ADDENDUM # 003

Date: 04/16/18

RE: Cherokee Nation Entertainment
Tahlequah Casino

From: James R Childers Architect, Inc.
45 South 4th Street
Fort Smith, Arkansas 72901

This addendum forms part of the Contract Documents, and modifies the documents as noted below. Bidder must acknowledge receipt of this addendum in the FMC Bid Form. Failure to do so may subject the bidder to disqualification.

Item 1 Addendum #003 Summary of Changes

Item 2 Specs

Item 3 Civil Drawings

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Addendum 03

DATE: **4/16/2018**

PROJECT: CNE Tahlequah Casino

PROJECT NO: 18-010

To the Prospective Bidders of the Work titled above:

This Addendum is to be incorporated into the Contract Documents and modifies the current version of the Contract Documents for the above referenced Project.

The Addendum consists of the following:

Item	Size	No. of Pages
Addendum	8 1/2 x 11	2
Specifications	8 1/2 x 11	24
Drawings	30" x 42"	6

NARRATIVE SUMMARY OF MODIFICATIONS

The following is a general description of the modifications included in this addendum. The provided list may or may not include all modifications which have been made. The Contractor is advised to make their own review of the Construction Documents to determine all potential impacts to the Contract Price. The Scope of Work presented by the Construction Drawings and Specifications included herein shall be considered included in the submitted bid price.

1. The location of the gas meter has been changed and is now on the west side of the site instead of adjacent to the structure. Proposed gas lines downstream of the new meter location are now identified as private lines and have been added to the proposed Scope of Work.

2. The location of the domestic water meter has been changed and is now on the west side of the site instead of adjacent to the structure. The additional proposed domestic water line downstream of the new meter location is private and shall be added to the scope of work.

3. The diameter of the domestic water service line has been upsized from 4-in to 6-in per the Owner's request. The domestic water meter has also been increased in size from 4-in to 6-in.

4. The location of the irrigation meter has been changed and is now on the west side of the site.

5. An additional fire line tap has been added near the southwest corner of the site per the Owner's request. Additional 8-in fire line to connect the proposed fire loop to this new tap has been added to the Scope of Work.

6. The original 12-in fire line located north of the primary entrance has been reduced from 12-in to 8-in in diameter.

7. Proposed storm sewer improvements have been added to the Construction Drawings. This design is preliminary in nature and is to be utilized as a Basis of Bid.

8. Additional construction details have been added to the set to help further document the Basis of Bid for proposed private storm sewer improvements.

REVISIONS TO THE PROJECT MANUAL

Item 1. Refer to the Project Manual: As shown below replace the entire spec section with the revised spec sections included in this addendum as an attachment.

A. Section 33 4100 Private Storm Sewer

Item 2. Refer to the Project Manual: As shown below add the entire specification sections included in this addendum as an attachment.

A. Section 23 1123 Facility Natural Gas Piping

REVISIONS TO THE CONSTRUCTION DRAWINGS

Item 1. Refer to Drawings: As shown below replace the entire drawing sheet with the revised drawings sheet included in this addendum as an attachment.

Replace:

Number	Name	Issue Date
C0.01b	INDEX AND GENERAL CONSTRUCTION NOTES	March 27, 2018
C2.02b	UTILITY PLAN INDEX	March 27, 2018
C7.02b	WATER INDEX	March 27, 2018

With the attached:

Number	Name	Issue Date
C0.01b	INDEX AND GENERAL CONSTRUCTION NOTES	April 16, 2018
C2.02b	UTILITY PLAN INDEX	April 16, 2018
C7.02b	WATER INDEX	April 16, 2018

Item 2. Refer to Drawings: As shown below add the entire drawing sheet included in this addendum as an attachment.

Add:

Number	Name	Issue Date
C5.02b	STORM SEWER INDEX	April 16, 2018
C9.25b	CIVIL CONSTRUCTION DETAILS	April 16, 2018
C9.30b	CIVIL CONSTRUCTION DETAILS	April 16, 2018

END OF ADDENDUM

SECTION 23 1123

FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping and tubing joining materials.
3. Steel carrier pipe.
4. Valves.
5. Pressure regulators.
6. Service meters.
7. Concrete bases.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 Specification Sections, apply to this Section.

1.3 RELATED SECTIONS

A. Section 31 2000: Earth Moving.

1.4 REFERENCED STANDARDS

A. Latest version or edition shall apply unless otherwise noted.

1. American Society of Mechanical Engineers (ASME)
   a. *Boiler and Pressure Vessel Code*.
   b. B1.20.1, *Pipe Threads, General Purpose, Inch*.
   c. B1.20.3, *Dryseal Pipe Threads, Inch.*
   d. B16.33*, Manually Operated Metallic Gas Valves for use in Gas Piping Systems up to 125 psi (Sizes NPS 1/2 - NPS 2)*.
   e. B16.38, *Large Metallic Valves for Gas Distribution: Manual Operated,NPS 2 1/2 (DN 65) to NPS 12 (DN 300), 125 psig (8.6 bar) Maximum.*
   f. B16.40, *Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems*.
   g. B16.5, *Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard*.
2. ASTM International
   a. A 53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless*.
   b. A 126, *Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings*.
   c. B 584, *Standard Specification for Copper Alloy Sand Castings for General Applications*.
   d. D 2513, *Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fitting*.
   e. D 2657, *Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings*.
   f. D 2683, *Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing*.

g. D 2774, *Standard Practice for Underground Installation of Thermoplastic Pressure Piping*.

h. D 3261, *Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing*.

3. American Welding Society (AWS)
   a. D1.1/D1.1M, Structural Welding Code – Steel.
   b. D10.12, *Guide for Welding Mild Steel Pipe*.
   c. *Brazing Handbook*.
4. American National Standards Institute (ANSI)
   a. B109.1, *Diaphragm-Type Gas Displacement Meters (Under 500-Cubic-Feet-per-hour Capacity)*.
   b. Z21.80, *Line Pressure Regulators*.
5. Manufacturers Standardization Society (MSS)
   a. SP-78, *Cast Iron Plug Valves*.
   b. SP-110, *Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared End.*
6. Master Painters Institute (MPI)
   a. EXT 5.1D, *Exterior Paint.*
   b. INT 5.1E, *Interior Paint*.
   c. INT 5.1Q, *Interior Paint.*
7. National Fire Protection Agency (NFPA)
   a. NFPA 70, National Electrical Code.
8. Society of Automotive Engineers (SAE) International
   a. J513, *Refrigeration Tube Fittings - General Specifications*.

1.5 DEFINITIONS

A. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

B. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

C. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

D. NRTL: Nationally Recognized Testing Laboratory

1.6 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:
   1. Piping and Valves: 100 psig minimum unless otherwise indicated.
   2. Service Regulators: 100 psig minimum unless otherwise indicated.
   3. Minimum Operating Pressure of Service Meter: 5 psig.

B. Natural-Gas System Pressure within Buildings: More than 2 psig but not more than 5 psig.

C. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
2. Pressure regulators. Indicate pressure ratings and capacities.
3. Service meters. Indicate pressure ratings and capacities. Include supports.

1.8 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.9 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Protect stored PE pipes and valves from direct sunlight.

1.11 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of natural-gas service.
2. Do not proceed with interruption of natural-gas service without Owner's written permission.

1.12 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
    a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
    b. Casing: Steel pipe complying with ASTM A 53, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering. Vent casing aboveground.

c. Aboveground Portion: PE transition fitting.

d. Outlet shall be threaded or flanged or suitable for welded connection.

e. Tracer wire connection.

f. Ultraviolet shield.

g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

4. Transition Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.

b. Outlet shall be threaded or flanged or suitable for welded connection.

c. Bridging sleeve over mechanical coupling.

d. Factory-connected anode.

e. Tracer wire connection.

f. Ultraviolet shield.

g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

5. Plastic Mechanical Couplings, NPS 1-1/2 and Smaller: Capable of joining PE pipe to PE pipe.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Mueller Co.; Gas Products Division or approved equivalent

b. PE body with molded-in, stainless-steel support ring.

c. Buna-nitrile seals.

d. Acetal collets.

e. Electro-zinc-plated steel stiffener.

6. Plastic Mechanical Couplings, NPS 2 and Larger: Capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Mueller Co.; Gas Products Div.

b. Fiber-reinforced plastic body.

c. PE body tube.

d. Buna-nitrile seals.

e. Acetal collets.

f. Stainless-steel bolts, nuts, and washers.

7. Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Smith-Blair, Inc.

b. Stainless-steel flanges and tube with epoxy finish.

c. Buna-nitrile seals.

d. Stainless-steel bolts, washers, and nuts.

e. Factory-installed anode for steel-body couplings installed underground.

2.2 STEEL CASING

A. Construct steel casing in the location indicated on the construction drawings. Depth of casing shall be as required to permit completion of the indicated scope of work. In no instance shall the outside top of the steel carrier pipe be less than 30-in from the proposed top of paving subgrade elevation. Contractor shall provide submittal of proposed carrier pipe to Owner for approval prior to installation.

B. PE natural gas pipe:

1. Insert plastic pipe into casing in a manner that will protect the plastic. The leading end of the plastic must be closed before insertion.
2. Any portion of exposed plastic piping which spans disturbed earth should be protected by adequate consolidation and compaction of backfill beneath and around the exposed section or by bridging between casing ends.
3. The inserted pipe must be padded where it emerges from the casing to prevent it from bearing on the end of the casing.
4. The casing pipe should be prepared to the extent necessary to prevent any sharp edges, projections or abrasive material from damaging the plastic pipe during or after insertion. Contractor shall utilize pigs or reamers as required and shall pull a test piece of the proposed PE natural gas pipe size through the casing for examination prior to the actual insertion.
5. Tensile loading should not exceed half the tensile strength of the inserted pipe. “Weak links” made from smaller sizes of PE natural gas pipe can be fabricated to protect the inserted pipe from damage due to excessive pulling stress.

C. Steel casing seals: Contractor shall provide neoprene, rubber, or comparable seals at each end of steel casing pipe. Submittal of proposed seals shall be provided to Owner for review and approval prior to procurement.

D. Casing vents: Steel vents shall be constructed at either end. Vent diameter shall be as required to evacuate the casing pipe in the event of a leak and in no instance shall said vents be less than 2-in in diameter.

1. Top of vent: To be turned down at a 45-degree angle to prevent the entrance of water. Terminal end of vent shall be a minimum of 36-in above the finished grade.
2. Contractor shall provide corrosion resistant finish on all vents following the completion of construction activities. Color subject to review and approval of Owner.

2.3 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig .
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. McDonald, A. Y. Mfg. Co.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Mueller Co.; Gas Products Div.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. PE Ball Valves: Comply with ASME B16.40.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Lyall, R. W. & Company, Inc.
2. Body: PE.

3. Ball: PE.
4. Stem: Acetal.
5. Seats and Seals: Nitrile.
6. Ends: Plain or fusible to match piping.
7. CWP Rating: 80 psig.
8. Operating Temperature: Minus 20 to plus 140 deg F.
9. Operator: Nut or flat head for key operation.
10. Include plastic valve extension.
11. Include tamperproof locking feature for valves where indicated on Drawings.

G. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.4 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Meter Company.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 100 psig.

2.5 SERVICE METERS

A. Diaphragm-Type Service Meters: Comply with ANSI B109.1.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. American Meter Company.

2. Case: Die-cast aluminum.
3. Connections: Steel threads.
4. Diaphragm: Synthetic fabric.
5. Diaphragm Support Bearings: Self-lubricating.
6. Compensation: Continuous temperature and pressure.
7. Meter Index: Cubic feet and liters.
8. Meter Case and Index: Tamper resistant.
9. Remote meter reader compatible.
10. Maximum Inlet Pressure: 100 psig.
11. Pressure Loss: Maximum 0.5-inch wg.
12. Accuracy: Maximum plus or minus 1.0 percent.

2.6 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 30-in below finished grade. Comply with requirements in Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

C. Install underground, PE, natural-gas piping according to ASTM D 2774.

D. Copper Tubing with Protective Coating:

1. Apply joint cover kits over tubing to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

E. Install fittings for changes in direction and branch connections.

F. Install pressure gage upstream and downstream from each service regulator.

3.4 SERVICE-METER ASSEMBLY INSTALLATION

A. Install service-meter assemblies aboveground, on concrete bases.

B. Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.

C. Install strainer on inlet of service-pressure regulator and meter set.

D. Install service regulators mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.

E. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.

F. Install service meters downstream from pressure regulators.

G. Install metal bollards to protect meter assemblies. Comply with drawing requirements for pipe bollards.

3.5 VALVE INSTALLATION

A. Install underground valves with valve boxes.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

C. Install anode for metallic valves in underground PE piping.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

H. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.7 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.8 LABELING AND IDENTIFYING

A. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.9 PAINTING

A. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.
    a. Prime Coat: Alkyd anticorrosive metal primer.
    b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    c. Topcoat: Exterior alkyd enamel (gloss).
    d. Color: Gray.

B. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
    a. Prime Coat: Quick-drying alkyd metal primer.
    b. Intermediate Coat: Interior latex matching topcoat.
    c. Topcoat: Interior latex (gloss).
    d. Color: [Gray].
2. Alkyd System: MPI INT 5.1E.
    a. Prime Coat: Quick-drying alkyd metal primer.
    b. Intermediate Coat: Interior alkyd matching topcoat.
    c. Topcoat: Interior alkyd (gloss).
    d. Color: Gray.

C. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.10 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Use 3000-psig, 28-day, compressive-strength concrete and reinforcement as required.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.12 OUTDOOR PIPING SCHEDULE

A. Underground natural-gas piping shall be the following:

1. PE pipe and fittings joined by heat fusion, or mechanical couplings; service-line risers with tracer wire terminated in an accessible location.

3.13 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.

B. Underground:

1. PE valves.

3.14 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Distribution piping valves for pipe sizes NPS 2 and smaller shall be the following:

1. One-piece, bronze ball valve with bronze trim.

B. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be the following:

1. Cast-iron, lubricated plug valve.

END OF SECTION 23 1123

SECTION 33 4100
PRIVATE STORM SEWER

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes storm sewer piping and related components outside the building which are to be retained by the Owner as private improvements at the completion of the project.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 00 and Division 01 Sections, apply to this Section.

1.3 REFERENCED STANDARDS

A. Latest version or edition shall apply unless otherwise noted.

1. American Association of State Highway and Transportation Officials (AASHTO)
    a. M252, Standard Specification for Corrugated Polyethylene Drainage Pipe.
    b. M294, Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter.
2. American Concrete Institute (ACI)
    a. 318, Building Code Requirements for Structural Concrete and Commentary.
3. American Concrete Pipe Association (ACPA)
    a. Concrete Pipe Installation Manual.
4. American Society of Testing and Materials (ASTM)
    a. A 48, Standard Specifications for Gray Iron Castings.
    b. C 76, Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
    c. C 443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gasket.
    d. C 890, Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
    e. C 891, Standard Practice for Installation of Underground Precast Concrete Utility Structures.
    f. C 913, Standard Specification for Precast Concrete Water and Wastewater Structures.
    g. C 923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Lateral.
    h. C 924,Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
    i. C 990, Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
    j. C 1173, Standard Specification for Flexible Transition Couplings for Underground Piping System.
    k. C 1460, Standard Specification for Shielded Transition Couplings for Use With Dissimilar DWV Pipe and Fittings Above Ground.
    l. C 1479, Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations.
5. PVC Pipe Association

a. UNI-B-06, Recommended Low-Pressure Air Testing of Installed Sewer Pipe.

1.4 DEFINITIONS

A. ACI: American Concrete Institute.

B. AHJ: Authority Having Jurisdiction

C. ACPA: American Concrete Pipe Association.

D. Box Inlet: Square concrete structure with openings for collection of storm water at the top of one or more sidewalls. Inlet is typically provided with a concrete lid containing a standard manhole frame and lid.

E. CGMA: Corrugated Metal Pipe Arch

F. CGMP: Corrugated Metal Pipe

G. Combination Inlet: Storm water inlets which include both grates and curb hoods.

H. Crushed Rock Foundation: Aggregate layer placed beneath proposed storm sewer structures.

I. Grated Area Inlet: Storm water inlets which include grates only. When installed in paved areas, frame is typically cast into adjacent paving. When installed in non-paved areas, concrete apron is usually documented around perimeter of grate.

J. HDPE: High Density Polyethylene.

K. HDPP: High Density Polypropylene.

L. IPC: International Plumbing Code, version as adopted by AHJ.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product used in completion of the scope of work.

B. Shop Drawings: for all pre-cast concrete or PVC structures used in the completion of the scope of work.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle pre-cast storm sewer structures according to manufacturer's written rigging instructions.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.
3. Do not proceed with interruption of service without Utility Owner’s written permission.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: for concrete reinforcement and dowel bars used in the work.

1. Billet Steel: Grade 40 per AASHTO M 31.

2. Axle Steel: Grade 40 per AASHTO M 53.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

C. Zinc Repair Material: ASTM A 780.

2.3 CONCRETE MATERIALS

A. Portland cement: Shall conform to the requirements of AASHTO M 85 or AASHTO M 240. Type I, Type I (SM), Type I (PM), and Type IP shall be used in concrete for general concrete construction. Type II shall be used in concrete exposed to moderate sulphate action or moderate heat of hydration. Type III may be used when high early strength concrete is required. Unless otherwise approved by the Engineer, the product of only one mill of any one brand and type of portland cement shall be used on any structure or adjacent structures. Provide suitable means of storing and protecting the cement against dampness.

1. Cement which for any reason has become partially set or which contains lumps of caked cement will be rejected. Cement salvaged from discarded or used bags shall not be used. All methods of sampling and testing shall be in accordance with the requirements of AASHTO M 85 or AASHTO M 240.

B. Water: All water used in mixing or curing Portland cement concrete or cement treated base shall be clean and practically free from oil, salt, acid, alkali, organic matter, or other substances injurious to the finished product. Water from city water supply may be accepted without being tested. Water from doubtful sources shall not be used until tested and approved. When required by the Engineer, the quality of the mixing water shall be determined in accordance with AASHTO T 26. When tests are made comparing the water with water of known satisfactory quality, any indication of unsoundness, marked change in time of set, or reduction in mortar strength shall be sufficient cause for rejection of the water under test

C. Fine Aggregate: This specifications cover the quality and size of fine aggregates for Portland cement concrete pavements or bases, and incidental structures. Mortar sand shall meet the requirements of AASHTO M 45.

1. General Requirements. Fine aggregate shall consist of natural sand, or, subject to approval, combinations of manufactured sand and natural sand, having hard, strong, durable particles, and it shall conform to these Specifications. Mix and store fine aggregate from different sources in separate stockpiles; in addition, do not use them alternately in the same class of construction or mix without permission from the Engineer or as provided herein for manufactured sand. When manufactured sand is approved for use in combination with natural sand, at least 50 percent of the total fine aggregate by mass shall be natural sand. Store and batch the two materials separately. Each of the materials shall conform to the requirements of these Specifications, except that the mortar strength test shall be made on the blend of materials proposed for use.

