SECTION 02553 - NATURAL GAS DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for natural gas distribution outside the building:

1. Piping.
2. Valves.
3. Service regulators.
4. Service meters.
5. Concrete bases.

1.3 DEFINITIONS

A. Gas Main: Utility's natural gas piping.

B. Gas Distribution: Piping from gas main to individual service-meter assemblies.

C. Service-Meter Assembly: Piping, valves, service regulator, service meter, and specialties.

D. Point of Delivery: Piping outlet from service-meter assembly.

E. Natural Gas Piping: Piping that conveys natural gas from point of delivery to natural gas utilization devices inside the building.

F. PE: Polyethylene plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Working-Pressure Ratings:

1. Piping and Valves: 100 psig minimum, unless otherwise indicated.
2. Service Regulators: 100 psig minimum, unless otherwise indicated.
3. Service Meters: 5 psig minimum, unless otherwise indicated.

1.5 SUBMITTALS

A. Product Data: For the following:

1. PE pipe and fittings.
2. Steel Pipe and Fittings.
3. Service regulators. Indicate pressure ratings and capacities.
4. Service meters. Indicate pressure ratings and capacities. Include bypass fittings, meter bars, and supports.
5. PE valves.
6. Tracer wire.

B. Shop Drawings: For natural gas service piping and service meter assembly. Include plans, elevations, sections, details, and attachments to other work.

C. Welding certificates.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For the following natural gas distribution equipment and accessories to include in emergency, operation, and maintenance manuals.

1. Service regulators.
2. Service meters.

F. Provide three copies of referenced specifications NFPA 54 and NFPA 70 to be retained by the Government.

1.6 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

B. Comply with requirements of utility supplying natural gas and with Title 49 of the Code of Federal Regulations (CFR), Part 192.

C. Comply with ANSI Z223.1 or NFPA 54 for materials, installation, testing, inspection, and purging.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle liquids to avoid spillage and ignition. Notify gas supplier. Do not leave flammable liquids on premises overnight.

B. Preparation for Transport: Prepare valves and specialties for shipping as follows:

1. Ensure that units are dry and internally protected against rust and corrosion.
2. Protect against damage to threaded ends, flange faces, and weld ends.
3. Set valves in position for handling that avoids damage to seats and operating parts.

C. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent damage and entrance of dirt, debris, and moisture.

D. Store valves and specialties with end protectors in place, unless necessary for inspection; then reinstall for storage.

E. Store valves and specialties indoors and maintain temperature higher than ambient dew-point temperature. Support off ground or pavement in watertight enclosures if outdoor storage is necessary.

F. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor if stored inside.

G. Protect flanges, fittings, and piping specialties from moisture and dirt.

H. Store plastic pipe and valves protected from direct sunlight. Support pipes to prevent sagging and bending.

1.8 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 gas supply according to requirements indicated:

1. Notify Construction Manager 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 Construction Manager's written permission.

1.9 COORDINATION

A. Coordinate connection to gas main with utility.

B. Coordinate natural gas distribution with other utility Work.

C. Coordinate pipe materials, sizes, entry locations, and pressure requirements with natural gas piping.

D. Work Interruptions: Leave natural gas distribution piping in safe condition if interruptions in work occur while alterations or repairs are being made to existing gas piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPES AND FITTINGS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

B. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B; Schedule 40, black.

1. Steel pipe shall only be used for above ground applications.
2. Malleable-Iron Fittings: ASME B16.3, Class 150, standard pattern, with threads complying with ASME B1.20.1.
3. Steel Fittings: ASME B16.9, wrought-steel butt-welding type; and ASME B16.11, forged steel.
4. Steel Flanges and Flanged Fittings: ASME B16.5.
5. Unions: ASME B16.39, Class 150, black malleable iron; female pattern; brass-to-iron seat; ground joint.

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

1. PE Fittings: ASTM D 2683, socket type or ASTM D 3261, butt type with dimensions matching ASTM D 2513, SDR 11, PE pipe.

D. Transition Fittings: Manufactured pipe fitting with one PE pipe end for heat-fusion connection to PE pipe and with one ASTM A 53/A 53M, Schedule 40, steel pipe end for threaded connection to steel pipe.

E. Service-Line Risers: Manufactured PE pipe fitting with PE pipe inlet for heat-fusion connection to underground PE pipe; PE pipe riser section with protective-coated, anodeless, steel casing and threaded outlet for threaded connection to aboveground steel piping.

