Representative, Building Department Official, and the Public Works Director or his Representative will meet to determine that granting of a modification for an individual case will meet the goals and requirements of the City without unduly jeopardizing the public and the individual's interest.

The City shall first receive a written request for a modification to the standards from any interested party. Upon receipt of the request the panel of three discussed above shall find that a special individual reason makes the strict letter of the standard impractical and shall find the modification is in conformance with the intent and purpose of the standards and shall find that such modification does not in any way lessen the integrity of the standards. When such findings of fact are made, the panel may grant such modification as it deems appropriate. The details of any action granted as modification by this panel shall be recorded and entered in the files of the City, with the specific reason for the granting of said modification.

3. LICENSING

These standards are not intended to eliminate the need for the involvement of a licensed professional engineer on a specific project. Per Idaho Code Title 54, Section 1218, a licensed professional engineer must design the plans and specifications for public works projects, as well as supervise or conduct construction observation.

All Contractors performing public work improvements within the City of Tetonia shall possess a valid Idaho Contractors License and shall be licensed to perform the construction for which they are contracted,

including but not limited to those required by the Tetonia City Code, Idaho Code or other State Law, or by the Code of Federal Regulations or other Federal Law.

4. INSURANCE/CITY TO BE NAMED AS ADDITIONAL INSURED

The Contractor shall not commence public work improvements until he/she has obtained all insurance required under this Section or until he/she has satisfied the City in this respect; nor shall he/she allow any subcontractor to commence work until such subcontractor has also obtained such required insurance applicable to such subcontractor's work. The Contractor shall maintain such required insurance coverage throughout the term of this contract as will hold the City harmless and shall indemnify the City for any losses arising out of the Contractor's operations, including any contingent liability arising therefrom. The cost of such insurance shall be borne by the Contractor. The Contractor shall furnish copies of all insurance policies and/or certificates of insurance to the City at the time of execution of this agreement. Each policy shall include a provision to the effect that it shall not be subject to cancellation, or reduction in the amounts of its liabilities, or any other material change, until notice has been given in writing to the City and the City Engineer not less than fifteen (15) days prior to such action. The contractor shall further cause the City to be named as an additional insurer on all applicable insurance policies.

4.1 WORKER'S COMPENSATION

The Contractor shall take out and maintain during the term of this contract, statutory worker's compensation insurance for all employees who will work on this project, and if any work is subcontracted, the Contractor shall require the subcontractor similarly to provide such insurance for all of the latter's employees unless they are included under the protection afforded by the Contractor.

4.2 COMPREHENSIVE PUBLIC AND GENERAL LIABILITY

The Contractor shall take out and maintain during the term of this contract comprehensive public and general liability insurance. The comprehensive public and general liability insurance shall have, at a minimum, a coverage limit of at least FIVE HUNDRED THOUSAND DOLLARS (\$500,000.00) per occurrence, and ONE MILLION DOLLARS (\$1,000,000.00) aggregate. Policies containing deductible clauses will not be acceptable.

4.3 BUILDERS RISK INSURANCE

The Contractor shall take out and maintain during the term of this contract builders risk insurance which shall be written in completed value form, shall protect the Contractor and the City against 'all-risks' of direct physical loss to buildings, structures, equipment and materials to be used in providing, performing or completing the project. This insurance shall be written with limits not less than the insurable value of the project on completion. This insurance shall include coverage while equipment or materials are in warehouses, during installation, during testing, and after the project is completed, but prior to final payment.

4.4 SUBCONTRACTOR'S INSURANCE

The contractor shall require all subcontractors to maintain the above referenced insurance requirements and shall verify that such requirements have been met by requiring all subcontractors to provide certification, therefore.

5. DEFINITIONS

Agreement	The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
Architect	The Project Architect, if such is designated by the Contract Documents.
Attorney	The City Attorney of Tetonia, Idaho.
Bid/Proposal	The written document which is required to be signed by the Bidder and which contains the formal statement of price or prices to be paid by the Owner for the performance required.
Bidder	The individual or entity who submits a Bid directly to Owner.
City	The City of Tetonia, Teton County, Idaho, is a municipal corporation existing under and by virtue of the laws of the State of Idaho. Action herein designated as taken by the City is to be considered the acts of the Council acting through the Mayor and Clerk.
City Engineer	The City Engineer for the City of Tetonia, Idaho.
City Representative	The person appointed to represent the city, which may be City personnel or the City Engineer.
Clerk	The duly appointed City Clerk of the City of Tetonia, Idaho.
Construction Drawings	The part of the Contract Documents prepared or approved by Engineer that graphically shows the location, character, dimensions, and details of the Work to be performed by the Contractor.
Contract	The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
Contract Documents	Those items so designated in the Agreement. These generally consist of the plans, specifications, agreement, performance bond, payment bond and proof of various types of insurance, including all modifications thereof incorporated in the documents before their execution.
Contract Record Drawings	Drawings that show as-built locations and on-site changes to the Plans.
Contractor	The person, persons, firm, partnership, corporation or other entity with whom Owner has entered into the Agreement. The term also includes the Contractor's agents or employees.
Council	The duly elected Council of the City of Tetonia, Idaho.
Developer	The Owner, builder, or person sponsoring the construction.

Drawings	All references within these specifications to "Drawings" shall mean the City approved standard construction drawings or the Tetonía City Public Works Standards and Technical Specifications as applicable.
Engineer	The Developer's Engineer or the individual or entity named Project Engineer in the Agreement.
General Conditions	General Conditions of the Construction Contract per ISPWC Division 100 or per the Contract Documents that set the minimum performance requirements for the Contractor and the rights and responsibilities of the parties involved.
Owner	The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
Plans	See Construction Drawings.
Public Works Improvements	Any Work or product that will become the property of the City.
Right-of-Way	A general term denoting land, property or interest therein, usually in a strip, acquired for or devoted to highway, public street, or other improvements.
Specifications	That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work. Whenever the term "these specifications" is used in this document, it means the provisions set forth in this document as rules and regulations for the City of Tetonía.
Subcontractor	The person, persons, firm, corporation or other entity performing work under contract with the 'Contractor' but subject, in such performance, to all the requirements of the 'Contract Documents' insofar as they are pertinent.
Substantial Completion	The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.
Work	The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

END OF SECTION 101.

SECTION 102. CONTROL OF WORK

1. COMPLIANCE

The Contractor shall observe and comply with all Federal, State, and Local laws, codes, ordinances, and regulations, including all licensing and permit requirements which, in any manner, apply to the work being performed under this contract. No pleas of misunderstanding or ignorance on the part of the Contractor will in any way serve to modify the provisions of this requirement. The Contractor and his/her surety shall indemnify and save harmless the City and its employees, agents, and representatives against any claim or liability arising from or based on the violation of any such laws, codes, ordinances, or regulations, whether by himself/herself, his/her employees, or his/her subcontractors.

2. CONTRACTOR RESPONSIBLE FOR WORK AND SAFETY

The Contractor shall be responsible for all work, materials, and the safety of the work, equipment, and materials until the finished project is accepted by the Owner and City.

3. AUTHORITY OF THE CITY

The city may appoint the City Engineer or City Representative to inspect all materials used and all work done. The City Engineer/Representative may make periodic visits to the site of the project to observe the progress and quality of the Work and to determine, in general, if the Work is proceeding in accordance with these standards. The City Engineer/Representative will not be solely authorized to revoke, alter, relax, revise, or issue instructions contrary to the plans and these Specifications (see Section 101.2).

The City Engineer/Representative shall not be responsible for construction means, methods, techniques, sequences or procedures or for safety precautions and programs in connection with the Work. Visits and observations made by the City shall not relieve the Contractor of his obligation to conduct comprehensive inspections of the Work and to furnish materials and perform acceptable work and to provide adequate safety precautions in conformance with the intent of the Contract Documents.

The City Engineer/Representative shall decide questions which may arise as to the quality and acceptability of materials furnished and work performed. The Developer's Engineer shall decide questions as to the manner of performance and rate of progress of the work; questions which may arise as to the interpretation of the plans and specifications for the Work; and questions as to the satisfactory and acceptable fulfillment of the terms of the Agreement.

The City Engineer/Representative, including his/her employees and agents shall at all times have access to the work wherever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and for inspection. Inspections by the City Engineer/Representative shall be promptly made. If any work should be covered up without approval or consent of the City Engineer/Representative, it shall be uncovered, if required by the City Engineer/Representative, for examination. The costs associated with the uncovering of such non-approved work shall be the responsibility of the Contractor.

END OF SECTION 102.

SECTION 103. PUBLIC WORKS IMPROVEMENT REQUIREMENTS

1. SCOPE

The required public works improvements shall include all street and utility improvements in front of all lots along all dedicated streets to a connection with existing improvements of the same kind or to the boundary or the subdivision nearest existing improvements. Design must provide for future extension to adjacent development and be compatible with the contour of the ground for proper drainage. All water lines, sewer lines, and any other buried conduit shall be installed to the boundary lines of the development. See Tetonia City Code, Title 10 – Subdivision Regulations for additional improvement requirements and design standards.

2. CONSTRUCTION DRAWINGS

Complete and detailed construction plans and drawings for public works improvements shall be submitted to the City for review by the City Engineer/Representative prior to commencing construction or receiving final subdivision plat approval. No construction shall be started until plans have been approved by the City Engineer/Representative and a preconstruction meeting has been held. All costs associated with the plan review performed by the City Engineer/Representative will be paid for by the Developer.

3. PRECONSTRUCTION MEETING

Prior to commencement of construction activities, a pre-construction meeting will be held. Those in attendance shall be, but not limited to, the Developer, Contractor, Sub-contractor(s), Developer's Engineer, Public Works Director, and City Engineer. The Developer shall provide four (4) copies of the approved plans, which will be stamped approved and initialed by all parties, a copy of the Notice of Intent (NOI) from the Environmental Protection Agency, a Storm Water Pollution Prevention Plan (SWPPP), and any other permits as required. A plan set will remain with the city, City Engineer, Developer's Engineer, and Contractor. The Contractor is required to keep a set of plans, NOI, SWPPP, and other permits as required on-site at all times.

The Developer shall present a written schedule for the entire project, specifying the beginning and completion dates for each phase of work. Once approved by the City Engineer/Representative, this schedule shall be adhered to by the Contractor, and they shall employ the necessary workforce and equipment to maintain such a schedule. The contractor further agrees that the approval by the City Engineer/Representative of such schedule shall not create any liability in the City Engineer or the City for Contractor's means, methods, sequences, techniques, or site safety.

Items that may be discussed at the preconstruction meeting include, but are not limited to, the following:

1. Lines of Communication
2. Staging Area and Job Site Use
3. Design Intent / Contract Documents
4. Scheduling / Coordination
5. Meetings & Inspections
6. Quality Control
7. Job Site Record Keeping
8. Pre-construction Submittals
9. Submittals
10. Request for Payment

11. Questions & Clarifications
12. Modifications and/or Changes
13. Claims & Delays
14. Construction Methods and Safety Procedures (Comply with OSHA)
15. Testing & Inspections
16. Substantial Completion
17. Warranty
18. Final Acceptance / Closeout

4. CONSTRUCTION & INSPECTION

All public works construction shall be subject to inspection by the City. It shall be the responsibility of the Contractor to ensure that inspections take place where and when required. Certain types of construction shall have continuous inspection, while others may have only periodic inspections. Inspectors provided by the City shall be paid for by the Developer.

4.1 CONTINUOUS INSPECTIONS

Continuous inspection may be required on (but not limited to) the following types of work:

- (1) Laying of street surfacing.
- (2) Placing of concrete for curb and gutter, sidewalks, and other structures.
- (3) Laying of sewer pipe, irrigation pipe, drainage pipe, water mains, water service laterals and testing.

On construction requiring continuous inspection, no work shall be done except in the presence or with permission of the City Engineer/Representative.

4.2 PERIODIC INSPECTIONS

Periodic inspections shall be required on (but not limited to) the following types of work:

- (1) Street grading and gravel base.
- (2) Excavations for curb and gutter and sidewalks.
- (3) Excavations for structures.
- (4) Trenches for laying pipe.
- (5) Forms for curb and gutter, sidewalks and structures.

4.3 EXCAVATION CONSTRUCTION

Excavation construction will not be allowed from November 1st to April 1st or at the discretion of the City.

4.4 REQUESTS FOR INSPECTIONS

Requests for inspections shall be made to the City by the Contractor. Requests for inspection on work requiring continuous inspection shall be made three (3) working days prior to commencement of work. Notice shall also be given one (1) day in advance of the start of work requiring periodic inspection, unless specific approval is given otherwise by the City Engineer/Representative, or his duly authorized representatives.

4.5 OTHER

- a. At the request of the City, the Developer's Engineer shall provide weekly written progress and inspection reports to the City.
- b. All construction work within the City shall be limited to between the hours of 7:00 AM to 7:00 PM.
- c. Contractors shall implement appropriate erosion control, eliminating sediment transport to City infrastructure and private property. Contractor shall pay all costs associated with sediment removal from City infrastructure, private property, or environmental remediation.

5. CONSTRUCTION TESTING

All in-place density testing shall be performed by a materials testing laboratory that is certified by the State of Idaho. The cost of obtaining necessary construction testing, such as soil "proctors," asphalt extractions, gradations, "Marshall" Asphalt densities, and concrete test cylinders, shall be provided by and paid for by the Owner.

6. APPROVAL BY CITY ENGINEER/REPRESENTATIVE

An inspection shall be made by the City Engineer/Representative or authorized representative after all construction work is completed. Any faulty or defective work shall be corrected by the persons responsible for the work, and at their expense, within a period of thirty (30) days of the date of the City Engineer/Representative's or authorized representative's Inspection Report defining the faulty or defective work.

Final approval is required by the City Engineer/Representative prior to improvements being dedicated to the City or connected to City infrastructure and prior to release of Performance Bonds. Any items that require power from the power company such as streetlights, lift stations, etc. shall be transferred to the City's name after final acceptance of the improvements has been given. The approval checklists in this Section can be used as a guide.

7. WARRANTY PERIOD

If within two (2) years after substantial completion of improvements any work is found to be defective, the Contractor or Developer shall promptly, without cost to the City, either correct such defective work or remove it from the site and replace it with non-defective work. If the Contractor and Developer do not promptly comply, or in an emergency where delay would cause serious risk of loss, injury, or damage, the City may have the defective work corrected or the rejected work removed and replaced, and all direct and indirect costs of such removal and replacement, together with twenty-five (25) percent in addition thereto, as and for such failure on the part of the Developer to make the repairs, shall be collected by the City in the manner most convenient to the City from the Developer or Contractor.

8. USE OF COMPLETED PORTION

The City reserves the right to use and occupy any portion of the improvement within the City right-of-way that has been completed sufficiently to permit use and/or occupancy, and such use and/or occupancy shall not be construed as an acceptance of the work as a whole or any part thereof. Any claims which the City may have against the Contractor shall not be deemed to have been waived by such use and/or occupancy.

CITY OF TETONIA

PUBLIC IMPROVEMENTS APPROVAL CHECKLIST

CULINARY WATER

PROJECT NAME:	Developer's Engineer		City's Representative	
	DATE	SIGNED	DATE	SIGNED
PIPELINES				
1. Waterline Pipe Bedding Material & Placement				
2. Trench Backfill Material & Placement				
3. Trench Compaction				
4. Waterline flushed per City Standards				
5. Blue board installed in trenches located in roadway				
WATER SERVICES & METER PITS				
1. Installed per City Standards				
2. Tracer wire installed				
3. All meter pits and lids inspected and installed per standard				
HYDRANTS				
1. Installed per City Standards				
2. Operating				
VALVES				
1. Installed on all legs of Tee's and Crosses				
2. Operating Properly				
*NEW SOURCE WATER TESTING				
1. Sand Content				
2. Total Coliform				
3. Influence of Surface Water				
4. Corrosivity				
5. Nitrate and Nitrite				
6. Inorganic Contaminants				
7. Organic Contaminants				
8. Trihalomethanes-Total				
9. Lead and Copper				
10. Radionuclides				
** TESTING				
1. Pressure Test				
2. Leakage Test				
3. Chlorine Disinfection Report (24 ppm min after 24 hours)				
4. Backflow Prevention Test				
5. Bacteriological Test/Report				
6. Testing Documentation Submitted & Approved				
BOOSTER PUMP STATION				
1. Installed per Approved Plans & City Standard				

w/backup pump				
2. Building Grading and Landscaping				
3. O&M Manuals Submitted and Approved by DEQ prior to acceptance from the city				
OTHER				
1. Mark water service crossing in curb & gutter				
2. Wrenches Provided				
"AS-CONSTRUCTED" DRAWINGS				
1. Submitted and approved				
ENGINEER'S CERTIFICATE				
I certify that the public improvements have been constructed in accordance with the City of Tetonian Public Works Standard Specifications & Drawings.				
Signed: _____ Date: _____				
WARRANTY PERIOD FOR THE ABOVE IMPROVEMENTS SHALL BEGIN ON: _____				
Notes:				
<ol style="list-style-type: none"> 1. All items must be dated and signed by a City Representative prior to acceptance of the infrastructure. 2. The Contractor shall have a set of the stamped "Approved" Drawings on site at all times. 3. Full time inspection is required from the Developer. City Representatives will make spot inspections throughout construction. 4. *Testing requirements established by Idaho DEQ, also IDAPA, <i>Idaho Rules for Public Drinking Water Systems</i> 5. ** A City representative shall be present at all testing of waterlines and hydrants. 				

CITY OF TETONIA
PUBLIC IMPROVEMENTS APPROVAL CHECKLIST

SANITARY SEWER

	Developer's Engineer		City's Representative	
PROJECT NAME:	DATE	SIGNED	DATE	SIGNED
PIPELINES				
1. Sewer Pipe Bedding Material & Placement				
2. Trench Backfill Material & Placement				
3. Trench Compaction				
MANHOLES				
1. Grouting Completed & Accepted				
2. Manholes are properly sealed				
3. Manholes Lids per City Standards				
TESTING				
1. Pressure Test				
2. Deflection Test (30 days after installation)				
3. Hydro Cleaning				
4. Closed Circuit Television (CCTV) Inspection (30 days after installation)				
5. Testing Documentation Submitted & Approved				
SEWER LIFT STATION				
1. Installed per Approved Plans & City Standards w/backup pump				
2. SCADA System Complete and Approved				
3. O&M Manuals Submitted and Approved by DEQ prior to acceptance from the city				
OTHER				
1. Mark sewer lateral crossings in curb & gutter				
2. Manhole lid lifters provided				
"AS-CONSTRUCTED" DRAWINGS				
1. Submitted and Approved				
ENGINEER'S CERTIFICATE				
I certify that the public improvements have been constructed in accordance with the City of Tetonian Public Works Standard Specifications & Drawings.				
Signed: _____ Date: _____				
WARRANTY PERIOD FOR THE ABOVE IMPROVEMENTS SHALL BEGIN ON: _____				
Notes:				
<ol style="list-style-type: none"> 1. All items must be dated and signed by a City Representative prior to acceptance of the infrastructure. 2. The Contractor shall have a set of the stamped "Approved" Drawings on site at all times. 3. Full time inspection is required from the Developer. City Representatives will make spot inspections throughout construction. 				

CITY OF TETONIA
PUBLIC IMPROVEMENTS APPROVAL CHECKLIST

ROADS/PATHWAYS

PROJECT NAME:	Developer's Engineer		City's Representative	
	DATE	SIGNED	DATE	SIGNED
STRUCTURAL BACKFILL				
1. Gradation Requirements				
2. Compaction Tests				
3. Trench Compaction				
BASE COURSE				
1. Gradation Requirements				
2. Compaction Tests				
3. Thickness Tests (if required)				
HOT PLANT MIX PAVEMENT				
1. Gradation Requirements				
2. Compaction Tests				
3. Thickness Samples				
4. Smoothness Checks				
5. Additional Thickness Test Locations (if required)				
STREETLIGHTS				
1. Installed per Approved Plans and City Standards				
STREET SIGNS				
1. Installed per Approved Plans and City Standards				
SEAL COAT				
1. Installed per Approved Plans and City Standards				
PAVEMENT MARKINGS				
1. Installed per Approved Plans and City Standards				
BIKE LANES				
1. Installed per Approved Plans and City Standards				
"AS-CONSTRUCTED" DRAWINGS				
1. Submitted and Approved				
ENGINEER'S CERTIFICATE I certify that the public improvements have been constructed in accordance with the City of Tetonian Public Works Standard Specifications & Drawings. Signed: _____ Date: _____ WARRANTY PERIOD FOR THE ABOVE IMPROVEMENTS SHALL BEGIN ON: _____				
Notes: <ol style="list-style-type: none"> 1. All items must be dated and signed by a City Representative prior to acceptance of the infrastructure. 2. The Contractor shall have a set of the stamped "Approved" Drawings on site at all times. 3. Full time inspection is required from the Developer. City Representatives will make spot inspections throughout construction. 				

9. CONTRACT RECORD DRAWING REQUIREMENTS

Contract Record Drawings showing as-built information are required for all improvements and systems that are dedicated to the City of Tetonia. Contract Record drawings shall be prepared by a surveyor, or an engineer registered in the State of Idaho and shall contain the following minimum information:

9.1 MINIMUM REQUIRED DATA

9.1.1 WATER DISTRIBUTION SYSTEMS

1. At least two (2) ties to all valves, service lines, fittings, and fire hydrants from permanent points (manholes, property lines, property corners, curbs or street monuments). An acceptable station and offset system or GPS location may be used.
2. Location of mains from property or easement lines and alignment distance from centerline of road at 300+/-ft. intervals.
3. Separation distance between culinary water lines and waste/storm water lines if they exist within 10 feet of water mains. Vertical separation between culinary water lines and waste/storm water lines if there is less than 18 inches of separation. Detail the mitigation method used at the crossing.
4. Water main material, lengths, and distance of mains from building or structures within 10 feet of the water main.
5. Distance from hydrant-to-hydrant valve.
6. Pertinent easement information includes width of easement, legal description, and distance from water main to sides of easement.
7. Revegetation Plan for disturbed areas.

9.1.2 SEWAGE COLLECTION SYSTEMS

1. Manholes are to be designated by stationing from a known, and easily located, starting point. Provide sewer line lengths, materials, and slopes between manholes.
2. Manhole rim and flow lines are to be designated to the nearest 0.01 feet and referenced to a known benchmark.
3. Location of force mains and gravity mains from property or easement lines and alignment distance from centerline of road at 300+/-ft. intervals.
4. Separation between reuse or force mains and water mains if they exist within 10 feet of water mains. Vertical separation between reuse or force mains and water mains if there is less than 18-inches of separation. Detail the mitigation method used at the crossing.
5. The type of sewer main material and distance of mains from buildings or structures within 10 feet of the sewer main.
6. Distance from manhole to manhole and distance from downstream manhole to each sewer lateral/main wye. Finished invert and manhole rim elevations in addition to sewer lateral terminating end elevations.
7. Sewer laterals are to be located with respect to lot corners.
8. Pertinent easement information including width of easement, legal description, and distance from sewer main to sides of easement.
9. A certification by the surveyor/engineer accepting responsibility for accuracy of information supplied on the as-built drawings and a statement that all mains are within easements and/or public right-of-ways.
10. Revegetation Plan for disturbed areas.
11. Grease trap sizing information and drawings.

12. Ownership information of lift stations (i.e., Development/HOA).

9.1.3 *STORM DRAINAGE SYSTEMS*

1. Plan drawn to scale not smaller than 100 feet to the inch, showing the road(s) and lot layout or site plan.
2. Topography at 1-foot minimum contour intervals.
3. Areas of grading and land disturbance.
4. Location of existing wetlands, watercourses, canals, ditches, springs and culverts.
5. Location of any 100-year floodplain as shown on the effective Flood Insurance Rate Maps (FIRM) including any applicable Letters of Map Change (LOMC).
6. Storm inlets are to be designated by stationing from a known, and easily located, starting point. Right and left offsets will be used.
7. Pertinent easement information including width of easement, legal description, and distance from storm drainpipe to side of easement.
8. Pipe size, length, and materials shall be shown.
9. Storm inlet rim, grate, and flow lines are to be designated to the nearest 0.01 feet and referenced to a known benchmark.
10. As-built volumes for stormwater detention and retention systems.

9.1.4 *ROADWAYS*

1. Roadway centerline elevations shall be shown at intervals of 100 feet, except at high and low points which shall be designated whether at the designated interval or not.
2. Roadway elevations are to be designated to the nearest 0.01 feet and referenced to a known benchmark.
3. Pertinent Right-of-Way information including width, property lines and street monument locations.
4. Street names should be shown on as-built drawings.
5. Sidewalk, Park strip, Curb and Gutter details.
6. Tree locations in park strip for developments (two approved trees per lot).
7. Typical street cross-sections.
8. Revegetation plan for disturbed areas.
9. Street signage and striping plan per latest edition MUTCD.
10. Street lighting plan.
11. Drainage Plan including land drain details.

9.1.5 *IRRIGATION SYSTEMS*

1. Pipe material and size shall be shown.
2. Location of valves, blow-off, backflow prevention devices, etc. shall be shown.
3. Location within street right of way and horizontal distance from other utilities shall be shown.
4. Location of irrigation controller.
5. Location of main water shut off valve.

9.1.6 *LIGHTS*

1. Lighting Layout.

2. Wiring Layout and Meter Location.

9.1.7 PARKS

1. Irrigation Layout which includes valve locations, blow-off locations, winterizing equipment and locations, and backflow prevention devices.

9.2 CONTROLS

9.2.1 MINIMUM HORIZONTAL CONTROLS

1. Within easements: Bearing and distance of utility as referenced to property corners. Bearing to be based on plat data when within a platted subdivision.
2. Within road right-of-way: Stationing with offsets right and offsets left. Stationing to begin at a prominent, easily described and easily identified point. Stationing to be based on plat data when within a platted subdivision.
3. Benchmark referenced to NAD horizontal datum of 1983, State Plane, Idaho East.

9.2.2 VERTICAL CONTROL

1. A benchmark referenced to NAVD vertical datum of 1988.

9.3 CERTIFICATION

An engineer or surveyor certification shall be placed on the As-Built Drawings and shall include:

- A. Basis of horizontal and vertical control.
- B. Statement that drawings were checked in the field and are a true representation of improvements.

9.4 CONTRACT RECORD DRAWING FORMAT

- A. Minimum Contract Record Drawing data letter height size shall not be less than 1/10-inch for 24-inch X 36-inch drawings and 1/20-inch for 11-inch X 17-inch drawings.
- B. The statement "RECORD DRAWING" shall be placed on the drawing.
- C. Record drawings shall be drawn to scale on sheets not larger than 24-inch X 36-inch, preferably on 11-inch X 17-inch sheets. Rights-of-way, easements, and lot lines shall be accurately shown. Lot and block numbers and street names shall be included.
- D. One AutoCAD 2010 digital copy on CD/DVD, one digital pdf copy, and three (3) signed, dated, and sealed prints are required. The Engineer/Surveyor's name and registration number shall be either typed or printed, in legible form, below the seal. After the surveyor/engineer has certified the locations, the Engineer of Record shall certify that the system depicted on the Record Drawings was constructed in conformance with approved plans and will function as intended.
- E. All submitted Contract Record Drawings shall be inspected for compliance to the above-mentioned standards. Drawings found to be lacking in one or more items shall be returned to the Owner with an explanation of the reasons for rejection.

10. SNOW REMOVAL

Snow removal responsibilities shall be provided by the Developer until such a time that 100 percent build out has occurred.

END OF SECTION 103.

SECTION 104. STORM DRAINAGE DESIGN STANDARDS

1. DESCRIPTION

This Section defines the general requirements for drainage and grading plans, including the Storm Water Pollution Prevention Plan (SWPPP).

2. DRAINAGE AND GRADING REQUIREMENTS

A storm drainage and grading plan is required that shows stormwater flow directions, inlets, outlets, catch basins, waterways, culverts, retention and detention basins, orifice plates, outlets to off-site facilities, off-site drainage facilities, and any other proposed drainage facility planned to accommodate stormwater runoff from the project site. A drainage report that describes and includes calculations for the design of the storm drainage system should be submitted and approved by the City Engineer prior to final plat approval.

2.1 WATER QUALITY

It is the City policy and the Developer's responsibility, wherever attainable, to restore, protect, and maintain the chemical, physical, and biological integrity of City and State waters and to restore their beneficial uses. To do so, drainage design shall address the treatment of surface and storm water runoff quality, both wet-weather and dry-weather discharges.

In order to maintain water quality of City and State waters and to maintain predevelopment hydrology of developed project sites, the 95th percentile rainfall event shall be managed on the developed site by using stormwater facilities that infiltrate, evapotranspire, and/or harvest and reuse rainwater. The 95th percentile rainfall event, also known as the Water Quality Capture Volume (WQCV), for the City of Tetonia is 0.65-inches falling over a 24-hour period based on the period of record from 1927 to 1982 for the Tetonia rain gauge (USC00102676). Thus, 95% of daily storm events are estimated to have a depth of 0.65-inches or less. Facilities should be designed, constructed, and maintained to manage one hundred percent (100%) of the 95th percentile rainfall event on site and shall not be allowed to discharge to surface waters.

Total runoff volume from a site should be determined using the Direct Determination Method, which takes into account rainfall, depression storage, and infiltration. The hydrologic soil group from the site should be used to determine estimated infiltration on the site.

An example of stormwater facilities that can be used include, but are not limited to, bio-retention areas, stormwater planter boxes, vegetated swales, infiltration trenches, infiltration wells, permeable pavements, cisterns and rainwater harvesting systems, and green roofs.

2.2 CONVEYANCE SYSTEMS

Minor drainage conveyances include culverts, pipes, and inlets and are to accommodate peak flow for the 10-year storm event. Major drainage conveyance systems include detention basins, streets, and channels, and are to accommodate the 100-year storm event. Adequate spillway provisions must be provided to pass stormwater runoff in excess of the 100-year storm event.

The runoff flow rate and volume post-development shall be equal to or less than the pre-development runoff flow rate and volume. If this condition cannot be met, special approval must be obtained by the City Engineer, and the Developer must show that all downstream facilities are adequate to convey the post-development flows.

The Rational Method or the SCS Curve Number approach may be used to determine peak flow rates for the 10-year and 100-year storm events. Intensity-Duration-Frequency (IDF) curves for the City of Tetonia for use with the Rational Method were developed using data published by NOAA Atlas 2 and guidelines from the University of Idaho¹. IDF curves are shown in Figure 1 and the data is included in Table 1. A 24-hour, Type II storm distribution should be used with the SCS Curve Number approach. For the City of Tetonia, the 100-year, 24-hour storm results in 2.66 inches of precipitation and the 10-year, 24-hour storm results in 1.68 inches of precipitation.

Table 1. IDF DATA FOR THE CITY OF TETONIA

Storm Duration (min)	2 yr Intensity (in/hr)	10 yr Intensity (in/hr)	25 yr Intensity (in/hr)	100 yr Intensity (in/hr)
5	1.62	3.22	3.92	4.46
10	1.26	2.50	3.04	3.46
15	1.06	2.11	2.57	2.92
30	0.74	1.46	1.78	2.03
60	0.47	0.92	1.13	1.28
120	0.28	0.50	0.61	0.72
180	0.21	0.35	0.43	0.52
360	0.13	0.19	0.24	0.30
720	0.07	0.12	0.15	0.19
1440	0.04	0.07	0.09	0.11

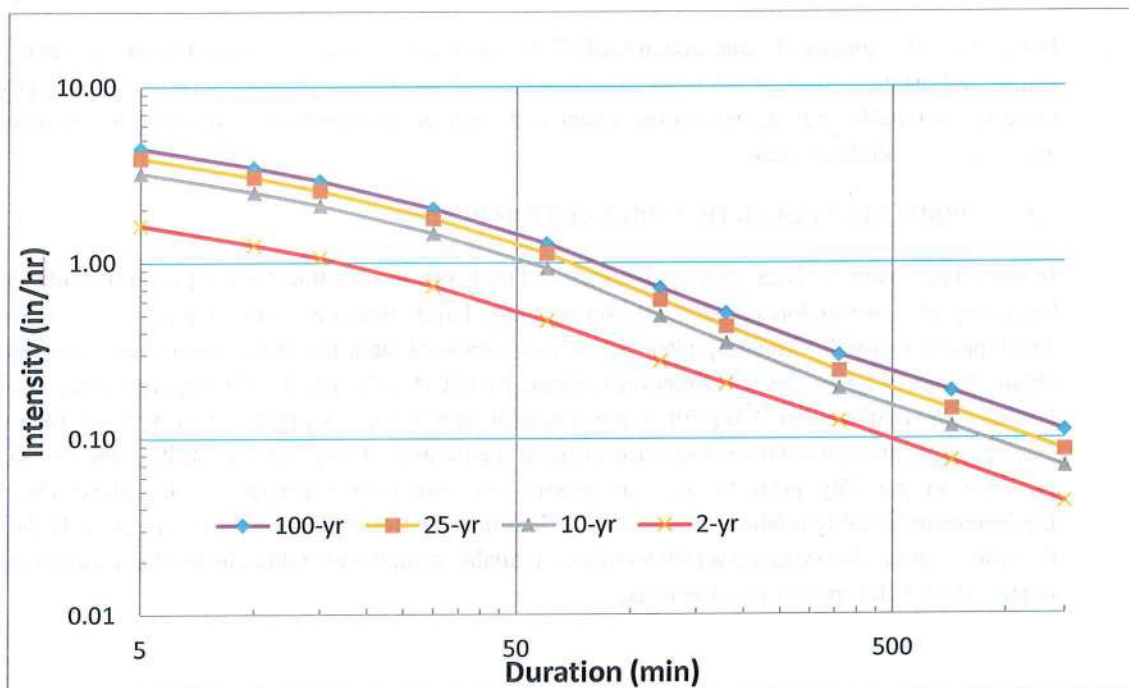


Figure 1. IDF CURVES FOR THE CITY OF TETONIA

¹ Development of IDF Curves in Idaho using NOAA Atlas 2,
<http://www.webs1.uidaho.edu/ce421/notes/ididf.htm>

2.3 IRRIGATION DITCHES

The Developer shall investigate the existing and proposed use of any irrigation ditch or canal within the project limits to determine if they are to be perpetuated. If the irrigation system is to be continued, the Developer is responsible to contact the water right holders or canal company to obtain their requirements for protection of the irrigation system.

Underground utilities that cross irrigation ditches must be marked with permanent fiberglass marking posts located 15-ft each side of the ditch measured from the center of the ditch. Posts should be colored blue for water lines and green for sewer lines.

The discharge of storm water into irrigation ditches shall not be allowed. If an irrigation ditch is to be used as a storm water receptor, a written agreement must be secured between the Developer and the canal company and provided to the city stating that the canal company will accept responsibility for receiving stormwater runoff.

2.4 OFFSITE DRAINAGE

Public water shall not be discharged onto or through private property without the appropriate easement. An easement with the right of access conveyed to Tetonia City shall be provided whenever public conveyance systems are constructed on privately owned land. A minimum easement width of twenty feet centered on the drainage conveyance is required. The width may be in excess of the minimum when situations require.

In the event that proposed construction shall direct surface or storm water runoff to properties or facilities owned and maintained by agents other than the Tetonia City, written proof of permission, or approval from these agents must be provided prior to acceptance of drainage concept plans, and subsequent issuance of City approval of the drainage plan.

2.5 STORMWATER POLLUTION PREVENTION PLANS

In accordance with NPDES (National Pollutant Discharge Elimination System) requirements, prior to the beginning of construction on any development site larger than one acre or part of a common plan of development that will ultimately disturb 1 or more acres of land, the Developer or his representative must obtain coverage under the Construction General Permit (CGP), which will require having a Stormwater Pollution Prevention Plan (SWPPP) in place and filing a Notice of Intent (NOI) with the EPA at least 14 calendar days prior to commencing earth disturbing activities. A copy of the SWPPP and the NOI shall be provided to the City prior to any site grading or construction activities. The Idaho Department of Environmental Quality publication, "Catalog of Stormwater Best Management Practices for Idaho Cities and Counties", latest edition, and SWPPP templates available from the EPA shall be used as a guidance document to meet the NPDES permit requirements.

END OF SECTION 104.

DIVISION 200

DEMOLITION AND

EARTHWORK

SECTION 201. PROTECTION OF EXISTING IMPROVEMENTS

1. DESCRIPTION

This Section covers measures and instructions for preventing damage to existing structures and utilities, whether above ground or underground.

2. PROTECTION OF EXISTING UTILITIES

2.1 INTEGRITY OF UTILITIES

The Contractor shall be responsible for safeguarding and maintaining the integrity of all utilities within the work area, whether they are shown on the plans or not. This responsibility includes securing the assistance of available utility location services in the area in which the Work is being performed. The design engineer has attempted to show the location of all utilities anticipated to conflict with the Work. However, when a conflicting utility line is discovered that was not shown on the plans, the Contractor shall contact the utility's owner and notify the Engineer/City Representative immediately for resolution of the conflict. When realignment or relocation of the Work, or relocation of the conflicting utility is deemed necessary, the Engineer/City Representative shall give directions in writing for the Contractor to proceed. Work resulting from such direction may be treated as a changed condition, and appropriate authorization and payment may be made in accordance with the General Conditions.

2.2 LOCATING UTILITIES

It is the Contractor's responsibility to notify "DIG LINE" prior to excavating and to comply with Idaho Code Section 55-2207 and all other applicable laws and regulations regarding the protection of underground utilities. It shall be the responsibility of the Contractor to locate and expose or identify all existing utilities, both underground and overhead, for the purpose of preventing damage to them. The Contractor shall notify all concerned utility offices at least 48 hours in advance of construction operations in which a utility agency's facilities may be involved. This shall include, but not be limited to, irrigation water, culinary water, sanitary sewer, telephone, gas, and electric.

2.3 CHANGES TO UTILITIES

The Contractor shall be responsible for any and all changes to, or re-connections to, public utility facilities encountered or interrupted during execution of the Work, and all costs related thereto shall be borne by the Contractor. The Contractor shall negotiate with, and pay, the respective utility agency for work it must do in connection with moving, repairing, or restoring its utility(s). The Contractor shall further make all necessary notifications, scheduling, coordination, and management of details related to any such interference. The potential or projected cost of any public utility interference shall be included in the Contractor's price covering the major Contract Item to which the interference or changes are attributable.

2.4 MAINTENANCE OF SERVICE

2.4.1 CONTINUOUS SERVICE

Unless otherwise required in the Contract Documents, all utilities, both underground and overhead, shall be maintained in continuous service throughout the entire contract period. The Contractor shall be responsible and liable for any damage to, or interruption of service caused by the construction.

2.4.2 ACCIDENTAL INTERRUPTION OF SERVICE

In the event of interruption of other utility services as a result of accidental breakage, the Contractor shall promptly notify the appropriate responsible authority. The Contractor shall then cooperate with that authority to restore service as soon as possible. The expense of such repair and/or temporary service shall be borne by Contractor and shall not be the responsibility of the City. In no case shall interruption of any water or other utility service be allowed outside working hours unless the Engineer/City Representative has issued prior authorization. When changeover of service connections to new utility lines becomes necessary, interruptions of individual services for periods of up to 8 hours will be allowed, providing 24-hour advance notice has been given to affected users.

2.4.3 TEMPORARY INTERRUPTION AND RELOCATION

If the Contractor desires to disrupt any utility or appurtenance, the Contractor shall make the necessary arrangements and agreements with the owner or operator of the respective utility and shall be completely responsible for all costs concerned with the disruption and reconstruction. Disruption and/or reconstruction shall be subject to inspection and approval by the Engineer/City Representative and the owner of the utility.

3. PROTECTION OF PROPERTY AND EXISTING STRUCTURES

3.1 REMOVAL OR RELOCATION OF PROPERTY

All property removed or relocated by the Work shall be reconstructed in its original or new location as soon as possible. Restoration of existing property or facilities shall be to a condition as good as or better than its original condition.

3.2 DAMAGE TO PROPERTY

The Contractor shall exercise particular care in protecting surrounding buildings, trees, and property from injury during the demolition and construction operation and shall be responsible for their protection and shall repair or compensate the property owner thereof for any damage which may result from such demolition and construction operations. All property damaged by the Contractor, whether inside or outside the limits of work, shall be the responsibility of the Contractor. All such damage shall be repaired with like material and restored to its original condition, or better. The expense of such compensation or repair shall be borne by the Contractor.

3.3 PROTECTION OF TREES

The Contractor shall exercise particular care in protecting trees located on private or public property from injury during the demolition and construction operations. If the Contractor causes any damage, mutilation, or destruction whatsoever, of any public tree, due to Contractor's need to remove, top, excavate, fill, or compact the roots of such public tree, or by the placement or storage of any materials which are hazardous to trees, near such public tree, the Contractor shall:

- a. Inform the City Engineer in writing of such need; and
- b. Plot the location of such tree on the site plan which is the subject of this agreement; and
- c. Receive written approval of City Engineer/Representative for the removal of affected tree(s)

prior to causing tree damage.

3.4 EXISTING TRAFFIC SIGNS AND FACILITIES

Existing traffic and street name signs which will interfere with construction shall be removed by the Contractor and stored in a safe place. These signs shall not be removed until the Contractor has obtained the consent of the traffic regulatory authorities having jurisdiction and until the necessary measures have been taken to safeguard traffic after the signs have been removed. Preservation and maintenance of the signs shall be the sole responsibility of the Contractor. As soon as sign location no longer interferes with work, the Contractor shall reset all such signs at locations indicated by the traffic regulatory authorities having jurisdiction, in cooperation with the City Engineer. All costs incurred in work outlined above shall be considered as incidental to the construction contract and shall be borne by Contractor.

4. PROTECTION OF PAVED SURFACES

To avoid unnecessary damage to paved surfaces, tracked equipment shall use rubber cleats or paving pads when operating on or crossing all existing paved surfaces unless authorized otherwise in writing by the Engineer/City Representative.

5. RIGHTS-OF-WAY AND EASEMENTS

5.1 MINIMAL DISTURBANCE OF RIGHTS-OF-WAY

When construction easements have been obtained by the Owner, the Contractor shall respond appropriately to minimize disturbances to surface improvements within the easements. The Contractor shall obtain a signed release from each property owner, approving restoration work in the construction easements across its respective property/s.

5.2 CONSTRUCTION AREAS

The Contractor shall confine construction operations to the area within the dedicated rights-of-way for public thoroughfares, or within areas for which construction easements have been obtained, unless the Contractor has made separate special agreements with the affected property owners in advance.

5.3 PROPERTY OWNER NOTIFICATION

The Contractor shall give at least 48-hours advance notification of commencement of construction to property owners having land on which construction will take place. During all construction operations, the Contractor shall construct and maintain such facilities as may be required to provide access by all property owners to their property. No one shall be cut off from access to their property for a period exceeding eight (8) hours unless the Contractor has made special written arrangements with the affected persons. The Contractor shall grade all disturbed surfaces required for motor vehicle traffic at least daily unless directed otherwise or in writing by the Engineer/City Representative.

6. MAINTAINING POSTAL SERVICE

Postal service shall be maintained in accordance with instructions of the U.S. Postal Service. The Contractor shall be responsible for moving mailboxes to temporary locations designated by the U.S. Postal Service, and at completion of the work he/she shall replace them in locations and in condition satisfactory to the U.S. Postal Service.

It will be the Contractor's responsibility to contact the U. S. Postal Service for their requirements in maintenance of postal service and to follow those requirements.

In cases where posts upon which the box or boxes are fastened are in such a condition that they cannot be reset, the Contractor shall furnish posts for this purpose at his/her own expense.

All costs incurred in work outlined above shall be considered as incidental to the construction contract and shall be borne by Contractor.

END OF SECTION 201.

SECTION 202. EARTHWORK MATERIALS

1. DESCRIPTION

This Section covers obtaining permission, permits, clearances, etc.; as necessary to develop source(s), purchasing or manufacturing, loading, hauling, placing and compacting earthwork materials described herein or required by these Specifications.

1.1 RELATED WORK

Section 302 - Trench Excavation and Backfill

1.2 SUBMITTALS

When the Bid Schedule indicates quantities of materials described in this Section in excess of 50 cubic yards or 50 tons, or when requested otherwise by the Engineer/City Representative, the Contractor shall provide test results from a certified independent laboratory which has sampled and performed the prescribed test(s) for those materials.

1.3 DEFINITIONS

Granular Material - Material for which the sum of plasticity index (AASHTO T-90) and the percent of material passing a No. 200 sieve (AASHTO T-27) shall not exceed 23.

Silt - Material which passes the No. 200 (AASHTO T-11) sieve and has a plasticity index not greater than 10.

Clay - Material which passes the No. 200 sieve and has a plasticity index greater than 10. Bedding - Materials placed immediately around and adjacent to pipe installed in trenches.

Borrow - Material obtained from a source away from the site on which installed and/or excavated and used to supplement insufficient quantities of material required.

2. MATERIALS

2.1 ON-SITE TRENCH OR STRUCTURAL BACKFILL

On-site trench or structural backfill consists of material excavated during trenching or foundation excavation which is free of cinders, ashes, wood, vegetation, frozen or other deleterious material or rocks with a maximum particle size not greater than 6-inches. Material may be required to be processed or transported along the excavation.

2.2 IMPORTED TRENCH OR STRUCTURAL BACKFILL

Imported trench or structural backfill consists of granular material obtained from sources indicated on the Drawings, designated in the Special Provisions or approved by the Engineer/City Representative. Borrow materials shall be free of cinders, ashes, wood, vegetative matter, frozen or other deleterious matter with a maximum particle size not greater than 6-inches. Pit run borrow may be used as backfill in trenches above pipe zone, excavations for structures, in roadway subgrades, or as otherwise shown on the plans or called for by the Engineer/City Representative. Material may be processed or may be pit run.

2.3 ON-SITE PIPE BEDDING & PIPE ZONE BACKFILL

On-site pipe bedding consists of material excavated during the trenching operation which is free of cinders, ashes, wood, vegetation, frozen or other deleterious material or rocks with a maximum particle size not greater than that shown below in Table 1. Material may be required to be processed or transported along the trenching operation.

2.4 IMPORTED PIPE BEDDING & PIPE ZONE BACKFILL

Imported pipe bedding consists of granular material excavated from an approved borrow source which is free of cinders, ashes, wood, vegetation, frozen or other deleterious material or rocks with a maximum particle size not greater than ¾-inch.

2.5 SAND

Sand shall be graded granular material which passes a 3/8-inch sieve, with no more than 10 percent passing the No. 200 sieve (AASHTO T-27) and free from cinders, ashes, wood, vegetation, frozen or other deleterious material.

2.6 GRAVEL PIPE BEDDING

Gravel pipe bedding shall be graded gravel that has been screened so that the maximum particle size is 1-inch and contains no more than 10 percent passing the No. 200 sieve (AASHTO T-11). Gravel pipe bedding material shall be free from cinders, ashes, wood, vegetative matter, frozen or other deleterious material.

2.7 UNTREATED BASE COURSE

Untreated base course consists of processed natural gravel and crushed rock with an approved soil binder without any deleterious materials, tested in accordance with AASHTO T-27 and T-11 which meets the gradation requirements in Table 2 below.

Table 2. MAXIMUM PARTICLE SIZE FOR UNTREATED BASE COURSE

Sieve Size	Percent Passing
¾-inch	100
½-inch	70-90
#4	40-60
#16	20-40
#200	5-12

2.8 BITUMINOUS SURFACING

Plant mix bituminous material, with maximum particle size not greater than ¾-inch, meeting the requirements of Section 803 of these Specifications.

2.9 DRAIN GRAVEL

Drain gravel consists of washed natural gravel or crushed rock or slag, with a maximum particle size of 1-inch, with 100 percent being retained on the No. 10 sieve, and without any deleterious material.

2.10 RIPRAP

Riprap consists of durable, angular, sound and hard field or quarry stones free from cracks and structural defects. Source of supply shall be approved by the Engineer/City Representative. Fifty percent of the stones shall be of sizes between one-half and two-thirds of the riprap layer thickness shown on the Drawings. Not more than 10-percent of the stones by weight shall be of a size less than one-tenth of the riprap layer thickness shown on the Drawings and the specific gravity of the stones must range between 2.5 and 2.82 (AASHTO T-85). The durability of the stones shall be in excess of 40 percent (AASHTO T-210).

2.11 SUBGRADE GRANULAR FILL

Subgrade granular fill consists of well graded granular soils with a maximum of 50 percent passing the No. 4 sieve and a maximum of 20 percent passing the No. 200 sieve and no materials greater than 6-inches in diameter.

3. CONSTRUCTION REQUIREMENTS

3.1 BORROW AND DISPOSAL SITES

The Contractor shall, at its own expense, secure all necessary access and borrow sites for acquisition or removal and dispose of excess backfill or waste materials.

3.2 ON-SITE MATERIALS

Unless otherwise directed by the Engineer/City Representative, on-site pipe bedding and trench backfill will be used for installation of all pipe. In areas where suitable on-site material is not available, other materials which meet these Specifications, will be used when approved by the Engineer/City Representative.

END OF SECTION 202.

SECTION 203. PAVEMENT SAW CUTTING

1. DESCRIPTION

This Section covers cutting through designated sections of bituminous and/or concrete pavement surface with approved equipment in preparation for pavement removal.

1.1 RELATED WORK

Section 204 - Removal and Replacement of Surface Improvements

Section 302 - Trench Excavation and Backfill

2. CONSTRUCTION REQUIREMENTS

2.1 SAW CUTTING

2.1.1 NEATNESS IN CUTTING

Pavement cuts shall be made with a saw to produce straight vertical cuts through the full depth of the surfacing layer. The Contractor is responsible for preserving and maintaining a neat clean edge on the cut pavement to facilitate pavement repair or replacement under Section 204-Removal and Replacement of Surface Improvements.

2.1.2 MORATORIUM ON CUTTING

Asphalt that has been placed within the past 5 years shall not be cut or disturbed without the express consent of the City Engineer or City Representative.

2.1.3 CUT MATERIALS TO BE LEFT IN PLACE

Cut pavement materials shall be left in place. Removal of cut pavement will be included as part of other work items in the Contract.

2.1.4 BROKEN PAVEMENT

When pavement has deteriorated or is severely cracked and broken, the Contractor shall discontinue cutting operations and obtain direction from the Engineer/City Representative as to how cutting should proceed.

If pavement is broken after sawcutting and prior to replacement, the Contractor shall re-cut the pavement. Such re-cutting shall not be measured for payment.

2.2 WHEEL CUTTING

Wheel cutting is not permitted.

2.3 ROTOMILLING

Rotomilling of existing pavement is an acceptable alternative to saw cutting, providing that the resulting pavement edges are left clean and neat. Rotomilled material may be suitable for trench backfilling or as a substitute for road base. For such use, rotomilled material must meet the following conditions: that; no chunks

or pieces larger than one inch in any dimension are used, that it is placed in separate lifts from untreated base course, that it is compacted to 95% of its maximum density, and that it is acceptable to the Engineer/City Representative and to the Owner.

END OF SECTION 203.

SECTION 204. REMOVAL AND REPLACEMENT OF SURFACE IMPROVEMENT

1. DESCRIPTION

This Section covers removal and restoration of existing features, public or private, including but not limited to asphalt or concrete pavement, concrete structures, curb and gutter, sidewalk, gravel surfacing, driveways, crosswalks, landscaping, field crops, irrigation ditches, fences, culverts, buried or exposed utilities, abandoned utilities, small utility buildings and the disposal of resulting waste materials and debris.

1.1 RELATED WORK

Section 201 - Protection of Existing Improvements

Section 203 - Pavement Cutting

Section 302 - Trench Excavation and Backfill

Section 801 - Hot Plant Mix Bituminous Surfacing

Section 802 - Road Mix Bituminous Surfacing

2. MATERIALS

2.1 GENERAL

Restoration work shall be accomplished so as to restore the feature to its original, or better, condition and/or function as it existed prior to removal. Do not cut or remove asphalt pavement that has been placed within the previous 5 years without the express consent of the City Engineer/Representative.

It is recognized that exact duplication of materials cannot always be achieved, but reasonable effort is expected from the Contractor to restore the feature with materials which will provide the same or better service and appearance as observed prior to removal.

All materials shall be new.

2.2 BITUMINOUS SURFACE

2.2.1 PRIMER OR TACKER COAT

Shall be an approved bituminous material such as type MC-70-250, SS1, or CS-1.

2.2.2 PATCHING AND REPAIR

Plant mix material that meets or exceeds the requirements of Section 801 herein, or of the local State Department of Transportation for asphalt surface road repair, shall be used for patching and repair.

2.2.3 SURFACING

Shall be hot mix bituminous surfacing unless otherwise approved by the City Engineer or City Representative, meeting or exceeding the requirements of Sections 801 or 802 herein, or of the local State Department of Transportation for asphalt surface road repair.

3. CONSTRUCTION REQUIREMENTS

3.1 UNCLASSIFIED REMOVAL AND RESTORATION

3.1.1 EXISTING IMPROVEMENTS

All existing facilities disturbed by the Contractor in prosecution of the Work, including but not limited to asphalt or concrete pavement, concrete structures, curb and gutter, sidewalk, gravel surfacing, driveways, crosswalks, landscaping, field crops, irrigation ditches, fences, culverts, buried or exposed utilities, abandoned utilities, small utility buildings or any other structures or obstructions designated to be removed on the Drawings, by the Engineer/City Representative, or these Specifications, shall be removed, cleaned up, and then restored or replaced in kind by the Contractor in new condition.

3.1.2 ADJACENT IMPROVEMENTS

Care shall be exercised in such removal to assure that adjacent facilities or structures, which are to remain, are not disturbed. Any damage to such existing facilities or structures resulting from carelessness or negligence on the Contractor's part shall be satisfactorily restored to new condition at the Contractor's expense.

3.1.3 VEGETATION

Trees, shrubs, and other landscape plants designated to be saved for replanting shall be carefully removed, bundled, set aside and protected for replanting by the Contractor. Turf Sod to be saved for replanting shall be removed by machine cutting. In lieu of removal and replacement of turf sod or field crops, the Contractor may, upon approval of the property owner, remove and replant the same. Such agreements shall be documented on the final property release to be signed by the property owner.

3.2 TOPSOIL

3.2.1 REMOVAL AND PROTECTION

In all construction areas where re-growth of vegetation is desired, and when called for by the Contract Documents, the Contractor shall remove, segregate, stockpile, store, and protect topsoil during excavation. Topsoil shall be kept free from contamination from foreign materials and other soils. The Contractor shall arrange construction activities to avoid damage or disturbance to the stockpiled soil.

3.2.2 REPLACEMENT

When backfill operations have been completed, the topsoil shall be replaced and restored to the original contours or as called for on the Drawings, in accordance with these Specifications.

3.3 GRAVEL SURFACE

3.3.1 REMOVAL

When restoration of graveled driveways, roadways, or parking areas is required, the existing gravel surfacing shall be graded off and stockpiled safely away from ongoing work activities, to prevent contamination with subsurface materials. It may then be reapplied and compacted during restoration activities.

3.3.2 RESTORATION

Areas to be restored shall be backfilled and graded to uniform lines and compacted to the density prescribed for trenching in Section 302. Existing gravel surfacing materials shall then be replaced in uniform 3 inch layers compacted to 95% of maximum density. After compaction, the affected area shall be graded smooth. Sufficient new material of equal or better quality shall be applied and mixed in, to replace materials lost during prosecution of the Work, to ensure a 3-inch minimum gravel cover after compaction and grading.

3.4 BITUMINOUS SURFACE

3.4.1 REMOVAL

Bituminous pavement surface shall be removed and restored in accordance with this paragraph unless provisions for restoration are made in other Sections of these Specifications. The pavement surface, public or private, designated for removal shall be removed to neat lines. No ripping or rooting will be permitted outside of the limits of the cut lines. Do not cut or remove asphalt pavement that has been placed within the previous 5 years without the express consent of the City Engineer/Representative.

Existing driveways, sidewalks, etc., which do not match the new finish grade as shown on the Drawings, also shall be removed preparatory to restoration work.

3.4.2 DISPOSAL

Surfacing materials removed shall be disposed of in accordance with Section 1001 of these Specifications, and will not be permitted in the backfill, except as specifically authorized by the Engineer/City Representative and in accordance with local requirements.

3.4.3 RESTORATION

Restoration of bituminous surface shall proceed according to the following steps:

- First, the sub-grade shall be graded to a uniform surface, and 12 inches of Untreated Base Coarse (UBC) gravel shall be placed over the area in lifts not thicker than 3 inches, compacted to 95% of its maximum density.
- Then, the exposed edges of existing pavement shall be primed with a material approved for this purpose.
- Unless shown otherwise on the drawings or required otherwise by the Engineer/City Representative, hot mix bituminous surfacing shall be spread and compacted in individual, 3-inch maximum lifts over the base course. The minimum thickness of the new bituminous surfacing layer shall be equal to the adjacent surface thickness but shall be not less than 3 inches

thick when compacted to 95% of its maximum density.

- Rolling operations shall be conducted in such a manner that shoving or distortion will not develop beneath the roller. The surface shall be finished to a smooth, uniform line and grade with surface deviations not exceeding plus or minus 1/4 inch in 10 feet, unless the surface is subject to more stringent State, County, or Municipal requirements. The determination of smoothness compliance may be made with a straight edge or string line at the option of the Engineer/City Representative. Any irregularities shall be satisfactorily corrected at the sole expense of the Contractor.
- Existing driveways, sidewalks, etc., which were removed because they did not match the new finish grade, shall be replaced and restored to their original or better condition to match the new finish grade shown on the Drawings, or as directed by the Engineer/City Representative.

3.5 REMOVAL AND RESTORATION OF CONCRETE IMPROVEMENTS.

3.5.1 *REMOVAL*

Existing concrete pavement in streets, alleys, driveways, sidewalks, etc., public or private, shall be cut in accordance with Section 203, and removed to the lines indicated on the Drawings, or as directed by the Engineer/City Representative. No ripping or rooting will be permitted outside of the limits of saw cut lines.

