

PROJECT MANUAL

ALTA HIGH SCHOOL GYM FIRE PROTECTION

11055 S 1000 E,
SANDY, UT 84094

BOARD OF EDUCATION
CANYONS SCHOOL DISTRICT

O & P PROJECT NO. 23122
February 2024

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SECTION 01100 - SUMMARY

1.0 PART 1.00 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Special Conditions and other Division 1 Specification sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS:

Project Identification: Project consists of adding fire protection to the existing gym, fire riser, and fire line into the existing school at Alta High school, for Canyons School District.

1. Project Location: Alta High School
11055 S 1000 E, Sandy, UT 84094
2. Owner: Canyons School district.

Identification: The Contract Documents, dated February 2024, were prepared for Project by Olsen & Peterson Consulting Engineers, Inc.

1.3 DESCRIPTION OF WORK:

Briefly and without force and effect upon the contract documents, the work of the Contract can be summarized as follows:

The work includes asphalt paving, excavation, backfill, normal concrete work, and other work as indicated, for installation of fire line and culinary piping.

1.4 CONTRACTOR USE OF PREMISES:

General: The Contractor shall limit his use of the premises as indicated.

Use of the Site: Confine operations at the site to the areas permitted under the contract and as directed by the Owner. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction.

Keep existing driveways and entrances serving the premises clear and available to the Owner and his employees at all times. Do not use these areas for parking or storage of materials.

Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to areas directed by Owner. If additional storage is necessary, obtain and pay for such storage off site.

Lock automotive type vehicles, such as passenger cars and trucks and other mechanized or motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

Provide signs, lights, rope offs, etc. to protect the people at all times.

1.5 OWNER OCCUPANCY:

Full Owner Occupancy: The Owner will occupy the site during the entire period of construction. Cooperate fully with the Owner or his representative during construction operations to minimize conflicts and to facilitate Owner usage. Perform the work so as not to interfere with the Owner's operations.

1.6 CONTRACT:

Project will be constructed under a general construction contract.

1.7 SPECIFICATION FORMATS AND CONVENTIONS:

Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Content Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall", "shall be", or "shall comply with", depending on the context are implied where a colon (:) is used within a sentence or phrase.

2.0 EXECUTION

2.1 EXECUTION OF THE WORK:

The execution of the work shall proceed in sequence as scheduled by the Contractor and as approved by the Owner and the users of the building.

End of Section

SECTION 01310 – PROJECT MANAGEMENT AND COORDINATION

1.0 GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Special Conditions and other Division 1 Specification sections, apply to this Section.

1.2 SUMMARY:

This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Administrative and supervisory personnel.
4. Project meetings.

1.3 COORDINATION:

Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work.

Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.4 PROJECT MEETINGS:

General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction, as indicated in other sections of the Project Manual.

Progress Meetings: Conduct progress meetings at regular intervals. Coordinate dates of meetings with preparation of payment requests.

End of Section

SECTION 01320 – CONSTRUCTION PROGRESS DOCUMENTATION

1.0 GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Special Conditions and other Division 1 Specification sections, apply to this Section.

1.2 SUMMARY:

This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work.

1.3 SUBMITTALS:

Contractor's Construction Schedule: Submit two printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.

1.4 COORDINATION:

Coordinate preparation and processing of schedules and reports with performance of construction activities.

Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

2.0 PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL:

Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.

Activities: Comply with the following:

1. Submittal Review Time: Include review and re-submittal times indicated in Division 1 Section "Submittal Procedures" in schedule.
2. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.

Constraints: Include constraints and work restrictions indicated in the Contract Documents, and show how the sequence of the Work is affected.

Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. ON the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.

Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

2.2 CONSTRUCTION SCHEDULE:

Bar-Chart Schedule: Submit horizontal bar-chart-type construction schedule within seven days of date established for commencement of the Work.

Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

3.0 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE:

Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same location. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

End of Section

SECTION 02220 - TRENCH EXCAVATING, BACKFILLING, AND COMPACTION

1.0 GENERAL

1.1 WORK INCLUDED

- A. Contractor shall provide all materials, labor, equipment, transportation and other items required to perform excavation, backfilling and compaction Work as indicated or as required to accomplish Work of other sections of these specifications. All excavation, backfilling and compaction Work shall be in accordance with applicable regulations and as specified herein.
- B. Excavating, backfilling and compaction includes, but is not limited to the following:
 - 1. Preparation
 - 2. Excavation, backfilling and compaction
 - 3. Dewatering and/or runoff control measures
 - 4. Trench shoring
 - 5. Clean up, protection, maintenance

1.2 RELATED WORK

- A. Section 02590 - Restoration of Existing Improvements
 - 1. Restoration of surfaces or facilities lost, damaged or displaced as a result of Work included in this section.
- B. Section 02665 - Potable Water Distribution Systems
 - 1. Trench excavation, bedding, backfill and compaction requirements.

1.3 REFERENCES

- A. The applicable provisions of the latest editions of the References listed below shall govern the Work covered under this Section, unless there is a conflict between said References and the requirements of this Section. In the case of such a conflict, the requirements of this Section shall apply.
- B. Utah Occupational Safety and Health Division (UOSHD).
- C. American Association of State Highway and Transportation Officials (AASHTO):
- D. American Society for Testing and Materials (ASTM)

1.4 SUBMITTALS

- A. Submit evidence of materials conformance with applicable requirements as well as these specifications.

1.5 QUALITY ASSURANCE

- A. Comply with federal, state, and local codes and regulations.
- B. All working conditions shall be in accordance with the "Utah Occupational Safety and Health Division", Safe Practices for Excavation & Trenching Operations, latest edition, or other Laws or Regulations which apply.
- C. White City Water Improvement District requirements shall govern for all culinary water and fire line water.
 - 1. All work shall conform to the applicable standards, regulations, and requirements of the White City water improvement district.
 - 2. Permits shall be obtained and paid for by the Contractor.

2.0 PRODUCTS

2.1 MANUFACTURERS

- A. Materials suppliers shall provide, upon request, verification of a consistent record of meeting or exceeding materials or performance standards as specified herein.

2.2 FOUNDATION MATERIALS

- A. All foundation materials shall be free from alkali, salt, and petroleum products, roots, sod, limbs, and other vegetative matter, slag, cinders, ashes and rubbish, or other material that in the opinion of the Engineer may be objectionable or deleterious.
- B. Undisturbed soil foundation material:
 - 1. Shall be natural trench bottom soil unless unable to adequately support pipe or structures.
 - 2. Shall not be lumpy or frozen.
- C. Gravel:
 - 1. Shall be hard, durable, broken stone or slag.
 - 2. Shall be graded within the following limits:

<u>Sieve</u>	<u>% Passing</u>
1"	100
3/4"	85-100
1/2"	20-40
No. 4	10-20

2.3 BEDDING MATERIALS

A. Sand Bedding Material:

1. Shall be free from alkali, salt, and petroleum products, roots, sod, limbs, and other vegetative matter, slag, cinders, ashes and rubbish, or other material that in the opinion of the Engineer may be objectionable or deleterious.
2. Graded within the following limits:

<u>Sieve</u>	<u>% Passing</u>
3/4"	100
No. 4	80-100
No. 10	30-50
No. 40	10-30
No. 200	0-15

2.4 BACKFILL MATERIALS

A. Granular backfill:

1. Shall be readily compactable and shall be free from alkali, salt, and petroleum products, roots, sod, limbs, and other vegetative matter, slag, cinders, ashes and rubbish, or other material that in the opinion of the Engineer may be objectionable or deleterious.
2. Graded within the following limits:

<u>Sieve</u>	<u>% Passing</u>
2-1/2 inch	100
No. 10	50 max.
No. 40	30 max.
No. 200	18 max.

3. May be select material from excavation if it will meet all requirements of granular backfill, including compaction requirements as specified for type of surface improvement above trench.

B. Excavated Soil Backfill Material:

1. Shall be free from alkali, salt, and petroleum products, roots, sod, limbs, and other vegetative matter, slag, cinders, ashes and rubbish, or other material that in the opinion of the Engineer may be objectionable or deleterious.
2. Shall be select material from excavation, with no particle larger than 4 inches in diameter.
3. Use on-site materials only if specified compaction requirements can be met.

3.0 EXECUTION

3.1 EXAMINATION

- A. It shall be the Contractor's sole responsibility to locate all (whether or not shown on the Drawings) existing water, sanitary sewer, storm drain, and gas lines, electrical and telephone conduit and other underground utilities with their existing house service connections, and all other underground structures in order that no damage or loss of service will result from interference with existing lines.
- B. Review all available drawings, notes, and information on the location of these underground lines and structures in determining the location of the existing facilities.
- C. Have an electronic pipe finder on the job at all times and mark all lines on the road ahead of the excavating machine.
- D. Blue Stakes Location Center shall be contacted 48 hours before any excavation is commenced.
- E. Mark with paint any existing cracks on concrete along which work will take place, in order to determine after the construction is completed whether such damage was caused by the operations of the Contractor or had occurred previously. Any concrete showing unmarked cracks upon completion of construction will be evidence of damage by the Contractor's forces, and shall be replaced or repaired to the satisfaction of the Owner of the damaged concrete, at the Contractor's own expense.
- F. All fences removed for excavation shall be returned to their original condition except that damaged portions will be replaced with new fencing at the Contractor's expense.
- G. Obtain all required permits.

3.2 METHODS AND PROCEDURES

- A. General Requirements
 - 1. All gas, sanitary sewer, storm drain, water and other pipelines, flumes and ditches of metal, wood or concrete, underground electrical conduits and telephone cable, and all walks, curbs, and other improvements encountered in excavating trenches carefully shall be supported, maintained and protected from injury or interruption of service until backfill is complete and settlement has taken place.
 - 2. If any existing facility is damaged or interrupted, promptly after becoming aware thereof and before performing any Work affected thereby, except in an emergency, identify the owner of such existing facility, and give written notice thereof to that owner and the Owner and Engineer. Indemnify the Owner from any and all damages resulting from damaged facilities.
 - 3. All damage, injury or loss resulting from lack of adequate sheeting, bracing, and shoring shall be the responsibility of the Contractor; and the Contractor shall effect all necessary repairs or reconstruction resulting from such damage.
 - 4. The trenches shall not be backfilled until the utilities systems as installed conform to the requirements of the Drawings and Specifications. Where, in the opinion of the Engineer, damage is likely to result from withdrawing sheeting, the sheeting shall be left in place.

5. Trenches shall be backfilled to the proper surface with material as shown or specified. Trenches improperly backfilled shall be reopened to the depth required for correction, then refilled and compacted as specified, or the condition shall be otherwise corrected as approved.
6. Care shall be exercised so that when backfilling is complete and settlement has taken place, all existing pipes, flumes, ditches, conduits, cables, walks, curbs, and other improvements will be on the same alignment and grade as they were before work commenced.
7. Compaction shall be the responsibility of the Contractor. He shall select the methods to be used and carefully perform the work of backfilling and compaction so as to prevent damage to new or existing piping. Any new or existing piping damaged during the Contractor's work shall be replaced as directed by the Engineer with new piping.

3.3 **INSTALLATION**

A. Excavation

1. Excavation for pipe lines, concrete valve boxes, manholes and appurtenant structures shall include the work of removing all earth, sand, gravel, quicksand, stone, loose rock, solid rock, clay, shale, cement, hardpan, boulders, and all other materials necessary to be moved in excavating the trench for the pipe; maintaining the excavation by shoring, bracing, and sheeting or well pointing to prevent the sides of the trench from caving in while pipe laying is in progress; and removing sheeting from the trench after pipe has been laid.
2. Trench support system shall be suitable for the soil structure, depth of cut, water content of soil, weather conditions, superimposed loads, vibration. Contractor may select one of the following methods of ensuring the safety of workers in the trench, as approved by the Utah State Industrial Commission or its safety inspectors:
 - a. Sloping sides of trench to the angle of repose at which the soil will remain safely at rest.
 - b. Shoring trench sides by placing sheeting, timber shores, trench jacks, bracing, piles, or other materials to resist pressures surrounding the excavation.
 - c. Using a movable trench box built-up of steel plates and a heavy steel frame of sufficient strength to resist the pressures surrounding the excavation.
3. Trenches shall be of the necessary width for proper laying of pipe. Care shall be taken not to overexcavate. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe along the entire length of the barrel of the pipe.
4. Trenches shall be excavated to the depths shown on the Drawings, including any required allowances for the sewer rock foundation, when required, and for other pipe bedding requirements.
5. Minimum cover over the top of the pipe, including any paving, shall be as follows:
 - a. Water supply piping: 4.0 feet minimum from finish grade.