2.3 JOINING MATERIALS

A. Components, Tapes, Gaskets, and Bolts and Nuts: Suitable for natural gas and as recommended by piping manufacturer.

2.4 SHUTOFF VALVES

A. Shutoff Valves, General: Manual operation, suitable for natural gas service, and with 100-psig minimum working-pressure rating.

B. Plastic ball valves, plug valves and disc design valves shall have slip-fit ends for smaller diameter pipes and butt fusion ends for larger diameter pipe. Body and ends shall be PE 2406, conforming with ANSI B16.4 and ASTM D2513, latest DOT-approved editions.

1. Manufacturers:
   a. Perfection
   b. Broen Ballomax
   c. Lyall Polytec
   d. Nordstrom Polyvalve

C. Valve Boxes: Valve boxes shall be either cast-iron or plastic, two-section box. Include top section with cover with "GAS" lettering, bottom section with base to fit over valve and barrel 5 inches in diameter, and adjustable extension of length required for depth of bury. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head and with stem of length required to operate valve.

2.5 SERVICE REGULATORS

A. Description: Natural gas service regulator complying with ANSI B109.4 or DIR 006.3-listed for service regulators.

1. Construction: Single-stage, steel-jacketed, corrosion-resistant diaphragm type. Include atmospheric vent and elevation compensator.
2. Pipe Connections:
   a. NPS 2 and Smaller: Threaded.
   b. NPS 2-1/2 and Larger: Flanged.
3. Manufacturers:
   a. American Meter Co.
   b. Fisher Controls International.
   c. Invensys Energy Metering.
   d. National Meter.
   e. Schlumberger Limited.

2.6 SERVICE METERS

A. Service Meters, General: Positive-displacement gas meter.

1. Construction: Metal case with temperature compensation, and corrosion-resistant internal components.
2. Pipe Connections:
   a. NPS 2 and Smaller: Threaded.
   b. NPS 2-1/2 and Larger: Flanged.

B. Small-Capacity Service Meters: ANSI B109.1, diaphragm type, with registration in cubic feet for meters with capacities of 500 cfh and less.

1. Manufacturers:
   a. American Meter Co.
   b. Fisher Controls International.
   c. Invensys Energy Metering.
   d. National Meter.
   e. Schlumberger Limited.

C. Large-Capacity Service Meters: ANSI B109.2, diaphragm type, with registration in cubic feet for meters with capacities of more than 500 cfh.

1. Manufacturers:
   a. American Meter Co.
   b. Invensys Energy Metering.
   c. Sensus Metering Systems.

D. Rotary Service Meters: ANSI B109.3, rotating-lobe type, with registration in cubic feet.

1. Manufacturers:
   a. American Meter Co.
   b. Schlumberger Limited.
   c. Dresser Roots

E. Service-Meter Bars: Malleable- or cast-iron frame for supporting service meter. Include offset swivel pipes, nuts with O-ring seal, factory- or field-installed dielectric unions, and threaded ends.

1. Exception: Omit offset swivel pipes if dimensions match meter connections.
2. Manufacturers:
   a. Fisher Controls International.
   b. McDonald, A. Y. Mfg. Co.
   c. Mueller Company.
   d. National Meter.
   e. Schlumberger Limited.

F. Service-Meter, Bypass Fitting: Ferrous, tee pipe fitting with integral ball check valve and capped side inlet for temporary natural gas supply.

1. Manufacturers:
   a. Lyall, R. W. & Company, Inc.
   b. Williamson, T. D., Inc.
   c. Schlumberger Limited.

2.7 TRACER WIRE

A. Wire shall be #14AWG with a solid copper core (0.0808" diameter) or a copper-clad steel core high strength wire with a minimum 30 mil polyethylene jacket complying with ASTM-D-1248. The wire shall have a 30 volt rating with a conductivity of 21% IACS. The average tensile strength break load shall be 250 lbs.

2.8 CONCRETE BASES

A. Description: Precast concrete made of 3000-psi- minimum, 28-day compressive strength reinforced concrete; at least 4 inches thick and 4 inches larger in each dimension than supported item, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PREPARATION

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

B. Inspect natural gas piping according to fuel gas code to determine that natural gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 fuel gas code requirements for prevention of accidental ignition.

3.3 PIPING APPLICATIONS

A. Flanges, unions, and transition and special fittings with pressure ratings same as or higher than system pressure rating may be used, unless otherwise indicated.

B. Aboveground Piping:

1. NPS 2 and Smaller: Steel pipe, malleable-iron fittings, and threaded joints.
2. NPS 2-1/2 and Larger: Steel pipe, butt-welding-type fittings, and welded joints. Joints for connection to service regulators, service meters, and valves with flanged connections may be flanged. Joints for connection to service regulators, service meters, and valves with threaded connections NPS 2-1/2 to NPS 4 may be threaded.