Existing driveways, sidewalks, etc., which do not match the new finish grade as shown on the Drawings, also shall be removed preparatory to restoration work.

3.5.2 *DISPOSAL*

All materials removed shall be disposed of in accordance with Section 1001 of these Specifications, and will not be permitted in the backfill, except as specifically authorized by the Engineer/City Representative and in accordance with local codes.

3.5.3 *RESTORATION*

Sub surface preparations shall be the same as those in paragraph 3.4.3 above.

- Concrete pavement including sidewalks, driveways, roadways, and parking area surfacing shall be replaced by the Contractor in accordance with Division 3 of these Specifications, unless otherwise directed by the Engineer/City Representative
- Replacement of concrete sidewalk shall be accomplished by placing 4-inches of finished thickness of concrete except at drive accesses where the finished thickness shall not be less than 6-inches regardless of existing conditions.
- Those existing driveways, sidewalks, etc., which were removed because they did not match the new finish grade, shall be replaced and restored to their original or better condition to match the new finish grade shown on the Drawings, or as directed by the Engineer/City Representative.
- All other concrete improvements shall be restored in accordance with details shown on the Drawings, or as directed by the Engineer/City Representative, and as required by the provisions of Division 3 of these Specifications.

3.6 REMOVAL AND RESTORATION OF FENCES

When necessary to remove any fence to facilitate its operation, the Contractor shall obtain prior agreement with the owner of the fence for its removal. Temporary containment measures shall be provided, if needed, at no additional expense to the Owner. As soon as practical, the permanent fence shall be restored to its original condition or better.

3.7 RESTORATION OF IRRIGATION DITCHES

Restoration of irrigation ditches shall be made in such a manner that the ditch configuration and size will be equivalent to its original condition and the ditch will be located on its original alignment. Any embankment required to restore the original slope of the ditch will be layer compacted with mechanical compaction equipment to 90% of maximum dry density determined by AASHTO T-99.

3.8 CLEANUP

Areas of construction activity shall be left in a condition of uniform grade, blending into pre-existing contours and concealing, as much as possible, evidence of construction activity by back dragging or raking to conceal tire marks. Cleanup and disposal of surplus materials shall be performed in accordance with Section 1001.

END OF SECTION 204.

DIVISION 300

TRENCHING

SECTION 301. SUBSURFACE INVESTIGATION

1. DESCRIPTION

This Section covers the investigation of existing miscellaneous pipelines, wires or cables, and other miscellaneous sub-surface features as required by the Engineer/City Representative.

1.1 RELATED WORK

Section 201 - Protection of Existing Improvements

2. MATERIALS

The Contractor shall provide a backhoe and qualified operator; laborer with hand shovel; appropriate fuel and lubricants, necessary equipment servicing materials; and appropriate equipment for transporting the backhoe to perform the investigation. The backhoe shall be a rubber-tired backhoe, or an approved unit of equivalent or greater size and capacity.

3. CONSTRUCTION REQUIREMENTS

3.1 EXPOSURE BY EXCAVATION

When directed by the Engineer/City Representative, the Contractor shall excavate and expose miscellaneous pipelines, structural features, soil materials and other underground features which may be present at the work site. The location and extent of exposure shall be determined on site by the Engineer/City Representative. Designation of such areas shall be made in writing, usually in the form of a Work Order, by the Engineer/City Representative.

3.2 REPLACEMENT OF EXCAVATED MATERIALS

Work required hereunder shall include replacement of excavated materials sufficiently to restore the site to a safe condition as determined by the Engineer/City Representative. Full restoration of materials such as pavement, concrete slab work, sod, etc., in the investigated area will be accomplished in accordance with the Contract Documents and as directed by the Engineer/City Representative.

END OF SECTION 301.

SECTION 302. TRENCH EXCAVATION AND BACKFILL

1. DESCRIPTION

This Section covers excavation and backfill for piping appurtenances such as manholes, inlets, transition structures, junction structures, vaults, thrust blocks, valve boxes, catch basins, etc. All work shall be in compliance with Occupational Safety and Health Administration's (OSHA) laws and regulations.

1.1 RELATED WORK

Section 201 - Protection of Existing Improvements

Section 202 - Earthwork Materials

Section 204 - Removal and Replacement of Surface Improvements

Section 401 - Water Pipe Installation

Section 501 - Sewer Pipe and Manhole Installation

Section 1002 - Water for Construction

Section 1101 - Traffic Control

1.2 SUBMITTALS

1.2.1 *MOISTURE DENSITY TESTING AND GRADATION DETERMINATIONS*

A documentation system shall be maintained by the Contractor to record results from all moisture/density testing and gradation determinations. Records of these tests shall show the following information as a minimum:

- Date of test.
- Type of test.
- Name of person performing test.
- Location of sample taken.
- Results of test and comparison with specified value required for compliance.

Upon completion of each gradation test or moisture/density test, a copy of the record for the respective test shall be delivered to the Engineer/City Representative within one (1) working day following the completion.

1.2.2 *COMPLIANCE TESTING*

Documentation shall also be made, in field diaries, of all compliance tests performed by the Contractor. Documentation shall be made available to the Engineer/City Representative upon request.

1.3 DEFINITIONS

Trench Width - Shall not be more than 18 inches greater than the outside diameter of the pipe being installed at a point 12 inches above the top of the pipe unless otherwise shown on the Drawings. The width of the

trench above that level shall be the minimum width required for safe working conditions, sheeting, bracing and for proper installation of the work.

Trench Grade - The vertical elevation of the flowline of the pipe being installed in the trench.

Open Trench - Shall include trench sections which have been excavated and are awaiting completion of pipe installation, backfill, compaction or installation of a temporary surface.

Surface Restoration - Shall include the Work required to restore the ground surface disturbed for trench excavation. Replacement of road surfacing, planting and landscaping removed for trench excavation, will not be considered as trench excavation and backfilling.

Consolidated Backfill - A condition of backfilling for which a specified compaction density is required. Maximum lift, prior to compaction, for consolidated backfill shall be 8 inches unless otherwise approved by the Engineer/City Representative.

Unconsolidated Backfill - A condition of backfilling for which no compaction density is specified, and the required compaction effort is layer placing and then compacting by wheel rolling or use of compacting equipment. Lifts of up to 24 inches are allowed for unconsolidated backfill.

Unclassified Excavation - A determination for excavating whereby no consideration will be given to different kinds of materials that are encountered.

2. CONSTRUCTION REQUIREMENTS

2.1 PERMITS

For work which is to take place within state and/or federal road and highway rights-of-way, the Contractor shall be responsible for obtaining all required encroachment and construction permits prior to beginning any work within the rights-of-way.

All work in any city, town or county public right-of-way will also require an approved excavation permit from that entity. The Contractor shall be responsible for obtaining all required encroachment and construction permits prior to beginning any work within the rights-of-way.

2.2 CLEARING AND GRUBBING

On areas outside of established roadways, the area to be disturbed by the trenching operation shall be cleared and grubbed prior to beginning the trenching operation.

2.3 EXCAVATION

2.3.1 EXPOSURE OF UNDERGROUND FEATURES

Before any trench excavation is started, the Contractor shall locate and expose all existing underground utilities, structures, etc., which may interfere with, or conflict with, the trench being excavated (Idaho Dig Line 800-342-1585) or 811. In case of conflicts, the Contractor shall make adjustments in the location of the excavation at the direction of the Engineer/City Representative.

2.3.2 DEPTH OF EXCAVATION

The Contractor shall perform all excavation to the depth specified in the Drawings and/or as required

to accomplish the Work. During the excavation operations, excavated materials which are suitable for use as backfill for trenches or around structures, shall be piled separately at sufficient distance from the edge of the excavation to be out of the way of equipment and to prevent slides and cave-ins from embankment overloading. All excavated materials not suitable for, or not required for, fill or backfill shall be separated and removed promptly from the site of the Work and disposed in an approved site in accordance with Section 1001.

2.3.3 *PUBLIC TRAVEL*

Materials excavated within roadways, regardless of their disposition, shall be piled in such manner that will cause the minimum of inconvenience to public travel and always allow for emergency vehicle passage.

2.3.4 *OPEN TRENCH*

At no time shall the Contractor allow more than 500 cumulative feet of trench to be open for the overall project, unless otherwise approved by the Engineer/City Representative.

2.3.5 *SHORING*

All trench shoring shall meet Federal Requirements. Shoring and/or trench boxes shall be used wherever needed to protect workers and adjacent structures and property of the Work in accordance with OSHA requirements. The arrangement of bracing of shoring shall not be set so as to stress any portion of completed work.

2.3.6 *BARRICADING OPEN WORK*

Excavations left open at the end of the workday shall be surrounded by barricades and warning tape.

2.4 EXCAVATION IN ROCK

2.4.1 *SOLID ROCK EXCAVATION*

If the Contract Documents contain provisions for "Solid Rock Excavation" and if rock has been encountered in the excavation, and if the Contractor has made three attempts to remove the rock using a "Kelly" or similar type ripper having not less than 235 fly wheel horsepower, then the excavation of such material will be considered as "solid rock excavation".

2.4.2 *BLASTING*

When blasting is deemed necessary for rock removal, the Contractor shall comply with all applicable State and Local laws, ordinances, and provisions for blasting safety and obtain written approval from the Engineer/City Representative prior to starting of drilling and/or blasting operations.

In all cases, blasting shall be performed by a licensed experienced, qualified blaster. The Contractor is responsible for any and all damage caused by blasting, and blasting will not be allowed within 15 feet of any existing structures.

2.5 OVER-EXCAVATION

2.5.1 *UNAUTHORIZED OVER-EXCAVATION*

Care shall be taken to not excavate below the depth required by the Drawings. Any unauthorized over-excavation shall be refilled and compacted with material meeting the requirements of Section 202 and approved for use by the Engineer/City Representative at the expense of Contractor.

2.5.2 *ROCK*

Whenever rock is encountered in the trench bottom, the trench shall be over-excavated a minimum of 6 inches below the design elevation of the bottom of the pipe. The over-excavated portion of the trench shall be filled with approved bedding material and the bedding compacted.

2.5.3 *UNSTABLE NATIVE FORMATIONS*

The Contractor shall notify the Engineer/City Representative if soft, spongy, or otherwise unstable native formations, which are not suitable for structure or pipeline foundations, are encountered in excavations. In the event the Engineer/City Representative determines that the existing foundation materials are unacceptable, the Contractor will be directed to over-excavate, remove and replace the unsuitable soil materials. The over-excavation shall be backfilled with approved select materials and compacted in accordance with the requirements described herein.

2.6 PIPELINE ACCESSORY INSTALLATION

2.6.1 *EXCAVATION FOR ACCESSORIES*

The Contractor may excavate to place the sides of manholes, vaults, valve boxes, inlet structures, catch basins or other accessory structures directly against the excavated surface, provided that the faces of the excavation are firm and unyielding and are at all points outside the structure lines shown on the plans. If the native material is such that it will not stand without sloughing, the Contractor shall over-excavate to place the structure and this over-excavation shall be backfilled and compacted, using the same material required for the adjoining pipeline trench.

2.6.2 *ACCESSORY SUPPORT*

To prevent displacement of valve boxes and other accessory structures, trench backfill shall be compacted to at least 95% of maximum density as determined by AASHTO T-99 for 6 feet along the trench on each side of the box or structure.

2.7 TRENCH BOTTOM PREPARATION

The bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of the pipe. Bell or coupling holes shall be made in accordance with the recommendations of the pipe manufacturer after the trench bottom has been graded. Such depressions shall be of sufficient width to provide clearance for connecting and/or bolting. Holes for depressions shall be excavated only as necessary to permit proper joining of pipe sections.

2.8 SURFACE IMPROVEMENTS

When surface improvements must be removed, or are damaged or disturbed by the Work, their removal and restoration shall be accomplished by the Contractor in accordance with Sections 201 and 204 of these Specifications.

2.9 PROTECTION OF EXISTING UTILITIES

The Contractor shall protect all existing utilities, either above or below ground, in accordance with the provisions of 201 of these Specifications.

2.10 IRRIGATION DITCHES, PIPES AND STRUCTURES

The Contractor shall contact the owners of all irrigation facilities to be encountered by the work and make arrangements for construction clearances and/or facility shutdown schedules. All irrigation ditches, dikes, head gates, pipe, valves, culverts, etc., damaged or removed by the Contractor shall be restored by the Contractor to their original condition, or better, in accordance with Section 204 of these Specifications, at no additional cost to the Owner.

2.11 BUILDING FOUNDATIONS AND STRUCTURES

Where trenches are located adjacent to building foundations and structures, the Contractor shall take all necessary precautions against damage to such facilities. Water settling of backfill material in trenches adjacent to structures will not be permitted unless authorized in writing by the Engineer/City Representative. The Contractor shall be liable for any damage caused by the construction and shall restore or replace damaged property in accordance with Section 204 of these Specifications.

2.11.1 SIDEWALK, CURB AND GUTTER

Where sidewalk, curb, and gutter exist, excavation may be made by tunneling provided the following requirements are met. Excavation shall be vertical and as near to the curb or sidewalk as possible. The length of the tunnel shall not exceed the width of the sidewalk, curb and gutter. Where a separate sidewalk and curb exist, an excavation shall be made between the sidewalk and the curb. At least three feet of undisturbed earth shall be left under the sidewalk. Where the excavation does not meet these requirements, a section of sidewalk from joint to joint shall be removed and replaced.

Gas Lines and Water Lines may be jacked, augured or jetted under sidewalk, curb and gutter provided the resulting hole diameter does not exceed one (1) inch plus the outside diameter of the pipe installed.

Backfill of Sidewalk Tunnels. Where the sidewalk has been tunneled, the hole shall be filled from each end with earth compacted with bar tampers from the site to the maximum extent possible. A 3-foot section of trench on each side of the tunnel and any space between the sidewalk and curb shall be backfilled with mechanically compacted earth as specified.

2.12 WATER

2.12.1 WATER FLOW

The Contractor's operation shall always ensure the free flow of water in gutters, culverts, and natural watercourses. In irrigated land areas, excavated materials shall be piled on the downhill sides of

trenches.

2.12.2 GROUNDWATER

The Contractor shall have the responsibility of determining the presence and location of groundwater at the work site.

2.12.3 DEWATERING

Grading and other protective measures shall be performed as necessary to prevent surface or ground water from flowing into trenches or other excavations. Any water accumulated therein during construction, from surface or from underground sources, shall be promptly removed by pumping or by other approved methods at the Contractor's expense.

2.12.4 INSTALLATION IN WATER

No backfill, subgrade materials, concrete or masonry footings, foundations, floors, equipment, or pipe shall be placed or laid in water. Water shall not be allowed to rise over such work for at least 24 hours following the pour or placement of any concrete or mortar used in the work. Water shall not be allowed to rise unequally against structure walls for a period of 14 days following concrete placement or masonry erection.

Groundwater or surface water in piping trenches shall not be allowed to enter and flow through the piping while installation of pipe is in progress.

2.12.5 DISPOSAL

The Contractor shall dispose of all water from the work in a suitable manner without damage to adjacent properties.

2.13 BEDDING AND PIPELINES

2.13.1 BEDDING INSTALLATION

Pipe bedding shall be installed according to applicable Sections of these Specifications for pipeline construction.

2.14 BACKFILL

2.14.1 BACKFILL MATERIALS AND PLACEMENT

Backfill shall be accomplished using acceptable materials as described in Section 302 as follows:

- All backfill materials shall be at $\pm 2\%$ of optimum moisture content when placed in the trench or other excavation.
- Consolidated trench backfill shall be placed in lifts not greater than 8 inches.
- Unsuitable excavated material, or material with incorrect moisture content shall be removed and replaced.
- Soft spongy material that causes areas which "pump" when heavy loads pass over them, shall be removed and replaced with suitable material.
- Dry material that will not "ball" shall be removed and replaced.
- (The two foregoing conditions shall be considered sufficient evidence, without further testing,

that the moisture content is incorrect and shall be grounds for removal and replacement of the material. Such replacement, if required, shall be at the sole expense of the Contractor.)

- Placement of backfill against cast-in-place concrete structures shall not be started until the concrete has been cured for the time required in these standard specifications or prescribed by the Engineer/City Representative.

2.14.2 COMPACTION

Compaction procedures shall be as follows:

- The Contractor shall be responsible for obtaining construction water needed for compaction in accordance with Section 1002 of these Specifications.
- Bedding and consolidated backfill material shall be compacted with tamping, vibrating or conventional wheeled compaction equipment. Use care not to damage pipe while compacting bedding materials.
- The use of wheel rolling for compaction shall only be approved for compacting unconsolidated backfill materials.
- For work within state or federal highway rights-of-way, compaction shall meet the requirements of the respective applicable specifications.
- Backfill shall be thoroughly compacted to densities not less than those shown in the following table:

Table 3. TABLE OF MINIMUM DENSITY REQUIREMENTS
(based on AASHTO-99 and T-91 and on ASTM D-2922 and E-3017)

Location	From Surface to 2 Feet Below Surface	From 2-Feet Below Surface to Top of Bedding	Bedding
Within 6 feet of, and/or under, any existing or proposed structure, pavement, curb, sidewalk or similar construction included in the Contract	95% for granular and non- granular materials	95% for all materials	95% at all locations
Around any structure outside 6 feet:	90% for all materials	90% for all materials	90% at all locations
Cultivated and landscaped areas:	85% for all materials	85% for all materials	85% at all locations
Undeveloped Land:	Unconsolidated – see definition	Unconsolidated – see definition	85% at all locations

2.15 SETTLING AND SUBSIDENCE

Dips or uneven surfaces caused by subsidence or post-construction settlement of fill or backfill in any trenches, excavations, fills, or embankments within the work, which become apparent within the warranty period, shall be repaired by the Contractor.

2.16 SAMPLING AND TESTING

2.16.1 TESTING BY INDEPENDENT LABORATORY

As directed by the Engineer/Representative, the Contractor shall provide for all sampling and testing through a qualified, independent testing laboratory at the Contractor's own expense.

2.16.2 SCHEDULE OF SAMPLING AND TESTING

The following schedule of sampling and testing provides minimum requirements, to assure compliance with all materials and compaction requirements described herein. The number of samples and tests shown shall be considered minimum, and field conditions may necessitate additional sampling and testing as required by the Engineer/Representative.

Table 4. GRADATION DETERMINATION (AASHTO T-27 and T-11)

Trench Location	Testing Required
Materials imported or manufactured at a site determined by this contract	One test per site or source
On-site excavated materials along trenches.	One test per geographical area where material composition and gradation visually appears consistent.

**Table 5. MOISTURE/DENSITY RELATIONSHIP (Proctor)
(AASHTO T-99 or T-180 Method D)**

Trench Location	Testing Required
Materials imported or manufactured at a site determined by this Contract.	One test per site unless the material visually appears to change.
On-site excavated materials along trenches.	One test per geographical area where material composition visually appears consistent.

Table 6. COMPACTION COMPLIANCE TESTING REQUIREMENTS
(AASHTO T-191 or Portable Nuclear Gauges)

Trench Location	Testing Required
Street crossing with gravel or bituminous surfacing.	One test per lift for each crossing.
Parallel to centerline of bituminous or gravel surfaced streets or roadways.	One test per lift for each 500-feet of trench length.
Along unsurfaced roads or in cultivated or landscaped areas.	One test per lift for each 1,000-feet of trench length with at least one test per area.
Under or adjacent to manholes, wet wells, enclosures, boxes, etc.	None, unless geological conditions are inconsistent and requested by the Engineer/Representative.

NOTE: The term "test" shall mean a single test with acceptable results, equal to or better than specified minimums. In the event compaction test results fall below the required minimum density, the Contractor shall re-compact and test the material until a test with acceptable results is obtained. Any test failure shall result in additional tests as required by the Engineer/City Representative, at no cost to the City, to ensure that overall project quality objectives are met.

END OF SECTION 302.

SECTION 303. ROADWAY EXCAVATION AND EMBANKMENT

1. DESCRIPTION

This Section covers construction of roadways and embankments, roadway ditches, channel changes, furrows, slope rounding, benches, berms, dips, approaches, and subsidiary work.

1.1 DEFINITIONS

Roadway - The graded portion of a road within the top of cut slopes and the toe of embankment slopes, excavated and placed to form a surface for vehicular travel.

Excavation - That portion of the roadway which is removed from its original position and deposited within the roadway as embankment.

Embankment - Excavated earth materials moved from an original source and placed within the roadway.

Unsuitable Material - Excavated earth materials determined by the Engineer/City Representative to be unsuitable for placement in roadway embankment. Such materials may include rock too large for placement in embankment, topsoil containing excessive vegetative debris, unstable earth materials, etc.

Roadbed - That portion of the roadway graded to the surface upon which vehicles travel, including the shoulders.

Subgrade - The graded roadbed finished according to the details shown on the Drawings and prepared to receive surfacing when called for on the Drawings.

Borrow - Earth materials excavated from a designated source, outside the roadway, and placed in embankments within the roadway. Designated sources for borrow material shall be shown on the Drawings or elsewhere described in the Contract Documents and shall be approved by the Engineer/City Representative prior to being placed on embankment.

Pioneering - The beginning or opening of a route on which a roadway is to be constructed prior to clearing or starting any earthwork excavation.

Structure Excavation - Excavation, backfill and/or disposal of material required in the roadway for construction of culverts, bridge foundations or other structures.

Cushion - Soil materials placed over rocks or solid rock portions of the roadway to provide a gradable surface. Cushion materials shall not contain rocks large than one-third of the minimum thickness of the cushion layer.

2. CONSTRUCTION REQUIREMENTS

2.1 PIONEERING

Pioneering operations for the top of excavation slopes, toe of embankments, or pioneer road construction shall be accomplished to prevent undercutting of the final excavation slope, depositing of materials outside of the roadway limits and any restriction of drainage.

2.2 UTILIZATION OF EXCAVATED MATERIALS

All suitable excavated material shall be used in the construction of embankments, subgrades, shoulders, slopes, bedding and backfill for structures and for other purposes as described below:

2.2.1 *EXCESS EXCAVATION*

Designed excess excavation shall be disposed of as indicated in Section 1001 of these standard specifications.

2.2.2 *ROCK FOR SLOPE PROTECTION*

When approved by the Engineer/City Representative, excavated rock suitable for protection of embankments may be conserved and used in lieu of a designated materials source.

2.2.3 *CONSERVING MATERIAL*

Material encountered in the excavation, suitable for cushion, road finishing or other purposes, may be conserved and utilized instead of materials from designated sources.

2.2.4 *EXCAVATION OF UNSUITABLE MATERIAL*

Unsuitable material shall be excavated. Disposal will be as shown on the Drawings. Excavated areas shall be backfilled with suitable material when necessary to complete the Work. Frozen material shall not be placed on embankments. Rocks that are too large to be incorporated into the embankment shall be broken for incorporation into the embankment or maneuvered to the face of the embankment and embedded so that they will not roll or obstruct the use and maintenance of the roadbed or moved to locations approved by the Engineer/City Representative.

2.2.5 *CONSERVATION OF TOPSOIL*

Suitable topsoil shall be removed, transported, and deposited in designated stockpile areas.

2.2.6 *ABANDONED STRUCTURES AND OBSTRUCTIONS*

Abandoned structures and obstructions shall be treated in accordance with Section 204 - Removal and Replacement of Surface Improvements.

2.3 DRAINAGE EXCAVATION

Drainage excavation shall include construction of side ditches, minor channel changes, inlet and outlet ditches, furrow ditches, ditches constructed along the road but beyond the roadway limits and other minor earth drainage structures as shown on the Drawings. Excavated material shall be utilized in accordance with subsection 2.1 above.

2.4 FINISHING ROADBED

2.4.1 *OVERSIZE MATERIALS*

For roads receiving aggregate base or surface course, only rocks that do not protrude above the subgrade more than one-third of the depth of the base or surface course or 2-inches, whichever is less, may remain in place.

For unsurfaced roads, the top 4-inches below the finished road surface shall not contain rocks larger than 4-inches in greatest dimension. Oversize material shall be removed, reduced to an acceptable size or covered by importing suitable material approved by the Engineer/City Representative.

2.4.2 *SHAPING AND DRESSING*

The subgrade shall be visibly moist during shaping and dressing. Low sections, holes, cracks or depressions shall be brought to grade with suitable material approved by the Engineer/City Representative. Final compaction of the subgrade shall meet the requirements of the embankment placing method specified.

2.5 SNOW REMOVAL

Snow and/or ice shall not be incorporated into the embankment. Snow shall be removed in advance of the work to be performed and shall be deposited beyond the roadway limits in a manner that will not result in erosion or waste material.

2.6 FINISHING SLOPES

2.6.1 *SLOPE SURFACE*

Slopes shall be finished as closely as is practicable to the lines staked on the ground or shown on the Drawings. The finished slope shall be left in a slightly roughened condition to facilitate the establishment of vegetative growth. The finish associated with template and string line, or hand-raking methods will not be allowed. Loose rock, loose debris and other loose material, each of which is larger than 4-inches in diameter, shall be removed from the slope.

2.6.2 *SLOPE TOP*

The tops of excavations, excluding areas of solid rock, shall be blended with the adjacent terrain by rounding when shown on the Drawings. Decomposed rock that may be cut without blasting or ripping shall be rounded. Earth overlying rock shall be rounded above the rock.

2.7 BLASTING

2.7.1 *CONTROLLED BLASTING*

All rock excavations that require blasting shall be formed with controlled blasting techniques. Controlled blasting is defined as the controlled usage of explosives and blasting accessories in appropriately aligned and spaced drill holes for the purpose of producing a free surface or shear plane in the rock excavation slopes and of minimizing landscape damage, adjacent ground vibration and over break. Presplitting is not intended.

2.7.2 *TEST SECTIONS*

Unless directed otherwise by the Engineer/City Representative, the Contractor shall drill, blast and excavate short test sections (not to yield in excess of 1,000 cubic yards) to determine the controlled blasting method, hole spacing and charge best suited to the material encountered.

2.8 OVERBUILDING

Unless otherwise agreed to in writing by the Engineer/City Representative, excavation or embankment material shall be confined within the roadway limits to avoid overbuilding and to protect the adjacent property.

2.9 SUBGRADE TREATMENT

2.9.1 TREATMENT MATERIALS

Subgrade treatment shall consist of soil modification by mixing aggregates, placing geotextiles, fiber mat, rock blanket or other similar materials over areas of unsuitable embankment foundation material.

2.9.2 SWAMPY GROUND

When an embankment is to be placed across swampy ground and removal of unsuitable material or subgrade treatment is not required, the lower part of the embankment may be constructed in a single layer to the minimum depth necessary to support construction equipment.

2.10 EMBANKMENT PLACEMENT

All embankments shall be placed by one or more of the following methods:

2.10.1 METHOD 1 - SIDE CASTING AND END DUMPING

Embankment may be placed by side casting and end dumping. Where material containing a large amount of rock is used to construct embankments, a solid embankment shall be provided by working smaller rocks and fines in with the large rocks and fines to fill the voids.

2.10.2 METHOD 2 - LAYER PLACEMENT

Surfaces steeper than a ratio of 3 horizontal to 1 vertical (3:1) upon which embankment is to be placed, shall be roughened or stepped when shown on the Drawings to provide permanent bonding of new and old materials.

- Embankment shall be layer placed, except over rock surfaces, in which case material may be placed by end-dumping to the minimum depth needed for operation of spreading equipment. Each embankment layer shall be leveled and smoothed before placement of subsequent layers. Hauling and spreading equipment shall be operated uniformly over the full width of each layer.
- Suitable material shall be placed in layers no more than 12-inches thick, except when the material contains rock more than 9-inches in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. No layer shall exceed 24-inches before compaction.
- Placing individual rocks or boulders greater than 24-inches will be permitted provided the embankment will accommodate them. Such rocks and boulders shall be at least 6-inches below subgrade. They shall be carefully distributed, and the voids filled with finer material to form a dense and compacted mass.
- Where material containing large amounts of rock is used to construct embankments, the layers may be of sufficient thickness to accommodate the material involved. A solid embankment with adequate compaction shall be constructed by working smaller rock and fines in with the larger rocks to fill the voids and by operating hauling and spreading equipment uniformly over the full

width of each layer as the embankment is constructed.

- Material shall be at a moisture content suitable to obtain a mass that will not visibly deflect under the load of the hauling and spreading equipment. Excessively wet excavated material shall be handled in accordance with Subsection 2.2.1 above.

2.10.3 METHOD 3 - LAYER PLACEMENT (ROLLER COMPACTION)

Embankments shall be placed as specified in Method 2. Placement shall be in horizontal layers not exceeding 12-inches prior to compaction, except when the material contains rock more than 9-inches in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. Compaction shall be obtained with equipment in compliance with the requirements described in the Specifications. Compaction equipment shall be operated over the full width of each layer until visible deformation of the layer ceases or, in the case of the sheep foot roller, the roller "walks out" of the layer. At least three complete passes will be made.

2.10.4 METHOD 4 - CONTROLLED COMPACTION

Embankments shall be placed as specified in Method 2 except earth embankments shall be placed in horizontal layers not exceeding 12-inches (loose measure) and compacted. Material shall be at a moisture content suitable for attaining the required compaction. Embankments and the top 1-foot of excavation sections shall be compacted to at least 95 percent of the maximum density as determined by AASHTO T 180, Method C or D.

- The density of the embankment material shall be determined during the progress of the Work in accordance with AASHTO T 191, T 205 or T 238; T 217, T 239 or T 255; and T 224.
- Density requirements will not apply to portions of rock embankments that cannot be tested in accordance with approved methods. When this condition exists, compaction shall be provided by working smaller rocks and fines in with the larger rocks to fill the voids and by operating equipment over the embankment materials.

2.11 COMPACTION EQUIPMENT

2.11.1 EQUIPMENT

Compaction equipment shall be capable of obtaining compaction requirements without detrimentally affecting the compacted material. The compacting units may be any one of the types described herein, provided they are capable of compacting each lift of material as specified and meet the minimum requirements contained herein.

2.11.2 ROLLER REQUIREMENT

Minimum requirements for rollers are as follows:

- Stamping or grid rollers shall be capable of exerting a force of 250 pounds per inch of width of roller drum.
- Steel-wheel rollers, other than vibratory, shall be capable of exerting a force of not less than 250 pounds per inch of width of the compression roll or rolls.
- Vibratory steel-wheel rollers shall have a minimum weight of 6 tons. The compactor shall be equipped with amplitude and frequency controls and specifically designed to compact the material on which it is used.
- Pneumatic-tire rollers shall have smooth tread tires of equal size that will provide a uniform

compacting pressure for the full width of the roller and capable of exerting a ground pressure of at least 80 psi.

2.12 CONSTRUCTION TOLERANCES

A Table of Tolerance is provided below:

Table 7. TABLE OF TOLERANCES

MEASUREMENT	TOLERANCE CLASS		
	A	B	C
Roadbed Width (feet)	+0.5	+1.0	+2.0
Subgrade Elevation (feet)	± 0.1	± 0.2	± 0.5
Centerline Alignment (feet)	± 0.2	± 0.5	1.0

Deviations shall be uniformly graded in the direction of change for a distance of 200-feet or more along the roadway. Roadway ditches shall always be constructed to flow in the direction shown on the Drawings, regardless of allowable deviations. Roadbed width shall be no less than the dimension shown on the Drawings or staked in the field. When a tolerance class is not otherwise indicated on the Drawings, Class B tolerance deviations will be allowed for roadway construction.

2.13 WATER

Water provided for compaction, dust control, or planting and care of vegetation, shall be developed, hauled and applied in accordance with Section 1002.

END OF SECTION 303.

DIVISION 400

WATER

SECTION 401. WATERLINE PIPE INSTALLATION

1. DESCRIPTION

This Section covers pipe and fittings of the type, class and size designated for water systems defined, in this Specification.

1.1 RELATED WORK

Section 202 - Earthwork Materials

Section 302 - Trench Excavation and Backfill

Section 402 - Waterline Valves and Hydrants

Section 403 - Water System Control Valves

Section 404 - Water Service Connections

Section 405 - Water Main Flow Meters

Section 601 - Pipe and Piping Systems

1.2 SUBMITTALS

1.2.1 TESTING

As construction proceeds, the Contractor shall submit test documentation in accordance with this Section of these Specifications.

1.3 DEFINITIONS

Fitting - Any component of a pipeline, excluding the pipe itself and valves and meters, which is used for connecting pipe sections; changing line direction or size; connecting meters, valves, tanks, etc.; or starting or terminating pipelines.

Mains - Water distribution pipes, located in streets or rights-of-ways, to which water service connections are made for users of the system.

Run - Any identified section of a pipeline.

Saddle - A fitting placed on a pipe to reinforce the pipe wall, through which a tapping hole is drilled.

Service Lateral - The line which connects to the water meter or to the service stub at the property line extending from there, on private property, to the plumbing at the foundation of a house or business.

Service Stub - The line running from the tap on a main to the meter or to the property line as appropriate.

Tap - The actual connection made to water mains which includes drilling an opening into the main, threading, installing a tapping saddle when appropriate, and installing a valve into the opening. All taps must be made by a licensed contractor.

2. MATERIALS

2.1 PIPE AND FITTINGS See Section 601

2.2 PIPELINE LOCATION IDENTIFIERS

Pipeline location identifiers generally take the form of marker posts, warning tape, and tracer wire.

2.2.1 *TRACER WIRE*

Unless otherwise described on the plans or herein, the tracer wire shall be an insulated, #10, direct bury copper wire designed and manufactured for this purpose.

2.2.2 *WARNING TAPE*

The warning tape shall be an inert, plastic, direct bury type with a 2-inch minimum width of the appropriate safety color, and specifically manufactured for underground utility identification. The tape shall have wording imprinted on it identifying the type of utility it is protecting.

2.2.3 *MARKING POSTS*

Shall be fiberglass compound, aluminum, or other corrosion resistant metal of 5 foot length and 4 inches wide, or otherwise as shown on the Drawings. They shall be fitted with a deterioration resistant warning notice or label appropriate to the application.

2.3 MISCELLANEOUS FITTINGS AND MATERIALS

2.3.1 *POLYETHYLENE ENCASEMENT*

Where soil conditions are determined to be severely corrosive, tubular polyethylene encasement shall be installed around buried ductile iron piping and fittings in accordance with ANSI/AWWA C105.

2.3.2 *CASING PIPE*

Where casing pipe is required by the Engineer/City Representative, the Contractor shall furnish and install the casing.

2.3.3 *PIPE PENETRATION OR CASING SEALS*

Where required on the Drawings or in these Specifications, the Contractor shall furnish and install pipe-to-wall linked rubber seals in core drilled structures, walls, pipe sleeves, or casings in accordance with the manufacturer's instructions. Seals shall be "Link Seals" by Thunderline Corporation, or an approved equal.

2.3.4 *PIPE RESTRAINTS*

Pipe restraints shall be as follows:

- Concrete thrust blocking shall be formed, sized, and placed as described herein and shown on the Drawings. Reinforcing bars used in thrust block construction shall be preformed and fusion bonded epoxy coated.
- Mechanical restraint of piping shall be accomplished with one of the following restraining systems or an approved equal:
- Grooved Ductile Iron AWWA Couplings by Victaulic Company of America (use only with

- exposed piping systems).
- MEGALUG thrust restraints by EBAA Iron Sales, Inc.
- No MJ fittings shall be allowed. All fittings shall be flanged or restrained with the approved restraints shown above.
- All joints of pipe installed under streambeds or canal crossings, or installed in casing pipes, shall be protected with mechanical restraint.
- Restraint protection of above ground or exposed piping in buildings or enclosures shall be accomplished only with mechanical restraints.

3. CONSTRUCTION REQUIREMENTS

3.1 HANDLING AND APPROVAL OR REJECTION OF MATERIALS

All materials delivered to and used at the job site are subject to approval of the Engineer/City Representative or the Owner. Care shall be taken during handling of the pipe, to avoid any impact which might cause damage. Dropping pipe during unloading will not be permitted. Pipe will be carefully inspected in the field before and after laying. If any cause for rejection is discovered in a pipe before or after laying, it shall be removed and replaced by the Contractor at his own expense. Any pipe found to be unfit or rejected due to cracks, broken bells or spigots, irreparable chipped lining, etc., shall be removed from the job site.

3.2 ALTERATION OF ALIGNMENT

With written permission from the Engineer/City Representative, piping alignment may be varied from that shown on the Drawings, to avoid structural or mechanical difficulties, or to avoid the work of other trades. The Contractor still will be liable to provide all materials and labor required to complete all work in accordance with the best practice of the trade, and to the satisfaction of the Engineer/City Representative.

3.3 INSTALLATION

3.3.1 DEWATERING

Prior to pipe laying and jointing, sufficient dewatering effort shall be provided to maintain the ground water level at or below the surface of the trench bottom or base of the bedding course. The dewatering operation: however accomplished, shall be carried out in such a manner as to not permanently disturb natural underground water conditions.

3.3.2 CONNECTION TO EXISTING FACILITIES

When connections are to be made to any existing pipe or appurtenances, for which the actual elevation or position cannot be determined without excavation, the Contractor shall excavate for, and expose the existing pipe or appurtenances before laying any new pipe. The City or Engineer/City Representative shall inspect the existing pipe or appurtenances before any connection is made and be onsite when the connection is made. The Contractor shall make any adjustments in line or grade which may be necessary to accomplish the intent shown on the Drawings. All taps shall be made by a licensed public works contractor and paid for by the Developer.

Where new fittings, valves, meters, restraints etc., are required to be installed in, or attached to, existing piping, or where connections are to be made to existing piping, the Contractor shall furnish and install the necessary components needed to accomplish the work, whether or not specifically indicated on the Drawings.

3.3.3 CAPPING PIPE END

At the close of each workday, or whenever the work ceases for any reason, the end of the pipe shall be securely closed.

3.3.4 JOINING

Joining of pipe shall be as follows:

- When making connections, pipe shall be cut and beveled in a neat and workmanlike manner, so as to provide a smooth, beveled end at right angles to the axis of the pipe. Pipe and fittings shall be assembled so there will be no distortion or springing of the pipelines. Flanges, unions, flexible couplings and other connections shall come together at the proper orientation. The fit shall not be made by springing any piping, nor shall orientation or alignment be corrected by taking up on any flange bolts. Flange bolts, union halves, flexible connectors, etc., shall slip freely into place. If the proper fit is not obtained, the piping shall be altered to fit.
- With bell and spigot joints, care should be taken to properly align the pipe before joints are forced home. Gaskets shall be lubricated in accordance with manufacturer's instructions. During insertion of the spigot end, the pipe shall be partially supported by hand, sling, or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since the most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.
- Where fusion of polyethylene pipe joints is required, sections of pipe shall be joined in a continuous length on the job site above ground. Joining shall be by the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. Equipment used for butt fusion joining shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements, alignment, and fusion pressures.

3.3.5 LAYING

All pipe laid shall be retained in position, using mechanical means if necessary, so as to maintain alignment and joint closure until sufficient pipe bedding and backfill have been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the prescribed line and grade shown on the plans, within specified limits. No blocking of any kind shall be used to adjust the pipe to grade, except when used with concrete embedment. Bedding materials shall be placed so the bottom surface of the pipe will have full bearing for the entire barrel length. The pipe shall rest on not less than 1/4 of its outside perimeter. Bell holes shall be dug as required to assure uniform support along the barrel but shall be no larger than necessary.

Unless otherwise approved by the Engineer/City Representative, pipe shall be laid upgrade from the point of connection on the existing pipeline or from a designated starting point. Pipe shall be installed with the bell end forward or upgrade, unless approved otherwise. When pipe laying is not in progress, the forward end of the pipe shall be kept closed with an approved temporary plug.

3.3.6 PIPE RESTRAINT

Pipe restraint work shall be as follows:

- The Contractor shall provide and install either concrete thrust blocks or mechanical pipe

restraints on all pressure piping not connected with bolted flanges or welded joints. Fire hydrants shall be restrained, on the 90° bend, with both a concrete thrust block and mechanical pipe restraints.

- For projects involving pipeline construction covered under this section of the Specifications, a pipe restraint schedule is included in the Drawings. Pipe restraints (thrust blocks and/or mechanical restraints) shall be furnished and/or constructed and installed as shown on the Drawings and described in the schedule.
- Pressure pipe shall be properly blocked or restrained at all fittings, wherever the pipeline makes a change in direction of 11.25 degrees or more, wherever it changes sizes, or wherever it ends.
- Placement of concrete thrust blocking shall provide bearing against undisturbed vertical earth banks or approved compacted backfill, sufficient to absorb thrust from line pressure, and in a configuration so that pipe joints and fittings will be accessible. All fittings restrained by concrete thrust blocks shall be wrapped in visqueen prior to placement of concrete.
- All restraints shall be in place before any hydrostatic testing and flushing are performed on the system.
- The Contractor shall allow visual inspection of every thrust block or mechanical restraint before it is buried.

3.3.7 FINISH BEDDING

After the pipe is laid, additional bedding material shall be placed in 6-inch lifts to a level even with the spring line of the pipe and compacted. The portion of the trench from the spring line to 12 inches above the top of the pipe shall then be filled and compacted in the same way.

3.3.8 REQUIREMENTS FOR INSTALLATION NEAR SEWER LINES

Locate potable water piping at least 10 feet horizontally (measured edge to edge) from any existing or proposed parallel sewer or wastewater leach line. Should conditions prevent the 10-foot separation, the water line may be laid closer than 10 feet to sewer lines (but not leach lines) provided:

- The water line is laid 18 inches above the top of the sewer line, but deep enough to prevent freezing, and
- The water line is laid in a separate trench, or
- The water line is laid on an undisturbed earth shelf on one side of the sewer line trench, or
- The water line is laid in a sewer or drain line trench, which has been backfilled and compacted to not less than 95% of maximum density, as determined by ASTM D690.

Where potable water lines cross sewer lines, the bottom of the water line shall be at least 18 inches above the top of the sewer line for ten feet on each side of the sewer line, measuring perpendicularly from the water line to the sewer line. When such vertical separation is impossible to achieve, a vertical separation of less than 18 inches may be allowed provided:

- In new construction for both water line and sewer line they shall be constructed of ductile iron pipe or thermoplastic pipe joined by either mechanical or bolted flange joints. Thermoplastic pipe may also use solvent welded joints. In situations with an existing sewer line, the new water line shall be constructed as previously described.
- And, when making such a crossing, install the water line in such manner that the center of a full length of pipe is on the centerline of the sewer line to isolate the water line joints as far as possible from the sewer line.

3.3.9 REQUIREMENTS FOR INSTALLATION UNDER WATER CROSSINGS

A minimum cover of two (2) feet shall be provided over the pipe and the following shall be provided:

- The pipe shall be of special construction, having flexible, restrained, or welded watertight joints and encased in an approved pipe.
- Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; the valves shall be easily accessible and not subject to flooding.
- Permanent taps for other provisions to allow insertion of a small meter to determine leakage and obtain water samples shall be made on each side of the valve closest to the supply source.

3.3.10 EXPOSED PIPING

No exposed piping shall be installed until all equipment to which the pipe is to be attached has been installed and it can be determined where piping and fittings shall be located to make a neat, efficient arrangement. Piping shall be aligned with equipment connections such that no external load or stress will be transferred to any equipment from the piping. Piping shall be installed with a sufficient number of unions, flexible couplings, or flanged joints, to allow for convenient inspection and maintenance.

Exposed pipe work shall be suspended or supported, to prevent sagging or over-stressing of the pipe and connections. Assembly of pipe and fittings shall be accomplished so there will be no distortion or springing of the pipe. The fit shall not be made, nor the alignment corrected by taking up on any flange bolts. Joints shall come together in proper orientation, and flange bolts, union halves, flexible couplings, etc. shall slip freely into place. If the proper fit is not obtained, the piping shall be altered to make the fit meet the above requirements.

Exposed pipe shall be installed in straight runs parallel to the axis of the structures. Pipe runs shall be horizontal and vertical; except that gravity drain lines shall be pitched down in the direction of flow at a slope not less than 1/8 inch per foot.

All exposed pipe shall be painted. Factory finished items are not required to be field painted except touch-up. The color and type of paint used shall be submitted to the City for their approval.

3.3.11 DRAINS AND OTHER SYSTEMS

In addition to other requirements in this Section, all irrigation and other lines fitted with drains shall be installed such that continuous slope is maintained to designated drain locations. In areas where there are both culinary water pipelines and irrigation pipelines, exposed portions of irrigation water piping shall be identified by distinctive coloring or other marking. Culinary and irrigation lines and extensions shall be completely separated, installed in separate trenches, and there shall be no cross-connection between the systems under any circumstances.

3.4 FLUSHING AND CLEANING

3.4.1 FLUSHING WITH WATER

Prior to proceeding with pressure testing (and/or disinfection if required) of completed lines, the Contractor shall fill the test section with clean, potable water and flush the lines. The Contractor shall furnish all equipment and labor to complete the flushing as required by this Section.

3.4.2 DIFFICULT CONTAMINANTS

Certain contaminants, especially in caked deposits, resist flushing at any velocity. If, in the opinion of the Engineer/City Representative, such contaminants have entered the line during construction, the interior of the pipe shall be swabbed, as necessary, to remove the debris prior to proceeding with flushing.

3.4.3 MINIMUM FLUSHING FLOW AND VELOCITY

The Contractor shall make all arrangements to establish a minimum 2.5 feet per second (fps) flow velocity in the line during the flush. Flushing shall proceed until the installed pipe is free of debris. The flows needed to produce the required flushing velocity indicated above are provided in the table below.

Table 8. FLUSHING FLOW AND VELOCITY

Pipe Diameter (inches)	Flow (gpm) to Produce 2.5 fps
4	100
6	200
8	400
10	600
12	900
16	1600

NOTE: With 40 psi residual pressure, 2 1/2 inch and 4-1/2-inch hydrant outlet nozzles will have the ability to discharge approximately 1,000 GPM and 2,500 GPM respectively.

3.5 TESTING

The Developer's inspector and the City Engineer/ Representative shall be present during all testing procedures.

The Contractor shall perform all testing, and shall furnish all materials, equipment, and labor necessary to complete this work as required. Any work that fails to meet the acceptance criteria of prescribed testing shall be repaired and/or replaced at no additional cost to the City. All repair work shall be re-tested. This sequence shall be repeated until the work meets the acceptance criteria. City may require samples to be delivered to the testing lab by City staff at developer's expense.

3.5.1 PRESSURE TESTING

All pipelines constructed for carrying potable, non-potable, and water-borne products shall be pressure tested for leakage when they are completely assembled, unless directed otherwise in these Specifications or in writing by the Engineer/City Representative.

The city has portable recordable pressure testing equipment that may be used for the testing. The Contractor shall coordinate all tests with the City Engineer/Representative.

WARNING - The hydrostatic test procedures described herein are not applicable to air pressure testing.

Prior to pressurization all required flushing shall have been completed. Pipeline sections to be tested shall be isolated from any connecting lines. Air release taps shall be provided at points of highest elevation, the test section shall be filled with clean potable water, and all air shall be removed from the line. Pressure on the test section shall then be brought to test pressure 150% of working pressure or 200 psi (whichever is greater) for a duration of two hours. Permanent plugs shall be inserted into the air release tap holes after the test has been completed.

3.5.2 LEAKAGE TESTING

The leakage test shall be conducted concurrent with the pressure test. The amount of leakage, if any, will be determined by measuring the quantity of additional water required to maintain the prescribed hydrostatic pressure test during the test period. Accurate means shall be provided to measure the quantity of water required to maintain full pressure on the line for the 2-hour test period, the measured leak rate shall not exceed the rate "Q" computed as follows:

$$Q = LD (P^{0.5}) / 148,000$$

where: Q = Leakage rate (gal/hour)
L = Length of tested pipe (feet)
D = Nominal diameter of pipe (inches)
P = Average test pressure (psi)

When the allowed amount of leakage is exceeded, leaks shall be located and repaired, and the system shall then be re-tested by the Contractor until compliance is achieved.

All visible leaks in exposed pipe shall be repaired.

3.5.3 OPERATIONAL TESTING (pressurized irrigation only)

Pressurized irrigation systems shall be tested for proper system operation after backfill is in place and sprinkler heads have been adjusted to final position. This test shall demonstrate that the system meets coverage requirements (based on operation of one circuit at a time) and that all automatic controls function properly.

3.5.4 NON-RIGID PIPE DEFLECTION TESTING

At the Engineer/City Representative's request, the Contractor shall test requested portions of all non-rigid pipe after being installed and backfilled to ensure that circumferential deflection does not exceed 5% of the diameter. Such a test will consist of passing a mandrel through an open section of pipe, sized appropriately to detect non-compliance. The mandrel shall be sized in accordance with the requirements provided in Section 501 for checking sewer pipe. In the event deflection non-compliance is found, the Contractor shall make repairs as outlined in Section 402 and additional testing of other sections of pipe will be requested.

3.5.5 TESTING DOCUMENTATION

The Contractor shall maintain a record of all testing performed, together with the test results obtained, for each line installed under this Contract. Minimum information to be included in these records shall be as follows:

- All Documents:
 - Date of issuance of the record
 - Name of Contract
 - Contractor's name and address
- Disinfection Report:
 - Name and address of treatment supervisor
 - Disinfection method used
 - Location and boundary description of section to be disinfected.
 - Time and date of disinfectant introduction
 - Time and date of disinfectant release
 - Initial disinfectant residual (PPM) for each outlet tested.
 - Time and date of flushing after disinfection
 - Signature of treatment supervisor (signifies completion of disinfection activities)
- Bacteriological Report:
 - Date issued.
 - Project name and location
 - Laboratory's name, certification number, address and phone number
 - Test location
 - Time and date of sample collection
 - Name of person collecting sample
 - Time and date of laboratory test start
 - Coliform bacteria test results for each sample
 - Certification that water conforms (or fails to conform) to bacterial standards of the appropriate state public drinking water regulations.
 - Bacteriologist's signature
- Test Report:
 - Type of test
 - Location of test
 - Sizes, types, and lengths of pipe in test section, and test boundary description
 - Date and Time test started.
 - Date and Time test completed.
 - Test pressure (Pressure Test only)
 - Amount of leakage/allowable leakage (*Pressure Test only*)
 - Mandrel dimensions (Obstruction and Non-Rigid Pipe Deflection Tests only)
 - Test result (*pass/fail*) (*All Tests*)
 - Printed Name/Signature and Date of Test Supervisor (Contractor's representative) (*All Tests*)
 - Printed Name/Signature of Inspector (Engineer/City Representative's representative) witnessing and approving the test (*All Tests*)

3.6 DISINFECTION

3.6.1 REGULATORY COMPLIANCE

All pipelines to be used for culinary water service shall be disinfected in accordance with the requirements of state and local public drinking water regulations.

3.6.2 REQUIREMENT OF CHLORINE

Before being placed into service, all new mains and repaired portions of, or extensions to, existing

mains shall be chlorinated so that a chlorine residual of not less than 25 ppm remains in the water after standing 24 hours in the pipe. The initial chlorine content of the water shall be not less than fifty (50) parts per million.

3.6.3 FORM OF APPLIED CHLORINE

Chlorine shall be applied by one of the methods which follow, to give a dosage of not less than 50 ppm of available chlorine. Calcium Hypochlorite granules must not be used on solvent welded plastic pipe or on threaded-joint steel pipe.

3.6.4 DRY CALCIUM HYPOCHLORITE

As each length of pipe is laid, sufficient high test calcium hypochlorite (65-70% chlorine) shall be placed in the pipe to yield a dosage of not less than 50 ppm available chlorine, calculated on the volume of the water which the pipe and appurtenances will contain.

The following table gives the amount of calcium hypochlorite (70% available chlorine) to be used for each 20-foot length of pipe to give a concentration of 50 ppm of available chlorine.

Table 9. AMOUNT OF CALCIUM HYPOCHLORITE FOR

Diameter of Pipe	Each 20 ft. Length in Tablespoonfuls	Pounds Per 1000 ft. of Pipe
4-inch	1/2	0.5
6-inch	1½	1.0
8-inch	2½	1.6
10-inch	4	2.5
12-inch	6	3.6
14-inch	8	---

3.6.5 LIQUID CHLORINE

A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device, or the dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine gas, or the gas itself, must provide means for preventing the backflow of water into the chlorine.

3.6.6 CHLORINE-BEARING COMPOUNDS IN WATER

A mixture of water and high-test calcium hypochlorite (65-70% Cl) may be substituted for the chlorine gas-water mixture. The dry powder shall first be missed as a paste and then thinned to a 1% chlorine solution by adding water to give a total quantity of 7.5 gallons of water per pound of dry powder. This solution shall be injected in one end of the section of main to be disinfected while fitting the main with water in the amounts as shown in the table which follows.

Table 10. CHLORINE REQUIREMENTS FOR 100-FT. LENGTHS OF VARIOUS SIZES OF PIPE

Pipe Size Inches	Volume of 100-ft Length Gallons	Amount Required to Give 50 ppm Cl. 1% Chlorine-Water Solution in Gals.
4	65.3	0.027
6	146.5	0.061
8	261.0	0.108
10	408.0	0.170
12	588.7	0.240

3.6.7 SODIUM HYPOCHLORITE

Sodium Hypochlorite, commercial grade (15% Cl) or in the form of liquid household bleach (5% Cl) may be substituted for the chlorine gas-water mixture. This liquid chlorine compound may be used full strength if diluted with water and injected into the main in correct proportion to the fill water so that dosage applied to the water will be at least 50 ppm.

3.6.8 RETENTION PERIOD

Treated water shall be retained in the pipe for at least twenty-four (24) hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least 25 parts per million.

3.6.9 CHLORINATING VALVES AND HYDRANTS

In the process of chlorinating the newly laid pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent and under normal operating pressure.

3.6.10 FINAL FLUSHING AND TESTING

In the process, chlorine treated water shall be thoroughly flushed from the newly laid pipe until the replacement water throughout its length shows, upon test, the absence of chlorine. In the event chlorine is normally used in the source of supply, then the tests shall show a residual not in excess of that carried in the system.

3.6.11 BACTERIOLOGICAL SAMPLES:

The Contractor shall take three bacteriological samples from the installed pipeline with the Engineer present. The locations of the samples shall be at intervals along the pipeline as directed by the Engineer. The sampling bottles and methods used shall be in accordance with the State of Idaho, "Public Drinking Water Regulations," or other similar applicable regulating agencies. Sample results shall be sent to the Public Works Director.

3.6.12 REPETITION OF FLUSHING AND TESTING:

Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained. Failure to get a satisfactory test shall be considered as the failure of the Contractor to keep the pipe clean during construction, or to properly chlorinate the main, and no additional payment will be made for refushing and rechlorinating.

After disinfection, the lines shall be flushed until residual chlorine is reduced to the levels safe for consumption. Samples for bacteriological testing can then be taken. The Contractor shall safely and legally dispose of contaminated water used for disinfection after consultation with the local authorities. Under no circumstances shall heavily chlorinated water be allowed to mix with "live" waters, meaning waters in lakes, rivers, streams or wetlands.

3.7 PIPELINE LOCATION IDENTIFIERS

The Contractor shall furnish and install such identifiers as prescribed in these Specifications.

3.7.1 TRACER WIRE

Tracer wire shall always be installed in the trench with non-metallic pipelines, during or immediately following their installation and may be required in the installation of metallic pipelines where electric conductance is necessary and is not provided through the pipeline because of its type of construction. Tracer wire placement shall be as shown on the Plans but shall generally be immediately beneath (preferred), to the side, or above the pipeline with approximately 4 inches of separation. Tracer wire shall be brought to the surface of the ground at all valves and risers and where otherwise shown on the plans.

Tracer wire shall be installed as shown in the Plan details. Where splices in the wire are required, the Contractor shall solder the wire connections. Tee splices shall be made with a minimum of 4 turns wrapped tightly around the bared portion of the main tracer. Do not cut the main tracer wire. Line splices shall be made by crossing the two bare sections of wire with a minimum of 4 turns in opposite directions as shown in splice detail. Solder and finish connection using a No. 1 welding tip with a soft non-carbonizing flame or a propane torch, using rosin flux and 60/40 rosin core solder. Do not use acid core solder under any circumstances. Use only enough heat to ensure a smooth solder joint. Heat should be applied to the wire, not to the solder. Heat the connection for a few seconds and touch the end of the solder to the joint; when the proper temperature is achieved, the solder will melt and flow freely around the connection. Allow the wire to cool and do not move while cooling. Insulate by applying several turns of 3 m 88 or approved equal electrical tape around the soldered joint. Extend the tape well over the wire insulation in all directions.

Some soil conditions and/or installation circumstances may require the additional installation of cathodic protection for the tracer wire. When this is the case, cathodic protection will appear as a separate bid item and details for its installation will appear on the Plans and elsewhere in these Specifications.

3.7.2 WARNING TAPE

A continuous ribbon of warning tape shall be installed during the backfill operation. Tape shall be

placed 12-inches above the top of the pipeline or otherwise as shown on the drawings. At roll ends and at places where the tape has been broken, the loose ends shall be tied together to prevent separation during the rest of backfill.

3.7.3 MARKING POSTS

Marking posts shall be installed at the placement intervals shown on the Plans. Posts shall not be deformed or damaged during installation. The Contractor shall use a post hole digger to install markers when there is danger of damage to posts from pounding or hammering.

END OF SECTION 401.

SECTION 402. WATERLINE VALVES AND HYDRANTS

1. DESCRIPTION

This Section covers the valves and fire hydrants in water transmission and distribution lines, together with fittings, thrust blocking, and boxes and enclosures related to the operating equipment.

1.1 RELATED WORK

Section 401 - Waterline Pipe Installation

Section 403 - Water System Control Valves

Section 601 - Pipe and Piping Systems

1.2 SUBMITTALS

1.2.1 VALVES 12 INCHES AND SMALLER, AND HYDRANTS

For valve sizes 12-inches and smaller, and fire hydrants, the Contractor shall furnish the manufacturer's standard data and catalogues for review and approval.

1.2.2 VALVES LARGER THAN 12 INCHES

For all valves sized larger than 12-inches, the Contractor shall furnish shop drawings and technical data prepared by the manufacturer for review and approval.