6. Grading of trenches shall be performed to avoid interference of water and sewer lines with other underground utilities and structures:
 - a. Water supply piping: Unless otherwise indicated, trenches shall be graded to avoid high points with the necessity of placing vacuum and relief valves in the water lines.
 7. The width of trench, measured at the top of the pipe, shall be as narrow as possible but not wider than 15 inches on each side of sewer or water pipe.
 8. Excavation for manholes, concrete valve boxes, and similar structures shall be sufficient to leave at least 12 inches in the clear between the outer surfaces and the embankment or timber that may be used to hold and protect the banks.
 9. Excess materials shall be hauled away from the construction site or otherwise disposed of by the Contractor as approved by the Engineer.
- B. Backfilling
1. Materials for trench backfill shall be as shown on the Drawings.
 2. Pipe bedding:
 - a. Consists of preparing an acceptable pipe foundation, excavating the pipe groove in the prepared foundation and backfilling from the foundation to 12 inches above the top of the pipe. All piping shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded.
 - b. Pipe foundation: Shall consist of natural soil in the bottom of the trench, or a built-up foundation if conditions so warrant. Wherever the trench subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, and where groundwater must be drained, the trench shall be excavated below the bottom of the pipe to such depth as may be necessary, and this additional excavation filled with clean, compacted sewer rock.
 - c. A pipe groove shall be excavated in the pipe foundation to receive the bottom quadrant of the pipe so that the installed pipe will be true to line and grade. Bell holes shall be dug after the trench bottom has been graded. Bell holes shall be excavated so that only the barrel of the pipe bears on the pipe foundation.
 - d. Pipe bedding from pipe foundation to 12 inches above top of pipe: Materials shall be deposited and compacted in layers not to exceed 8 inches in uncompacted depth. Deposition and compaction of bedding materials shall be done simultaneously and uniformly on both sides of the pipe. All bedding materials shall be placed in the trench with hand tools or other approved method in such a manner that they will be scattered alongside the pipe and not dropped into the trench in compact masses. Materials used shall be as shown in the Typical Trench Section in the Drawings and as specified in Part 2.
 3. Each lift shall be evenly spread and moistened or dried by disk harrowing or other means so that the required density will be produced.

4. Backfill around valves with Granular Backfill Material.

C. Compaction

1. Backfill Compaction Requirements:

- a. Under pavements, or other surface improvements, the minimum density shall be 95% of laboratory maximum density as determined by AASHTO Designation T-180 (ASTM D-1557).
- b. In shoulders and other unimproved areas, the minimum density shall be 85% of laboratory maximum as determined by AASHTO Designation T-180 (ASTM D-1557).

2. Compaction shall be performed in strict accordance with the manufacturer's recommendations for each type of pipe.

3. Mechanical compaction: Shall be accomplished by the use of sheeps-foot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers of a size and type necessary to achieve the required degree of compaction.

D. Dewatering

1. The Contractor shall do all pumping, shall build all drains and do all the work necessary to keep the trench and pipes free from water during the progress of the work.
2. In wet trenches, a channel shall be kept open along the side of the pipe for conducting the water to a sump hole, from which it shall be pumped out of the trench. No water shall be allowed to enter the pipe.

3.4 PROTECTION

- A. Provide barricades and restrict access as appropriate to prevent damage to Work in place.
- B. Contractor shall be responsible for protection of Work in place against displacement, damage, or loss until Owner's acceptance. Any work and subsequently damaged, lost or displaced shall be repaired or replaced to the Owner's satisfaction at no additional cost.

3.5 CLEANING

- A. Thoroughly clean, rake, wash, flush or sweep as required to clean adjacent improvements of materials covered as part of this Work prior to submitting for Owner's acceptance.
- B. Contractor shall provide all labor, equipment, materials and other items as required to perform clean up as required by the Owner, adjacent property owners and other jurisdictions.
- C. Finish grading of areas affected by this Work shall be required as part of clean up.
- D. The roadway including shoulders, slopes, ditches, and borrow pits shall be smoothly trimmed, and shaped by machinery, or other satisfactory methods, to the lines, grades and cross-sections, as established, and shall be so maintained until accepted. Any surplus material not suitable for spreading along the road to widen the existing shoulder or raise the grade shall be disposed of as specified above.

3.6 **TESTING**

- A. The Contractor shall employ a testing laboratory to perform field and laboratory density tests, except that the Contractor shall make such additional tests, at his expense, as deemed necessary by him to assure that the work of compaction is performed properly, determine any adjustments in compacting equipment, thickness of layers, moisture content and compactive effort or other means necessary to obtain the specified minimum relative density. Provide access to the work and all men and machinery necessary to aid the testing laboratory personnel in performing field density tests or taking samples for laboratory tests. In general, tests and samples shall be made as the work proceeds.
- B. Have testing laboratory perform maximum density tests on materials to be compacted from samples submitted by Contractor taken from locations selected by the Engineer.
- C. Have testing laboratory perform field density tests of compacted backfill materials. The approximate location and number of such tests shall be as shown on the drawings, as described in the Bid Form, or as selected by the Engineer. Field density tests shall be taken as follows:
 - 1. In planted or unimproved areas:
 - a. 18" above the top of the pipe
 - b. Finished grade
 - 2. In streets, roads, parking lots or other paved areas:
 - a. 18" above the top of the pipe
 - b. 24" to 36" below the gravel road base
 - c. Gravel road base subgrade
 - d. Top of gravel road base
 - e. Top of bituminous surface course
- D. Copies of test results prepared by the testing laboratory shall be transmitted to the Contractor at the same time they are transmitted to the Engineer.
- E. Successful performance of compaction at the location of the field density test shall not relieve the Contractor of his responsibility to meet the specified density requirements for the complete project.

End of Section

02513 – CONCRETE SITEWORK

1.0 GENERAL

- A. Contractor shall provide all materials, labor, tools, equipment, fees, permits, transportation and other items required to furnish and install concrete sitework as indicated or as required to accomplish Work of other sections of these specifications. All concrete sitework shall be in accordance with applicable regulations and as specified herein.
- B. Concrete site work includes, but is not limited to the following:
 - 1. Form Construction
 - 2. Concrete Materials
 - 3. Placing Concrete
 - 4. Sidewalk and Curb and Gutter Joints
 - 5. Hot and Cold Weather Concreting
 - 6. Finishing
 - 7. Curing
 - 8. Testing, Clean-up and Protection

1.1 RELATED WORK

- A. Section 02220 - Excavating, Backfilling and Compaction
 - 1. Materials and compaction requirements for sub grades beneath paved areas.

1.2 REFERENCES

- A. The applicable provisions of the latest editions of the References listed below shall govern the Work covered under this Section, unless there is a conflict between said References and the requirements of this Section. In the case of such a conflict, the requirements of this Section shall apply.
- B. American National Standards Institute (ANSI)
- C. The American Concrete Institute (ACI)
- D. American Society for Testing and Materials (ASTM)
- E. American Association of State Highway and Transportation Officials (AASHTO)
- F. White City Corporation Standard Construction Details

1.3 SUBMITTALS

- A. Submit evidence of materials conformance with applicable requirements as well as these specifications.

- B. Submittals generally include, but are not limited to the following:
1. A mix design shall be submitted to Engineer at least two weeks prior to commencement of the work.
 2. Submit construction, expansion and contraction joint layout plan for review and approval at least 14 days prior to start of concreting.
 3. Submit manufacturer's data for all materials used.
 4. Provide weight tickets to owner's representative for all ready-mixed concrete at the time of delivery to the site.

1.4 QUALITY ASSURANCE

- A. Qualifications of Workmen:
1. Use workmen thoroughly trained and experienced in placing and finishing the types of concrete specified. Provide a minimum of one ACI certified flatwork finished with each concrete finishing crew.
- B. Comply with federal, state and local codes and regulations.
- C. Comply with hot or cold weather requirements when applicable.
- D. Two (2) Year Written Guarantee.
1. Provide two year written guarantee to the Owner, in form approved by the Engineer to promptly remove and/or repair defective concrete (cracking, spalling, pitting or honeycombing) as directed by Engineer and at Contractor's expense. New replacement work shall carry a similar new two year written guarantee. Guarantee shall start from Date of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Contractor shall be responsible for proper storage of all equipment and materials to be provided as part of this specification in accordance with the manufacturer's recommendations and shall be responsible for security and proper handling of such equipment and materials at the project site.
- B. Any materials lost, stolen, or damaged prior to Owner's final acceptance are to be replaced or repaired to the Owner's satisfaction by the Contractor at no additional cost to the Owner.
- C. Ready mixed concrete: Concrete shall be mixed only in such quantities as are required for immediate use. The maximum allowable time between charging of the material in the mixing drum and final placing shall be ninety minutes for air temperatures below 80 F and sixty minutes for temperatures above 80 F. Concrete not placed within these time limits, or if an initial set has developed shall not be used. Tempering concrete by adding water or by other means will not be permitted.

2.0 PRODUCTS

2.1 MANUFACTURERS

2.2 PORTLAND CEMENT CONCRETE MATERIALS

A. Cement:

1. Portland cement shall be Type II, complying with ASTM C150 - Standard Specification for Portland Cement.

B. Coarse Aggregates:

1. Shall conform to ASTM C33 - Standard Specification for Concrete Aggregates.
2. Coarse aggregate shall be graded within the following limits:

C. Sieve % Passing

1-1/2" 100
1" 95 - 100
1/2" 25 - 60
No. 4 10 - 40

1. Coarse aggregate shall consist of gravel, crushed slag, or crushed stone, composed of hard, strong and durable particles, free of injurious coatings.

D. Fine aggregate:

1. Shall conform to ASTM C33.
2. Fine aggregate shall consist of natural sand, composed of hard, strong and durable particles.
3. Fine aggregate shall be uniformly graded from coarse to fine within the following gradation:

E. Sieve % Passing 3/8" 100

No. 4 95 100
No. 8 80-100
No. 16 50 85
No. 30 25-60
No. 50 10 30
No. 100 2 10

F. Water:

1. Water used in washing aggregate and mixing concrete shall be of a potable quality clean and free from oil, acid, salt, injurious amounts of alkali, organic matter or other deleterious substances.

G. Admixtures:

1. No admixture will be permitted to be used in Portland cement concrete except for an air entraining agent, and a concrete coloring agent.

- H. Air entraining agent:
 - 1. Shall be used in all concrete.
 - 2. The agent shall conform to ASTM Designation C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
 - 3. Shall be added at the mixer.
- I. Concrete curing compound:
 - 1. Liquid membrane curing compound shall comply with ASTM Designation C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete, Type II Class A. Moisture loss not more than 0.055 gr./sq. cm when applied at 200 sq. ft./gal.

2.3 PORTLAND CEMENT CONCRETE MIX

- A. Portland Cement Concrete shall consist of a mixture of water, Portland Cement, fine and coarse aggregates, and an air entraining agent.
- B. The proportions of the concrete materials shall produce a mixture that will work readily into corners and angles of forms and around reinforcing steel.
- C. The methods of measuring concrete materials shall permit proportions to be accurately controlled and easily checked. Measurement of materials for ready mixed concrete shall conform to ASTM C94 - Standard Specification for Ready-Mixed Concrete.
- D. Concrete mix design:
 - 1. Intended Use: Storm drainage, curbs, walks and driveways.
 - Coarse Aggregate Size: 1"
 - Minimum Cement Content: 6.5 sacks/CY
 - Minimum 28 Day Compressive Strength: 4000 psi
 - Minimum 28 Day Flexural Strength: 550 psi
 - Required Slump: 2.5 - 4 inches
 - Air Entrainment 5 - 6.5 percent
- E. The contractor shall be responsible for the mix design.

2.4 JOINT MATERIALS

- A. Filler material shall be pre-formed, non-extruding resilient type complying with ASTM D-544 of thickness to fill joint.
- B. Joint sealant shall be polyurethane based, self leveling, one part elastomeric sealant complying with FS-TT-S00230 Class A Type I. (unless Type II is recommended by manufacturer for application). Select marketing materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration.

2.5 CONCRETE REINFORCEMENT

- A. Reinforcing steel:
 - 1. All reinforcing bare material used for reinforcement of concrete shall be intermediate Grade 60 steel conforming to the requirements of ASTM A-615.