C. Underground Piping: PE pipe, PE fittings, and heat-fusion joints.

D. Underground-to-Aboveground Piping Connections: Service-line riser.

E. PE-to-Steel Piping Connections: Transition fitting.

3.4 VALVE APPLICATIONS

A. Drawings indicate types of shutoff valves to be used. If specific types are not indicated, the following requirements apply:

1. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping gas mains.
2. Underground: Use PE valves.
3. Aboveground, NPS 2 and Smaller: Nonlubricated tapered plug valves.
4. Aboveground, NPS 2 and Smaller: Ball valves.
5. Aboveground, NPS 2-1/2 and Larger: Nonlubricated plug valves.

3.5 PIPING INSTALLATION

A. Install underground, natural gas distribution piping buried at least 36 inches below fiished grade.

B. Install underground, PE, natural gas distribution piping according to ASTM D 2774.

C. Install underground, PE, natural gas distribution piping at entrance to and under part of building in steel piping protective conduit that is vented to outside.

D. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

E. Terminate service-regulator horizontal vents or horizontal vent piping with reducing-elbow fittings with large end as outlet. Install fitting outlet turned down with corrosion-resistant insect screen in outlet.

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

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

E. Install service meters downstream from pressure regulators.

F. Install pressure-relief or pressure-limiting devices so they can be readily operated to determine if devices are free of debris, tested to determine pressure at which they will operate, and examined for leakage if closed.

3.7 VALVE INSTALLATION

A. Install PE shutoff valves on branch connections to existing underground, natural gas distribution piping. Install valves with valve boxes.

B. Install metal shutoff valves on aboveground, natural gas distribution piping.

3.8 JOINT CONSTRUCTION

A. Comply with 49 CFR part 192 for basic joint construction.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect gas distribution piping to natural gas source and extend to service-meter assemblies and points indicated. Connect to building's natural gas piping if it is installed; otherwise, terminate piping with caps, plugs, or flanges, as required for piping material.

C. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment having threaded pipe connection.

D. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.

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

F. Install aboveground, natural gas distribution piping upstream from equipment shutoff valves, electrically continuous, and bonded to grounding electrode according to NFPA 70.

G. Do not use natural gas distribution piping as grounding electrode.

3.10 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on or near each service regulator, service meter, and earthquake valve.

1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

B. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tape over natural gas distribution piping during backfilling of trenches for piping.

3.11 PAINTING

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

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

3.12 FIELD QUALITY CONTROL

A. Test, inspect, and purge natural gas distribution according to requirements of fuel gas code and utility.

B. Repair leaks and defective valves and specialties and retest system until no leaks exist.

C. Report results in writing.

D. Verify correct pressure settings for service regulators.

END OF SECTION 02553

SECTION 02741 - HOT-MIX ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Hot-mix asphalt paving.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.2 DEFINITIONS

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

B. DOT: Department of Transportation.

1.3 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt paving according to materials, workmanship, and other applicable requirements of the City of Omaha Standard Specifications for Public Works Construction, 2003 Edition.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: For each job mix proposed for the Work.

C. Material Test Reports: For each paving material.

D. Provide two (2) copies of City of Omaha Standard Specifications for Public Works Construction, 3rd Edition to be retained by the Government.

1.5 QUALITY CONTROL

A. Manufacturer Qualifications: A qualified manufacturer.

1. Manufacturer shall be a paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of the state in which Project is located.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 548. CONTRACTOR shall provide all testing by a qualified third party testing firm. Testing firm shall be preapproved by the Government.

C. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:

1. Prime and Tack Coats: Minimum surface temperature of 60 deg F (15.5 deg C).
2. Asphalt Base Course: Minimum surface temperature of 40 deg F (4 deg C) and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.5 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. The mineral aggregate shall consist of crushed gravel, crushed stone, sands, gravel, and mineral filler conforming to the requirements specified below. That portion of the materials which retains a No. 4 sieve shall be designated as coarse aggregate; that portion which passes a No. 4 sieve and retains on a No. 200 sieve shall be designated as fine aggregate; and that portion which passes a No. 200 sieve shall be designated as mineral filler.