1.2.3 CONTENT

Submittals shall include complete details, dimensions, weights, diameter of stems, alloy for all valve parts and any information that may be required to assemble, install, operate and maintain the valve.

1.2.4 BUTTERFLY VALVES

Certification of performance together with leakage and hydrostatic tests as described in Section 13 of ASTM/AWWA C504 shall be furnished to the Engineer/City Representative upon the Engineer/City Representative's request.

1.2.5 BALL VALVES

Certification of performance together with leakage and hydrostatic tests as described in Section 5 of ASTM/AWWA C507, shall be furnished to the Engineer/City Representative upon the Engineer/City Representative's request.

1.3 DESIGN STANDARDS

Water system gate or butterfly valves shall be installed at every change in direction. Tee intersections shall have valves installed on all legs.

2. MATERIALS

2.1 GATE VALVES

2.1.1 COMPLIANCE

All gate valves shall conform to AWWA C-515 with the following characteristics:

2.1.2 3-INCH AND SMALLER VALVES

Valves 3-inches and smaller shall be as follows:

- Valves shall be manufactured by Ford, Hayes, Mueller, Red & White, or an approved equal.
- Valves shall be standard, double-disc, non-rising stem valves with wheel handles.
- Valve bodies shall be all bronze or brass.
- Valves shall be threaded, unless shown otherwise on the Drawings or required in these Specifications.

2.1.3 GATE VALVES 4-INCH THROUGH 12-INCH

Gate valves 4-inches through 12-inches in size shall be as follows:

- Valves shall have a ductile iron body.
- Valves shall have a solid cast iron, rubber coated, wedge gate and a resilient seat.
- Gate shall be designed to work equally well with pressure on either side of it.
- Valves shall be of the non-rising stem type and shall be left hand opening (counter-clockwise) with a 2-inch square operating nut.
- All interior ferrous surfaces exposed to fluid flow shall have an NSF approved, fusion bonded, epoxy coating. Epoxy coatings shall be factory applied by an electrostatic or thermosetting process.

2.1.4 VALVES ON WATER MAINS

Valves on water mains shall have the following features:

- In-line valves shall be mechanical joints conforming to AWWA C111.
- Valves attached to side outlets shall be flanged.
- By-pass valves shall be flanged.
- Valves in blow-off lines shall be flanged.
- Valves in fire hydrant lines shall be flanged and bolted directly to the hydrant tee.
- Valves in air release and vacuum relief lines shall be flanged or threaded.
- Valves 12-inches and smaller shall be equipped with O-ring packing.

2.2 BUTTERFLY VALVES (valves larger than 12-inches shall be butterfly valves)

2.2.1 MANUFACTURER

Butterfly valves shall be Dresser Industries "450", Allis-Chalmers "Streamseal", Henry Pratt "Groundhog", Mueller Lineseal III, or an approved equal.

2.2.2 COMPLIANCE

Butterfly valves shall conform to AWWA C-504.

2.2.3 CLASS

Valves shall be Class 150 seated, tight closing valves, furnished with mechanical or flanged joints.

2.2.4 SEATS

Rubber valve seats shall be replaceable without disassembling the valve and shall not be interrupted by the shafting. Rubber seats may be retained on the disc edge by stainless steel clamping in lieu of bonding to the valve body.

2.2.5 SHAFT PACKING

Shaft packing shall be of the self-adjusting permanent type.

2.2.6 OPERATION

Underground opening and closing shall be accomplished with permanently lubricated screw-type operators, totally enclosed and of watertight construction. Overload protection shall be incorporated into the operator allowing the application of 450 foot-pounds input torque at full-open and full-closed positions without damage to the operator or valve. A 2-inch square wrench nut and valve box shall be provided for operating the valve. Valves shall open counterclockwise unless indicated otherwise in the Special Provisions.

2.3 BALL VALVES

2.3.1 MANUFACTURER

Valves shall be produced by a manufacturer having at least five years' experience in the manufacture of water works and valves.

2.3.2 VALVES 4-INCHES AND LARGER

Ball valves, 4-inches and larger, shall be ductile iron or cast-steel body, double seated valves meeting the requirements of ANSI/AWWA C-507.

2.3.3 SMALLER VALVES

Smaller valves shall be stainless steel, bronze, or iron bodied valves of the size, type and class shown on the Drawings.

2.4 CHECK VALVES

2.4.1 COMPLIANCE

Check valves shall be manufactured in accordance with ANSI/AWWA C-508.

2.4.2 DESIGN

Check valves shall be of a clear waterway, swing-check type. They shall be designed to be mounted horizontally. They shall be fitted with flanged ends for easy servicing. They shall have an iron body and be bronze mounted.

2.4.3 SEATING

Valves shall be provided with a metal to resilient material seating.

2.5 HOSE BIBS

Hose bibs shall be 3/4-inch bronze or brass body, Watts Model SC-1, Red & White Model RW 301 or approved equal. All hose bibs shall have a tee handle and hose bib vacuum breaker installed that are non-removable.

2.6 SAMPLE FAUCET

Sample faucet shall be a 1/2-inch chromed or brass body hose bib without hose connection threads.

2.7 FIRE HYDRANTS

2.7.1 TYPE

Fire hydrants shall be of compression type. The name or mark of the manufacturer, size of the valve opening, and the year of manufacture shall be plainly cast in raised letters and so placed on the hydrant barrel as to be visible after the hydrant has been installed. As a minimum requirement, hydrants shall be of a dry barrel type and shall be designed for working pressures of two hundred fifty (250) pounds per square inch and shall conform to AWWA C502. All hydrants shall break away at ground level on impact and shall be designed to prevent water leakage when damaged.

The hydrant body shall be ductile iron, fully mounted with approved non-corrodible metals. All wearable surfaces shall be either bronze or some other non-corrodible material and there shall be no moving bearing or contact surfaces of iron in contact with iron or steel. All contact surfaces shall be finished in the workman-like manner and all wearing surfaces shall be easily renewable.

Fire hydrants shall have a minimum of (5) five-inch main valve opening with mechanical or flanged ends. Hydrants shall have a (4 1/2-inch) flange and one-half inch steamer nozzle national standard hose coupling threads and (2 1/2-inch) two- and one-half inch hose nozzles all conforming to ASA specifications B-26.

All hydrants shall withstand hydrostatic tests of twice the design working pressures. Hydrants shall open by turning to the left (counterclockwise); operating nut shall be national standard one and one-half (1 1/2-inch) pentagon measured from point to opposite flat. Hydrants shall have an all-bronze drain valve, which shall provide for rapid drainage of the hydrant after use and shall close securely when the hydrant is open.

All nozzles shall be fitted with cast iron threaded caps with operating nut of the same design and proportions as the hydrant's operating nut. The cap shall be threaded to fit the corresponding nozzle and shall be fitted with suitable neoprene gaskets for positive water tightness under test pressures.

All iron parts of the hydrant, both inside and outside, shall be thoroughly cleaned and painted. All inside surfaces below the sidewalk ring shall be coated with asphalt varnish, Federal Specifications TT-P 51A or JANP -450. They shall be covered with two (2) coats, the first having dried thoroughly before the second is applied.

The outside of the hydrant above the sidewalk ring shall be thoroughly cleaned and thereafter painted with one (1) coat of paint of durable composition conforming to Federal Specification TT-P-86a, type

live and two additional coats of red or approved equal on the body and cap.

The traffic section shall be a minimum of thirty-four (34-inches) inches between ground level and the hose nozzles. The entire nozzle section shall be able to rotate 360 degrees by loosening four bolts.

Approved types are "Waterous Pacer WB 67-250" or an approved equal.

2.7.2 DESIGN

Hydrants shall be designed as follows:

- Hydrants shall be of the "compression" with safety flange and safety stem coupling above the ground line so that they can be repaired without shutting off the water.
- Hydrants shall be of the dry top design with two or more "O" rings sealing the water from the operating mechanism.
- Hydrants shall be furnished with 5-inch minimum valve openings, one 4 1/2-inch NST pumper connection and two 2 1/2-inch hose connections.
- Hose nozzle threads, pump nozzle threads, operating nut and opening direction shall match existing hydrants in the system.
- Hydrants shall be designed for 5-feet of cover, unless shown otherwise on the Drawings.
- Hydrants shall be submitted to the City for approval.

2.7.3 PAINTING

The portion of the hydrant above the ground line shall be painted in accordance with the City's standards. The hydrant shall be painted red and the nozzle caps white.

2.7.4 SNOW FLAGS

Snow flags shall be the RoDon Hydra-Finder standard 5-foot length. The "flat" mounting brackets shall be used for installation.

2.8 OPERATING WRENCHES

The Contractor shall furnish two, T-handle, operating wrenches for each project incorporating valves with 2-inch, square-head, operating nuts.

2.9 VALVE BOXES

Valve boxes shall be cast iron, two piece, and adjustable valve boxes. Valve boxes shall be of the slip joint screw type and be of sufficient length for the pipe burial depth required. The cast iron cover of the valve box shall have the word "water" stamped thereon.

2.10 CONCRETE ENCLOSURES

Concrete enclosures for valves shall be precast and of the type, size and configuration shown on the Drawings and shall be fabricated in accordance with the requirements for precast concrete construction.

3. CONSTRUCTION REQUIREMENTS

3.1 SETTING VALVES AND VALVE BOXES

All valves shall be set and jointed to the pipe in the manner described for pipe laying and jointing in Section

401 of these Specifications. Valves shall be oriented with the operating nut vertical. Valve boxes shall be centered and plumb over the operating nut and shall be set so that no shock or stress will be transmitted to the valve. The tops of the valve boxes shall be set flush with the ground surface, concrete collars, or street surfacing, unless otherwise shown on the Drawings.

3.2 VALVE RESTRAINT

Restraint shall be installed on all valves connected with slip-on, gasketed, or O-ring joints (i.e., bell & spigot, mechanical, etc.) in accordance with these Specifications and as shown on the Drawings.

3.3 CONNECTING TO EXISTING MAINS

3.3.1 CONNECTION TO EXISTING WORK

All connections to existing water mains shall be made by the Contractor, unless otherwise provided in these Specifications. The Contractor shall provide labor and materials, including special fittings and restraint devices, required to make the required connections between existing lines and new lines.

3.3.2 INTERRUPTION OF SERVICES

Where the connection of new work to old requires interruption of service, the Owner, Engineer/City Representative and Contractor shall mutually agree upon a date for such connection which will allow ample time to assemble labor and materials and to notify all customers in accordance with Section 201.

3.4 FIRE HYDRANT INSTALLATION

3.4.1 SETTING

All hydrants shall stand plumb use hand level with the pumper nozzle facing the street. The hydrant shall be set with the ground line at the location indicated by the hydrant manufacturer.

3.4.2 DRAINAGE

Drainage shall be provided at the base of the hydrant by placing clean gravel under and around the base of the hydrant as shown on the Drawings.

3.4.3 RESTRAINT

All hydrants shall be restrained by setting thrust blocks and mechanical restraint assemblies in accordance with the Drawings.

3.4.4 AUXILIARY GATE VALVES

All fire hydrant assemblies shall include auxiliary gate valves positioned as shown on the Drawings.

3.5 THRUST BLOCKS

Thrust blocks and joint restraints (Mega Lug) shall be formed to prevent coverage of the pipe joints in accordance with the details shown on the Drawings. All thrust blocks shall be set against undisturbed earth.

END OF SECTION 402.

SECTION 403. WATER SYSTEM CONTROL VALVES

1. DESCRIPTION

This Section covers the water system control valves, including pressure release, pressure sustaining, pressure reducing, water level control, air relief, vacuum relief, deep well pump control, back flow prevention and surge control with their enclosures and miscellaneous support equipment.

1.1 RELATED WORK

Section 401 - Waterline Pipe Installation

Section 402 - Waterline Valves and Hydrants

Section 601 - Pipe and Piping Systems

Section 701 - Portland Cement Concrete

Section 702 - Concrete Forming, Finishing and Curing

Section 703 - Concrete Reinforcement

1.2 SUBMITTALS

1.2.1 CERTIFICATION OF COMPLIANCE

Certification of compliance to the standards and Specifications contained herein shall be obtained from the manufacturer and provided by the Contractor at the time of delivery of these materials to the project site.

1.2.2 DESCRIPTIVE LITERATURE

Descriptive literature which identifies the manufacturer, model numbers, materials of which the control valves are fabricated, and their capacities shall be provided by the Contractor to the City.

1.2.3 OPERATION AND MAINTENANCE INSTRUCTIONS

The manufacturer's installation, operation and maintenance literature for each control valve shall be furnished to the City prior to the time of final acceptance for payment.

2. MATERIALS

2.1 GENERAL

All control valves furnished and installed under this contract shall be of the model, size, and type shown on the Drawings or required in these Specifications. They shall have been produced by the same manufacturer and shall be provided by a supplier located in the state in which the installation is to be made. They shall be furnished with a manufacturer applied, NSF approved, fusion bonded, epoxy coating. Seats shall be designed so that they are easily maintained and without edges that induce cutting or wear at low flows. Unless otherwise required to meet specific service conditions, all cast iron or steel valves shall be 150 lb. Class.

2.2 ALTITUDE CONTROL VALVES

Altitude control valves shall be manufactured by CLA-VAL Company or approved equal. Valves shall be of ductile iron flanged, spring loaded, 3-way, diaphragm actuated, globe pattern valves. Valve control shall be provided by a pressure difference sensor (and when called for on the Drawings or in these Specifications, fitted with a direct acting solenoid control) with appropriately sized piping and supports. Valves shall have a valve position indicator, cocks to isolate the pilot system and closing speed control. Four-inch and smaller valves shall be fitted with flow clean strainer while larger valves shall be provided with a "Y"-pattern strainer in the pilot control system.

2.3 PRESSURE RELIEF/PRESSURE SUSTAINING VALVES

Shall be ductile iron, modulating, hydraulic operated, pilot controlled, flanged valves with globe pattern. All pressure sustaining valves shall be designed to maintain constant upstream pressure at the set point indicated on the Drawings or in the Special Provisions. Pressure sustaining valves shall be provided with a position indicator operated by a pressure difference sensor and shall have appropriately sized piping and supports. The pilot system shall be capable of being isolated with shut-off cocks, be fitted with a strainer, and shall be able to control closure to prevent surges.

2.4 COMBINATION BACK PRESSURE/SOLENOID SHUTOFF VALVE

Shall be ductile iron, flanged, globe pattern, modulating hydraulic operated, pilot controlled, with solenoid activated shut-off. The valve shall open sufficiently to maintain a pre-set inlet (back) pressure. When the inlet pressure is less than the control setting, the pilot system shall close the valve tightly. The pilot system shall be capable of being isolated with shut-off cocks, be fitted with a strainer and shall be able to control closure to prevent surges.

2.5 PRESSURE REDUCING VALVES

Shall be modulating pressure reducing with globe pattern. Valves shall be provided with pilot control which operates such that positive and gradual closure can occur to prevent any surge or line shock. Pressure reducing valves shall be equipped with a valve position indicator, cocks to isolate the pilot system, speed for control of closure and a strainer on the pilot system inlet.

2.6 BACK-FLOW PREVENTION VALVES

Shall meet AWWA Standards and shall be tested upon installation. Test results must be submitted to the city within 5 days of testing. All assemblies used shall be on the USC-FCCCR approved list and meet State and Local Requirements.

2.6.1 BACKFLOW PREVENTION ASSEMBLY

The nomenclature "assembly" refers to a backflow preventer which are designed to be in-line tested and repaired, and to meet the head loss and flow requirements of the recognized approval authority. The "assembly" consists of the backflow prevention unit, two resilient seated shutoff valves, and test cock(s).

2.6.2 BACKFLOW PREVENTION DEVICE

The nomenclature "device" refers to a backflow preventer that is not designed for in-line testing. IDAPA:

- A. If double check valves and/or reduced pressure principal backflow prevention devices are used, they must pass a performance test conducted by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research or meet American Water Works Association C-510 or C-511 standard or another equal test approved by the Department. (7-1-97)
- B. If atmospheric vacuum breakers and pressure vacuum breakers are used, they shall be marked approved by the international association of Plumbing and Mechanical Officials (IAPMO) or by the American Society of Sanitary Engineer/City Representatives (ASSE). (10-1-93)
- C. Resilient seated shutoff valves shall be used after the effective date of these rules when double check valves, reduced pressure backflow prevention devices, and pressure vacuum breakers are installed. (12-10-92)

2.7 AIR/VACUUM RELIEF VALVES

Shall be simple lever type, kinetic combination air valves, with cast iron body and stainless-steel floats. Vents for air/vacuum relief valves shall be threaded GI pipe and shall be protected with fittings covered with No. 24 stainless steel, bronze or aluminum screen.

2.8 DEEP WELL SOLENOID PUMP CONTROL VALVE

Shall be globe pattern, hydraulically operated diaphragm valve controlled by a solenoid pilot valve. The pilot system shall have separate adjustable flow control valves, a "Y" strainer, and shall be fitted with cocks to enable isolation during servicing. The valve stem shall have a limit switch to serve as an electrical interlock between the valve and pump motor.

2.9 ENCLOSURES

Enclosures for control valves shall be concrete, furnished and installed in accordance with these Specifications.

2.10 MISCELLANEOUS PIPE, FITTINGS, VALVES AND EQUIPMENT

Miscellaneous pipe, fittings, valves and equipment needed to assemble and support operation of the control valves shall be in conformance with Sections 601, 401, and 402 of these Specifications.

3. CONSTRUCTION REQUIREMENTS

Prior to installing control valves, the Contractor shall flush, blow out, or otherwise clean all dirt and debris from connecting lines. Control valves shall be installed with appropriate supporting piping and equipment in accordance with manufacturer's recommendations. Control valves shall be fitted with flanged connections or installed in a manner which will allow easy removal in the enclosure or area wherein the valves are installed. As soon as control valves are pressurized (placed in service), the Contractor shall check and adjust, if necessary, all valve assemblies to assure they are adjusted correctly and functioning as designed. All flow control valves shall be supplied with controllable solenoid valves and outputs such that they can be connected to the SCADA/Telemetry system for remote operation and observation.

END OF SECTION 403.

SECTION 404. WATER SERVICE CONNECTION

1. DESCRIPTION

This Section covers the materials which include excavation, water main tapping, stops, valves, service lines, meters, settings, boxes and other accessories required for installing water services to system users.

1.1 RELATED WORK

Section 302 - Trench Excavation and Backfill

Section 401 - Waterline Pipe Installation

Section 601 - Pipe and Piping Systems

1.2 SUBMITTALS

1.2.1 DESCRIPTIVE LITERATURE

Descriptive literature which identifies the manufacturer, model, size, material and parts lists from which the piping, fittings, valves and meters are manufactured, including installation instructions, shall be provided to the City.

1.2.2 CERTIFICATION OF COMPLIANCE

Written certification of compliance from the respective manufacturer shall be provided with each delivery of metal fittings, valves and meters.

1.3 DEFINITIONS

Mains - Water distribution pipes, located in streets or rights-of-ways, to which water service connections are made for users of the system.

Tap - The actual connection made to water mains which includes drilling an opening into the main, threading, installing a tapping saddle when appropriate, and inserting (screwing) a valve into the opening. All taps shall be made by a licensed public works contractor.

Saddle - A fitting placed on a pipe to reinforce the pipe wall through which the tapping hole is drilled.

Key - Can mean either: the center piece of a corporation or curb valve which is turned to control flow through the valve; or the "T-shaped" tool used by operators to reach and turn the key or closing piece of a valve.

Setter (also referred to as "yoke") - Is the prefabricated assembly of pipes and valves installed in a meter box and connected into the service line in which the water meter is mounted (or "set").

2. MATERIALS

2.1 SADDLES

Double Strap saddles shall be ductile iron with epoxy coating and stainless-steel straps designed and sized specifically for tapping water mains. Threading shall be tapered, and the saddle shall conform to

ANSI/AWWA C800. Straps shall provide full support around the circumference of the pipe and have a bearing area of sufficient width along the pipe axis so that the pipe will not be distorted when tightened.

2.2 CORPORATION STOPS

Corporation stops shall be brass body ball-type or balanced pressure, o-ring sealed plug type valves with tapered threads and in conformance with the requirements of ANSI/AWWA C800.

2.3 CURB VALVES

Curb valves shall be brass body ball-type valves; or balanced pressure, o-ring sealed, plug type valves. Curb valves shall be furnished with City regulated 1-inch slide pipe box. The curb box shall be sized to properly fit the valve and adjust to the depth to which the valve is set.

2.4 SERVICE LATERAL PIPE

Service lateral pipe shall be as called for on the Drawings and in accordance with the following:

2.4.1 POLYETHYLENE PIPE

Polyethylene service pipe shall conform to the requirements of AWWA C-901, "Polyethylene (PE) Pressure Pipe, Tubing and Fittings, 3/4-inch through 3-inch for water." PE Pipe shall be pressure tubing conforming to Table 6 of said specification. Tubing shall be Class 160 with a DR of 9.0 or Class 200 with a DR of 7.3. If not specified, DR 7.3 shall be used.

2.4.2 COMPRESSION CONNECTIONS

Ends of polyethylene tubing inserted in compression connections should be fitted with insert reinforcement.

2.5 METER SETTER (YOKE)

The meter setter shall be fit with brass tubing (when required) and copper alloy and copper alloy fittings. Setters shall be furnished with brass body, angle or straight, ball-type inlet valves with fittings appropriately sized to fit the meter. When required, a cast iron yoke band shall be furnished to provide the setting. 1 1/2-inch & 2-inch Meter Setter shall be Mueller/Ford Coil Vault Meter Setters.

2.6 DUAL CHECK VALVE

Unless indicated otherwise on the Drawings, a dual check valve shall be provided with each meter setting. Valves shall be copper alloy bodied, dual valves with independent/ internally loaded check valves which meet the requirements of the State and local health authorities and conform to ASTM/AWWA C510.

2.7 WATER METERS

Water meters shall be cold water displacement type meters which complies with ANSI/AWWA C700. The main case and bottom plate shall be of bronze and the meter shall be sized and equipped as shown on the Drawings. The 3/4-inch, 1-inch, 1 1/2-inch and 2-inch meters shall be Model MasterMeter with radio read by SENSUS Technologies or an approved equal. The 3-inch and up meters shall be MasterMeter with radio read by SENSUS Technologies or an approved equal.

2.8 METER BOX

Meter boxes shall be Mueller/Ford thermal coil meter boxes or approved equal, 1-inch minimum piping. Meter boxes shall be 60-inch, 18-inch diameter single meter style. Meter boxes shall be equipped with a 4-inch minimum foam pad.

1 ½-inch & 2-inch Meter boxes shall be Mueller/Ford EZ-Vault system.

2.9 METER BOX RING AND COVER

The meter box ring and cover shall be cast iron with a minimum diameter of 18-inches but shall be appropriately sized to fit larger meter boxes where required. The words "WATER METER" shall be cast into the cover. The cover shall be a locking type with a pentagonal head, corrosion resistant, screw down, locking device. Covers shall have touch pad receptacles.

2.10 METER BOX DRAINAGE

Meter box drainage shall be provided by placing 1-cubic yard of drain gravel at the base of the new meter box drain.

3. CONSTRUCTION REQUIREMENTS

3.1 TRENCHING AND BACKFILL

Trenching and backfill for installation of service connections shall be completed in accordance with Section 302. Service lines shall have a minimum of 60 inches of cover. All service lines constructed under existing asphalt shall be installed using trenchless installation techniques. A minimum of two (2) attempts in varying locations must be made prior to requesting approval to install services in existing asphalt using standard open-cut construction techniques.

3.2 INSTALLATION OF CONNECTIONS

Installation of water service connection components shall be as shown on the Drawings. All connections to the water main pipe shall be made by using a saddle rather than a direct tap. Service lines shall be slightly snaked in the trench near the connection to the water main to allow for some movement to avoid a rigid connection.

3.3 REPLACEMENT OF EXISTING FACILITIES

When replacement of specified components of service connections is required, the Contractor shall: protect existing equipment, provide appropriate connecting fittings to accommodate the new component, use care in removal and salvaging of the existing component and deliver the existing components to the Owner's maintenance shop or headquarters.

END OF SECTION 404.

SECTION 405. WATER MAIN FLOW METER

1. DESCRIPTION

This Section includes information on furnishing and installing tubular flanged water flow meter(s) of the size and type and location shown on the Drawings and as described in these Specifications.

1.1 RELATED WORK

Section 401 – Water Pipe Installation

2. MATERIALS

2.1 PERFORMANCE CAPABILITY

Flow meters shall be able to accurately operate in working pressures up to 150 PSI, at temperatures up to 140 degrees F. and for flows 1/8-3 GPM and greater depending on the application. Meter sizes and measuring capacity shall be as shown on the Drawings. The meter's flow indicator shall be mechanically driven with a 3.5-inch (minimum) dial that provides a flow reading and totalizer reading up to six digits in GPM and total gallons. Meters installed in systems or at locations which are controlled by an electronic telemetry system shall be furnished with flow transmitters which can be connected into that system to indicate flow conditions.

2.2 FABRICATION

Flow meters shall be manufactured to meet the requirements of ANSI/AWWA C704 with a steel meter tube fitted with straightening vanes, all of which is coated with a fusion epoxy resin. Interior components of the meter shall be fabricated from stainless steel, plastic or other corrosion resistant materials which will provide long service. The propeller shall be magnetically connected to the drive mechanism and mounted with bearings which provide smooth operation for flows in both directions. The gearbox shall be cast bronze and the meter head shall be fabricated from cast iron or epoxy coated steel.

3. CONSTRUCTION REQUIREMENTS

Flow meters shall be installed in accordance with the manufacturer's recommendations and consistent with the Drawings. The Contractor shall provide all materials and installation labor to assure proper installation and calibration of the meter(s) required.

END OF SECTION 405.

SECTION 406. PRESSURE GAUGES

1. DESCRIPTION

This Section covers pressure gauges and their support piping and fittings in buildings and other structures at locations shown on the Drawings.

1.1 RELATED WORK

Section 401 – Waterline Pipe Installation

Section 601 – Pipe and Piping Systems

2. MATERIALS

2.1 PRESSURE GAUGES

Shall be US Gauge, Model 550L, stem mounted, and oil filled, as manufactured by AMETEK or an approved equal. Gauges have a 2 1/2-inch (minimum) stainless steel case with a pressure relief plug. The window shall be polycarbonate plastic with neoprene sealing gasket. The pressure reading range shall be as required for the application.

2.2 SUPPORTING PIPE AND FITTINGS

Shall be 1/4-inch threaded Schedule 40 galvanized pipe.

3. CONSTRUCTION REQUIREMENTS

Pressure gauges shall be installed in accordance with the manufacturer's recommendations and at the locations shown on the Drawings. The Contractor shall provide sufficient supporting pipe to mount pressure gauges vertically and oriented to be read easily. When possible, pressure gauges should be installed at least three pipe diameters downstream from any valve in the pipeline.

END OF SECTION 406.

DIVISION 500

SEWER

SECTION 501. SEWER LINE PIPE AND MANHOLE INSTALLATION

1. DESCRIPTION

This Section covers the pipe, fittings and manholes and their appurtenances for sanitary and storm sewers and subsurface drainage systems.

1.1 RELATED WORK

Section 202 - Earthwork Materials

Section 302 - Trench Excavation and Backfill

Section 601 - Pipe and Piping Systems

1.2 DEFINITIONS

Culvert - A section of pipe installed transversely under a road, highway, railroad, or canal for the purpose of conveying water flow.

Fitting - Any component of a pipeline, excluding the pipe itself, which is used for connecting pipe sections or connecting to valves, tanks, structures, etc.

Flowline - A line formed by the inverts of a pipeline.

Infiltration - Any uncontrolled seepage of groundwater into a sewer line or system. **Inflow** - Any water entering a sewer.

Invert - The bottom or lowest point of the internal surface of a cross-section of a pipeline.

Lateral - Any line which connects to, and extends from, a sewer main line. A Service Lateral is any line which connects to a sewer service stub at the property line and extends on private property to the sewer plumbing at the foundation of a house or business.

Permeability - The property of a material which describes the rate of movement of any fluid through the pores of the material.

Resilient Connector - A flexible (rubber, plastic, etc.) connection fitting manufactured specifically for joining one pipe to another or to a structure, and capable of being deflected or deformed without leakage.

Run - Any identified section of a pipeline.

Service Stub - The line which connects to a sewer main line at the service tap and extends from there to the property line.

Service Taps - Connections to sewer main collection lines from individual services.

Springline - The points of maximum horizontal distance on the inside surface of a circular pipe or in rectangular pipe; the mid height of the internal vertical walls.

2. MATERIALS

2.1 PIPE

See Section 601 for pipe materials specifications.

2.2 MANHOLES AND ENCLOSURES

2.2.1 MANHOLES

Manholes consist of the base, riser, cone, grade rings, rings and covers. Manholes shall be constructed of pre-cast, reinforced concrete and shall conform to the Drawings and to ASTM Standard C478. Unless shown otherwise on the Drawings, the wall thickness of 48-inch and 60-inch manholes shall be minimum 5-inches and 6-inches respectively. The cone sections shall be eccentric and be designed to meet AASHTO HS-20 loading requirements. Pipe connections and/or knockouts shall be sized and located according to the Drawings. Grade rings shall have 4-inches minimum and 1-foot maximum vertical thickness.

2.2.2 JOINTS

All manhole components shall be joined with tongue and groove joints and joints shall be sealed so that they are watertight. Sealant materials shall be flexible butyl resin sealant which conforms to AASHTO M-198B, or a rubber gasket may be used if it is specifically designed for installation in concrete manholes and conforms to ASTM C361.

2.2.3 RINGS AND COVERS

Manhole rings and covers shall be cast iron, Domestic Steel only, be H-20 loading rated, be manufactured to fit the concrete openings of the manhole and shall meet the requirements of ASTM A48, Class 30B. The clear opening of the ring shall be 24-inches minimum. Vented covers, without dustpans, shall be provided for all manholes located where drainage or flooding will not occur. Watertight covers shall be provided wherever the manhole may be flooded with street runoff or floodwater. The combined weight of the ring and cover shall be not less than 360-pounds. All covers shall have cast into the upper surface the word "SEWER" and other lettering and insignias as may be shown on the plans.

2.2.4 STEPS

Plastic or fiberglass steps reinforced with steel, which conform to ASTM C487 or ASTM C478 standards, shall be installed in all sections of each manhole as shown on the Drawings.

2.2.5 CONNECTIONS

All connections to the manhole with piping shall be made with flexible positive seal, watertight gaskets or boots manufactured by Forsheda NPC, Inc., or an approved equal which meets the requirements of ASTM C923.

2.3 PIPELINE LOCATION IDENTIFIERS

Pipeline location identifiers generally take the form of marker posts, warning tape, and tracer wire. The Contractor shall furnish and install such identifiers as shown on the Drawings and prescribed in these Specifications.

3. CONSTRUCTION REQUIREMENTS

3.1 HANDLING AND APPROVAL OR REJECTION OF MATERIALS

Care shall be taken during unloading and hauling to avoid impact which might damage the pipe. Pipe dropped during unloading shall not be installed unless approved by the Engineer/City Representative and may be rejected by the Engineer/City Representative. Pipe will be carefully inspected in the field before and after laying. If any cause for rejection is discovered in a pipe after it has been laid, it shall be removed and replaced by the Contractor at no additional cost to the Owner. Any pipe which is found to be unfit or is rejected due to cracks, broken bells or spigots, chipped exterior or lining, etc., shall be removed from the job site.

3.2 TRENCHING

Excavation and backfill of trenches for sewer piping and manholes shall be performed in accordance with Section 302 – “Trench Excavation and Backfill” of these Specifications.

3.3 PIPE INSTALLATION

3.3.1 DEWATERING

Prior to pipe laying and jointing, when water is present in the trench, sufficient de-watering effort shall be made to maintain the water level at or below the surface of the trench bottom or the base of the bedding course. The de-watering operation, however accomplished, shall be carried out in such a manner as not to permanently disturb natural groundwater conditions.

3.3.2 CONNECTION TO EXISTING WORK

When connections are to be made to any existing pipe, conduit, or other appurtenance for which the actual elevation or position cannot be determined without excavation, the Contractor shall excavate for, and expose the existing pipe conduit, etc., before laying any new pipe or conduit. The Contractor shall furnish and install the necessary couplings, fittings, etc., needed to accomplish the cutting in, or connections, whether or not specifically indicated on the Drawings.

The Engineer/City Representative shall be allowed to inspect the existing pipe or conduit before any connection is made. The Engineer/City Representative may then make adjustments as required in the line and grade to accomplish the intent shown on the Drawings.

3.3.3 PIPE JOINING

Pipe joining shall be as follows:

- When making connections, pipe shall be cut in a neat and workmanlike manner and beveled so as to provide a smooth end at right angles to the axis of the pipe. Pipe and fittings shall be assembled so there will be no distortion or springing of the pipelines. Care must be taken to properly align the pipe before joints are forced home. During insertion of the spigot end, the pipe shall be partially supported

by hand, sling or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since the most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

- Where fusion of polyethylene pipe joints is required, sections of pipe shall be joined in a continuous length on the job site above ground. Joining shall be by the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. Equipment used for butt fusion joining shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements, alignment, and fusion pressures.
- PVC pipe, 2 inches and smaller in diameter, shall be joined by solvent welding. No disturbance of joints, including from trench backfill operations, will be allowed until solvent welded joints are cured.
- PVC pipe, larger than 2 inches in diameter, shall be joined by means of gasketed joints.
- With bell and spigot joints, care should be taken to properly align the pipe before joints are forced home. Gaskets shall be lubricated in accordance with manufacturer's instructions. During insertion of the spigot end, the pipe shall be partially supported by hand, sling, or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since the most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

3.3.4 PIPE LAYING

All pipe shall be laid to conform to the prescribed line and grade shown on the plans, within specified limits, if any. No blocking of any kind shall be used to adjust the pipe to grade, except when used with concrete embedment. Unless otherwise approved by the Engineer/City Representative, pipe shall be laid upgrade from the point of connection on the existing pipeline or from a designated starting point. The pipe shall be installed with the bell end forward or upgrade, unless approved otherwise.

The Contractor shall install gravity sewer pipelines at the proper slope by the use of a laser targeting system. Lasers shall be set at the proper slope in manholes and targets shall be affixed at the end of pipe sections being installed. As an alternative to targets, the laser beam may be set at the sewer invert, slope, and elevation. The inside bottom surface of the pipeline will be set directly next to the laser beam. Gravity sewer pipeline alignment shall be a straight line, both vertically and horizontally, between manholes.

All pipe laid shall be retained in position, by mechanical means if necessary, so as to maintain alignment and joint closure until sufficient pipe bedding and backfill have been installed to adequately hold the pipe in place.

3.3.5 PIPE BEDDING

Bedding materials shall be placed so the bottom surface of the pipe will have full bearing for the entire barrel length. The pipe shall rest on not less than 1/4 of its outside perimeter. Bell holes shall be dug as required to assure uniform support along the barrel but shall be no larger than necessary. After the pipe is laid, additional bedding material shall be placed and compacted in 6-inch lifts to a level even with the spring line of the pipe. The portion of the trench from the spring line to 12 inches above the top of the pipe shall then be filled and compacted in the same way.

3.3.6 COVERING PIPE END

At the close of each workday, or whenever the work ceases for any reason, the end of the pipe shall be securely covered or plugged, unless otherwise permitted by the City Engineer/Representative.

3.3.7 CONSTRUCTION NEAR CULINARY WATER LINES

Locate sewer lines at least 10 feet horizontally from any existing or proposed parallel culinary water line. When installation conditions prevent the 10-foot separation, the sewer and water lines may be laid closer, provided.

- The elevation of the bottom of the water line is at least 18-inches above the top of the sewer pipe, and
- The water line is laid in a separate trench, or
- The waterline is laid on an undisturbed earth shelf on one side of the sewer line trench, or
- The waterline is laid in a sewer or drain line trench which has been backfilled and compacted to not less than 95% of maximum density determined by ASTM D690.
- Where culinary water lines and sewer lines cross, either above or below the other, the lines shall be placed:
 - So as to provide a minimum separation of 18-inches between the top of one line and the bottom of the other.
 - So that the joints of each are equidistant on either side of the other line with as much separation as possible.
 - So that, where a sewer line crosses over a water line, the sewer line is adequately supported to prevent it sagging or falling onto the water line and causing damage to it.
- In such crossings, where the foregoing vertical and horizontal requirements are impossible to achieve:
 - The sewer shall be designed and constructed of cast iron, ductile iron, galvanized steel, or other protected steel as approved.
 - Such construction shall extend for a minimum distance of ten feet on each side of the point of crossing.
 - Mechanical joints shall be used.
- As an alternative, the Engineer/City Representative may approve installation of the sewer pipe so that it is fully encased in 12-inch-thick concrete for a distance at least 10-feet each side of the crossing.

3.4 PRESSURE PIPE RESTRAINT

3.4.1 THRUST BLOCKS

Thrust blocks and/or mechanical restraints shall be installed on pressure pipelines in accordance with these Specifications and Drawings before any hydrostatic testing is performed on the system. Pressure pipe shall be properly blocked at all fittings whenever:

- The pipeline makes a change in direction of 11 degrees or more,
- It changes size, or
- It terminates (see restraining details in Drawings).

3.4.2 CONCRETE THRUST BLOCKS

Concrete thrust blocking shall be formed and placed, so that joints and fittings will be accessible. In addition, all pressure pipe 12-inches in diameter and larger shall have mechanical restraint furnished and installed at all joints within 60 feet each way from any bend, in addition to thrust blocks shown in the drawings.

3.4.3 VISUAL INSPECTION

The Contractor shall allow the Engineer/City Representative to visually inspect every thrust block before it is buried.

3.5 MANHOLE INSTALLATION

3.5.1 BASES

Prior to setting the base for manholes, the bottom of the excavation shall be carefully graded to provide uniform bearing and support for the manhole. Where the manhole base is cast in place, all loose material shall be removed, and excavation shall be made to assure placement is made on undisturbed soil. Where pre-cast bases for manholes are used, the trench shall be over-excavated at least 6-inches and filled with granular backfill as described herein and compacted and graded to provide uniform bearing and support for the manhole. Where manholes are installed on existing piping, the base may be formed by placing concrete around and under the existing pipe and then cutting away the top one-third of the pipe to form an open channel, after the concrete has been allowed to adequately cure (see invert channels below).

3.5.2 INVERT CHANNELS

Invert channels shall be formed from concrete to conform in shape and slope to that of the sewer line. The depth of the channel shall be at least three-quarters of the diameter of the sewer pipe it serves. Adjacent floor area shall be sloped towards the invert channel to provide a minimum slope of one inch per foot.

3.5.3 JOINTS AND CONNECTIONS

All joints between manhole components shall be made watertight with a permanently flexible sealant. Connections to manholes with new piping shall be made with a rubber boot or seal which will assure a flexible, watertight seal and which conforms to ASTM C923. The connector shall be of a size specifically designed for the pipe material and hole size placed in the wall of the manhole. All joints shall be grouted on the inside of the manhole. Grouting shall be accomplished with a non-shrink grout and accomplished with good workmanship.

3.5.4 DROP MANHOLES

Drop sewer manholes shall be constructed in accordance with the details shown on the drawings, whenever a grade difference of more than 18-inches occurs in that manhole. For grade differences of less than 18-inches, the flowline of the manhole base shall be sloped to provide a smooth transition between incoming and outgoing sewer lines.

3.6 FLUSHING AND CLEANING

Prior to proceeding with testing, all sewer lines, manholes, and structures and connected piping installed under this Contract shall be flushed and cleaned. The Contractor shall provide all labor, materials, cleaning equipment, and water required to clean the system components. Cleaning and testing must be done prior to acceptance. No sewage water shall be placed in the system until flushing and testing have been completed.

Before isolating a specific section of line for flushing, the Contractor shall be responsible for making the necessary arrangements and appropriate piping connections to safely discharge the water used for flushing, to avoid any property damage or contamination of bodies of natural surface or ground water. The Contractor shall fill each section to be tested with clean potable water and then flush the line. The Contractor shall make the necessary arrangements so that a 2.5-foot per second flow velocity will be established in the lines during flushing. Flows required to produce the required flushing velocity indicated above are provided as follows:

Table 11. FLUSHING FLOW AND VELOCITY

Pipe Diameter (inches)	Flow (gpm) to Produce 2.5 fps
4	100
6	200
8	400
10	600
12	900
16	1600

3.7 TESTING

3.7.1 BACKFILL AND COMPACTION

No testing of any sewer line shall be performed until the trench has been backfilled and compacted to the appropriate unsurfaced grade or level.

3.7.2 FORCE MAINS

- **PIPE** – Sewer force main pipe shall be PVC C900 with suitable thickness for design conditions. The force main shall be installed meeting all separation requirements as outlined in these specifications and in accordance with IDAPA requirements.
- **METERS** – Meters on pressurized sewer force mains shall be Seimens Mag or an approved equal.
- **IDENTIFICATION** – Sewer force mains shall be appropriately identified with trench tape saying, “raw sewage”.
- **LEAKAGE TESTING** - Force mains shall be hydrostatically tested according to the requirements of Section 401.3.6 and 5.5.3.3 of the “Idaho Standards for Public Works Construction”.
- The Contractor shall furnish all necessary personnel, water, equipment, supplies, and plugging

devices required to perform leakage tests as described therein. Any leaks or other deficiencies that are detected shall be repaired and the test section of pipe shall then be re-tested by the Contractor. This process shall be repeated until compliance is achieved.

3.7.3 GRAVITY MAINS

All gravity main sewer piping shall be air pressure tested for exfiltration. Air pressure testing shall be accomplished in accordance with recommended practice (UNI-B-6) of the Uni-Bell PVC Pipe Association for all pipelines less than 36-inches in diameter. Pressure testing will be made at all joints for lines 36-inches or greater in diameter. Testing will be performed with equipment equivalent to that manufactured by Cherne Industrial, Inc. and consistent with the procedure described as follows:

- All wyes, tees, and/or ends of lateral stubs shall be suitably capped and braced to withstand the internal test pressure of the section being tested. Caps shall be easily removable for making future lateral or extension connections.
- Test sections of sewer line shall be isolated by plugging at each manhole with pneumatic plugs. One of the plugs shall be fitted with connections to allow the following:
 - Inflation of the pneumatic plug.
 - Pressure measurement inside the isolated section of sewer line.
 - Introduction of air under pressure into the isolated section of sewer line.
- Air for pressurizing and gauges for measuring pressures shall be supplied through and incorporated into a control panel manufactured specifically for such testing. The control panel shall be fitted with a 3 1/2-inch (or larger), 0 to 30-psi gauge for reading the internal line pressure. Calibrations on the gauge for the 0 through 10-psi range shall be in tenths of pounds.
- Personnel will not be allowed in any involved manhole while pressure is being applied to a test section.
- Air shall be introduced into the test section until the pressure stabilizes at 3.5 psi. Then the time required for the pressure to drop to 3.0 psi shall be observed, recorded, and compared to the following table of acceptability standards:

Table 12. ALLOWABLE TIME FOR A 0.5 psi TEST PRESSURE DROP IN PVC SEWER PIPE

Pipe Diam. (inches)	Minimum Time in Minutes and Seconds for Various Lengths of Pipe							
	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
6	2:52	2:52	2:52	2:52	2:55	3:27	3:59	4:27
8	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
18	8:30	9:37	9:37	16:01	19:14	22:26	25:38	28:51

If the level of any groundwater present is higher than the level of the test section, the test air pressure shall be increased until it is 4 psi greater than the average backpressure induced on the line by the

ground water. At least two minutes shall be allowed for the interior air pressure to stabilize at that pressure. Pressure in the line then shall be observed until it has decreased to 3.5-psi above the groundwater backpressure. The foregoing described test for a 0.5-psi pressure drop can then be commenced.

- Exfiltration testing for all pipe and joints shall be considered acceptable when the time measured for pressure to decrease from 3.5 to 3.0 psi is equal to or greater than the time shown above in the table.

Infiltration testing also shall be conducted for all gravity main sewer lines when the groundwater level is above the top of the pipe section being tested. Tests shall be made by observing and measuring the amount of water infiltration. Testing shall be conducted from manhole to manhole. The length of pipe to be tested shall not exceed 700 feet. The following steps shall be taken as the testing proceeds:

- Measurement of ground water elevation shall be made at the upper and lower ends of the test section and recorded. The upper end of the test section shall then be plugged and the flow of water leaving the lower end will be measured, by directing the flow into a container of known volume or by observation of flow over a weir.
- Acceptance of the test section for infiltration compliance will be given when the rate of flow out of the section is less than 200 gallons per inch of internal pipe diameter per mile per 24-hour day.

All manholes shall be checked for infiltration by observing their interior surfaces for signs of water infiltration.

In areas of high groundwater manholes shall be vacuum air tested according to the following ISPWC Division 500-Sewer- 2007 Revisions, Section 502-Manholes-pages 8-9 requirements.

Vacuum Testing.

- a. Tester NPC Manhole Vacuum Tester, or approved substitution.
- b. Procedure
 1. Plug Holes: Plug lift holes with non-shrink grout and pipes with plugs.
 2. Brace Plugs: Brace plugs to prevent them from being drawn into the manhole.
 3. Place Test Head: Inside of the top of the cone section and inflate seal in accordance with the manufacturer's recommendations.
 4. Draw a Vacuum: To 10 inches of mercury and shut off the vacuum pump.
 5. Measurement: With the valves closed, measure the time for the vacuum to drop to 9 inches.
- c. Requirement: Time to be greater than those indicated in Table 13.
- d. Retest: If the manhole fails the initial test, make repairs and retest at no additional cost to the Contract.

Table 13. MINIMUM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS

Manhole Depth (ft)	Diameter, (in)				
	48	54	60	66	72
	Time (seconds)				
8	40	43	46	49	53
10	45	49	53	56	61
12	50	55	59	63	69
14	55	61	66	71	77
16	60	66	72	78	87
18	60	68	75	83	90
20	60	68	75	83	90
22	60	68	75	83	90
24	60	68	78	87	97
26	64	75	85	94	105
28	69	81	91	101	113
30	74	87	98	108	121

3.7.4 DEFLECTION TESTING

All flexible wall sewer piping shall be tested for deflection by passing a mandrel sized to pass through a 5-percent deflection (or deformation) of the pipe section being tested. The Engineer/City Representative may waive this requirement on short footage projects. Requirements for making such tests are provided as follows:

- Deflection testing shall not be conducted until backfill in the trench has been in place for at least 30 days.
- The test shall be performed by moving the mandrel through the test section without the aid of a mechanical pulling device.
- The mandrel shall be fitted with an odd number of fins or legs (at least nine) which are not worn sufficiently to affect the mandrel's diameter. The fins shall be sized to fit the specific type and size of pipe being tested and shall be stamped by the manufacturer to identify the type and size of pipe. When requested, the Contractor shall provide proof rings to check the mandrel's diameter. The length of the contact edge of the fins shall be at least equal to the pipe's nominal diameter.

- Acceptance of the test section of pipe will be given when the mandrel can pass through that section without stoppage. If stoppage occurs, the pipe shall be excavated and exposed for examination to determine if damage to the pipe has taken place. When pipe damage has occurred, the damaged section shall be removed and replaced by the Contractor. If an obstruction has been caused by deflection, but the pipe is undamaged, the Contractor shall replace the bedding as necessary and carefully re-compact the bedding and backfill. When such corrective measures are completed, the mandrel shall be passed through the test section again to assure compliance.

3.8 CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION (Only accepted method).

Provide digital copy of line inspection.

3.8.1 QUALIFICATIONS

CCTV sewer line inspection to be performed by firms which are suitably equipped, experienced, qualified, and staffed for sewer line CCTV inspection. Firms shall be approved and accepted by the City. CCTV shall not be conducted until backfill in the trench has been in place for at least 30 days.

3.8.2 PROCEDURE

CCTV inspection shall be conducted after backfill and prior to surface repair. Equipment shall be calibrated for the various water depths and pipe sizes encountered during the inspection. A calibration tape shall be onsite during the calibration process. A measuring staff gage shall be attached to the end of the camera and visible on the video.

3.8.3 NOTIFICATION

The contractor shall notify the City at least 48 hours in advance of conducting the CCTV inspection to allow the City, at the City's discretion, to witness.

3.8.4 LINE CLEANING

All lines shall be cleaned according to these specifications prior to CCTV inspection.

3.8.5 WATER/DYE

Red dye mixture shall be added immediately prior to CCTV inspection. Sufficient dye shall be introduced into the upstream manhole to produce a visible flow in the downstream manhole(s). Once the flow has been noted in the downstream manhole, it shall be stopped.

3.8.6 EQUIPMENT

CCTV sewer line inspection equipment to include a digital color camera system, camera propulsion equipment, measuring device mounted in front of camera, and van to allow witness of CCTV by inspector.

3.8.7 VIDEO

The digital video shall include the following video and audio information:

1. Video:
 - Project Number and Name

- Date of TV inspection
 - Upstream and downstream manhole numbers
 - Current distance along line segment
2. Audio:
- Date of TV inspection
 - Verbal confirmation of upstream and downstream manhole numbers and/or locations
 - Verbal description of pipe, size, type, and pipe joint length
 - Verbal description of location of each service connection
3. Tape identification tag:
- Manhole to manhole designation

3.8.8 SUBMITTAL

Contractors shall submit tapes and logs to the City for their review within one (1) week after taping. Tapes submitted to the City shall be the property of the City.

3.8.9 ACCEPTANCE CRITERIA:

- No visible standing water in pipeline caused by grade defects greater than ¼ inch.
- No pipeline structural defects observed.
- No pipeline installation defects observed.
- No infiltration observed.

3.8.10 DEFECTIVE PIPE

The contractor shall uncover and remove defective pipe sections, re-work bedding material and install new pipe. The re-constructed sections shall again be CCTV inspected to ensure grade; inspection tapes shall be re-submitted to the City for their review. All materials, labor, and associated costs with removal and replacement of defective pipe shall be borne by the Contractor.

3.8.11 TESTING DOCUMENTATION

The Contractor shall maintain a record of the procedures performed and the test results for all tests performed on pipelines installed. Information contained on the record shall include the following:

- Identification of Contract.
- Contractor's name and name of testing entity, if performed by other than Contractor.
- Name of Test Supervisor.
- Date of test.
- Type of test (air pressure, infiltration, deflection, CCTV, etc.).
- Identification of test section which includes location, size, and type of pipe.
- Test results (pass/fail, amount of leakage, etc.).
- Description of failure, if any, including reason for failure and corrective measures taken.
- Signature of Test Supervisor.
- Approval signature of City or City's representative witnessing the tests.

Photocopies of the test documentation shall be provided in report format to the City within one (1) week after the tests are performed. Pipelines will not be accepted for service until after all the testing documentation has been submitted and approved by the Tetonia Public Works Department.

3.9 PIPELINE LOCATION IDENTIFIERS

The Contractor shall furnish and install all pipeline location identifiers as called for on the Plans.

3.10 CLEANUP

Following acceptance of testing and completion of backfilling and surface restoration, the Contractor shall prepare the work for contract closeout.

All new sewer lines shall be jetted and cleaned prior to acceptance from the City.

END OF SECTION 501.

DIVISION 600

PIPING AND STORM

DRAINS

SECTION 601. PIPE AND PIPING SYSTEMS

1. DESCRIPTION

This Section is a materials specification and is included for guidance in selecting materials for pipe and related fittings and appurtenances used in the construction of water, sewer, and drainage systems.

1.1 RELATED WORK

Section 401 - Waterline Pipe Installation

Section 402 - Waterline Valves and Hydrants

Section 403 - Water System Control Valves

Section 501 - Sewer Line Pipe and Manhole Installation

2. MATERIALS

2.1 NSF COMPLIANCE

All pipe and materials furnished and installed for culinary use shall comply with National Sanitary Foundation (NSF) Standard 61. Also, all plastic pipe must be approved by the NSF for potable water use and shall carry the factory "NSF" stamped label on the pipe indicating such approval.

The original manufacturer's pipes and materials must be used in making repairs to water and sewer systems in order to prevent voiding warranties on all products.

2.2 DUCTILE IRON PIPE

2.2.1 INTERIOR COATING

The interior surface of all DI pipe shall be coated with a standard coating of cement-mortar in accordance with ANSI/AWWA Standard C-104 unless required otherwise in the Contract Documents. Field coating of DI pipe will not be acceptable.

2.2.2 BURIED PIPE

Shall be as follows:

- The buried ductile iron pipe shall be Thickness Class 51.
- Shall meet requirements of ANSI/AWWA C-151.
- Joints shall be bell and spigot or mechanical, which meet the requirements of ANSI/AWWA C-111.

2.2.3 EXPOSED PIPE

Shall meet these requirements, unless shown otherwise on the Drawings:

- Exposed ductile iron pipe shall be Thickness Class 53.
- Pipe shall comply with ANSI/AWWA Standard C-151.
- Pipe joints shall be flanged, meeting the requirements of ANSI/AWWA C-115, or mechanical

type couplings (MTC), meeting the requirements of ANSI/AWWA C-606. MTC shall be Victaulic grooved couplings, as manufactured by Victaulic Company of America or approved equal), unless shown otherwise on the drawings.

- 3-inch to 12-inch compact flanged fittings shall be ductile iron and shall be produced in accordance with laying lengths specified in ANSI/AWWA C10/A21.10. Flange surface shall be faced and drilled in accordance with ANSI Class 125 B16.1. Nominal body thickness shall be Manufacturer's Standard but shall not be less than those specified in ANSI/AWWA C153/A21.53 "Standards for Ductile Iron Compact Fittings". Flange thickness shall be in accordance with the Manufacturer's Standards. The working pressure rating shall be 250 psi for water. Fittings shall be made in the United States of America and shall not have been refurbished or reworked by anyone other than the manufacturer. When greater than 250 psi is called for on the plans, then the Supplier shall furnish higher class rated flanges. Standard Class 125 template for drilling shall be used for all flanges. Drilling templates shall be in multiples of four, so that fittings may be made to face in any quarter. Bolt holes shall straddle the centerline and shall be equally spaced. Misalignment of bolt holes of two opposing flanges shall not exceed 0.12 inches. Blind flanges 12 inches and over shall be provided with lifting eyes. Insulated flanges shall be provided where required.
- Gaskets shall be full faced, 1/16-inch-thick compressed sheets of Aramid fiber base, with nitrile binder and non-stick coating, suitable for temperatures to 700°, pressures to 1000 psig and a pH range of 1 to 11. Blind flange gaskets shall cover the entire inside face of the flange and shall be cemented in place. Gaskets shall be manufactured by John Crane, style 2160; Garlock, style 3000; or approved equal.

2.3 GALVANIZED IRON PIPE AND FITTINGS

Shall be of the schedule rating shown on the Drawings and shall be used only in exposed, non-corrosive atmospheres where piping diameters are less than 4 inches.

2.4 HIGH DENSITY POLYETHYLENE (HDPE)

HDPE pipe shall meet the typical PE 4710 piping physical properties with a minimum cell classification of PE 445474 C or higher.

2.4.1 HIGH DENSITY POLYETHYLENE (HDPE) FITTINGS

HDPE fittings shall meet the AWWA C906 Section 2.3 Fusion Fitting Requirements.

2.5 PIPE AND FITTINGS FOR WATER SERVICE LINES

Shall meet the requirements provided in Section 404 for water service connections.

2.6 PIPE FOR GRAVITY SEWER SYSTEMS

Gravity sewer pipelines may be constructed with PVC or polyethylene (PE) plastic sewer pipe and fittings. Such materials shall be of the type, configuration and size shown on the Drawings and/or on the Bid Schedule.

2.6.1 PVC PIPE

All PVC sewer pipe and fittings shall meet the standards of ASTM D3034 and F679. Such pipe shall be manufactured with a rubber gasketed joining system which meets ASTM.

D3212 and shall be furnished with a standard dimensional ratio of 35 (SDR 35) for wall thickness, unless shown otherwise on the Drawings.

2.6.2 PE PIPE

All PE sewer pipe and shall be smooth, solid wall, high density polyethylene pipe manufactured from PE3408/PE3608 material conforming to ASTM D3350, Type III, Class C, Category 5, Grade P34 per ASTM D1238 Fittings for this pipe shall be molded from a polyethylene compound equal to or exceeding the properties of the pipe being supplied.

2.6.3 PROFILE WALL PVC

Profile wall PVC pipe may be used for sizes 8-inch through 36-inch diameter unless otherwise shown on the plans or specified. The profile wall pipe shall be seamless and meet the requirements of ASTM F949. The Profile wall pipe stiffness shall be a minimum of 115 psi for 8-inch & 10-inch, and 46 psi for 12-inch – 36-inch, when tested at 5% deflection in accordance with ASTM D2412. The pipe shall be made of PVC compound having a minimum cell classification of 12454 as defined in ASTM Specification D1784. Joints shall be bell and spigot type with flexible elastomeric seals conforming to ASTM D3212. All profile wall pipe gaskets shall be one piece having two sealing surfaces indexing two valleys to ensure water tightness and meet the requirements of ASTM F477.

2.7 PIPE FOR PRESSURE SEWER SYSTEMS

Pressure sewer pipelines shall be constructed with DI, PVC, or PE plastic sewer pipe. Fittings and materials shall be of the type, SDR rating, (or pressure class) and size shown on the Drawings and/or on the Bid Schedule.

2.7.1 PVC PIPE

All PVC pipe for pressure sewer lines shall be rigid, pressure rated, and thermoplastic pipe which meets the standards of ASTM D2241. Fittings for PVC pipelines shall be Class 50, cement mortar lined, rubber gasketed, DI which meet the requirements of ANSI/AWWA C153 and C104.

2.7.2 PE PIPE

PE pipe for pressure sewer lines shall be smooth, solid wall, high density polyethylene pipe manufactured from PE3408/PE3608 material conforming to ASTM D1248, Type III, Class C, Category 5, Grade. Fittings for this pipe shall be molded from a polyethylene compound equal to or exceeding the properties of the pipe being supplied.