2. All rods shall be deformed and round.
 3. All reinforcement shall be uncoated, free from rust, scale, form oil, etc.
 4. Welded wire fabric for concrete reinforcement shall conform to ASTM A-185.
- B. Accessories:
1. All accessories, including such items as chairs, spacers, saddles, etc., shall be of steel formed in such a manner and with sufficient strength to perform the intended functions. Chairs, spacers, saddles, etc., which are set in contact with forms, are to be galvanized or provided with plastic tips or coating to prevent rust spots on finish concrete surface.
- C. Wire:
1. All tying steel shall not be less than 18 gage annealed iron lacing wire. All wire tie ends shall point away from forms.
- D. Fibermesh:
1. All flatwork to have fibermesh.

2.6 FORM MATERIALS

- A. Forms shall be of suitable material and of a type, size, shape, quality, and strength to insure construction as designed.
- B. Metal forms for exposed surfaces may be used when all bolt and rivet holes are countersunk so that a plane, smooth surface of the desired contour is obtained.
- C. Rough lumber may be used for forming surfaces that will be covered by earth in the finished structure.
- D. Forms for all surfaces that will not be completely enclosed or hidden below the permanent surface of the ground shall be made of surfaced lumber, or material which will provide a surface at least equal to surfaced lumber or plywood.
- E. All lumber shall be free from knotholes, loose knots, cracks, splits, warps, or other defects affecting the strength or appearance of the finished work. Any lumber or material which becomes badly checked or warped, prior to placing concrete, shall not be used.
- F. All forms shall be free of bulge and warp, and shall be cleaned thoroughly before being used.

2.7 EQUIPMENT

- A. The use of Power Screed equipment will be required for all concrete pavement work.
- B. Slip-Form Paver:
 1. At the option of the Contractor, and with the approval of the Engineer, concrete pavement may be constructed by the use of slip-form paving equipment. The slip-form paver shall consist of a self-propelled, self-powered machine capable of spreading, vibrating, tamping, striking-off, and shaping the concrete to the desired line, grade, and thickness in one continuous passage.
 2. The slip-form paver shall be equipped with internal-type vibrators meeting the following requirements:

- C. Eccentric Diameter 1-7/8 inch
- D. Frequency 9,500 vibrations per minute (min)
- E. Spacing 24 inches maximum when mounted transversely; 18 inches when mounted longitudinally
 - 1. The vibrators shall be operated horizontally at the height of the midpoint of the concrete slab and shall be mounted so they will maintain this position. The vibrators may be mounted in a traverse or longitudinal position.
 - 2. Each vibrator shall be equipped with an indicator light or other electrical device that will indicate whether or not the vibrator is operating. The lights or other devices shall be mounted on the paving machine so they can be easily seen by the operator and the inspector. If the lights or other devices show that a vibrator or vibrators are not operating properly, the paving operations shall be stopped immediately. Paving operations shall not be resumed until the faulty vibrator or vibrators have been repaired or replaced.
 - 3. The paver shall be capable of providing a continuous deposit of concrete with a minimum of starting and stopping. Trailing forms shall be of a sufficient length to leave a smooth, straight, vertical edge or a keyed longitudinal construction joint of the shape shown on the Drawings. The trailing forms shall be held in position by suitable devices sufficiently rigid to prevent spreading of the forms under the weight of the concrete and finishing operations.

3.0 EXECUTION

3.1 EXAMINATION

- A. Coordinate layout and installation of concrete sitework with other construction elements to ensure adequate headroom, working clearance, and access.
- B. Examine surfaces to receive concrete sitework for compliance with installation tolerances and other conditions affecting performance of the paving system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 METHODS OR PROCEDURES

- A. Preparation
 - 1. Remove all wood scraps, ice, snow, frost and debris from the areas in which concrete will be placed.
 - 2. Thoroughly clean the areas to ensure proper placement and bonding of concrete.
 - 3. All reinforcement shall be free from loose mill scale, loose or thick rust, dirt, paint, oil, or grease, and shall present a clean surface.
 - 4. Thoroughly wet the forms (except in freezing weather), or oil them and remove all standing water.
 - 5. Thoroughly clean all transporting and handling equipment.
 - 6. Notify the Owner at least 24 hours before placing concrete.

7. Obtain the Architect/Engineer's approval of location of all construction joints and control joints in the Work prior to start of concrete placement.
8. Erect and maintain suitable barriers to protect the finished surface. Any section damaged from traffic or other causes occurring prior to its official acceptance, shall be repaired or replaced by the Contractor at his own expense in a manner satisfactory to the Architect/Engineer.

B. Hot Weather Concreting

1. Hot weather is defined as any combination of high air temperature, low relative humidity, and wind velocity tending to impair the quality of fresh or hardened concrete or otherwise resulting in abnormal properties. Hot weather concreting shall follow the guidelines of ACI 305R, latest edition.
2. Undesirable hot weather effects on concrete in the plastic state may include:
 - i. Increased water demand.
 - ii. Increased rate of slump loss and corresponding tendency to add water at job site.
 - iii. Increased rate of setting resulting in greater difficulty with handling, finishing, and curing, and increasing the possibility of cold joints.
 - iv. Increased tendency for plastic cracking.
 - v. Increased difficulty in controlling entrained air content.
3. Undesirable hot weather effects on concrete in the hardened state may include:
 - i. Decreased strength resulting from higher water demand and increased temperature level.
 - ii. Increased tendency for drying shrinkage and differential thermal cracking.
 - iii. Decreased durability.
 - iv. Decreased uniformity of surface appearance.
4. Placing and curing:
 - i. Concrete shall be handled and transported with a minimum of segregation and slump loss. Concrete temperature at time of placement shall be such that the rate of evaporation for the weather conditions shall not cause cracking.
 - ii. b. The aggregate shall be cooled by frequent spraying in such a manner as to utilize the cooling effect of evaporation. The placement schedule shall be arranged, as approved, in such a manner as to provide time for the temperature of the previously placed course to begin to recede. The mixing water shall be the coolest available at the site insofar as is practicable.
 - iii. Concrete shall be placed where it is to remain.
 - iv. Concrete shall be placed in layers shallow enough to assure vibration well into the layer below.

- v. Surfaces exposed to the drying wind shall be covered up immediately after finishing with polyethylene sheets and be water cured continuously as soon as the concrete has set up. Curing compounds, in lieu of water, may be used.
- vi. Joints be made on sound, clean concrete.
- vii. Finishing operations and their timing be shall be guided only by the readiness of the concrete for them, and nothing else.
- viii. Curing shall be conducted in such a manner that at no time during the prescribed period will the concrete lack ample moisture and temperature control. Facilities must be ready to protect promptly all exposed surfaces from drying. All work determined by Engineer to be damaged from hot weather shall be removed and replaced at no cost to Owner.
- ix. All materials and workmanship required to meet the hot weather requirements shall be supplied at the Contractor's own expense.

C. Cold Weather Concreting

- 1. Cold weather is generally defined as a period when for more than 3 successive days the mean daily temperature drops below 40 F. When temperatures above 50 F occur during more than half of any 24-hour period, the weather should no longer be regarded as "cold". The times and temperatures given for various conditions and situations are not exact values and should not be used as such. Weather conditions are variable and common sense must be used to protect the concrete. Cold weather concreting shall follow the guidelines of ACI 306R, latest edition.
- 2. All materials and workmanship required to meet the cold weather requirements shall be supplied at the Contractor's own expense.
 - i. Preparation:
 - 1. When specific written authorization is given to permit concreting operations at temperatures below those specified herein, arrangements for covering, insulating, housing, or heating materials and/or newly placed concrete should be made in advance of placement and should be adequate to achieve the temperature and moisture conditions recommended herein in all parts of the concrete. All equipment and materials necessary should be at the work site before the first frosts are likely to occur, not after concrete has been placed and its temperature begins to approach the freezing point.
 - ii. Concrete Temperature:
 - 1. The temperature of the concrete as mixed shall be maintained as shown in the following table:
 - a. Air Temperature Minimum Concrete Temperature as mixed
 - i. Above 30 F 60 F
 - ii. 0 F to 30 F 65 F
 - iii. Below 0 F 70 F

- b. The minimum concrete temperature as placed and maintained shall be 55 F.

- iii. Placement and protection:

1. During placement of concrete, tarpaulins, or other readily movable coverings supported on horses or framework should follow closely the placing of the concrete so that only a few feet of concrete are exposed to outside air at any time.
2. The housing, covering, or other protection used in curing shall remain intact at least 24 hours after artificial heating is discontinued.
3. All concrete placed in forms shall have a temperature between 55 and 70 after placement. Adequate means shall be provided for maintaining the surrounding air at 60 F for at least seventy-two (72) hours after placing and at no less than 40 F for an additional four days. All methods and equipment for heating shall be subject to approval. Insulating blankets shall be used when required to maintain a satisfactory temperature during the curing period.
4. No dependence shall be placed on salt or other chemicals for the prevention of freezing.
5. If heating or other protective measures need to be taken to prevent concrete from freezing, the concrete may require special curing methods to prevent rapid drying, as described in ACI 306R-78.
6. Salt or other chemicals shall not be used for prevention of freezing.

3.3 INSTALLATION

A. Form Construction

1. Forms shall be constructed so that the finished concrete shall be of the form and dimensions shown on the plans and true to line and grade, and sufficiently rigid to resist deflection. Design of form work and removal of forms and shores are to conform to ACI 381. The responsibility for their adequacy shall rest with the contractor.
2. All forms shall be mortar tight and designed and constructed so that they may be removed without injuring the concrete.
3. If, at any stage of the work, during or after placing the concrete, the forms sag or bulge to such an extent as to allow concrete to fall below the elevation shown on the plans, or outside the true line of the form, the concrete affected shall be removed.
4. No concrete may be deposited against the earth as a side form.

B. Placing Steel Reinforcement

1. Reinforcing bars shall be accurately placed as shown on the plans and shall be firmly and securely held in position in accordance with the "Manual of Standard Practice" of the Concrete Reinforcing Steel Institute, using concrete or metal chairs, spacers, metal hangers, supporting wires and other appropriate devices of sufficient strength to resist crushing under full load. Metal chairs which extend to the surface of the concrete (except where shown on the plans) and wooden supports, shall not be used.

2. Placing bars on layers of fresh concrete as the work progresses and adjusting bars during the placing of concrete will not be permitted.
3. Tack welding of reinforcing bars in place shall not be allowed.
4. Splicing:
 - i. Splices of bars shall be made only where shown on the Drawings or as approved by the Owner.
 - ii. Where bars are spliced, they shall be lapped at least 30 diameters, unless otherwise shown on the plans.
 - iii. Splicing shall be accomplished by placing the bars in contact with each other and wiring them together.
5. Bending reinforcement:
 - i. Bends and hooks in bars shall be made in the manner prescribed in the "Manual of Standard Practice" of the Concrete Reinforcing Steel Institute.
 - ii. Bars shall not be bent or straightened in a manner which will injure the material.
 - iii. Bars with kinks or unspecified bends shall not be used.

C. Placing Concrete

1. Convey concrete from mixer to place of final deposit by methods that will prevent separation and loss of materials.
 - i. The free fall of concrete from the end of the spout or chute, or from a transporting vehicle, shall not exceed 10 feet for thin walls (10 inches or less in thickness) nor more than 5 feet for other types of construction.
 - ii. When the distance through which concrete must be dropped vertically exceeds the maximums specified above, a tremie or flexible metal spout shall be used. Flexible metal spouts having sufficient strength to hold the weight of the concrete shall be composed of conical sections not more than 3 feet long, with the diameter of the outlet and taper of the various sections such that the concrete will fill the outlet and be retarded in its flow.
 - iii. Chutes, troughs, or pipes used as aids in placing concrete shall be arranged and used so that the ingredients of the concrete will not be separated. Chutes and troughs shall be of metal or metal lined. When steep slopes are necessary, the chutes shall be equipped with baffle boards or a reversed section at the outlet. Open troughs and chutes shall extend, if necessary, down inside the forms or through holes left in the forms; or the ends of such chutes shall terminate in vertical downspouts.
2. Place concrete as dry as possible consistent with good workmanship, never exceeding the maximum specified slump.
3. On arrival at the job site, adding water to the mix shall not be allowed.
4. Place concrete at such a rate that concrete is at all times plastic and flows readily between bare bars.