1. Coarse Aggregate for Surface Course shall meet the following requirements:

• Deleterious Substances (combined aggregate weighted avg.) Clay Lumps and Friable Particles, ASTM C142-78 Lightweight Pieces, ASTM C-123-94	3.0% max
• Absorption by Water, ASTM C127-88	3.0% max
• Soundness Loss by ASTM C88-90, using sodium sulfate (NaS04) Crushed Rock (limestone, dolomite, granite, quartzite) Sand gravel, gravel, crushed gravel, crushed sand-gravel	 10.0% max 12.0% max
• Wear loss by L.A. Abrasion, ASTM C131-89	40.0% max

- At least 75 percent of the blended coarse aggregate shall be crushed. Individual coarse crushed limestone and other ledge rock shall be considered 100 percent crushed. Coarse crushed sand gravel will be assigned a crushed percentage value as determined by Nebraska Department of Roads Test Method T586. Each individual coarse aggregate will be evaluated and a weighted average will be used for the minimum 75 percent criteria.

2. Fine Aggregate for Surface Course shall consist of crushed or uncrushed particles substantially free from clay lumps and vegetable matter.

- At least 75% of the amount passing a #200 sieve by washing method shall pass the same sieve by the dry screening method.
- Organic Impurities, ASTM C40-42 lighter or equal to standard
- Absorption by Water, ASTM C128-93 3.0% max
- The blended fine aggregate (minus No. 4 sieve retained on the No. 200 sieve) shall have a minimum air void content of 40 percent as determined by AASHTO TP 33 "Test Method for Uncompacted Void Content of Fine Aggregate (As Influenced by Particle Shape, Surface, Texture, and Grading)". Each individual fine aggregate shall be tested for air voids and the weighted average shall be at least 40 percent.

3. The Bituminous Material shall have a PG binder grade of 64-22 and conform to the requirements of AASHTO Specification MP1-93 for performance graded asphalt cements.

2.2 AGGREGATES AND MIXES

A. Surface Course Aggregate and Mix: The Surface Course Aggregate and mix shall meet the requirements of Surface Type FMC as outlined in the City of Omaha Public Works' "Table of Hot Mix Asphaltic Concrete Parameters". A copy of the table is attached at the end of this specification section.

B. Base Course Aggregate and Mix: The base course aggregate and mix shall meet the requirements of Base Course as outlined in the City of Omaha Public Works' "Table of Hot Mix Asphaltic Concrete Parameters". A copy of the table is attached at the end of this specification section.

C. Recycled asphalt pavement shall not be allowed in this project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 COMPACTION

A. HAULING AND SPREADING: The prepared bituminous mixture shall be hauled and spread in accordance with City of Omaha, Standard Specifications for Public Works Construction, "Hauling and Spreading Asphaltic Concrete Mixtures".

1. In addition to a spreading and finishing machine, the Contractor will be required to furnish shovelers and rakers to do touch-up work behind the machine. Asphaltic concrete shall not be placed when mixture temperature is less than 225°F nor when the ambient temperature is less than 50°F.

B. Compaction: As soon as the mixture will carry the compaction equipment without undue displacement or shoving, it shall be compacted with self-propelled rollers. Rolling equipment shall comply to the requirements of the City of Omaha *Standard Specifications for Public Works Construction*, Section 401.06, "Compaction and Finishing Asphaltic Concrete Mixtures".

1. The asphaltic concrete surface shall be compacted to in-place density when compared to maximum laboratory density expressed as a percentage within the range as shown below. Maximum laboratory density shall be determined in accordance with ASTM "Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures", Designation D2041.

5/8 inch surface course - 92 to 94 percent

C. Testing: The Government will furnish asphalt plant control services and will do all the usual testing connected with this type of work. The contractor will be required to furnish a building about 8 feet by 12 feet, equipped with benches, lights, electric power, water and heat, if necessary, for the use of the plant control technicians.

D. Joints: Placing of bituminous mixture shall be as nearly continuous as possible, and the roller shall pass over the unprotected end of the freshly laid mixture only when the laying of the course is discontinued for such length of time as to permit the mixture to become chilled. In all such cases, when the work is resumed the material laid shall be cut back so as to produce a slightly beveled edge for the full thickness of the course. All edges that have cooled for more than one hour shall be tacked with bituminous material, except that cooled longitudinal joints need not be tacked if an infra-red heating device is used on the bituminous spreading machine. The old material which has been cut away shall be removed from the work and the new mixture laid against the fresh cut. If desired, a stout rope may be stretched across the pavement where the joint is to be made. When the work is resumed, the material laid shall be cut back to the rope which will be removed, together with the surplus material, and the fresh mix laid against the joint thus formed. Hot smoothing irons may be used for sealing joints, but in such case, extreme care shall be exercised to avoid burning the surface.

E. Surface Tests: While still warm, the surface shall be tested as follows, and corrected as necessary by properly adding or removing material, retesting and rerolling until the finished surface complies with the test requirements.