2.8 PIPE AND FITTINGS FOR IRRIGATION SYSTEMS

Irrigation pipe shall be either DI or Pressure Rated PVC, of the type and class shown on the Drawings, for lines diameters 4-inches and greater. Buried lines smaller than 4 inches in diameter shall be Schedule Rated PVC as shown on the Drawings.

2.9 PIPE FOR DRAIN SYSTEMS

Piping for sub-drainage may be constructed with polyvinyl chloride (PVC) or polyethylene (PE) plastic non-pressure drainage or sewer pipe and fittings. Such materials shall be of the type, configuration and size shown on the Drawings and/or on the Bid Schedule.

2.9.1 PVC PIPE

All PVC drainage pipe and fittings shall meet the standards of ASTM F794. Such pipe shall be manufactured with a rubber gasketed joining system which meets ASTM D3212 and may be furnished with ribbed, corrugated or smooth exterior walls with smooth interior wall surfaces, unless shown otherwise on the Drawings. Rubber gasketed joints will not be required for collection pipe applications with perforated or slotted pipe sections.

2.9.2 PE PIPE

All PE drainage pipe shall be solid, corrugated or ribbed wall high-density polyethylene pipe with smooth interior wall surfaces. Material shall conform to ASTM D3350, Type III, Class C, Category 5, Grade P34. Fittings for this pipe shall be molded from a polyethylene compound and with equivalent properties and configurations specifically designed to fit the pipe being supplied.

2.10 MISCELLANEOUS FITTINGS AND MATERIALS

2.10.1 PIPE SUPPORTS

Floor mounted pipe supports for suspended; exposed piping systems shall be adjustable stanchion type supports designed to cradle the pipe diameter by 170 degrees. The support shall fit ductile iron or steel diameters snugly, without excessive gaps between the support and the pipe. Support saddle width shall be a minimum of 2 inches wide. The support must offer a minimum of 3 inches of final adjustment, after installation. Supports shall be supplied with independent base and adjustment collar designed to accept standard sized Schedule 40 galvanized steel pipe for coarse adjustment. Supports shall be fabricated from A36 mild steel and shall have an electro-galvanized finish. Floor mounted pipe supports shall be the Standon Model S92 or C92 as manufactured by Material Resources, Inc., 22700 N. W. Quatama Street, Hillsboro Oregon 97124, or approved equal. The standard required model shall be the S92.

2.10.2 "Y" STRAINERS

Y Strainers shall be constructed of high-tensile ASTM A126 Class B Cast Iron with blow-off connections and self-aligning cylindrical screens and shall be equal to Watts Regulator Series 77F or better quality.

2.10.3 FASTENERS

Fastener requirements are as follows:

- Unless otherwise required in these Specifications, all bolting hardware for buried pipe, fittings, valves, and components shall be of manufacturer's standard materials.
- Unless otherwise required in these Specifications, all bolting materials for exposed pipe, fittings, valves, and components shall be Type 316 stainless steel. Where space restrictions preclude the use of regular bolts, stainless steel threaded studs may be used on all valve flange connections.
- In all instances where stainless steel threaded fasteners are used, a coating of an approved, permanent anti-seize compound shall be applied to the fastener to prevent galling and to assist in disassembly.
- All bolts and/or studs shall extend through the nuts at least 1/4 inch.

2.10.4 COUPLINGS

Couplings shall meet the following requirements:

- Couplings shall meet the requirements of ANSI/AWWA C219. All flexible couplings shall meet the minimum requirements of Smith Blair 400 series.
- Sleeves shall have a smooth inside taper and there shall be no surface irregularities on any sealing surface. Gaskets shall be suitable for the project application.
- Flexible couplings for buried DI and PVC pipe sizes 2 through 16 inches in diameter shall be fabricated of stainless steel or ductile iron. For pipe sizes larger than 16 inches, flexible couplings shall be of steel. Coupling components for use in potable water systems shall be factory coated with an FDA approved, bonded epoxy coating, applied to an average 12 mil thickness.
- Flexible couplings for exposed pipe shall be manufactured of steel, unless shown otherwise on the Drawings, or approved by the Engineer/City Representative. Coupling components for use in potable water systems shall be factory coated with an FDA approved, fusion-bonded epoxy coating, applied to an average 12 mil thickness.

2.10.5 RESTRAINT HARNESS

Where required, restraint harness for bell and spigot pipe joints shall be manufactured by EBAA Iron Co. or an approved equal. The restraint shall consist of a split bell ring to go behind the bell and a split, serrated ring to grip the pipe on the other side of the joint. The harness shall be held together with clamping bolts and tie bolts. The rings shall be fabricated of grade 60-42-10 DI conforming to ASTM A536. Clamping bolts shall be grade 5 galvanized machine bolts. Tie bolts are of low alloy steel. The harness shall have a minimum working pressure of 150 psi. Harness size shall meet the respective application.

2.10.6 VALVES AND FITTINGS

Shall be as specified in their respective Sections in these Specifications.

2.10.7 BOXES AND ENCLOSURES

Shall be of the size, type, and configuration indicated on the Drawings and Contract Documents.

3. CONSTRUCTION REQUIREMENTS

Underground utilities that cross irrigation ditches must be marked with permanent fiberglass marking posts located 15-ft each side of the ditch measured from the center of the ditch. Posts should be colored blue for water lines and green for sewer lines.

See Sections 401 and 501 for construction requirements for applicable piping systems.

END OF SECTION 601.

DIVISION 700

CONCRETE

SECTION 701. PORTLAND CEMENT CONCRETE

1. DESCRIPTION

This Section contains requirements for Portland cement concrete materials and concrete mix designs.

1.1 RELATED MATERIALS AND WORK

Section 702 - Concrete Forming, Finishing and Curing

Section 703 - Concrete Reinforcement

1.2 SUBMITTALS

1.2.1 PROPOSED MIX DESIGN

Each proposed mix design shall be submitted 14 days prior to its use in the Work. Indicate whether mix has been designed for pumping. Mix design submittals shall include the following information:

- Water-cement ratio.
- Proportion of materials in the mix.
- Source and type of cement.
- Analysis of water to be used, unless potable.
- Type and name of admixtures applied. Indicate when accelerating or retarding admixtures are to be used and the resulting change in placement times.
- Slump, air content, and temperature of samples.
- Unit weights of fresh and dry light weight concrete.
- Any applicable and verifiable test documentation available if the submitted mix design has been used by the Contractor in prior projects.

1.2.2 AGGREGATE TEST REPORT

Aggregate Test Report (submit for each aggregate source):

- Data of test analysis.
- Sieve analysis.
- Organic impurities.
- Sodium sulfate soundness test.
- Reactivity of aggregate.
- Complete identification of source of aggregate.

1.2.3 CHANGES IN MIX DESIGN

After the design of the mix or mixes has been approved by the Engineer/City Representative, neither the source, character, or grading of the aggregate, nor the brand or type of cement shall be changed, without 48 hours written notice to the Engineer/City Representative. Should such changes become necessary, no concrete containing such new or altered materials shall be placed until the revised mix design has been submitted to the Engineer/City Representative for review and approval.

1.3 DEFINITIONS

Workability - The ease of placing, consolidating and finishing freshly mixed concrete.

Consolidation - Hand rodding or mechanically vibrating actions which give freshly mixed concrete the characteristics of a thick fluid so as to minimize voids when set.

Hydration - The chemical reaction between water and calcined limestone resulting in the excellent bonding properties of the cement particles with one another and with the aggregates in the mix.

Curing - Synonymous with the hydration reaction. May be enhanced by procedures which assure the retention of sufficient moisture to allow the reaction to go as far to completion as possible.

Strength - The maximum resistance of a mortar or concrete specimen to axial compressive loading expressed in psi.

Admixtures - Chemical additives to concrete mixes intended to adjust setting time, reduce water demands, increase workability and entrain air.

Air Entrainment - Introduction of chemicals to concrete mixtures which produce microscopic air bubbles which improve the workability and ability to resist deterioration due to freezing.

Reinforcement - Materials formed or mixed in concrete mixtures, to increase the ability of the concrete to withstand loading when set (hardened).

Water-Cement Ratio - The weight of the water divided by the weight of the cement in a concrete mixture.

Tempering - The addition of water to mixed concrete after arrival on site.

2. MATERIALS

2.1 CEMENT

2.1.1 *SITE-PLACED CONCRETE*

For site-placed concrete, cement shall be Type II (low alkali) cement, meeting requirements of ASTM C-150, unless otherwise directed by the Engineer/City Representative or these Specifications. Do not use cement containing lumps, or cement which has partially set. Do not mix cement originating from different sources or manufacturers.

2.1.2 *PRE-CAST CONCRETE*

For pre-cast concrete, concrete shall be Class 5000 (minimum) in accordance with ACI 318 for units to be installed above ground. For units installed below ground, concrete shall be Class 4000 in accordance with ASTM C 478 and ASTM C 858.

2.2 WATER

Shall be potable or water which meets the requirements of AASHTO T-26.

2.3 REINFORCEMENT

Shall be in accordance with Section 703 of these Specifications.

2.4 ADMIXTURES

2.4.1 AIR ENTRAINMENT

Air entrainment of concrete shall meet the requirements of AASHTO M-154 (ASTM C-260).

2.4.2 PLASTICIZERS

Water reducing agents (plasticizers) and set retarding agents shall meet the requirements of AASHTO M-194 (ASTM C-494). Only types A or F will be approved as water reducing agents and only types D or G will be approved as set retarding agents. Water reducing agents and set retarding agents shall be pre-measured and added in strict accordance with manufacturer's instructions. Calcium chloride will not be approved.

2.4.3 FLY ASH

Pozzolan (fly ash) may be used to replace a percentage of cement in the mix design in accordance with ASTM C-618, under the following conditions:

- The minimum required cement content shall be expressed in the design formula before replacement calculations are made.
- The amount of Portland cement replaced by pozzolan shall not exceed 15% for exterior concrete (concrete exposed to weather) and 20% for interior concrete.
- The ratio of replacement by weight of pozzolan to cement shall be 1.25 to 1.0.
- Loss of ignition of pozzolan shall be less than 3 percent, and the water requirement shall not exceed 100 percent.
- All other requirements of this Section still apply.
- Mix designs including trial batches are required for each aggregate source and for each concrete class.
- See also Subsection 2.6.4 below.

2.5 AGGREGATE

2.5.1 AGGREGATE RATIO

The combined weight of coarse and fine aggregate material passing the No. 200 sieve shall not exceed 1.75 percent of the total weight of aggregate. The ratio of coarse to fine aggregate shall not be less than one (1) nor more than two (2), nor shall the amount of coarse aggregate be great enough to cause difficulty in concrete placement or honeycombing in the structure.

2.5.2 COARSE AGGREGATE

Coarse aggregate shall comply with AASHTO M-80, using gradations from the following table:

Table 14. COARSE AGGREGATE GRADATIONS

Aggregate Size	Percent Passing (by weight)							
	Sieve Size							
	2½-inch	2-inch	1½-inch	1-inch	¾-inch	½-inch	3/8-inch	No. 4
2-inch to No. 4	100	95-100		35-70		10-30		0-5
1½-inch to No. 4		100	95-100		35-70		10-30	0-5
1-inch to No. 4			100	95-100		25-60		0-10
¾-inch to No. 4				100	90-100		20-55	0-10

Maximum coarse aggregate gradation shall not be larger than 1/5 of the narrowest dimension between sides of forms; shall not be larger than 1/3 the depth of slabs; shall not be larger than 3/4 of the minimum clear distance between reinforcing bars or between bars and forms, whichever is less; and shall not be larger than 2 inches.

The maximum percentage by weight of deleterious substances allowed in coarse aggregate materials shall be:

Table 15. DELETERIOUS SUBSTANCES ALLOWED IN COARSE AGGREGATE

Substance	Percent
Soft fragments	2.0
Coal and lignite	0.3
Clay lumps	0.3
Other deleterious substances	2.0

2.5.3 FINE AGGREGATE

Fine aggregate shall comply with AASHTO M-6 using gradations from the following table:

Table 16. FINE AGGREGATE GRADATIONS

Sieve Size	Percent Passing (by weight)
3/8-inch	100
No. 4	95 to 100
No. 16	45 to 80
No. 50	10 to 30
No. 100	2 to 10

The maximum percentage by weight of deleterious substances allowed in fine aggregate shall be:

Table 17. DELETERIOUS SUBSTANCES ALLOWED IN FINE AGGREGATE

Substance	Percent
Coal and lignite	0.3
Clay lumps	0.5
Other deleterious substances	2.0

2.5.4 AGGREGATE SOUNDNESS AND REACTIVITY

As determined in accordance with ASTM C-88, potentially deleterious aggregates shall not be used unless service records have shown the aggregates to be innocuous, and the Engineer/City Representative subsequently approves them in writing.

2.6 MIXING REQUIREMENTS

2.6.1 CONCRETE CLASSIFICATIONS

Mixing requirements for the specific concrete classes indicated on the Drawings and/or within these Specifications shall be as follows:

Table 18. CONCRETE CLASSIFICATIONS

Concrete Properties	Concrete Classifications	
	5000	3500
Coarse Aggregates (see requirements shown below)		
Maximum Water/Cement Ratio (gal/sack)	5.0	6.5
Minimum Cement Content (sacks/CY)	***	6.0
Slump (inches)**	2 to 4	2 to 4
Air Content (percent + or - 1%)	4.0 to 6.0	4.0 to 6.0
Required Average 28 Day Compression Strength Test (psi)****	5000	3500
Required Minimum 28 Day Compression Strength Test (psi)****	4800	3300

Notes:

* All concrete installed shall be Class 3500 unless otherwise required in the Contract Documents.

** When water reducing agents are not used.

*** Cement content shall be appropriate to produce a mixture meeting the requirements for water/cement ratio and workability for the specific job conditions.

**** One compressive strength test shall consist of the average strength of two cylinders in the test sample.

2.6.2 REQUIRED AVERAGE DAY COMPRESSIVE STRENGTH

The Contractor shall furnish and install concrete that will produce a Required Average (28) Day Compressive Strength as shown on the table above. The average of any three consecutive (28) day strength tests shall not fall below the required Minimum (28) Day Compressive Strength Test shown. If the average of any three consecutive tests falls below the Required Minimum, the average strength of the concrete shall be increased at the contractor's expense by increasing the cement content.

2.6.3 WATER REDUCING AGENTS

When water reducing agents (plasticizers) are used in the concrete mixtures shown above, maximum slump requirements may be increased to 5 inches with low range water reducers and to 8 inches with high-range water reducers.

2.6.4 FLY ASH

When fly ash is used in the mix, the cement in the water/cement ratio denotes the cement and fly ash combined. Cement shall be introduced into the batcher before the fly ash.

2.6.5 CONCRETE PLACED IN WATER

For concrete deposited in water, add one additional bag of cement per cubic yard more than the design requires for concrete placed above water.

3. CONSTRUCTION REQUIREMENTS

3.1 STORING CEMENT

Bagged and bulk cement shall be stored in weatherproof enclosures to exclude moisture and contaminants.

3.2 STOCKPILING AND HANDLING AGGREGATE

3.2.1 *CLEAN SITE*

The site provided for stockpiling aggregates shall be clean with adequate space to provide separate stockpiles for coarse and fine aggregates.

3.2.2 *WASHING AGGREGATE*

Washed aggregates shall be allowed to drain to a uniform moisture content, and stockpiles shall be built at least 48 hours before use.

3.2.3 *HEIGHT*

Aggregate shall not be dropped more than 10 feet from the conveyor, nor shall cone shaped piles more than 10 feet high be built.

3.2.4 *STOCKPILE LAYERING*

Stockpiles shall be built in thin layers (5 feet maximum) in such manner, to prevent spillage of aggregate over the sides of the stockpile.

3.2.5 *FROZEN MATERIALS*

Stockpiles containing snow, ice, or frozen materials shall not be used.

3.3 BATCHING MATERIALS

3.3.1 *SCALES*

The Contractor shall provide scales or arrange for the usage of scales that have been certified by State agencies within the past 12 months.

3.3.2 *BATCH MIXERS*

Batch mixers shall be operated at the manufacturer's recommended drum speed. Drums and blades shall be kept free from excessive cement and mortar build up. Cement shall be introduced into the batcher before fly ash, and all admixtures shall be introduced to the mixer separately.

3.3.3 *CENTRAL MIXING PLANT*

At central mix plants, all materials shall be mixed for at least 80 seconds at recommended drum speed. When more water is added to the cement mixture, the materials shall be mixed for an additional 30 seconds.

3.3.4 MIXING PERIOD

The mixing period for truck mixers shall be maintained between 70 and 100 revolutions at mixing speed. Maintain a minimum of 90 revolutions for front end discharge trucks. Concrete mixing shall be completed before the truck leaves the batch plant yard.

3.3.5 WATER REDUCING AGENTS

If water reducing agents are added at the site, they shall be added using injection equipment capable of rapidly and uniformly distributing the admixture. Prior to discharge, the concrete shall be mixed for a minimum of 5 minutes at a drum rate not less than 12 rpm or more than 15 rpm discharge.

3.4 HEATING AGGREGATE AND WATER

3.4.1 HEATING EQUIPMENT

When approved by the Engineer/City Representative, the Contractor, at its own expense, may provide and operate heating equipment to heat aggregate and water because of cold weather conditions. All heating operations shall meet temperature limitations provided in these Specifications and shall conform to Standard ACI 306. The Contractor shall ensure that excessive heat does not cause "flash set" when the cement is added.

3.4.2 UNIFORM HEATING

Aggregates shall be heated uniformly with steam or dry heat. Water shall be heated to between 70°F and 150°F when introduced into the mixer. Measures shall be taken to prevent overheating and hot spot development. No combustion products (ash, smoke, gas and etc.) shall contact the aggregate.

3.5 COOLING CONCRETE MIXTURE

3.5.1 COOLING EQUIPMENT

When approved by the Engineer/City Representative, the Contractor, at its own expense, may provide and operate equipment to refrigerate water, provide ice or cool aggregate, to mix concrete due to hot weather conditions. All methods of cooling shall meet the requirements of ACI 305.

3.5.2 USE OF ICE

When ice is introduced into the mixer, it shall be in such form as to be completely melted and dispersed throughout the mix at the completion of the mixing time. The mixing time shall be held to the minimum practicable, consistent with producing concrete meeting the specified requirements.

3.6 CONCRETE TRANSPORT

3.6.1 TRUCKS

Concrete mixtures shall be transported only in conventional transit mixers or agitator trucks with rating plates that are readable. Trucks shall be equipped with visible water meters and revolution counters and shall be capable of measuring all water introduced into the mixing drum.

3.6.2 *LOADING*

Trucks shall not be loaded:

- In excess of their rated mixing capacity, or
- In excess of 63 percent of the drum gross volume, or
- In quantities less than 2 cubic yards

3.7 CONCRETE TEMPERING

3.7.1 *ADDING WATER*

Concrete may be tempered through the addition of water under the following conditions:

- Water shall be added within specified time limits.
- Wherever possible, water shall be added after the truck leaves the batch plant.
- Water shall not be added in excess of the water/cement ratio or in excess of that specified on the batch tickets.
- The mixing drum shall be rotated at least 30 revolutions at the manufacturer's recommended mixing speed when water is added, OR addition of water for tempering shall be followed by 3 minutes of mixing at mixing speed prior to discharge.
- Water shall not be added after 1/2 cubic yard or more of concrete has been discharged from the drum.

3.7.2 *LOW SLUMP*

When concrete arrives at the site with a slump below specification, the Contractor may temper the mix up to the maximum approved water/cement ratio, provided:

- The mix design allows for on-site water addition.
- The amount of water added is accurately measured to the nearest gallon.
- The maximum slump is not exceeded; and
- The person adding water is approved to do so by the Engineer/City Representative and the concrete supplier.

3.7.3 *TEMPERING WITH PLASTICIZER*

Do not deliver concrete containing plasticizer to the site unless the batch delivery ticket displays water/cement ratio prior to plasticizer addition. Tempering with plasticizer after delivery time window expiration shall not be allowed.

3.8 CONCRETE SAMPLING AND TESTING

3.8.1 *PROCEDURE*

Tests for slump, air entrainment, and temperature by an independent certified testing facility shall be provided by the Contractor. Independent test facility can be changed by Engineer/City Representative at any time. Sampling and testing will be performed at the expense of the Contractor and as directed by the Engineer/City Representative.

3.8.2 SAMPLING FREQUENCY

Concrete sampling frequency shall be as noted below:

- A minimum of one air test (ASTM C-231) and one slump test (ASTM C 143) shall be performed for each placement over 5 cubic yards. At least one air and one slump test shall be performed for each additional load of concrete placed.
- For each test, the concrete temperature and the time shall be verified and recorded. Air and slump test results shall be recorded on batch delivery tickets.
- If an air test fails, immediately retest the same load. The concrete shall be rejected if the second air test fails to meet specified requirements. If the second air test meets specified requirements, a third test will be performed to establish concrete acceptance or rejection.
- If the slump for an individual load cannot be corrected by tempering within the mix design requirements and within the requirements of these Specifications, the load shall be rejected.
- The testing facility shall prepare test cylinders for strength testing in accordance with ASTM C-31 & ASTM C-39.
- At least one strength test shall be performed for each placement over 5 cu. yd., and one additional test for every 50 cu. yards of concrete placed or more frequently at the Engineer/City Representative's discretion. Three cylinders shall be prepared for each test. One cylinder from each test may be set aside at the Contractor's request for strength verification prior to form removal. The average compressive strength of two cylinders constitutes one compressive strength test.
- The Contractor shall provide space in the work area and protect sample cylinders from disturbance for 24 hours after they are cast or until they are moved from the work area by testing laboratory personnel or under the direction of the Engineer/City Representative.
- The average compressive strength shall meet the requirements shown in Table 18. CONCRETE CLASSIFICATIONS.

END OF SECTION 701.

SECTION 702. CONCRETE FORMING, FINISHING, AND CURING

1. DESCRIPTION

This Section covers materials, accessories and labor required to form, finish and cure interior and exterior cast-in-place concrete.

1.1 RELATED WORK

Section 701 - Portland Cement Concrete

Section 703 - Concrete Reinforcement

1.2 SUBMITTALS

1.2.1 SHOP DRAWINGS

When called for in these Specifications, the Contractor shall furnish shop drawings for precast concrete structures. Such drawings shall show dimensions of the structure and general construction of forms, jointing, location of ties and other items affecting visibility.

1.2.2 FORM RELEASE AGENT

Where concrete surfaces are scheduled to receive special finishes or applied coverings, which may be affected by the form release agent, submit manufacturer's instruction for use of agent.

1.2.3 CHEMICAL HARDENER

Submit name, type, chemical analysis and manufacturer's recommended rate of application for chemical hardener, when specified.

1.2.4 CURING COMPOUNDS

Submit manufacturer's specifications, test information, ingredients, certification, and installation recommendations for curing compounds. This information may become the basis of acceptance or rejection of the work cured by the material used.

215.1.3 DEFINITIONS

Shoring - The framework installed to support formwork.

Re-Shoring - Framework installed or not removed which serves as support for formwork after concrete sets and there is less need for the support.

Form Coatings - Compound coated on forms, preventing concrete surface bonding to the forms.

Curing Compound - Liquid medium sprayed or coated on concrete to retain moisture.

2. MATERIALS

2.1 FORM TIES AND SPREADERS

Shall be removable or snap-off metal, designed to prevent form deflection and to prevent spalling concrete surfaces upon removal. Form ties shall be factory fabricated. Field fabricated ties will not be acceptable. The portion of the tie remaining within concrete after removal of exterior parts should be 1 inch below the outer concrete surface, and the remaining hole in the concrete surface shall not be larger than 1 inch diameter, unless approved otherwise by the Engineer/City Representative.

2.2 JOINT FILLER

Shall be furnished and installed.

2.3 FORM RELEASE AGENTS

Commercial formulation form release agent compounds shall be used. Form release agents shall not bond with, stain or adversely affect concrete surfaces requiring later bond or adhesion. They shall not impede the wetting of surfaces to be cured with water or curing compounds. Surplus oil on forms and form oil on reinforcing steel and construction joints shall be removed before concrete is placed.

2.4 FILLETS FOR CHAMFERED CORNERS

Shall be wood strips 3/4 inch by 3/4-inch size and of maximum possible length.

2.5 MORTAR AND GROUT

Shall be furnished in accordance with ASTM C1107.

2.6 LIQUID CHEMICAL HARDENER

Shall be a colorless aqueous solution, containing a blend of magnesium fluosilicate, zinc fluosilicate and a wetting agent. The mixture shall contain not less than 2 pounds fluosilicate per gallon and shall not interfere with adhesives and the bonding of finishes where such is indicated.

2.7 WATER

Water for curing shall meet the requirements of Section 701 herein.

2.8 MOISTURE RETAINING SHEETING

Shall be white, waterproof paper, polyethylene film or burlap-polyethylene sheet which meets the requirements of ASTM C-171.

2.9 MOISTURE ABSORPTIVE COVER MAT

Shall be clean cotton or burlap fabric roll goods.

2.10 CURING COMPOUND

Shall be a clear type with fugitive dye conforming to ASTM C-309, Type I, unless otherwise approved by the Engineer/City Representative.

3. CONSTRUCTION REQUIREMENTS

3.1 SITE CONDITIONS

The Contractor shall examine the condition of the area on which forms are to be installed and conditions under which the work of this Section is to be performed and shall correct unsatisfactory conditions which would prevent proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 DESIGN OF FORM-WORK

3.2.1 *LOADING*

Formwork shall be designed to safely support all vertical and lateral loads that may be induced by wet concrete both during the placement and afterward, until such loads can be supported by the structure itself as the concrete sets and begins to cure. Forms and falsework shall be designed to include assumed values of live load, dead load, weight of moving equipment to be operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperatures, foundation pressures, stresses, lateral stability and other factors pertinent to the safety of the structure during construction.

In form-work design, provide for all openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screed, bulkheads, anchorage, inserts and other features as required on the Drawings.

3.2.2 *TOLERANCES*

Form-work design shall call out material and components of sufficient strength, thickness, number of ties, amount of bracing, etc., to withstand the pressure of newly placed concrete without bow or deflection.

3.3 FORM-WORK CONSTRUCTION

3.3.1 *COMPLIANCE*

Formwork shall be constructed in compliance with ACI 347, to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grade, and level and plumb work in finished structures.

3.3.2 *MATERIALS*

Formwork shall be constructed from steel, steel reinforced panels, smooth grade plywood, or other materials which may be approved by the Engineer/City Representative or shown on the Contract Documents for special purposes. Plywood material with raised grain, patches, or other defects that will mar the finished surface of the concrete surface shall not be used.

3.3.3 *ERECTION*

Form facing materials shall be erected, supported, braced and maintained by structural members spaced to prevent deflection. Formwork shall be tight, to prevent leakage of cement paste during concrete placement. Joints shall be solidly butted together and backed up as required to prevent leakage and fins. Forms placed in successive units for continuous surfaces shall be fitted to provide accurate alignment, free from irregularities, and within allowable tolerances. Use selected materials to obtain required

finishes.

Provide for all openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screed, bulkheads, anchorage, inserts and other features required. Accurately place and securely support items to be built into forms. Provide formed openings for elements to be embedded in or pass through the concrete. Install accessories in accordance with manufacturer's instructions and ensure items are not disturbed during concrete placement. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finished slab surface. Provide and secure units to support types of screeds required.

Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Bevel wood inserts for forming keyways, reglets, recesses and the like, to prevent swelling and assure ease of removal.

Formwork shall accommodate the work of all other trades where materials and products must be purchased and fabricated before the opportunity exists to verify the measurements of the adjacent construction affecting their installations. Verify size and location of all openings, recesses and chases with the trade requiring such items, and ensure that forms for openings and construction which accommodate installation by other trades, be accurately sized and located as dimensioned on the Drawings.

3.3.4 FORM RELEASE AGENT

Coat form/concrete contact surfaces with form coating compound before reinforcement is placed. Do not allow excess form coating material to accumulate in the forms or to come into contact with surfaces which will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions.

3.3.5 CLEANING

Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt and other debris just before concrete is placed.

3.3.6 TOLERANCES

The Engineer/City Representative recognizes that, given the realities of the physical world, there are times when formwork for concrete cannot be constructed closely enough to yield zero tolerances in the finished work. Therefore, the following tolerances are allowed but shall not be exceeded:

- In general, deviation in alignment of slabs and walls shall not exceed $\frac{1}{4}$ inch in the horizontal or vertical dimensions of a pour. All slabs which are indicated to be level shall have a maximum deviation of $\frac{1}{8}$ inch in 10 feet without any apparent change in grade.
- The maximum tolerance from true level and plumb throughout the entire length and/or height of a structure shall be $\pm \frac{1}{4}$ inch and without any abrupt changes from one part of the pour to another.
- Form-work construction for circular structures shall be allowed a maximum deviation in the arc of $\frac{1}{4}$ inch in each 10 feet of radius; therefor, as an example, a tank with a 50-foot radius shall be allowed a maximum deviation of 1- $\frac{1}{4}$ inch from the center of the tank to the arc of the wall. In circular construction, the Contractor also is allowed to deviate from the finish line shown on the Drawings through the use of form panels, which will give chord lengths not to exceed 2 feet.

In the event that deviation from the Drawing dimensions results in problems in the field, the Contractor shall be responsible for resolution of the conditions, as approved by the Engineer/City Representative,

without additional expense to the Owner.

3.4 REMOVAL OF FORMS

3.4.1 CONSIDERATIONS ASSOCIATED WITH FORM REMOVAL

Forms shall be removed in a manner to ensure complete safety of the structure. Forms shall not be removed until concrete has sufficient strength to carry its own weight and the loads upon it with safety. Do not pry against the face of concrete; use only wooden wedges.

3.4.2 MINIMUM ELAPSED TIME

Forms shall not be removed sooner than the minimum elapsed times given in the following schedule unless allowed otherwise in the Contract Documents or as directed by the Engineer/City Representative.

When directed by the Engineer/City Representative, because of weather conditions or for other reasons, the forms shall remain in place for longer periods than stated below. The periods of time for form removal set forth below are minimums with no allowances for external loading. The periods of time set forth below are permissive only and do not relieve the Contractor of responsibility for risks associated with form removal.

Table 19. MINIMUM ELAPSED TIME FOR CONCRETE FORMS TO REMAIN IN PLACE

Structural Component	Over 50°F	Between 40° and 50°F
Walls and perimeter forms at slab on grade panels	2 days	3 days
Underside of slabs	10 days	14 days
Side forms of beams	2 days	3 days
Underside of beams	10 days	14 days
Stairways	10 days	14 days

The time periods shown above are based on concrete materials being mixed and placed in accordance with these Specifications. When high early strength inducing admixtures are used in concrete, the Engineer/City Representative may permit form removal after shorter times than those shown in the table. Form removal time also may be reduced if test cylinders of concrete, field cured along with the concrete they represent, have reached the strength specified in Section 701 – Portland Cement Concrete.

3.4.3 RE-SHORING

Where no re-shoring is planned, leave forms and shoring used to support weight of concrete in beams, slabs and other concrete members in place until concrete has attained its specified strength. Where re-shoring is planned, supporting formwork may be removed when concrete has reached 70 percent of specified strength, provided re-shoring is installed immediately.

Place re-shores as soon as practical after stripping operations are complete, but in no case later than the end of the working day on which stripping occurs. During re-shoring, do not subject concrete in beam, slab, column or any other structural member to combined dead, construction, and live loads in excess of loads permitted for developed concrete strength at time of re-shoring. Tighten re-shores to carry required loads without over stressing.

Re-shores shall remain in place until the supported concrete has reached its specified strength.

3.5 CONCRETE FINISHING

3.5.1 FINISHING FORMED SURFACES

Within 72 hours after the forms are removed, the Contractor shall finish exposed surfaces in accordance with one of the procedures described below. Where no finish requirement is provided on the Drawings, formed concrete surfaces exposed to view and surfaces designated to receive paint shall be given a "Smooth" finish and slabs shall be given a "Trowel" finish. When workmanship is less than the acceptable standard, provide one of the rubbed finishes at no additional cost to Owner.

- F1 - As Cast Form Finish - No finish.
- F2 - Rough Finish - Patch defects and chip or rub off fins exceeding 0.33-inch height.
- F3 - Smooth Finish - In addition to the rough finish requirements, patch tie holes and defects and remove fins completely. When surface texture is impaired and form joints misaligned, grind, bush-hammer or correct such areas. Slurry grout areas evidencing minor mortar leakage to match adjacent concrete. Repair major mortar leakage as a defective area.
- F4 - Smooth Rubbed Finish - Remove forms and perform necessary patching as soon after placement as possible. Finish newly hardened concrete no later than 24 hours following form removal. Perform a smooth finish, then wet surfaces and rub with carborundum brick or other abrasive until uniform color and texture are produced.
- F5 - Grout Cleaned Rubbed Finish - Undertake this operation after all contiguous surfaces are completed and accessible. Perform a smooth finish, then brush blast with abrasive basting to open surface pores. The wet surface of concrete sufficiently to prevent absorption of water from grout. Mix grout in accordance with the manufacturer's recommendations and rub a uniform coat over surface to be finished. Immediately after grouting, scrub surface with cork float or stone to coat surface and fill voids. While grout is still plastic, remove excess grout by working surface with rubber float or sack. After surface whitens from drying, rub vigorously with a clean burlap. Keep damp for at least 36 hours after final rubbing.
- F6 - Cork Floated Rubbed Finish - Remove forms within 2 to 3 days of placement where possible. Perform a smooth finish and then dampen wall surface. Mix mortar in accordance with the manufacturer's recommendations, and apply with firm rubber float or with trowel, filling all surface voids and compress mortar into voids. If mortar surface dries too rapidly to permit proper compaction and finishing, apply a small amount of water with fog sprayer. Produce a final texture with a cork float using a swirling motion.
- F7 - Unformed Finish - After concrete is placed, strike smooth, tops of walls or buttresses, horizontal offsets and similar unformed surface occurring adjacent to formed surfaces. Float to texture which is reasonably consistent with formed surface. Continue final treatment on formed surfaces uniformly across unformed surfaces.
- F8 - Blasted Finish - Complete a smooth finish then perform abrasive blasting within 24 to 72 hours after casting. Coordinate with form-work construction, concrete placement schedule and form-work removal to ensure that surfaces are blasted at the same age for uniform results. Reapply

curing protection after blast finishing.

- F9 - Architectural Finish - Finish in accordance with ACI 303.
- F10 - Tooled Finish - Dress thoroughly cured concrete surface with electric, air or hand tools to uniform texture, and give a bush hammered surface texture. Remove sufficient mortar to exposed coarse aggregate in relief and to fracture coarse aggregate for tooled finish.
- F11 - Stamped Finish - Surface shall be vibrated or stamped (tamping should be minimized) once and then wood floated to an even surface within a tolerance of +1/8-inch in 10-feet in any direction. If color is used, apply such that a uniformly distributed color shade shall be the result. The application of color hardener shall be repeated until the desired results are achieved to the satisfaction of the City Engineer or match existing.

3.5.2 REPAIRING FORMED CONCRETE SURFACES

When the Drawings indicate repairs are required or when the Engineer/City Representative determines areas are defective and require repair, the following procedure shall be taken to make repairs:

- Remove defective concrete to sound concrete and make edges perpendicular to surface or slightly undercut. Feathered edges are not permitted.
- Dampen area to be patched and at least 6 inches surrounding it.
- Prepare bonding grout by mixing to consistency of thick cream and brush into surface.
- Tie holes shall be cleaned, thoroughly dampened, and filled solid with patching mortar.
- Make any patches in concrete to closely match color and texture of surrounding surfaces. Determine mix formula for patching mortar by trial to obtain a good color match with concrete when both patch and concrete are cured and dry.
- Mix white and gray Portland cement as required to match surrounding concrete to produce grout having consistency of thick paint. Use a minimum amount of mixing water.
- Mix patching mortar in advance and allow to stand, without addition of water, and without frequent manipulation, until it has reached a stiff consistency. After surface water has evaporated from patch area, brush bond coat into surface. When the bond coat begins to lose water sheen, apply patching mortar. Thoroughly consolidate mortar into place and strike-off to leave patch slightly higher than surrounding surface. Leave undisturbed for at least 1 hour before the final finish. Keep patched area damp for 72 hours or apply curing compound.
- Do not use metal tools in finishing an exposed patch.
- Whereas cast finishes are indicated, total patched area may not exceed 1 in 500 of as cast surface. This is in addition to form tie patches, if ties are permitted to fall within as cast areas.
- In any finishing process which is intended to expose aggregate on surface, patched areas must show aggregate. The outer 1-inch of patch shall contain the same aggregates as surrounding concrete. After curing, expose aggregates together with aggregates of adjoining surfaces by same process.

3.5.3 FINISHING SLAB SURFACES

In no case shall water be added to the surface (i.e., by sprinkling) to finish. Slab surfaces shall receive one of the following finish treatments as indicated on the Drawings:

- S1 - Floated Finish - After concrete has been placed, consolidated, struck-off and leveled, do not work further until ready for floating. Begin floating when water sheen has disappeared, and surface has stiffness sufficient to permit operation. During or after first floating, check plainness of entire surface with a 10-foot-long straightedge applied at 2 or more different angles. Cut down high spots

- and fill low spots to the required tolerance. Re-float slab immediately to a uniform sandy texture.
- S2 - Trowel Finish - Float finish the surface. Power trowel or hand trowel as required to provide a uniform surface. Do not apply (i.e., sprinkle) water or dry cement to the surface of concrete when finishing. First troweling after floating shall produce smooth surface relatively free of defects but may still show some trowel marks. Second trowel by hand after surface has hardened. Leave finished surface essentially free of trowel marks, uniform in texture and appearance. On surfaces intended to support floor coverings, grind off defects which would show through floor coverings.
 - S3 - Broom Finish - Trowel finish the surface. Power trowel or hand trowel as required to provide uniform surface. Lightly brush surface parallel to direction of drainage with a hair broom. Coarseness of broom bristle may be varied slightly, to achieve desired degree of surface roughness.
 - S4 - Exposed Aggregate Finish - Immediately after surface of concrete has been leveled to tolerance and surface water has dissipated, spread aggregate uniformly over surface to provide complete coverage to the depth of a single stone. Embed aggregate into surface by light tamping. Float surface until embedded aggregate is fully coated with mortar and surface has been brought to tolerance. Start exposure of aggregate after matrix has hardened sufficiently to prevent dislodgement. Flow ample quantities of water, without force, over surface of concrete while matrix encasing aggregate is removed by brushing with a fine bristle brush. Continue until aggregate is uniformly exposed. An approved chemical retarder sprayed onto freshly floated surface may be used to extend working time.
 - S5 - Chemical Hardener Finish - Apply liquid chemical hardener finish to interior concrete floors where indicated. Do not apply liquid chemical concrete hardener on floor areas scheduled to receive synthetic matrix terrazzo, setting beds for tile, terrazzo, vinyl flooring or like items. Apply hardener after complete curing and drying of concrete surface in accordance with manufacturer's recommendations. Evenly apply each coat and allow 24 hours for drying between coats. After the final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

3.6 CONCRETE CURING

3.6.1 SURFACES WITH UNREMOVED FORMS

When forms are left in place (i.e., underside of beams, etc.) the Contractor shall proceed with curing adjacent surfaces without regard to the formed surfaces. When such forms are removed, curing shall then proceed over the entire surface.

3.6.2 CURING CONDITIONS

Immediately after finishing of concrete surfaces (formed or slab) the Contractor shall verify the concrete surfaces are ready for curing. The Contractor shall correct any conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected. A minimum ambient temperature of not less than 40° shall be maintained for at least 7 days during concrete curing. Concrete shall then be cured by one of the following methods:

- Moisture Cover - Water or continuous water-fog spray shall be applied, or the concrete surface shall be covered with water saturated absorptive mat kept continuously soaked, for not less than 7 days and nights.
- Moisture Retaining Sheet - Place cover in widest practicable width with sides and ends lapped and sealed to prevent moisture loss for a period of not less than 7 days and nights. All holes or tears in the cover sheet shall be kept repaired during the curing period.

- Membrane Curing Compound – All required repairs, patching, and final finishing operations shall be completed prior to application. Curing compound shall be applied as soon as the concrete is firm enough to work on. Slab surfaces shall be coated with curing compound within one hour after form removal; if more than one hour has elapsed, the surface shall be water cured. Colored concrete shall be cured and finished with a concrete curing and sealing compound meeting ASTM C309.

The compound shall be thoroughly mixed and a minimum of two coats shall be applied, with each coat applied in a direction different from that used for the preceding coat. The surface shall be coated and re-coated in a continuous operation until the surface has a uniform appearance; is effectively and completely sealed; and until a coating film remains on the surface of the concrete that can be scraped from the surface at any and all points after drying for at least 24 hours. Continuity of the coating shall be maintained, and all damage to the curing compound membrane shall be repaired, during the specified cure period.

Curing compound shall not be allowed within the silhouette of any construction joint. If any curing compound enters the construction joint, the joint shall be sandblasted prior to placing any new concrete.

Curing compound shall not be used on surfaces to be painted or coated.

Surfaces intended to contain potable water (tank interiors, etc.) shall not be cured with curing compounds.

Curing compound shall not be removed in less than 7 days from the time of application without written approval from the Engineer/City Representative. When approved and prior to such removal, the Contractor shall provide a detailed plan for adequately curing the concrete.

END OF SECTION 702.

SECTION 703. CONCRETE REINFORCEMENT

1. DESCRIPTION

This Section covers the steel bars, wire fabric and rod mats required for cast-in-place concrete, with the necessary support chairs, bolsters, bar support and spacers required for supporting the reinforcement.

1.1 RELATED Work

Section 701 - Portland Cement Concrete

1.2 SUBMITTALS

1.2.1 MILL TEST CERTIFICATION

Manufacturer's mill test certificates of supplied concrete reinforcement, indicating physical and chemical analysis shall be submitted.

1.2.2 WELDER CERTIFICATION

Each welder's certification data shall be submitted to and approved by the Engineer/City Representative prior to performance of welding on the project.

1.2.3 SHOP DRAWINGS

Shop Drawings shall be submitted and shall indicate the sizes, spacings, locations and quantities of reinforcing steel and wire fabric; bending and cutting schedules; any proposed splicing; and reinforcement support, spacing devices and stirrup spacing.

1.2.4 BAR SUPPORT SAMPLES

The Contractor shall submit for the Engineer/City Representative's approval samples of all bar supports it proposes to use along with a written description of where each type of bar support would be used.

2. MATERIALS

2.1 CONCRETE REINFORCEMENT MATERIALS

2.1.1 STEEL REINFORCEMENT

Unless otherwise specified, reinforcing steel shall be grade 60 billet steel conforming with ASTM A-615, including supplementary requirements S1. All such reinforcing shall be deformed steel bars with deformations in accordance with ASTM A-615. Bars shall be either uncoated or coated as indicated. ASTM A-706 steel shall be used if welding is indicated or allowed. All reinforcement shall be supplied in the maximum lengths practical or as indicated, unless otherwise authorized by the Engineer/City Representative.

2.1.2 WIRE FABRIC

Welded steel wire fabric shall be in accordance with ASTM A-185 plain type. It shall be new stock

and free of any rust when placed in the Work. Wire fabric may be supplied in flat sheets or coiled rolls and may be either coated or uncoated as indicated.

2.1.3 STIRRUPS

Stirrup steel shall be in accordance with ASTM A-82.

2.1.4 SPIRAL REINFORCEMENT

Spiral reinforcement for columns or other components shall be cold drawn steel wire in accordance with ASTM A-82.

2.1.5 DOWEL BARS

Plain dowel bars for expansion joints shall be in accordance with ASTM A-615, 60-ksi-yield grade steel. Dowel bars shall be epoxy coated in roadway pavements. Metal dowel cans shall be provided at one end of the dowel to permit longitudinal movement of the dowel within the concrete section. The Contractor shall provide for movement equal to the joint width plus 0.5- inch. Load transfer bars shall be painted with 1 coat of paint conforming to AASHTO M-254 and coated 1/2 with grease.

2.2 ACCESSORY MATERIALS

2.2.1 TIE WIRE

Tie wire shall be 16-gauge minimum cold drawn plain steel wire and shall be in accordance with ASTM A-82.

2.2.2 REINFORCEMENT SUPPORTS

Unless otherwise required in the Drawings or these Specifications, reinforcement supports bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement in place shall be wire type bar supports complying with CRSI recommendations. Wood, brick, and other unacceptable materials will not be allowed.

2.2.3 SUPPORTS EXPOSED TO VIEW

Where support legs are in contact with forms on concrete surfaces exposed to view, supports shall be stainless steel or shall be provided with either hot dip galvanized or plastic protected legs.

2.3 FABRICATION

2.3.1 STANDARDS

Steel reinforcement shall be cut, bent and fabricated in accordance with ACI 315 and with approved machine methods, in either the shop or the field.

2.3.2 BENDING

Bars shall be accurately formed to the dimensions shown on the Drawings or applicable bending schedule. Bending or straightening in the shop or the field shall be accomplished so that the steel is not damaged. All bars shall be cold bent. Bends for hooks on bars shall be made around a pin having a diameter not less than 6 times the minimum thickness of the bar. Kinked bars shall not be used. Bars

with bends not indicated on Drawings or final Shop Drawings shall not be placed in the Work. Reinforcement bars shall not be bent after they are embedded in concrete.

2.3.3 *SPLICES*

Reinforcing splices not indicated on the Drawings shall be approved by the Engineer/City Representative and shall be located at points of minimum stress. The location of splices shall be indicated on Shop Drawings. Welding of reinforcing bars, when authorized by the Engineer/City Representative, shall be performed in accordance with AWS D1.4. All rebar which is welded shall be grade 60 ASTM A706 material.

3. CONSTRUCTION REQUIREMENTS

3.1 DELIVERY AND STORAGE

3.1.1 *DELIVERY*

Deliver reinforcement to the job site bundled, tagged and marked. Use metal tags indicating bar size, lengths and other information corresponding to markings shown on placement diagrams.

3.1.2 *STORAGE*

Take all means necessary to protect reinforcement materials before, during and after installation and to protect the installed work of other trades. Store all reinforcement materials in a manner to prevent excessive rusting and fouling with grease, dirt and other bond breaking coatings. Take all necessary precautions to maintain identification after bundles are broken. In the event of damage or errors, immediately make all repairs or replacements necessary and at no additional cost to the Owner.

3.2 REINFORCEMENT ERECTION

3.2.1 *CLEAN AND SOUND MATERIALS*

At the time of placement in the Work, reinforcement shall be free of loose mill scale, loose or excessive rust, paint, oil or grease, or other coating which may destroy its bond with the concrete. Bars with reduced cross-section due to rusting or other cause, even if all rust has been removed, shall not be allowed in the Work.

3.2.2 *CLEARANCE*

Maintain the distance from vertical forms and between layers of reinforcement by means of prefabricated chairs, ties, hangers or other approved devices in accordance with "reinforcement support" paragraphs below. Placement and fastening of reinforcement in each section of the Work must be approved before concrete is placed.

3.2.3 *CLEAR DISTANCE*

The clear distance between parallel bars shall not be less than one and one-half times the diameter of the bars and shall in no case be less than 1 inch nor less than the maximum size of the coarse aggregate specified.

3.2.4 MINIMUM COVER

Unless otherwise shown on the Drawings or approved by the Engineer/City Representative, for all formed surfaces, the minimum concrete cover over the steel reinforcement shall be in accordance with the latest edition of ACI 318 for the size of bar and type of concrete placement.

3.2.5 CUTOUTS AND OPENINGS

Where reinforcing steel has to be cut to permit passage of pipe or to create openings with no detail available on the Drawings for extra reinforcement in such areas, the area of steel removed by the creation of the opening must be replaced by placement of at least double the area of the steel removed equally around the openings created. The steel shall be placed such that it extends 5 feet beyond the opening on each side, to provide for sufficient bond.

3.2.6 METAL MESH

Sheets of metal mesh shall be bent as shown or required on the Drawings to fit the work. It shall be rolled or otherwise straightened to make a perfectly flat sheet before placement in the Work. Supports for metal mesh shall meet requirements for reinforcing bar supports.

Sheets of metal mesh shall be spliced in accordance with ACI 318 and shall be overlapped no less than 12 inches or one square plus 6 inches, whichever is greater, to maintain a uniform strength. The mesh shall be securely fastened at the ends, edges and at all supports to maintain clearances and overlaps.

3.2.7 NOTICE TO OTHER TRADES

The Contractor shall ensure that all other crafts, sub-contractors, City Engineer/Representative support groups, and etc., whose work is related to concrete placement, are provided with ample notice and opportunity to introduce and finish required embedded items before concrete placement. All sleeves, inserts, anchors and any other embedded items shall be located and set in place prior to concrete placement. All voids in embedded items shall be temporarily filled to prevent entry of concrete.

3.3 SPLICING

3.3.1 CITY ENGINEER/REPRESENTATIVE APPROVAL

Except as shown on the Drawings, reinforcing steel shall not be spliced at any location without specific written approval of the City Engineer/Representative. Splices in adjacent bars shall be staggered as directed by the City Engineer/Representative.

3.3.2 LAP SPLICES

Unless shown otherwise on the Drawings, or approved by the Engineer/City Representative, bars up to and including number 11 shall be lap spliced in accordance with ACI 318 and shall be fastened together with steel wire. Unless shown otherwise on the Drawings, or approved by the Engineer/City Representative, bars at a lap splice shall be in contact with each other, and in no case shall the lap be less than 40 diameters of the spliced bars.

Unless shown otherwise on the Drawings, or approved by the Engineer/City Representative, where bars are to be lap spliced at joints in the concrete, all bars shall project from the concrete first placed

for a minimum length equal to the lap splice length as indicated on the Drawings. All concrete or other deleterious coating shall be removed from dowels and other projecting bars by wire brushing or sand blasting before the bars are embedded in a subsequent concrete placement.

3.3.3 *WELDING*

Reinforcing steel shall be welded only if shown on the Drawings or approved in writing by the Engineer/City Representative. All welding of reinforcing steel shall comply with AWS D1.4.

3.3.4 *MECHANICAL SPLICES*

Mechanical splices may be used with prior consent of the City Engineer or City Representative.

3.3.5 *EXPANSION JOINTS*

Reinforcement, or other embedded metal items bonded to the concrete, shall not be permitted to extend continuously through any expansion joint, with the exception of dowels in floors bonded on only one side of joint.

3.4 REINFORCEMENT SUPPORT

3.4.1 *PLACEMENT*

All reinforcement shall be supported and retained in place, true to indicated lines and grades, by the use of approved bar supports, sized to position the steel in the exact location required on the Drawings. Supports shall be spaced at intervals of not more than 5 feet on center in any direction, to prevent movement of the steel during concrete placement. Deck steel shall be tied down to beams or forms at regular intervals not exceeding 5 feet on center in any direction.

3.4.2 *CONCEALMENT*

Supports shall be completely concealed in the concrete and shall not discolor or otherwise mar the surface of the concrete.

3.4.3 *SAND PLATES*

Supports with sand plates or horizontal runners shall be used for slabs on grade where the base material will not support chair legs.

3.5 QUALITY COMPLIANCE

Reinforcing materials found to be damaged or at variance with the requirements of the Drawings or these Specifications for size, quantity, strength, position, arrangement, or other attribute, shall result in rejection of the concrete Work if they are not brought into compliance.

END OF SECTION 703.

1. The purpose of this specification is to establish the minimum requirements for the materials and workmanship for the construction of aggregates and asphalt.

2. The materials and workmanship for the construction of aggregates and asphalt shall be in accordance with the following specifications:

3. The materials and workmanship for the construction of aggregates and asphalt shall be in accordance with the following specifications:

DIVISION 800

AGGREGATES AND

ASPHALT

4. The materials and workmanship for the construction of aggregates and asphalt shall be in accordance with the following specifications:

5. The materials and workmanship for the construction of aggregates and asphalt shall be in accordance with the following specifications:

6. The materials and workmanship for the construction of aggregates and asphalt shall be in accordance with the following specifications:

7. The materials and workmanship for the construction of aggregates and asphalt shall be in accordance with the following specifications:

SECTION 801. HOT PLANT MIX BITUMINOUS SURFACING

1. DESCRIPTION

This Section covers manufacturing, transporting, laying and compacting hot mixtures of bituminous surfacing for roads, parking areas, sidewalks and other traffic surfaces.

1.1 RELATED WORK

Section 204 – Removal and Replacement of Surface Improvements

Section 802 - Road Mix Bituminous Pavement

Section 803 - Asphalt Tack Coat

1.2 SUBMITTALS

1.2.1 MIX DESIGN

The Contractor shall develop and submit proposed mix-designs based on the Marshall Method for Hot Asphalt Paving Mixtures as established in AASHTO T 245. The submittal shall include a laboratory report incorporating all of the information required by that specification, together with curves developed from the mix designs showing varying percentages of asphalt by dry weight of mix versus unit weight, percent air voids, stability, flow and percent voids in mineral aggregate.

1.2.2 JOB MIX FORMULA

At least 15 days prior to producing bituminous mixtures, the Contractor shall submit to the City Engineer/Representative, in writing, a proposed job-mix formula for each mixture for use in setting the job-mix formula to be used with the proposed materials. For bituminous mixtures, the proposed job-mix formula shall be based on a mix-design-run on aggregates, crushed or otherwise, produced for the project and using the bituminous material that will be furnished for the project.

Each job-mix formula shall propose definite single values (hereafter referred to as Target Values or TV) for:

- The percentage of aggregate passing each specified sieve based on the dry weight of aggregate. These percentages shall be within the range shown in Table 2-H.
- The percentage of bituminous material to be added based on the total weight of mixture.
- The temperature of the mixture as it leaves the mixer.
- The temperature of the mixture placed on the road immediately preceding initial compaction of the mixture.
- The kind and percentage of additives to be used (Hydrated lime may be added to prevent stripping).
- The kind and percentage of mineral filler to be used.
- The percentage of water, based on the total dry weight of mixture.
- The maximum specific gravity of dense graded hot mix bituminous paving mixtures as determined by AASHTO T 209 (For open graded hot mixes, the laboratory density developed during mix design shall be used as the TV. It shall be the maximum density for the TV bituminous content).

- The mixture shall have a minimum dry retained strength value of 200 psi.

Should a change in source of material be proposed, or should a job-mix formula prove unsatisfactory, the Contractor shall establish a new job-mix formula and shall submit same to the Engineer/City Representative.

1.2.3 PENETRATION/VISCOSITY/TEMPERATURE RELATIONSHIPS

The Contractor shall submit penetration/viscosity/temperature relationships for the bituminous material to be used in the Work along with a certification from the supplier attesting to their accuracy. If the supplier finds it desirable or necessary to change crudes or blends of crudes, new relationships must be supplied along with a sample to use in running a new mix-design. This submittal shall be made not less than 15 days prior to delivery of material from the changed source of materials. The penetration and viscosity values shall be determined at the temperatures and by the procedures specified in AASHTO M 226.

1.3 DEFINITIONS

Plant - Stationary machinery used for manufacturing mixtures of asphalt cement, liquid asphalt with aggregate to form a uniform mixture of bituminous surfacing. Sometimes referred to as "batch plant".

Aggregate - Crushed stone, gravel or slog with uniform particle sizes. Gradation - A group of particle size limits that are prescribed for aggregate.

Job-Mix Gradation - A gradation of aggregate which has been developed by a contractor or material supplier which can consistently be produced from a given source.

Job-Mix Formula - A mixture of asphalt materials and aggregate which can be consistently produced from a given source with the available plant of a contractor or material supplier.

Course - A single layer of bituminous surfacing.

Mat - Single or multiple layers of bituminous surfacing which have been placed. Lot - The amount of bituminous mixture placed during a production day.

2. MATERIALS

2.1 ASPHALT CEMENT

Shall meet the requirements of AASHTO M 20 for penetration-graded asphalt cement and AASHTO M 226 for viscosity-graded asphalt cement. When not shown otherwise, the Contractor shall use PG 58-28 asphalt material type and grade or as approved by the City Engineer.

2.2 AGGREGATES

Aggregates for hot bituminous mixtures shall be crushed stone, slag or gravel meeting the quality and gradation requirements shown below in Tables 1-H and 2-H. Aggregate gradation shall meet the gradation for $\frac{3}{4}$ -inch³/₄" non-rutting unless otherwise specified.

When crushed gravel is used, at least 50 percent by weight of the particles retained on the Number 4 sieve shall have at least one mechanically fractured face.

Table 20. CRUSHED AGGREGATE QUALITY REQUIREMENTS FOR HOT BITUMINOUS PAVEMENT

Description	AASHTO Test Method	Requirements
Percent Wear	T 96	40 max.
Durability Index, Coarse and Fine	T 210	35 min.
Sand Equivalent (Alternative Method Number 2)	T176	45 min
Stripping Test	T 182	Min. 95% coated**

** An approved chemical additive may be used to meet this requirement.

*Table 21. GRADATION LIMITS FOR CRUSHED AGGREGATE
USED IN HOT BITUMINOUS SURFACING*

Sieve Size	Percent of Total Aggregate (dry weight)		
	¾-inch (2) (Non-rutting)	¾-inch (3)	½-inch (4)
1 inch			
¾ inch	100	100	
½ inch	74-99		100
3/8 inch	69-91	75-91	
No. 4	49-65	46-62	60-80
No. 8	33-47		
No. 16	21-35	22-34	28-42
No. 50	6-18	11-23	11-23
No. 200	2-6	5-9	5-9

When aggregate is produced and/or stockpiled in more than one size, the blend of sizes shall be based on results of mix design properties that yield the most ideal results. The blended gradations; however, must stay within the gradation limits given herein.

3. CONSTRUCTION REQUIREMENTS

3.1 BITUMINOUS SURFACE MIXING, PLACEMENT, AND FINISHING

3.1.1 PLANT DESIGN AND EQUIPMENT

Plants shall be specifically designed and manufactured to produce a uniform bituminous mixture. The plant shall be capable of controlling and accurately proportioning both aggregates and asphalt cement. Automatic controls shall be provided to shut down the plant when a supply of aggregate or bituminous material is not available.