2. Deleterious Substances. The amount of deleterious substances shall not exceed the following limits: Clay lumps and friable particles 3%, Coal and Lignite 0.25%

3. Organic Impurities. All fine aggregate shall be free from injurious amounts of organic impurities. Aggregates subjected to the colorimetric test for organic impurities and producing a color darker than the standard shall be rejected unless they pass the mortar strength test as specified below. Should the aggregate show a darker color than that of samples originally approved for the work, its use shall be withheld until tests satisfactory to the Engineer have been made to determine whether the increased color is indicative of an injurious amount of deleterious substances. NOTE: A fine aggregate failing in the test may be used provided that, when tested for the effect of organic impurities on strength of mortar, the relative strength at 7 and 28 days calculated in accordance with Section 10 of AASHTO T 71 is not less than 95 percent.
4. Gradation. Fine aggregate shall be well graded from coarse to fine, and when tested by means of laboratory sieves. Gradation shall meet the following requirements:
    a. Sieve size: 3/8-in, percent passing: 100%.
    b. Sieve size: No. 4, percent passing 95-100%.
    c. Sieve size: No. 8, percent passing 80-100%.
    d. Sieve size: No. 16, percent passing 50-85%.
    e. Sieve size: No. 30, percent passing 25-60%.
    f. Sieve size: No. 50, percent passing 5-30%.
    g. Sieve size: No. 100, percent passing 0-10%.
5. The gradation requirements given above represent the extreme limits which shall determine suitability for use from all sources of supply. The gradation from any one source shall be reasonably uniform and not subject to the extreme percentages of gradation specified above. For the purpose of determining the degree of uniformity, determine a fineness modulus (See Note). Determination shall be made from a representative sample obtained by the Engineer from the Contractor' s proposed source.
    a. Fine aggregates will be rejected from any one source having a variation in fineness modulus greater than 0.20 either way from the fineness modulus of the representative sample.
    b. NOTE: The fineness modulus of an aggregate is determined by adding the total percentages of material in the sample that are coarser than each of the following sieves (cumulative percentages retained), and dividing the sum by 100; No. 100 (150 µm), No. 50 (300 µm), No. 30 (600 µm), No. 16(1.18 mm), No. 8 (2.36 mm), No. 4 (4.75 mm), 3/8 inch (9.5 mm), 3/4 inch (19.0 mm), 1 1/2 inch (37.5mm), and larger increasing at the ratio of 2 to 1.
6. Methods of Sampling and Testing. Sampling and testing of fine aggregate shall be in accordance with the following AASHTO Methods:
    a. Sampling T 2
    b. Friable particles T 112
    c. Coal and lignite T 113
    d. Amount of passing a No. 200 sieve T 11
    e. Organic impurities T 21
    f. Mortar-making properties T 71
    a. Sieve analysis T 27

D. Coarse Aggregate: This specification covers the quality and size of coarse aggregate for use in portland cement concrete pavements or bases and incidental structures.

1. General Requirements. Coarse aggregate shall be a gravel or crushed stone which shall conform to the requirements of AASHTO M 80, Class A, except as modified by these

Specifications. Coarse aggregate shall produce Class A concrete with a durability factor of 50 or more. The durability factor will be determined after 350 cycles of alternate freezing and thawing in accordance with AASHTO T 161, Procedure A. The Los Angeles Abrasion percent wear shall be limited to a maximum of 40 percent after 500 revolutions when tested in accordance with AASHTO T 96. The sodium sulfate soundness requirement shall not apply. Use only coarse aggregate shall consisting of clean, tough, durable particles, practically free from clay, shale, coatings of any character, disintegrated or soft pieces, conglomerates, mud balls, sticks, salt, alkali, or vegetable matter. Crushed stone or crushed gravel from different sources may be combined in the mix when stored and batched separately in recommended proportions, upon written permission of the Engineer. At least 70 percent of all aggregate retained on the No. 4 (4.75 mm) sieve in the combined mix shall be crushed stone or mechanically crushed gravel having two or more fractured faces and shall contain not more than 15 percent of flat and elongated pieces. (A flat and elongated piece is one in which the length is greater than five times the average thickness).

2. Gradation. The coarse aggregate shall be well graded as follows:
   a. No. 357:
      1) Sieve size 2-1/2-in., percent passing 100%.
      2) Sieve size 2-in., percent passing 95-100%.
      3) Sieve size 1-in., percent passing 35-70%.
      4) Sieve size 1/2-in., percent passing 10-30%.
      5) Sieve size No. 4, percent passing 0-5%.
      6) Sieve size No. 200, percent passing 0-1.5%.
   b. No. 57
      1) Sieve size 1-1/2-in., percent passing 100%.
      2) Sieve size 1-in., percent passing 95-100%.
      3) Sieve size 1/2-in., percent passing 25-60%.
      4) Sieve size No. 4, percent passing 0-10%.
      5) Sieve size No. 8, percent passing 0-5%.
      6) Sieve size No. 200, percent passing 0-2%.
   c. No. 67
      1) Sieve size 1-in., percent passing 100%.
      2) Sieve size 3/4-in., percent passing 90-100%.
      3) Sieve size 3/8-in., percent passing 20-55%.
      4) Sieve size No. 4, percent passing 0-10%.
      5) Sieve size No. 8, percent passing 0-5%.
      6) Sieve size No. 200, percent passing 0-2%.
   d. No. 7
      1) Sieve size 3/4-in., percent passing 100%.
      2) Sieve size 1/2-in., percent passing 90-100%.
      3) Sieve size 3/8-in., percent passing 40-70%.
      4) Sieve size No. 4, percent passing 0-15%.
      5) Sieve size No. 8, percent passing 0-5%.
      6) Sieve size No. 200, percent passing 0-2%.

e. No. 8

1) Sieve size 1/2-in., percent passing 100%.

2) Sieve size 3/8-in., percent passing 85-100%.

3) Sieve size No. 4, percent passing 10-30%.

4) Sieve size No. 8, percent passing 0-10%.

5) Sieve size No. 16, percent passing 0-5%.

6) Sieve size No. 200, percent passing 0-2%.

3. Furnish coarse aggregate for Class A concrete in the No. 57 size only except as noted below

4. Furnish coarse aggregate for massive Class A concrete in the No. 357 size.

5. Furnish coarse aggregate for thin section concrete in the No. 7 size.

2.4 CONCRETE MIXTURES

A. Prepare design mixtures, for each class of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Class A

a. Compressive Strength (28 Days):

1) 3,500-psi for rigid vehicular pavements.

2) 3,000-psi for all other civil improvements.

b. Maximum Cement Content: 564-lb/yd^3

c. Minimum 28-day Air Content: 6% $\pm$ 1.5%

d. Water-Cement Ratio at Point of Placement: 0.48.

e. Slump Limit: 2 inches, plus or minus 1 inch.

C. Cementitious Materials: Use fly ash, ground granulated blast-furnace slag, as needed to reduce the total amount of portland cement which would otherwise be used. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. November through March: Fly ash meeting the requirements of this section may be substituted for up to 15% of the required cement. Ground granulated blast furnace slag meeting the requirements of AASHTO M 302 Grade 100 or Grade 120 may be substituted for up to 25% of the required cement. A combination of up to 25% ground granulated blast furnace slag and up to 15% fly ash may be substituted for up to 40% of the required cement.

2. April through October: A combination of up to 25% ground granulated blast furnace slag and up to 20% fly ash may be substituted for up to 45% of the required cement.

3. Substitution shall be by weight: 1.0 pound (1 kg) for each 1.0 pound (1 kg) of cement. The concrete mix design shall be appropriately adjusted. These substitutions will not be allowed for high early strength concrete, Class P concrete or concrete containing Type IP, Type I (PM), or Type I (SM) cement. If the specified minimum cement content is satisfied, additional fly ash or ground granulated blast furnace slag, or silica fume complying with ASTM C 1240, may be added to the mix when approved as part of the mix design.

D. Water Cement Ratio. Using the weight in pounds of each material, calculate the water-cement ratio (W/C) by the following equation: W/C = Water/ (Cement + Fly Ash + Blast Furnace Slag +

Silica Fume) The water actually used is determined by the water measured into the batch plus the free water on wet aggregate minus the water absorbed by dry aggregate plus water in any admixture solutions and shall not exceed the limit specified.

E. Slump. The slump shall be as shown, or as specified in the contract documents, or as approved by the Engineer, and the consistency required shall be that which will provide satisfactory workability for the type work being done. Slump tests will be made during the progress of the work as a measure of uniformity of the consistency of the concrete. If using a high-range water reducing admixture, limit the slump to a maximum of 9 inches (230 mm).

F. Compressive Strength. Compressive strength is based on the average of three test cylinders. When the class of concrete is not expressly indicated on the Plans, the following requirements shall govern:

1. Class AA. Use Class AA concrete in superstructure items, such as bridge floors, approach slabs, reinforced concrete piles, drilled shaft foundations, parapet walls, concrete rail and handrails.
2. Class A. Use Class A concrete for pavements and in substructures items, such as pier caps, columns, abutments, retaining walls, box culverts, and all reinforced concrete not requiring Class AA concrete.
3. Class AP. Use Class AP concrete in shoulders, merge areas and gore areas for PCC pavements, unless otherwise directed by plan notes.
4. Class C. Use Class C concrete for soil erosion control structures.

2.5 CONCRETE MIXING

A. Base the mix design on absolute volume for the class of concrete specified and the consistency suitable for satisfactory placement of the concrete. Design and produce concrete mixtures that conform to the Class of Concrete in this section and base the mix design on absolute volume. Proportion the coarse and fine aggregate in accordance with ACI 211.1. Use the least amount of sand and mixing water which will ensure concrete of the required workability for placement conditions. Meet the minimum strength within 72 hours of placement for high early strength concrete. Submit the mix design at least 14 days before production to the Engineer. Include at least the following information with each mix design:

1. Project identification
2. Name and address of contractor and producer
3. Mix design designation
4. Intended use of the mix design
5. Expected travel time from batch to placement
6. If the concrete will be pumped or not
7. Aggregate sources, gradation, moisture content, saturated surface dry batch mass, LA abrasion (AASHTO T 96), and freeze thaw durability (AASHTO T 103).
8. Fineness modulus of fine aggregate.
9. Cement type and source
10. Type of cement replacement, if used, and source
11. Type of admixtures and sources
12. Material proportions
13. Air content
14. Slump
15. Water / cement ratio
16. Strengths at 7 and 28 days

17. Strengths at 72 hours for high early strength concrete.

B. Do not place any concrete until the mix design is approved. Submit new mix designs if the mix design is rejected by the Engineer, the source of any material changes, or the mix design produces unacceptable workability or production test results.

2.6 STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

2.7 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subgrade or aggregate base surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.

G. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents

H. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete.
4. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

2.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture-retaining-cover curing as follows:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.

2.9 SOIL MATERIALS

A. Crushed Rock Foundation: Uniformly graded crusher run material without rounded faces. Gradation shall be as follows:

1. Sieve size: 2-in, percent passing: 100%.
2. Sieve size: ½-in, percent passing less than 30%.

2.10 PRIVATE STORM SEWER AND FITTINGS

A. Dual Wall HDPE (NPS 12 and smaller): Advanced Drainage Systems (ADS) N-12 or approved equal. Pipe shall meet the requirements of ASTM F2648.

1. Joints: per ASTM F477. Joints shall be per Construction Drawings and the following schedule:

a. Soil-tight (ST): bell and spigot joint meeting the requirements of ASTM F2648.

b. Water-tight (WT): bell and spigot joint meeting the requirements of ASTM D3212.

2. Fittings: per ASTM F2306. Joint type shall be equivalent to that of adjacent pipe(s).

3. Perforations: Where specified, perforations shall be provided per the requirements of AASHTO M252 for NPS 4 through NPS 10 and AASHTO M294 for NPS 12 through NPS 60.

B. Dual Wall HDPP **(NPS 15 and greater)**: Advanced Drainage Systems (ADS) High Performance Storm approved equal. Pipe shall meet the requirements of ASTM F2881.

1. JOINT PERFORMANCE Pipe shall be joined with a gasketed integral bell & spigot joint meeting the requirements of ASTM F2881. 12 through 60-in shall be watertight according to the requirements of ASTM D3212. Spigots shall have gaskets meeting the requirements of ASTM F477. Gasket shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during joint assembly. Pipe shall have an exterior bell wrap installed by the manufacturer.
2. Fittings: Conform to ASTM F2881 and AASHTO M330. Bell and spigot connections shall utilize a spun–on, welded or integral bell and spigots with gaskets meeting ASTM F477. Bell & spigot fittings joint shall meet the watertight joint performance requirements of

ASTM D3212. Corrugated couplings shall be split collar, engaging at least 2 full corrugations.

2.11 PRIVATE STORM SEWER STRUCTURES

A. Meeting Construction Drawing requirements in regards to location, dimensions, depth, invert elevation(s), weir elevation(s), grate elevation, rim elevation, and/or top of curb elevation. Material of construction shall be as indicated on the Construction Drawings and shall generally be pre-cast concrete or cast-in-place concrete.

B. Material Substitutions: subject to review and approval of the Engineer and the following schedule:

1. Permitted substitutions:
   a. Pre-cast concrete for cast-in-place concrete.
   b. Pre-cast concrete or cast-in-place concrete for PVC
   c. Pre-cast concrete or cast-in-place concrete for masonry.
2. Prohibited substitutions:
   a. PVC for masonry, pre-cast concrete, or cast-in-place concrete
   b. Masonry for pre-cast concrete or cast-in-place concrete.

C. Brick masonry structures:

1. Brick: 2-1/4" x 7-5/8" x 3-5/8". Meeting the requirements of ASTM C55, Grade S-1.

2. Mortar: ASTM C270, Type M.

D. Cast-in-place concrete structures:

1. Concrete: Class A.
2. Reinforcement: of the size, length, and configuration indicated on the Construction Drawings. Reinforcing steel shall be billet or axle steel.

E. Pre-cast structures: Pre-cast manhole structures shall meet the requirements of ASTM C478. All other pre-cast concrete structures shall meet the requirements of ASTM C913. All pre-cast structures shall be designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading.

1. Joint Sealants: ASTM C 990, bitumen or butyl rubber.
2. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

F. PVC structures:

1. General: PVC structures shall be ADS Nyloplast or approved equal.

2. Materials: PVC structures shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the specified configuration.

a. Joints: The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The flexible elastomeric seals shall conform to ASTM F477. The pipe bell spigot shall be joined to the main body of the drain basin or catch basin. The raw material used to manufacture the pipe stock that is used to manufacture the main body and pipe stubs of the surface drainage inlets shall conform to ASTM D1784 cell class 12454.

G. Frames, Covers, and Grates: ASTM A 48, Class B, Grade U-60-60, designed for A-16 (AASHTO HS20-44) structural loading. Manufacturers and models shall be per the following schedule, substitutions subject to review and approval of the engineer:

1. Manhole Frame and Cover: Deeter Foundry, Product No. 1159.

PART 3 - EXECUTION

3.1 EARTHWORK

A. All excavation, trenching, and backfilling shall be completed as indicated on the Construction Drawings. Contractor is responsible for protecting items to remain for the duration of the project as well as adjacent, off-site features. The following additional standards shall also apply:

1. Private Dual Wall HDPE Installations: per requirements of ASTM D2321 and pipe manufacturer requirements.

3.2 PRIVATE STORM SEWER PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use trenchless methods as indicated on the Construction Drawings.

3.3 PRIVATE STORM STRUCTURE INSTALLATION

A. Brick Masonry Structures:

1. Foundations: A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of Class A Concrete per Section [02751][32 1313]. The foundation shall be built to the correct elevation, and shall be finished to insure the least possible resistance of flow.

2. Laying Bricks:

a. All bricks shall be thoroughly clean. The bed which is to receive the brick shall be thoroughly cleaned and wetted with water before placing mortar thereon. All brick shall be laid in freshly made mortar composed of one part by volume of Portland Cement and three parts by volume of sand, with the possible addition of hydrated lime in an amount not to exceed fifteen percent (15%) by volume of the cement used. The brick shall be laid in courses using the shoved joint method to thoroughly bond them into the mortar and always with the joints completely filled with mortar. The brick shall be laid in a work person-like manner and true to the lines and grades indicated on the Plans. The arrangement of headers and stretchers shall be such as will thoroughly bond the masonry, and unless otherwise indicated, brick masonry shall be of alternate headers and stretchers with consecutive courses breaking joints. The courses shall be laid continuously with joints broken or alternating evenly with the joints in the proceeding courses. The joints shall not be less than one-fourth inch (1/4") more than one-half inch (1/2") in thickness. Face

joints shall be neatly struck, using the weather joint. All joints shall be finished properly as the laying of brick progresses.

b. No spalls or batts shall be used except in shaping around irregular openings or connections or when unavoidable to finish out a course, in which case, a full brick shall be used at the corner and the bat in the interior of the course.

c. In case any brick is removed, or a joint broken during the laying, the brick shall be taken up, the mortar thoroughly cleaned from the brick, bed, joints, and the brick relaid in fresh mortar. In hot and dry weather or when directed, the brick masonry shall be protected and kept moist for a period of at least forty-eight (48) hours after laying of the brick.

d. Brick masonry shall not be constructed in freezing weather or when bricks contain frost, except by written permission of the Engineer and subject to such conditions for protection against freezing.

B. PVC Structures: Install using conventional flexible pipe backfill materials and procedures. Backfill material shall be crushed stone or other granular material meeting the requirements of Class 2 material as defined in ASTM D2321. Bedding and backfill for surface drainage inlets shall be placed and compacted uniformly in accordance with ASTM D2321. The drain basin body shall be cut at the time of the final grade. Use of brick, stone, or concrete block shall be prohibited in setting the final grate elevation. For installations subject to vehicular traffic, Contractor shall provide a concrete apron at the perimeter of the installation per Construction Drawing requirements.

C. Cast-in-Place Concrete Structures: Complete construction per requirements of ACI 318.

D. Pre-Cast Structures: Install structure per requirements of ASTM C891.

3.4 CONNECTIONS

A. Connect non-pressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."

B. Make connections to existing piping and underground manholes.

1. Make branch connections from side into existing underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.

b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

2. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.5 IDENTIFICATION

A. Materials and their installation are specified in Section 31 2000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use warning tape or detectable warning tape over ferrous piping.

2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.6 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:
    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.
3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of Service Provider.
3. Schedule tests and inspections by Service Provider with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of Service Provider, UNI-B-6, and the following:
    a. Test concrete piping according to ASTM C 924.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.7 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION **33 4100**

GENERAL CONSTRUCTION NOTES

1. GENERAL

1.1. ALL WORK SHALL CONFORM TO THE PROJECT SPECIFICATIONS ISSUED BY THE ENGINEER AND ACCOMPANYING THESE DRAWINGS.

1.2. CONSTRUCTION TRAFFIC CONTROL SHALL BE PROVIDED AS NECESSARY AT ANY POINTS OF ENTRANCE OR EXIT ONTO PAVED STREETS. NO CLOSURE OF PUBLIC OR PRIVATE ROADWAYS SHALL BE ALLOWED WITHOUT PRIOR WRITTEN CONSENT OF THE CITY OF TAHLEQUAH OR THE OWNER, RESPECTIVELY. COST OF TRAFFIC CONTROL SHALL BE CONSIDERED INCIDENTAL AND INCLUDED IN THE BID PRICE OF OTHER ITEMS OF WORK.