5. When placing is once started, carry it on as a continuous operation until placement of the section is complete.
6. Do not pour a greater area at one time than can be properly finished without checking; this is particularly important during hot or dry weather.
7. Thoroughly consolidate by suitable means during placement, working it around all embedded fixtures and into corners of forms.
8. No water shall be added to the concrete surface behind the screed. Addition of water to the concrete surface shall be cause for shutting down the placement operations and rejection of any suspect work.
9. Do not use re-tempered concrete that has been contaminated by foreign materials.
10. Struts, stays, and braces serving temporarily to hold the forms in correct shape and alignment, pending the placing of concrete at their locations, shall be removed when the concrete placing has reached the elevation rendering their service unnecessary. These temporary members shall be entirely removed from the forms.
11. Unless necessary materials and equipment are readily available to adequately protect the concrete in place, placing operations may be postponed by the Engineer when, in his opinion, impending conditions may result in rainfall or low temperatures which will impair the quality of the finished work. The Contractor shall pay for all delay related costs resulting from such postponements including costs for removing and replacing damaged concrete. In case rainfall should occur after placing operations are started, provide ample covering to protect the work.
12. Whenever it is necessary to continue the mixing, placing, and finishing of concrete after daylight hours, the site of the work shall be adequately lighted so that all operations are plainly visible. Every effort shall be made to enable finishing to be done in daylight.
13. Except by specific written authorization from the Architect/Engineer, concreting operations shall not be continued when a descending air temperature, in the shade and away from artificial heat, falls below 40 F, nor shall operations be resumed until ascending air temperature reaches 35 F. However, such authorization shall in no way relieve the Contractor of responsibility for proper results. Any concrete injured by frost action shall be removed and replaced at the Contractor's expense. All materials and workmanship required to meet the cold weather requirements shall be supplied at the Contractor's own expense.
14. The concrete shall be distributed to such depth and width that the plan thickness and grade will be obtained for the entire width of the pass. The spread concrete shall be vibrated, screened, and tamped by mechanical means. No manual screeding or tamping will be allowed, except in those cases where the use of a mechanical tamper and screeder would be obviously impracticable. Any delay in excess of fifteen minutes in vibrating, screeding and tamping shall constitute cause for shutting down the operation until the difficulties are corrected.
15. Discharge of mixed concrete from hauling equipment and processing by the initial power laydown machine or power screed shall be accomplished within sixty minutes after introduction of the mixing water to the cement and aggregates.
16. The concrete shall be deposited in such a manner as to require as little rehandling as possible. It shall be thoroughly vibrated against and along the faces of the forms.

Necessary hand spreading shall be done with shovels, not with rakes. Workmen shall not be allowed to walk in the newly placed concrete with boots coated with earth.

D. Sidewalk and Curb and Gutter Joints

1. Locate joints as specified herein or as required on the plans.
2. Make all joints perpendicular and straight.
3. Joints for concrete structures that were removed or damaged as a result of construction under this contract shall match joints in the remaining original structure.
4. Expansion Joints
 - i. Sidewalk: Expansion joints one half inch in thickness shall be constructed every 40-50 feet by using premolded expansion joint material. Also, expansion joints shall be placed where the new sidewalk meets existing sidewalks, fixed objects and where it meets the curb at all handicap ramps. No dowel bars shall be required at the joints.
 - ii. Curb & gutter: Expansion joints, one half inch in thickness, shall be constructed every 40-50 feet and at changes in direction by using premolded expansion joint filler. For both formed and slipformed curb and gutter, joint filler shall also be placed between the curb and/or gutter and storm drainage structures.
 - iii. Joint sealant will be installed over all expansion joints. Provide bond breaker and install per manufacturer specifications.
5. Contraction Joints
 - i. Sidewalk: Contraction joints shall be constructed at intervals equal to the width of the walk by cutting into the fresh concrete to a minimum depth of 1/4 of the thickness of the concrete to create a plane of weakness. The edges of tooled joints shall be rounded to provide a neat, workmanlike appearance.
 - ii. Curb: Contraction joints shall be constructed every ten feet as shown on the plans by using steel templates not less than one eighth inch nor more than three-sixteenth inch in thickness. The templates shall be removed as soon as the concrete has set sufficiently to hold its shape. Where curbs and curb and gutter are placed by slipform methods, the contraction joints every ten feet may be provided by cutting into the fresh concrete to a minimum depth of 1 1/2 inches to create a plane of weakness. The edges of such joints shall be rounded to provide a neat workmanlike appearance.
6. Immediately after the forms are removed, the expansion joints shall be inspected carefully. Any concrete or mortar that has sealed across the joint shall be cut neatly and removed.

E. Finishing

1. The surface of the concrete shall be finished smooth and true to grade by float. The finishing shall commence immediately after the concrete is placed and shall progress at a rate equal to the progress of the paving operation. Any delay in excess of thirty minutes in performing the preliminary finishing shall constitute cause for shutting down the mixing operations until the finishing is resumed.

2. Hand methods of strike-off and consolidation will only be permitted when the width of pavement to be constructed is less than 10 feet or at rounded intersections where the use of machine finishing is impracticable.
3. While the concrete is still plastic, the entire slab surface will be tested by the Contractor for trueness with an accurate 10 foot straightedge. Any depressions that are found shall be immediately filled with freshly mixed concrete, struck-off, consolidated and refinished. High spots shall also be struck-off and refinished.
4. In advance of the curing operations the pavement shall be textured by brooming. Initial brooming operation shall permit Owner to review texture and recommend modifications, if any.
5. Finished Surface:
 - i. The finished surface shall be true to grade and cross section, free from ruts, humps, depression or other irregularities. The surface shall not deviate from line and grade by more than 1/8 inch, plus or minus, in 10 feet. The determination of compliance with smoothness may be made with a straightedge or string line at the option of the Engineer. Any irregularities that may be found shall be corrected at the expense of the Contractor by means of a suitable grinding and grooving tool.
 - ii. The grinding tool shall consist of a machine equipped with cutting wheels mounted on a horizontal shaft. The grinding action shall be conducted parallel to the centerline. Grinding operations shall be deferred, as directed by the Engineer, whenever tearing of aggregate with the surface occurs and shall not be resumed until the concrete has hardened sufficiently to avoid tearing.
 - iii. The finished surface across contact joints shall not deviate from a straight line by more than 1/8 inch (vertically) in 12 inches when tested with a straightedge. The Contractor shall take the necessary precautions to prevent slumping of the edge of the concrete at contact joints.
 - iv. Line and grade control: The Contractor shall establish references at reasonable intervals, usually at subgrade elevation, for line and grade control of the placing operations. The Contractor shall furnish, place, and maintain such supports, wire devices, and materials as may be required to provide continuous line and grade reference controls to the placing machine, trimmers or paver.
 - v. At least one ACI certified concrete finisher to be on crew at all times.

3.4 PROTECTION

- A. The Contractor shall protect the concrete against all damage and markings. Barricades shall be placed at the proper locations to prevent traffic from using the pavement.
- B. When it is necessary to provide for traffic crossing the concrete, the Contractor shall, at his expense, construct suitable substantial crossings to bridge over the concrete satisfactory to the Architects/Engineer.
- C. Newly placed concrete shall be protected from damage by rain, snow and hail. Placing operations shall be stopped when rain is threatening, as determined by the Owner. The Contractor shall have available on the project enough material to cover the plastic concrete to

prevent damage by rain, snow or hail. Any concrete damage due to rain, snow or hail shall be removed by the Contractor at his expense.

D. No traffic or Contractor's hauling equipment will be permitted on the concrete until the concrete has developed a modulus of rupture of 450 psi, when tested in accordance with AASHTO Designations T-97 but, in no case before ten calendar days have elapsed after the concrete has been placed. The concrete shall be cleaned and all joints shall be sealed and trimmed as previously specified before traffic is allowed to use the pavement.

E. Curing

1. Protect the concrete from the effects of weather in accordance with HOT WEATHER CONCRETING AND COLD WEATHER CONCRETING in this section.
2. Water for curing shall be as specified in PART 2 - PRODUCTS.
3. Other curing requirements may be required in individual Specifications Sections.
4. Membrane curing compound method:
 - i. Surface of newly placed or exposed concrete shall be kept moist or wet until the curing compound is applied. The curing compound shall be applied immediately after all patching or surface finishing has been completed.
 - ii. The curing compound shall be delivered to the work in ready-mixed form. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. The compound shall not be diluted or altered in any manner.
 - iii. Curing compound that has become chilled to such an extent that it is too viscous for satisfactory application shall be warmed to a temperature not exceeding 100 F, unless otherwise specified by manufacturer's recommendations.
 - iv. The curing compound shall be applied to the exposed surface at a uniform rate of 1 gallon per 100 square feet of area, unless otherwise required by manufacturer's recommendations.
 - v. In the event that the application of curing compound is delayed, the application of water as provided in this section shall be started immediately and shall be continued until application of the compound is resumed or started.

3.5 TESTING

- A. Testing will be provided by an independent testing laboratory employed by the Owner. Refer to individual Specifications Sections for other Field Quality Control requirements.
- B. Concrete sampled from a concrete pump shall be sampled from the hose after all of the priming grout has been wasted. The end of the hose shall be placed in a horizontal position before the concrete is discharged into the sampling pan. The concrete shall not be allowed to fall into the sampling pan.
- C. The Contractor, at his expense, shall furnish the concrete required for testing.

D. Strength, slump and air tests shall be taken in accordance with the following unless otherwise specified in individual Specifications Sections:

1. Strength, slump and air tests may be taken in accordance with the placement rate per day as shown below:

<u>Rate/day (C.Y.)</u>	<u>Air</u>	<u>Slump</u>	<u>Compress. Strength</u>
0-8	1	1	Optional
8-20	1	1	1
For each 20 C.Y.			
or fraction thereof	1	1	1

2. Compressive strength test specimens shall be made and cured in accordance with ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field; Specimens shall be tested in accordance with ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - i. Three specimens shall be made by the Engineer for each test, and these shall be broken at 7 and at 28 days, with one held in reserve.
 - ii. At least one test (3 specimens) shall be made for each class of concrete or each poured during one day.
3. Flexural strength test specimens shall be prepared in accordance with AASHTO Designation T-23 and tested for flexural strength in accordance with AASHTO Designation T-97.
 - i. Four specimens shall be made by the Engineer for each test, and one shall be broken at 3, one at 7 and 2 at 28 days, with one held in reserve.
 - ii. At least one test (4 specimens) shall be made for each class of concrete poured during one day.
4. If an air test does not meet the specification, a second air test shall be made immediately upon the same load. The concrete shall be accepted if the second air test meets the specification or rejected and removed from the project if the second air test does not meet the specification.
5. Slump and air tests shall be made in accordance with ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete and C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method, respectively.
6. The maximum allowable time between charging of the material in the mixing drum and final placing shall be ninety minutes for air temperatures below 80 F and sixty minutes for temperatures above 80 F. Concrete not placed within these time limits, or if an initial set has developed shall not be used. Tempering concrete by adding water or by other means will not be permitted.
7. If a compressive strength test is below the required specified strength, the Engineer shall immediately notify the Contractor or his authorized representative.

8. All costs incurred in resampling and retesting shall be paid by the Contractor if the retested strength is below the specified strength, and shall be assumed by the Owner if the retested strength is above the specified strength.

3.6 CLEANING

- A. Contractor shall remove all forms, excess materials, debris and other items upon completion of concrete site work.
- B. All damage to concrete site work prior to Owner's acceptance shall be repaired or replaced to Owner's satisfaction at the expense of the Contractor.

End of Section

02590 – RESTORATION OF EXISTING IMPROVEMENTS

1.0 GENERAL

1.1 WORK INCLUDED

- A. Contractor shall provide all materials, labor, equipment, transportation, and other items required to restore existing improvements dislocated, damaged, or removed as indicated or as required to accomplish Work of other sections of these specifications. All restoration Work shall be in accordance with applicable regulations and as specified herein.
- B. Restoration of existing improvements includes, but is not limited to the following:
 - 1. General Restoration Requirements
 - 2. Restoration or replacement of gravel, asphaltic concrete, or portland cement concrete pavements, including base course and striping.
 - 3. Portland cement concrete curbs, gutters, sidewalks, and driveways
 - 4. Landscaping improvements
 - 5. Miscellaneous improvements

1.2 RELATED WORK

- A. Section 02220 - Excavating, Backfilling and Compaction
 - 1. Compaction requirements under paving and landscaped areas, removal of unsuitable materials.
- B. Section 02513 - Concrete Site work
 - 1. Requirements for concrete curb and gutters, sidewalks, and driveways.
- C. Section 02665 – Fire Water Distribution Systems
 - 1. Materials and installation practices for valves, hydrants and water appurtenances.