1. The finished pavement shall show no deviation from the general surface in excess of ¼" as measured in the following manner: A 10' straight edge shall be placed parallel to the center line of the roadway so as to bridge any depressions, and touch all high spots. Ordinates measured from the face of the straight edge to the surface of the pavement shall not exceed 0.25", and any depressions and any high area in excess of 0.25" shall be corrected by the contractor.

2. Such portions of the completed pavement as are defective in finish, density, or composition, or that do not comply in all respects with the requirements of the specifications, shall be taken up, removed, and replaced with suitable material, properly laid in accordance with these specifications, and at the expense of the contractor.

END OF SECTION 02741

Table of Hot Mix Asphaltic Concrete Parameters

City of Omaha Public Works Department (01-11-06)

MIX DESCRIPTION	FINE MIX (FM)			COARSE MIX (CM)			BASE COURSE	WEDGE COURSE	METRO AREA HOT MIX
	SURFACE TYPE FMR	SURFACE TYPE FMC	SURFACE TYPE FMM	SURFACE TYPE CMR	SURFACE TYPE CMC	SURFACE TYPE CMM			
APPLICATION	THIN OVERLAY : PARKING OR ROADWAY without trucks	THIN OVERLAY / LEVELING : RESIDENTIAL OR COLLECTOR	THIN OVERLAY / LEVELING : MAJOR	SURFACE COURSE : PARKING OR ROADWAY without trucks	SURFACE COURSE : RESIDENTIAL OR COLLECTOR	SURFACE COURSE : MAJOR	BASE COURSE : FLEXIBLE SUBGRADE	WEDGE COURSE : BRICK	STREET REPAIRS & PATCHING
TRAFFIC VOLUME	LIGHT	MEDIUM	HEAVY	LIGHT	MEDIUM	HEAVY	ALL	ALL	ALL
COARSE AGGREGATE CRUSHED PARTICLE NDOR	Min. 55 %	Min. 65%	Min. 85/80%*	Min. 70 %	Min. 75 %	Min. 85/80%*	—	—	—
UNCOMPACTED VOID CONTENT OF FINE AGGREGATE, AASHTO	40 % min.	42 % min.	42 % min.	40 % min.	42 % min.	42 % min.	—	—	—
FLAT AND ELONGATED PIECES	N/A	10% max.	10% max.	N/A	10% max.	10% max.	N/A	N/A	
SAND EQUIVALENT	40 min.	40 min.	45 min.	40 min.	40 min.	45 min.	40 min.		
PERFORMANCE GRADED BINDER AASHTO MP1	PG 64-22	PG 64-22	PG 70-28	PG 64-22	PG 64-22	PG 70-28	PG 64-22	PG 64-22	PG 64-22
RAP, % by total wt. of mix**	15 max**	15 max**	not allowed	15 max**	15 max**	not allowed	30 max		
MIX DESIGN AIR VOIDS, %	Target 4.0	Target 4.0	Target 4.0	Target 4.0	Target 4.0	Target 4.0	Target 4.0	Target 4.0	—
PRODUCTION AIR VOIDS, %	4.0 +/- 1	4.0 +/- 1	4.0 +/- 1	4.0 +/- 1	4.0 +/- 1	4.0 +/- 1	4.0 +/- 1	4.0 +/- 1	
VOIDS in the MINERAL AGGREGATE, %	Min. 14.0	Min. 14.0	Min. 14.0	Min. 13.0	Min. 13.0	Min. 13.0	Min. 12.0	Min. 14.0	—
VOIDS FILLED, %	65-78	65-78	65-78	65-78	65-78	65-78	50 - 80	65 - 85	—
FILM THICKNESS, microns	***	***	***	***	***	***	—	—	—
FILLER TO EFFECTIVE BINDER RATIO	0.8 - 1.6	0.8 - 1.6	0.8 - 1.6	0.8 - 1.6	0.8 - 1.6	0.8 - 1.6	0.8 - 1.6	0.8 - 1.6	—
Compaction Gyrations Ninitial	6	7	8	6	7	8	6	6	N/A
Compaction Gyrations Ndesign	50	75	100	50	75	100	50	50	N/A
Compaction Gyrations Nmaximum	75	115	160	75	115	160	75	75	N/A
% Gmm @ Nini (max.)	90.5	89.0	89.0	90.5	89.0	89.0	91.5	91.5	N/A
% Gmm @ Nmax (max.)	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	N/A
SIEVE SIZE	% passing	% passing	% passing	% passing	% passing	% passing	% passing	% passing	% passing
1"	—	—	—	—	—	—	100	—	—
3/4"	—	—	—	100	100	100	90 / 100	—	—
5/8"	—	—	—	—	—	—		—	100
1/2"	100	100	100	90 / 100	90 / 100	90 / 100	90 max.	100	—
3/8"	90 / 100	90 / 100	90 / 100	90 max.	90 max.	90 max.		90 / 100	90 / 100
# 4	90 max.	90 max.	90 max.	—	—	—		90 max.	65 / 89
# 8	32 / 67	32 / 67	32 / 67	28 / 58	28 / 58	28 / 58	23 / 49	32 / 67	45 / 65
# 200	2 / 10	2 / 10	2 / 10	2 / 10	2 / 10	2 / 10	2 / 10	2 / 10	4 / 12
COMPACTION DENSITY ASTM D2041 (% RICE) Mat Compaction	92 Minimum	92 Minimum - 94 Target Maximum	92 Minimum - 94 Target Maximum	92 Minimum	92 Minimum - 94 Target Maximum	92 Minimum - 94 Target Maximum	90 Minimum	90 Minimum	90 Minimum
COMPACTION DENSITY ASTM D2041 (% RICE) Join Compaction	90 Minimum	90 Minimum	90 Minimum	90 Minimum	90 Minimum	90 Minimum	90 Minimum	90 Minimum	90 Minimum