1.3. CONTRACTOR SHALL CONTACT THE ENGINEER AS SOON AS POSSIBLE SHOULD ANY CIRCUMSTANCES FOUND DURING THE COURSE OF PROJECT COMPLETION NECESSITATE A VARIANCE FROM THE PLANS. VARIANCE FROM THE PLANS WILL BE REVIEWED BY THE ENGINEER AND THE OWNER.

2. STORMWATER/EROSION CONTROL

2.1. PRIOR TO INITIATION OF CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL VERIFY THAT A NOTICE OF INTENT (NOI) HAS BEEN FILED WITH THE ENVIRONMENTAL PROTECTION AGENCY (EPA). IN THE EVENT THAT AN NOI IS NOT CURRENTLY ON FILE, THE CONTRACTOR SHALL BE RESPONSIBLE FOR FILING SAID DOCUMENT IN CONFORMANCE WITH EPA REQUIREMENTS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT THE GUIDELINES SET FORTH IN THE PERMITS ARE IN PLACE PRIOR TO INITIATING CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PAYMENT OF ALL FEES ASSOCIATED WITH STORM WATER PERMITS.

2.2. THE NOTICE OF INTENT (NOI) AND THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP), AS WELL AS ANY OTHER APPLICABLE DOCUMENTS SHALL BE KEPT ON SITE BY THE CONSTRUCTION SUPERINTENDENT AT ALL TIMES. SAID ITEMS SHALL BE MADE AVAILABLE TO STATE AND MUNICIPAL AUTHORITIES UPON REQUEST.

2.3. ANY DISCHARGES FROM THE SITE SHALL CONFORM TO THE SWPPP. THE CONTRACTOR SHALL INSTALL ADDITIONAL STORMWATER CONTROL DEVICES AS NECESSARY TO ENSURE COMPLIANCE WITH SAID DOCUMENT.

2.4. CONSTRUCTION OF ALL EROSION CONTROL MEASURES SHALL BE PERFORMED BY THE CONTRACTOR PRIOR TO THE INITIATION OF ANY LAND DISTURBING ACTIVITIES. INSPECTION OF THESE STRUCTURES MAY BE PERFORMED BY EPA, ODEQ, AND/OR THE CITY OF TAHLEQUAH STORM WATER QUALITY DEPARTMENT. MAINTENANCE OF EROSION CONTROL MEASURES SHALL BE PERFORMED BY THE CONTRACTOR AS INDICATED IN THE SWPPP OR AT A SUFFICIENT INTERVAL TO ENSURE RETENTION OF SEDIMENTS.

2.5. A STABILIZED CONSTRUCTION ENTRANCE SHALL BE PROVIDED BY THE CONTRACTOR AT ANY POINTS OF ENTRANCE OR EXIT ONTO ADJACENT PAVED STREETS. WASHDOWN OF VEHICLES SHALL BE PERFORMED AS NECESSARY TO REDUCE/ELIMINATE SIGNIFICANT DEPOSITS OF SOIL ON ROADWAY. REMOVAL OF SOIL FROM STREET SHALL BE PERFORMED BY THE CONTRACTOR AS REQUESTED BY THE AHJ.

2.6. DISTURBED PORTIONS OF THE SITE, INCLUDING STOCKPILES, WHERE CONSTRUCTION ACTIVITY TEMPORARILY CEASES FOR AT LEAST 21-DAYS, SHALL BE TEMPORARY STABILIZED NO LATER THAN 14-DAYS FROM THE LAST CONSTRUCTION ACTIVITY IN THAT AREA. TEMPORARY STABILIZATION SHALL BE COMPLETED PER THE SWPPP.

2.7. DISTURBED PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES PERMANENTLY CEASE SHALL BE STABILIZED NO LATER THAN 14-DAYS FROM THE LAST CONSTRUCTION ACTIVITY IN THAT AREA. PERMANENT STABILIZATION SHALL BE COMPLETED PER THE SWPPP.

2.8. IN THE EVENT THAT CONSTRUCTION SEQUENCING OR WEATHER MAKE STABILIZATION OF DISTURBED AREAS WITHIN THE REQUIRED TIME IMPRACTICAL, THE CONTRACTOR SHALL STABILIZE THE SOILS WITH STRAW OR FIBER MULCH. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF MULCH AND ESTABLISHMENT OF PERMANENT VEGETATION ONCE WEATHER AND/OR SEQUENCING PERMITS. SEE SWPPP FOR ADDITIONAL INFORMATION.

3. EXISTING UTILITIES

3.1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES WHICH MAY BE IMPACTED BY THE WORK OF THE APPROVED PLANS. THE CONTRACTOR SHALL COMPLETE THE SCOPE OF WORK IN SUCH A MANNER AS TO PRECLUDE DAMAGE TO EXISTING UTILITIES AND/OR STRUCTURES. DAMAGE TO FACILITIES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE, TO THE SATISFACTION OF THE FACILITY OWNER.

3.2. EXISTING UTILITIES SHOWN ON THE APPROVED PLANS IN THE APPROXIMATE LOCATION WHERE EVIDENCE OF THEIR LOCATION WAS AVAILABLE EITHER BY FIELD OBSERVATION OR FROM INFORMATION PROVIDED BY THE OWNER, AND/OR UTILITY COMPANY. NEITHER THE OWNER, THE UTILITY OWNER, NOR THE ENGINEER ACCEPT RESPONSIBILITY FOR DAMAGE DONE BY THE CONTRACTOR TO EXISTING FACILITIES. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LOCATE AND PROTECT ALL UTILITIES DURING CONSTRUCTION.

3.3. CONTRACTOR SHALL VERIFY EXACT HORIZONTAL AND VERTICAL LOCATION OF EXISTING UTILITIES, SPECIFICALLY AT CRITICAL TIE-IN POINTS, PRIOR TO INITIATION OF CONSTRUCTION ACTIVITIES. VERIFICATION OF SIZE AND CONSTRUCTION MATERIAL (I.E., PVC, DIP, RCP, ETC.) SHALL BE PERFORMED DURING THESE ACTIVITIES.

4. GEOTECHNICAL

4.1. ALL EARTHWORK AND SUBGRADE PREPARATION SHALL BE COMPLETED PER THE JANUARY 17, 2018 REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL EVALUATION PREPARED BY BUILDING & EARTH (BUILDING & EARTH PROJECT NO. OK170293) AND SECTION 31 2000 OF THE PROJECT SPECIFICATIONS. CONFLICTS BETWEEN THE TWO DOCUMENTS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION PRIOR TO THE SUBMISSION OF BID. REQUIREMENTS WHICH SPECIFICALLY IMPACT THE SCOPE OF WORK INCLUDE, BUT ARE NOT LIMITED TO:

4.1.1. TOPSOIL THICKNESS IN BORINGS RANGED FROM 2 TO 30-IN. TOPSOIL THICKNESS LIKELY VARIES IN UNEXPLORED LOCATIONS. THESE SOILS ARE ANTICIPATED TO LOSE STABILITY WITH SLIGHT INCREASE IN SOIL MOISTURE CONTENT AND WILL NOT PROVIDE A WORKABLE PLATFORM.

4.1.2. RESIDUAL CLAY SOILS WERE ENCOUNTERED BELOW THE TOPSOIL IN ALL BORINGS AND EXTENDED TO DEPTHS OF 1 TO 10-FT. CLAY SOILS VARY FROM NEAR-SURFACE, LOW TO MODERATE PLASTICITY RESIDUAL CLAY SOILS, TO MODERATE TO HIGH-PLASTICITY SOILS. SEE SECTION 3.3.2 OF THE GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.

4.1.3. A LIMESTONE UNIT WAS ENCOUNTERED BELOW RESIDUAL CLAY SOILS IN ALL BORINGS AT DEPTH OF 1 TO 9.8-FEET. THIS LIMESTONE UNIT EXTENDED TO THE AUGER REFUSAL DEPTH OF 2 TO 10.5-FEET BELOW THE EXISTING GROUND SURFACE. AUGER REFUSAL DEPTH ARE REPORTED IN SECTION 3.3.4 OF THE GEOTECHNICAL REPORT.

4.1.4. GROUNDWATER SEEPAGE WAS ENCOUNTERED IN PORTIONS OF THE BORINGS AT DEPTHS OF 8 TO 9-FT BELOW EXISTING GRADE. FREE WATER WAS MEASURED AT 4 TO 6-FT, 24-HOURS AFTER COMPLETION OF DRILLING OPERATIONS.

4.1.5. HIGH SOIL MOISTURE CONTENTS WERE OBSERVED AT THE TOPSOIL/RESIDUAL CLAY INTERFACE AS WELL AS AT THE RESIDUAL CLAY/LIMESTONE INTERFACE. BASED ON THIS, THE GEOTECHNICAL ENGINEER HAS IDENTIFIED A HIGH PROBABILITY FOR THE DEVELOPMENT OF PERCHED WATER.

4.1.6. SWALE AREA: AS NOTED IN THE GEOTECHNICAL REPORT, SOFT TO MEDIUM STIFF SOILS WITH RELATIVELY HIGH MOISTURE CONTENTS WERE IDENTIFIED THROUGHOUT THE SWALE WHICH BISECTS THE PROPERTY. HIGH MOISTURE CONTENTS WERE NOTED TO DEPTH OF APPROXIMATELY 6-FT. SOFT, WET, AND UNSTABLE SOIL CONDITIONS SHOULD BE ANTICIPATED WITHIN AND ADJACENT TO THE SWALE ALIGNMENT. SEE SECTION 4.2 OF THE GEOTECHNICAL REPORT FOR ADDITIONAL DETAIL AND INFORMATION.

4.1.7. MOISTURE SENSITIVE SOILS:

4.1.7.1. THE SITE WILL BE PRONE TO DEVELOPMENT OF NEAR-SURFACE PERCHED WATER. NEAR-SURFACE SOILS WILL DEGRADE IF ALLOWED TO BECOME SATURATED. THE CONTRACTOR IS ADVISED TO NOT ALLOW WATER TO POND BY MAINTAINING POSITIVE DRAINAGE AND PROVIDING TEMPORARY DEWATERING METHODS.

4.1.7.2. THE CONTRACTOR SHOULD ANTICIPATE SOME DIFFICULTY DURING THE EARTHWORK PHASE OF THIS PROJECT DURING CONSTRUCTION. INCREASED MOISTURE LEVELS WILL FURTHER SOFTEN THE SUBGRADE. THE SOILS ARE UNSTABLE AND SHOULD BE EXPECTED TO RUT AND PUMP UNDER THE INFLUENCE OF CONSTRUCTION TRAFFIC.

4.1.8. HARD ROCK EXCAVATION TECHNIQUES SHOULD BE ANTICIPATED WITHIN THE UNDERLYING LIMESTONE UNIT. THE DEPTH OF THIS UNIT VARIES FROM 2-FT TO 10-FT ACROSS THE SITE. SEE SECTION 4.8.1 OF THE GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.

4.1.9. UTILITY TRENCH BACKFILL: ALL UTILITY TRENCHES SHALL BE BACKFILLED AND COMPACTED PER THE REQUIREMENTS OF SECTION 4.7 OF THE GEOTECHNICAL RPOERT. LIFT THICKNESS MAY BE REQUIRED TO BE REDUCED TO 4 TO 6-IN IN ORDER TO ACHIEVE REQUIRED COMPACTION USING HAND-OPERATED EQUIPMENT.

4.2. GROUNDWATER HAS BEEN ENCOUNTERED ON THE SITE AT DEPTHS OF 4 TO 9-FT. CONTRACTOR SHALL BE RESPONSIBLE FOR DEWATERING OF EXCAVATION AS NECESSARY TO COMPLETE THE INDICATED SCOPE OF WORK. COST OF DEWATERING ACTIVITIES SHALL BE CONSIDERED INCIDENTAL AND INCLUDED IN THE SUBMITTED BID. SEE SECTION 31 2319 OF THE PROJECT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

4.3. UNSATISFACTORY OR UNUSABLE SOIL MATERIAL GENERATED DURING EARTHWORK OPERATIONS SHALL BECOME THE CONTRACTOR'S PROPERTY AND SHALL BE REMOVED FROM THE SITE PRIOR TO FINAL INSPECTION AND ACCEPTANCE BY THE OWNER.

4.4. ROCK AND OTHER UNFORESEEN OBSTRUCTIONS ENCOUNTERED DURING THE COMPLETION OF SITE WORK SHALL BE REMOVED BY THE CONTRACTOR AT NO COST TO THE OWNER.

4.5. THE CONTRACTOR SHALL SPRINKLE DISTURBED AREAS AS NECESSARY TO REDUCE/ELIMINATE THE CREATION OF DUST DURING GRADING ACTIVITIES. THE COST OF SPRINKLING SHALL BE CONSIDERED INCIDENTAL AND INCLUDED IN THE SUBMITTED BID.

4.6. SHORING, BRACING, TERRACING/BENCHING, AND OTHER MEASURES ASSOCIATED WITH PROTECTION OF WORKERS IN AN AROUND EXCAVATIONS SHALL BE PERFORMED AS NECESSARY TO MEET ALL APPLICABLE OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION (OSHA) REQUIREMENTS AND REGULATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING ALL NECESSARY MEASURES ARE IN PLACE. SEE SECTION 31 5000 OF THE PROJECT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

5. SANITARY SEWER

5.1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST VERSION OF OKLAHOMA ADMINISTRATIVE CODE TITLE 252, CHAPTER 656. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO SECURE A COPY OF THE STATE REGULATIONS FOR REFERENCE.

5.2. PUBLIC SANITARY SEWER IMPROVEMENTS SHALL BE CONSTRUCTED PER THE CITY OF TAHLEQUAH STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC IMPROVEMENTS. PRIVATE IMPROVEMENTS SHALL BE CONSTRUCTED PER SECTION 22 1313 OF THE PROJECT SPECIFICATIONS AND THE REQUIREMENTS OF THE INTERNATIONAL PLUMBING CODE (VERSION AS ADOPTED BY THE CITY OF TAHLEQUAH). CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING AND REVIEWING ALL REFERENCED DOCUMENTS AND DETERMINING APPLICABILITY TO THE INDICATED SCOPE OF WORK.

5.3. A CONSTRUCTION PERMIT FROM THE OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY IS REQUIRED PRIOR TO EXTENSION OF ANY PUBLIC SANITARY SEWER LINES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THAT THIS PERMIT HAS BEEN ACQUIRED PRIOR TO CONSTRUCTION. ADDITIONAL COSTS AND/OR DELAYS RESULTING FROM CONSTRUCTION OF THE SANITARY SEWER LINES PRIOR TO ACQUISITION OF THE PERMIT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

5.4. A WORK ORDER FROM THE CITY OF TAHLEQUAH DEPARTMENT OF UTILITIES SHALL BE REQUIRED PRIOR TO EXTENSION OF ANY PUBLIC SANITARY SEWER LINES. IF PUBLIC SANITARY SEWER LINE IMPROVEMENTS ARE INCLUDED WITHIN THE SCOPE OF WORK, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO SECURE THIS WORK ORDER. ADDITIONAL COSTS AND/OR DELAYS RESULTING FROM CONSTRUCTION OF ANY WATER LINES PRIOR TO ACQUISITION OF THE WORK ORDER SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

5.5. LEAKAGE AND DEFLECTION TESTING SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 22 1313 OF THE PROJECT SPECIFICATIONS. LEAKAGE ALONG ANY NEWLY INSTALLED SANITARY SEWER LINE SHALL NOT EXCEED 50 GALLONS PER INCH DIAMETER PER MILE PER DAY. DOCUMENTATION OF TESTING, PROCEDURES AND RESULTS SHALL BE PROVIDED TO THE ENGINEER WITHIN 24 HOURS OF COMPLETION OF THE TEST(S).

5.6. IN ACCORDANCE WITH THE OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY (ODEQ), THE CONTRACTOR SHALL UTILIZE BEDDING MATERIAL IN ACCORDANCE WITH OAC 252:655-9-2(G)(3).

5.7. COVER ABOVE TOP OF PIPE SHALL BE MAINTAINED AS SPECIFIED ON THE PLANS. IN NO SITUATION SHALL THE COVER FROM TOP OF PIPE BE LESS THAN 30-INCHES.

5.8. IN THE EVENT THAT MINIMUM SEPARATION BETWEEN THE SANITARY SEWER LINES AND ANY ADJACENT WATER LINES (24-INCHES VERTICALLY, 10-FEET HORIZONTALLY) CANNOT BE MET, THE SPECIAL PROVISIONS OF OAC 252:655-9-1(H) SHALL BE MET BY THE CONTRACTOR.

5.9. ALL PVC SANITARY SEWER LINES SHALL HAVE A MINIMUM STIFFNESS OF 46-PSI IN ACCORDANCE WITH OAC 252:655-9-1(B).

5.10. ALL MANHOLES SHALL HAVE A MINIMUM DIAMETER OF 48-INCHES. MANHOLES LESS THAN 4.5-FEET DEEP SHALL BE FULL DIAMETER FROM TOP TO BOTTOM. MANHOLE BASES SHALL BE A MINIMUM OF 8-INCHES THICK AND SHALL EXTEND AT LEAST 4-INCHES BEYOND THE MANHOLE WALL.

5.11. ALL CONCRETE USED IN MANHOLE CONSTRUCTION SHALL HAVE A COMPRESSIVE STRENGTH GREATER THAN OR EQUAL TO 3,500-PSI. PRECAST REINFORCED CONCRETE MANHOLES SHALL CONFORM TO ASTM C-478.

5.12. INLET AND OUTLET LINES SHALL BE JOINED TO THE MANHOLE VIA A WATER-TIGHT CONNECTION WHICH ALLOWS FOR DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE TO TAKE PLACE IN ACCORDANCE WITH OAC 252-655-9-4(E).

5.13. CONTRACTOR SHALL PROVIDE FIELD NOTES AND AS-BUILT SURVEYS TO ENGINEER UPON COMPLETION OF SANITARY SEWER CONSTRUCTION. BOTH DIGITAL AND HARD COPIES SHALL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO ACCEPTANCE OF THE IMPROVEMENTS BY THE OWNER. AS-BUILT INFORMATION SHALL INCLUDE LOCATIONS AND ELEVATIONS OF ALL FITTINGS AS INSTALLED. A COMPLETE AND ACCURATE LIST OF QUANTITIES SHALL BE INCLUDED WITH, OR SHOWN ON, THE PLAN SHEETS. QUANTITES SHALL INCLUDE BEDDING AND PIPE, ALONG WITH FITTINGS AND INCIDENTAL ITEMS. SUBMITTED SURVEYS SHALL BE SIGNED AND SEALED BY A LICENSED LAND SURVEYOR AND SHALL BE PREPARED UTILIZING THE IDENTICAL VERTICAL AND HORIZONTAL DATUM INDICATED ON THE APPROVED PLANS. COST OF AS-BUILT SURVEYS SHALL BE CONSIDERED AN INCIDENTAL ITEM AND SHALL BE INCLUDED IN THE BID PRICE OF OTHER ITEMS OF WORK.