1.3

REFERENCES

- A. The applicable provisions of the latest editions of the References listed below shall govern the Work covered under this Section, unless there is a conflict between said References and the requirements of this Section. In the case of such a conflict, the requirements of this Section shall apply.
- B. State of Utah Standard Specifications for Road and Bridge Construction, latest edition including all addendums.
- C. American Society for Testing and Materials (ASTM)
- D. American Association of State Highway and Transportation Officials (AASHTO)
- E. American Concrete Institute (ACI)

- F. Concrete Reinforcing Steel Institute (CRSI)
- G. Sandy City Standard Construction Details

1.4 SUBMITTALS

- A. Submit shop drawings, manufacturer's literature, certifications, and other product data in accordance with other sections and as specified herein.
- B. Required submittals include, but are not limited to:
 - 1. Manufacturer's recommended transportation, unloading, and storage requirements as well as installation guides and instructions for materials provided as part of this Work.
 - 2. Evidence of materials conformance with applicable requirements as well as these specifications.
 - 3. Dimensional information for pipes, valves, fittings, castings, structures and other items provided as part of this Work.
- C. Contractor shall maintain accurate construction record drawings for items restored as part of this Work, but covered by subsequent landscaping, paving or as a result of Work of other sections of these specifications. These records shall be submitted to Engineer for approval prior to application for final payment.

1.5 QUALITY ASSURANCE

- A. Transportation, handling, storage and installation practices shall be in accordance with manufacturer's recommended practice for materials provided as part of this Work.
- B. Use adequate numbers of skilled workmen who are trained and experienced in the type of construction required.
- C. The quality of the finished restored improvement, as determined by the Owner, shall be of equal or better quality than was said improvement prior to being damaged or removed.
- D. Sandy City requirements shall govern for all water line work.
 - 1. All work shall conform to the applicable standards, regulations, and requirements of the White City Water Improvement District.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Contractor shall be responsible for proper transportation ,unloading, handling, storage, and security of all equipment and materials to be provided as part of this specification in accordance with manufacturer's recommendations.
- B. Materials shall be stored in such a manner as to prevent damage or degradation. Any materials damaged prior to installation shall be removed from the project and replaced with new materials at no additional cost. Lost or stolen materials shall be replaced at no additional cost.

2.0 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers providing materials or equipment as part of this specification shall have a minimum of five (5) years experience in the design, manufacture, testing and support of such materials.
- B. Manufacturers shall provide, upon request, verification of a consistent record of meeting or exceeding materials or performance standards as specified herein.

2.2 MATERIALS - GENERAL

- A. Materials shall be as required to complete the restoration of existing improvements, and shall be at least equal to original improvement at the time of damage or removal, as determined by the owner of said improvement, and shall match original construction in finish and dimension.
- B. Materials shall be in accordance with requirements of local jurisdiction having authority. Obtain approval of all materials from local jurisdiction having authority prior to ordering.

2.3 UNTREATED BASE COURSE

- A. Base course shall be in accordance with State of Utah Standard Specifications for Road and Bridge Construction, Paragraphs 301.2 and 301.3, 1-inch Gradation:

Sieve % Passing

1" 100

1/2" 79 - 91

No. 4 49 - 61

No. 16 27 - 35

No. 200 7 - 11

2.4 BITUMINOUS PAVING MATERIALS

- A. Bituminous prime coat shall be MC-70 asphalt conforming to AASHTO M82 - Cut Back Asphalt (Medium Curing Types).
- B. Bituminous tack coat shall be a mixture of one part slow setting emulsified asphalt and one part water.
 - 1. Emulsified asphalt shall meet either of the following requirements:
 - a. Conform to SS-1h as described in AASHTO M140 - Emulsified Asphalt.
 - b. Conform to CSS-1h as described in AASHTO M208 - Cationic Emulsified Asphalt.
- D. Asphaltic concrete surface course shall be plant mix in accordance with State of Utah Standard Specifications for Road and Bridge Construction, Section 402, and shall consist of mineral aggregate and bituminous binder.

1. Mineral aggregate shall meet one of the following gradations, as determined by the Inspector:

- a. 1/2 inch gradation:

Sieve % Passing

1/2" 100 No. 4 60 - 80

No. 16 28 - 42 No. 50 11 - 23

No. 200 5 - 9

- b. 3/4 inch gradation:

Sieve % Passing

3/4" 100

3/8" 75 - 91

No. 4 46 - 62

No. 16 22 - 34 No. 50 11 - 23

No. 200 5 - 9

1. Bituminous material shall be asphalt cement with a viscosity grade of AC-10 as determined by AASHTO M226 - Viscosity Graded Asphalt Cement and Paragraph 704.2 of the State of Utah Standard Specifications for Road and Bridge Construction.

2.5 PORTLAND CEMENT CONCRETE

- A. Portland cement concrete for curbs, gutters, sidewalks and driveways shall conform to the requirements of Section 02513 - Concrete Sitework.

2.6 SOD AND VEGETATION

- A. All materials shall be from sources approved by the Owner; however, such approval does not relieve the Contractor from responsibilities for growth, maintenance and replacement specified herein.
- B. Topsoil:
 1. Topsoil for backfill mixture for tree pits shall be fertile, friable, natural loam, surface soil, reasonably free of clay lumps, brush, weeds, and other litter, and free of rocks, stumps, stones larger than 2" in any dimension, and other extraneous or toxic matter harmful to plant growth. Obtain topsoil only from naturally well drained sites where topsoil occurs in a depth of not less than 4".
 2. Do not obtain from bogs or marshes.
- C. Manure:
 1. Well dried, rotted, unleached, pulverized cattle manure reasonably free from refuse and harmful materials.
- D. Mulch:
 1. Fine grind bark mulch.

E. Sod:

1. Strongly rooted blend of Kentucky Blue Grass sod, not less than 2 years old and free of weeds and undesirable native grasses.
2. Provide only sod capable of growth and development when planted (viable, not dormant).
3. Recommended Kentucky Blue Grass mixture is: 50% Baron, 25% Glade and 25% Touchdown, or approved equal.

F. Commercial fertilizer:

1. Agriform 20 10 5 21 gram fertilizer tablets for trees and shrubs. Provide three tablets per tree.
2. Ammonium sulfate fertilizer in pellet form for lawn areas at 40 actual pounds of nitrogen per acre.

3.0 **EXECUTION**

3.1 **EXAMINATION**

- A. Verify that Work covered under other sections of these specifications is complete to the point that Work covered under this section may properly commence without hindering or damaging Work of other trades. Do not proceed with construction until unsatisfactory conditions have been corrected.
- B. Verify that Work performed under other sections of these specifications has been adequately inspected, tested and accepted prior to covering up that Work as part of the Work specified under this section.
- C. Carefully examine restoration areas, verifying dimensions, materials and other restoration requirements with Engineer and Owner prior to beginning Work covered under this section.

3.2 **METHODS AND PROCEDURES**

A. General Requirements

1. Contractor shall obtain all permits necessary for the restoration of existing surface improvements.
2. Contractor shall protect all public and private property adjacent to the work. Exercise due caution to avoid damage to such property.
3. All improvements damaged or removed shall be restored in accordance with local jurisdiction having authority. In case of conflict between these specifications and local authority specifications, the local authority shall govern.
4. Repair or replace all existing surface improvements, which were damaged or removed as a result of operations of Work under this contract. Restoration shall be of at least equal quality and identical in dimension to original improvement unless specifically specified otherwise.

3.3 **INSTALLATION**

A. Asphaltic Concrete Surfaced Areas

1. Where trenches are excavated through asphaltic concrete surfaced areas such as roads, driveways or parking areas, the surface shall be restored by preparing the subgrade, placing base course(s), placing tack and prime coats, and placing the asphaltic concrete surface course(s).
2. Subgrade preparation shall conform to applicable parts of Paragraphs 221.3 and 225.3 of the State of Utah Standard Specifications for Road and Bridge Construction:
 - i. Average of field density determinations shall be 95% of the maximum dry density, with no determination lower than 92%.
 - ii. The maximum dry densities shall be determined in accordance with the following:
 1. A-1 Soils: AASHTO Designation T-180, Method D.
 2. All other Soils: AASHTO Designation T-99, Method D.
3. Thickness of base course shall be 6 inches, shall match existing, or shall be as required by local authority having jurisdiction, whichever is greater.
4. Placing and compaction of base course shall conform to applicable parts of Section 301 of the State of Utah Standard Specifications for Road and Bridge Construction, excluding pay factor allowances.
5. Tack Coat
 - i. Tack coat shall be applied at the rate of 0.05 to 0.15 gal/SY. A hand sprayer or brush shall be used to apply tack coat to vertical faces of previously constructed bituminous pavement (over 1/2 hour hence) prior to placing an adjacent or parallel pass, curbs, gutters, slab edges, and all structures to be in actual contact with the bituminous pavement. Tack coat shall also be applied uniformly at the same rate to the horizontal top surface of each lift of bituminous pavement prior to placing the next lift of bituminous pavement to promote a bond between the two courses of pavement. None of the material shall penetrate into the pavement and for this reason the application should be limited.
 - ii. Prior to applying the material, the surface to be treated shall be swept or flushed free of dust or other foreign material.
 - iii. Protect all surfaces not required to receive tack coat from any inadvertent application.
 - iv. The temperature range of the tack coat at the time of application shall be such that the viscosity will be between 50 and 100 centistokes as determined in accordance with ASTM Designation D 2170.
 - v. Under no circumstances shall traffic be permitted to travel over the tacked surface. If detours cannot be provided, restrict operation to a width that will permit at least one way traffic over the remaining portion of the roadbed. If one way traffic is provided, the traffic shall be controlled in accordance with governing authority.

vi. After application of tack coat, sufficient time shall be given to allow for complete separation of asphalt and water before paving operations begin. The tack coat shall be applied on only as many surfaces as will be paved against in the same day.

6. Mixing, placing, spreading and compaction of bituminous surface course shall conform to applicable parts of Section 402 of the State of Utah Standard Specifications for Road and Bridge Construction, excluding pay factor allowances.

B. Concrete Curbs, Gutter, Sidewalks and Driveways

1. Shall be removed and replaced to the next joint or scoring lining beyond the actually damaged or broken sections; or in the event that joints or scoring lines do not exist or are three or more feet from the removed or damaged section, the damaged portions shall be removed by saw cutting full-depth.
2. All new concrete shall match, as nearly as possible, the appearance of adjacent concrete improvements. Where necessary, lampblack or other pigments shall be added to the new concrete to obtain the desired results.
3. Concrete forms shall be true to line and of sufficient strength to ensure against bulging or displacement.
4. Contraction and expansion joints shall match original construction in placement and size, unless otherwise required by local jurisdiction having authority.
5. Reinforcement shall be replaced as in original construction, unless otherwise required by local jurisdiction having authority, and shall be installed in accordance with applicable CRSI and ACI Standards.
6. Finishing and curing shall be in accordance with local jurisdiction having authority.

C. Vegetated Areas

1. Prior to placing sod or other final vegetative cover, examine and repair the subgrade as necessary to assure a smooth and even surface which will match grade and contours of surrounding undisturbed ground. Finish grade construction areas to match grade prior to construction activities. Assure that a positive slope away from all building walls is maintained for at least 10 feet to prevent runoff from approaching walls.
2. Prepare soil under areas to receive vegetation by placing topsoil to a depth equal to surrounding conditions or to 6", whichever is greater. Disk or till 3 cubic yards manure per 1000 square feet of surface area to a depth of 8 inches.
3. Roll and rake areas receiving vegetation to smooth, even surface, free of ridges, with loose, uniformly fine texture.
4. Allow for final vegetation thickness when preparing subgrade.
5. Restore raked areas to specified condition if eroded or otherwise disturbed after fine grading and prior to placing vegetative cover.
6. Remove stones over 1 1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter.
7. Limit preparation to areas which will be planted promptly after preparation.

8. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before sodding. Do not create a muddy soil condition.

D. Sprinkling Systems:

1. Restore all sprinkling systems and fences disturbed, removed, or damaged by construction operations in a condition at least equal to that prior to construction.

E. Sodding:

1. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to sub grade or sod. Tamp or roll lightly to ensure contact with sub grade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.
2. Secure sod on slopes with U-shaped wire clips as required to prevent slippage. Immediately after planting, sod shall be thoroughly watered with a fine spray. Watering shall occur as frequently as needed to keep sod constantly moist for a period of 14 days after planting. Two weeks after planting, apply ammonium sulfate in pellet form at 40 actual pounds of nitrogen per acre. Water thoroughly immediately after fertilizing.