* "85/80" denotes that 85% of the coarse aggregate has one or more fractured faces and 80% has two or more fractured faces

** Recycled Asphalt Pavement (RAP) must be specified in the contract documents as an allowable option for FMR, FMC, CMR, & CMC surface mixes otherwise, not to be used Recycled Asphalt Pavment (RAP) is allowed at the specified percentage in the Base Course Mix

*** A minimum film thickness of 9 microns will be used as a parameter to establish optimum asphalt content during the mix design

SECTION 02751 - CEMENT CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:

1. Driveways and roadways.
2. Curbs and gutters.
3. Walkways.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
2. Division 2 Section "Pavement Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.3 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.5 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

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, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.

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

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

PART 3 – EXECUTION

3.1 CONCRETE MIXTURE

A. Composition Of Concrete: Concrete shall be proportioned in accordance with Section 501.02(L) of the City of Omaha Standard Specifications for Public Works Construction, latest edition.

Concrete for pavement placed using self-propelled concrete spreaders shall be L 6 Air-Entrained or L 65 Air-Entrained, as indicated in the PLANS. Concrete for pavement to be placed using hand finishing methods shall be L 65 Air-Entrained. Concrete mixes, including cement types, shall not be changed during a continuous placement. Prior to any concrete placement, the CONTRACTOR shall submit the mix proportions for the concrete to be supplied and a certification by the concrete supplier that the proposed mix(es) conform to City of Omaha Standard Specifications for Public Works Construction, latest edition.

B. Plant Checks: Contractor shall provide Contracting Officer's Representative with documentation of current plant certification per Section 501.03(A) of the City of Omaha Standard Specifications for Public Works Construction, latest edition. Certification shall be provided for all plants that are used on project. Plant checks of the concrete batching plant will generally be performed prior to large pours, especially if adverse weather conditions prevail, or at any other time deemed appropriate. The Contracting Officer's Representative will determine when a plant check is required and will so notify the testing laboratory, who may make a no-notice plant check. The plant check will be in general compliance with the City of Omaha Standard Specifications for Public Works Construction, latest edition and will include the collection of a cement sample. If the materials or plant operation are found to be in non-conformance with the City of Omaha Standard Specifications for Public Works Construction, latest edition, no additional concrete shall be batched or placed until the problem(s) is(are) corrected.

3.2 <u>FIELD TESTING OF P.C.C.:</u> The types of tests required and the frequency of testing for P.C.C. shall be as specified in these Project Specifications and the City of Omaha Materials and Testing Manual except as modified below:

a. Slump tests shall be conducted according to the requirements of ASTM C 143. Slump tests shall be made for each set of cylinders or as required by the Engineer. Concrete slump requirements, as listed in Table 501.01 of the City of Omaha Standard Specifications

for Public Works Construction, latest edition, are 2.5"+/-1.5" for Formed Pavement and 1.5"+/-1.5" for Slip Formed Pavement.

b. Air content tests shall be conducted according to the requirements of ASTM C 231, or ASTM C 173. If test by either method indicates non-compliance the concrete shall be rejected. There shall be no Pay Factor calculations, for either pay reductions or bonuses, based on Air Content. Air content tests shall be made for each set of cylinders or as required by the Engineer. Air content, per Table 501.01 of the City of Omaha Standard Specifications for Public Works Construction, latest edition, shall be 6.5% ± 1%.