5.14. ADDITIONAL REQUIREMENTS FROM THE TAHLEQUAH PUBLIC WORKS AUTHORITY SHALL BE AS FOLLOWS:
- 5.14.1. ALL PVC SANITARY SEWER LINES SHALL HAVE A MAXIMUM SDR OF 35.
- 5.14.2. BEDDING MATERIAL SHALL BE 3/4-IN WASHED ROCK. BEDDING MATERIAL TO BE PROVIDED 6-IN BELOW PIPE AND 12-IN ABOVE PIPE.
- 5.14.3. ALL MANHOLES SHALL HAVE A MINIMUM DIAMETER OF 4-FT.
- 5.14.4. ALL PUBLIC MANHOLES SHALL BE PROVIDED WITH STANDARD TAHLEQUAH MANHOLES LIDS AND RINGS.
- 5.14.5. FLAT-TOP MANHOLES SHALL BE PROHIBITED.

6. WATER

6.1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST VERSION OF OKLAHOMA ADMINISTRATIVE CODE TITLE 252, CHAPTER 626. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO SECURE A COPY OF THE STATE REGULATIONS FOR REFERENCE.

6.2. PUBLIC WATER LINE IMPROVEMENTS SHALL BE CONSTRUCTED PER THE CITY OF TAHLEQUAH STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC IMPROVEMENTS. PRIVATE IMPROVEMENTS SHALL BE CONSTRUCTED PER SECTION 22 1113 OF THE PROJECT SPECIFICATIONS AND THE REQUIREMENTS OF THE INTERNATIONAL PLUMBING CODE (VERSION AS ADOPTED BY THE CITY OF TAHLEQUAH). CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING AND REVIEWING ALL REFERENCED DOCUMENTS AND DETERMINING APPLICABILITY TO THE INDICATED SCOPE OF WORK.

6.3. A CONSTRUCTION PERMIT FROM THE OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY SHALL BE REQUIRED PRIOR TO EXTENSION OF ANY PUBLIC WATER LINES. IF PUBLIC WATER LINE IMPROVEMENTS ARE INCLUDED WITHIN THE SCOPE OF WORK, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THAT THIS PERMIT HAS BEEN ACQUIRED PRIOR TO THE START OF CONSTRUCTION. ADDITIONAL COSTS AND/OR DELAYS RESULTING FROM CONSTRUCTION OF ANY WATER LINES PRIOR TO ACQUISITION OF THE PERMIT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

6.3. A WORK ORDER FROM THE CITY OF TAHLEQUAH DEPARTMENT OF UTILITIES SHALL BE REQUIRED PRIOR TO EXTENSION OF ANY PUBLIC WATER LINES. IF PUBLIC WATER LINE IMPROVEMENTS ARE INCLUDED WITHIN THE SCOPE OF WORK, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO SECURE THIS WORK ORDER. ADDITIONAL COSTS AND/OR DELAYS RESULTING FROM CONSTRUCTION OF ANY WATER LINES PRIOR TO ACQUISITION OF THE WORK ORDER SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

6.4. CONTRACTOR SHALL COMPLETE PROPOSED TAPS IN ACCORDANCE WITH CITY OF TAHLEQUAH POLICIES AND PROCEDURES. TAPPING ACTIVITIES SHALL BE COORDINATED THROUGH THE UTILITIES DIVISION OF THE CITY OF TAHLEQUAH.

6.5. A MINIMUM HORIZONTAL SEPARATION OF 10-FEET SHALL BE MAINTAINED BETWEEN ANY POTABLE AND NON-POTABLE WATER LINE EXTENSIONS AND ANY ADJACENT SANITARY SEWER LINES. IN THE EVENT THAT THIS SEPARATION IS NOT POSSIBLE, THE WATER LINE SHALL BE CONSTRUCTED IN A SEPARATE TRENCH AND THE SEWER LINE SHALL BE DESIGNED, CONSTRUCTED, AND TESTED AS A WATER LINE PIPE IN ACCORDANCE WITH OAC 252:655-9-1(H).

6.6. ALL HIGH POINTS IN PROPOSED WATER LINES ARE SHOWN ON PLANS. CONTRACTOR SHALL MAINTAIN POSITIVE PIPELINE SLOPE TOWARD DESIGNATED HIGH POINTS AND SHALL NOT CREATE ADDITIONAL HIGH POINTS IN THE PIPE ALIGNMENT.

6.7. INSTALLATION OF EACH FIRE HYDRANT SHALL BE COMPLETED SO AS TO ACHIEVE THE STEAMER NOZZLE ELEVATION SPECIFIED ON THE PLANS. COMPLETED HYDRANT INSTALLATIONS WHICH DO NOT MEET THE SPECIFIED ELEVATION SHALL BE ADJUSTED ACCORDINGLY. COST OF RAISING OR LOWERING RECENTLY INSTALLED HYDRANTS SHALL BE AT THE EXPENSE OF THE CONTRACTOR.

6.8. ALL WASTE MATERIAL (INCLUDING WATER GENERATED DURING FLUSHING PROCEDURES) SHALL BECOME THE CONTRACTOR'S PROPERTY AND SHALL BE DISPOSED OF IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS. SALVAGEABLE MATERIALS AND EQUIPMENT SHALL BE RETURNED TO OWNER UNLESS RE-USED FOR THIS PROJECT.

6.9. ADDITIONAL SERVICES FOR LANDSCAPE IRRIGATION SHALL BE PROVIDED AS INDICATED BY THE LANDSCAPE ARCHITECT. LOCATIONS AND SIZES OF ADDITIONAL IRRIGATION SERVICES SUBJECT TO REVIEW AND APPROVAL BY THE ENGINEER.

6.10. COVER ABOVE THE TOP OF PRIVATE WATER LINES SHALL BE MAINTAINED AS SPECIFIED ON THE PLANS. IN NO SITUATION SHALL THE COVER FROM TOP OF PIPE BE LESS THAN 30-INCHES.

6.11. PRESSURE AND LEAKAGE TESTING FOR PRIVATE WATER LINES SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 22 1113 OF THE PROJECT SPECIFICATIONS AND PER STANDARD C-601 OF THE AMERICAN WATER WORKS ASSOCIATION (AWWA). DOCUMENTATION OF TESTING, PROCEDURES AND RESULTS SHALL BE PROVIDED TO THE ENGINEER WITHIN 24 HOURS OF COMPLETION OF THE TEST(S).

6.12. DISINFECTION PROCEDURES FOR PRIVATE WATER LINES SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 22 1113 OF THE PROJECT SPECIFICATIONS AND PER STANDARD C-651 OF THE AMERICAN WATER WORKS ASSOCIATION (AWWA). DOCUMENTATION OF TESTING, PROCEDURES AND RESULTS SHALL BE PROVIDED TO THE ENGINEER WITHIN 24 HOURS OF COMPLETION OF THE TEST(S).

6.13. REACTION BLOCKING FOR PRIVATE WATER LINES SHALL BE PROVIDED AT ALL BENDS, TEES, AND HYDRANTS AND SHALL BE INSTALLED PER SECTION 22 1113 OF THE PROJECT SPECIFICATIONS.

6.14. GATE VALVES INSTALLED ON PRIVATE WATER LINES SHALL MEET THE REQUIREMENTS OF ANSI/AWWA C509 AND SHALL HAVE MECHANICAL JOINT ENDS. MECHANICAL JOINTS AND JOINT ACCESSORIES SHALL MEET THE REQUIREMENTS OF ANSI/AWWA A21.1/C111. ALL BOLTS, INCLUDING THOSE IN VALVE BODY SHALL BE STAINLESS STEEL.

6.15. CONTRACTOR SHALL PROVIDE FIELD NOTES AND AS-BUILT SURVEYS TO ENGINEER UPON COMPLETION OF WATER LINE CONSTRUCTION. BOTH DIGITAL AND HARD COPIES SHALL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO ACCEPTANCE OF THE IMPROVEMENTS BY THE OWNER. AS-BUILT INFORMATION SHALL INCLUDE LOCATIONS AND ELEVATIONS OF ALL FITTINGS AND VALVING AS INSTALLED. A COMPLETE AND ACCURATE LIST OF QUANTITIES SHALL BE INCLUDED WITH, OR SHOWN ON, THE PLAN SETS. QUANTITIES SHALL INCLUDE BEDDING AND PIPE, ALONG WITH FITTINGS, VALVES AND INCIDENTAL ITEMS. SUBMITTED SURVEYS SHALL BE SIGNED AND SEALED BY A LICENSED LAND SURVEYOR AND SHALL BE PREPARED UTILIZING THE IDENTICAL VERTICAL AND HORIZONTAL DATUM INDICATED ON THE APPROVED PLANS.

6.16. ADDITIONAL REQUIREMENTS FROM TAHLEQUAH PUBLIC WORKS AUTHORITY SHALL BE AS FOLLOWS:
- 6.16.1. WATER LINES SHALL HAVE A MAXIMUM SDR OF 21.
- 6.16.2. BEDDING MATERIAL SHALL BE SAND IN DRY AREAS AND 3/4-IN WASHED ROCK IN WET AREAS.
- 6.16.3. BEDDING MATERIAL SHALL BE PROVIDED 6-IN BELOW PIPE AND 12-IN ABOVE THE PIPE (MINIMUM).
- 6.16.4. FIRE HYDRANTS SHALL BE AVK FIRE HYDRANTS WITH TAHLEQUAH THREAD (301).
- 6.16.5. VALVES SHALL BE AVK.
- 6.16.6. CONTRACTOR TO PROVIDE 12/14 GUAGE COATED TRACER WIRE STUBBED OUTSIDE OF VALVE BOXES AND AT THE HYDRANT. WIRES SHALL BE SOLDERED TOGETHER OR OTHER APPROVED METHOD. TRACER WIRE MUST BE UNCUT AND ACCESSIBLE OUTSIDE ALL VALVE STAND AND HYDRANTS.
- 6.16.7. CONTRACTOR TO PROVIDE MIDCO RESTRAINTS ON ALL PVC PIPE.
- 6.16.8. BELL RESTRAINTS SHALL BE PROVIDED WITHIN 40-FT (IN ALL DIRECTIONS) FROM A MECHANICAL JOINT.
- 6.16.9. MEGA-LUG RESTRAINTS SHALL BE PROVIDED ON DUCTILE IRON PIPE.
- 6.16.10. ANY WATER LINES OVER 12-IN MUST BE DUCTILE IRON PIPE.
- 6.16.11. VALVE OPERATOR EXTENSIONS SHALL BE PROVIDED ON ANY VALVES BURIED DEEPER THAN 48-IN.
- 6.16.12. ALL DUCTILE IRON PIPE SHALL BE WRAPPED IN PLASTIC.
- 6.16.13. STEEL CASINGS SHALL BE PROVIDED UNDER ROADWAYS WITH CASING SPACES AND END CAPS.
- 6.16.14. ALL WATER METERS SHALL BE INSTALLED IN NON-TRAFFIC AREAS.

8. GAS

8.1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 23 1123 OF THE PROJECT SPECIFICATIONS AND CHAPTER 4 OF THE INTERNATIONAL FUEL GAS CODE, 2012 (IFGC). THE IFGC SHALL BE CONSIDERED TO SUPERCEDE THE NOTED SPECIFICATION SECTION IN THE EVENT OF INCONSISTENCIES BETWEEN THE TWO DOCUMENTS.

8.2. ALL GAS LINES LOCATED ON THE SITE ARE PRIVATE LINES AND ARE NOT OWNED OR MAINTAINED BY THE GAS SERVICE PROVIDER. CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING OWNER'S MAINTENANCE STAFF AND COORDINATING IMPROVEMENTS DOCUMENTED IN THE CONSTRUCTION DRAWINGS PRIOR TO PERFORMING WORK. ANY SERVICE INTERRUPTIONS REQUIRED FOR COMPLETION OF THE SCOPE OF WORK SHALL BE FULLY COORDINATED WITH THE OWNER A MINIMUM OF 48-HOURS PRIOR TO THE ANTICIPATED INTERRUPTION.

8.3. ALL GAS PIPING, TUBING, AND FITTINGS SHALL BE POLYETHYLENE AND SHALL CONFORM TO THE 2009 EDITION OF ASTM D 2513.

8.3.1. FACTORY-ASSEMBLED ANODLESS RISERS SHALL BE RECOMMENDED BY THE MANUFACTURER FOR THE GAS USED AND SHALL BE LEAK TESTED BY THE MANUFACTURER IN ACCORDANCE WITH WRITTEN PROCEDURES.

8.3.2. SERVICE HEAD ADAPTERS AND FIELD-ASSEMBLED ANODELESS RISERS INCORPORATING SERVICE HEAD ADAPTERS SHALL BE RECOMMENDED BY THE MANUFACTURER FOR THE GAS USED, AND SHALL BE DESIGNED AND CERTIFIED TO MEET THE REQUIREMENTS OF CATEGORY I OF THE 2009 EDITION OF ASTM D 2513 AND USDOT (CFR, TITLE 49, PART 192.281(e)). THE MANUFACTURER SHALL PROVIDE THE USER WITH QUALIFIED INSTALLATION INSTRUCTIONS AS PRESCRIBED BY THE USDOT (CFR, TITLE 49, PART 192.283(b)).

8.4. PIPE SHALL BE MARKED "GAS" AND "ASTM D 2513". PIPE, TUBING, AND FITTINGS SHALL BE CLEAR AND FREE FROM CUTTING BURRS AND DEFECTS IN STRUCTURE. DEFECTS IN PIPE, TUBING, AND FITTINGS SHALL NOT BE REPAIRED. DEFECTIVE PIPE, TUBING, AND FITTINGS SHALL BE REPLACED.

8.5. PLASTIC PIPE, TUBING, AND FITTINGS SHALL BE JOINED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. SUCH JOINTS SHALL COMPLY WITH THE FOLLOWING:

8.5.1. THE JOINT SHALL BE DESIGNED AND INSTALLED SO THAT THE LONGITUDINAL PULL-OUT RESISTANCE OF THE JOINT WILL BE AT LEAST EQUAL TO THE TENSILE STRENGTH OF THE PLASTIC PIPING MATERIAL.

8.5.2. HEAT-FUSION JOINTS SHALL BE MADE IN ACCORDANCE WITH QUALIFIED PROCEDURES THAT HAVE BEEN ESTABLISHED AND PROVEN BY TEST TO PRODUCE GAS-TIGHT JOINTS AT LEAST AS STRONG AS THE PIPE OR TUBING BEING JOINED. JOINTS SHALL BE MADE WITH THE JOINING METHOD RECOMMENDED BY THE PIPE MANUFACTURER. HEAT FUSION FITTINGS SHALL BE MARKED "ASTM D 2513."

8.5.3. WHERE COMPRESSION-TYPE MECHANICAL JOINTS ARE USED, THE GASKET MATERIAL IN THE FITTING SHALL BE COMPATIBLE WITH THE PLASTIC PIPING AND WITH THE GAS DISTRIBUTED BY THE SYSTEM. AN INTERNAL TUBULAR RIGID STIFFENER SHALL BE USED IN CONJUNCTION WITH THE FITTING. THE STIFFENER SHALL BE FLUSH WITH THE END OF THE PIPE OR TUBING AND SHALL EXTEND AT LEAST TO THE OUTSIDE END OF THE COMPRESSION FITTING WHEN INSTALLED. THE STIFFENER SHALL BE FREE OF ROUGH OR SHARP EDGES AND SHALL NOT BE A FORCE FIT IN THE PLASTIC. SPLIT TUBULAR STIFFENERS SHALL NOT BE USED.

8.6. ALL MATERIALS USED SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE STANDARDS UNDER WHICH THE MATERIALS ARE ACCEPTED AND APPROVED. IN THE ABSENCE OF SUCH INSTALLATION PROCEDURES, THE MANUFACTURER'S INSTRUCTIONS SHALL BE FOLLOWED. WHERE THE REQUIREMENTS OF REFERENCED STANDARDS OR MANUFACTURER'S INSTRUCTIONS DO NOT CONFORM TO MINIMUM PROVISIONS OF THE CONSTRUCTION DOCUMENTS, THE PROVISIONS OF THIS CODE SHALL APPLY.

8.7. GAS PIPING SHALL NOT PENETRATE BUILDING FOUNDATION WALLS AT ANY POINT BELOW GRADE. GAS PIPING SHALL ENTER AND EXIT A BUILDING AT A POINT ABOVE GRADE AND THE ANNULAR SPACE BETWEEN THE PIPE AND THE WALL SHALL BE SEALED.

8.8. UNDERGROUND PIPING SYSTEMS SHALL BE INSTALLED A MINIMUM DEPTH OF 30-INCHES BELOW GRADE

8.9. GAS LINE TRENCHES SHALL BE GRADED SO THAT THE PIPE HAS A FIRM, SUBSTANTIALLY CONTINUOUS BEARING ON THE BOTTOM OF THE TRENCH.

8.10. THE INSTALLATION OF PLASTIC PIPE SHALL HAVE THE FOLLOWING LIMITATIONS: PLASTIC PIPE SHALL BE INSTALLED OUTDOORS UNDERGROUND ONLY. PLASTIC PIPE SHALL NOT BE USED WITHIN OR UNDER ANY BUILDING OR SLAB OR BE OPERATED AT PRESSURES GREATER THAN 100 PSIG (689 KPA) FOR NATURAL GAS OR 30 PSIG (207 KPA) FOR LP-GAS.

8.10.1. EXCEPTIONS

8.10.1.1. PLASTIC PIPE SHALL BE PERMITTED TO TERMINATE ABOVE GROUND OUTSIDE OF BUILDINGS WHERE INSTALLED IN PRE-MANUFACTURED ANODELESS RISERS OR SERVICE HEAD ADAPTER RISERS THAT ARE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.

8.10.1.2. PLASTIC PIPE SHALL BE PERMITTED TO TERMINATE WITH A WALL HEAD ADAPTER WITHIN BUILDINGS WHERE THE PLASTIC PIPE IS INSERTED IN A PIPING MATERIAL FOR FUEL GAS USE IN BUILDINGS.

8.10.1.3. PLASTIC PIPE SHALL BE PERMITTED UNDER OUTDOOR PATIO, WALKWAY AND DRIVEWAY SLABS PROVIDED THAT THE BURIAL DEPTH COMPLIES WITH SECTION 404.12.

8.11. CONNECTIONS: CONNECTIONS MADE OUTDOORS AND UNDERGROUND BETWEEN METALLIC AND PLASTIC PIPING SHALL BE MADE ONLY WITH TRANSITION FITTINGS CONFORMING WITH ASTM D 2513 CATEGORY I OR ASTM F 1973.

8.12. A YELLOW INSULATED COPPER TRACER WIRE OR OTHER APPROVED CONDUCTOR SHALL BE INSTALLED ADJACENT TO UNDERGROUND NONMETALLIC PIPING. ACCESS SHALL BE PROVIDED TO THE TRACER WIRE OR THE TRACER WIRE SHALL TERMINATE ABOVE GROUND AT EACH END OF THE NONMETALLIC PIPING. THE TRACER WIRE SIZE SHALL NOT BE LESS THAN 18 AWG AND THE INSULATION TYPE SHALL BE SUITABLE FOR DIRECT BURIAL.

8.13. TESTING OF PIPING: BEFORE ANY SYSTEM OF PIPING IS PUT IN SERVICE OR CONCEALED, IT SHALL BE TESTED TO ENSURE THAT IT IS GAS TIGHT. TESTING, INSPECTION AND PURGING OF PIPING SYSTEMS SHALL COMPLY WITH SECTION 406 OF THE IFGC.