F. Miscellaneous Restoration Items

1. All other improvements interrupted or removed to permit the construction specified herein shall be restored. Miscellaneous improvements to be restored shall include, but shall not be limited to, the following:
 - ii. Culverts
 - iii. Fences
 - iv. Utilities

3.4 **PROTECTION**

A. Provide barricades and restrict access as appropriate to prevent damage to Work in place.

1. Contractor shall be responsible for protection of Work in place against displacement, damage, loss or theft until Owner's acceptance. Any Work installed and subsequently damaged, lost or displaced shall be repaired or replaced to the Owner's satisfaction at no additional cost.

B. Planting Maintenance:

1. Begin maintenance immediately after planting, and continue until inspection and acceptance, in no case less than 30 days from the time of completion of Work.
2. Maintain lawns for not less than 30 days and longer as required to establish an acceptable lawn. To be acceptable, lawn must be past second mowing with no bare spots. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

3.5 **CLEANING**

- A. Thoroughly clean, rake, wash and/or flush all restoration Work prior to submitting for Owner's acceptance.

End of Section

SECTION 02665 – FIRE WATER DISTRIBUTION SYSTEMS

1.0 GENERAL

1.1 WORK INCLUDED

- A. Contractor shall provide all materials, labor, equipment, transportation, and other items required to provide and install potable water distribution systems as required by applicable codes and regulations, and as specified herein.
- B. Fire water distribution systems shall include, but not be limited to the following.
 - 1. Fire water transmission or distribution piping.
 - 2. Valves, fittings, and accessories.
 - 3. Thrust blocking and corrosion protection.
 - 4. Hydrostatic and Leakage testing.

1.2 RELATED WORK

- A. Section 02220 - Excavation, Backfill and Compaction.
 - 1. Excavation of trenches, pipe bedding and backfill, compaction of backfill
- B. Section 02675 - Disinfection of Water Distribution Systems
- C. Division 03000 - Concrete
 - 1. Thrust blocks, structures associated with water systems.

1.3 REFERENCES

- A. The applicable provisions of the latest editions of the References listed below shall govern the Work covered under this Section, unless there is a conflict between said References and the requirements of this Section. In the case of such a conflict, the requirements of this Section shall apply.
- B. American Water Works Association (AWWA)
- C. American Society for Testing and Materials (ASTM)
- D. American National Standards Institute (ANSI)
- E. American Association of State Highway and Transportation Officials (AASHTO)
- F. Ductile Iron Pipe Research Association (DIPRA)

1.4 SUBMITTALS

- A. Submit shop drawings, manufacturer's literature, certifications, and other product data in accordance with Section 01300 - Submittals.
- B. Required submittals include, but are not limited to:
 - 1. Evidence of materials conformance with these specifications.
 - 2. Manufacturer's recommended transportation, unloading and storage requirements. Manufacturer's installation guides and instructions.
 - 3. Dimensional information for pipe, valves, fittings, castings, and structures.
- C. Contractor shall maintain accurate construction record drawings of all as-built valve, fitting, and line locations, manhole locations, pipe lengths, and other relevant data and shall submit these records to the Engineer for approval prior to application for final completion.

1.5 QUALITY ASSURANCE

- A. Transportation, handling, storage and installation practices shall be in accordance with manufacturer's recommended practice for materials provided as part of this Work.
- B. Contractor's personnel shall be experienced in the installation of materials provided as part of the Work, and shall comply with manufacturer's recommended practices during handling, placement and installation of such materials.
- C. Pipe, valve and appurtenant materials and Workmanship shall be in accordance with ANSI/NSF 61 and AWWA Standards as applicable.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Contractor shall be responsible for proper transportation, unloading, handling, storage and security of all equipment and materials to be provided as part of this specification in accordance with manufacturer's recommendations.
- B. Materials shall be stored in such a manner as to prevent damage or degradation. Any materials damaged prior to installation shall be removed from the project and replaced with new materials at no additional cost. Lost or stolen materials shall be replaced at no additional cost.
- C. Load and unload pipe, fittings, specials, valves and accessories by lifting with hoists or skidding so as to avoid shock or damage. Do not skid or roll pipe on skidways against pipe already on the ground.
- D. Each length of pipe shall be unloaded opposite or near the place where it is to be laid in the trench.
- E. Polyvinyl Chloride (PVC) piping, fittings, and materials shall be protected during storage from ultraviolet and ozone degradation. Noticeably faded materials shall not be installed and shall be promptly removed from project site.
- F. At times when pipe laying is not in progress, the open end(s) of pipe in the trench shall be closed by a watertight plug.
- G. Under no circumstances is the pipe to be dropped into the trench.

2.0 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers providing materials or equipment as part of this specification shall have a minimum of five (5) years in the design, manufacture, and testing of such materials.
- B. Manufacturers shall provide, upon request, verification of a consistent record of meeting or exceeding materials or performance standards as specified herein.
- C. Allowable Manufacturers - Subject to compliance with specified requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to the following:
 - 1. Fire Line Water System Piping
 - a. Ductile Iron Class 350 pipe - 4"-12"
 - b. Ductile piping shall be wrapped.
 - c. All bolts shall be greased.
 - 3. Valves
 - a. Gate Valves
 - i. Mueller Company, Decatur, Illinois
 - ii. Clow/McWane Incorporated, Birmingham, Alabama
 - iii. American Darling
 - b. Tapping Sleeves and Valves
 - i. Mueller Company, Decatur, Illinois
 - ii. Clow/McWane Incorporated, Birmingham, Alabama
 - c. Butterfly Valves
 - i. Mueller Company, Decatur, Illinois
 - ii. Clow/McWane Incorporated, Birmingham, Alabama
 - d. Check Valves
 - i. Mueller Company, Decatur, Illinois
 - ii. Clow/McWane Incorporated, Birmingham, Alabama
 - e. Air Relief/Vacuum Valves
 - i. Crispin Multiplex Manufacturing Company, Berwick, Pennsylvania
 - ii. G A Industries, Mars, Pennsylvania
 - iii. APCO Willamette Valve and Primer Corporation, San Clemente, California
 - f. Pressure Reducing Valves
 - i. CLA-VAL Company, Newport Beach, California
 - ii. G A Industries, Mars, Pennsylvania

2.2 FIRE LINE WATER SYSTEM PIPING

- A. Water system piping shall be of the size, type, and class indicated on the drawings and as specified herein.

- B. Fire Line Water System Piping
 - a. Ductile Iron Class 350 pipe - 4"-12"
 - b. Ductile piping shall be wrapped.
 - c. All bolts shall be greased.

2.3 CORROSION PROTECTION

- A. Bolts: Apply 2 coats of Coal for Mastic (Kopper 50 or equal) to all exposed surfaces of bolts and to all bolt threads after installation of piping, fittings, valves, and couplings.
- B. Fittings, valves, and specialties shall be tape wrapped with Polyken 930 filler tape for filling voids and with Polyken 930 tape to cover.
- C. Polyethylene encasement, if required, shall conform to AWWA/ANSI C105/A21.5 - American National Standard for Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

2.4 VALVES

- A. Gate valves:
 - 1. Shall be iron body, fully bronze mounted, resilient seat non-rising bronze stem with mechanical joint ends, except as otherwise specified or shown on the Drawings.
 - 2. Gate valves shall conform to the following requirements:
 - a. AWWA C509 - Resilient Seated Gate Valves for Water Supply Service.
 - 3. All valves shall be provided with a 2" square operating nut for key operation from ground surface and open to the left, unless handwheels are indicated.
 - 4. Valve body and gates shall be rated to a design working pressure of 200 psig for valves up to 12", and 150 psig for valves of 16" or greater. All valves shall be factory tested to twice the rated working pressure.
 - 5. Gate valves for potable water service shall be epoxy lined in accordance with AWWA/ANSI C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.
 - 6. Gate valves shall be similar and equivalent to that produced by the following manufacturers:
 - a. Mueller Cat. No. A-2370 or A-2380
 - b. Clow Cat. No. F-6100 or F-5000 Series
- B. Tapping valves and sleeves:
 - 1. Tapping valves shall have large diameter seat rings to permit entry of tapping machine cutters. Inlet shall be flanged. Outlet shall suit branch piping and shall include the required flange for tapping machine adapter connection. Tapping valves shall conform to the applicable requirements for gate valves as specified herein.
 - 2. Tapping sleeves shall be suitable for assembly around the existing main. Body shall be high strength ribbed construction. End gaskets shall be sized to suit the existing main.

3. Tapping valves and sleeves shall similar and equivalent to those produced by the following manufacturers:

- a. Clow Cat. No. F-5205
- b. Mueller Cat. No. H-600 Series

D. Check Valves

1. Check valves shall conform to the requirements of AWWA/ANSI C508 - Swing Check Valves for Waterworks Service - 2 in. Through 24 in. NPS.

2. Check valves for potable water service shall be epoxy lined in accordance with AWWA/ANSI C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.

3. Check valves shall be weighted swing arm type unless otherwise noted, similar and equivalent to those produced by the following manufacturers:

- a. Mueller Cat. No. A-2600 Series

2.5 VALVE BOXES

A. Shall be suitable for HS-20 (AASHTO) traffic loading.

B. Shall be furnished and installed over each line valve and over each auxiliary hydrant valve. All buried valves shall be installed complete with two-piece, cast iron, screw type, 5-1/4 inch shaft valve box. Cove to be labeled 'WATER'.

2.6 SERVICE SADDLES

A. Shall consist of a brass body and two flattened silicone bronze straps, meeting applicable sections of ANSI/AWWA C800 - Underground Service Line Valves and Fittings.

B. Outlet shall be tapped with AWWA I.P. thread (F.I.P.T.). Outlet shall be o-ring sealed.

C. Shall be rated for a maximum working pressure of 200 psi.

2.7 REPAIR CLAMPS

A. Clamps shall provide a gasketed seal around the full circumference of the pipe. Bolts shall be high strength stainless steel.

B. Gasket dimensions shall suit existing and new pipe, as required.

C. Quality standard: Mueller series 520 and 530.

3.0 EXECUTION

3.1 EXAMINATION

A. Verify that Work covered under other sections of these specifications is complete to the point that Work covered under this section may properly commence without hindering or damaging Work of other trades. Do not proceed with construction until unsatisfactory conditions have been corrected.

- B. Carefully examine all pipe fittings, valves and other appurtenances for damage and other defects immediately before installation.
- C. Mark and hold defective materials for inspection by Owner, who may prescribe corrective repairs or reject the materials.
- D. Prior to installation, inspect valves for direction of opening, freedom of operation, tightness of pressure-resisting bolts, cleanliness of valve ports and seating surfaces, handling damage and cracks. Hold defective valves for inspection by Owner.
- E. Verify installation or connection requirements prior to construction by potholing as necessary.

3.2 METHODS AND PROCEDURES

- A. General
 - 1. Prior to pipe installation, prepare trench in accordance with the plans and Section 02220 - Excavation, Backfilling and Compaction.
 - 2. Proper implements, tools, and facilities shall be provided and used for the safe and convenient performance of the Work. All pipe, fittings, and valves shall be lowered carefully into the trench by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to materials, protective coatings and linings. Under no circumstances shall water system materials be dropped or dumped into the trench.
 - 3. Manufacturers' Installation Manual recommendations for handling and laying pipe, fittings and related materials shall be strictly adhered to. In no case shall these materials be dropped or dumped during transport, unloading, or handling.

3.3 INSTALLATION

- A. Water Pipe Installation
 - 1. Water pipe installation shall be in accordance with the applicable requirements of the following documents:
 - a. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
 - b. AWWA/ANSI C105/A21.5 - Standard for Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
 - c. UNI-B-3-92 - Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nominal Diameters 4-36 Inch).
 - 2. All lumps, blisters, and excess coating shall be removed from the bell and spigot ends of each pipe, and the outside of the spigot and the inside of the bell shall be wiped clean and dry so as to be free from dirt, sand, grit, or any foreign material before the pipe is laid. Bevel and file spigot of pipe to prevent gasket damage during joint assembly.
 - 3. The water pipe shall be laid and maintained to lines and grades established by the Drawings and Specifications with fittings and valves at the required locations unless otherwise approved by Owner.