The plant shall be equipped with appropriate dust collectors and/or control equipment, which enable operation of the plant to meet local and State environmental and health requirements. Liquids from a wet scrubber, when used, shall not be discharged into live streams, lakes or ponds. Effluent from such equipment shall be collected and deposited according to applicable State and local requirements.

Thermometers shall be installed in the plant to accurately indicate the temperature of the bitumen at the charging value in the mixer unit and at the discharge chute of the mixer unit.

Accurate weight measurement of ingredients is essential. Bituminous mix plants shall have associated weight measurement equipment (scales, etc.) with an incremental accuracy of not more than 10 pounds to weigh materials.

3.1.2 MIXING

The aggregates, bituminous material, additives, mineral filler and water shall be measured or gauged and introduced into the mixer in the amount specified by the job mix formula. The bituminous material shall be evenly heated to the specified temperature. A continuous supply of the bituminous material shall be fed to the mixer at a uniform temperature. The temperatures of asphalt cement delivered to the mixer shall be sufficient to achieve a kinematic viscosity of 150 to 300 centistokes.

Aggregate for pugmill mixing shall be heated, dried, and delivered to the mixing unit at a temperature within $\pm 30^{\circ}\text{F}$ of the temperature of the bitumen, temperature not to exceed 325 degrees F. Moisture content of the aggregate shall not exceed 1 percent at the time it is introduced into the mixing unit. Flames used for drying and heating shall be properly adjusted to avoid damage to, and soot formation on, the aggregate.

After the required amounts of all materials have been introduced into the mixer, the ingredients shall be mixed until a complete and uniform coating of the particles and a thorough distribution of the bituminous material throughout the aggregate have been obtained.

3.1.3 HAULING

Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds that have been thinly coated with a material to prevent the mixture from adhering to the beds. Truck beds shall not contain any water or deleterious material prior to loading.

The Contractor, at no cost to the Owner, shall provide scales for weighing the vehicles used for

hauling the bituminous mixture. If of the required accuracy, these scales may be the same as those used to weigh ingredients at the mix plant. The Contractor shall provide such scales at no additional cost to the Owner.

3.1.4 PLACEMENT

Except for small areas inaccessible to such equipment, hot bituminous mixtures shall be placed with bituminous pavers. Pavers shall be self-contained, power-propelled units, provided with an adjustable activated-screed or strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mix material in lane widths and thickness' as shown on the Drawings. When shown on the Drawings, pavers shall be equipped with a control system capable of automatically maintaining the proper screed elevation.

Placement of the bituminous mixture shall be continuous. The mixture shall be spread and struck off to the grade and elevation established in the Contract Drawings. Unless otherwise shown on the Drawings, mix shall be placed in lifts which, when compacted, will not exceed 4-inches in thickness.

The longitudinal joint in one layer shall offset that in the layer immediately below by approximately 6-inches, making sure that the joint in the top layer shall be at the center or dividing line of every two-lanes of traveled roadway. Transverse joints in succeeding layers and in adjacent lanes shall be offset at least 10-feet.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable (along forms, curbs, headers, walls and other places), the mixture shall be placed and finished using hand tools and then thoroughly compacted with hot hand tampers, smoothing irons or mechanical tampers.

Bituminous surface shall not be placed when: weather conditions prevent proper handling, hauling and placing of the mixture; when the base course is frozen; or when the average temperature of the underlying surface is below 35 degrees F. and air temperature is rising. Placement on water covered surfaces will not be permitted.

3.1.5 COMPACTION

Compaction shall be performed with vibratory or non-vibratory steel-wheel rollers and pneumatic-tire rollers. Initial breakdown rolling shall be accomplished while the mix temperature exceeds 250° F. Rolling shall be completed before the mix temperature drops to 175° F.

Rollers shall begin at the sides and proceed longitudinally parallel to the road centerline, each trip overlapping 6-inches or two times the pavement depth, whichever is greater, gradually progressing to the center. When paving in echelons or abutting a previously placed lane, the longitudinal joint should be rolled first, then followed by the above rolling procedure. On super-elevated curves, the rolling shall begin at the low side and progress to the high side.

Rollers shall not pass over the unprotected end of a freshly laid mixture. Transverse joints shall be formed by cutting back into the previous run to expose the full depth of the course. Heat shall be applied to contact surfaces of transverse joints just before additional mix is placed against them.

3.2 EXCESS BITUMINOUS SURFACE MATERIAL.

Material trimmed from the edges, together with any other discarded bituminous mixture, shall be removed

from the roadway and disposed of by the Contractor in an approved area.

3.3 TESTING

3.3.1 CONTRACTOR TESTING

The Contractor shall be responsible for providing the necessary tests for controlling and maintaining the mixture within the limits indicated in the approved job-mix formula. Sampling and testing will be performed on each lot of material as it is placed. Gradation and asphalt content samples will be taken immediately behind the paver at the following rate:

Table 22. LOT TESTING

Lot Size –Sq. Yds.	Minimum Number of Samples
1500 and greater	4
Less than 1500	3

Density and thickness samples will be taken at a rate of one sample per each lot of up to 1500 square yards. When lot size exceeds 1500 square yards, two samples will be taken.

Checks for smoothness will be made at locations selected by the Engineer/City Representative for each lot. Smoothness checks will not be required where transitions or variations will not allow compliance with the criteria.

Acceptance of bituminous material placed shall be made by comparing test results with the job-mix formula and the dimensions provided in these Specifications. Acceptance of each lot will be given when test results are within the following tolerances:

Table 23. BITUMINOUS TEST

Test	Maximum Deviation
Asphalt Content	Mean of tests on each lot is less than 1%
Gradation	Mean of tests for any sieve size is less than 10%
Density	Any test is 92% or greater
Thickness	Any test is less than 0.5-inches
Smoothness	0.25-inches in 10-feet longitudinally or transversely

Any corrective measures necessary to bring the bituminous surface into compliance must be made while the surface temperature is still greater than 175° F.

3.3.2 ENGINEER/CITY REPRESENTATIVE TESTING

At his own discretion, the Engineer/City Representative also may spot-check the bituminous mix for acceptability and for determination of compliance with installation requirements. These spot-checks will not be used for acceptance but for guidance. On request, the results will be made available to the Contractor by the Engineer/City Representative.

END OF SECTION 801.

SECTION 802. ROAD MIX BITUMINOUS SURFACING

1. DESCRIPTION

This Section covers the requirements for furnishing bituminous and aggregate materials, mixing those materials in place on graded surfaces and laying and compacting those mixtures for roads, parking areas, and other traffic surfaces.

1.1 RELATED WORK

Section 803 - Asphalt Tack Coat

1.2 DEFINITIONS

Blade - The grading or manipulation of road surfacing materials with a road grader blade. Aggregate - Crushed stone, gravel or slag with uniform particle sizes.

Gradation - A group of particle size limits that are prescribed for aggregate. Course - A single layer of bituminous surfacing.

Mat - A single or multiple layers of bituminous surfacing, which have been placed.

2. MATERIALS

2.1 ASPHALT

The asphalt shall be the type and grade of asphalt shown on the Drawings and shall meet the current requirements contained in the "Standard Specifications for Paving and Industrial Asphalts" issued by the Asphalt Institute. When the asphalt type and grade are not shown on the Drawings, or in these Specifications, MC-70 or MC-250 liquid asphalt will be acceptable.

2.2 AGGREGATE

Aggregate shall be crushed stone, slag or gravel meeting the quality and gradation requirements shown below in Tables 1-R and 2R, unless shown otherwise in the Special Provisions or elsewhere in the Contract Documents. At least 50 percent by weight of the particles retained on the Number 4 sieve shall have at least one mechanically fractured face. Aggregates may be sampled and tested at random and must meet the requirements below. Failure of materials to meet the requirements of these standards may result in rejection of all materials placed prior to the tests.

**Table 24. CRUSHED AGGREGATE QUALITY REQUIREMENTS
FOR ROAD-MIX BITUMINOUS PAVEMENT**

Description	AASHTO Test Method	Requirements
Percent Wear	T 96	40 max.
Durability Index, Coarse and Fine	T 210	35 min.
Sand Equivalent (Alternative Method Number 2)	T 176	45 min.
Stripping Test	T 182	Min. 95% coated**

** An approved chemical additive may be used to meet this requirement.

**Table 25. GRADATION LIMITS FOR CRUSHED AGGREGATE
USED IN ROAD-MIX BITUMINOUS SURFACING**

Sieve Size	Percent of Total Aggregate (dry weight) ¾-inch
¾ inch	100
½ inch	---
3/8 inch	78-92
No. 4	55-67
No. 8	---
No. 16	28-38
No. 50	---
No. 200	7-11

3. CONSTRUCTION REQUIREMENTS

3.1 BITUMINOUS MIXTURE

3.1.1 SCALES

If scales are not available for weighing vehicles used for hauling the aggregate and bituminous material, the Contractor shall provide such scales at no cost to the Owner.

3.1.2 AGGREGATE

When aggregate on the existing surface is to be used for the bituminous mixture, that aggregate shall be scarified to the depth indicated on the Drawings and bladed into a windrow away from the surface being constructed. The exposed surface shall then be uniformly bladed and rolled, or watered and rolled to form a tight, lightly moistened surface.

When new aggregate is to be used for the bituminous mixture, the existing base shall be lightly scarified and bladed to a uniform grade to the dimensions shown on the Drawings. This graded surface shall then be rolled, or watered and rolled, to form a tight lightly moistened surface. Aggregate then shall be placed on the prepared surface and bladed into a uniform section which can be easily measured to check its volume.

If the surface moisture of the aggregate is greater than 3 percent of the dry weight of the aggregate and emulsified asphalt is not being introduced, the aggregate shall be aerated by movement until its moisture content is reduced to 3 percent or less. When an acceptable moisture content is achieved, the aggregate shall be spread into a uniform layer of convenient width for introduction of the bituminous material.

3.1.3 MIXING

Mixing of materials shall be as follows:

- For blade grader mixing, application of bituminous material to the aggregate shall be accomplished with a distributor designed, equipped, maintained and operated so that bituminous material will be applied in successive applications at an even temperature and uniform rate on variable widths of surface up to 12-feet. The distributor must be capable of controlling rates of application from 0.05 to 2.0 gallons per square yard, with uniform pressure and with a variation from the rate set not to exceed 0.02 gallon per square yard. Operable measuring equipment shall be included on the distributor which includes a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, and a thermometer for measuring the temperature of the bituminous material in the tank. Asphalt viscosity shall range between 50 and 200 centistokes at application. Distributors shall be equipped with (1) a power unit for the pump and (2) full circulation spray bars that adjust laterally and vertically.
- Travel mixers shall not be used to introduce the bituminous material, unless specifically authorized in writing by the Owner. Approval also must be obtained in writing from the Owner before moving the unit to the work site.
- No more than 0.50 gallon of bituminous material shall be applied per square yard in any one application. Partially mix the asphalt material with the aggregate immediately after each application. Windrow and mix the entire surface course after the last application of asphalt by blading the mixture from side to side of the roadway. The mixture shall be blade mixed until a complete and uniform coating of the particles and a thorough distribution of the bituminous material throughout the aggregate is achieved, and no more than 50% of the original volatiles shall remain in the mix. The mixture shall be uniform in appearance, texture, asphalt content, and free from pockets of segregated aggregates. The Contractor shall not cut into the underlying base course or contaminate the mixture with earth or other foreign matter while mixing.
- Any excess or deficiency of material in the mix shall be corrected by the addition of aggregate or bituminous material as appropriate and the bituminous mixture re-mixed until it meets requirements. Should the mixture show an uneven distribution of materials, the materials shall be re-mixed until this condition is corrected.

3.2 PLACEMENT

3.2.1 *SPREADING*

The spreading of the mix shall not be started until the surface to be covered is approved by the Owner. Form the completed mixture in a window of approved cross section and spread in a single course to the plan elevations, grades, and cross sections.

3.2.2 *WINDROWING MATERIAL AT DAY'S END*

At the end of each day's work or if work is halted for other reasons, all loose material shall be bladed into a window, whether all mixing is complete or not, and retained in that window until operations are resumed. Do not leave non-compacted spread material on the roadbed overnight.

3.2.3 *WEATHER CONDITIONS*

The bituminous mixture shall not be placed when weather conditions prevent proper mixing and placing of the mixture; when the base course is frozen; or when the average temperature of the underlying surface is below 50° Fahrenheit and air temperature is rising. Placing on water covered surfaces will not be permitted.

3.3 COMPACTION

3.3.1 *ROLLING*

Steel-wheel rollers and pneumatic-tire rollers shall have a total compacting width of not less than 60-inches and a gross weight adjustable within the range of 200 to 350 pounds per inch of compaction width. All tires on the pneumatic roller shall be equally inflated and have a means of adjusting the contact pressure to suit project conditions. Roll without shoving or distorting the surface.

Initial rolling shall be with the pneumatic-tire roller and final rolling shall be completed with a steel-wheeled roller. Rollers shall begin at the sides and proceed longitudinally parallel to the center of the surface being placed, each trip overlapping 6-inches or two times the pavement depth, whichever is greater, gradually progressing to the center. When paving in echelons or abutting a previously placed lane, the longitudinal joint should be rolled first, then followed by the above rolling procedure. On super-elevated curves, the rolling shall begin at the low side and progress to the high side.

3.3.2 *IRREGULAR AREAS*

On areas where irregularities or unavoidable obstacles make the use of mechanical equipment impracticable, (along forms, curbs, headers, walls and other places) the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or mechanical tampers.

3.3.3 *TOLERANCES*

Finish to a smooth, uniform line and grade with surface deviations not exceeding plus or minus 3/8-inch in 10 feet.

3.4 TESTING

3.4.1 CONTRACTOR TESTING

The Contractor shall be responsible for providing the necessary tests for controlling and maintaining the mixture within the limits indicated in these Specifications and the Drawings.

3.4.2 OWNER TESTING

The Owner may also make tests for spot-checking acceptability and determination of compliance with installation requirements.

3.4.3 SAMPLING

Sampling and testing will be performed on each lot of material placed. A lot equals the amount of material placed during a production day. When production is less than 500 square yards per day, the Owner may not require sampling and testing.

3.4.4 THICKNESS SAMPLES

Thickness samples will be taken at a rate of one sample per each lot of up to 1500 square yards. When lot size exceeds 1500 square yards, two samples will be taken. Specified thickness standards may be waived if additional thickness is required by the approved Contractor's drawings to level an existing surface.

3.4.5 SMOOTHNESS CHECKS

Checks for smoothness will be made at locations selected by the Owner for each lot. A straight edge or string line shall be used to determine smoothness compliance. Smoothness checks will not be made where transitions or variations will not allow compliance with the criteria.

3.5 EXCESS MATERIAL

Material trimmed from the edges and any other discarded bituminous mixture shall be removed from the roadway and disposed of by the Contractor in an approved manner conforming to State environmental codes and regulations.

END OF SECTION 802.

SECTION 803. ASPHALT TACK COAT

1. DESCRIPTION

This Section covers preparing an existing bituminous or concrete surface and then furnishing and applying an asphalt coating to it.

1.1 RELATED WORK

Section 801 - Hot Plant Mix Bituminous Pavement

Section 802 - Road Mix Bituminous Pavement

2. MATERIALS

The asphalt coating shall meet the current requirements contained in the "Standard Specifications for Paving and Industrial Asphalts" issued by the Asphalt Institute, for the type and grade of asphalt shown on the Drawings or in these Specifications. When the asphalt type and grade are not shown on the Drawings or in these Specifications, SS-1 or SS-1h emulsified asphalt diluted with not more than one-part water to one-part emulsified asphalt will be acceptable.

3. CONSTRUCTION

3.1 WEATHER LIMITATIONS

Tack coats shall be applied only when air and roadbed temperatures in the shade are greater than 50° F. Application of tack coats shall not be made during rain, fog, dust, or other unsuitable weather.

3.2 PREPARATION

Prior to application of the tack coat, the receiving surface shall be broomed to remove dust and loose foreign materials. The Contractor shall provide notice of application to adjacent property owners 24 hours prior to applying the coating. Appropriate measures shall be taken to provide crossings for foot or vehicular traffic to minimize tracking of freshly applied tack coating.

If flushing of the surface with water is necessary for removal of dust and foreign material, the Engineer/City Representative may require flushing. When flushing is ordered, the Contractor will be authorized compensation for flushing by issuance of a Change Order.

3.3 APPLICATION

Limit application of tack coats to areas which can be covered with an asphalt pavement layer that same day when possible.

Application of the coating shall be accomplished with a distributor designed, equipped, maintained and operated so that bituminous material will be applied at an even temperature and uniform rate on variable widths of surface up to 16-feet. The distributor must be capable of controlling rates of application from 0.05 to 2.0 gallons per square yard, with uniform pressure and with a variation from the rate set not to exceed 0.02 gallon per square yard. Operable measuring equipment shall be included on the distributor which includes a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, and a

thermometer for measuring temperature of the bituminous in the tank. Distributors shall be equipped with (1) a power unit for the pump; (2) full circulation spray bars that adjust laterally and vertically; and (3) a hose and nozzle attachment for applying material to areas inaccessible to the distributor spray bar.

Spray rates for the coating shall be as required by these Specifications. When no rate is specified otherwise, the Engineer/City Representative may require an application rate for emulsions of 0.05 to 0.15 gallons per square yard.

3.4 PROTECTION

Protect adjacent structures, (curbing, sidewalks, guardrails, signposts, etc.) from being spattered or marred by covering with suitable materials. The expense of removal of such spattering shall be borne by the Contractor.

Traffic shall not be allowed to travel over the freshly applied coating until it has cured sufficiently to not be picked up by traffic.

END OF SECTION 803.

SECTION 804. ASPHALT SEAL COAT/CHIP SEAL

1. DESCRIPTION

This Section covers preparing an existing bituminous surface and then furnishing and applying an asphalt coating, followed with an application of cover aggregate when required.

2. MATERIALS

2.1 ASPHALT COATING

The asphalt coating shall meet the current requirements contained in the "Standard Specifications for Paving and Industrial Asphalts" issued by the Asphalt Institute, for the type and grade of asphalt shown on the Drawings or in these Specifications. When the asphalt type and grade is not shown on the Drawings or in these Specifications, GSB-88, or an approved equal with the specifications shown in Table 25, emulsified asphalt diluted with not more than one-part water to one-part emulsified asphalt will be acceptable.

Table 26. Asphalt Coating Requirements

Characteristic	Test Method	Requirement
Saybolt Viscosity at 77°F (25°C)	ASTM D-244	20 to 100 seconds
Residue by Distillation, or Evaporation		57% min.
Sieve test two tenths of one %)	ASTM D-244	0.2%
5-day Settlement test	ASTM D-244	5.0% max.
Particle charge (1)	ASTM D-244	Positive

2.2 COVER AGGREGATE

Cover aggregates shall be crushed slag or natural aggregates which meet requirements for quality and gradation shown below in Table 27, unless otherwise approved by the City.

Table 27. COVER AGGREGATE QUALITY AND GRADATION REQUIREMENTS

Characteristic/Sieve Size	AASHTO Test Method	Requirement
Quality		
Wear	T-96	40% maximum
Stripping	T-182	95% maximum (coated**)
Durability Index	T-210	35% minimum
One mechanically fractured face to material retained on No. 8 Sieve.		50% minimum
Gradation		
½-inch	T-11	100% passing
3/8-inch	T-11	70 100 % passing
No. 4	T-11	0-20% passing
No. 8	T-11	0-5% passing
No. 200	T-11	0-2% passing

** An approved chemical additive may be used to meet this requirement.

The aggregate shall be clean and contain less than 2 percent moisture based on dry weight.

3. CONSTRUCTION

3.1 WEATHER LIMITATIONS

Seal coats shall be applied between May 15 and August 31 and only when air and roadbed temperatures in the shade are greater than 65 degrees F. Application of seal coats shall not be made during rain, fog, dust, or other unsuitable weather. Written approval must be obtained from the Engineer/City Representative to apply the seal coating at any other time or condition.

3.2 PREPARATION

3.2.1 CLEANING

Within four hours prior to application of the asphalt coat, the receiving surface shall be broomed to remove dust and loose foreign materials. The Contractor shall provide notice of application to adjacent property owners not less than 24 hours prior to applying the coating. Appropriate measures shall be taken to provide control of foot or vehicular traffic to protect and minimize tracking of the freshly applied seal coating.

3.2.2 FLUSHING

If flushing of the surface with water is necessary for removal of dust and foreign material, the Engineer/City Representative may require flushing. When flushing is ordered, the Contractor will be authorized compensation for flushing by issuance of a Change Order.

3.3 APPLICATION

3.3.1 *ASHPALT DISTRIBUTOR*

Application of the asphalt material shall be accomplished with a distributor designed, equipped, maintained and operated so that bituminous material will be applied at an even temperature and uniform rate on variable widths of surface up to 12-feet. The distributor must be capable of controlling rates of application from 0.05 to 2.0 gallons per square yard, with uniform pressure and with a variation from the rate set not to exceed 0.02 gallon per square yard. Operable measuring equipment shall be included on the distributor which includes a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, and a thermometer for measuring temperature of the bitumen in the tank. Distributors shall be equipped with (1) a power unit for the pump; (2) full circulation spray bars that adjust laterally and vertically; and (3) a hose and nozzle attachment for applying material to areas inaccessible to the distributor spray bar.

The distributor shall be moving forward at the proper application speed when the spray bar is actuated. Junctions of spreads shall be carefully joined, without overlap, to ensure a smooth surface results after the seal coating is applied. Transverse joints shall be made by using building paper to mask off previous adjoining seal coatings. Upon completion of a joint, the building paper and coating material shall be removed and disposed of in a manner consistent with local waste disposal requirements.

Spray rates for the coating shall be as required by the Drawings or these Specifications. When no rate is specified otherwise, the Engineer/City Representative may require an application rate of 0.35 to 0.40 gallons per square yard.

3.3.2 *AGGREGATE SPREADING*

The aggregate spreader shall be specifically designed for uniformly depositing aggregate over a surface at variable controlled rates. Spreading of aggregate directly from a dump truck will not be approved. Spreading of aggregate on areas inaccessible to spreading equipment will be accomplished by hand spreading with shovels and rakes and then rolled with hand-operated rollers or compactors sufficiently to embed the aggregate.

Spreading operations shall proceed in a manner that the aggregate contacts the bituminous material before it chills, sets up, dries, or other conditions occur that may impair adhesion of the aggregate to the asphalt. The aggregate spreader shall be operated so that it is not more than 100-feet behind the asphalt distributor and so that the bituminous material will be covered with aggregate before any traffic passes over it.

Any piles or ridges of aggregate materials resulting from uneven distribution shall be removed before any rolling over the area. Initial rolling shall consist of one pass with a pneumatic-tire roller in a longitudinal direction. The amount of rolling shall be sufficient to uniformly bond the aggregate over the full width, and in no case shall be less than three complete coverages.

3.4 PROTECTION

3.4.1 ADJACENT STRUCTURES

Adjacent structures, (curbing, sidewalks, guardrails, signposts, etc.) shall be protected from being spattered or marred with sprayed asphalt by covering with suitable materials. The removal of the resulting spattering shall be made at the expense of the Contractor.

3.4.2 TRAFFIC

Controlled traffic shall not be allowed to travel over the freshly applied coating for 4 hours after it has been rolled and cured sufficiently not to be picked up by traffic. The finished surface shall be swept to remove loose aggregate particles before allowing uncontrolled traffic on it.

END OF SECTION 804.

DIVISION 900

IRRIGATION

SECTION 901 – IRRIGATION

1. DESCRIPTION

This Section contains requirements for landscape irrigation systems, including piping, valves, drip systems, quick couplers, controllers, and boxes for automatic control valves.

1.1 PERFORMANCE REQUIREMENTS

Irrigation zone control shall be automatic operation with controller and automatic control valves.

1.1.1 *DELEGATED DESIGN*

Design 100 percent coverage irrigation system, including comprehensive engineering analysis by a qualified irrigation designer who is trained and experienced in irrigation design of the size and scope of this project, using performance requirements and design criteria indicated. The Contractor shall verify site conditions.

1.1.2 *MINIMUM WORKING PRESSURES*

The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:

- Irrigation Main Piping: 200 psig.
- Circuit Piping: 150 psig.

1.2 SUBMITTALS

1.2.1 *PRODUCT DATA*

For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.2.2 *WIRING DIAGRAMS*

For power, signal, and control wiring.

1.2.3 *DELEGATED-DESIGN SUBMITTAL*

For irrigation systems indicated to comply with performance requirements and design criteria, including analysis data signed by the qualified irrigation designer responsible for their preparation.

1.2.4 *ZONING CHART*

Show each irrigation zone and its control valve.

1.2.5 *CONTROLLER TIMING SCHEDULE*

Indicate timing settings for each automatic controller zone.

1.3 QUALITY ASSURANCE

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. MATERIALS

2.1 PIPES, TUBES, AND FITTINGS

2.1.1 *PE PIPE WITH CONTROLLED ID*

- ASTM F 771 and ASTM 2239, PE 4710 compound; SDR 11.5 and SDR 15.
- Insert Fittings for PE Pipe: ASTM D 2609, nylon or propylene plastic with barbed ends. Include bands or other fasteners.

2.1.2 *PVC PIPE, PRESSURE RATED*

- ASTM D 2241, PVC 1120 compound, SDR 21.
- PVC Socket Fittings: ASTM D 2467, Schedule 40.
- PVC Socket Unions: Construction similar to MSS SP-107, except both headpiece and tailpiece shall be PVC with socket or threaded ends.

2.2 PIPING JOINING MATERIALS

2.2.1 *SOLVENT CEMENTS FOR JOINING PVC PIPING*

- ASTM D 2564.
- Include primer according to ASTM F 656.

2.2.2 *PLASTIC, PIPE-FLANGE GASKET, BOLTS, AND NUTS*

- Type and material recommended by piping system manufacturer unless otherwise indicated.

2.3 MANUAL VALVES

2.3.1 *BRONZE BALL VALVES*

- Standard: MSS SP-110.
- SWP Rating: 150 psig.
- CWP Rating: 600 psig.
- Body Design: Two piece.
- Body Material: Bronze.
- Ends: Threaded or solder joint if indicated.
- Seats: PTFE or TFE.
- Stem: Bronze.
- Ball: Chrome-plated brass.
- Port: Full.

2.3.2 PLASTIC BALL VALVES

- Standard: MSS SP-122.
- Pressure Rating: 150 psig.
- Body Material: PVC.
- Type: Union.
- End Connections: Socket or threaded.
- Port: Full.

2.4 AUTOMATIC DRAIN VALVES

Description: Spring-loaded-ball type of corrosion-resistant construction and designed to open for drainage if line pressure drops below 2-1/2 to 3 psig.

3. CONSTRUCTION REQUIREMENTS

3.1 EARTHWORK

- a) Excavating, trenching, and backfilling are specified in the City of Tetonia Public Works Standards & Technical Specifications.
- b) Install warning tape directly above pressure piping, 6-inch below finished grades, and 6-inch below subgrade under pavement and slabs.
- c) Drain Pockets: Excavate to sizes indicated. Backfill with cleaned gravel or crushed stone, graded from 3/4-inch to 3-inches, to 12-inches below grade. Cover gravel or crushed stone with sheet of asphalt-saturated felt and backfill remainder with excavated material.
- d) Provide minimum cover over top of underground piping as indicated on the Irrigation Plans and Details.

3.2 PIPING INSTALLATION

- a) Location and Arrangement: As indicated on the approved Preliminary Irrigation System Layout submittal unless deviations are approved on Coordination Drawings.
- b) Install piping at minimum uniform slope of 0.5 percent down toward drain valves.
- c) Install piping free of sags and bends.
- d) Install groups of pipes parallel to each other, spaced to permit valve servicing.
- e) Install fittings for changes in direction and branch connections.
- f) Install unions adjacent to valves and to final connections to other components with NPS 2 (DN 50) or smaller pipe connection.
- g) Install flanges adjacent to valves and to final connections to other components with NPS 2-1/2 (DN 65) or larger pipe connection.
- h) Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.
- i) Install expansion loops in control-valve boxes for plastic piping.
- j) Lay piping on solid subbase, uniformly sloped without humps or depressions.
- k) Install PVC piping in dry weather when the temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.

3.3 JOINT CONSTRUCTION

- a) Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- b) Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before

assembly.

- c) Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - i. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - ii. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- d) Flanged Joints: Select rubber gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- e) Ductile-Iron Piping Gasketed Joints: Comply with AWWA C600 and AWWA M41.
- f) PE Piping Fastener Joints: Join with insert fittings and bands or fasteners according to piping manufacturer's written instructions.
- g) PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - i. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - ii. PVC Pressure Piping: Join schedule number, ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - iii. PVC Nonpressure Piping: Join according to ASTM D 2855.

3.4 VALVE INSTALLATION

- a) Underground Curb Valves: Install in curb-valve casings with tops flush with grade.
- b) Above ground Valves: Install as components of connected piping system.
- c) Throttling Valves: Install in underground piping in boxes for automatic control valves.
- d) Drain Valves: Install in underground piping in boxes for automatic control valves.

3.5 AUTOMATIC IRRIGATION-CONTROL SYSTEM INSTALLATION

- a) Equipment Mounting: Install exterior controller on wall where indicated.
 - i. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - ii. Install anchor bolts to elevations required for proper attachment to supported equipment.
- b) Install control cable in same trench as irrigation piping and at least 2 inches below piping. Provide conductors of size not smaller than recommended by controller manufacturer.

3.6 FIELD QUALITY CONTROL

- a) Perform tests and inspections.
- b) Tests and Inspections:
 - i. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - ii. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
 - iii. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- c) Any irrigation product will be considered defective if it does not pass tests and inspections.

- d) Prepare test and inspection reports.

3.7 ADJUSTING

- a) Adjust settings of controllers.
- b) Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.
- c) Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than 1/2-inch 1/2" above, finish grade.

END OF SECTION 901.

DIVISION 1000

CONSTRUCTION SITE

MANAGEMENT

SECTION 1001. ENVIRONMENTAL CONTROL

1. DESCRIPTION

This Section includes requirements that shall be followed by the Contractor, to protect the environment. The Contractor shall also comply with any applicable additional requirements made by federal, state, or local government agencies.

2. CONSTRUCTION REQUIREMENTS

2.1 EXPLOSIVES AND BLASTING

The use of explosives on the work will not be permitted unless approved otherwise in the Contract Documents or in writing by the Engineer/City Representative.

2.2 DUST ABATEMENT

2.2.1 CONTROL MEASURES

The Contractor shall furnish all labor, equipment, water, and means required to provide effective dust control and abatement measures. Control measures shall be applied as often as necessary and wherever directed in writing by the Engineer/City Representative, to prevent construction operations from producing dust in amounts that may be damaging to property, vegetation, or animals, or detrimental to persons within reasonable proximity of the Work site.

2.2.2 HAUL ROUTES AND WORK SITES

The Contractor shall identify haul routes or material handling areas, outside of the Work site, whereon dust may be generated, and shall exercise appropriate measures to abate any dust problem caused by its operation. Such dust abatement measures shall be taken immediately when observed or when required in writing by the Engineer/City Representative.

2.3 STORM AND GROUND WATER

2.3.1 CONTROL MEASURES

The Contractor shall provide and maintain, at all times during construction, ample means and devices to promptly remove all water entering the Work, whether the water is surface or ground water. Water removed by the Contractor shall be directed into temporary sediment ponds, basins or tanks to allow for settling of debris prior to release to storm drainage infrastructure or natural streams or drainage ways.

2.3.2 DRAINAGE PATTERNS

In excavation, fill, and grading operations, the Contractor shall take care to disturb the existing drainage pattern as little as possible. Particular care shall be taken not to direct drainage water onto private property or into streets or drainage ways.

2.3.3 FORDING OF WATERWAYS

Fording of live streams or anybody of live water to accomplish the Work shall not be permitted.

Mechanized equipment also shall not be operated in live water to accomplish the Work unless authorized in writing by the Engineer/City Representative, or in the Contract Documents.

2.3.4 FILLING OF WATERWAYS

The Engineer/City Representative will not approve the filling of any ditches, washes, drainage ways, streams, wetlands, or other City surface waters by the Contractor to accomplish the Work unless specific instructions are included in the Contract Documents that provide for how the affected drainages or surface waters are to be treated.

2.4 STREET CLEANUP DURING CONSTRUCTION

The Contractor shall immediately clean all spilled dirt, gravel, and other foreign material caused by the construction operations from all streets open to public use. Streets within the project's work zone closed to public use shall be cleaned prior to weekends and prior to opening to public use.

2.5 NOISE ABATEMENT

In or near inhabited areas, the Contractor's operations shall be performed in a manner to prevent noise from becoming a nuisance or problem. Particular consideration shall be given to noise generated by repair and service activities during the night hours.

2.6 CHEMICALS

All chemicals and/or petroleum-based products used during project construction or furnished for project shall be handled, applied and disposed of in strict accordance with the printed instructions of the manufacturer, Safety Data Sheets (SDS), and regulations enforced by Federal, State and Local health authorities.

2.7 WASTE AND SURPLUS MATERIALS DISPOSAL

2.7.1 CLEAN WORK SITE

The Contractor shall keep the Work site, haul roads and other areas of use in an orderly, neat, and clean condition. The Contractor shall promptly remove all waste materials and rubbish and keep the site free from any accumulation of surplus materials. It shall be the responsibility of the Contractor, at its own expense, to remove and legally dispose of all surplus materials resulting from all Work activities performed in accordance with the Contract Documents. All directions from the City Engineer and all authorized public officials having jurisdiction over health and safety shall be obeyed.

2.7.2 SURPLUS MATERIAL

Surplus material includes, but is not limited to, salvaged materials and equipment that otherwise would have been abandoned in place, rocks too large to be used as backfill, wood and other organic or unsuitable materials, trash, rubbish, and waste products of any nature, and any other debris generated by the Work.

2.7.3 REGULATORY COMPLIANCE

Disposal of surplus materials shall be accomplished in accordance with all local codes, laws,

ordinances, and all applicable safety laws (particularly to the requirements of Part 1926 of the OSHA Safety and Health Standards for Construction) in effect at the approved disposal site. In no case shall it be acceptable for any surplus material to be disposed of in streams, marshes or wetlands.

2.7.4 APPROVAL OF DISPOSAL

The Engineer/City Representative will not approve any disposal operation, which creates an unsightly and/or unsanitary nuisance. The Contractor shall maintain disposal sites in a reasonable condition of appearance during construction. When designated and/or public disposal sites are unavailable, written approval must be obtained from the Engineer/City Representative to dispose of any surplus materials on any other site. All disposal sites are subject to approval by the Engineer/City Representative. The Contractor shall secure permission and all permits required for use of any dumpsite not previously arranged and designated by the Owner. The Contractor shall retain copies, and provide copies upon request, of all disposal permits and/or agreements obtained for the Contract Work.

2.7.5 SCHEDULED REMOVAL

The Contractor shall establish regular intervals of collection and disposal of surplus materials during construction. Stockpiling of surplus materials for later disposal will not be approved or allowed.

2.8 OPEN BURNING

Open burning of materials may be allowed only in strict accordance with all regulations in effect for the area at which the burning would be performed, and the Contractor shall obtain any necessary permits from the appropriate governing entity prior to the start of burning. The Contractor shall not allow fire to spread beyond the material intended for burning. No accumulation of residue from burning shall remain on or adjacent to the construction site, without written approval of the Engineer/City Representative.

2.9 SANITATION

2.9.1 TOILETS

The Contractor shall provide fixed or portable chemical toilets for employee use in conformance with the requirements of Part 1926 of the OSHA Standards for Construction and when public toilets are not available or within fifteen (15) minutes walking distance of the Work site.

2.9.2 COLLECTION OF WASTES

The Contractor shall be responsible for daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor shall be disposed of away from the site in accordance with all laws and regulations pertaining thereto.

2.10 HAZARDOUS MATERIAL

2.10.1 REGULATORY COMPLIANCE

Disposition of any hazardous material or toxic or hazardous waste shall be made in accordance with the requirements and regulations administered by the State agency wherein the Work site is

located.

2.10.2 ABNORMAL CONDITONS

Abnormal conditions include, but are not limited to, the following: buried barrels with liquid or solid contents; buried or above ground tanks with liquid contents; obnoxious odors; excessively hot earth; stained and discolored soils; smoke; unidentifiable powders, sludge, pellets; or any other similar condition.

2.10.3 DISCOVERY AND NOTIFICATION

If any abnormal conditions are encountered during construction, which indicate the presence of a hazardous material, toxic, or hazardous waste, the Contractor shall immediately suspend work in the area of the discovery and notify the Engineer/City Representative and treat the situation with extreme caution. The Contractor's operation in the area of discovery shall not resume until so directed by the Engineer/City Representative; however, the Contractor shall continue working in other areas of the project, unless otherwise directed by the Engineer/City Representative.

2.10.4 DISPOSAL

When it becomes necessary for the Contractor to dispose of discovered materials, the Work may be considered a change and administered in accordance with the General Conditions. Should the disposition of discovered waste material require special procedures or handling by certified personnel, the Contractor will make all such arrangements. When it becomes necessary to obtain permits for transporting or handling discovered material, the Owner will obtain the permits.

2.10.5 SPILLS AND NOTIFICATION

In the event of spills of petroleum-based products or hazardous wastes by the Contractor, the Contractor shall immediately notify the Engineer/City Representative. The Contractor shall also notify the appropriate State environmental enforcement agency, unless the spill consists of less than one (1) gallon of petroleum-based products. In no case will notification be made later than 24 hours after the discovery of the spill. In addition, written notification shall also be made within 5 calendar days of the discovery.

2.10.6 COST OF CLEANUP

All costs for cleanup and disposal of hazardous materials due to spills, inappropriate handling, or negligence of the Contractor shall be borne by the Contractor.

2.11 ENVIRONMENTAL COMPLIANCE

2.11.1 REGULATORY COMPLIANCE

The Contractor shall comply with the applicable requirements of the National Historic Preservation Act as it relates to the preservation of ALL environmental resources. Clearance for the protection of environmental resources located within the designated Work site is the responsibility of the Owner and such clearance has been obtained for the Contract, unless provided for otherwise in the Contract Documents.

2.11.2 DISCOVERY OF HISTORIC/ARCHEOLOGICAL OBJECTS

The Contractor shall observe the following:

- **DISCOVERY AND NOTIFICATION** - If a suspected or unsuspected historic, archeological, or paleontological item, feature, or site is encountered, construction operations shall be immediately stopped in the vicinity of the discovery and the Engineer/City Representative shall be notified of the nature and exact location of the findings. The Contractor shall not damage the discovered objects and shall provide written confirmation of the discovery to the Engineer/City Representative within two (2) calendar days.
- **RESTRICTION OF CONSTRUCTION** - Should operations in the vicinity of a discovery be restricted, the Engineer/City Representative will keep the Contractor informed concerning the status of the restriction. The Contractor should be aware that the time necessary for the Owner to negotiate the handling of the discovered is variable and is dependent on the nature and condition of the circumstances. It is possible that a delay of as much as three weeks in the vicinity of the discovery can be expected. The Engineer/City Representative will inform the Contractor when the restriction is terminated. Changes required to accommodate delay or Work resulting from the discovery will be authorized in accordance with the General Conditions.

2.12 OPERATIONS OUTSIDE OF THE PROJECT SITE

In the event the Contractor chooses to use any site or means of obtaining resources beyond those provided as part of the Contract, the Contractor shall retain the services of a qualified, certified environmental consultant to produce a research design or plan for obtaining any and all necessary environmental clearances for such use. The Contractor shall provide the plan to the Engineer/City Representative for review and approval, as required, following which the plan shall be implemented. The Contractor shall submit evidence of environmental clearances and compliance before commencing any activities within the extended use area. At a minimum, clearances will include those listed below. Additional clearances may be required as necessary.

2.12.1 CULTURAL RESOURCES (*Archeological and Historic*)

Clearance may require consultation with the State Historic Preservation Office.

2.12.2 THREATENED AND ENDANGERED SPECIES

Compliance may require written clearance from the U.S. Fish and Wildlife Service.

2.12.3 FLOODPLAINS

May require consultation with the Federal Emergency Management Agency (FEMA) or corresponding state agency.

2.12.4 WETLANDS AND OTHER BODIES OF WATER

May require consultation with the Army Corps of Engineer/City Representatives and/or appropriate state agency.

END OF SECTION 1001.

SECTION 1002. WATER FOR CONSTRUCTION

1. DESCRIPTION

This Section covers the water for: dust control, pre-wetting, mixing or compacting earth materials for road, site, and/or trench construction, and for other needs associated with the Work.

2. MATERIALS

Water shall be free of dirt and silt or any substances injurious to plant life. A separate supply of potable water shall be provided by the Contractor for drinking when it becomes necessary to provide water for workers.

3. CONSTRUCTION REQUIREMENTS

Water provided for construction shall be obtained from a source approved by the Engineer/City Representative and shall be sufficient to provide for the anticipated needs of the contract. A Bulk Water Permit is required for any construction water obtained from a City of Tetonia source.

Water hauling equipment shall have watertight tanks of known capacity and shall be equipped with a pressure pump and spray system with the capability of applying the whole load uniformly. The spray system shall have a positive shut-off control. The water tank shall have a minimum capacity of 1,000 U.S. Gallons, and the capacity shall be clearly marked on the tank. The Contractor may be required to verify the tank capacity. All tanks shall have an air gap at the inlet.

A water meter with a backflow preventer will be used for water dispensing, providing its measurement can be verified.

END OF SECTION 1002.

DIVISION 1100

TRAFFIC

SECTION 1101. TRAFFIC CONTROL

1. DESCRIPTION

This Section covers furnishing and maintaining all traffic control devices, flaggers, and pilot vehicles necessary for protection of the Work, the workers, and the traveling public. The requirements of this Section are not intended to supersede, but shall supplement, the provisions contained in the "Manual of Uniform Traffic Control Devices" issued by the U.S. Department of Transportation, and any other applicable state or local traffic control regulations.

1.1 SUBMITTALS

The Contractor shall provide a traffic control plan, consistent with requirements detailed in the current edition of the Manual of Uniform Traffic Control Devices (MUTCD), for City Engineer/Representative review and approval prior to closing or barricading any public streets.

1.2 DEFINITIONS

Traffic Control Devices - All temporary traffic control and warning devices required to warn traffic of, and to guide it through, construction areas as required under this Contract, including, but not limited to portable cones and barricades, signs, channeling devices, paint striping, lighting devices, flags, etc.

Flaggers - Qualified and alert persons equipped with safety warning devices who direct traffic through construction areas.

Traffic Lane - Ten (10) feet of clear street width with a safe motor vehicle speed of twenty-five (25) miles per hour.

Pilot Car - Any designated and properly marked vehicle used for leading groups of vehicular traffic through construction areas.

2. CONSTRUCTION REQUIREMENTS

2.1 COORDINATION OF WORK AND TRAFFIC CONTROL

The Contractor shall endeavor to organize its work force in such a manner as to minimize the closure of public streets and roadways and to minimize impact to commercial businesses within and surrounding the Work site. If conditions justify, the Engineer/City Representative may direct the Contractor to conduct Work in specific areas and/or to specific tasks to avoid closure or interference with traffic on public streets and roadways. Work shall not begin until all required traffic control devices are in place.

2.2 CLOSURE OF PUBLIC THOROUGHFARES

The Contractor shall not close any public street or roadway without prior approval by the Engineer/City Representative and notification of emergency service providers. When closure is necessary, and approved, the street or roadway shall only be closed to through traffic and not to local traffic. Closure may extend for one city block only, or 700 feet, whichever is less. Closure of streets and roadways shall be made with barricades meeting State and MUTCD standards. The contractor shall provide a marked detour route for any street closure. Traffic shall be kept open on streets and roadways where no detour is possible. The Contractor shall

promptly reopen streets and driveways to the public after construction work requiring their closure is completed and all safety issues have been resolved.

2.3 MAINTENANCE OF ACCESS

Local traffic shall be provided access to private properties at all times, except during necessary stages of construction when it is impractical to carry on the construction and maintain traffic simultaneously, such as for the placing of asphalt concrete pavement, placing and curing of Portland cement pavement, and deep sewer excavation which prohibits safe travel of vehicular traffic. The Contractor shall make special arrangement with affected persons prior to closing access to private properties.

No private driveway may be closed except as provided herein or unless permission is given the Contractor by the owner of the property affected.

Emergency traffic such as police, fire, and disaster units shall be provided reasonable access at all times. The Contractor shall be solely responsible for any damage which may result from failure to provide such reasonable access.

2.4 MAINTENANCE OF EXISTING SIGNS

Existing traffic signs other than stop, yield, and street name signs shall be maintained by the Contractor until such time as construction renders them obsolete. At that time the Contractor shall remove signs and posts without damage and deliver them as directed by the Engineer/City Representative.

2.5 PROTECTION OF WORK AND TRAFFIC

All obstructions and excavations, within traveled streets and roadways, shall be protected with traffic control devices meeting Idaho Transportation Department and MUTCD standards. Traffic control devices, placed within streets and roadways, shall be illuminated at night, and such illumination shall function from sunset to sunrise. Local jurisdiction may require traffic control measures greater than those of Idaho Transportation Department and MUTCD standards, in which case the Contractor shall comply with such requirements.

The Contractor shall take every precaution to protect pedestrians and vehicular traffic. Whenever the Engineer/City Representative finds traffic control conditions at the Work site to be inadequate to assure public safety or the Contractor's protective facilities to be inadequate, the Engineer/City Representative may require the Contractor to provide the additional necessary facilities or services. The Contractor shall bear the cost of the additional protection.

END OF SECTION 1101.

DIVISION 2000

MISCELLANEOUS

SECTION 2001. Left Blank Intentionally**SECTION 2002. LIGHTING****1. DESCRIPTION**

This Section covers lighting requirements for street and sidewalk lighting.

1.1 RELATED WORK

Refer to applicable City ordinances and resolutions regarding dark-sky compatible lighting.

1.2 SUBMITTALS**1.2.1 PRODUCT DATA**

For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.

2. MATERIALS

Approved materials for the pole, lamp, and base are shown in the Standard Drawings.

2.1.1 Electrical Components, Devices, and Accessories

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

3. CONSTRUCTION REQUIREMENTS

Assembly and construction shall be done in accordance with the Standard Drawings. All electrical work shall be performed by a licensed electrician. Comply with IEEE C2, "National Electrical Safety Code" and NFPA 70.

3.1 LUMINAIRE INSTALLATION

Install lamps in each luminaire. Fasten luminaire to structural supports per manufacturer's recommendations. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

3.2 POLE INSTALLATION

Raise and set poles using web fabric slings (not chain or cable).

3.2.1 Alignment

Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

3.2.2 Clearances

Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Construction Drawings:

- Fire Hydrants and Storm Drainage Piping: 60 inches
- Water, Gas, Electric, Communication, and Sewer Lines: 10 feet
- Trees: 15 feet from tree trunk.

3.2.3 Concrete Pole Foundations

Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 702.

3.2.4 Foundation-Mounted Poles:

Mount pole with leveling nuts and tighten top nuts to torque level recommended by pole manufacturer.

- Retain first subparagraph below if seismic restraint is required by local code or authorities having jurisdiction. See Evaluations.
- Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
- Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
- Install base covers unless otherwise indicated.
- Use a short piece of 1/2-inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from the interior of pole.

3.2.5 Poles and Pole Foundations Set in Concrete Paved Areas

Install poles with minimum of 6-inch wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.

3.3 CORROSION PREVENTION

3.3.1 Aluminum

Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

3.3.2 Steel Conduits

In concrete foundations, wrap conduit with 0.010-inch thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

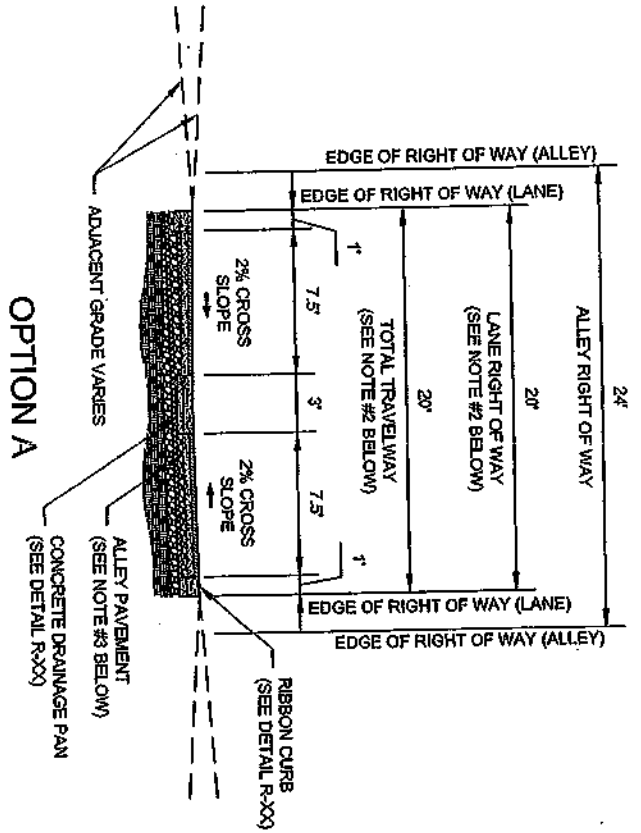
3.4 GROUNDING

Ground metal and monometallic poles and support structures.

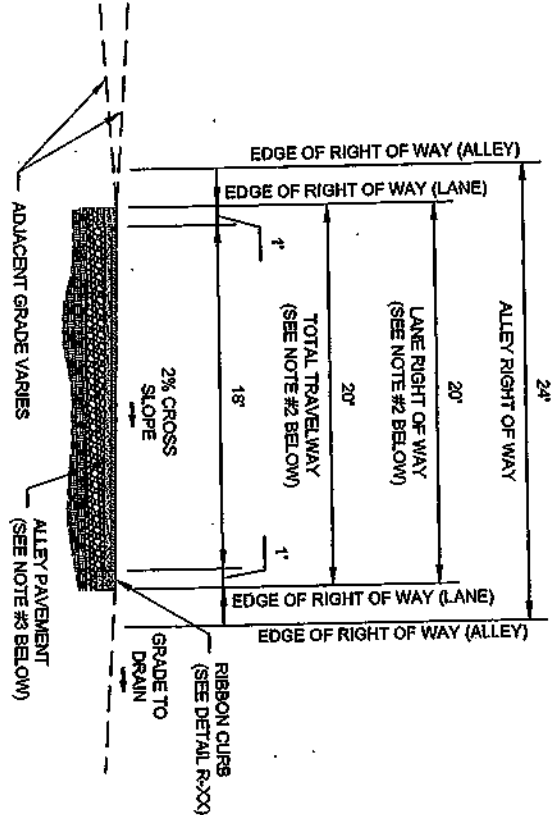
- Install grounding electrode for each pole unless otherwise indicated.
- Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- Ground metallic components of pole accessories and foundations.

END OF SECTION 2002.

STANDARD DRAWINGS



OPTION B

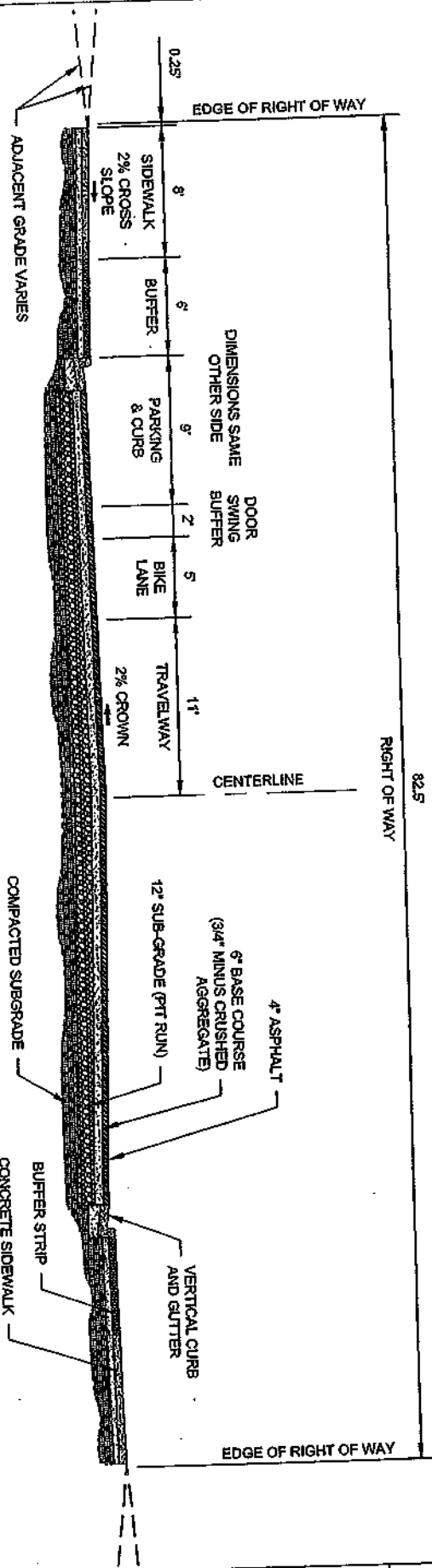


- GENERAL NOTES:**
1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONIA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST ADDITION). SEE STANDARD DETAILS FOR ADDITIONAL INFORMATION REGARDING CONSTRUCTION OF STREET IMPROVEMENTS AND PAVEMENT MARKINGS.
 2. TOTAL TRAVELWAY WIDTH AND RIGHT OF WAY WIDTH MAY BE REDUCED TO A MINIMUM OF 16' WHERE FIRE ACCESS IS NOT REQUIRED.
 3. ALLEY PAVEMENT OPTIONS SHOULD INCLUDE:
 - ASPHALT
 - CONCRETE
 - INTERLOCKING CONCRETE PAVERS (PERMEABLE)
 - GRAVEL

ALLEY / LANE

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	ALLEY



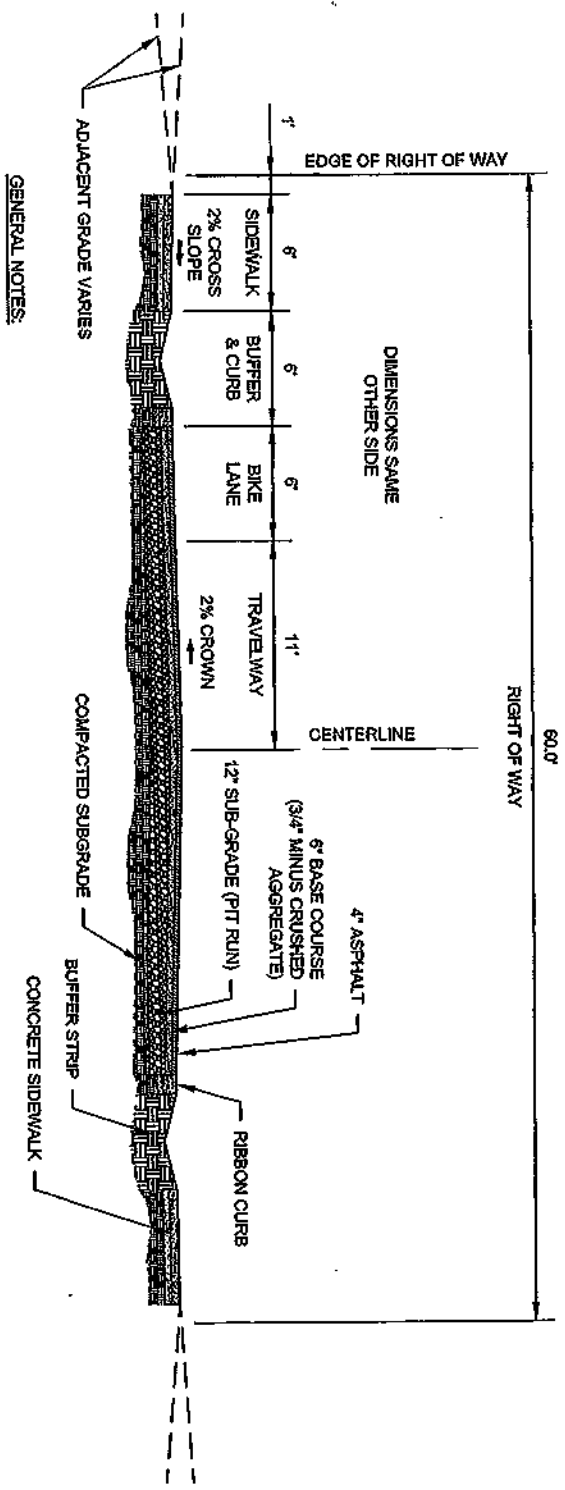
GENERAL NOTES:

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONIA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST ADDITION). SEE STANDARD DETAILS FOR ADDITIONAL INFORMATION REGARDING CONSTRUCTION OF STREET IMPROVEMENTS AND PAVEMENT MARKINGS.
2. SEE DETAIL R-08 FOR BUFFER STRIP ALTERNATIVES.