c. Compressive Strength tests shall be made in accordance with the requirements of ASTM C39. Compressive Strength specimens shall be made and cured according to the requirements of ASTM C 39. Testing shall be based on the frequencies in Table 45.01 of the City of Omaha Materials and Testing Manual. A sample shall be considered a set of three cylinders. One compressive strength test shall be made on the 7th day after concrete placement. The remaining two cylinders shall be tested on the 28th day after concrete placement. The concrete paving represented by the beams shall be considered acceptable if the average strength of the two 28-day cylinders is greater than the strengths listed in Table 501.01 of the Project Specifications. If the average of the 28 day compressive strengths is below the required strength, the pay factors shown in Table 501.02 shall be applied to the pavement area represented by the deficient strength sample.

d. Concrete testing shall be conducted every 150 cubic yards of concrete poured or once per day when pouring.

e. If an anomaly resulting from casting a cylinder is visible in the cylinder, or if an anomaly is observed during the breaking of a cylinder, the results of that cylinder's test shall be discarded. If a cylinder's test results are discarded due to either the described anomalies or an out of tolerance break location per ASTM C 39, then the paving represented by the cylinders shall be considered acceptable if the compressive strength of the remaining 28-day cylinders is greater than the strength listed in Table 501.01 of the City of Omaha Standard Specifications for Public Works Construction, latest edition.

f. The area represented by a compressive strength test shall be the full width of pavement extending along the centerline in both directions covering the calculated area based on the testing frequency volumes. This area will be the area of pavement to be accepted, paid for at reduced price or removed and replaced, as applicable, for each test set. Removal and replacement shall be to the next transverse joint beyond the halfway point from the under strength test.

g. If the Contracting Officer's Representative believes cylinder and core test results are indicative of a concrete materials problem, he may order chemical and petrographic testing of samples of the in-place concrete and of any samples collected during the plant check.

3.3 Pavement Thickness: Pavement thickness shall be verified by coring in accordance with ASTM C174, Standard Test Method for Measuring the Thickness of Concrete Elements Using Drilled Concrete Cores.

a. Lot Size: Lot size for thickness testing shall be 300 CY each of concrete placed.

b. Testing Frequency: Each lot shall have three core samples taken. Locations for the sampling shall be randomly generated.

c. Measurement:

i. Cores measuring greater than the design thickness shall be considered the design thickness for the lot thickness averaging.

ii. Individual cores measuring greater than 1.0" deficient in thickness shall be cause for the removal and replacement of the deficient thickness area. This area shall be established, at the Contractors expense, by taking additional cores at 25 ft intervals longitudinally, each direction from the deficient core, until cores of the design thickness are obtained. The removal and replacement area shall be the entire width of pavement, from the joint nearest each end of the defined area. The removal and replacement of the deficient pavement shall be at no additional expense to the owner.

1. The two end cores shall be used in place of the original rejected core in calculating the lot average.

3.4 Concrete Placement Time Limit: Concrete not placed within 90 minutes after batching shall be considered rejected and shall not be used in the paving operation. Concrete discharged from the truck prior to the 90 minute expiration limit and which remains unused and unfinished past the 90 minute point shall not be used in the paving operation. All rejected concrete shall be removed from the jobsite and properly disposed of at no additional expense to the owner.

3.5 Protecting And Curing Compressive Test Specimens: The CONTRACTOR shall be responsible for protecting and curing of the compressive test specimens for the 24 hours that they remain in the field. If the CONTRACTOR is not satisfied with the standard procedures employed by the testing laboratory to control the curing environment, it shall be the CONTRACTOR'S responsibility to accomplish the following:

a. Notify the Contracting Officer within 24 hours;
b. Arrange for other than the standard curing precautions; and
c. Pay any additional costs associated with the non-standard curing precautions.

3.6 INTEGRAL CURB AND GUTTER: All pavement shall have 6" integral curb and gutter (Type A), except where noted on the PLANS. Separate payment will not be made for integral curb and gutter.

3.7 WATER FOR FINISHING: In no case shall water be added to the surface of the concrete for finishing. Addition of water for finishing is cause for removal and replacement of the concrete at the CONTRACTOR'S expense.

END OF SECTION 02751

SECTION 02920 - LAWNS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Seeding.

B. Related Sections:

1. Division 2 Section "Site Clearing" for topsoil stripping and stockpiling.
2. Division 2 Section "Earthwork" for excavation, filling and backfilling, and rough grading.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.

D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

E. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.4 SUBMITTALS

A. Product Data: For each type of product used for replacement.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.5 QUALITY ASSURANCE

A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

B. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.7 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion Substantial Completion.