4. When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the approval of Engineer to provide clearance as required by federal, state, or local regulations or as deemed necessary by Engineer to prevent future damage or contamination of either structure.
5. Lay all water lines on a continuous grade to avoid high points except as shown on the Drawings.
6. Prevent foreign material from entering the pipe while it is being placed in the trench. During laying operations, no soil, debris, tools, clothing, or other materials shall be placed in, or allowed to enter the pipe.
7. Assemble joints in accordance with manufacturer's recommendations.
8. The pipe shall be brought to correct line and grade, and shall be secured in place with approved backfill material in accordance with Section 02220 -Excavation, Backfilling and Compaction.
9. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that recommended by pipe manufacturer.
10. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Owner. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation should the trench fill with water.
11. Where necessary, cut pipe perpendicular to the pipe centerline. Grind cut ends and rough edges smooth. For push-on joint connections, the cut end shall be beveled.
12. Fire hydrants shall be set plumb at proper finish grade as indicated on the drawings (see typical hydrant detail).

B. Valve Installation

1. Locate valves as shown on drawings.
2. Orient valve-operating stems in a manner that will allow proper operation.
3. A valve box shall be provided for every valve that has no gearing or operating mechanism or in which the gearing or operating mechanism is fully protected with a gear case. The valve box shall not transmit shock or stress to the valve and shall be centered over the operating nut of the valve. Set box cover at grade shown on Drawings.
4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Support pipe in such a manner as to prevent stress on the valve.

C. Thrust Block Installation

1. Provide thrust blocks at reducers, valves, tees, hydrants, plugs and caps, and at bends deflecting 11-1/4 degrees or more.
2. Place thrust block between solid ground and the component to be shored; the area of bearing on the pipe and on the ground in each instance shall be that shown on Drawings. Unless otherwise shown or directed, locate block so as to contain the resultant thrust force and so that the pipe and fitting joints will be accessible for repair.

3. Concrete for thrust blocks shall have a compressive strength of not less than 2500 psi at 28 days. Concrete mixes shall be provided in accordance with Section 03300 of these specifications.

D. Corrosion Protection

1. Polyethylene encasement, if required shall be provided and installed in accordance with the requirements of AWWA/ANSI C105/A21.5 - Standard for Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.

3.4 PROTECTION

- A. Provide barricades and restrict access as appropriate to prevent damage to Work in place.
- B. Contractor shall be responsible for protection of Work in place against displacement, damage, loss, or theft until Owner's acceptance. Any Work installed and subsequently damaged, lost, or displaced shall be repaired or replaced to the Owner's satisfaction at no additional cost.

3.5 CLEANING

- A. Thoroughly clean all pipe lengths or units of all debris immediately after laying.
- B. Thoroughly clean by flushing and remove all debris from water mains and appurtenances. Inspect and verify lines are clean prior to submitting facilities for Owner's acceptance.

3.6 TESTING

- A. Temporary connections for pressure testing shall be made by Contractor at his expense and removed by Contractor after satisfactory completion of the testing Work.
- B. Hydrostatic Pressure Test:
 1. After completion of the installation of the system, or any reasonable length thereof, prior to backfilling and after thorough flushing of the portion to be tested, pressure tests shall be made. The system to be tested shall be subjected to a hydrostatic pressure of 150 pounds per square inch, unless otherwise noted on the Drawings, for a period of not less than 2 hours duration.
 2. The portion to be tested shall be filled with water slowly and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The Contractor shall make the temporary connection for pressure testing.
 3. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation stops at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged by the Contractor.
 4. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Engineer.

C. Leakage Test:

1. A leakage test shall be conducted concurrently with the pressure test.
2. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.
3. Maximum leakage during the pressure test shall not exceed the following value "L": L = Allowable leakage in gallons per hour

$$\text{Where: } L = S \times D \times \text{square root } P / 133,200$$

S = Length (ft)
D = Diameter (in)
P = Pressure (psi)

Example: for a 4000' length of 16" pipe, tested at 150 psi for two hours, the maximum allowable leakage is calculated to be:

$$L = 11.8 \text{ gallons in 2 hours.}$$

4. Acceptance of installation shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than that specified above, the Contractor shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance.
5. All visible leaks, other than a minor amount of sweating, shall require immediate stoppage of the test and tightening of the joints so that, when pressure is again put on the system, there will be no leakage.

End of Section

SECTION 210000 - FIRE PROTECTION

PART 1 – PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The work in Section 210000, where applicable, and where not in conflict with governing codes and ordinances. Division 1 is a part of this and all other sections of these specifications.
- B. **Approved contractors shall be Preferred Fire Protection, Kimco Fire Protection, Chaparral Fire Protection, Fire Engineering Co., Delta Fire Protection Systems, Paradise Fire Protection Inc., Intermountain Fire Protection, and Firetrol Protection Systems.**
- C. Contractors not listed on the approved list must submit for approval and review prior to bid as required by bid documents.

1.2 SCOPE

- A. The work required includes the designing, hydraulically calculating pipe sizes, flows, and pressure, furnishing and installation of fire protection systems in accordance with the drawings, specifications, latest standards and codes for complete systems for the building.
- B. The work specified in this section shall be installed by none other than a recognized fire sprinkler contractor. All fire protection system piping shall be hydraulically calculated. All systems shall be subject to the inspection and approval of the local fire authority or his representative for compliance of applicable standards.
- C. All work shall be coordinated with other subcontractors.
- D. The sprinkler system shall consist of the required number of sprinkler heads, piping, hangers, drains, test pipes, alarms, valves, gauges, fire department connections, and all other parts to assure a complete system to meet the requirements of the owner's insurance underwriter, local authority having jurisdiction, and in accordance with nationally recognized standards.
- E. Codes & Standards:
 - 1. Water Supply: National Fire Code #24 - 2015 International Building Code.
 - 2. Wet Sprinkler System & Combined Systems: N.F.C. #13 and #14 - I.B.C.
 - 3. Alarm Equipment: N.F.C. #70 & 72A
 - 4. Standpipe & Hose Systems: N.F.C. #14 - I.B.C.
 - 5. Supervision: N.F.C. #13 and #14 - I.B.C.
 - 6. Temporary Fire Protection: N.F.C. #14 - I.B.C.
 - 7. Sprinkler Heads: N.F.C. #13
 - 8. Sleeves and Location: N.F.C. #13

F. Work Included Elsewhere:

1. Fire Hydrants - by Site Utilities Contractor
2. Underground Mains: N.F.C. #24
3. Concrete Work - by General Contractor
4. Access Doors - By General Contractor.
5. Painting of sprinkler piping - By Fire Protection Contractor.
6. Color coding or pipe identification - By Fire Protection Contractor.
7. Wiring of flow switches and gate valve supervisory switches - By Electrical Contractor.

1.3 WORK BY FIRE PROTECTION CONTRACTOR

- A. This contractor shall furnish and install all labor, material, and equipment to make a complete and working fire protection system fully tested and approved in accordance with the drawings and standards of this specification for the new building.

1.4 UNDERGROUND WATER SUPPLY

- A. Fire protection contractor shall perform a flow test at or near site prior to final calculations for system. Flow test to be performed in the presence of local fire marshal and Canyons School District representative.
- B. Connect fire sprinkler mains to connections provided by others as shown on the drawings and install U.L. labeled pipes into building at locations shown. Coordinate testing and flushing of this portion of the main in accordance with N.F.C. #24 and furnish test certificates to the Owner's representative.
- C. This contractor will be responsible for coordinating with the site utilities contractor to assure that the underground water supply has been flushed and tested in accordance with NFPA pamphlet #24 prior to the connection of the overhead sprinkler system.

Flow Test Information:

Date:	02-5-2024
Location:	11055 South 1000 East, Sandy, Utah
Static Pressure:	99 PSI
Residual Pressure:	88 PSI
Water Flow	1,424 GPM
Water Flow @ 20 PSI	4,129 GPM

D. Sprinkler System:

1. This system shall conform to N.F.C. #13 and #14 and I.B.C. Riser may be calculated but shall not be smaller than 6". Sprinkler systems are to be light, ordinary, or extra hazard, as required by NFC-13 and the Utah State Fire Marshall's office.
2. System shall be hydraulically calculated. Sprinkler system shall be light hazard, except for casual ordinary and extra hazard group 1 in storage and service areas. Density for light hazard areas shall be 0.10 gpm per sq. ft. over 1500 sq. ft. Remote area with a maximum head spacing of 225 sq. ft. Service area shall be density of 0.15 over 2000 sq. ft. with maximum spacing of 130 sq. ft.

1.5 QUALIFICATION OF DESIGNER

- A. Designer shall be an engineering technician or Senior Engineering Technician (Level III or Level IV), NICET certification for fire sprinkler system design.

1.6 QUALIFICATION OF INSTALLER

- A. It is intended that the system be designed and installed by a firm regularly engaged in the design and installation business of Fire Sprinkler contracting. The Owner's representative may require evidence to support the ability of the contractor to perform work in the scope and volume as specified. A contractor who cannot verify such experience, may be found not suitable to perform the work.

PART 2 – PRODUCTS

2.1 HANGERS

- A. All hangers to be in accordance with NFPA Pamphlet No. 13.

2.2 RISERS

- A. Rise piping into the building shall be a Ames stainless steel 'in-building riser' 6" no substitutions.
- B. Risers shall be at the locations shown and shall include a U.L. approved control valve, check valve, flow switch, pressure gauges, water motor gong, or electric bell, standard fire department connection, gate valve supervisory switch, test connections, and drains as required.
- C. FDC shall be duplex type, brass painted RED.

2.3 SPRINKLER HEADS

- A. Sprinkler heads shall be U.L. approved. "K" factors shall be the same on each system and/or floor. See plans for head types.
- B. Sprinklers shall be of the proper temperature rating. Location of sprinkler head wherever reasonably possible shall be symmetrical and coordinated with the ceiling pattern.
- C. Number and location of sprinkler heads shown on the drawings are schematic. Exact number and location of heads shall be determined by the system design, and architectural coordination.
- D. Provide dry pendent heads in areas subject to freezing, only where wet piping can be run in heated space. Otherwise, provide antifreeze loops.
- E. Provide spare head cabinets in accordance with NFPA No. 13 and equip same with at least ten (10) chrome heads, six (6) white heads, six (6) brass heads, and appropriate wrenches.
- F. Provide head guards in all areas where heads are subject to physical abuse.
- G. Colored head guards (*as selected by architect*) will be required at areas with metal ceilings.

2.4 VALVES

- A. All valves and fittings shall be listed by Underwriters Laboratories or approved by Factory Mutual for fire protection duty and shall be installed in accordance with their listing and/or approval. Control

valve shall have alarm supervisory switches with two sets of contacts and normally open/normally closed.

- B. All indicating valves will be of the listed and/or approved type with an electric tamper switch approved for use with that valve.
- C. Water hammer arrestors shall be provided ahead of all automatic valves to eliminate water hammer and shall be installed vertically in an accessible location.
- D. Hose valves off standpipes shall be U.L. approved. All valves shall be 2-1/2" with 2-1/2" X 1-1/2" reducer and cap with chains. Valves shall be polished brass and chrome plated.

2.5 PIPING

- A. All piping above ground shall be Schedule 40 domestic steel pipe and fittings.
- B. Schedule 40 equivalent, thin wall and foreign made pipe will not be permitted on this project.

2.6 EARTHQUAKE BRACING

- A. Install earthquake bracing in accordance with NFPA #13 Standards and Utah State Fire Marshall's Office.

2.7 STANDPIPES

- A. Class III Wet Standpipes at stage per NFPA 13 & 14.
- B. Class II Dry Standpipes at stairways per NFPA 13 & 14.
- C. Standpipes at stairways shall be concealed or installed tight at walls with concealed bracing.

2.8 SLEEVES

- A. Sleeves shall be furnished, together with their location and elevations to the construction manager, timely with required schedule or concrete pours. If sleeves are missed by this contractor, he shall be responsible for core drilling thru concrete at his own expense, and he shall be responsible for his cutting and patching. Sleeves shall be of the size, type, and length required by N.F.P.A. codes.

PART 3 – EXECUTION

3.1 TEMPORARY FIRE PROTECTION DURING COURSE OF CONSTRUCTION

- A. This contractor shall provide fire protection as required by N.F.C. #14 - Chapter 8 and shall be coordinated with the local fire department.

3.2 SHOP DRAWINGS

- A. Shop drawings, submittals, and hydraulic calculations, as necessary and required, shall be submitted to the Owner's representative for approval prior to incorporating materials or equipment into the work. Shop drawings shall be complete and in accordance with N.F.C. #13, #14, #20, and all applicable standards, submittals, and equipment, valves, flow switches, controls, and other important items shall be complete, showing details, description, and characteristics; hydraulic calculations shall be based on the water system fire flow capacities shown on the drawings and shall show flows, pressures, velocities, pipe size, and equivalent lengths as required for the system.