COLLECTOR COMMERCIAL 82.5' R.O.W
(PARALLEL PARKING)

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	CC-82.5



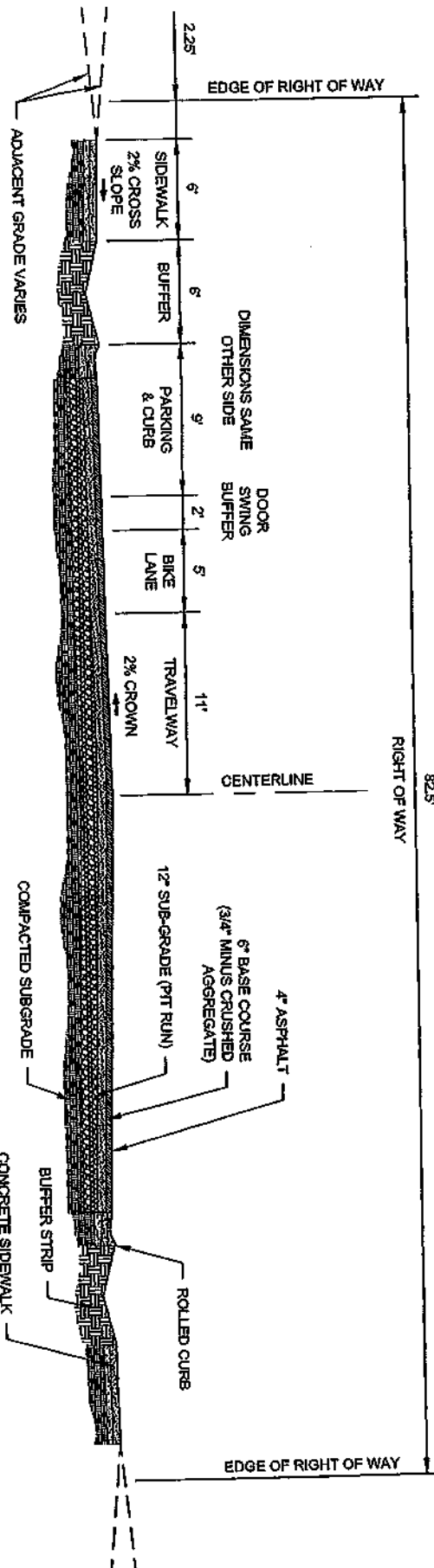
GENERAL NOTES:

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONIA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST ADDITION). SEE STANDARD DETAILS FOR ADDITIONAL INFORMATION REGARDING CONSTRUCTION OF STREET IMPROVEMENTS AND PAVEMENT MARKINGS.
2. SEE DETAIL R-08 FOR BUFFER STRIP ALTERNATIVES.
3. PATHWAY OPTION: BIKE LANES MAY BE ELIMINATED IF ONE SIDEWALK IS REPLACED WITH A 10' WIDE ASPHALT PATHWAY.

COLLECTOR RESIDENTIAL 60' R.O.W
(NO PARKING)

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	CR-60-NO PARK



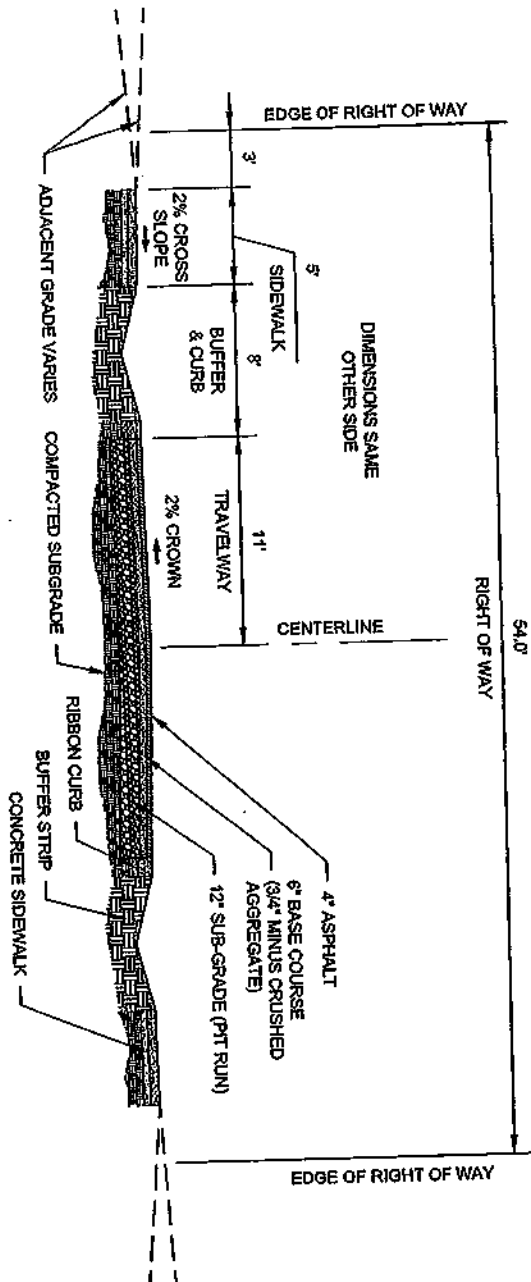
GENERAL NOTES:

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONIA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST ADDITION). SEE STANDARD DETAILS FOR ADDITIONAL INFORMATION REGARDING CONSTRUCTION OF STREET IMPROVEMENTS AND PAVEMENT MARKINGS.
2. SEE DETAIL R-408 FOR BUFFER STRIP ALTERNATIVES.
3. PATHWAY OPTION: BIKE LANES MAY BE ELIMINATED IF ONE SIDEWALK IS REPLACED WITH A 10' WIDE ASPHALT PATHWAY.

COLLECTOR RESIDENTIAL 82.5' R.O.W
(PARALLEL PARKING)

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	CR-82.5



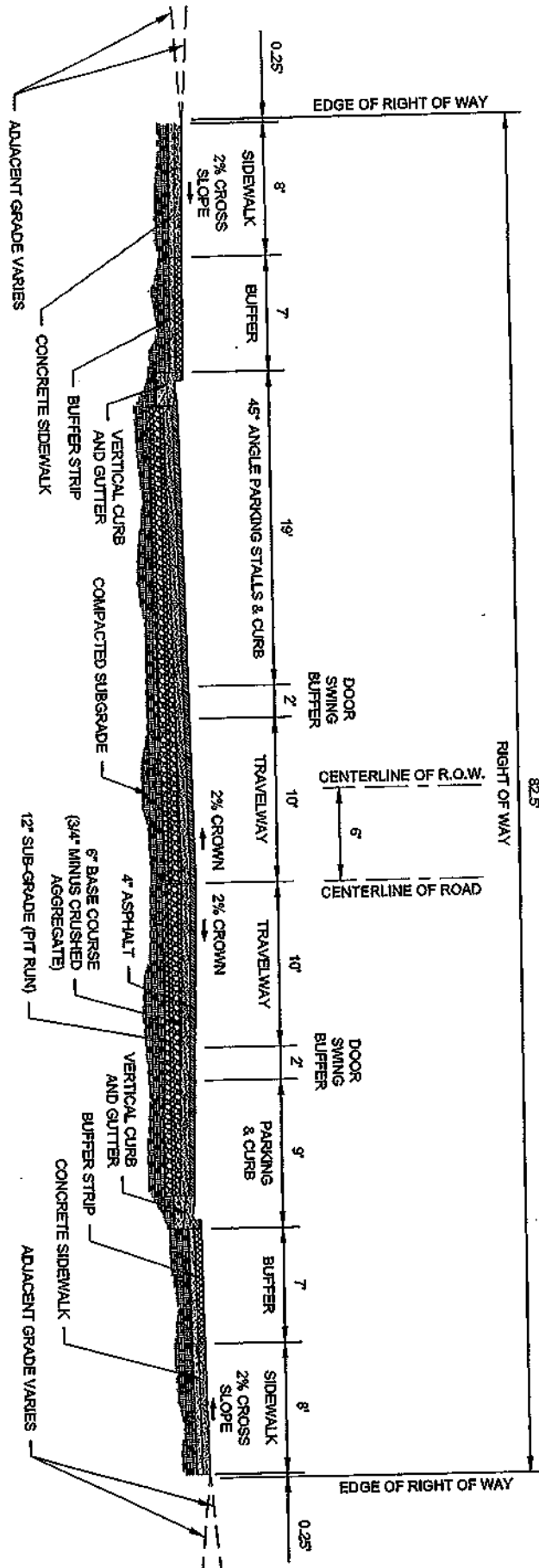
GENERAL NOTES:

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONIA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST ADDITION). SEE STANDARD DETAILS FOR ADDITIONAL INFORMATION REGARDING CONSTRUCTION OF STREET IMPROVEMENTS AND PAVEMENT MARKINGS.
2. SEE DETAIL R-08 FOR BUFFER STRIP ALTERNATIVES.

LOCAL RESIDENTIAL 54' R.O.W
(NO PARKING)

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	LR-54

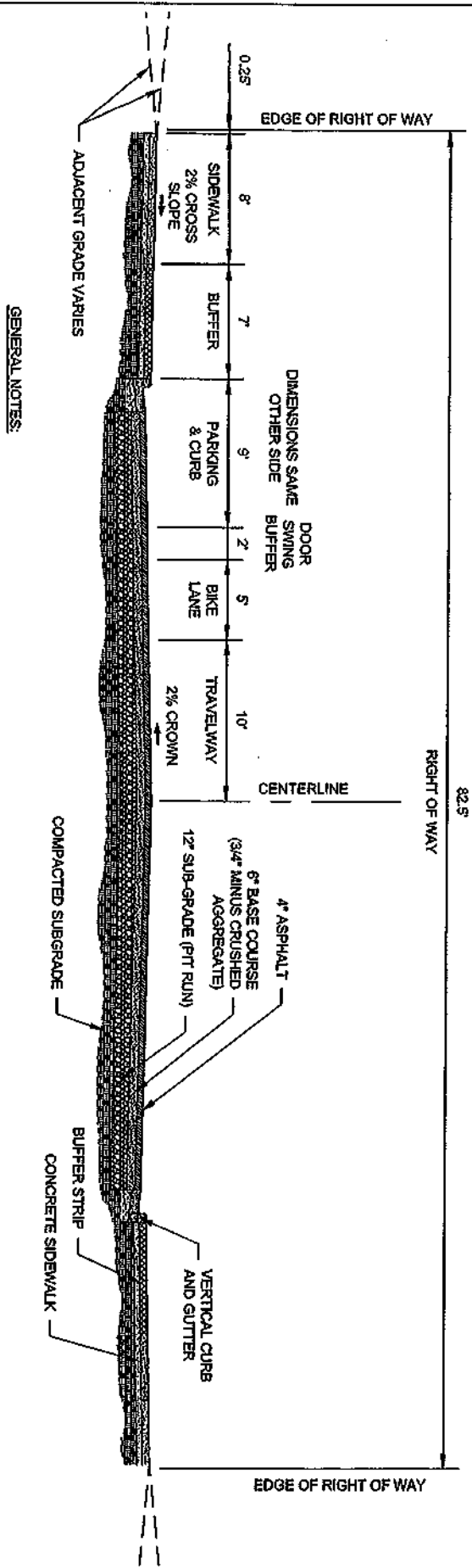


- GENERAL NOTES:**
1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST ADDITION). SEE STANDARD DETAILS FOR ADDITIONAL INFORMATION REGARDING CONSTRUCTION OF STREET IMPROVEMENTS AND PAVEMENT MARKINGS.
 2. SEE DETAIL R-08 FOR BUFFER STRIP ALTERNATIVES.

LOCAL COMMERCIAL 82.5' R.O.W
 (45° PARKING ONE SIDE, PARALLEL PARKING OTHER SIDE)

CITY OF TETONA - STANDARD DETAILS

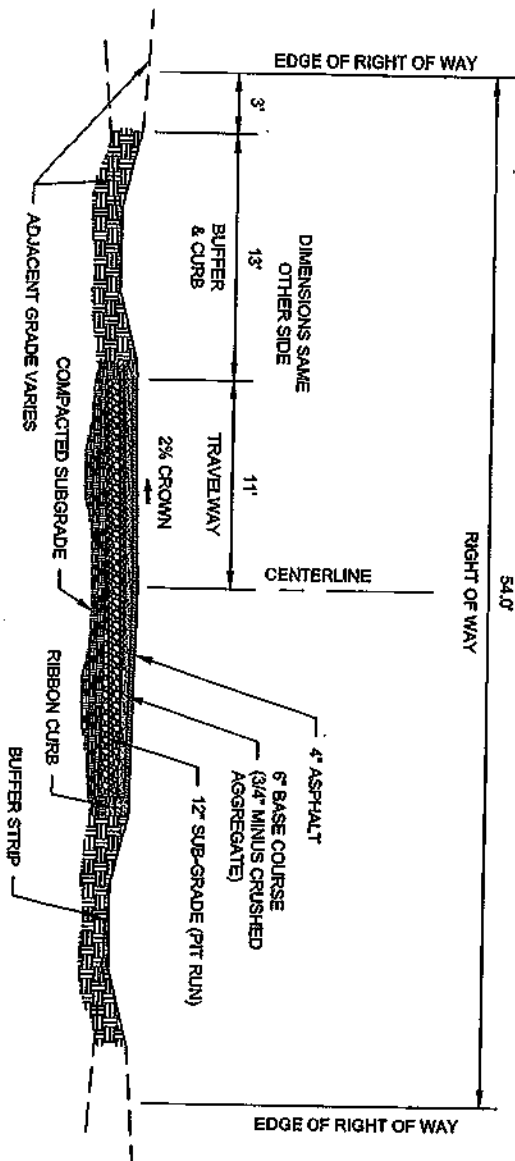
SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	LC-82.5-ANGLE



- GENERAL NOTES:**
1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONIA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST ADDITION). SEE STANDARD DETAILS FOR ADDITIONAL INFORMATION REGARDING CONSTRUCTION OF STREET IMPROVEMENTS AND PAVEMENT MARKINGS.
 2. SEE DETAIL R-08 FOR BUFFER STRIP ALTERNATIVES.

LOCAL COMMERCIAL 82.5' R.O.W
(PARALLEL PARKING)

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	LC-82.5



GENERAL NOTES:

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONIA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST ADDITION). SEE STANDARD DETAILS FOR ADDITIONAL INFORMATION REGARDING CONSTRUCTION OF STREET IMPROVEMENTS AND PAVEMENT MARKINGS.
2. SEE DETAIL R-08 FOR BUFFER STRIP ALTERNATIVES.

**LOCAL RESIDENTIAL 54' R.O.W
(RURAL-NO PARKING)**

CITY OF TETONIA - STANDARD DETAILS

SCALE:

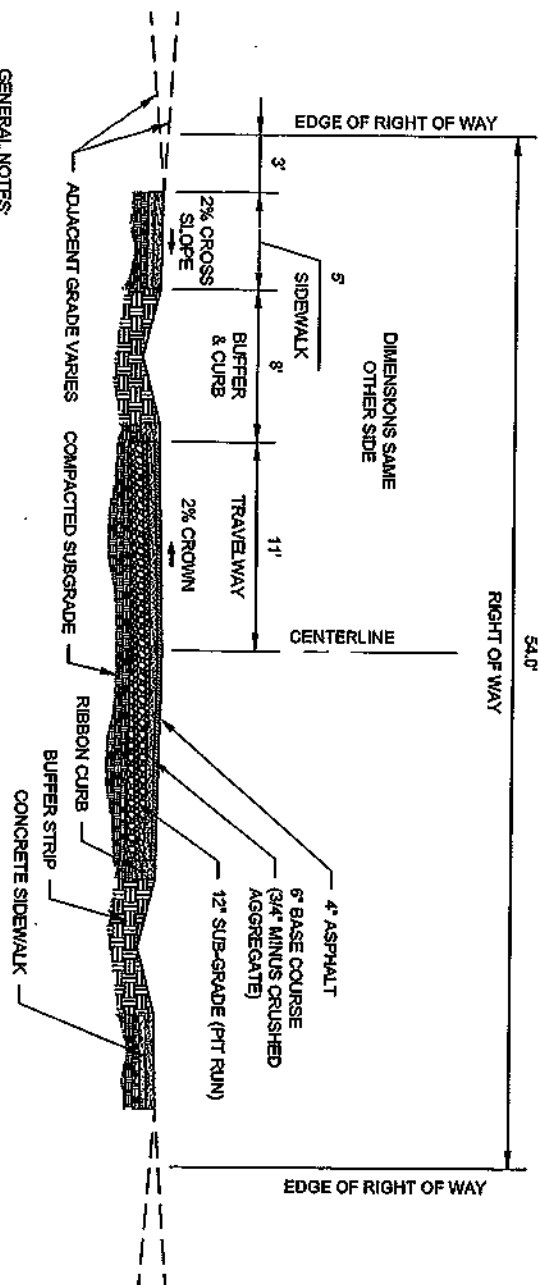
NONE

DATE:

10-01-2021

DRAWING #:

LR-54-RURAL



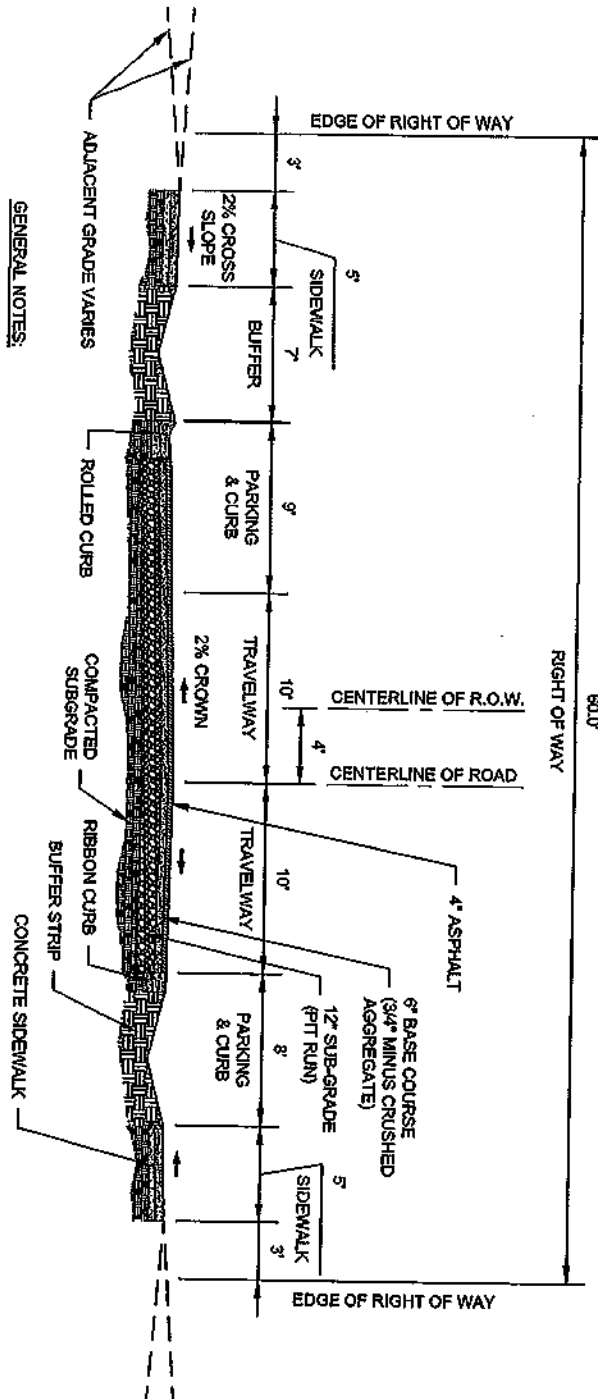
GENERAL NOTES:

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONIA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST ADDITION). SEE STANDARD DETAILS FOR ADDITIONAL INFORMATION REGARDING CONSTRUCTION OF STREET IMPROVEMENTS AND PAVEMENT MARKINGS.
2. SEE DETAIL R-08 FOR BUFFER STRIP ALTERNATIVES.

LOCAL RESIDENTIAL 54' R.O.W
(NO PARKING)

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	LR-54



GENERAL NOTES:

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST ADDITION). SEE STANDARD DETAILS FOR ADDITIONAL INFORMATION REGARDING CONSTRUCTION OF STREET IMPROVEMENTS AND PAVEMENT MARKINGS.
2. SEE DETAIL R-08 FOR BUFFER STRIP ALTERNATIVES.

LOCAL RESIDENTIAL 60' R.O.W
(PARKING ONE SIDE)

CITY OF TETONA - STANDARD DETAILS

SCALE:

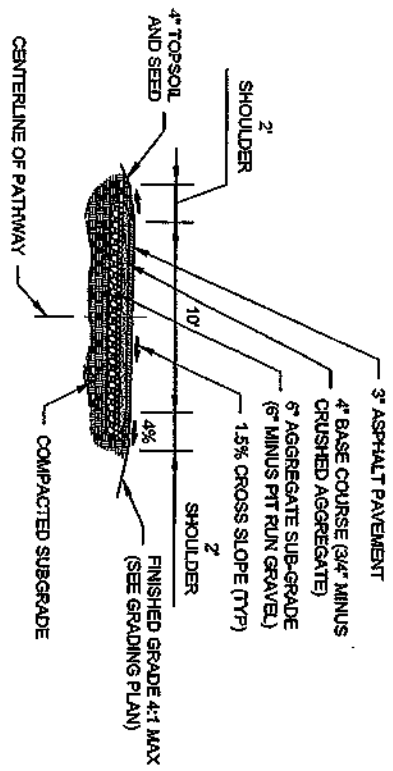
NONE

DATE:

10-01-2021

DRAWING #:

LR-60-PARK ONE

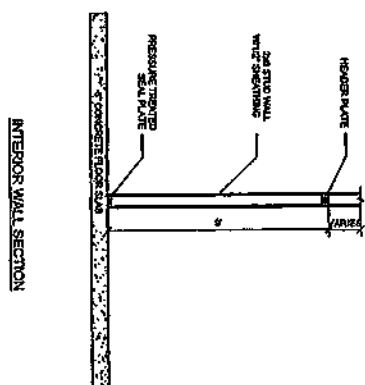
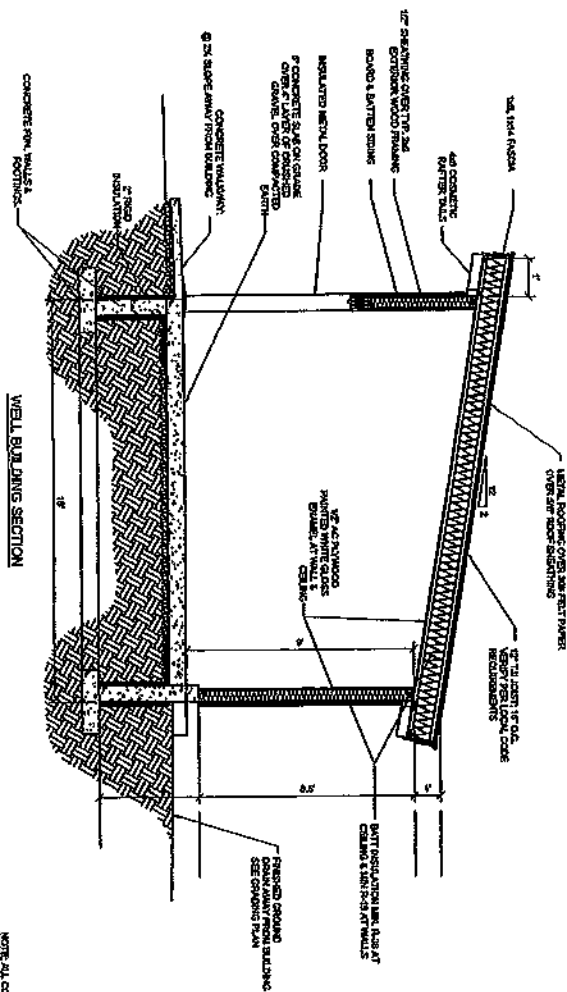
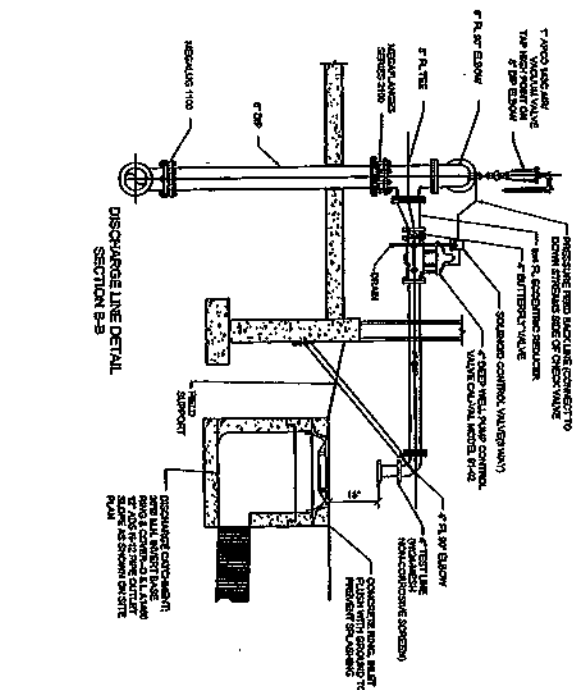


NOTES:

1. ASPHALT AGGREGATE GRADATION SHALL BE #4 PER CITY OF TETONIA PUBLIC WORKS STANDARDS (1/2" MINIMUM AGGREGATE SIZE).

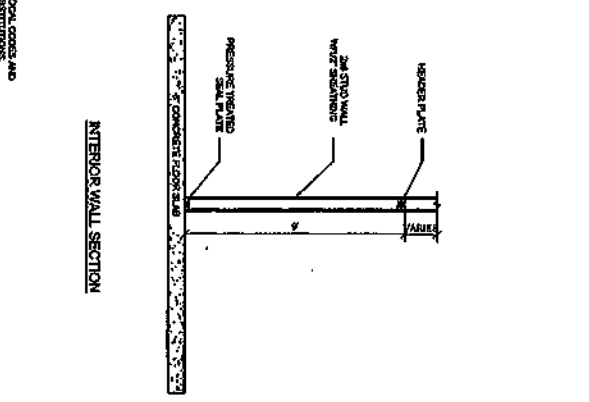
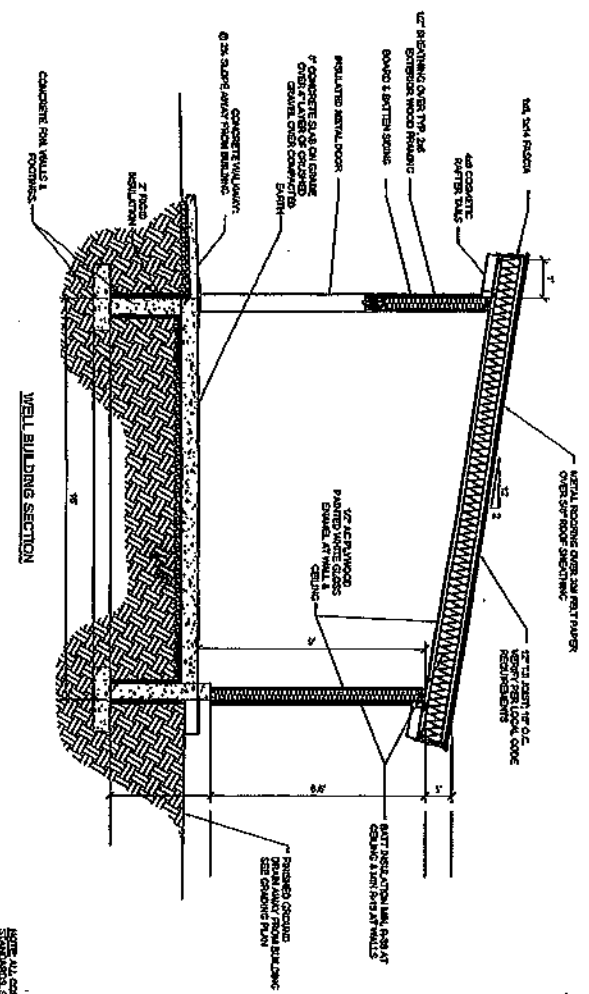
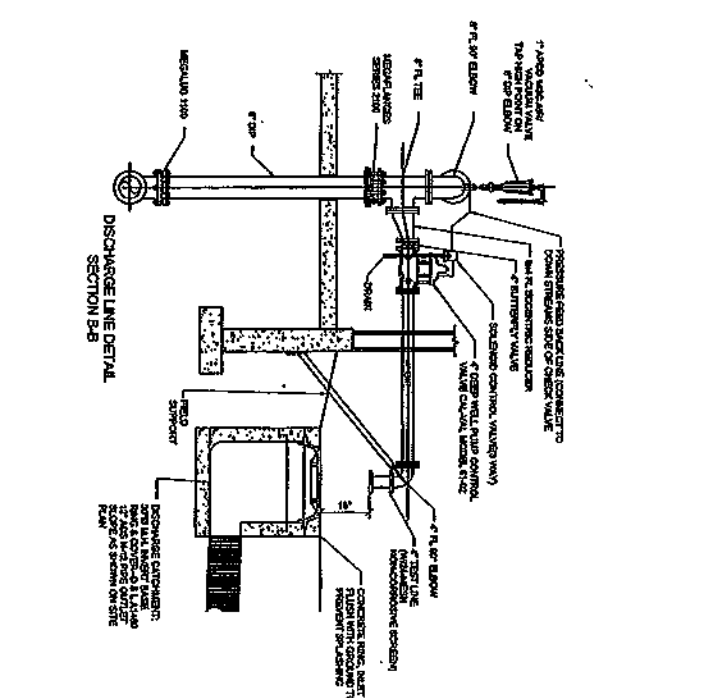
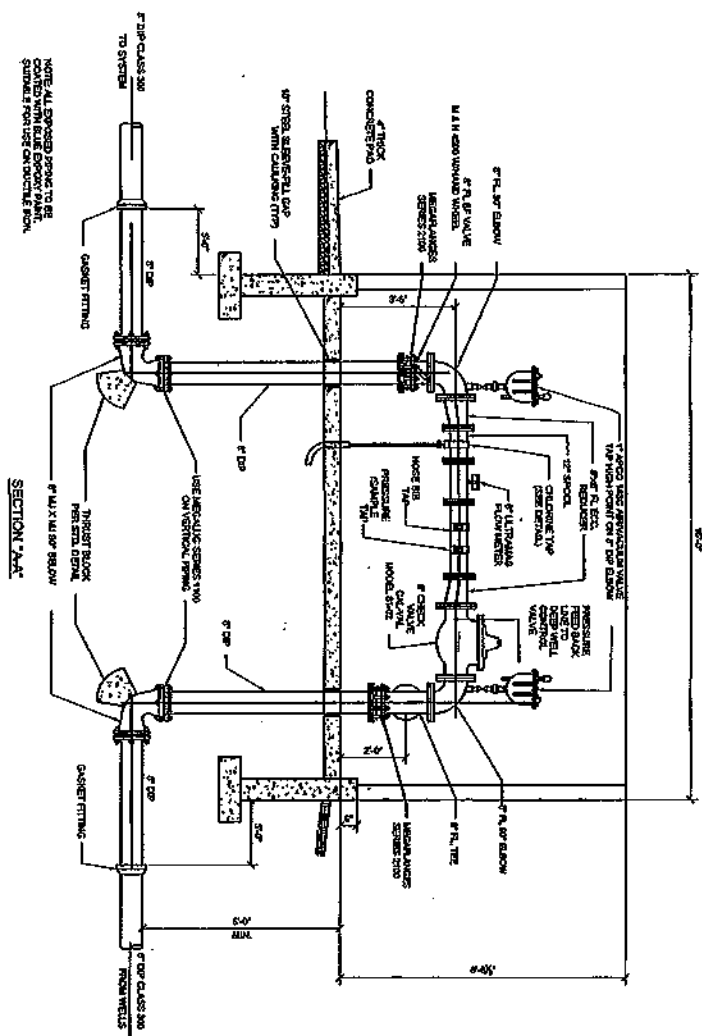
PATHWAY

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	PATHWAY

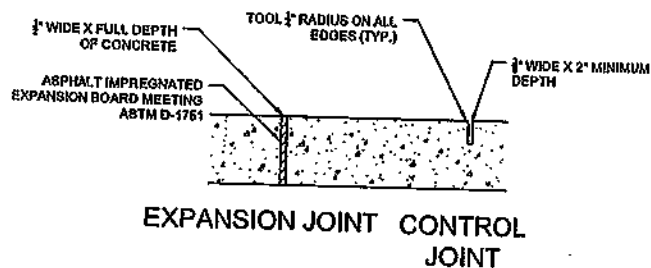
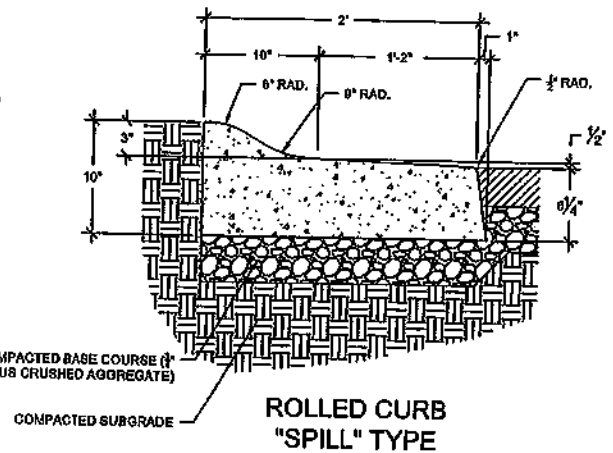
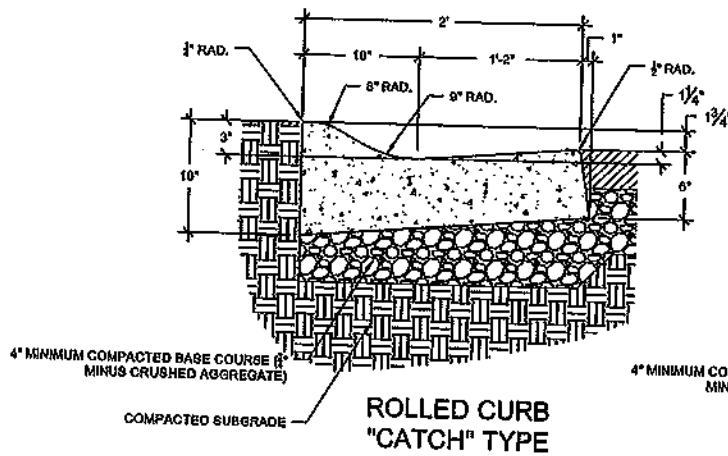
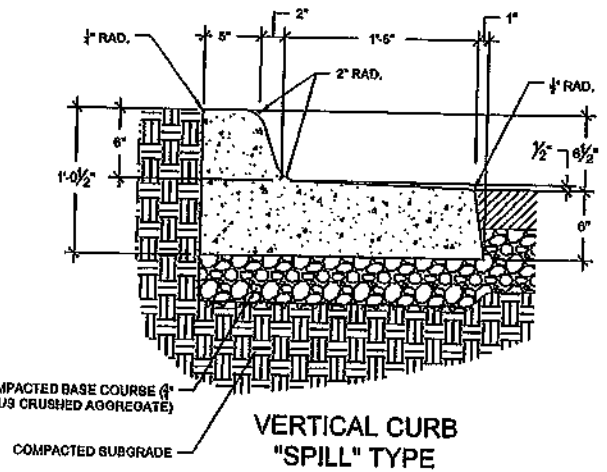
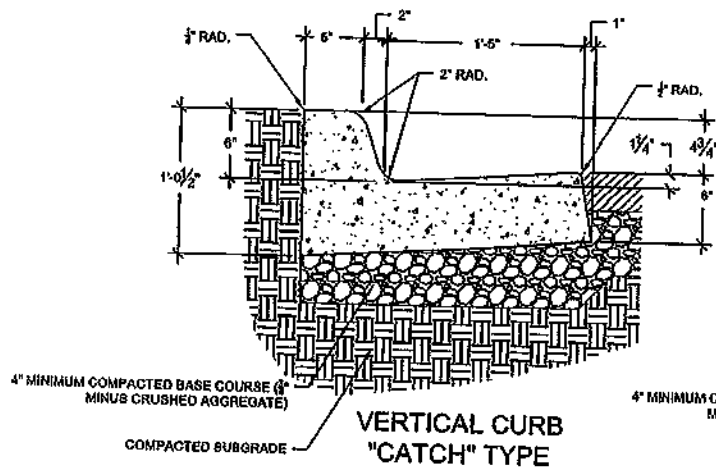


NOTE: ALL CONSTRUCTION TO BE DONE PER LOCAL CODES AND STANDARDS. SUBMITTAL NEEDED FOR ANY SUBSTITUTIONS.

SCALE:	NONE
DATE:	5-3-2016
DRAWING #:	W-10.1



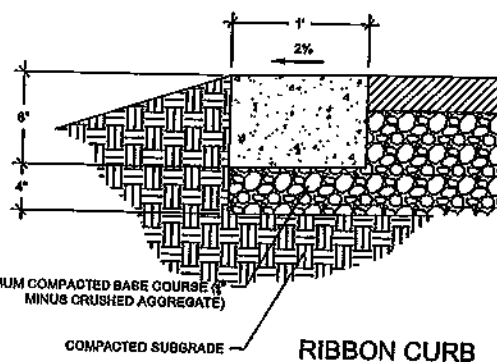
NOTE: ALL CONSTRUCTION TO BE DONE IN ACCORDANCE WITH CITY OF TETONIA STANDARD SPECIFICATIONS FOR WELL SUBSTITUTION.



CONCRETE JOINTS

NOTES:

1. INSTALL EXPANSION JOINTS AT 60' INTERVALS.
2. INSTALL CONTROL JOINTS, A MINIMUM OF 2" DEEP, AT 10' INTERVALS.



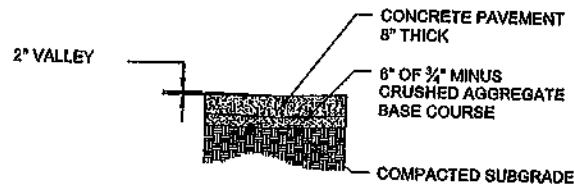
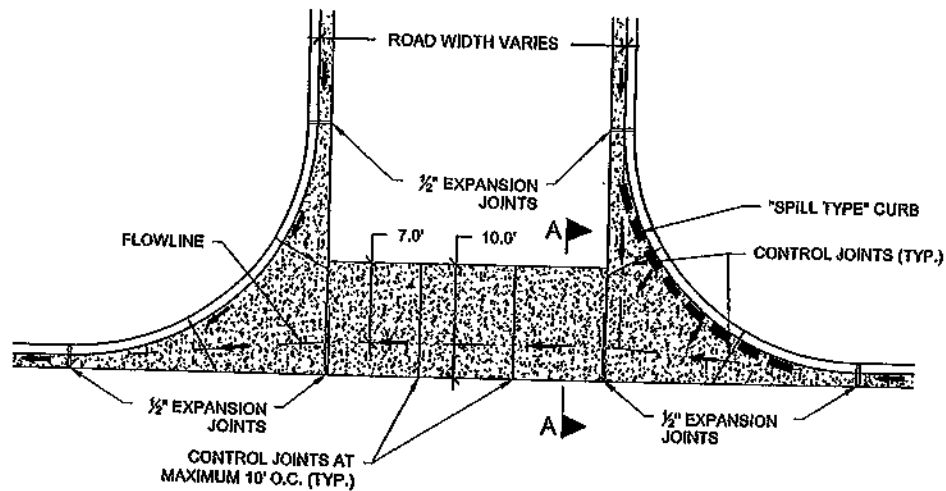
CURB AND GUTTER

CITY OF TETONIA - STANDARD DETAILS

SCALE: NONE

DATE: 10-01-2021

DRAWING #: R-01



SECTION A-A

GENERAL NOTES:

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONIA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST EDITION).
2. CONCRETE MIX COARSE AGGREGATE GRADATION SHALL BE $\frac{3}{4}$ TO #4 AS SPECIFIED IN SECTION 214, UNLESS OTHERWISE INDICATED.
3. CONCRETE SHALL BE FIBER REINFORCED CLASS 3500 AS SPECIFIED IN SECTION 214, UNLESS OTHERWISE INDICATED.
4. PROVIDE A LIGHT BROOM FINISH, PERPENDICULAR TO THE MAIN DIRECTION OF TRAVEL ON ALL CONCRETE SIDEWALKS, UNLESS OTHERWISE INDICATED.
5. TOOL $\frac{1}{4}$ " RADIUS ON ALL EXPOSED EDGES UNLESS OTHERWISE INDICATED.
6. INSTALL CONTROL JOINTS, $\frac{1}{2}$ THE DEPTH OF SLAB AT MAXIMUM 10' INTERVALS.
7. INSTALL $\frac{1}{2}$ " EXPANSION JOINTS AT MAXIMUM 60' INTERVALS.

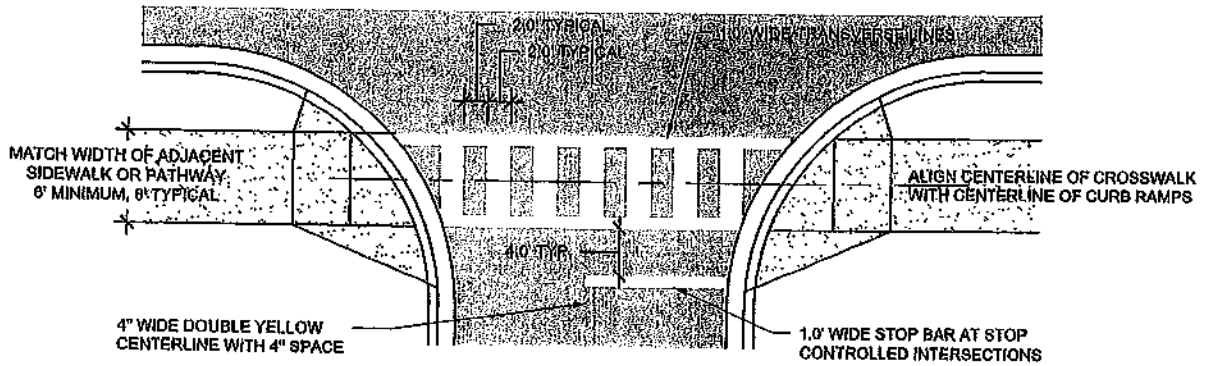
CONCRETE CROSS PAN / VALLEY GUTTER

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	R-02



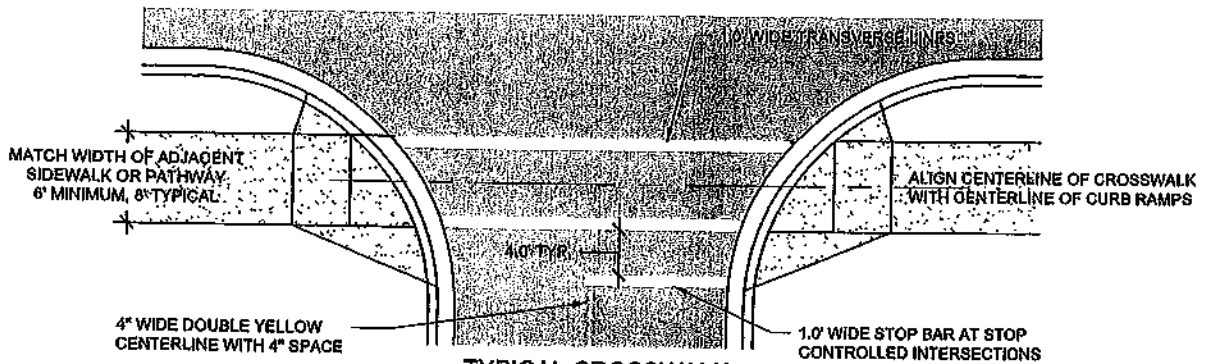
1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CITY OF TETONIA PUBLIC WORKS STANDARDS & TECHNICAL SPECIFICATIONS (LATEST EDITION).
2. CONCRETE MIX COARSE AGGREGATE GRADATION SHALL BE ¾ TO #4 AS SPECIFIED IN SECTION 214, UNLESS OTHERWISE INDICATED.
3. CONCRETE SHALL BE CLASS 3500 AS SPECIFIED IN SECTION 214, UNLESS OTHERWISE INDICATED.
4. PROVIDE A LIGHT BROOM FINISH, PERPENDICULAR TO THE MAIN DIRECTION OF TRAVEL ON ALL CONCRETE SIDEWALKS, UNLESS OTHERWISE INDICATED.
5. TOOL ¼" RADIUS ON ALL EXPOSED EDGES UNLESS OTHERWISE INDICATED.
6. PEDESTRIAN RAMPS SHALL CONFORM TO ALL APPLICABLE ADA STANDARD REQUIREMENTS.
7. DETECTABLE WARNING STRIPS SHALL BE YELLOW, REPLACEABLE, CAST IN PLACE, UV RESISTANT, COMPOSITE TILES WITH TRUNCATED DOMES IN COMPLIANCE WITH ALL ADA REQUIREMENTS.

CITY OF TETONIA - STANDARD DETAILS



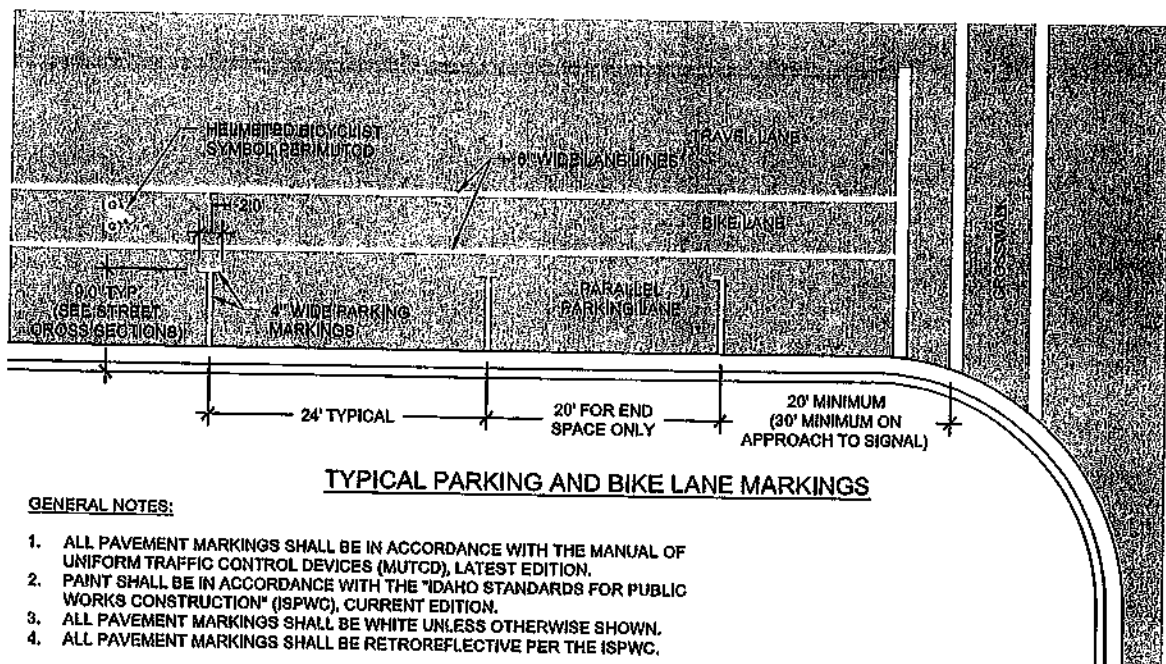
CROSSWALK "LADDER TYPE"

TO BE USED AT CROSSINGS ALONG SCHOOL ROUTES, AT MULTI-USE PATHWAYS, AND AT MID-BLOCK CROSSINGS



TYPICAL CROSSWALK

TO BE USED AT ALL OTHER CROSSINGS



TYPICAL PARKING AND BIKE LANE MARKINGS

GENERAL NOTES:

1. ALL PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD), LATEST EDITION.
2. PAINT SHALL BE IN ACCORDANCE WITH THE "IDAHO STANDARDS FOR PUBLIC WORKS CONSTRUCTION" (ISPMC), CURRENT EDITION.
3. ALL PAVEMENT MARKINGS SHALL BE WHITE UNLESS OTHERWISE SHOWN.
4. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE PER THE ISPMC.

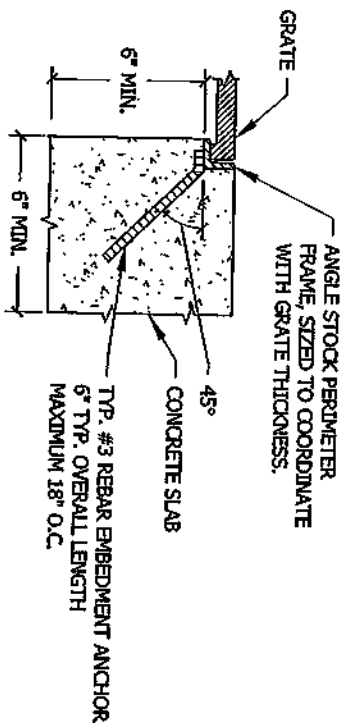
TYPICAL PAVEMENT MARKINGS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	R-04

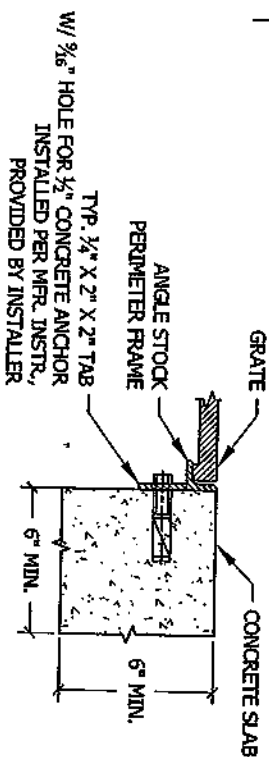
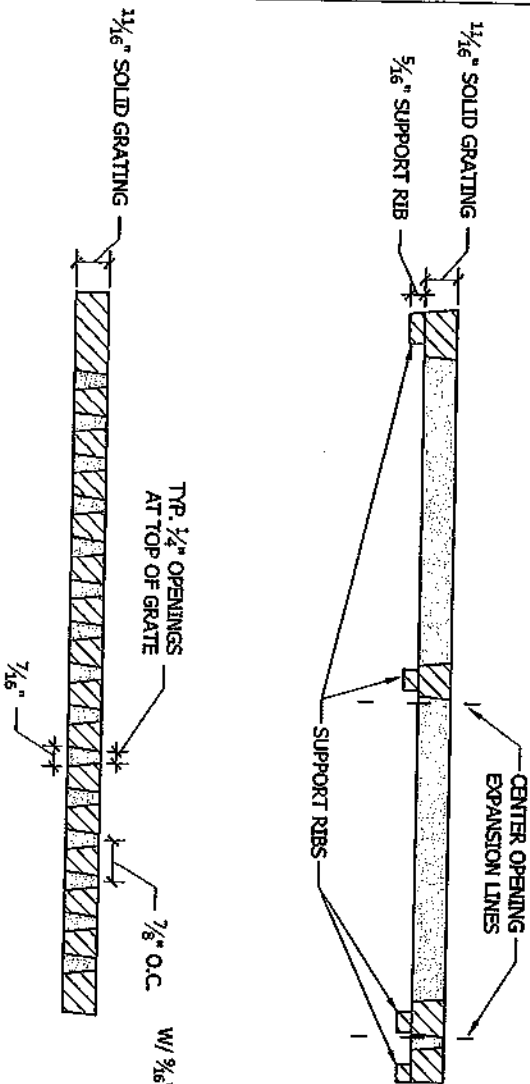
CITY OF TETONIA - STANDARD DETAILS

FRAME TYPE / SPECIFICATION:
MILD STEEL ASTM A36
FINISH: NATURAL. PAINTING OF RAW IRON
LOAD CLASSIFICATION: PEDESTRIAN

TYPICAL $\frac{1}{2}$ " HORIZONTAL GAP BETWEEN GRATE
AND FRAME. ALL VISIBLE WELDS TO BE
GROUND SMOOTH ON OUTSIDE EDGES.
FRAMES SHALL BE TRUE TO SQUARE. TOP OF
GRATE TO BE FLUSH WITH GRADE OF
SURROUNDING TOPPING MATERIAL (PAVER,
CONCRETE SLAB, ETC.)