8.14. PLASTIC PIPE BENDS SHALL COMPLY WITH THE FOLLOWING:

8.14.1. THE PIPE SHALL NOT BE DAMAGED AND THE INTERNAL DIAMETER OF THE PIPE SHALL NOT BE EFFECTIVELY REDUCED.

8.14.2. JOINTS SHALL NOT BE LOCATED IN PIPE BENDS.

8.14.3. THE RADIUS OF THE INNER CURVE OF SUCH BENDS SHALL NOT BE LESS THAN 25 TIMES THE INSIDE DIAMETER OF THE PIPE.

8.14.4. WHERE THE PIPING MANUFACTURER SPECIFIES THE USE OF SPECIAL BENDING TOOLS OR PROCEDURES, SUCH TOOLS OR PROCEDURES SHALL BE USED.

8.15. SHUT-OFF VALVES SHALL BE INSTALLED PER THE REQUIREMENTS OF SECTION 409 OF THE IFGC. SHUT-OFF VALVES SHALL BE INSTALLED OUTDOORS AT EACH BUILDING AND SHALL BE PLAINLY MARKED WITH AN IDENTIFICATION TAG ATTACHED BY THE INSTALLER SO THAT THE PIPING SYSTEMS SUPPLIED BY SUCH VALVES ARE READILY IDENTIFIED.

8.16. A LINE PRESSURE REGULATOR SHALL BE INSTALLED WHERE EQUIPMENT SERVICED BY THE GAS DISTRIBUTION SYSTEM IS DESIGNED TO OPERATE AT A LOWER PRESSURE THAN THE SUPPLY PRESSURE. LINE GAS PRESSURE REGULATORS SHALL BE LISTED AS COMPLYING WITH ANSI Z21.80. ACCESS SHALL BE PROVIDED TO PRESSURE REGULATORS. PRESSURE REGULATORS SHALL BE PROTECTED FROM PHYSICAL DAMAGE. REGULATORS INSTALLED ON THE EXTERIOR OF BUILDINGS SHALL BE APPROVED FOR OUTDOOR INSTALLATION.

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9. SURVEYING

9.1. COST OF STAKING TO BE INCLUDED IN SUBMITTED BID PRICE. ALL CONSTRUCTION STAKING SHALL BE PROVIDED BY INDEPENDENT LICENSED LAND SURVEYING COMPANY. CONTRACTOR TO PROVIDE QUALIFICATION STATEMENT FROM SURVEYOR TO ENGINEER AND OWNER FOR REVIEW AND APPROVAL PRIOR TO ENGAGING SURVEYOR.

9.2. PRIMARY CONTROL FOR CONSTRUCTION OF THE PROJECT HAS BEEN PROVIDED TO THE CONTRACTOR AS INDICATED IN THE CONSTRUCTION DRAWINGS. IT SHALL BE RESPONSIBILITY OF THE CONTRACTOR TO CONFIRM THE ACCURACY OF THE PROVIDED COORDINATE AND ELEVATION DATA PRIOR TO USING ANY OF THE LISTED POINTS FOR CONSTRUCTION STAKING OR PLACEMENT OF SECONDARY CONTROL.

9.3. PRIMARY CONTROL POINTS SHALL BE PROTECTED AND PRESERVED THROUGHOUT THE COURSE OF THE PROJECT. IN THE EVENT THAT THE LOCATION OF PRIMARY CONTROL INTERFERES WITH COMPLETION OF THE SCOPE OF WORK, THE CONTRACTOR SHALL CONTACT THE ENGINEER FOR REVIEW PRIOR TO DISTURBING THE CONTROL POINT.

9.4. COST ASSOCIATED WITH THE REPLACEMENT OF ANY PRIMARY CONTROL DAMAGED DURING THE COURSE OF WORK SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. REPLACEMENT CONTROL SHALL BE ESTABLISHED BY A LICENSED LAND SURVEYOR.

9.5. SECONDARY CONTROL SHALL BE SET AS NECESSARY BY THE CONTRACTOR TO ACCURATELY COMPLETE THE SCOPE OF WORK. COST ASSOCIATED WITH PLACEMENT OF ALL SECONDARY CONTROL AS WELL AS ANY NECESSARY CONSTRUCTION STAKING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

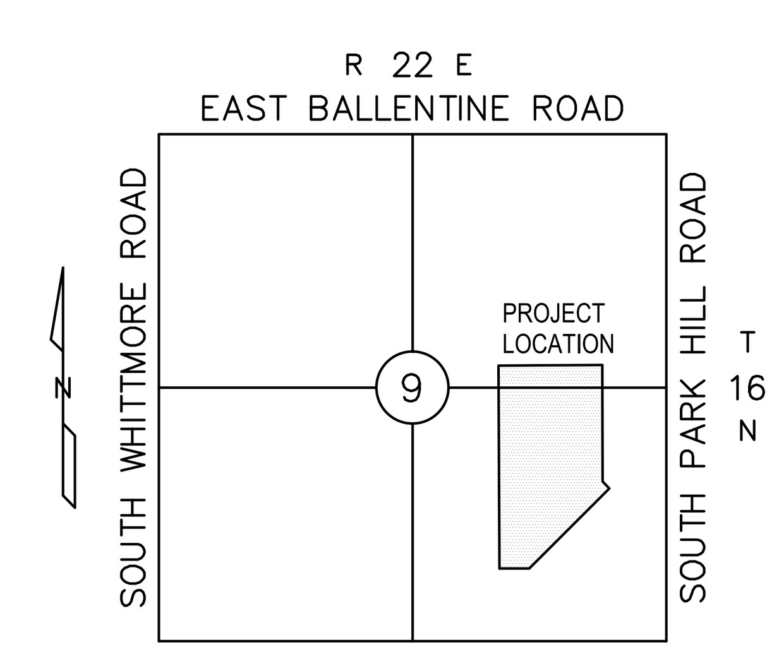
9.6. FIELD SURVEYS SHALL BE PROVIDED BY THE CONTRACTOR AS NECESSARY TO CALCULATE AND VERIFY ANY QUANTITIES USED TO CALCULATE CHANGES IN THE CONTRACT AMOUNT. ALL SURVEYS SHALL BE COMPLETED BY A LICENSED LAND SURVEYOR AND SHALL BE SUBMITTED TO THE ENGINEER IN BOTH DIGITAL AND HARD COPY FORMAT. COST OF SURVEY SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR

MATERIAL SYMBOLS

- SOIL MATERIAL (UNDISTURBED)
- SOIL MATERIAL (DISTURBED)
- AGGREGATE MATERIAL
- IRON
- BRICK
- CONCRETE
- ASPHALT
- REGULAR DUTY PAVING
- HEAVY DUTY PAVING
- EXTRA HEAVY DUTY PAVING
- SODDING / SEEDING / VEGETATIVE COVER

SURVEY CONTROL

TOPOGRAPHIC SURVEY HAS BEEN PREPARED BY KROHN SURVEYING, INC OF LONE GROVE, OKLAHOMA (PHONE 580.490.2422). AN UNOFFICIAL COPY OF THIS SURVEY HAS BEEN PROVIDED WITH THE CONSTRUCTION DRAWINGS FOR THE CONTRACTOR'S REFERENCE. SURVEY CONTROL FOR THE PROJECT SHALL BE AS IDENTIFIED ON THIS SURVEY.



LOCATION MAP

CIVIL SHEET INDEX

01

01

GRAPHICAL SYMBOLS

ANNOTATION REGARDING EXISTING CONDITIONS

ANNOTATION REGARDING PROPOSED CONDITIONS

- 1.05 — KEYNOTE REFERENCE
- NORTHING VALUE / N 681878.38 / E 2135117.45 / EASTING VALUE — COORDINATE DATA
- DETAIL TITLE / PC CONC STORM SEWER MANHOLE / DETAIL NUMBER 02 / SHEET NUMBER C9.25 — DETAIL REFERENCE (SEPARATE SHEET)
- DETAIL TITLE / PC CONC STORM SEWER MANHOLE / DETAIL NUMBER 02 — DETAIL REFERENCE (SAME SHEET)
- SECTION TITLE / SECTION A / SECTION NUMBER 02 / SHEET NUMBER C9.25 — SECTION REFERENCE (SEPARATE SHEET)
- SECTION TITLE / SECTION A / SECTION NUMBER 02 — SECTION REFERENCE (SAME SHEET)
- ELEVATION TITLE / ELEVATION A / ELEVATION NUMBER 02 / C9.25 — ELEVATION REFERENCE (SEPARATE SHEET)
- ELEVATION TITLE / ELEVATION A / ELEVATION NUMBER 02 — ELEVATION REFERENCE (SAME SHEET)
- BOTTOM OF SLOPE / TOP OF SLOPE — SLOPE SYMBOL
- *1.5%* — FINISHED GRADE (EXISTING)
- 1.50% — FINISHED GRADE (PROPOSED)
- 1155 / 1154 — CONTOUR DATA (PROPOSED)
- *1155 / 1154* — CONTOUR DATA (EXISTING)
- POINT NUMBER 8157 / POINT ELEVATION 1209.15 / POINT DESCRIPTION MTCH — GRADING POINT

UTILITY WARNING:
THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM RECORD DOCUMENTS OR FIELD LOCATIONS BY THE OPERATOR. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH THE SURVEYOR DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

UTILITY ELEVATIONS AND SIZES MAY HAVE BEEN MEASURED UNDER ADVERSE FIELD CONDITIONS. UPON EXPOSING THE UTILITY, ELEVATIONS AND LINE SIZES SHOULD BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CONTRACTOR SHOULD VERIFY CRITICAL ELEVATIONS USING THE BENCHMARK PROVIDED BY THE SURVEYOR OR ENGINEER. ANY DISCREPANCIES SHOULD BE IMMEDIATELY BROUGHT TO THE ENGINEER'S AND SURVEYOR'S ATTENTION.

BEFORE YOU DIG.. CALL OKIE 1-800-522-6543

James R. Childers Architect, Inc.
45 South 4th Street
Fort Smith, AR 72901
479-783-2480
www.childersarchitect.com

PROFESSIONAL SEAL: PROFESSIONAL ENGINEER JASON R. COTTON 21992 OKLAHOMA — 4/14/2018 DATE

CONSULTANT LOGO: ADG
920 West Main
Oklahoma City,OK 73106
P 405.232.5700
W www.adgokc.com
CA 6447, exp. 06.30.2018

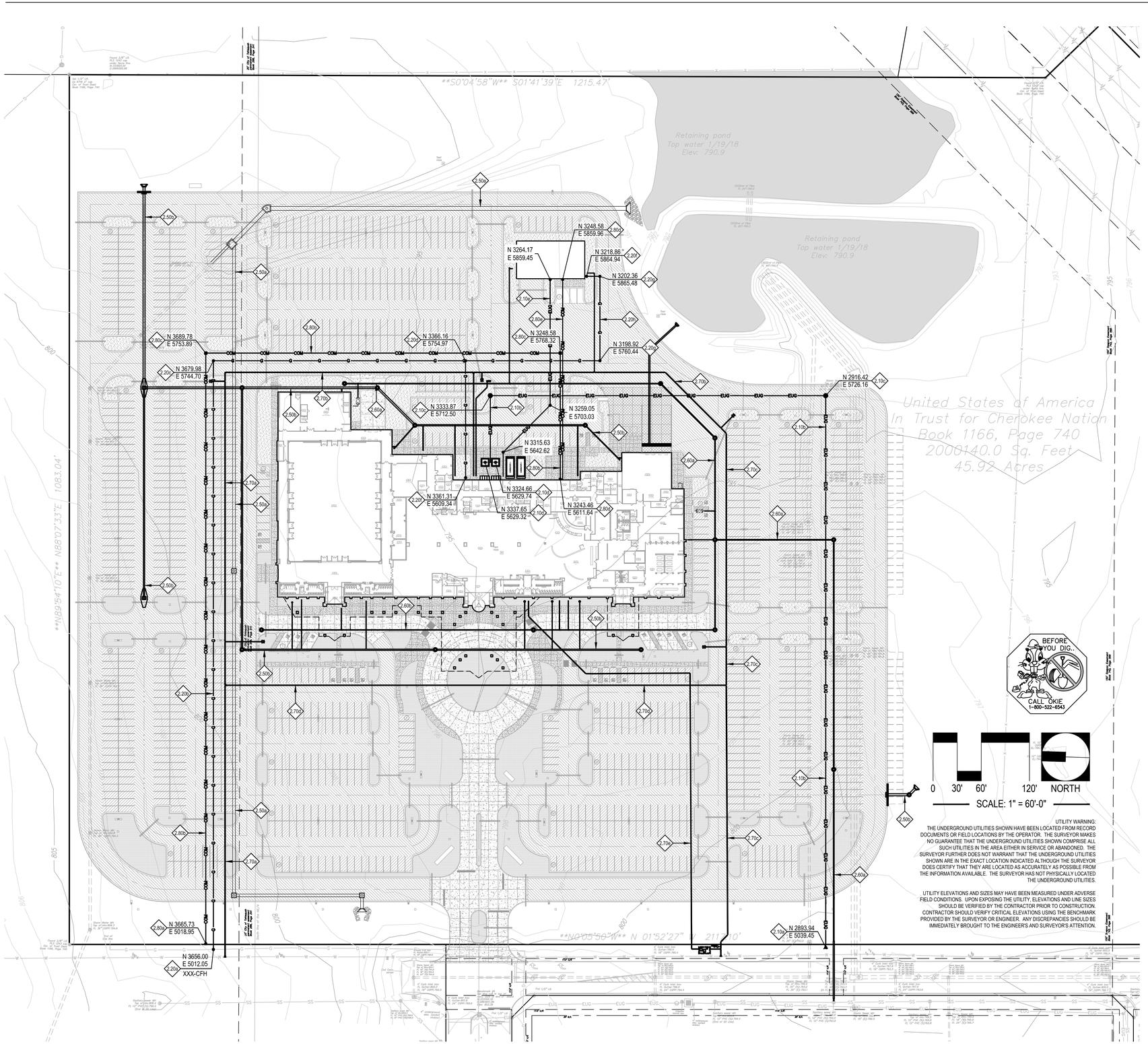
CLIENT: CHEROKEE NATION Entertainment — Cherokee CASINO

CHEROKEE NATION ENTERTAINMENT
TAHLEQUAH CASINO
TAHLEQUAH, OKLAHOMA

PROJECT PHASE: BID PACKAGE 02 (100% SET)

REVISIONS		
#	DATE	DESCRIPTION
01	04.16.2018	ADDENDUM 03

DATE: 03/27/18
JOB NUMBER: 17-06
SHEET NUMBER: C0.01b
INDEX AND GENERAL CONSTRUCTION NOTES



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LEGEND

- PROPOSED PC CONCRETE SIDEWALK / PATIO PER 03/C9.05c. WORK TO BE PERFORMED PER SECTION 32 1313 OF THE PROJECT SPECIFICATIONS. SIDEWALK IMPROVEMENTS IN PUBLIC R/W SHALL BE PER CITY OF CITY OF TAHLEQUAH STANDARDS AND SPECIFICATIONS.
- HEAVY-DUTY PAVING SECTION PER 01/C9.05c AND SECTION 32 1216 / 32 1313 OF THE PROJECT SPECIFICATIONS. IN THE EVENT THAT A RIGID PAVING SECTION IS SELECTED BY THE OWNER, CONTRACTOR TO PROVIDE FINAL JOINT LAYOUT TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. EXPANSION AND CONTRACTION JOINTS TO BE CONSTRUCTED PER 04/C9.05c AND 05/C9.05c, RESPECTIVELY. (RIGID ONLY)
- LIGHT-DUTY PAVING SECTION PER 01/C9.05c AND SECTION 32 1216 / 32 1313 OF THE PROJECT SPECIFICATIONS. IN THE EVENT THAT A RIGID PAVING SECTION IS SELECTED BY THE OWNER, CONTRACTOR TO PROVIDE FINAL JOINT LAYOUT TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. EXPANSION AND CONTRACTION JOINTS TO BE CONSTRUCTED PER 04/C9.05c AND 05/C9.05c, RESPECTIVELY. (RIGID ONLY)
- REINFORCED CONCRETE PAVING SECTION PER 02/C9.05c AND SECTION SECTION 32 1313 OF THE PROJECT SPECIFICATIONS. PROVIDED JOINT LAYOUT IS APPROXIMATE. CONTRACTOR TO PROVIDE FINAL JOINT LAYOUT TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. EXPANSION AND CONTRACTION JOINTS TO BE CONSTRUCTED PER 04/C9.05c AND 05/C9.05c, RESPECTIVELY.
- PROPOSED TURF AREA. CONTRACTOR TO INSTALL SOLID SLAB SODDING PER SECTION 32 9223 OF THE PROJECT SPECIFICATIONS. CONTRACTOR RESPONSIBLE FOR IRRIGATION AND MAINTENANCE OF TURF AREA UNTIL SUCH TIME THAT A VIGOROUS VEGETATIVE COVER HAS BEEN ESTABLISHED. SEE SWPPP FOR ADDITIONAL REQUIREMENTS RELATED TO STABILIZATION OF DISTURBED AREAS.
- PROPOSED LANDSCAPE BED. SEE LANDSCAPE DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DETAIL AND INFORMATION.