- B. Calculations shall be arranged in an orderly manner with sufficient reference points for the approving authority to review and approve.
- C. Testing shall be accomplished by this contractor for all required systems, equipment, and appurtenances, as required by the various standards and codes. The Owner's representative shall witness and sign off each item required. This contractor shall furnish required forms.

3.3 TESTS

- A. Install all test pipes and valves as required by NFPA No. 13. Locate inspector's test valves and auxiliary drain valves above ceilings in areas approved by the Architect and provide hose bibb connections. Conduct all tests as required by NFPA Standards and Insurance Services Office and submit copies of completed test forms to the building owner.
- B. All fire sprinkler related tests requiring the witnessing by local authorities will be the responsibility of this contractor. If tests are not run or do not have the proper witness or documentation, then they will be run late and all damage caused by the system, or caused in uncovering the system for such tests, will be borne by this contractor.
- C. The Utah State Fire Marshall and building owner shall be notified (in writing) at least three days in advance of the following:
 - 1. Hydrostatic test and final inspection of the underground prior to backfilling.
 - 2. Flushing of underground prior to connection to overhead.
 - 3. Hydrostatic test and final inspection of overhead, prior to the installation of the ceilings.

3.4 GENERAL REQUIREMENTS

- A. This contractor shall submit complete drawings, hydraulic calculations, and proper documentation to the local authority having jurisdiction and receive their approval before submitting such material to the Owner's representative for final approval. The contractor will be required to show proof of submittal to the Owner's insurance underwriter and local building authorities before installation may begin.
- B. All work of this contractor will be coordinated with other trades to insure minimal changes to the sprinkler system from the designs. Careful coordination of mechanical and electrical ducts, pipe and conduit shall be required. The ceiling cavity must be carefully reviewed and coordinated with all trades. In the event of conflict the installation of the mechanical equipment and piping shall be in the following order: plumbing waste, rainwater, and soil lines' supply, return, and exhaust ductwork; water piping; fire protection piping; and control conduit & wiring.
- C. Every effort shall be required to ensure that the heads form a symmetrical pattern in the ceiling with the ceiling grid, the lights, and diffusers and grilles and as shown on the Architect's reflected ceiling plan. Offsets shall be made in piping to accommodate ductwork in ceiling. Heads should be symmetrical, and all piping run parallel or perpendicular to building lines. In no case shall sprinkler heads be installed closer than 6" from ceiling grids or closer than approved distances from ceiling obstructions.
- D. All sprinkler piping shall be run concealed unless approved by the Owner's representative. All lines will be run as high as possible so as to not interfere with future changes to ceiling heights or other mechanical equipment. This contractor will be responsible for all sleeves, core drills, and sealing of penetrations in walls, floors, and structural members to facilitate the installation of the system, however, no holes in, or attachments to structural members will be allowed unless approved by the Owner's representative.

- E. All required drains and test pipes will be installed and finished in a workmanlike manner, terminating at a proper location to accommodate the required outflow without damaging the building or landscaping. Drain and test pipe locations shall be approved by the owner's representative.
- F. All piping, and heads located in un-heated spaces shall be installed with a glycol loop system. Coordinate location with the owner's representative. Indicating valves with tamper switches shall be installed and wired as required by code. Coordinate with electrical contractor.
- G. No piping or valve assemblies shall be run exposed in a finished area without the prior approval of the owner's representative.
- H. All heads located in specialty ceiling systems shall be coordinated with Architect prior to any installation.

3.5 JOB CLOSEOUT

- A. This contractor shall assure that all placards, signs, and instruction manuals are in place, and all tests are run before any consideration for final payment will be considered. This includes maintenance manuals, hydraulic calculations placards, spare head cabinets and the proper number of spare heads, and instruction to on-site personnel.
- B. This contractor shall, in addition to the above, furnish the owner one (1) set of re-producibles of the sprinkler system "record drawings" for his project files.

3.6 ENGINEER'S WATER SUPPLY ANALYSIS

- A. See attached

End of Section 210000

**WATER SUPPLY ANALYSIS FOR CANYONS SCHOOL DISTRICT
ALTA HIGH SCHOOL**

February 5, 2024

This report contains an analysis of the water supply available for the Alta High School, at 11055 S 1000 E, Sandy, Utah. The Report is prepared at the direction of and under contract to:

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Project Manager
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EXECUTIVE SUMMARY - The results of this Water Supply Analysis are summarized below as required on the Utah State Fire Marshal’s Office, Fire and Life Safety Plan Review Submittal Form (the following flow and pressure data comes from page 3 of 4 in this document):

Water Supply Data:

Flow = 1,424 GPM	Static = 99 PSI	Residual = 88 PSI
Date of Test = February 2, 2024	Available Fire Flow at 20 PSI = 4,129 GPM	

INTRODUCTION – CANYONS SCHOOL DISTRICT is proposing construction on an existing 36,000 sf building on their campus located at 11055 S 1000 E, Sandy, Utah.

Gardner Engineering has been retained to produce a water supply analysis for the subject project. The following is an analysis of the water supply, written with reference to the National Fire Protection Association’s 2013 Edition of its Standard for the Installation of Sprinkler Systems (NFPA 13 – 2013).

WATER SYSTEM DESCRIPTION - The portion of the Sandy City culinary water system providing water to the proposed site is gravity-fed and installed in a well-looped grid pattern. Refer to exhibit at the end of this document for a visual representation of the proposed facility, water system layout, and flow test reference points.

According to the Utah State Division of Drinking Water’s online records, the City has 37.15 million gallons (MG) of storage. The System receives its water from multiple wells¹ and multiple consecutive connection with Utah. The System is considered reliable.

¹ <https://waterlink.utah.gov/reports.html?systemId=1301> accessed 2/05/2024.

FLOW TEST –Please refer to the attached exhibit to see the approximate locations of hydrants and flow test data. The following information is prepared with numbered references to the NFPA 13 – 2013.

23.2.1 Water Supply Capacity Information (**per field test**).

- (1) Location and elevation of static and residual test gauge (Residual Hydrant) with relation to the estimated riser reference point in the new structure (RRP): Residual Hydrant is 990` pipe feet northwest and 10’ lower than the RRP.
- (2) Flow Hydrant (FH): FH is 480 pipe feet southwest and 4’ lower than the RRP
- (3) Static Pressure at Residual Hydrant, PSI 117
- (4) Residual Pressure at Residual Hydrant, PSI 104
- (5) Flow from Flow Hydrant, GPM² 1,547
- (6) Date..... February 2, 2024
- (7) Time (24 hr clock)..... 0930
- (8) Name of persons who conducted the test Logan Zollinger, (Gardner Engineering)
..... Gerald, Fire Marshal
- (9) Other sources of water supply, with pressure or elevation None

ANALYSIS – The following numbered information follows the outline given in NFPA 13 - 2013.

23.3.5.4 Supply Analysis (**per field test**)

- (1) Node tag at the sourceResidual Hydrant
- (2) Static pressure available at the source 117 PSI
- (3) Residual pressure available at the source 104 PSI
- (4) **Total flow available at the source³.....4,579 GPM**

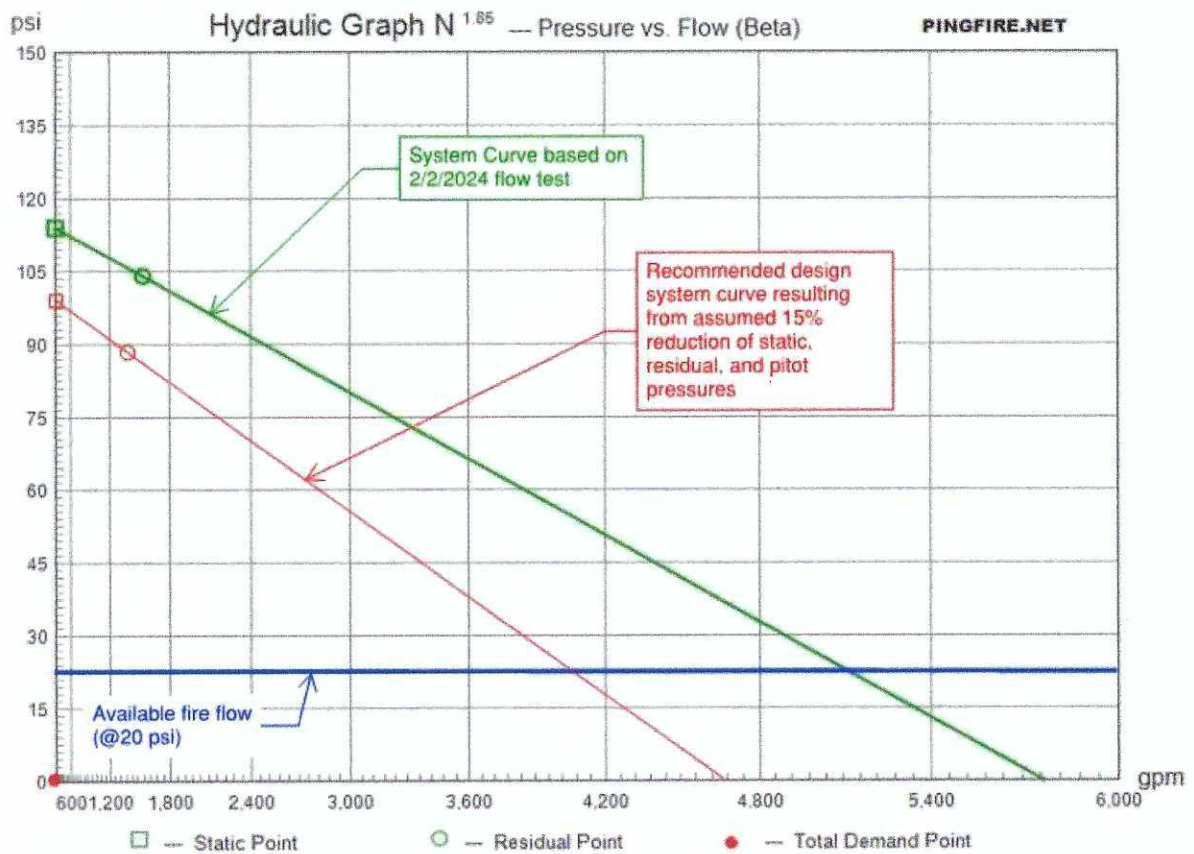
Per A.24.2.2.2 in NFPA13 – 2013, it is recommended that an adjustment be made to the flow test data to “account for daily and seasonal fluctuations...or...other condition that could affect the water supply”. Accordingly, the chart below was created to represent both the tested flow (green curve) and a 15% reduction in available pressure in the System (red curve) due to daily and seasonal demand patterns, as well as increased demands as the area builds out. The resulting table of flows and pressures given below this chart show the recommended design flow capacity at the site.

² Calculated using the Q formula: $29.83 \cdot cd^2 \cdot (p)^{0.5}$; where c=0.9 nozzle coefficient, d=2.5” outlet diameter and p=pitot pressure (field-measured pitot pressure at FH = 85 PSI) = 1,547 GPM;

³ Total flow available, Q_t , calculated using the equation $Q_t = Q \cdot (H_r^{0.54} / H_f^{0.54})$; where: Q = flow (1,547 GPM); H_r = (static pressure (117 PSI) less 20 psi); H_f = (static pressure (117 PSI) less residual pressure (104 PSI)).

23.3.5.3 Graph Sheet

The World's First Web-Based Hydraulic Graph N^{1.85} for Water Supply and Demand Information



Project Location:

Flow Test: Hydrant Elev.= ft., Static Pressure= psi, Residual Pressure= psi, Flow= gpm

Reduced: Hydrant Elev.= ft., Static Pressure= psi, Residual Pressure= psi, Flow= gpm

23.3.5.4 Supply Analysis (recommended design data: 15% reduction from flow test)

- (1) Node tag at the sourceResidual Hydrant
- (2) Static pressure available at the source 99 PSI
- (3) Residual pressure available at the source 88 PSI
- (4) Total flow available at the source⁴.....4,129 GPM

CONCLUSION

It is our opinion that it is reasonable to assume that a flow of at least 4,129 GPM will be available at the RRP throughout the year into the foreseeable future, absent a major catastrophic system event.

End of Water Supply Analysis (Exhibit follows)

⁴ Total flow available, Q_t, calculated using the equation Q_t = Q*(H_r^{0.54}/H_f^{0.54}); where: Q = flow (1,424 GPM – determined from reduced pitot pressure); H_r = (static pressure (99 PSI) less 20 psi); H_f = (static pressure (99 PSI) less residual pressure (88 PSI)).

Figure 1 – ALTA HIGH SCHOOL