TYPE "S" STANDARD FRAME



TYPE "R" RETROFIT FRAME

TREE GRATE & FRAME

CITY OF TETONIA - STANDARD DETAILS

SCALE:

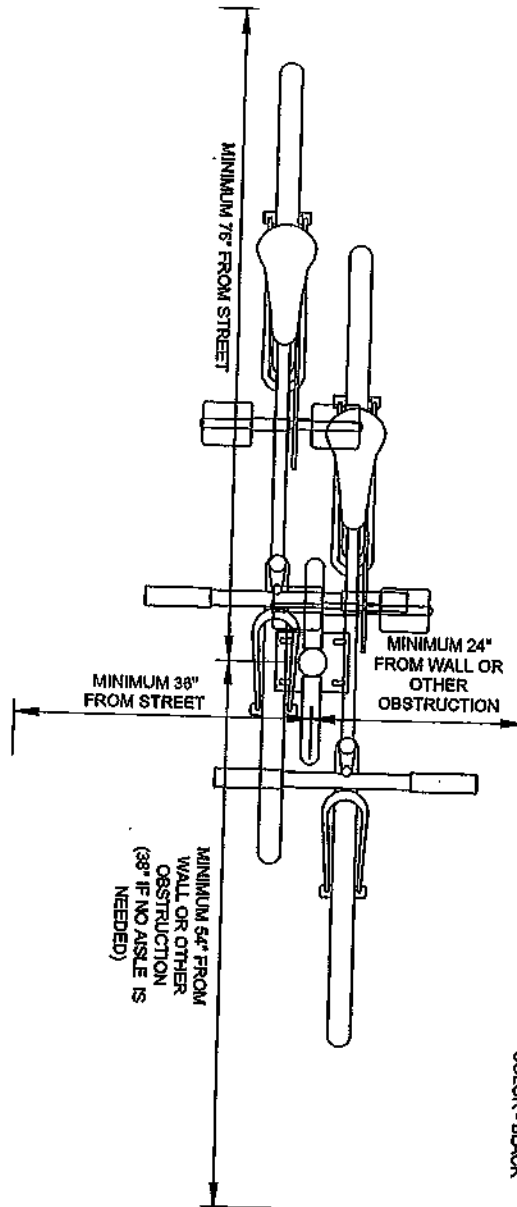
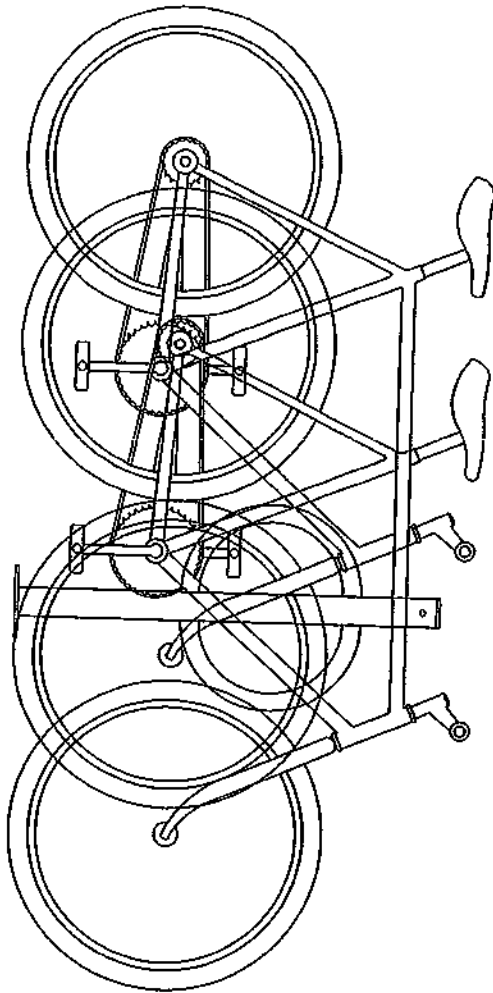
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DATE:

10-01-2021

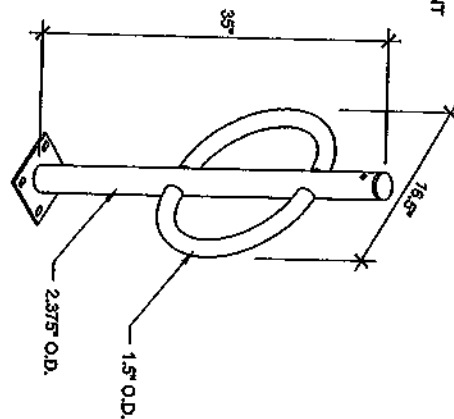
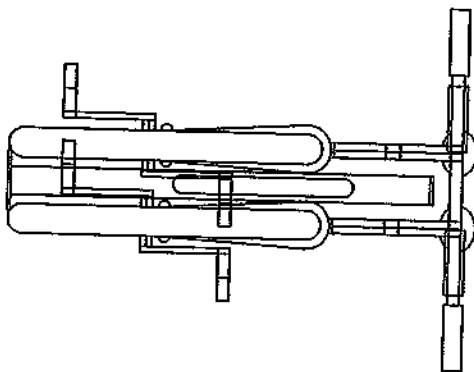
DRAWING #:

R-05



MANUFACTURER:
 DEPO BIKE RACKS CO.
 MINNEAPOLIS, MN 55406
 1-800-881-0298

MODEL / SPECIFICATION:
 MODEL - BIKE HITCH
 MOUNTING - SURFACE MOUNT
 FINISH - POWDER COAT
 COLOR - BLACK



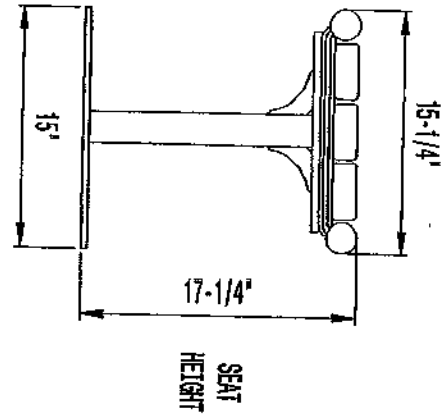
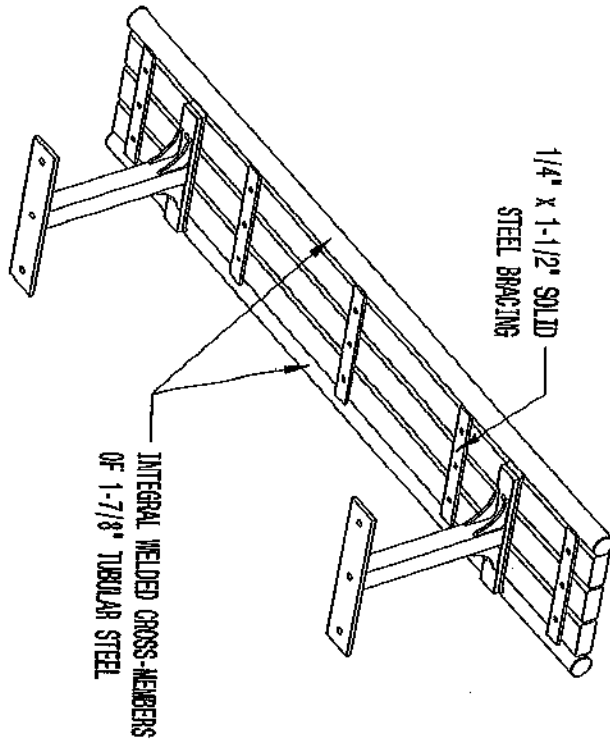
BIKE RACK

CITY OF TETONIA - STANDARD DETAILS

SCALE: NONE

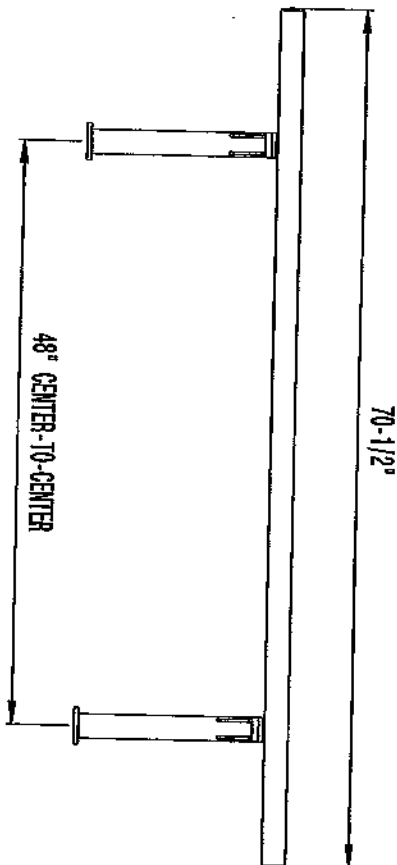
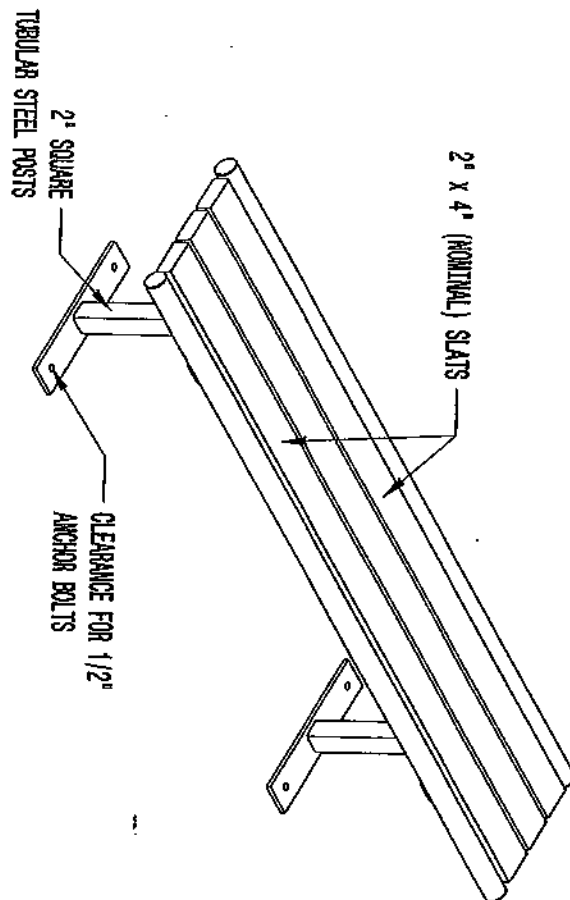
DATE: 10-01-2021

DRAWING #: R-06

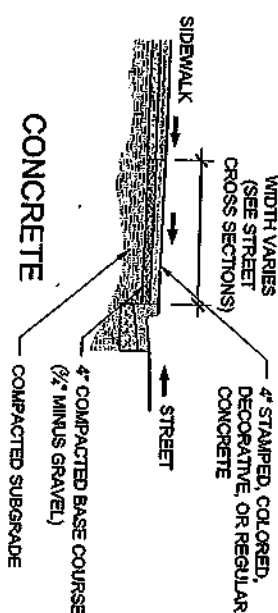
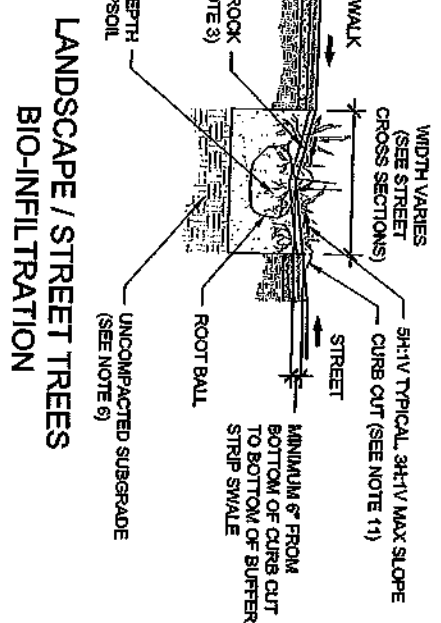
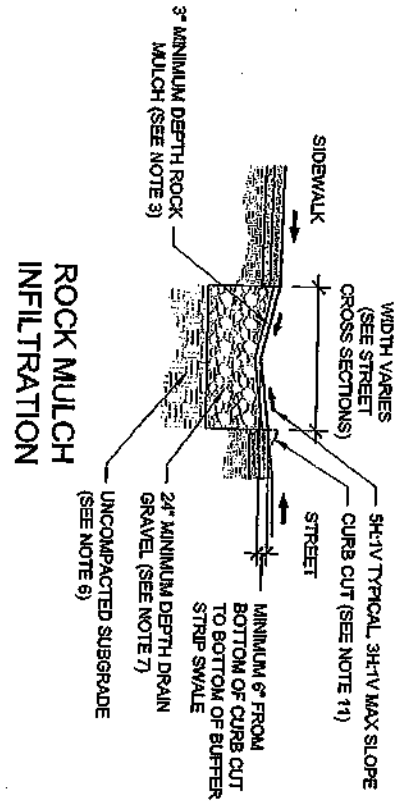


MANUFACTURER:
VICTOR STANLEY, INC.
P.O. DRAWER 320
DUNKIRK, MD 20754
1-800-368-2573

MODEL / SPECIFICATION:
MODEL - GREENSITE SERIES CM-S3
MOUNTING - SURFACE MOUNT
FRAME - POWDER COAT
SLATS - CHERRY PLASTIC
LENGTH - 6'
OPTIONS - NO BACK



BENCH

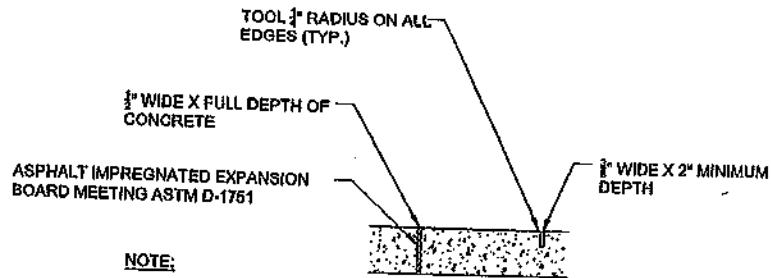


GENERAL NOTES:

1. BUFFER STRIPS ARE INTENDED TO PROVIDE SNOW STORAGE, DRAINAGE INFILTRATION, A SEPARATION BETWEEN PEDESTRIANS AND VEHICULAR TRAFFIC, AND AN AESTHETIC FEATURE IN THE STREETSCAPE.
2. IN COMMERCIAL AREAS, LANDSCAPING, TREE GRATES, OR CONCRETE MAY BE USED IN THE BUFFER STRIP. IN RESIDENTIAL AREAS, LANDSCAPING OR ROCK MULCH MAY BE USED.
3. ROCK MULCH MAY BE CRUSHED NATURAL STONE, RIVER ROCK, LAVA ROCK, OR PEA GRAVEL, AND SHALL CONSIST OF MATERIAL GRADED NO SMALLER THAN 1/2" IN DIAMETER (NO FINES). THE MATERIAL SHALL BE FREE DRAINING TO THE SUBSURFACE BELOW. ROCK MULCH MAY BE TREATED WITH A POLYMER BINDER TO FIX THE MATERIAL IN PLACE.
4. LANDSCAPING MAY INCLUDE SOIL, FESCUE, AND PERENNIALS. NATIVE PLANTS ARE PREFERRED AND ALL LANDSCAPING SHOULD BE LOW GROWING. LOW GROWING PLANT MATERIALS SHALL BE OF A HEIGHT THAT DOES NOT INTERFERE WITH SIGHT LINES AT INTERSECTIONS AND OTHER ACCESSSES. IN NO CASE SHALL PLANTS EXCEED 18" IN HEIGHT. TREES SHOULD BE SELECTED FROM THE RECOMMENDED TREES LIST.
5. MAXIMUM CROSS SLOPE OF BUFFER STRIP SHALL BE 1:12 (8%) WHERE THERE IS A PARKING LANE, OTHERWISE 4:1.
6. UNLESS OTHERWISE SPECIFIED, SEED ALL LANDSCAPE INFILTRATION AREAS WITH LOW GROWING, DROUGHT TOLERANT GRASS SEED MIX.
7. PROVIDE AN AUTOMATIC IRRIGATION SYSTEM FOR ALL PLANT MATERIALS.
8. PROVIDE A 2% SLOPE 48" PVC SLEEVE, 12" DEEP, UNDER ALL DRIVEWAYS AND OTHER PAVEMENTS CROSSING THE PLANTING/INFILTRATION STRIP FOR FUTURE IRRIGATION PIPING.
9. PROVIDE CURB CUTS IN CURB AT LOW POINTS AND AT 100' MAXIMUM INTERVALS TO FACILITATE DRAINAGE FLOW INTO BUFFER STRIP WHERE REQUIRED.
10. INCLUDE SLEEVES AT EACH LOT FOR IRRIGATION.
11. STAMPED AND COLORED DECORATIVE CONCRETE SHALL BE DAVIS COLORS BRICK RED 160 WITH A RUNNING BOND PATTERN (BRICK FOR F44-5100 S/O RUNNING BOND USED BRICK).

BUFFER STRIP ALTERNATIVES

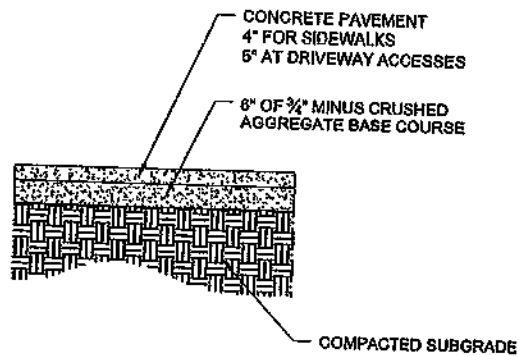
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DATE:	10-01-2021
DRAWING #:	R-08



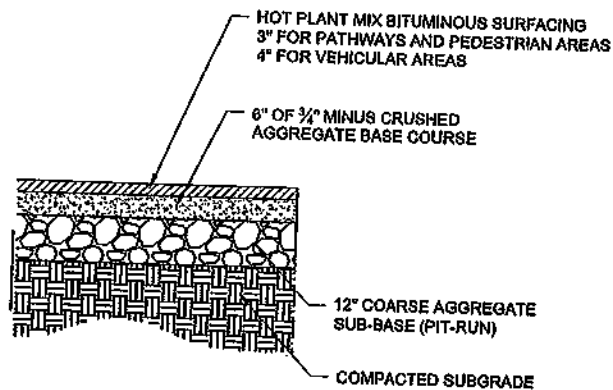
NOTE:

1. SEALANTS ARE REQUIRED ON ALL SIDEWALK JOINTS.

TYPICAL CONCRETE JOINTS



TYPICAL CONCRETE PAVEMENT



TYPICAL ASPHALT PAVEMENT

GENERAL NOTES:

1. IN AREAS OF CUT, SCARIFY EXISTING SUBGRADE TO A MINIMUM DEPTH OF 6" AND RECOMPACT TO 95% MAXIMUM DENSITY AS DETERMINED BY ASTM 698 (AASHTO T-99). IN AREAS OF FILL, PLACE SUITABLE FILL AND COMPACT IN LAYERS NOT TO EXCEED 6" UNTIL THE ELEVATION OF THE PROPOSED SUBGRADE IS REACHED.
2. IF UNSUITABLE MATERIAL IS ENCOUNTERED AT THE SUBGRADE, REMOVE UNSUITABLE MATERIAL TO A MINIMUM DEPTH OF 12" AND REPLACE WITH COARSE AGGREGATE. GEOTECHNICAL ENGINEERING AND PAVEMENT DESIGN MAY BE REQUIRED.
3. SEALANT OVER JOINTS IS REQUIRED AT SIDEWALKS.

PAVEMENT SECTIONS

CITY OF TETONIA - STANDARD DETAILS

SCALE: NONE

DATE: 10-01-2021

DRAWING #: R-09



STREET LIGHT (MAIN STREET ONLY)	SCALE:	NONE
	DATE:	10-01-2021
	DRAWING #:	R-12
CITY OF TETONIA - STANDARD DETAILS		

POLE:

Eurotique Cast Aluminum Extruded Post by Antique Street Lamps
(PX RH18 16 S5 LAB 4-3/8T11 ASL-37746 ANDG)

- One piece all aluminum construction with a two piece base cover.
- The poles shall have a straight shaft with integral anchor base plate.
- Shaft Style: S5 6" diameter smooth, .25 wall
- Anchorage: Anchor Bolt
- Tension: 4-3/8" x 11" Tall Tension
- Finish: Antique Dark Green
- Base EPA: .47
- Base Weight: 10
- The poles shall be extruded aluminum with cast aluminum anchor plate, base cover and handhole cover.
- Anchor bolts to be completely hot dip galvanized.

Arm / Mounting Bracket:

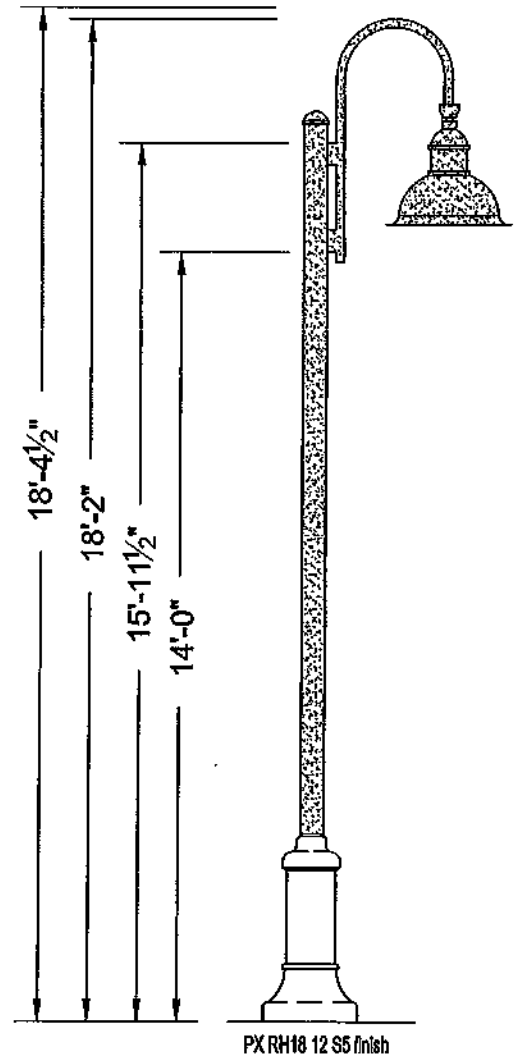
Eurotique Large Pendant Arm by Antique Street Lamps
(EAJ5/1 ANDG)

- The arms shall be one-piece construction
- All hardware shall be stainless steel.
- Arms shall have 1.5 inch NPT swivel nipples for luminaire mounting
- Prefix: Eurotique 5" Type J Arm 1@80
- Receptacle: FGIUS-S (Height Mounted 18'-6")
- Photocontrol: None
- Finish: Antique Dark Green
- Arm EPA: 1.92
- Arm Weight: 10

FIXTURE:

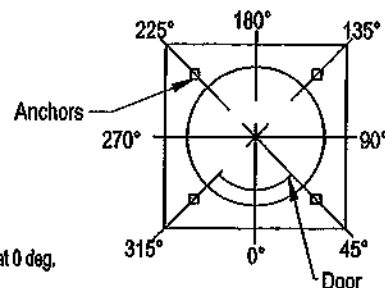
Eurotique Hanover Pendant by Antique Street Lamps
(EHL22 FT 49LED 525MA 3K GCF Mvolt R3 1DS ANDG)

- Driver housing and skirt with an internal light engine
- Stainless steel hardware
- Driver and Light engine assembly mount on a removable assembly plate and furnished with quick disconnect plugs
- CSA listed and labeled
- TGIC powder coat finish
- Prefix: EHL22 LED
- Base: Fluted Ballast Housing
- Source and Wattage: 49LED 525MA
- Color Temp: 3K CCT
- Lens Option: Glass, Clear Flat (Standard)
- Voltage: Mvolt (120-277V)
- Distribution: Type III
- Fuse: None
- Surge Protection Device: None
- Decorative Shield: Decorative Shield
- Finish: Antique Dark Green
- Luminaire: EPA: 1.88
- Luminaire Weight: 80



Anchorage/Orientation Plan

SEE "IDAHO STANDARDS FOR PUBLIC WORKS CONSTRUCTION" DIVISION 1100, LATEST EDITION FOR LIGHT POLE FOUNDATION AND ADDITIONAL REQUIREMENTS.



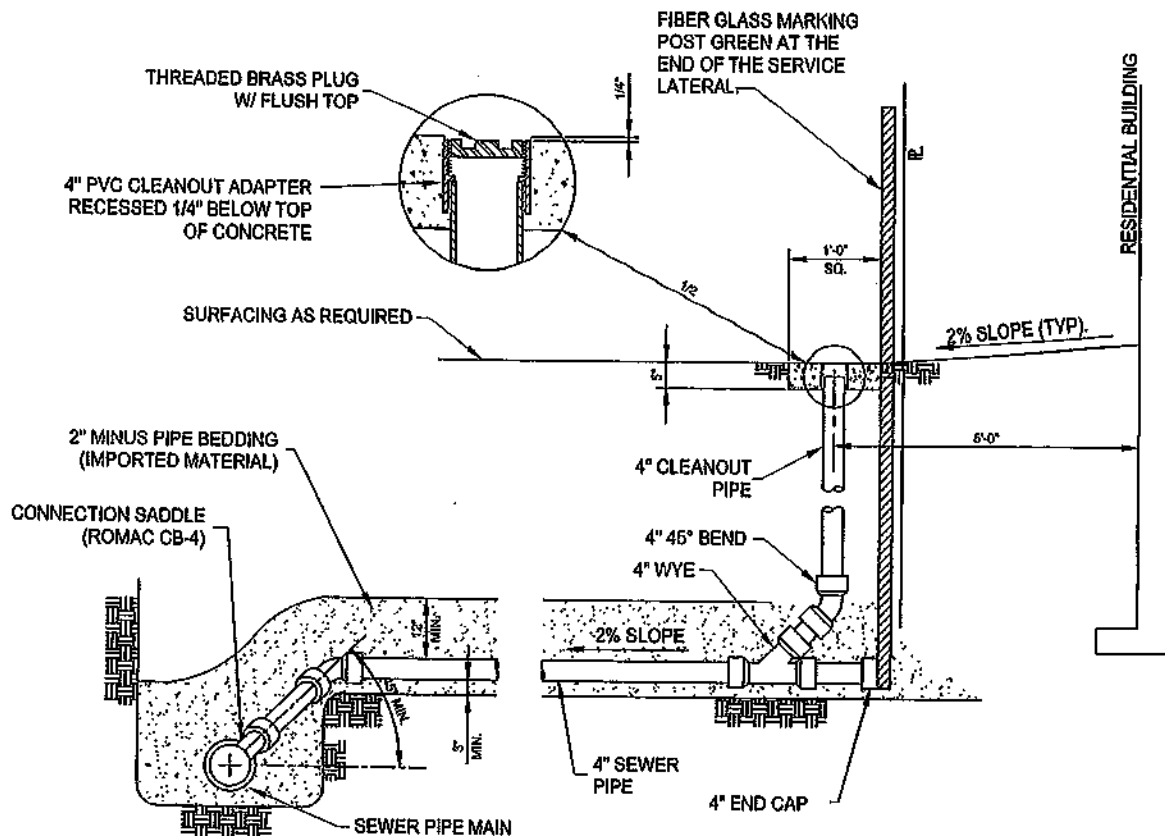
STANDARD STREET LIGHT (NON MAIN STREET)

SCALE: NONE

DATE: 10-01-2021

DRAWING #: R-11

CITY OF TETONIA - STANDARD DETAILS



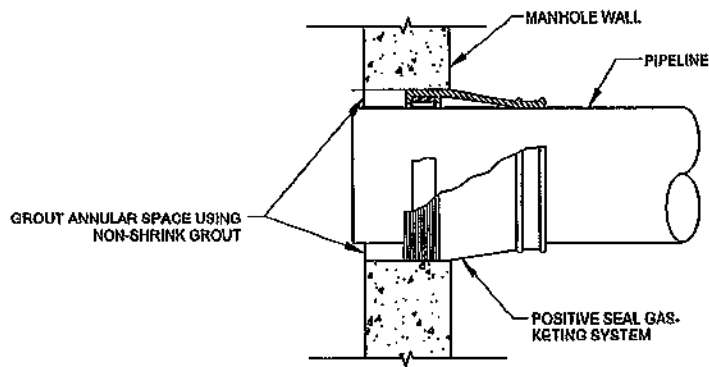
CONSTRUCTION NOTES:

1. WHEN A PRE-MANUFACTURED TAP OR TEE IS USED, THE CONNECTION SHALL BE LOCATED WITHIN THE LIMITS OF SERVICE CONNECTION SHOWN ON THESE DRAWINGS.
2. CLEANOUTS SHALL BE 6'-0" FROM FOUNDATION, CLEAR OF STRUCTURES, AND LOCATED EVERY 100' OF SERVICE, AND AT ANY BEND OVER 45°. CLEANOUTS SHALL NOT BE LOCATED IN PUBLIC RIGHT-OF-WAY WITHOUT WRITTEN PERMISSION OF THE CITY ENGINEER.
3. ALL NEW SEWER TAPS SHALL BE CAST IN PLACE BY THE MANUFACTURER OF THE MAIN LINE OR SHALL BE FIELD INSTALLED AS SPECIFIED IN THE STANDARD SPECIFICATIONS AND THESE DRAWINGS.
4. WHEN A RESIDENTIAL USE PLANS TO HAVE A SEWERED BASEMENT, HE SHALL INSTALL A BACKFLOW PREVENTION DEVICE ON THE SERVICE LINE.
5. SEWER MAINS SHALL NOT BE SHALLOWER THAN 9 FEET UNLESS AUTHORIZED BY THE CITY.
6. TWO ATTEMPTS AT TRENCHLESS INSTALLATION (BORING OR PNEUMATIC HAMMER) SHALL BE MADE PRIOR TO OPEN CUT INSTALLATION OF LATERALS LOCATED UNDER PAVEMENT.
7. ALL TAPS SHALL BE MADE BY A LICENSED PUBLIC WORKS CONTRACTOR.
8. CITY REPRESENTATIVE OR CITY ENGINEER SHALL INSPECT ALL SERVICE CONNECTIONS.
9. STAMP 8 IN CURB WHERE LATERAL CROSSES CURB AND GUTTER.

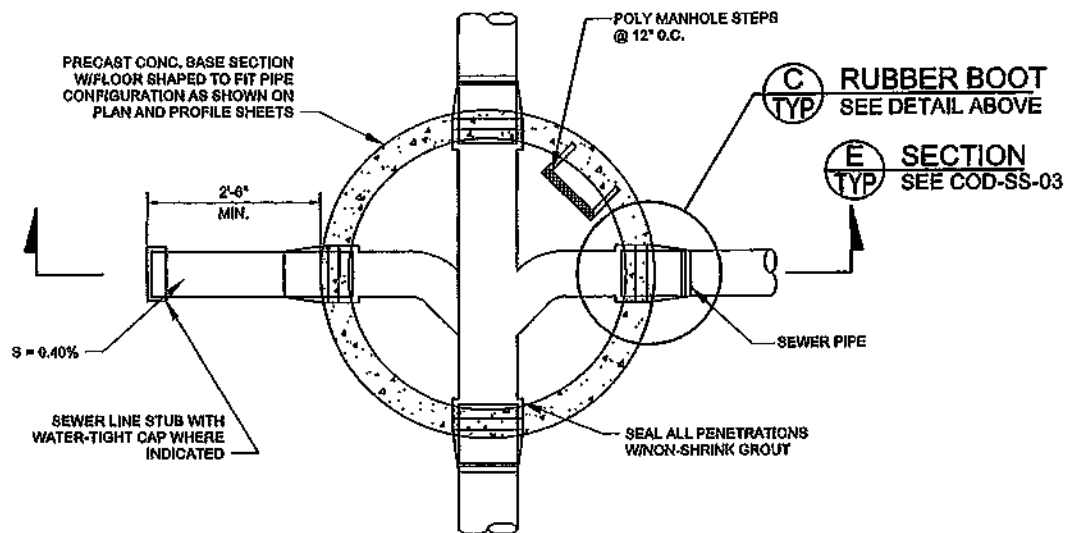
STANDARD DRAWINGS & SPECIFICATIONS SEWER SERVICE LATERAL

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	SS-01



C
TYP RUBBER BOOT DETAIL



D
TYP PLAN-MANHOLE

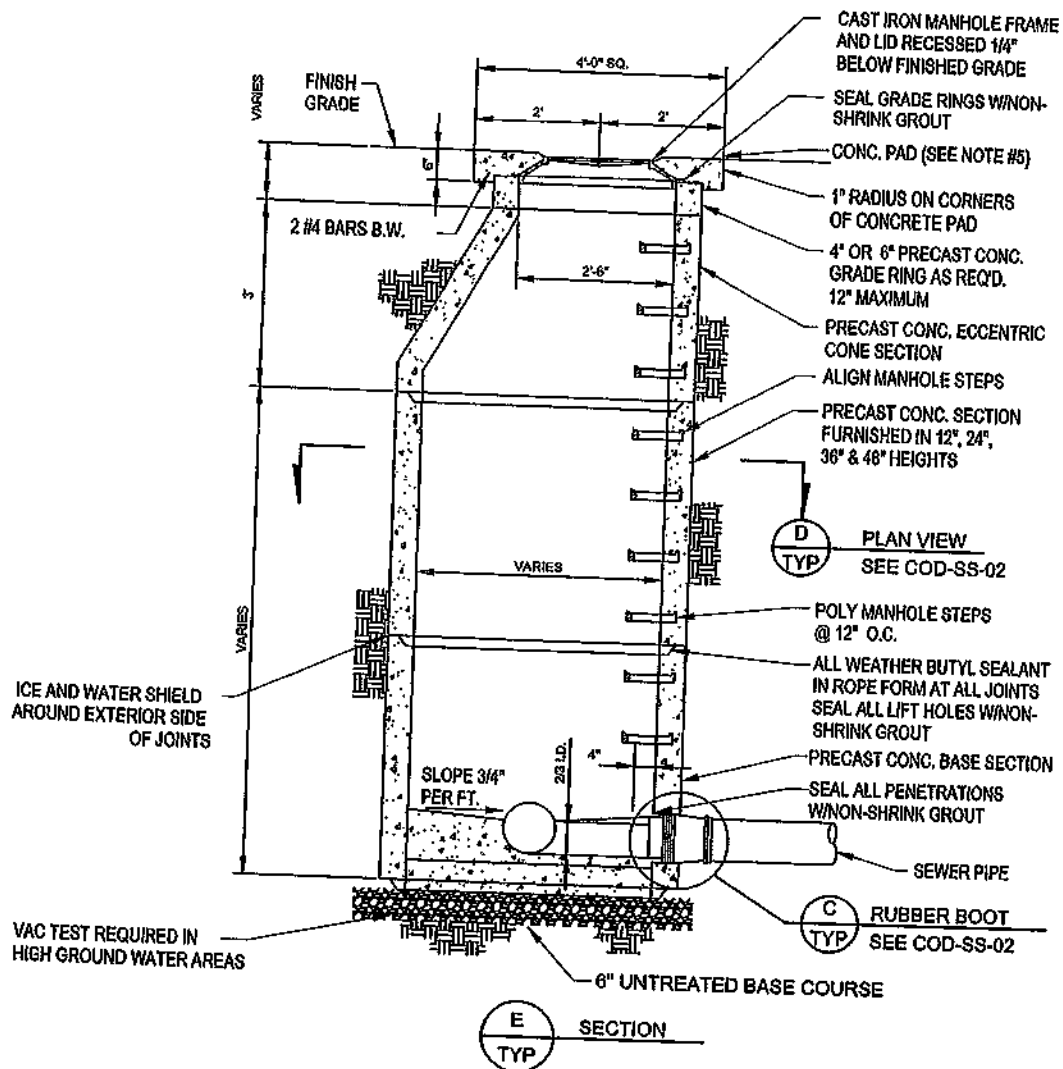
CONSTRUCTION NOTES:

1. ALL MANHOLE FLOW LINES SHALL BE CONSTRUCTED TO PROVIDE SMOOTH FLOW-THROUGH CHARACTERISTIC.
2. JOINTS, ETC., THAT MUST BE GROUTED, SHALL BE "DRY PACKED" WITH A NON-SHRINKING, NON-METALLIC, TYPE GROUT SUCH AS THORITE (STANDARD DRYWALL PRODUCTS INC.) OR EQUAL.
3. MATCH TOP OF PIPES WHEN THE INLET IS SMALLER IN DIAMETER THAN THE OUTLET OR AS DIRECTED BY THE CITY ENGINEER.
4. MAXIMUM SPACING BETWEEN MANHOLES SHALL BE 400 FEET OR AS DIRECTED BY THE CITY ENGINEER.
5. FLOW LINE OF OUTLET PIPE SHALL BE 0.10 FT. BELOW FLOW LINE OF SAME SIZE INLET PIPE.
6. MANHOLES SHALL BE 6' DIAMETER WHEN MORE THAN TWO CONNECTIONS ARE REQUIRED OR WITH A CHANGE IN DIRECTION OF 45 DEGREES OR MORE.

**STANDARD DRAWINGS AND SPECIFICATIONS
MANHOLE PLAN AND RUBBER BOOT**

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	SS-02



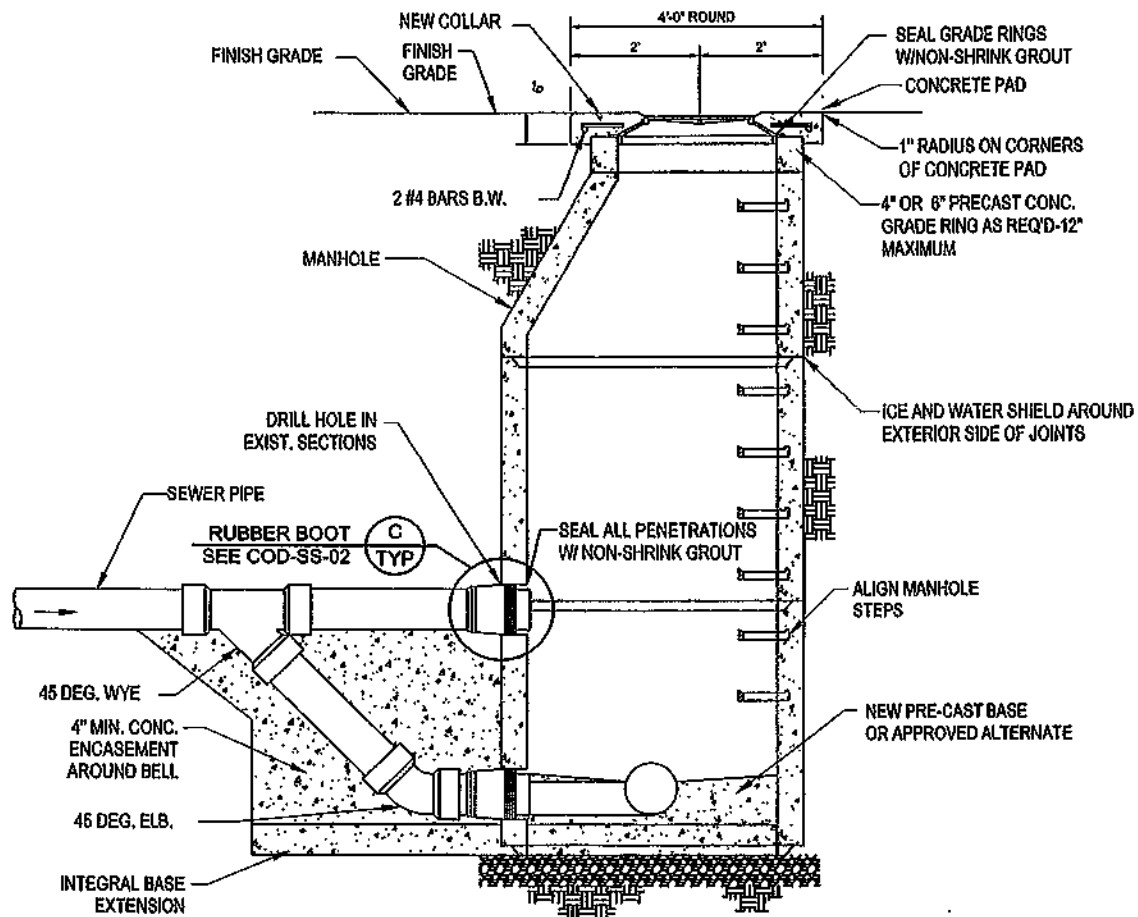
CONSTRUCTION NOTES:

1. ALL MANHOLE FLOW LINES SHALL BE CONSTRUCTED TO PROVIDE SMOOTH FLOW-THROUGH CHARACTERISTIC.
2. JOINTS, ETC., THAT MUST BE GROUTED, SHALL BE "DRY PACKED" WITH A NON-SHRINKING, NON-METALIC, TYPE GROUT SUCH AS TONITE (STANDARD DRYWALL PRODUCTS INC.) OR EQUAL.
3. MATCH TOP OF PIPES WHEN THE INLET IS SMALLER IN DIAMETER THAN THE OUTLET OR AS DIRECTED BY THE CITY ENGINEER.
4. MAXIMUM SPACING BETWEEN MANHOLES SHALL BE 400 FEET OR AS DIRECTED BY THE CITY ENGINEER.
5. FLOW LINE OF OUTLET PIPE SHALL BE 0.10 FT. BELOW FLOW LINE OF SAME SIZE INLET PIPE.
6. GRADE RING HEIGHT SHALL NOT EXCEED 8".
7. A 4" FIBER GLASS MARKING POST SHALL MARK ALL MANHOLES LOCATED OUTSIDE THE ROADWAY OR AS DETERMINED BY THE CITY.
8. A MANHOLE LID LIFTER (HOOK) SHALL BE PROVIDED TO THE CITY FOR EACH PHASE OF THE SUBDIVISION.
9. MANHOLE SHALL BE 4' DIA FOR UP TO 12" SEWER PIPE. LARGER MANHOLES ARE REQUIRED FOR PIPE SIZE LARGER THAN 12" AND SHALL BE DETERMINED ON A CASE BY CASE BASIS.

STANDARD DRAWINGS & SPECIFICATIONS MANHOLE SECTION

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	SS-03



D
TYP
DROP MANHOLE

CONSTRUCTION NOTES:

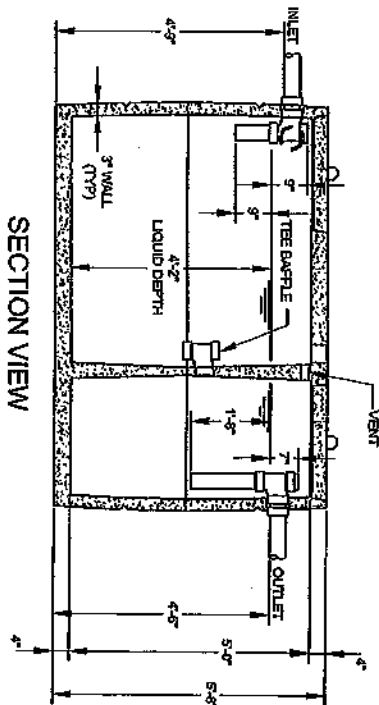
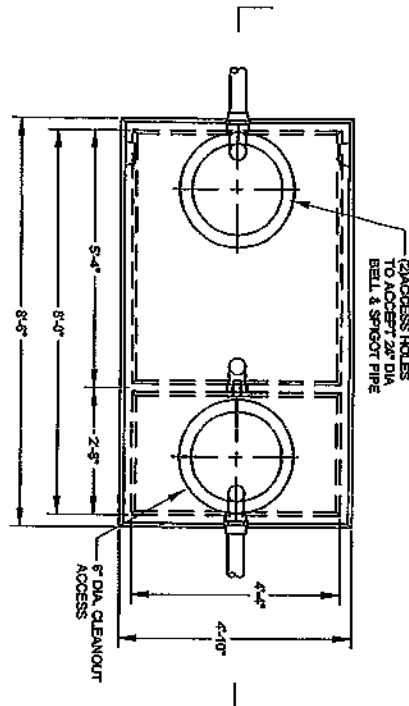
1. ALL MANHOLES FLOW LINES SHALL BE CONSTRUCTED TO PROVIDE SMOOTH FLOW-THROUGH CHARACTERISTIC.
2. ALL CONCRETE PIPES (24" OR LESS IN DIA.) CONNECTED TO MANHOLES SHALL HAVE A BELL AND SPIGOT JOINT LOCATED WITHIN 24" OF THE OUTSIDE WALL OF STRUCTURE. THIS PROTRUDING PORTION OF PIPE SHALL BE SUPPORTED WITH CONCRETE UP TO, BUT NOT INCLUDING THE JOINT.
3. ALL SURFACES (AGAINST WHICH CONCRETE OR GROUT IS TO BE PLACED) SHALL FIRST BE COATED WITH AN EPOXY BONDING AGENT SUCH AS BOND BOND (SONNE BORN CO.) PROBOND EPOXY ET-100 (PROTEX INDUSTRIES CO.) OR EQUAL.
4. JOINTS, ETC., THAT MUST BE GROUTED SHALL BE "DRY PACKED" WITH A NON-SHRINKING, NON-METALLIC, TYPE GROUT SUCH AS THORITE (STANDARD DRY WALL PRODUCTS INC.) OR EQUAL.
5. ALL BROKEN PIPE FACES TO BE SMOOTHED OFF WITH GROUT.
6. FLOW LINE OF OUTLET PIPE SHALL BE 0.10 FT. BELOW FLOW LINE OF SAME SIZE INLET PIPE. IF PIPE IS INSTALLED THROUGH MANHOLE WITHOUT ANY JOINTS, PIPES CAN BE INSTALLED AT AT DESIGN GRADE.
7. MATCH TOP OF PIPES WHEN THE INLET IS SMALLER IN DIAMETER THAN THE OUTLET OR AS DIRECTED BY THE CITY ENGINEER.
8. IF NEW PIPE IS CONCRETE, A SUPPORT BLOCK IS REQUIRED TO THE NEXT JOINT PAST THE CONCRETE BONDED JOINT.
9. GRADE RING HEIGHT SHALL NOT EXCEED 8".

**STANDARD DRAWINGS & SPECIFICATIONS
DROP MANHOLE**

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	SS-04

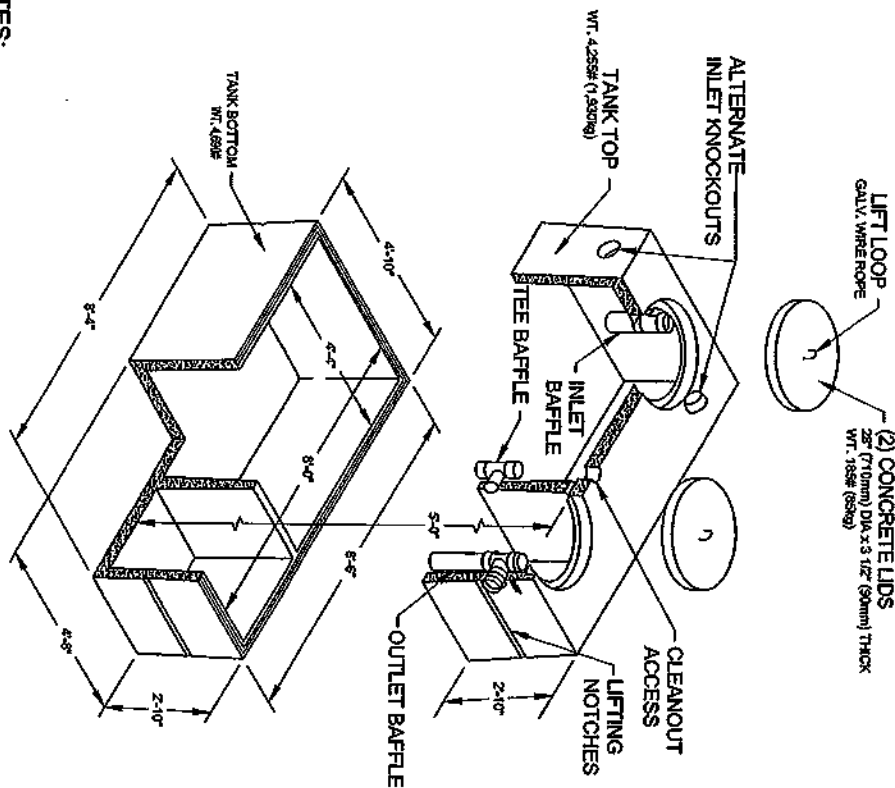
DETAIL DRAWING FOR:
1,000 GALLON (3,785L) GREASE INTERCEPTOR
LOW PROFILE(NON TRAFFIC RATED)



GENERAL NOTES:
1. TANK SIZES MUST BE APPROVED BY THE CITY

NOTES:

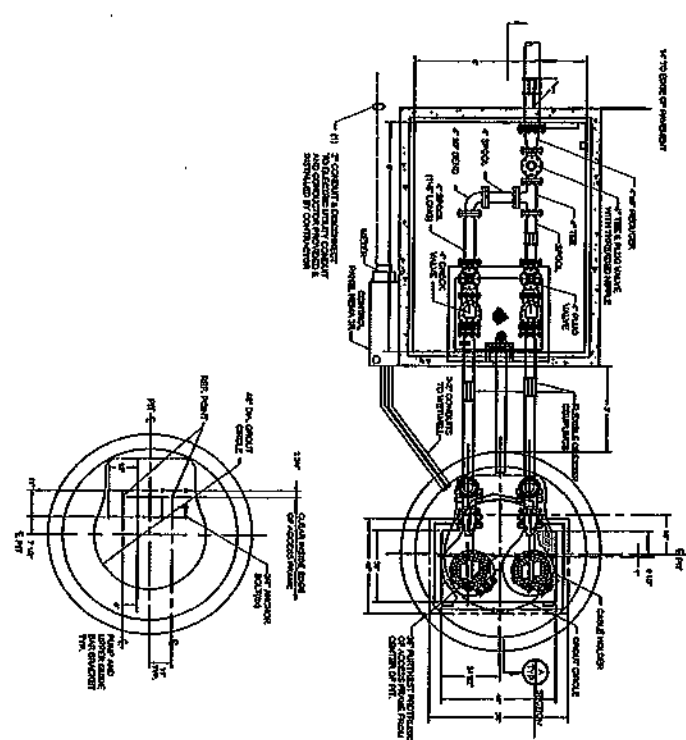
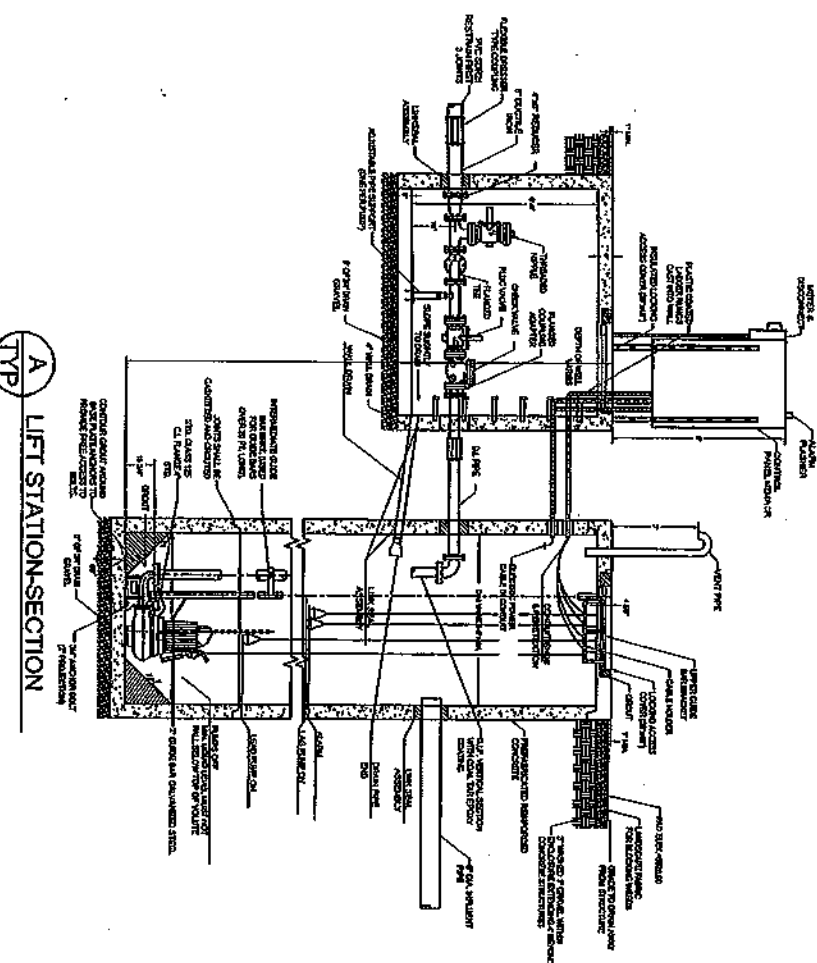
1. INLET & OUTLET ARE IDENTIFIED.
2. TANK IS MARKED 1,000 GALLON.
3. INLET & OUTLET BAFFLES WILL ACCEPT A NOM. 4" SCH. 40 PVC PIPE.
4. 1 1/2" x 3-8" STRIPS OF RAMMEX USED FOR SEALING JOINTS.
5. OPENINGS MAY BE SIZED & LOCATED AS SPECIFIED WITHIN STRUCTURAL LIMITATIONS.
6. BAFFLES ARE TO BE INSTALLED BY OTHERS.
7. METRIC EQUIVALENTS (SHOWN IN PARENTHESES) ARE ROUNDED TO NEAREST 5mm, 5kg OR 5L.
8. PLACE OILCASTLE LOGO ON OUTSIDE OF TANK.
9. 30S DEFORMED GALVANIZED WIRE, PLACED IN ACCESS LIDS FOR LIFTING.
10. DESIGNED FOR 5'-0" MAX. BURY.



STANDARD DRAWINGS & SPECIFICATIONS
GREASE TRAP

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	SS-05



LIFT STATION-PLAN VIEW

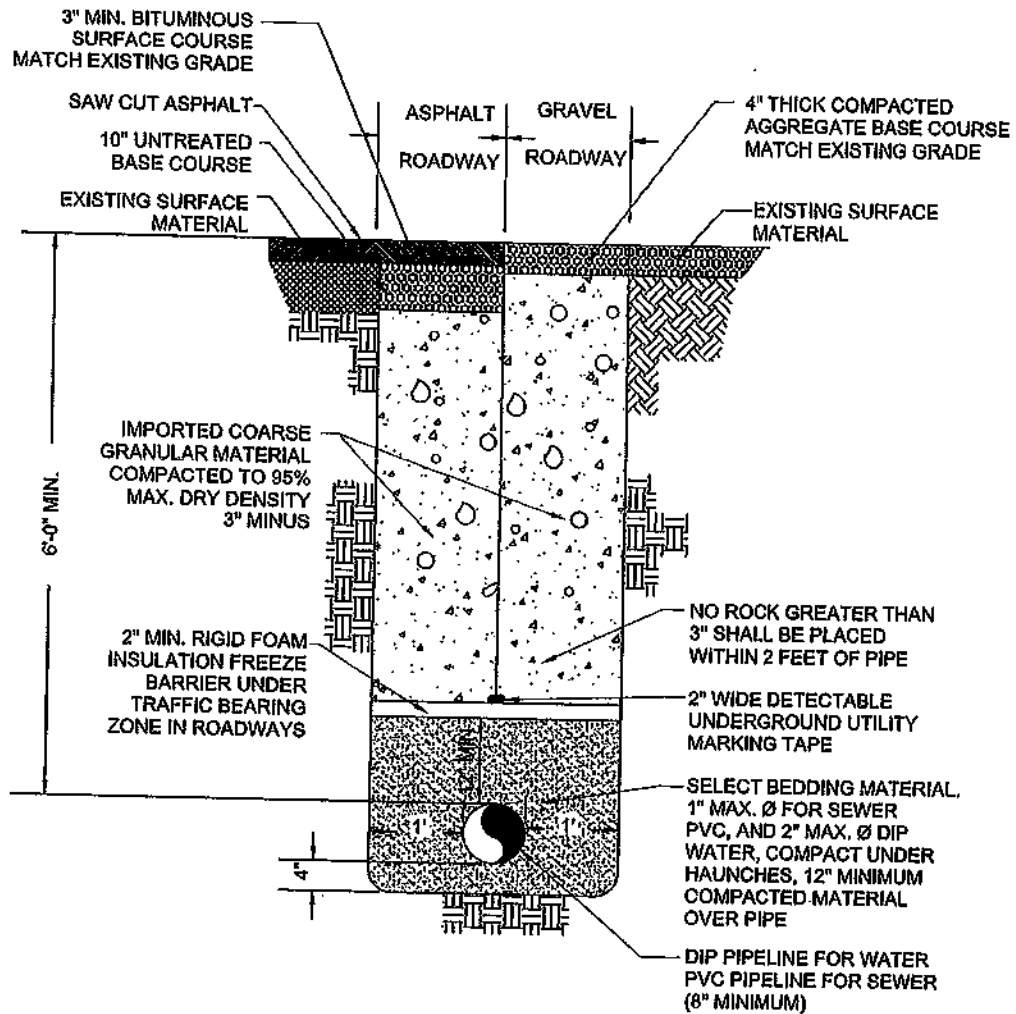
- NOTES:
1. LOCATE ANCHOR BOLTS USING CLEAR INSIDE EDGE OF ACCESS FRAME AND CENTER LINE OF PUMP AS REF. POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP RELATIVE TO ACCESS FRAME.
 2. GROUT OPENING FOR ACCESS FRAME.
 3. ANCHOR BOLT SPACING AND ACCESS OPENING MAY REQUIRE ADJUSTMENT TO MEET THE MANUFACTURER'S RECOMMENDED CLEARANCES AND TO PROVIDE FOR EASY REMOVAL AND INSTALLATION OF PUMP.
 4. ALL ELECTRICAL COMPONENTS SHALL BE RAINPROOFED AND INSTALLED BY THE CONTRACTOR IN ACCORDANCE WITH ALL APPLICABLE CODES AND REGULATIONS.
 5. LINK SEAL SHALL BE USED ON ALL WALL PENETRATIONS WITH THE EXCEPTION OF ELECTRICAL CONDUIT.
 6. AFTER START UP THE OWNER MUST PROVIDE AND USE PORTABLE VENTILATION EQUIPMENT FOR ENTERING WET AND DRY WELLS.
 7. FOUR (4) CONCRETE FILLED BOLLARDS SHALL BE PLACED ON THE FOUR CORNERS OF THE LIFT STATION AS DIRECTED BY THE ENGINEER.
 8. CONTRACTOR SHALL INSTALL AN AUTOMATIC TELEPHONE DIALING SYSTEM IN ACCORDANCE WITH CITY STANDARDS.

- GENERAL NOTE:
- THIS LIFT STATION DETAIL IS TO SERVE AS A GENERAL GUIDE LINE AND LAYOUT FOR LIFT STATIONS TO BE INSTALLED IN THE CITY OF TETONIA. THE DESIGNER'S ENGINEER SHALL SUBMIT THE LIFT STATION DESIGN SPECIFICATIONS TO DESK AND THE CITY FOR APPROVAL.
9. ACCESS COVER SHALL BE DESIGNED FOR HS-20 LOADING UNLESS OTHERWISE APPROVED.
 10. DUCTILE IRON REQUIRED FOR PIPING AND APPROPRIATELY FROM NET WELL TO DOWNSTREAM OF VALVE WELL.
 11. ALL HARDWARE (NUTS, BOLTS, ETC.) SHALL BE STAINLESS STEEL. NO GALVANIZED HARDWARE WILL BE ALLOWED.
 12. LIFT STATION PUMPS SHALL BE SUBMERSIBLE WITH THE MANUFACTURER APPROVED BY THE CITY.
 13. ALL LIFT STATIONS SHALL INCLUDE A SUBMERSIBLE STRAIN MAG-10 500 FLOW METER OR APPROVED EQUIV.

STANDARD DRAWINGS & SPECIFICATIONS
LIFT STATION-PLAN & SECTION

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	SS-06



GENERAL NOTES:

1. THE CONTRACTOR HAS THE ULTIMATE RESPONSIBILITY OF LOCATING ALL UNDERGROUND UTILITIES AND PROTECTING THEM FROM DAMAGE.
2. ALL EXCAVATIONS, TRENCHING, AND SHORING SHALL MEET THE REQUIREMENTS OF THE IDAHO OCCUPATIONAL HEALTH AND SAFETY COMMISSION.
3. NATIVE MATERIAL MAY BE USED ABOVE PIPE ZONE IF APPROVED BY THE CITY.

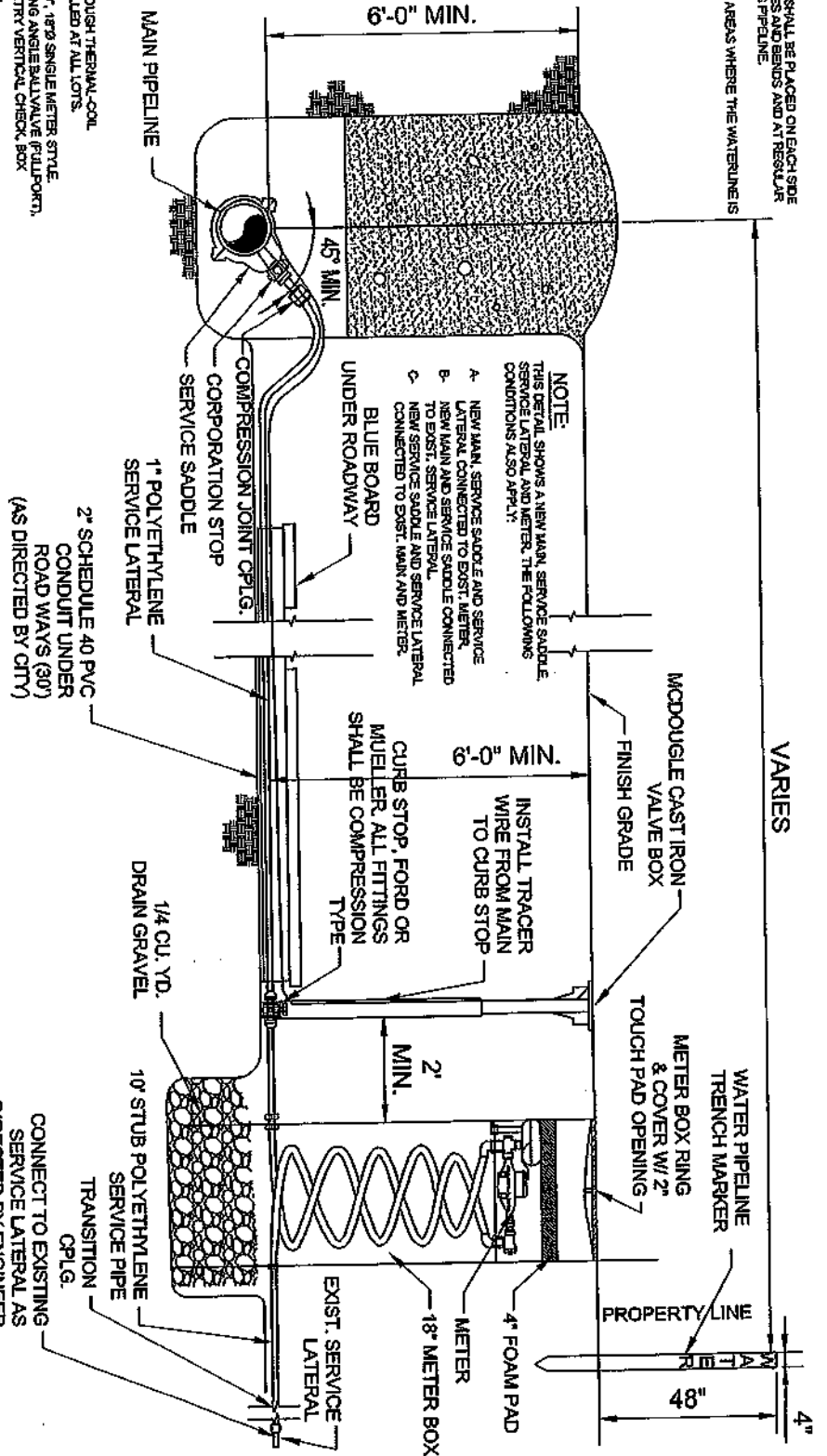
TYPICAL TRENCH DETAIL

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	UT-01

CITY OF TETONIA - STANDARD DETAILS

NOTE: PREPARE MARKERS SHALL BE PLACED ON EACH SIDE OF CUL CROSSINGS AT TEES AND BENDS AND AT REGULAR INTERVALS AT 1000 FT. ALONG PIPELINE.
MARKERS MAY BE OMITTED IN AREAS WHERE THE WATERLINE IS UNDER ROADWAYS.