UTILITY PLAN KEYNOTES

ID	DESCRIPTION
2.10a	PROPOSED POINT OF ENTRY ONTO PROPERTY FOR PRIMARY ELECTRIC EXTENSION. EXTENSION TO BE COMPLETED BY ELECTRICAL SERVICE PROVIDER. CONTRACTOR SHALL COORDINATE WORK IN AREA AS REQUIRED.
2.10b	PROPOSED LOCATION OF PRIMARY ELECTRICAL EXTENSION. WORK TO BE COMPLETED BY ELECTRICAL SERVICE PROVIDER. CONTRACTOR SHALL COORDINATE WORK IN AREA ACCORDINGLY.
2.10c	PROPOSED PRIMARY ELECTRICAL VAULT. WORK TO BE COMPLETED BY ELECTRICAL SERVICE PROVIDER. CONTRACTOR SHALL COORDINATE WORK IN AREA ACCORDINGLY.
2.10d	PROPOSED TRANSFORMER PAD PER ELECTRICAL SERVICE PROVIDER REQUIREMENTS. SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DETAIL AND INFORMATION.
2.10e	PROPOSED LOCATION OF SECONDARY ELECTRICAL EXTENSION. WORK TO BE COMPLETED BY ELECTRICAL CONTRACTOR. SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DETAIL AND INFORMATION.
2.20a	PROPOSED GAS METER LOCATION. METER INSTALLATION SHALL BE PER IFGC AND SHALL BE COMPLETED BY GAS SERVICE PROVIDER. CONTRACTOR SHALL COORDINATE WORK IN AREA.
2.20b	CONSTRUCT 1191.9-L.F. PRIVATE 4-IN GAS LINE PER 01/C9.15b AND SECTION 23 1123 OF THE PROJECT SPECIFICATIONS.
2.20c	(1) 4-IN X 1/4 PE BEND
2.20d	(1) 4-IN X 4-IN PE TEE (1) 4-IN x 2-IN PE REDUCER
2.20f	END CONSTRUCTION PRIVATE GAS LINE AT FACE OF STRUCTURE PER REQUIREMENTS OF IFGC AND SECTION 23 1123 OF THE PROJECT SPECIFICATIONS. SEE MEP DRAWINGS FOR CONTINUATION
2.20g	(1) 2-IN X 1/4 PE BEND
2.20h	CONSTRUCT 288.1-L.F. PRIVATE 2-IN GAS LINE PER 01/C9.15b AND SECTION 23 1123 OF THE PROJECT SPECIFICATIONS.
2.50a	STORM SEWER LINE A (BID PACKAGE 01) - NOT IN CONTRACT. SEE BID PACKAGE 01 DOCUMENTS FOR ADDITIONAL DETAIL AND INFORMATION.
2.50b	PROPOSED PRIVATE STORM SEWER. TO BE CONSTRUCTED AS PART OF BID PACKAGE 02. SEE STORM SEWER INDEX, SHEET C5.02b, FOR ADDITIONAL DETAIL AND INFORMATION.
2.60a	SANITARY SEWER LINE A. SEE SANITARY SEWER INDEX, SHEET C6.02b, FOR ADDITIONAL DETAIL AND INFORMATION.
2.60b	SANITARY SEWER LINE B. SEE SANITARY SEWER INDEX, SHEET C6.02b, FOR ADDITIONAL DETAIL AND INFORMATION.
2.70a	WATER LINE A. SEE WATER INDEX, SHEET C7.02b, FOR ADDITIONAL DETAIL AND INFORMATION.
2.70b	WATER LINE B. SEE WATER INDEX, SHEET C7.02b, FOR ADDITIONAL DETAIL AND INFORMATION.
2.70c	WATER LINE C. SEE WATER INDEX, SHEET C7.02b, FOR ADDITIONAL DETAIL AND INFORMATION.
2.70d	WATER LINE D. SEE WATER INDEX, SHEET C7.02b, FOR ADDITIONAL DETAIL AND INFORMATION.
2.70e	PROPOSED 6-IN DOMESTIC WATER SERVICE LINE (PRIVATE). SEE WATER INDEX, SHEET C7.02b, FOR ADDITIONAL DETAIL AND INFORMATION.
2.80a	PROPOSED POINT OF ENTRY ONTO PROPERTY FOR TELECOMM. SERVICE. EXTENSION TO BE COMPLETED BY TELECOMM. SERVICE PROVIDER(S). CONTRACTOR SHALL COORDINATE WORK IN AREA AS REQUIRED.
2.80b	PROPOSED TELECOMM. SERVICE EXTENSION. INSTALL THREE (3) 4-IN SCH40 PVC CONDUITS @ 30-IN BELOW FINAL PAVING SUBGRADE. CONTRACTOR TO PROVIDE 1/8-IN PULL-STRING IN EACH CONDUIT FOR LATER SERVICE EXTENSION BY SERVICE PROVIDER(S).
2.80c	PROPOSED TELECOMM. PULL BOX PER SERVICE PROVIDER REQUIREMENTS. CONTRACTOR SHALL PROCURE AND INSTALL PULL BOX. TOP OF PULL BOX SHALL BE FLUSH WITHIN FINAL FINISHED GRADE IN AREA. CONTRACTOR SHALL PROVIDE SUBMITTAL TO ENGINEER AND TELECOMM. SERVICE PROVIDER FOR REVIEW AND APPROVAL PRIOR TO PROCUREMENT.
2.80d	END TELECOMM. SERVICE EXTENSION. SEE MEP/IT DOCUMENTS FOR CONTINUATION TO DEMARK POINT.
2.80e	PROPOSED TELECOMM. SERVICE EXTENSION. INSTALL TWO (2) 4-IN SCH40 PVC CONDUITS @ 30-IN BELOW FINAL PAVING SUBGRADE. CONTRACTOR TO PROVIDE 1/8-IN PULL-STRING IN EACH CONDUIT FOR LATER SERVICE EXTENSION BY SERVICE PROVIDER(S).

NOTE TO CONTRACTOR: COORDINATE DATA HAS BEEN TRUNCATED FOR CLARITY. STATE PLANE COORDINATES MAY BE OBTAINED BY ADDING 330,000 TO ALL PROVIDED NORTHINGS. AND 2,860,000 TO ALL PROVIDED EASTINGS.

01 PLAN VIEW: INSET
SCALE: AS SHOWN

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DATE

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CA 6447, exp. 06.30.2018

CLIENT:
Cherokee Nation Entertainment
Cherokee Casino

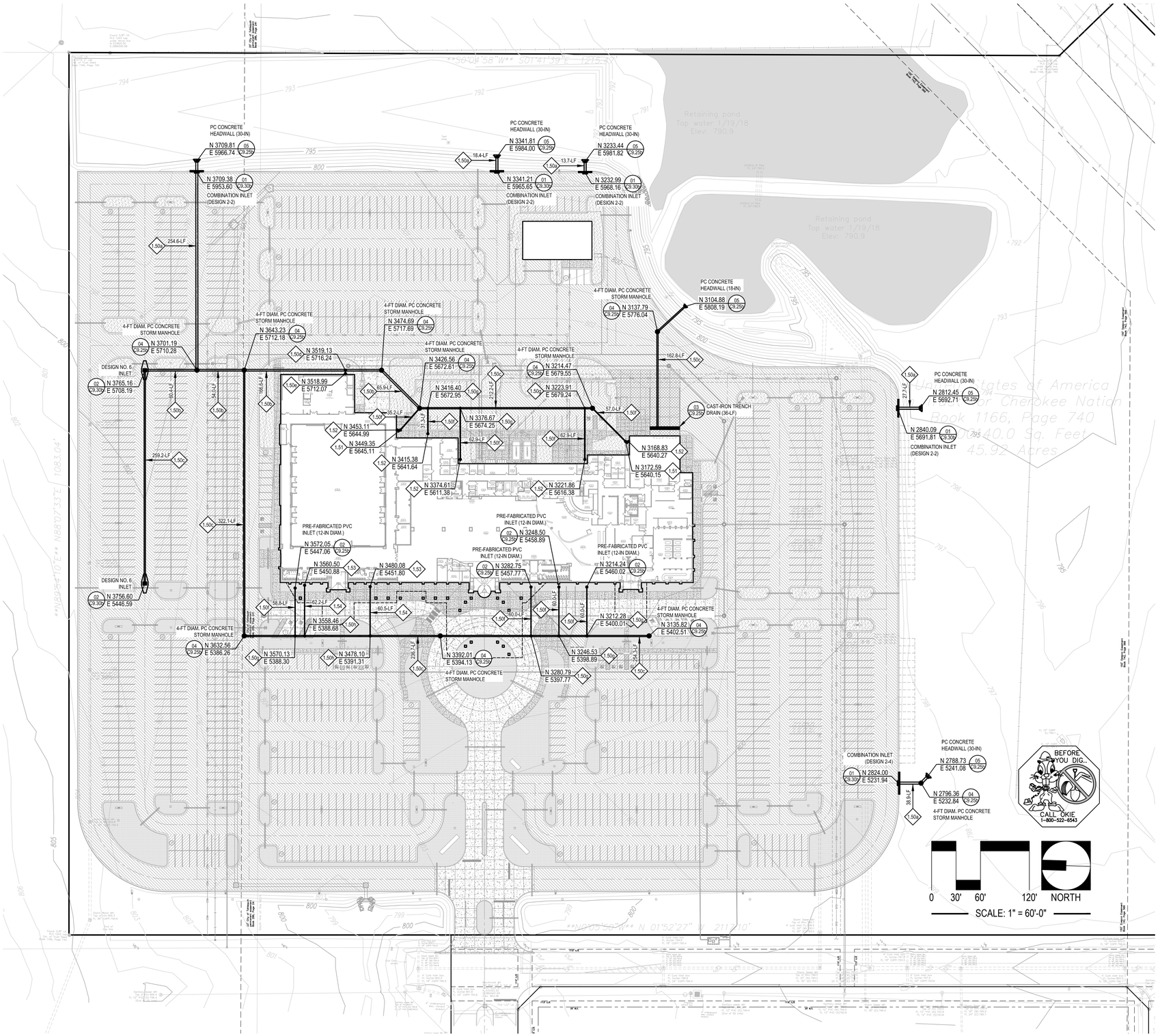
CHEROKEE NATION ENTERTAINMENT
TAHLEQUAH CASINO
TAHLEQUAH, OKLAHOMA

PROJECT PHASE:
BID PACKAGE 02
(100% SET)

REVISIONS		
#	DATE	DESCRIPTION
01	04.16.2018	ADDENDUM 03

DATE:	JOB NUMBER:
03/27/18	17-06

SHEET NUMBER:
C2.02b
UTILITY PLAN INDEX



01 PLAN VIEW: INSET

SCALE: AS SHOWN

LEGEND

- PROPOSED PC CONCRETE SIDEWALK / PATIO PER 03/C9.05c. WORK TO BE PERFORMED PER SECTION 32 1313 OF THE PROJECT SPECIFICATIONS. SIDEWALK IMPROVEMENTS IN PUBLIC R/W SHALL BE PER CITY OF CITY OF TAHLEQUAH STANDARDS AND SPECIFICATIONS.
- HEAVY-DUTY PAVING SECTION PER 01/C9.05c AND SECTION 32 1216 / 32 1313 OF THE PROJECT SPECIFICATIONS. IN THE EVENT THAT A RIGID PAVING SECTION IS SELECTED BY THE OWNER, CONTRACTOR TO PROVIDE FINAL JOINT LAYOUT TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. EXPANSION AND CONTRACTION JOINTS TO BE CONSTRUCTED PER 04/C9.05c AND 05/C9.05c, RESPECTIVELY. (RIGID ONLY)
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- PROPOSED TURF AREA. CONTRACTOR TO INSTALL SOLID SLAB SODDING PER SECTION 32 9223 OF THE PROJECT SPECIFICATIONS. CONTRACTOR RESPONSIBLE FOR IRRIGATION AND MAINTENANCE OF TURF AREA UNTIL SUCH TIME THAT A VIGOROUS VEGETATIVE COVER HAS BEEN ESTABLISHED. SEE SWPPP FOR ADDITIONAL REQUIREMENTS RELATED TO STABILIZATION OF DISTURBED AREAS.
- PROPOSED LANDSCAPE BED. SEE LANDSCAPE DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DETAIL AND INFORMATION.

STORM SEWER KEYNOTES

ID	DESCRIPTION
1.50a	CONSTRUCT 30-IN HDPP STORM SEWER PER 06/C9.25b AND SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.
1.50b	CONSTRUCT 24-IN HDPP STORM SEWER PER 06/C9.25b AND SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.
1.50c	CONSTRUCT 18-IN HDPP STORM SEWER PER 06/C9.25b AND SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.
1.50d	(1) 24-IN x 8-IN WYE (1) 8-IN x 45-DEG BEND
1.50e	(1) 8-IN SHIELDED TRANSITION COUPLING END CONST. 8-IN ROOF DRAIN LINE. SEE MEP DOCUMENTS FOR CONTINUATION.
1.50f	CONSTRUCT 8-IN HDPE STORM SEWER PER 01/C9.25b AND SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.
1.50g	(1) 18-IN x 8-IN HDPE WYE (1) 8-IN x 1/8 HDPE BEND
1.50h	(1) 18-IN x 4-IN HDPE WYE (1) 4-IN x 1/8 HDPE BEND
1.51	(1) 8-IN x 8-IN HDPE WYE (1) 8-IN x 4-IN HDPE WYE (1) 4-IN HDPE CAP (1) 4-IN x 1/8 HDPE BEND (5) VF 4-IN HDPE RISER PIPE (1) 4-IN HDPE CLEANOUT ADAPTER WITH CAP
1.52	(1) 8-IN SHIELDED TRANSITION COUPLING END CONST. 8-IN ROOF DRAIN LINE. SEE MEP DOCUMENTS FOR CONTINUATION.
1.53	(1) 4-IN SHIELDED TRANSITION COUPLING END CONST. 4-IN ROOF DRAIN LINE. SEE MEP DOCUMENTS FOR CONTINUATION.
1.54	CONSTRUCT 4-IN HDPE STORM SEWER PER 01/C9.25b AND SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.

NOTES TO CONSTRUCTION MANAGER (CM):

1. STORM IMPROVEMENTS SHOWN ON THIS SHEET SHALL BE UTILIZED BY THE CM AS A BASIS OF BID. NOT ALL PROPOSED STORM SEWER IMPROVEMENTS INDICATED ON THIS SHEET MAY BE YET TRANSLATED TO OTHER PERTINENT SHEETS OF THE CONSTRUCTION DRAWINGS.
2. GRATE, RIM, AND PIPE INVERT DATA FOR PROPOSED STORM SEWER SHOWN ON THIS PLAN SHALL BE PROVIDED AT A LATER DATE.
3. CHANGES TO THE CONTRACT AMOUNT AFTER BIDDING ACTIVITIES SHALL BE REVIEWED WITHIN THE CONTEXT OF THIS SHEET AND THE ASSOCIATED BASIS OF BID IT COMMUNICATES. LATER DISTRIBUTION OF GRATE, RIM, AND PIPE INVERT DATA MAY OR MAY NOT JUSTIFY CHANGES IN THE CONTRACT PRICE.
4. ALL STORM SEWER IMPROVEMENTS CONSTRUCTED ON THE PROJECT SITE SHALL BE CONSIDERED PRIVATE. OPERATION AND MAINTENANCE OF THESE IMPROVEMENTS SHALL BE THE RESPONSIBILITY OF THE OWNER AND NOT THE TAHLEQUAH PUBLIC WORKS AUTHORITY (TPWA).

UTILITY WARNING:
THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM RECORD DOCUMENTS OR FIELD LOCATIONS BY THE OPERATOR. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH THE SURVEYOR DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

UTILITY ELEVATIONS AND SIZES MAY HAVE BEEN MEASURED UNDER ADVERSE FIELD CONDITIONS. UPON EXPOSING THE UTILITY, ELEVATIONS AND LINE SIZES SHOULD BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. CONTRACTOR SHOULD VERIFY CRITICAL ELEVATIONS USING THE BENCHMARK PROVIDED BY THE SURVEYOR OR ENGINEER. ANY DISCREPANCIES SHOULD BE IMMEDIATELY BROUGHT TO THE ENGINEER'S AND SURVEYOR'S ATTENTION.

James R. Childers Architect, Inc.
45 South 4th Street
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479-783-2480
www.childersarchitect.com

PROFESSIONAL SEAL: JASON R. CHILDERS — OKLAHOMA — 4/15/2018 DATE

CONSULTANT LOGO:
ADG
920 West Main
Oklahoma City, OK 73106
P 405.232.5700
W www.adgokc.com
CA 6447, exp. 06.30.2018

CLIENT: CHEROKEE NATION Entertainment — Cherokee CASINO

CHEROKEE NATION ENTERTAINMENT
TAHLEQUAH CASINO
TAHLEQUAH, OKLAHOMA

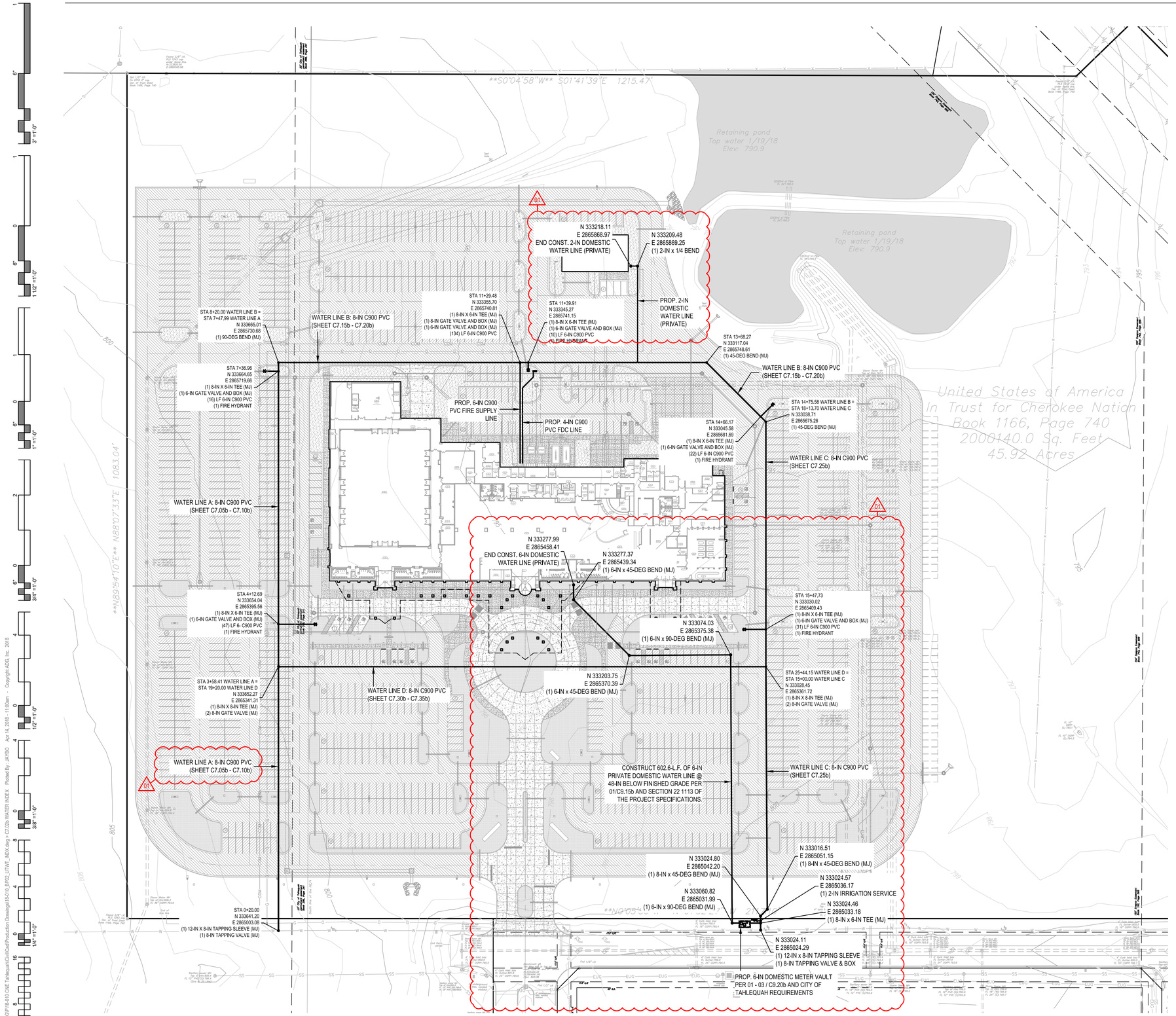
PROJECT PHASE:
BID PACKAGE 02
(100% SET)

REVISIONS		
#	DATE	DESCRIPTION
01	04.16.2018	ADDENDUM 03

DATE: 04.16.2018 | JOB NUMBER: 17-06

SHEET NUMBER: C5.02b

STORM SEWER INDEX



01 PLAN VIEW: INSET

SCALE: AS SHOWN

LEGEND

- PROPOSED PC CONCRETE SIDEWALK / PATIO PER 03/C9.05c. WORK TO BE PERFORMED PER SECTION 32 1313 OF THE PROJECT SPECIFICATIONS. SIDEWALK IMPROVEMENTS IN PUBLIC R/W SHALL BE PER CITY OF CITY OF TAHLEQUAH STANDARDS AND SPECIFICATIONS.
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- PROPOSED LANDSCAPE BED. SEE LANDSCAPE DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL DETAIL AND INFORMATION.