1. Spring Planting: March 15 to May 31.
2. Fall Planting: September 1 to November 15.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.8 MAINTENANCE SERVICE

A. Initial Lawn Maintenance Service: Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Seeded Lawns: 90 days from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SEED

A. Seed Species: State-certified seed of grass species, as follows or approved equal: (Standard of quality based on United Seeds, Ralston, NE (402) 331-4800).

1. Superturf 1, Turf Type Tall Fescue

a. Application Rate = 12 LBS per 1,000 S.F.
b. Consists of: 22.05% Blackwatch Turf, 22.05% Quest Turf, 22.05% Masterpiece Turf, 22.05% Interno Turf, 9.80% Topgun Perennial, 0.25% Crop, 1.70% Inert, and 0.05% Weeds.
c. Minimum Germination Rate 90%
Minimum percent purity 98%
Application rate (broadcast seeding = 450 lbs/acre PLS
Cover Crop: On all area seeded a cover crop shall be applied. The cover crop shall be annual rye grass applied at the rate of 40 lbs. of PLS per acre.

2.2 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, Class T or O, agricultural limestone containing a minimum of 80 percent calcium carbonate equivalent.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

2.4 FERTILIZER

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

PART 3 - EXECUTION

3.1 LAWN PREPARATION

A. Limit lawn subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than 2 inches (50 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply superphosphate fertilizer directly to subgrade before loosening.

2. Prepare/spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.

3. Prepare planting soil mix to a depth of 4 inches (100 mm) but not less than required to meet finish grades after light rolling and natural settlement. Do not prepare if planting soil or subgrade is frozen, muddy, or excessively wet.

C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 2 inches (50 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

E. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.2 SEEDING

A. Notify the Government Construction Representative a minimum of forty-eight (48) hours before commencing the work. Do not proceed with such work until authorized by the Government Construction Representative. Perform seeding operations from March 15 to May 31 or from September 1 to November 15 unless otherwise authorized in writing. Alternative dates authorized by the Government Construction Representative do not alter any warranty or establishment conditions or requirements. Perform dormant seeding after November 1. Do not perform seeding or fertilizing operations if the ground is wet, frozen, or otherwise untellable. Do not perform seeding or fertilizing operations when conditions do not allow for a uniform distribution of materials.

Prepare the seedbed by scarifying the upper four (4) inches of the soil in an acceptable manner a maximum of two (2) days before the sowing of seed. Perform disking, harrowing, and raking in the longitudinal direction on all slopes steeper than 1V:4H.

Apply mulch within twenty-four (24) hours after seeding unless otherwise directed by the Owner. Place the mulch covering at a thickness that shades the ground, reduces the rate of evaporation, and prevents ore reduces erosion due to water or wind. Furnish the equipment and assistance necessary for accurate placement of the specified quantities. Do not place mulch if, in the judgment of the Owner, the wind velocity is too great to allow uniform distribution of the mulch materials.

B. Maintain seeded areas for a minimum of six (6) months after application of the seeding materials. The Owner reserves the right to accept seeded area before completion of the six (6) month period. Reseed and maintain any areas not moist or fully growing at or before the completion of the six (6) month period.

C. Apply fertilizer using an approved mechanical spreader or approved hydraulic methods uniformly over all areas receiving seed. Do not blend any fertilizer without the Owner present. Incorporate fertilizer into the soil before seeding.

D. Apply seed after fertilizing using approved mechanical power-drawn drills equipped with press wheels or drag chains. Do not use hydraulic seeders without written authorization from the Owner. Using a stand lawn roller, harrow or hand rake and compact any areas in accessible to the drill and seeded using a broadcast-type seeder. Maintain a planting depth of one-half (1/2) to three-fourths (3/4) inches when using a mechanical power-drawn drill.

E. Straw Mulch. Place the mulch covering loosely enough to allow sunlight to penetrate and air to slowly circulate. Place the mulch covering at a thickness that shades the ground, reduces the rate of evaporation, and prevents or reduces erosion due to water or wind

Apply mulch using a mulch-blowing machine or other methods acceptable to the Owner. Apply straw at the rate of three (3) tons per acre.

Anchor the mulch using a mulch crimper or other approved equipment with dull disc blades without camber immediately after spreading. Use a mulch crimper equipped with a ballast compartment that allows an increase or decrease in the weight. Crimp mulch the same day that it is applied.

3.3 SATISFACTORY LAWNS

A. Lawn installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).

3.4 CLEANUP AND PROTECTION

A. Promptly remove soil and debris, created by lawn work, from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after lawn is established.

END OF SECTION 02920