VARIABLES



NOTE: WATERCROSSING THROUGH THERMAL-COL METER BOX INSTALLED AT ALL LOTS.

1. METER BOX SHALL BE 90", 18" SINGLE METER STYLE. INLET SHALL BE LOOKING ANGLE BALL VALVE (FULLPORT), OUTLET AS SE. TOP ENTRY VERTICAL CHECK BOX SHALL BE SIDE LOOKING.
2. METER SHALL BE SENSUS PEARL W/ TOUCH READ AND MDL.
3. ALL FITTINGS SHALL BE FORD OR MUELLER COMPRESSION TYPE FITTINGS.

CONSTRUCTION NOTES:

1. ALL 3/4" AND 1" SERVICE CONNECTIONS TO DUCTILE OR CAST IRON SUPPLY MAIN SHALL BE A SERVICE SADDLE WITH A CORP STOP. ALL OTHER SERVICE CONNECTIONS SHALL USE SERVICE SADDLES AS SPECIFIED.
2. ALL PIPELINES SHALL BE INSTALLED AT THE LOCATIONS AND DEPTHS OF THE PLANS OR AS OTHERWISE DIRECTED BY THE ENGINEER.
3. ALL PIPELINE MATERIALS SHALL CONFORM TO ASTM D2688-00, SCHEDULE 40, ASTM F794-01, OR ASTM F794-01.
4. CONTRACTOR SHALL PERFORM ALL WORK IN ACCORDANCE WITH IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) WATER QUALITY RULES AND REGULATIONS.
5. ALL DISTRIBUTION PIPE SHALL BE IN ACCORDANCE TO SECTION 217.
6. ALL DISTRIBUTION FITTINGS SHALL BE CAST IRON OR DUCTILE IRON, ANWW C-110 CLASS 250.
7. PIPE SHALL BE PLACED WITHIN THE RIGHT-OF-WAY DESIGNATED, AND IN NO CASE SHALL THE PIPELINE BE CLOSER THAN 3 FEET FROM THE PROPERTY LINE.
8. SERVICE LINE UNDER ROADWAY SHALL BE BACKFILL IN A 4 INCH PVC CASING FOR THE FULL WIDTH OF THE ROAD, (EXCEPT OTHER PROPERTY LINES).
9. MINIMUM HORIZONTAL SEPARATION FROM SEWER SHALL BE 10 FEET.
10. IF HORIZONTAL SEPARATION CANNOT BE MAINTAINED THEN WATER LINE SHALL BE 1'-6" VERTICALLY ABOVE SEWER OR SEWER SHALL BE TRENCHLESS INSTALLATION (ROCKING OR PNEUMATIC HAMMER) SHALL BE MADE PRIOR TO OPEN CUT INSTALLATION OF LATERALS LOCATED UNDER PAVEMENT.
11. TWO ATTEMPTS AT TRENCHLESS INSTALLATION (ROCKING OR PNEUMATIC HAMMER) SHALL BE MADE PRIOR TO OPEN CUT INSTALLATION OF LATERALS LOCATED UNDER PAVEMENT.

STANDARD DRAWINGS & SPECIFICATIONS WATER SERVICE CONNECTION 3/4" & 1"

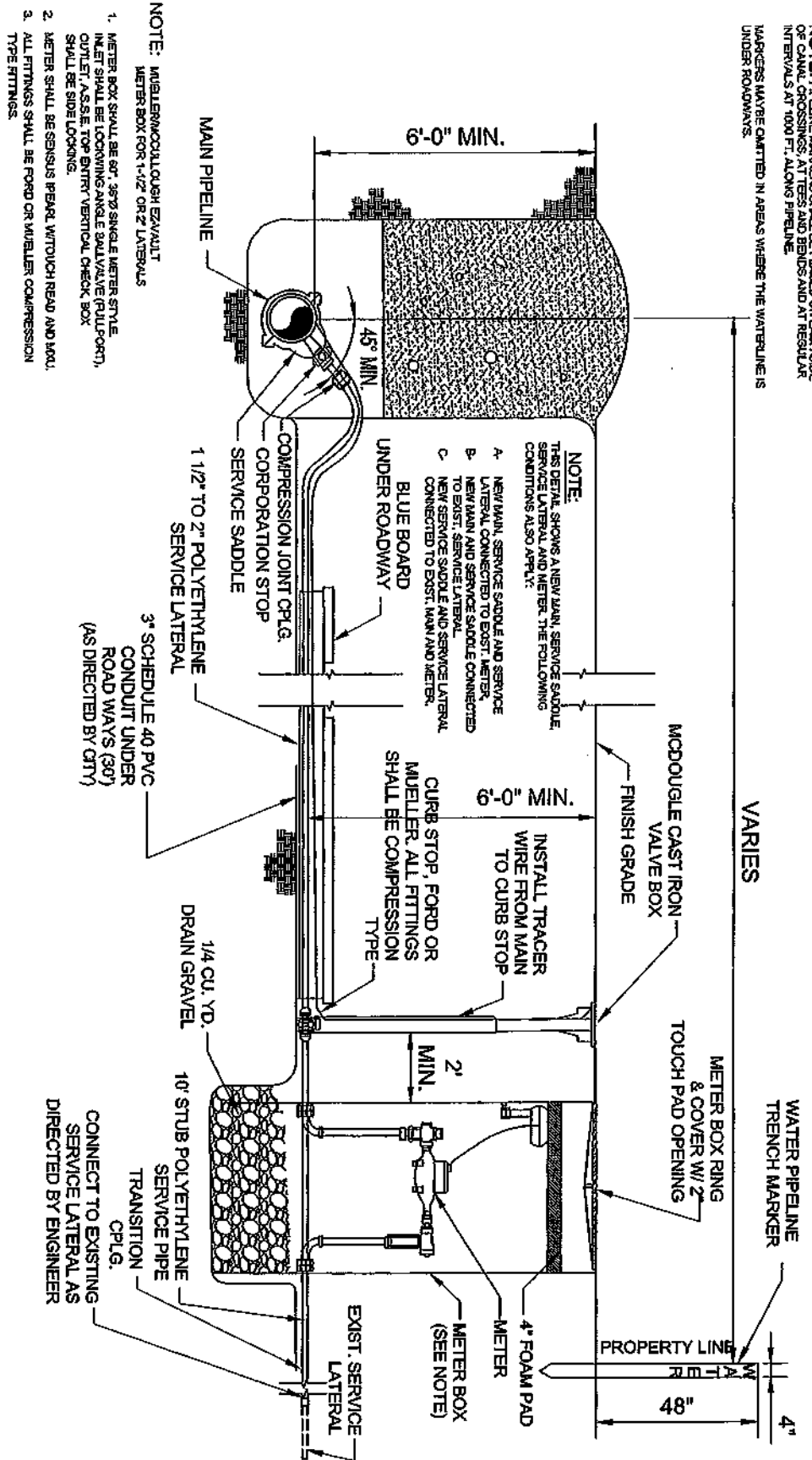
CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	W-01

NOTE: PRELIMINE MARKERS SHALL BE PLACED ON EACH SIDE OF CULM CROSSINGS, FITTERS, AND BRIDGES AND AT REGULAR INTERVALS AT 100 FT. ALONG PIPELINE.

MARKERS MAY BE CARRIED IN AREAS WHERE THE WATERLINE IS UNDER ROADWAYS.

VARIABLES



CONSTRUCTION NOTES:

1. ALL 3/4" AND 1" SERVICE CONNECTIONS TO DUCTILE OR CAST IRON SUPPLY MAIN SHALL BE A SERVICE SADDLE WITH A CORP STOP. ALL OTHER SERVICE CONNECTIONS SHALL USE SERVICE SADDLES AS SPECIFIED.
2. ALL PIPELINES SHALL BE INSTALLED AT THE LOCATIONS AND DEPTHS OF THE PLANS OR AS OTHERWISE DIRECTED BY THE ENGINEER.
3. ALL PIPELINE MATERIALS SHALL CONFORM TO ASTM D2688-04, SCHEDULE 40, ASTM F2624, OR ASTM F2624L.
4. CONTRACTOR SHALL PERFORM ALL WORK IN ACCORDANCE WITH DAHD DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) WATER QUALITY RULES AND REGULATIONS.
5. ALL DISTRIBUTION PIPE SHALL IN ACCORDANCE TO SECTION 27.1.
6. ALL DISTRIBUTION FITTINGS SHALL BE CAST IRON OR DUCTILE IRON, ANWWA C110 CLASS 250.
7. PIPE SHALL BE PLACED WITHIN THE RIGHT-OF-WAY DESIGNATED, AND IN NO CASE SHALL THE PIPELINE BE CLOSER THAN 3 FEET FROM THE PROPERTY LINE.
8. SERVICE LINE UNDER ROADWAY SHALL BE ENCASED IN A 4" INCH PVC CASING FOR THE FULL WIDTH OF THE ROAD, (EXCEPT OTHER PROPERTY LINE).
9. MINIMUM HORIZONTAL SEPARATION FROM SEWER SHALL BE 30 FEET.

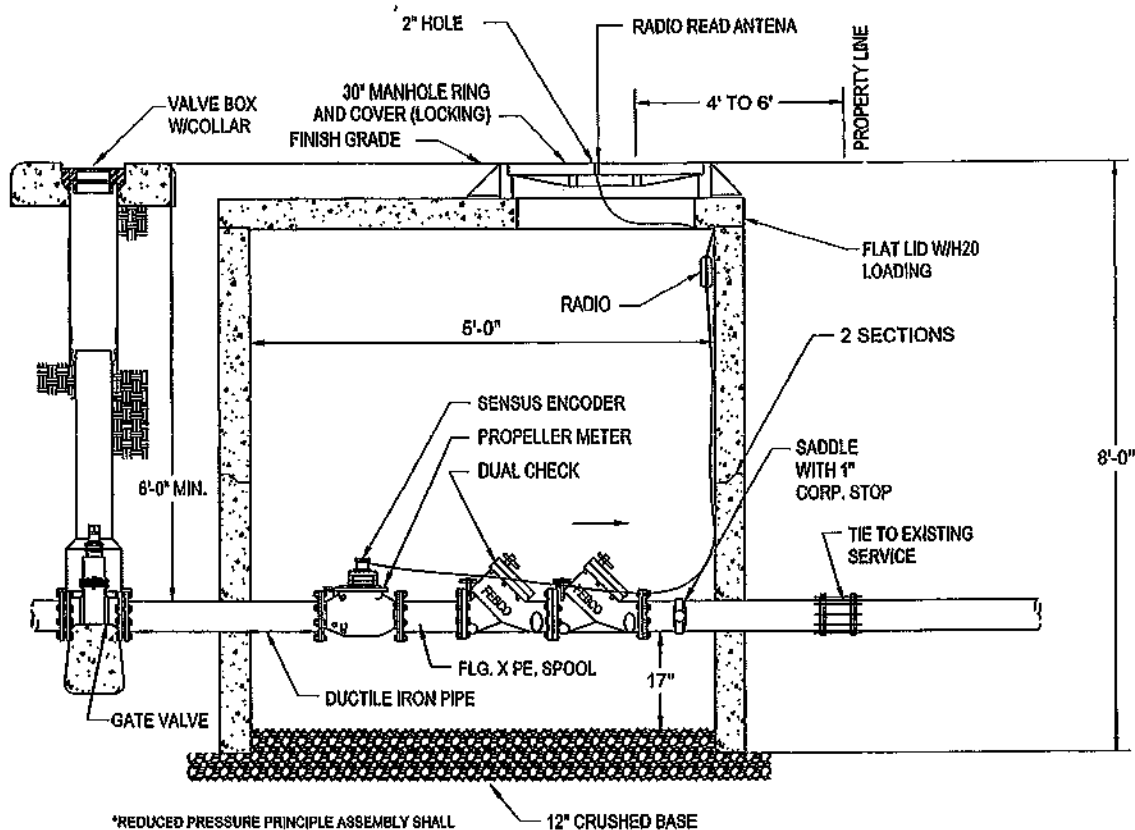
10. IF HORIZONTAL SEPARATION CANNOT BE MAINTAINED THEN WATER LINE SHALL BE 1'-6" VERTICALLY ABOVE SEWER OR SEWER SHALL BE CASED UNIT SEPARATION CAN BE MET.
11. TWO ATTEMPTS AT TECHNIQUELESS INSTALLATION (ISOLING OR PNEUMATIC HAMMER) SHALL BE MADE PRIOR TO OPEN CUT INSTALLATION OF LATERALS LOCATED UNDER PAVEMENT.

CONNECT TO EXISTING SERVICE LATERAL AS DIRECTED BY ENGINEER

STANDARD DRAWINGS & SPECIFICATIONS WATER SERVICE CONNECTION 1-1/2" & 2"

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	W-02



CONSTRUCTION NOTES:

1. ALL 3" AND 4" SERVICE CONNECTIONS TO DUCTILE OR CAST IRON SUPPLY MAIN SHALL BE HOT TAPPED IF INSTALLED ON A LIVE WATER MAIN OR WITH A TEE AND VALVE IF NEW CONSTRUCTION.
2. ALL PIPELINES SHALL BE INSTALLED AT THE LOCATIONS AND DEPTHS OF THE PLANS OR AS OTHERWISE DIRECTED BY THE ENGINEER.
3. ALL PIPELINE MATERIALS SHALL CONFORM TO ASTM D3034-80, SCHEDULE 40, ASTM F679-81, OR ASTM F794-83.
4. CONTRACTOR SHALL PERFORM ALL WORK IN ACCORDANCE WITH IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY (IDEQ), WATER QUALITY RULES AND REGULATIONS.
5. ALL DISTRIBUTION PIPE SHALL IN ACCORDANCE TO SECTION 217.
6. ALL DISTRIBUTION FITTINGS SHALL BE CAST IRON OR DUCTILE IRON, AWWA C-110 CLASS 250.
7. PIPE SHALL BE PLACED WITHIN THE RIGHT-OF-WAY DESIGNATED, AND IN NO CASE SHALL THE PIPELINE BE CLOSER THAN 3 FEET FROM THE PROPERTY LINE.
8. SERVICE LINE UNDER ROADWAY SHALL BE ENCASED IN A 4 INCH PVC CASING FOR THE FULL WIDTH OF THE ROAD, (EVERY OTHER PROPERTY LINE)
9. MINIMUM HORIZONTAL SEPERATION FROM SEWER SHALL BE 10 FEET.
10. IF HORIZONTAL SEPERATION CANNOT BE MAINTAINED THEN WATER LINE SHALL BE 1'-6" VERTICALLY ABOVE SEWER OR SEWER SHALL BE CASED UNTIL SEPERATION CAN BE MET.

STANDARD DRAWINGS & SPECIFICATIONS 3" & 4" METER VAULT

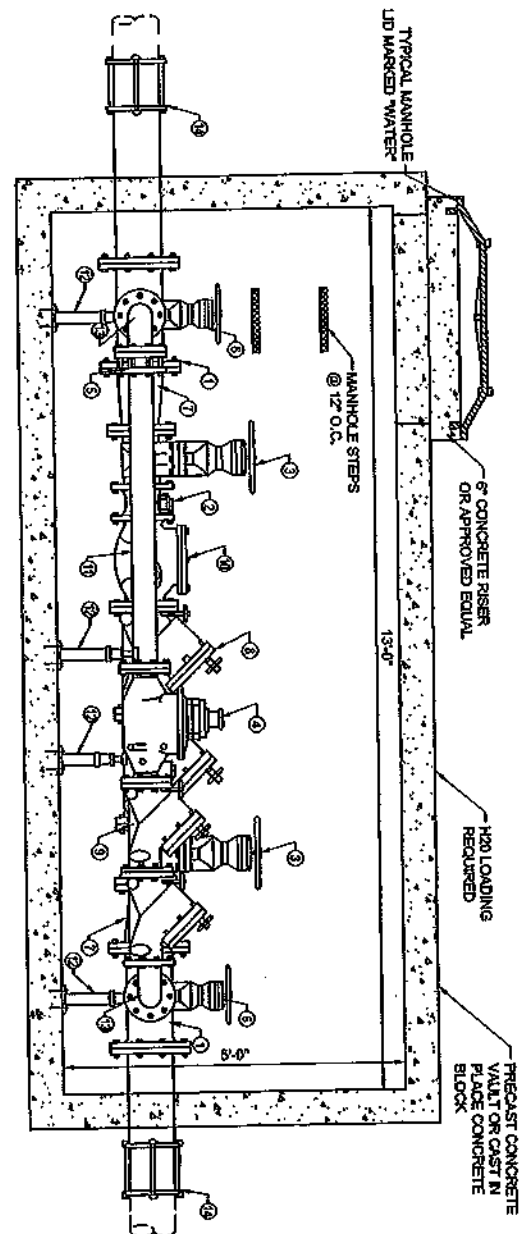
CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	W-03

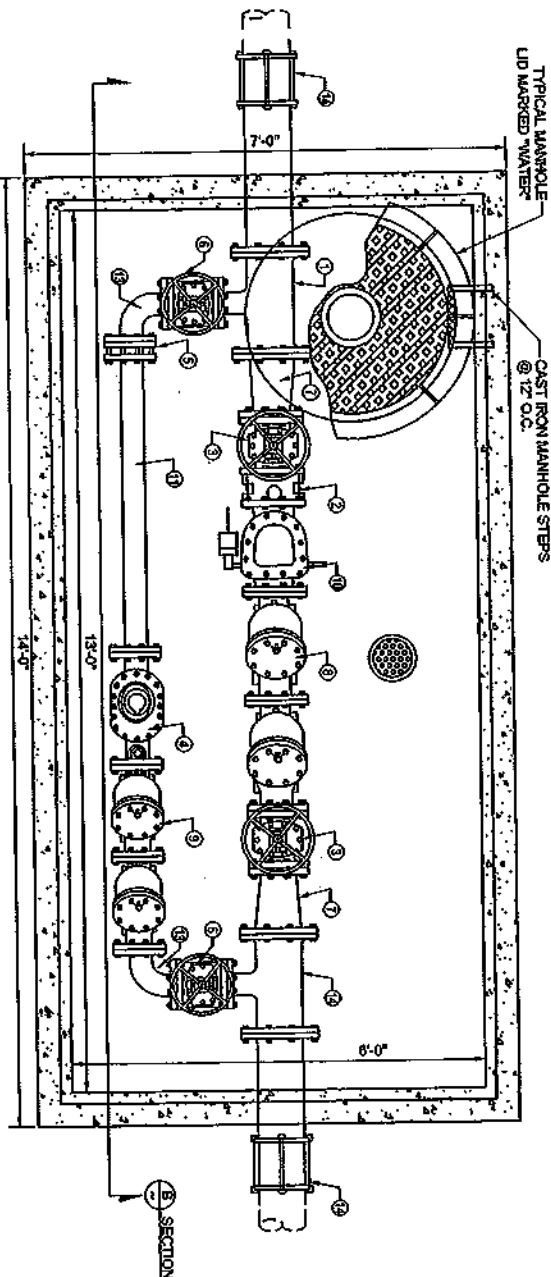
EQUIPMENT SCHEDULE			
NO.	DESCRIPTION	SIZE	REMARKS
1	TEE	8"x6"	FLANGED/FLANGED (2 RECD)
2	TURBO METER	6"	APPROVED BY CITY
3	GATE VALVE	6"	FLANGED/FLANGED (2 RECD)
4	DOWNSTREAM METER	4"	APPROVED BY CITY
5	FLANGED COUPLING ADAPTER	4"	
6	GATE VALVE	4"	FLANGED/FLANGED (2 RECD)
7	REDUCER	8"x6"	FLANGED/FLANGED (2 RECD)
8	DOUBLE CHECK BACKFLOW PREVENTER	6"	APPROVED BY CITY
9	DOUBLE CHECK BACKFLOW PREVENTER	4"	APPROVED BY CITY
10	SPRING TYPE LEVER & WEIGHT CHECK VALVE	6"	FLANGED/FLANGED
11	SPOOL	4"	FLANGED/FLANGED
12	Pipe Support	(6 RECD)	
13	3/4" BEND	4"	(2 RECD)
14	COUPLING SLEEVE	8"	

NOTES:

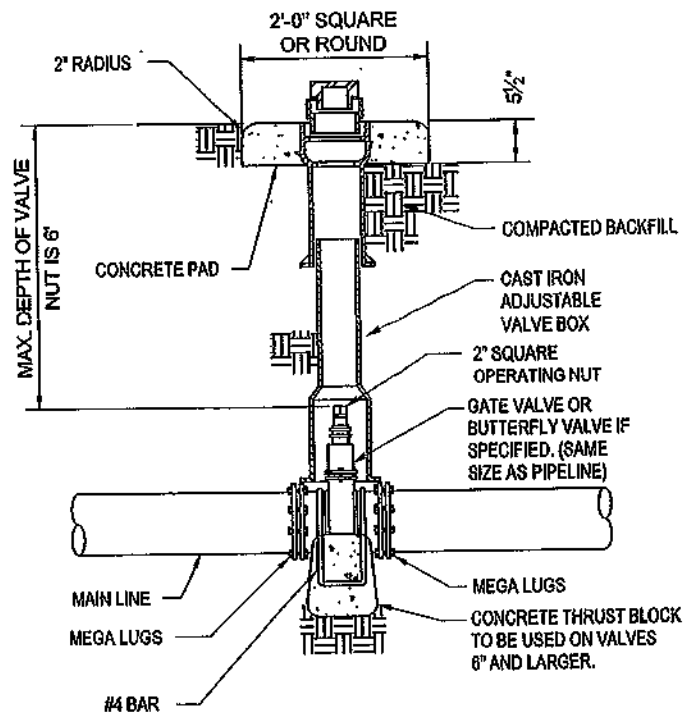
1. ALL FITTINGS, VALVES AND FLANGES SHALL BE CLASS 150.
2. THE CITY OF TETONIA SHALL APPROVE ALL MATERIALS INSTALLED.



B MASTER METER VAULT-SECTION



A MASTER METER VAULT-PLAN VIEW



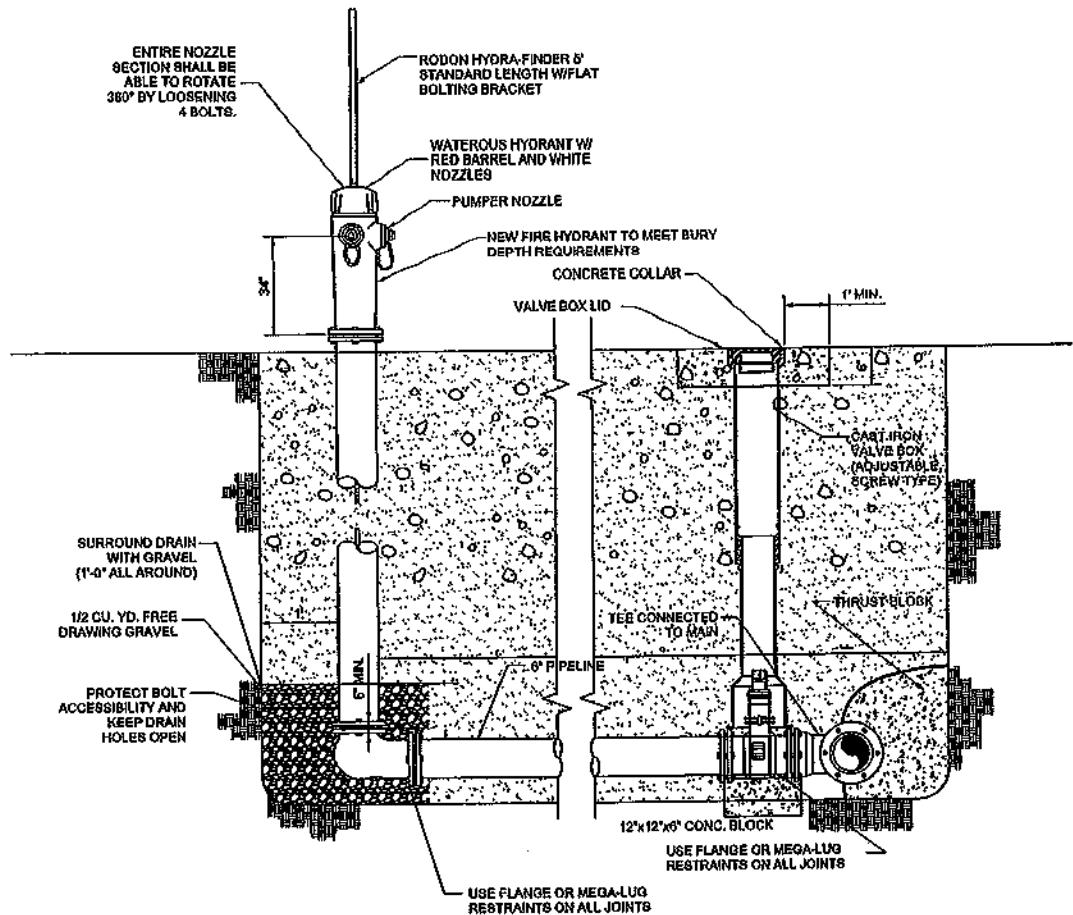
GENERAL NOTES:

1. VALVE BOX AND OPERATING NUT EXTENSION MAY BE NECESSARY IF VALVE IS INSTALLED DEEPER THAN 6 FEET.
2. 500 FT. MAXIMUM SPACING FOR ALL VALVES.
3. CONTRACTOR SHALL PROVIDE:
2 ADJUSTABLE VALVE WRENCHES,
2 HYDRANT WRENCHES PER PHASE OF DEVELOPMENT
4. VALVES SHALL BE INSTALLED ON ALL LEGS OF TEES AND CROSSES.
6. IF DEPTH IS GREATER THAN 6' EXTENSION(S) TO SEPARATING NUT IS(ARE) REQUIRED.

**STANDARD DRAWINGS & SPECIFICATIONS
GATE VALVE**

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	W-05



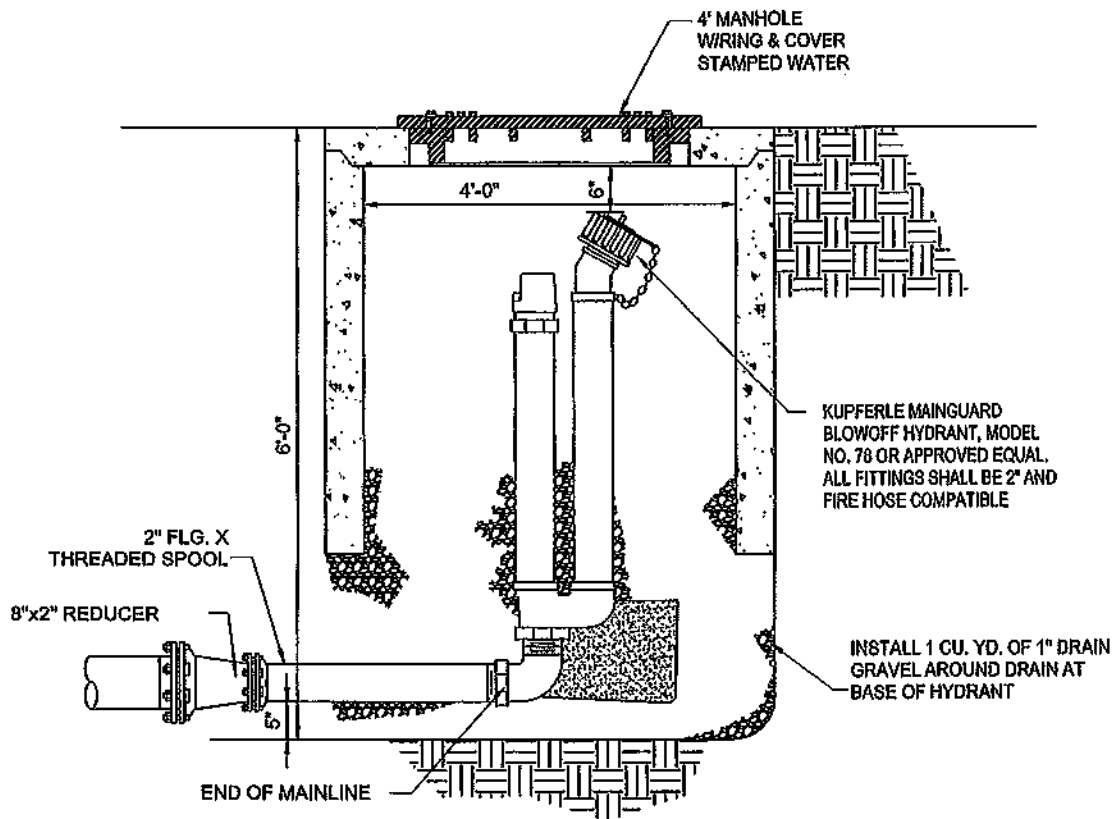
CONSTRUCTION NOTES:

1. ALL PIPELINES SHALL BE INSTALLED AT THE LOCATIONS AND DEPTHS INDICATED ON THE PLANS OR AS OTHERWISE DIRECTED BY THE ENGINEER.
2. ALL PIPELINE MATERIALS SHALL CONFORM TO ASTM D3034-80, SCHEDULE 40, ASTM F819-81, OR ASTM F794-83.
3. CONTRACTOR SHALL PERFORM ALL WORK IN ACCORDANCE WITH IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ), WATER QUALITY RULES AND REGULATIONS.
4. ALL DISTRIBUTION PIPE SHALL BE APPROVED BY THE CITY OF TETONIA PUBLIC WORKS.
5. ALL DISTRIBUTION FITTINGS SHALL BE CAST IRON OR DUCTILE IRON, ANHYA C-110 CLASS 250.
6. PIPE SHALL BE PLACED WITHIN THE RIGHT-OF-WAY DESIGNATED, AND IN NO CASE SHALL THE PIPE BE CLOSER THAN 3 FEET FROM THE PROPERTY LINE.
7. MINIMUM HORIZONTAL SEPARATION FROM SEWER SHALL BE 10' MEASURED OUTSIDE WALL TO OUTSIDE WALL OF PIPES.
8. IF HORIZONTAL SEPARATION CANNOT BE MAINTAINED THEN WATERLINE SHALL BE 1'-6" VERTICALLY ABOVE SEWER OR SEWER SHALL BE CASED UNIT. SEPARATION CAN BE MET.
9. ALL APPURTENANCES TO BE WRAPPED WITH 8 MIL PLASTIC TO PREVENT CONCRETE FROM ADHERING TO ANY PART OF FITTING.
10. JOINT RESTRAINTS SHALL BE USED FOR THRUST SUPPORT.
11. WATER VALVE LOCATIONS SHALL BE 8' FROM THE C.L. OF THE HIGHWAY TO THE C.L. OF A MAIN LINE VALVE AND A MAX. OF 3' FROM THE C.L. OF MAIN LINE TO THE C.L. OF THE FIRE HYDRANT OR PRIVATE SERVICE VALVE, OR AS DIRECTED BY THE ENGINEER.
12. FIRE HYDRANTS AND CURB STOPS SHALL BE LOCATED OUT OF SHOULDER AREA WHERE POSSIBLE. LOCATE 1' BEHIND WALK IN UTILITY EASEMENT AS SHOWN OR 1' IN FRONT OF WALK IF NO EASEMENT IS AVAILABLE BEHIND WALK.
13. CONTRACTOR SHALL PAINT CURB 10 FEET ON EACH SIDE OF HYDRANT.
14. CONTRACTOR SHALL PROVIDE A HYDRANT WRENCH FOR EACH PHASE OF THE PROJECT.
15. IF DEPTH IS GREATER THAN 6' EXTENSION(S) TO OPERATING HUT IS(ARE) REQUIRED.

STANDARD DRAWINGS & SPECIFICATIONS FIRE HYDRANT

CITY OF TETONIA - STANDARD DETAILS

SCALE	NONE
DATE:	10-01-2021
DRAWING #:	W-06



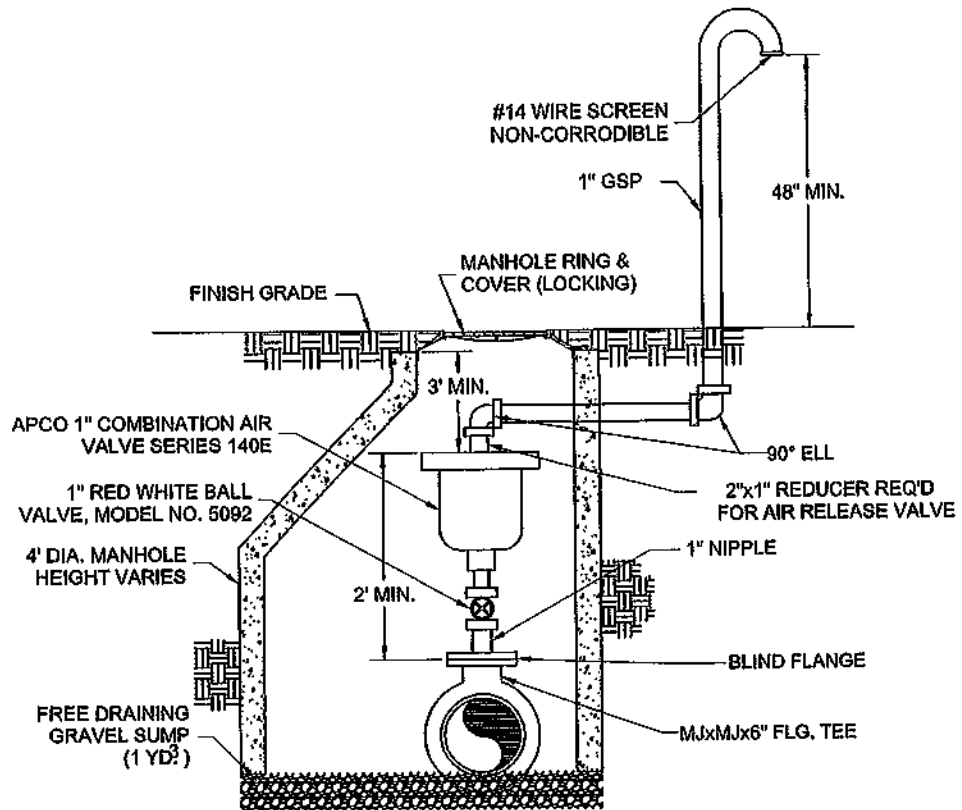
STANDARD DRAWINGS & SPECIFICATIONS
BLOW-OFF HYDRANT

CITY OF TETONIA - STANDARD DETAILS

SCALE: NONE

DATE: 10-01-2021

DRAWING #: W-07



STANDARD DRAWINGS & SPECIFICATIONS
COMBINATION AIR/VAC VALVE

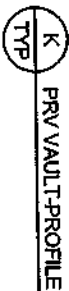
CITY OF TETONIA - STANDARD DETAILS

SCALE: NONE

DATE: 10-01-2021

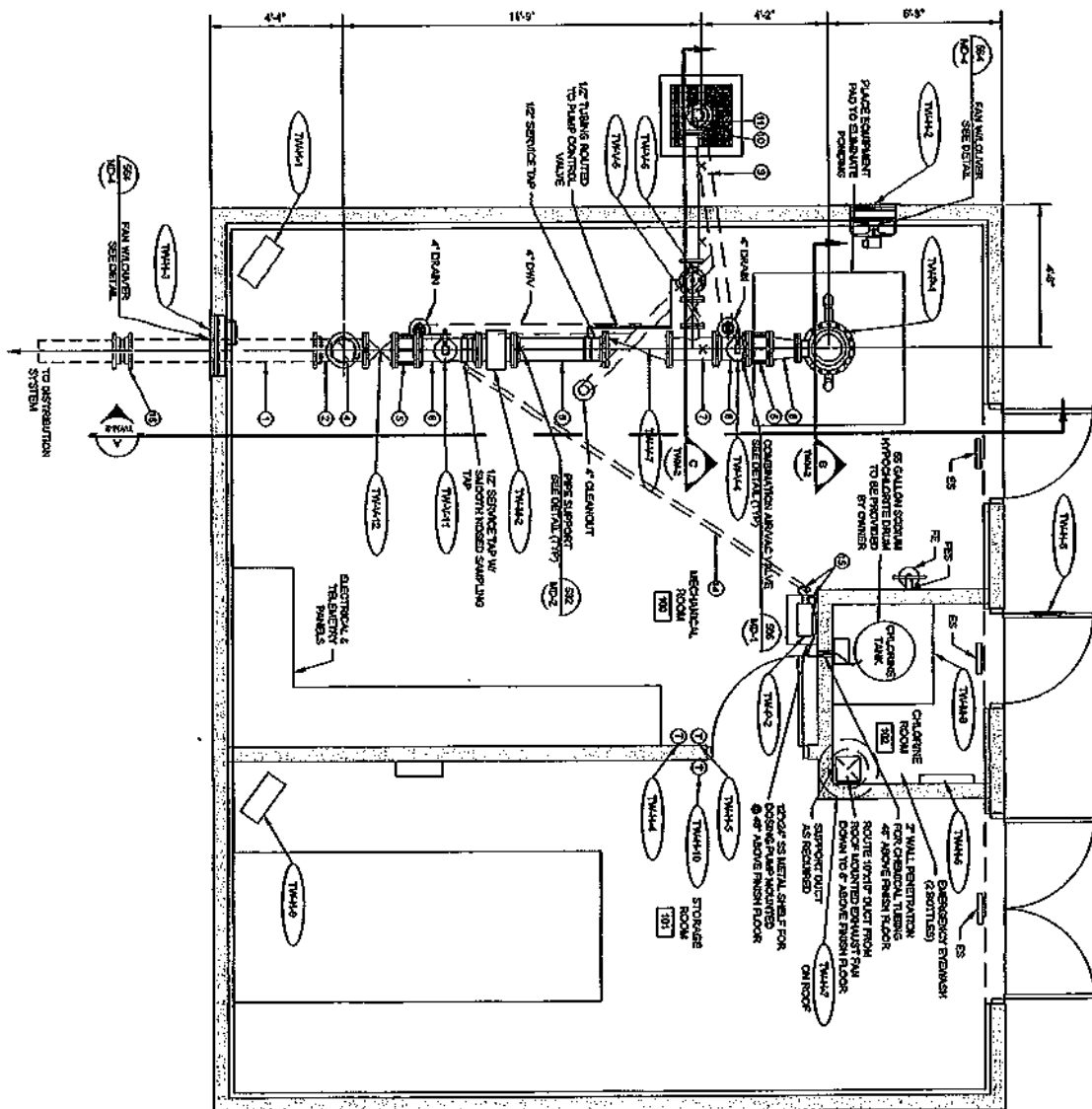
DRAWING #: W-08

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CITY OF TETONIA - STANDARD DETAILS

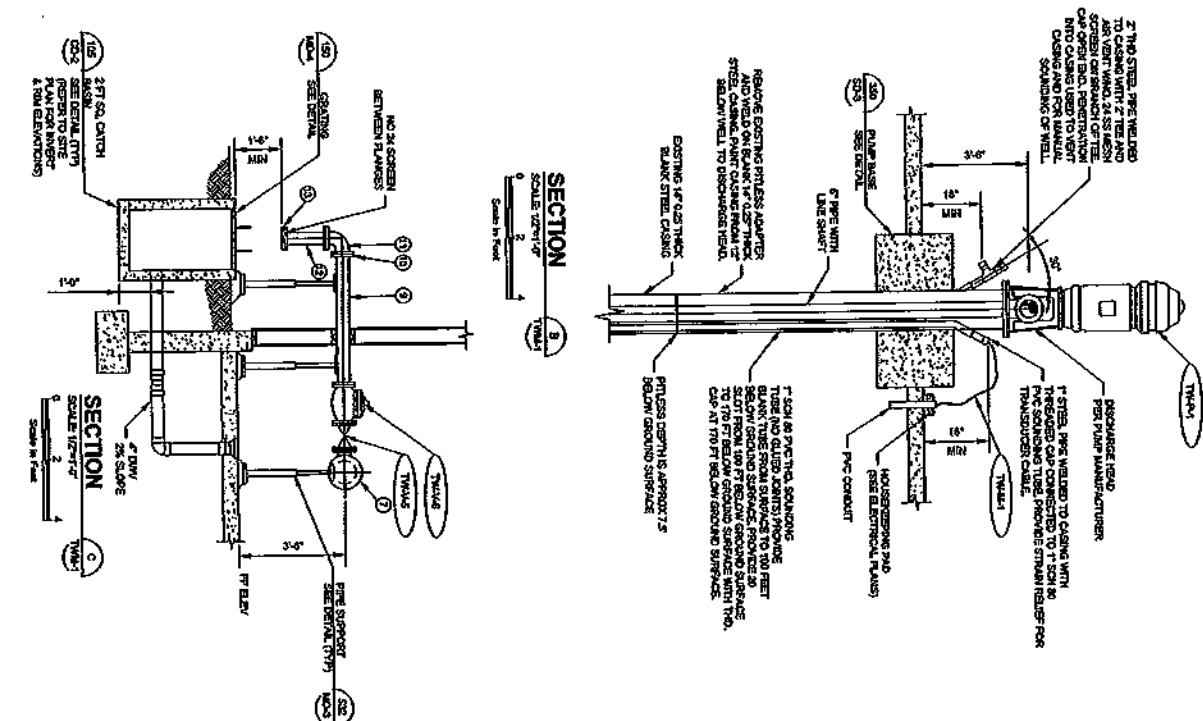
SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	W-09



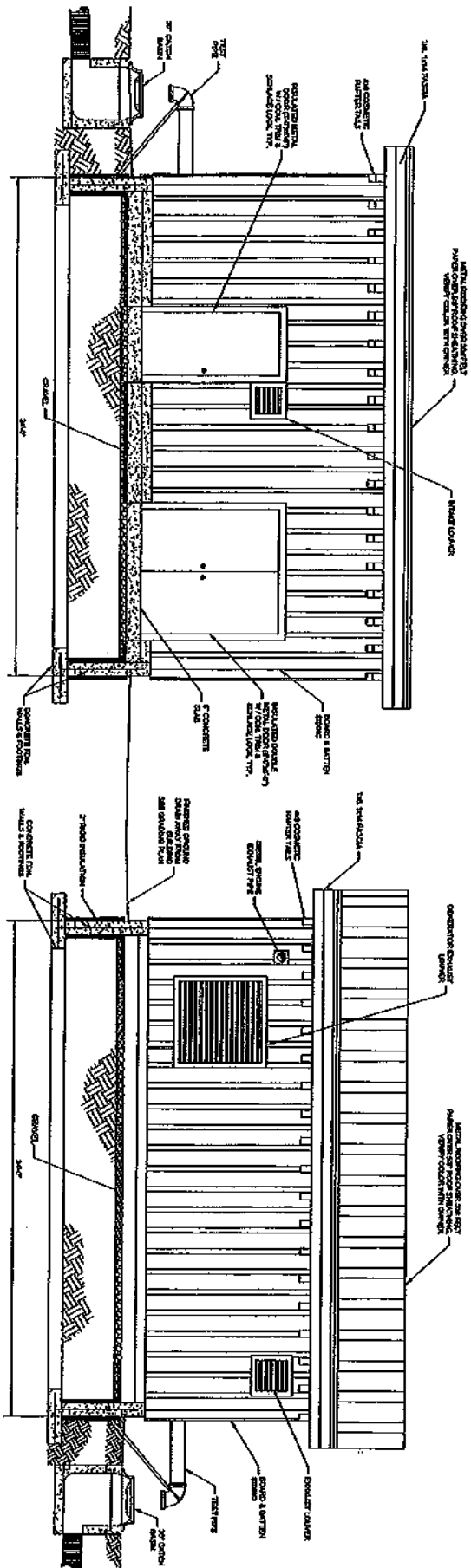
MECHANICAL PLAN
SCALE 1/8"=1'-0"
0 1 2
Scale in Feet

- NOTES:**
1. REFER TO SHEET SCH-4 FOR VALVE, MECHANICAL PUMP, AND PUMP SCHEDULES.
 2. ALL BOLTS SHALL BE STAINLESS STEEL.
 3. PAINT PERK, FITTING, PIPE STRAPS, AND APPURTENANCES BLUE.
 4. PAINT VALVES RED.
 5. PAINT IN RED LINE SHALL BE WELD VENTILATED PER PAINT MANUFACTURERS RECOMMENDATIONS DURING OFF DOWNS PERIOD.
 6. PROVIDE PIPE SUPPORTS SHOWN IN STANDARD DETAILS MARKED WITH AN "X" OR AS NEEDED.

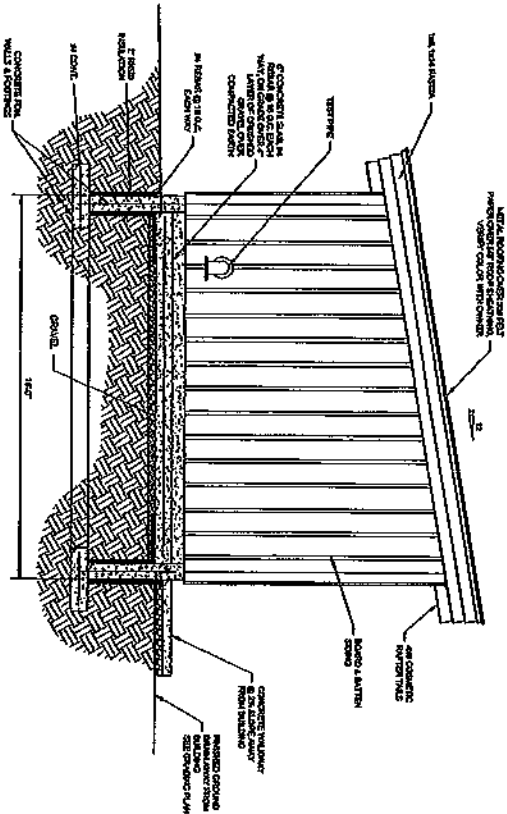
PIPE SCHEDULE				
NO.	DESCRIPTION	SIZE	JOINT	MATERIAL
1	STEEL	8"		FE
2	8" BRND	8"		FLY
3	STEEL	6"		FLY
4	8" BRND	6"		FLY
5	RESTRAINED DISMANTLING JOINT	6"		FLY
6	STEEL	4"		FLY
7	CONCRETE	4"		FLY
8	CONCRETE	4"		FLY
9	CONCRETE	4"		FLY
10	CONCRETE	4"		FLY
11	CONCRETE	4"		FLY
12	CONCRETE	4"		FLY
13	CONCRETE	4"		FLY
14	CONCRETE	4"		FLY
15	CONCRETE	4"		FLY
16	CONCRETE	4"		FLY



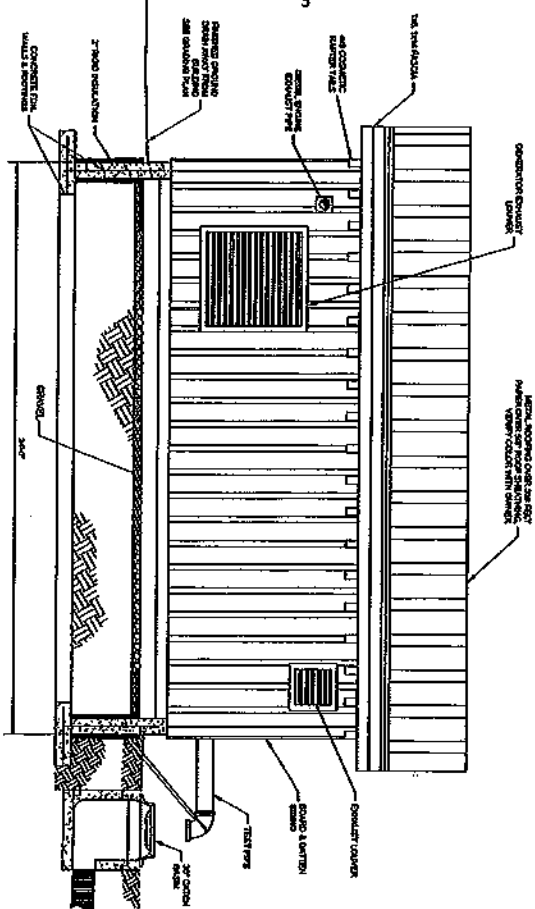
SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	W-10.2



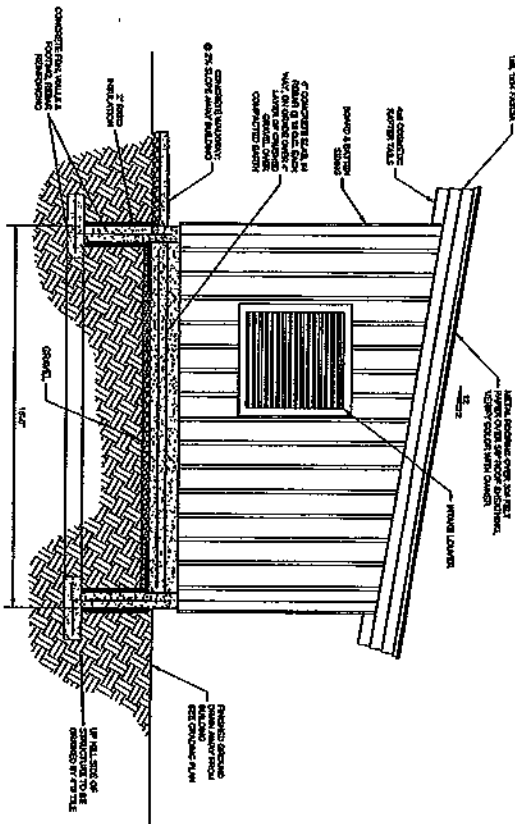
**BUILDING ELEVATION
FRONT VIEW**
SCALE: 3/4\"/>



**BUILDING ELEVATION
LEFT SIDE VIEW**
SCALE: 3/4\"/>



**BUILDING ELEVATION
BACK VIEW**
SCALE: 3/4\"/>



**BUILDING ELEVATION
RIGHT SIDE VIEW**
SCALE: 3/4\"/>

NOTE: ALL CONSTRUCTION SHALL BE DONE IN ACCORDANCE WITH THE CITY OF TETONIA STANDARD SPECIFICATIONS FOR CONSTRUCTION.

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	W-10.2

BLOCKS

NOTES: 1. #4 REBAR REQ'D AS SHOWN. REBAR SHALL RECEIVE A BITUMINOUS COAL TAR BASECOATING

2. SEE STANDARD DRAWING BELOW FOR THRUST BLOCK AREA REQUIREMENTS

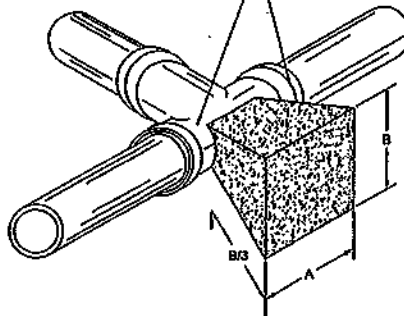
VERTICAL BEND

- NOTES: 1. #4 REBAR REQ'D AS SHOWN. REBAR SHALL RECEIVE A BITUMINOUS COAL TAR BASECOATING
2. SEE STANDARD DRAWING BELOW FOR THRUST BLOCK AREA REQUIREMENTS

-REBAR (TYP.)
SEE NOTE 1

VERTICAL BEND

CONCRETE TO BE
FORMED WITH SUITABLE
RIGID MATERIAL SO AS
NOT TO COVER ANY
MECHANICAL JOINTS OR
BOLTS.



NOTE: THIS TABLE IS BASED ON 150 PSI MAIN PRESSURE, 2000 PSF SOIL BEARING PRESSURE. CONCRETE BLOCKING MUST CURE FOR 24 HOURS PRIOR TO CHARGING SYSTEM.

DIMENSION FOR THRUST BLOCKING								
FITTING SIZES	TEES & PLUGS		90° BEND		45° BEND & WYES		REDUCERS & 22-1/2° BEND	
	A	B	A	B	A	B	A	B
4"	1'-7"	1'-2"	1'-8"	1'-6"	1'-8"	0'-10"	1'-7"	0'-6"
6"	2'-0"	1'-11"	2'-5"	2'-2"	1'-10"	1'-7"	1'-9"	0'-10"
8"	2'-8"	2'-6"	3'-2"	3'-0"	2'-5"	2'-1"	1'-9"	1'-6"
10"	3'-4"	3'-3"	4'-0"	3'-10"	3'-0"	2'-8"	2'-2"	1'-11"
12"	4'-0"	3'-10"	4'-8"	4'-6"	3'-6"	3'-3"	2'-7"	2'-3"

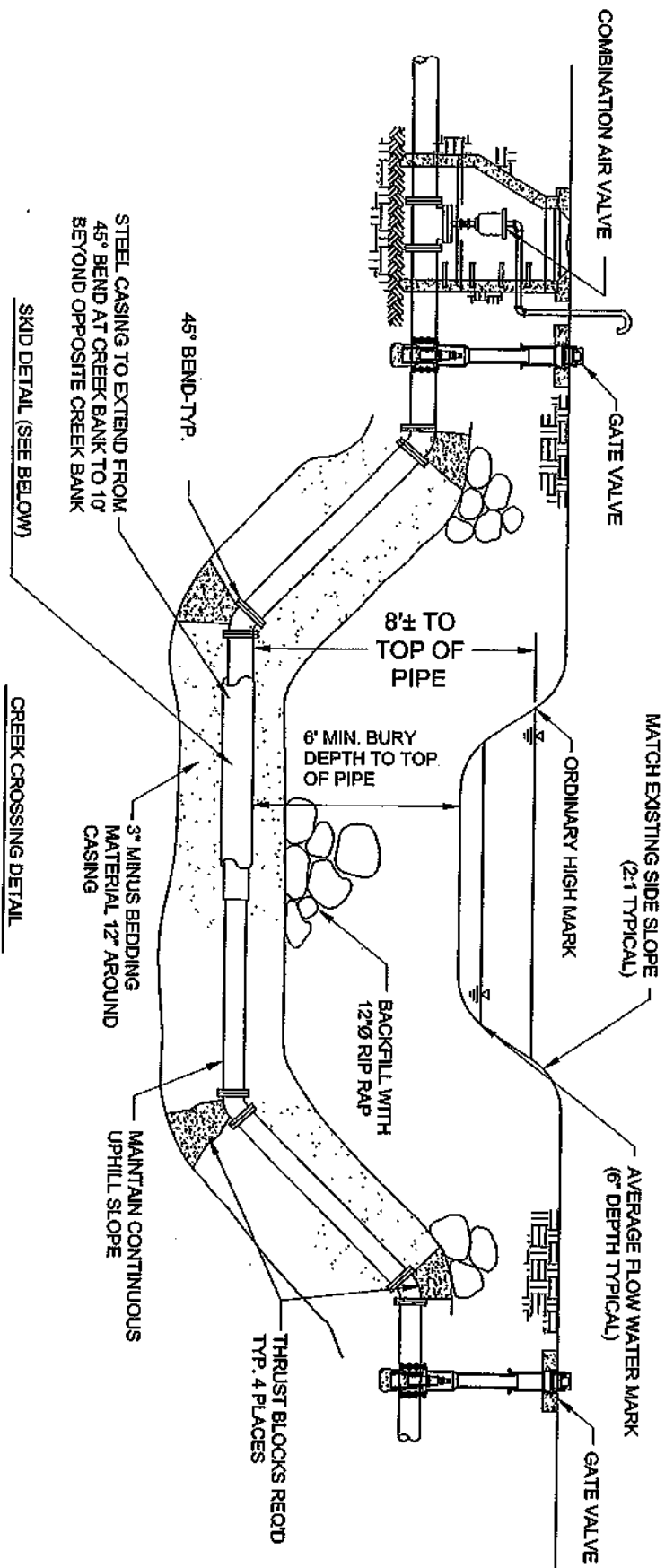
STANDARD DRAWINGS & SPECIFICATIONS

CITY OF TETONIA - STANDARD DETAILS

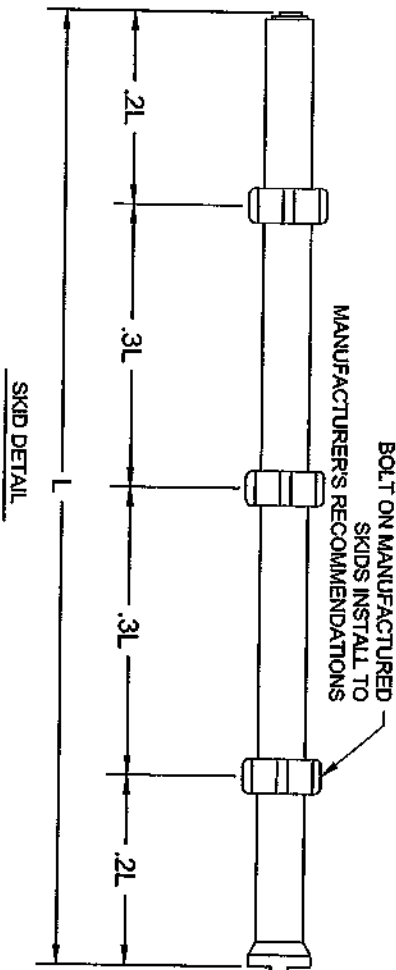
SCALE:	NONE
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DATE:	10-01-2021
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DRAWING #:	W-11
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NOTE:
1. CREEK CROSSING MUST BE
APPROVED BY ARMY CORP OF
ENG. PRIOR TO CONSTRUCTION.



STANDARD DRAWINGS & SPECIFICATIONS
CREEK CROSSING DETAIL FOR WATER & SEWER

CITY OF TETONIA - STANDARD DETAILS

SCALE:	NONE
DATE:	10-01-2021
DRAWING #:	W-12