NOTES TO CONSTRUCTION MANAGER (CM):

1. WATER LINE IMPROVEMENTS SHOWN ON THIS SHEET SHALL BE UTILIZED BY THE CM AS A BASIS OF BID. NOT ALL DESIGN CHANGES INDICATED ON THIS SHEET MAY BE YET TRANSLATED TO OTHER SHEETS IMPACTED BY THE DESIGN MODIFICATIONS.
2. CORRESPONDING MODIFICATIONS SHALL BE MADE TO SHEETS WHICH ARE IMPACTED BY THE MODIFICATIONS SHOWN ON THIS PLAN AT A LATER DATE.
3. CHANGES TO THE CONTRACT AMOUNT AFTER BIDDING ACTIVITIES SHALL BE REVIEWED WITHIN THE CONTEXT OF THIS SHEET AND THE ASSOCIATED BASIS OF BID IT COMMUNICATES. MODIFICATIONS TO OTHER IMPACTED SHEETS FOLLOWING BIDDING ACTIVITIES MAY OR MAY NOT JUSTIFY CHANGES IN THE CONTRACT PRICE.
4. ALL WATER DISTRIBUTION IMPROVEMENTS CONSTRUCTED ON THE PROJECT SITE SHALL BE CONSIDERED PRIVATE. OPERATION AND MAINTENANCE OF THESE IMPROVEMENTS SHALL BE THE RESPONSIBILITY OF THE OWNER AND NOT THE TAHLEQUAH PUBLIC WORKS AUTHORITY (TPWA).

01

0 30' 60' 120' NORTH

SCALE: 1" = 60'-0"

BEFORE YOU DIG... CALL OKIE 1-800-522-6543

UTILITY WARNING:
THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM RECORD DOCUMENTS OR FIELD LOCATIONS BY THE OPERATOR. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH THE SURVEYOR DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

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PROFESSIONAL SEAL:
JASON R. CHILDERS — ARKANSAS
4/14/2018
DATE

CONSULTANT LOGO:
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P 405.232.5700
W www.adgokc.com
CA 6447, exp. 06.30.2018

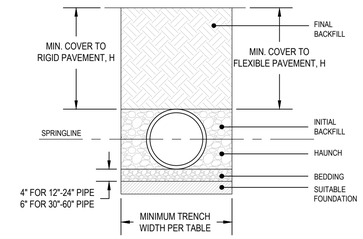
CLIENT:
CHEROKEE NATION Entertainment
Cherokee CASINO

CHEROKEE NATION ENTERTAINMENT
TAHLEQUAH CASINO
TAHLEQUAH, OKLAHOMA

PROJECT PHASE:
BID PACKAGE 02
(100% SET)

REVISIONS		
#	DATE	DESCRIPTION
01	04.16.2018	ADDENDUM 03

DATE: 03/27/18
JOB NUMBER: 17-06
SHEET NUMBER: C7.02b
WATER INDEX



RECOMMENDED MINIMUM TRENCH WIDTHS	
PIPE DIAMETER (IN)	MINIMUM TRENCH WITH (IN)
12	30
15	34
18	39
24	48
30	56
36	64
42	72
48	80
60	96

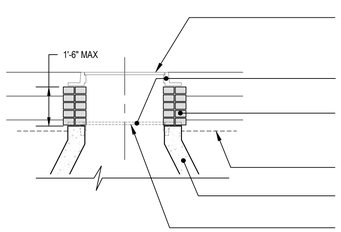
MINIMUM RECOMMENDED COVER BASED ON VEHICLE LOADING CONDITIONS		
PIPE DIAMETER	H-25	HEAVY CONSTRUCTION (75T AXLE LOAD)*
12" - 48"	12"	48"
54" - 60"	24"	60"
* VEHICLES IN EXCESS OF 75T MAY REQUIRE ADDITIONAL COVER		

GENERAL NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS", LATEST ADDITION, WITH THE EXCEPTION THAT THE INITIAL BACKFILL MAY EXTEND TO THE CROWN OF THE PIPE. SOIL CLASSIFICATIONS ARE PER THE LATEST VERSION OF ASTM D2321 (SEE XX/CS XX). CLASS IVB MATERIALS (MH, CH) AS DEFINED IN PREVIOUS VERSIONS OF ASTM D2321 ARE NOT APPROPRIATE BACKFILL MATERIALS.
2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.
3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER, AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.
4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II, III, OR IV. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. COMPACTION SHALL BE THE GREATER OF 95% OR THE COMPACTION REQUIREMENTS FOR ADJACENT SUBGRADES. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" (100MM) FOR 12"-24" (300MM-600MM) DIAMETER PIPE; 6" (150MM) FOR 30"-60" (750MM-1500MM) DIAMETER PIPE. THE MIDDLE 1/3 BENEATH THE PIPE INVERT SHALL BE LOOSELY PLACED. PLEASE NOTE, CLASS IV MATERIAL HAS LIMITED APPLICATION AND CAN BE DIFFICULT TO PLACE AND COMPACT; USE ONLY WITH THE APPROVAL OF A SOIL EXPERT.
5. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II, III, OR IV IN THE PIPE ZONE EXTENDING TO THE CROWN OF THE PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION. COMPACTION SHALL BE THE GREATER OF 95% OR THE COMPACTION REQUIREMENTS FOR ADJACENT SUBGRADES. PLEASE NOTE, CLASS IV MATERIAL HAS LIMITED APPLICATION AND CAN BE DIFFICULT TO PLACE AND COMPACT; USE ONLY WITH THE APPROVAL OF A SOIL EXPERT.
6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" (300MM) FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOTATION. FOR TRAFFIC APPLICATIONS, CLASS I OR II MATERIAL COMPACTED TO 90% SPD AND CLASS III COMPACTED TO 95% SPD IS REQUIRED TO THE TOP OF SUBGRADE. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS 12" (300MM) UP TO 48" (1200MM) DIAMETER PIPE AND 24" (600MM) OF COVER FOR 60" (1500MM) DIAMETER PIPE, MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT.

06 HDPP PIPE INSTALLATION AND BACKFILL

SCALE: AS SHOWN



TYPE A INSTALLATION (INSIDE VEHICULAR AND/OR PEDESTRIAN PAVING). CONTRACTOR SHALL PROVIDE 4'x4'x8" CONCRETE PAD FOR INSTALLATIONS IN FLEXIBLE PAVING.

DEETER FOUNDRY REVERSIBLE FRAME WITH SOLID COVER (PART NO. DF1159) OR APPROVED EQUAL. 'STORM SEWER' TO BE EMBOSSED ON COVER.

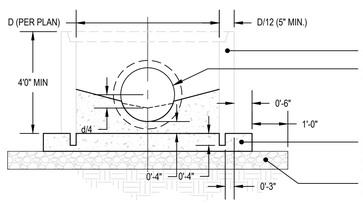
MORTARED BRICK MASONRY OR CONCRETE GRADE RINGS PER PROJECT SPECIFICATIONS. INSTALL AS REQUIRED TO ACHIEVE FINISHED GRADE (TYPE A INSTALLATIONS ONLY).

FINISHED GRADE ADJACENT TO TYPE B INSTALLATION UNLESS OTHERWISE INDICATED ON PLAN

CAST-IN-PLACE OR PRE-CAST PC CONCRETE MANHOLE PER CONSTRUCTION DOCUMENTS

TYPE B INSTALLATION (OUTSIDE VEHICULAR AND PEDESTRIAN PAVING). FRAME SHALL BE SECURED VIA GROUT TO TOP OF FINISHED MANHOLE.

FRAME AND COVER DETAIL



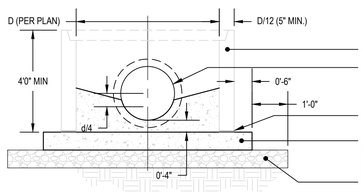
4-FT PRE-CAST BASE RISER PER ASTM C-478

CONNECTING STORM SEWER. JOINT TO BE SEALED WITH NON-SHRINK GROUT PER PIPE MANUFACTURER'S RECOMMENDATIONS.

3,000-PSI CLASS A CONCRETE PER SECTION 33 4100 OF THE PROJECT SPECIFICATIONS. BASE SLAB THICKNESS SHALL BE 6-IN FOR 4-FT DIAMETER MANHOLES, 8-IN FOR STRUCTURES GREATER THAN 4-FT IN DIAMETER

6-IN COURSE CRUSHED ROCK FOUNDATION PER SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.

PRE-CAST MANHOLE: BASE RISER SECTION WITH PRE-FORMED SOCKET (OPTION II)



4-FT PRE-CAST BASE RISER PER ASTM C-478

CONNECTING STORM SEWER. JOINT TO BE SEALED WITH NON-SHRINK GROUT PER PIPE MANUFACTURER'S RECOMMENDATIONS.

NON-HARDENING BUTYL RUBBER SEALANT PER ASTM 0990-94

3,000-PSI CLASS A CONCRETE PER SECTION 33 4100 OF THE PROJECT SPECIFICATIONS. BASE SLAB THICKNESS SHALL BE 6-IN FOR 4-FT DIAMETER MANHOLES, 8-IN FOR STRUCTURES GREATER THAN 4-FT IN DIAMETER

6-IN COURSE CRUSHED ROCK FOUNDATION PER SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.

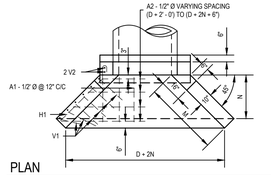
PRE-CAST MANHOLE: BASE RISER SECTION WITH MASTIC SEALER (OPTION I)

GENERAL NOTES:

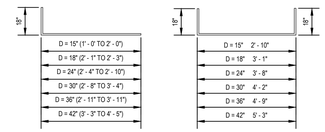
1. CONTRACTOR SHALL UTILIZE NON-SHRINK GROUT MATERIAL PER THE PROJECT SPECIFICATIONS AT THE MANHOLE/PIPE INTERFACE UNLESS OTHERWISE INDICATED ON THE DRAWINGS AS REQUIRED BY THE PIPE MANUFACTURER. CONTRACTOR RESPONSIBLE FOR ESTABLISHING WATER-TIGHT CONNECTION AT INTERFACE.
2. THE MANHOLE RING AND COVER SHALL BE ADJUSTED TO GRADE WITH CONCRETE RINGS OR SUCCESSIVE COURSES OF BRICK MASONRY. WHEN MASONRY UNITS ARE USED, TOTAL HEIGHT OF MASONRY WORK SHALL BE BETWEEN 12-IN AND 18-IN.
3. ALL CONCRETE FOR MANHOLE BASES, INVERTS AND WALL SHALL HAVE A MINIMUM COMPRESSION STRENGTH OF 3,000-PSI PER THE PROJECT SPECIFICATIONS..
4. FORMS SHALL BE PROVIDED FOR THE SHAPING AND FINISHING OF THE MANHOLE BOTTOMS. A MINIMUM OF TWENTY-FOUR (24) HOURS SHALL ELAPSE PRIOR TO POURING THE MANHOLE WALLS.
5. HONEYCOMBING OF CONCRETE LESS THAN TWO (2") INCHES DEEP IN MANHOLE WALLS MAY BE REPAIRED USING TYPE S MORTAR PER ASTM C-270.
6. ALL CONSTRUCTION JOINTS SHALL BE CLEANED OF ANY EXCESS FOREIGN MATTER PRIOR TO APPLICATION OF CONCRETE JOINT SEALER. CONCRETE JOINT SEALER SHALL COMPLY WITH ASTM D-1850.
7. CAST-IN-PLACE NON-REINFORCED CONCRETE MANHOLES
   - 7.1. CAST-IN-PLACE MANHOLE DIMENSIONS SHALL MEET OR EXCEED THE REQUIRED DIMENSIONS FOR PRECAST REINFORCED CONCRETE MANHOLES AS SPECIFIED BY ASTM C-478 (SEE BELOW).
   - 7.2. PROTECTIVE COATING: PROTECTIVE COATING SHALL NOT BE REQUIRED UNLESS OTHERWISE INDICATED ON THE PLANS OR DIRECTED BY THE ENGINEER.
   - 7.3. THE VERTICAL DROP OF CONCRETE POURS SHALL NOT EXCEED TEN (10') FEET. THE CONTRACTOR MAY UTILIZE A KEYED CONSTRUCTION JOINT WITH (4) NO. 4 DOWEL BARS (EQUALLY SPACED), OR A TREMMIE.
   - 7.4. MONOLITHIC POURS OF THE MANHOLE BOTTOM AND WALLS SHALL BE PERMITTED PROVIDED THAT ALL CONCRETE (BOTTOM AND WALLS) IS VIBRATED ACCORDING TO THE PROJECT SPECIFICATIONS.
8. PRECAST MANHOLES
   - 8.1. SHOP DRAWINGS OF ALL PRE-CAST MANHOLE STRUCTURES SHALL BE SUBMITTED TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO STRUCTURE PROCUREMENT.
   - 8.1. PRE-CAST MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM C-478. ALL MANHOLE SECTIONS SHALL BE INSTALLED COMPLETE WITH O-RING GASKETS AT EACH JOINT.
   - 8.2. PRE-CAST MANHOLE DIMENSIONS SHALL MEET OR EXCEED THE REQUIREMENTS OF ASTM C-478. THE MINIMUM WALL THICKNESS SHALL NOT BE LESS THAN ONE-TWELTH (1/12) OF THE INTERNAL DIAMETER OF THE LARGEST CONE OR RISER SECTION OR 5-IN, WHICHEVER IS GREATER.
   - 8.3. FIRST JOINT IN MANHOLE WALL SHALL NOT BE LESS THAN 4-FT FROM FLOOR OF STRUCTURE.
   - 8.4. CONCENTRIC AND ECCENTRIC CONE HEIGHTS SHALL BE 3'0" MINIMUM UNLESS OTHERWISE INDICATED ON PLANS. CONE SECTIONS SHALL NOT BE PERMITTED FOR MANHOLE INSTALLATIONS LESS THAN 4-FT IN HEIGHT.
   - 8.5. MANHOLES GREATER THAN 4-FT IN DIAMETER SHALL BE FINISHED WITH A PRE-CAST SOLID SLAB TOP AS REQUIRED TO PERMIT INSTALLATION OF A STANDARD 4-FT DIAMETER CONE SECTION. SHOP DRAWINGS TO BE SUBMITTED TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO PROCUREMENT.
   - 8.6. ALL LIFTING HOLES SHALL BE REPAIRED WITH A MIXTURE OF CEMENT AND SAND GROUT FIRMLY PACKED
9. MANHOLE STEPS AND LADDERS: STEPS AND LADDERS SHALL NOT BE CONSTRUCTED UNLESS OTHERWISE DIRECTED BY THE ENGINEER. IF CALLED FOR, THEY SHALL CONFORM WITH SECTION 13 OF ASTM C-478.

04 PC CONCRETE STORM MANHOLE

SCALE: AS SHOWN

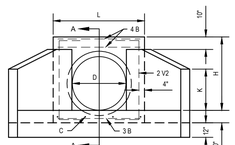


PLAN

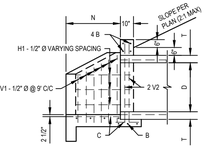


BENDING FOR VI BARS

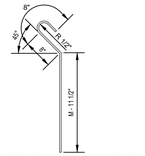
BENDING FOR V2 BARS



ELEVATION



SECTION A-A

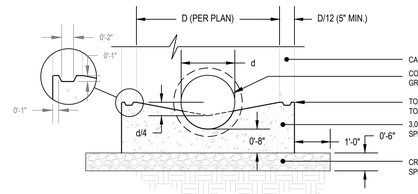


BENDING FOR H1 BARS

DIMENSIONS AND QUANTITIES FOR HEADWALLS WITH 45° WINGS																				* FOR ONE HEADWALL
DIMENSIONS								REINFORCING STEEL												QUANTITIES *
								A1 - 1/2" Ø		A - 1/2" Ø		B - 1/2" Ø		C - 1/2" Ø		H1 - 1/2" Ø		V1 - 1/2" Ø		V - 1/2" Ø		CLASS "A" *	REINF.
D	AREA SQ FT	T	H	K	L	M	N	#	LENGTH	#	LENGTH	#	LENGTH	#	LENGTH	#	LENGTH	#	LENGTH	#	LENGTH	CONC C.Y.	STEEL LBS
15"	1.23	2 1/4"	2' - 5 1/4"	1' - 5"	3' - 7"	1' - 9"	1' - 3"	4	1' - 0"	2	3' - 9" AV.	7	3' - 3"	3	1' - 6"	4	2' - 1"	4	3' - 5" AV.	4	5' - 10"	.74	57
18"	1.77	2 1/2"	2' - 8 1/2"	1' - 7"	3' - 10"	2' - 1 1/2"	1' - 6"	4	1' - 2"	2	4' - 3" AV.	7	3' - 6"	3	1' - 6"	4	2' - 6"	4	3' - 8" AV.	4	6' - 1"	.91	61
24"	3.14	3"	3' - 3"	1' - 10 1/2"	4' - 4"	2' - 10"	2' - 0"	5	1' - 8"	3	5' - 3" AV.	7	4' - 0"	3	1' - 6"	6	3' - 2"	6	4' - 1" AV.	4	6' - 8"	1.37	85
30"	4.91	3 1/2"	3' - 9 1/2"	2' - 2"	4' - 10"	3' - 6 1/2"	2' - 6"	5	2' - 2"	3	6' - 3" AV.	7	4' - 6"	4	1' - 6"	6	3' - 11"	8	4' - 6" AV.	4	7' - 2"	1.77	104
36"	7.07	4"	4' - 4"	2' - 5 1/2"	5' - 4"	4' - 3"	3' - 0"	6	2' - 8"	4	7' - 3" AV.	7	5' - 0"	4	1' - 6"	6	4' - 7"	10	4' - 11" AV.	4	7' - 9"	2.29	130
42"	9.62	4 1/2"	4' - 10 1/2"	2' - 9"	5' - 10"	4' - 1 1/2"	3' - 6"	6	3' - 2"	4	8' - 3" AV.	7	5' - 6"	4	1' - 6"	6	5' - 4"	12	5' - 4" AV.	4	8' - 3"	2.89	151

05 PC CONCRETE HEADWALL

SCALE: AS SHOWN



CAST-IN-PLACE MANHOLE WALL

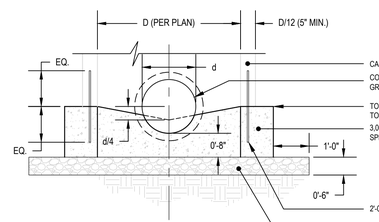
CONNECTING STORM SEWER. JOINT TO BE SEALED WITH NON-SHRINK GROUT PER PIPE MANUFACTURER'S RECOMMENDATIONS.

TOP OF BASE AT OR ABOVE CENTERLINE OF LARGEST PIPE. CONTRACTOR TO PROVIDE CONCRETE JOINT SEALER PER ASTM D-1850

3,000-PSI CLASS A CONCRETE PER SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.

CRUSHED ROCK FOUNDATION PER SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.

CAST-IN-PLACE MANHOLE: STANDARD BASE CONSTRUCTION



CAST-IN-PLACE MANHOLE WALL

CONNECTING STORM SEWER. JOINT TO BE SEALED WITH NON-SHRINK GROUT PER PIPE MANUFACTURER'S RECOMMENDATIONS.

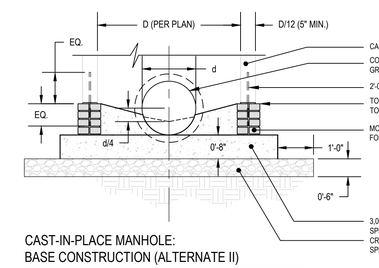
TOP OF BASE AT OR ABOVE CENTERLINE OF LARGEST PIPE. CONTRACTOR TO PROVIDE CONCRETE JOINT SEALER PER ASTM D-1850

3,000-PSI CLASS A CONCRETE PER SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.

2'-0" No. 4 DOWEL BARS, EQUALLY SPACED (QTY. 4)

CRUSHED ROCK FOUNDATION PER SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.

CAST-IN-PLACE MANHOLE: BASE CONSTRUCTION (ALTERNATE I)



CAST-IN-PLACE MANHOLE WALL

CONNECTING STORM SEWER. JOINT TO BE SEALED WITH NON-SHRINK GROUT PER PIPE MANUFACTURER'S RECOMMENDATIONS.

2'-0" No. 4 DOWEL BARS, EQUALLY SPACED (QTY. 4)

TOP OF BASE AT OR ABOVE CENTERLINE OF LARGEST PIPE. CONTRACTOR TO PROVIDE CONCRETE JOINT SEALER PER ASTM D-1850

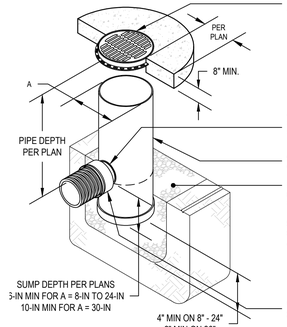
MORTARED BRICK MASONRY PER PROJECT SPECIFICATIONS. PLACE FORMS FOR MANHOLES WALLS ON FINISHED MASONRY BASE.

3,000-PSI CLASS A CONCRETE PER SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.
CRUSHED ROCK FOUNDATION PER SECTION 33 4100 OF THE PROJECT SPECIFICATIONS.

CAST-IN-PLACE MANHOLE: BASE CONSTRUCTION (ALTERNATE II)

03 CAST-IRON TRENCH DRAIN

SCALE: AS SHOWN



INTEGRATED DUCTILE IRON FRAME & GRATE TO MATCH BASIN O.D.

4"-30" ADAPTER. ADAPTER ANGLE AND DIAMETER PER PLANS. ADAPTER TYPE SHALL BE AS REQUIRED TO MAKE WATER-TIGHT CONNECTION.

ADS NYLOPLAST PVC DRAINAGE STRUCTURE OR APPROVED EQUAL

BACKFILL MATERIAL TO BE CRUSHED STONE OR OTHER GRANULAR MATERIAL MEETING THE REQUIREMENTS OF CLASS II MATERIAL AS DEFINED IN ASTM D2321. BEDDING & BACKFILL FOR SURFACE DRAINAGE INLETS SHALL BE PLACED & COMPACTED UNIFORMLY IN ACCORDANCE WITH ASTM D2321.

WATERTIGHT JOINT (CORRUGATED HDPE SHOWN)

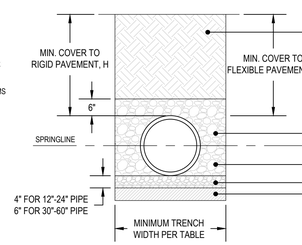
GENERAL NOTES:

1. PRE-FABRICATED PVC STRUCTURE TO BE ADS NYLOPLAST OF APPROVED EQUAL. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS TO ENGINEER FOR APPROVAL PRIOR TO PROCUREMENT.
2. 8" - 30" GRATES/SOLID COVERS SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05, WITH THE EXCEPTION OF THE 8" - 15" BRONZE GRATES.
3. 12" - 30" FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
4. DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS. ADAPTER ANGLES SHALL BE AS INDICATED ON DRAWINGS.
5. DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS & HANCOR DUAL WALL) & SDR 35 PVC.
6. GRATES SHALL MEET H-10 LOAD RATING FOR 12" - 24" PEDESTRIAN.
7. GRATES SHALL MEET H-20 LOAD RATING FOR 30" PED & 12" - 30" STD & SOLID.
8. ALL BRONZE GRATES, DROP IN GRATES, & 8" & 10" PED/STD GRATES & SOLID COVERS ARE RATED FOR LIGHT DUTY APPLICATIONS ONLY.
9. DOME GRATES HAVE NO LOAD RATING.

A	ADS PART No.	GRATE OPTIONS					
8"	2808AG	PEDESTRIAN / STANDARD		SOLID	BRONZE	DOME	DROP-IN
10"	2810AG	PEDESTRIAN / STANDARD		SOLID	BRONZE	DOME	DROP-IN
12"	2812AG	PEDESTRIAN	STANDARD	SOLID	BRONZE	DOME	DROP-IN
15"	2815AG	PEDESTRIAN	STANDARD	SOLID	BRONZE	DOME	DROP-IN
18"	2818AG	PEDESTRIAN	STANDARD	SOLID	-	DOME	DROP-IN
24"	2824AG	PEDESTRIAN	STANDARD	SOLID	-	DOME	DROP-IN
30"	2830AG	PEDESTRIAN	STANDARD	SOLID	-	DOME	-

02 PRE-FABRICATED PVC INLET

SCALE: AS SHOWN



RECOMMENDED MINIMUM TRENCH WIDTHS	
PIPE DIAMETER (IN)	MINIMUM TRENCH WITH (IN)
4	21
6	23
8	26
10	28
12	30
15	34
18	39
24	48
30	56
36	64
42	72
48	80
54	88
60	96

MINIMUM RECOMMENDED COVER BASED ON VEHICLE LOADING CONDITIONS		
PIPE DIAMETER	H-25	HEAVY CONSTRUCTION (75T AXLE LOAD)*
12" - 48"	12"	48"
54" - 60"	24"	60"
* VEHICLES IN EXCESS OF 75T MAY REQUIRE ADDITIONAL COVER		

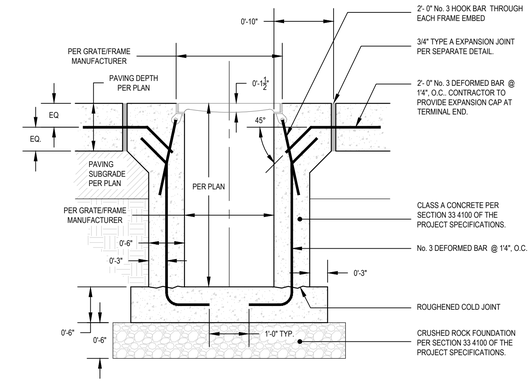
MINIMUM RECOMMENDED COVER BASED ON RAILWAY LOADING CONDITIONS	
PIPE DIAMETER	COOPER E-80*
UP TO 24"	24"
30 - 36"	36"
42" - 60"	48"
* COVER IS MEASURED FROM TOP OF PIPE TO BOTTOM OF RAILWAY TIE. E-80 COVER REQUIREMENTS ARE ONLY APPLICABLE TO ASTM F-2306 PIPE.	

GENERAL NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS", LATEST ADDITION.
2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.
3. WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER, AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.
4. SUITABLE MATERIAL SHALL BE CLASS I, II OR III. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" (100mm) FOR 4"-24" (100mm-600mm); 6" (150mm) FOR 30"-60" (750mm-900mm).
5. SUITABLE MATERIAL SHALL BE CLASS I, II OR III IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" ABOVE CROWN OF PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.
6. MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOATION. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS 12" UP TO 48" DIAMETER PIPE AND 24" OF COVER FOR 54"-60" DIAMETER PIPE, MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT.

01 HDPE PIPE INSTALLATION

SCALE: AS SHOWN



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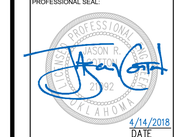
PROFESSIONAL SEAL:



DATE

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CA 6447, exp. 06.30.2018

CLIENT:

CHEROKEE NATION Entertainment
Cherokee CASINO

CHEROKEE NATION ENTERTAINMENT
TAHLEQUAH CASINO
TAHLEQUAH, OKLAHOMA

PROJECT PHASE:

BID PACKAGE 02
(100% SET)

REVISIONS		
#	DATE	DESCRIPTION
01	04.16.2018	ADDENDUM 03

DATE: 04.16.2018

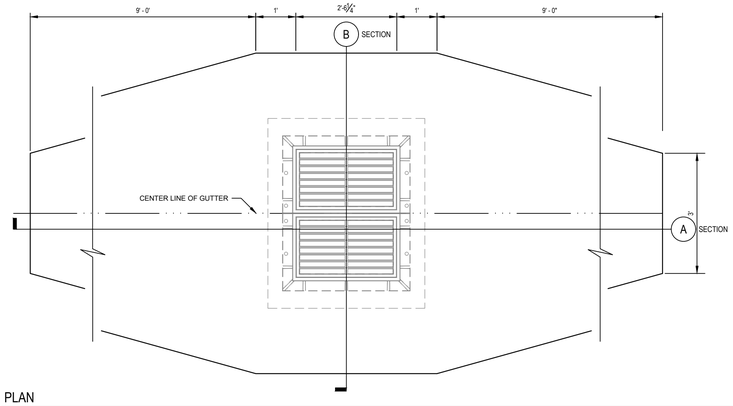
JOB NUMBER: 17-06

SHEET NUMBER:

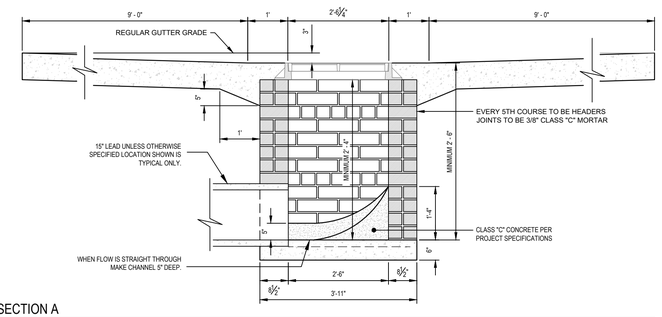
C9.25b

CIVIL CONSTRUCTION DETAILS

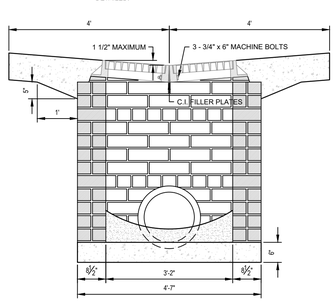
01



PLAN



SECTION A



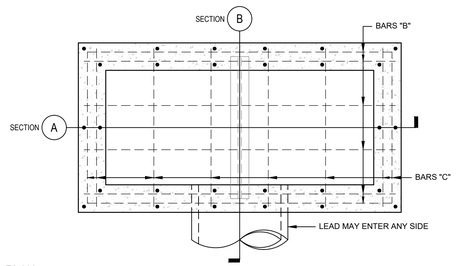
SECTION B

02 DESIGN NO. 6 INLET

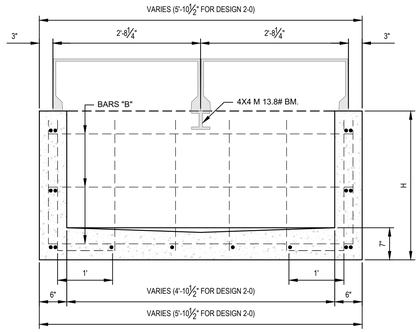
SCALE: AS SHOWN

GENERAL NOTES:

1. CASTINGS SHALL CONFORM TO THE A.S.T.M. SPECIFICATIONS FOR GRAY-IRON CASTINGS, SERIAL DESIGNATION A-48-29. ALL SURFACES SHALL BE LEFT UNPAINTED. NO WORDING OR MARKING OF ANY KIND OTHER THAN THOSE SHOWN ON THE PLANS WILL BE PERMITTED ON THE CASTINGS.
2. CASTINGS SHALL BE NEENAH CATALOG NUMBER R-3076 (THREE FLANGE) WITH TYPE V OR B GRATE (OR APPROVED EQUAL)
3. CONSTRUCTION WITHIN LIMITS OF PAVING:
   - 3.1. WHEN INLET IS LOCATED IN NEW PC CONCRETE PAVEMENT, THE CONCRETE APRON SHALL BE MONOLITHIC WITH NEW PAVEMENT AND CONFORM TO PLANS AND SPECIFICATIONS THEREOF.
   - 3.2. WHEN INLET IS LOCATED IN NEW OR EXISTING FLEXIBLE PAVEMENT, CONTRACTOR TO PROVIDE CONCRETE APRON PER PLANS (SEE NOTE 6, BELOW).
4. CAST IRON STEPS SHALL BE PLACED IN ALL INLETS 3' OR MORE IN DEPTH IN CONFORMITY WITH STANDARD SPECIFICATIONS.
5. THE GRATING TO BE USED IN THIS STRUCTURE WILL BE SHOWN ON THE PLANS OR DESIGNATED IN SPECIAL PROVISIONS.
6. THIS STRUCTURE WILL BE DESIGNED ON PLANS AS DESIGN NO. 6.
7. WALLS OF STORM SEWER INLET MAY BE OF (1) BRICK MASONRY AS SHOWN, (2) CLASS A CONCRETE PER THE PROJECT SPECIFICATIONS, OR (3) AN APPROVED PRE-CAST CONCRETE UNIT. SHOULD THE CONTRACTOR ELECT OPTION 2 OR 3, SHOP DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
   - 7.1. IF MASONRY OPTION IS SELECTED BY THE CONTRACTOR, BRICK SHALL BE CONCRETE AND CONFORM TO THE REQUIREMENTS OF ASTM C-55, GRADE S-1. BRICK DIMENSIONS TO BE 2-1/4" x 7-5/8" x 3-5/8". MORTAR SHALL MEET THE REQUIREMENTS OF ASTM C-270, TYPE M.
8. SIZE AND CONFIGURATION OF CONCRETE APRON SHALL BE AS DOCUMENTED IN THE PLANS. DIMENSIONS MAY DIFFER FROM THOSE DETAILED.



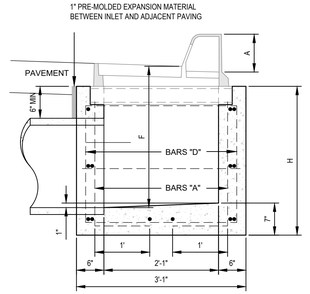
PLAN



SECTION A

CICI INLET DESIGN NUMBER		
DESIGN No.	GRATES	HOODS
2-0	2	2
2-1	2	4
2-2	2	6
2-3	2	8
2-4	2	10
3-0	4	4
3-1	4	6
3-2	4	8
3-3	4	10
3-4	4	12

BRICK OPTION (6-IN PC CONCRETE FLOOR, 8-IN BRICK WALLS)					
DESIGN NO.	2-0	2-1	2-2	2-3	2-4
BRICK (⅜" JOINTS)	445	725	995	1250	1495
1:2 MORTAR (C.Y.)	0.32	0.53	0.72	0.95	1.09
CLASS A CONCRETE	0.40	0.60	0.80	1.00	1.20



SECTION B

QUANTITIES FOR DESIGN 2-0 CICI				
SIZE OF LEAD	H (MINIMUM)	F (MINIMUM)	CLASS A CONCRETE (C.Y.)	REINFORCING STEEL (LBS)
18"	2'-8½"	2.57-FT	1.02	137
24"	3'-3"	3.11-FT	1.18	147
30"	3'-9½"	3.66-FT	1.34	180

DESIGN 2-0 CICI: PER ADDITIONAL FOOT OF DEPTH						
SIZE OF LEAD	CLASS A CONCRETE (C.Y.)	VERTICAL REBAR (LBS)	BAR A (MIN / LBS)	BAR B (MIN / LBS)	BAR C (MIN / LBS)	BAR A (MIN / LBS)
18"				5'-6" / 14	2'-9" / 16	H + 0'-4" / 14
24"	0.295	19	H + 0'-8" / 14			
30"				5'-6" / 18	2'-6" / 20	

ALL BARS SHALL BE NO. 4 UNLESS OTHERWISE NOTED

GENERAL NOTES:

1. CASTINGS SHALL CONFORM TO THE A.S.T.M. SPECIFICATIONS FOR GRAY-IRON CASTINGS, SERIAL DESIGNATION A-48-29. ALL SURFACES SHALL BE LEFT UNPAINTED. NO WORDING OR MARKING OF ANY KIND OTHER THAN THOSE SHOWN ON THE PLANS WILL BE PERMITTED ON THE CASTINGS.
2. ALL BOLTS USED TO SECURE CASTINGS SHALL BE MACHINED.
3. CURB INLETS SHALL BE PLACED ON UPSTREAM SIDE OF GRATE INLETS UNLESS OTHERWISE SPECIFIED. CONCRETE TROUGH FOR CURB INLETS AND CONCRETE STORM SEWER INLETS SHALL BE CONSTRUCTED AS ONE UNIT.
4. CASTINGS SHALL BE AS FOLLOWS UNLESS OTHERWISE INDICATED ON THE PLANS:
   - 4.1. FRAME AND GRATE:
     - 4.1.1. DESIGN No. 1 (3-FLANGE): NEENAH CATALOG NUMBER R-3076 WITH TYPE V GRATE (OR APPROVED EQUAL)
     - 4.1.2. DESIGN No. 2: NEENAH CATALOG NUMBER R-3077 WITH TYPE V GRATE (OR APPROVED EQUAL)
     - 4.1.3. ADDITIONAL GRATES: NEENAH CATALOG NUMBER R-3078 WITH TYPE V GRATE (OR APPROVED EQUAL)
   - 4.2. CURB HOODS
     - 4.2.1. 6-IN BARRIER CURB: NEENAH CATALOG NUMBER R-3076-6B (OR APPROVED EQUAL)
     - 4.2.2. 8-IN BARRIER CURB: NEENAH CATALOG NUMBER R-3076-8B (OR APPROVED EQUAL)
5. HORIZONTAL BARS ARE APPROXIMATELY 12-IN CENTERS. WHEN ADDITIONAL BARS ARE REQUIRED DUE TO ADDITIONAL DEPTH, APPROXIMATELY 22.5-LBS OF REINFORCING STEEL IS TO BE ADDED FOR EACH ADDITIONAL SET OF BARS.
6. COST OF 4 X 4 M 13.8# BM SUPPORTS FOR GRATE FRAME SHALL BE CONSIDERED INCIDENTAL AND INCLUDED IN THE BID PRICE FOR THE STRUCTURE(S).

01 COMBINATION INLET

SCALE: AS SHOWN

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4/14/2018
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Cherokee CASINO

CHEROKEE NATION ENTERTAINMENT
TAHLEQUAH CASINO
TAHLEQUAH, OKLAHOMA

PROJECT PHASE:
BID PACKAGE 02
(100% SET)

REVISIONS		
#	DATE	DESCRIPTION
01	04.16.2018	ADDENDUM 03

DATE: 04.16.2018
JOB NUMBER: 17-06

SHEET NUMBER:
C9.30b

CIVIL CONSTRUCTION DETAILS
01