

# City of Scottsdale



**2015**

**SUPPLEMENT TO  
MAG UNIFORM STANDARD  
SPECIFICATIONS AND DETAILS  
for  
PUBLIC WORKS CONSTRUCTION**

**EFFECTIVE SEPTEMBER 24, 2015**



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## CITY OF SCOTTSDALE SUPPLEMENT TO MAG UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

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**Standard Detail Drawings and Specifications:** are located on the City’s website at:  
**<http://www.ScottsdaleAZ.gov/Design/COSMAGSUPP/>**

NOTE: \* - Indicates new or revised specification sections for 2015 Supplement.

## **PART 100 - GENERAL CONDITIONS**

### **SECTION 101 ABBREVIATIONS AND DEFINITIONS**

#### **101.1 ABBREVIATIONS:** *Add the following abbreviation:*

COS = City of Scottsdale

#### **101.2 DEFINITIONS AND TERMS:**

**Electrical Conductors:** Primary conductors shall be those conductors designed with a rating capacity of 12.5 kV or less, single phase or three phase, or conduits designed or intended to carry those lines.

*Delete the definition of "Engineer" and substitute the following:*

**Engineer:** For all bond and Capital Improvement projects, the Engineer shall be the City Engineer acting directly or through a duly authorized representative. For all Improvement District projects, the Engineer shall be the City Engineer acting directly or through a duly authorized representative. For all Private development projects, the Engineer shall be the Development and Quality Compliance Director acting directly or through a duly authorized representative. For all references throughout Section 430 Landscape and Planting and Section 440 Sprinkler Irrigation System Installation, the Engineer shall be the COS Parks Department Landscape Specialist acting directly or through a duly authorized representative.

**Service Conductors:** Service conductors shall be those electrical lines designed for direct service to commercial, industrial, residential, streetlight, or other direct users, or conduits designed or intended to carry those lines.

**Trash and Litter:** Any item not installed as part of the landscape or hardscape. This includes but is not limited to leaves, wind-blown material, cigarette butts and tree limbs.

#### **101.3** *Add the following paragraph:*

Also, in order to avoid cumbersome and confusing repetition of expressions in these specifications, it is provided that whenever MAG Uniform Standard Specifications (or Details) for Public Works Construction are referenced using, for example, such phrases as MAG Detail No.\_\_\_\_, MAG Standard Detail No. \_\_\_\_, MAG Standard Specification Section \_\_\_\_, MAG Section No.\_\_\_\_, etc., it shall be understood as if the phrase were followed by the words, "as amended by the COS Supplement, latest version." Similarly, it is provided that whenever a COS Supplement to MAG Uniform Standard Specifications (or Details) for Public Works Construction are referenced using, for example, such phrases as COS Detail No. \_\_\_\_, COS Supplemental Detail No.\_\_\_\_, COS Supplemental Specification Section \_\_\_\_, COS Section No.\_\_\_\_, etc., it shall be understood as if the phrase were followed by the words, "as it amends the MAG Uniform Standard Specifications (or Details) for Public Works Construction, latest version."

**SECTION 102  
BIDDING REQUIREMENTS AND CONDITIONS**

**102.4 EXAMINATION OF PLANS, SPECIAL CONDITIONS AND SITE OF WORK:**

*At the end of the third paragraph, add the following:*

If no information is given, i.e. soils report or logs of test bores, bidders shall make their own investigations and form their own estimates of the surface and sub-surface conditions of the project, especially in the vicinity of utilities.

**102.6 SUBCONTRACTOR LIST, add the following:**

For Landscape Sub-Contractor include qualification data for firms and persons specified to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified. Landscape installer shall be an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment. Landscape Installer shall maintain an experienced full-time supervisor on the project site during times that landscaping is in progress.

**SECTION 103**  
**AWARD AND EXECUTION OF CONTRACT**

**103.6.1 General:** *Add the following paragraph:*

(F) Prior to obtaining an encroachment permit, the Contractor must have on file with the City a Certificate of Insurance verifying the following coverages: Commercial General Liability coverage with combined limits of \$1,000,000.00. The City of Scottsdale must be named as additional insured party on the Contractor's automobile and general liability policies. Call the City of Scottsdale, Development Services for any changes in the figures listed above (telephone (480) 312-2500).

**SECTION 105  
CONTROL OF WORK**

**105.15(B) FINAL ACCEPTANCE:** *Add the following paragraphs:*

Prior to partial or final acceptance of all public improvements, full size 4-mil (min.) reproducible photo mylar copies of the approved construction drawings of the subject improvements must be submitted to the City. In addition, 2 copies of any Traffic Signal Plans shall be submitted to the Traffic Signal Supervisor at 91919 E. San Salvador, Scottsdale, AZ 85258.

A certificate of occupancy for on-site improvements will not be issued to the developer until the Contractor is provided with a letter by the COS Field Engineering Manager that the work is complete and accepted by the City.

**SECTION 106  
CONTROL OF MATERIALS**

**106.2 SAMPLES AND TESTS OF MATERIALS, add the following:**

Samples: 5 lbs. of granite stone mulch for each color and texture of stone required for project, in labeled plastic bags.

COS Parks Department reserves the option of sampling 2% plant material prior to installation.

**106.5 STORAGE OF MATERIALS:**

*Delete the following sentences:*

That portion of the right-of-way and easements not required for public travel may be used for storage purposes, when approved by the Engineer. Any additional storage area required must be provided by the Contractor.

*Add the following paragraph:*

Temporary construction storage sites must be provided by the Contractor. Sites that are to be located outside of the limits of construction as shown on the plans require the submittal of a site plan for separate permitting and approval prior to any site disturbance. Proof of permission for use will also be required for private parcels. Storage sites must also conform to the requirements of MAG Subsection 107.6.1, including COS supplemental requirements.

**SECTION 107**  
**LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC**

*Add the following subsections:*

**107.2.1 AZPDES Permit:**

(A) General requirements:

The Contractor shall comply with the Arizona Pollutant Discharge Elimination System (AZPDES) Stormwater requirements for construction sites under the Arizona Department of Environmental Quality (ADEQ) General Permit for Discharge from Construction Activities to Waters of the United States (Permit). Under provisions of the Permit, the Contractor shall be designated as the site operator who has day-to-day operational control of those activities at the project which are necessary to ensure compliance with the storm water pollution prevention plan or other Permit conditions. The Contractor shall be responsible for providing necessary materials and for taking appropriate measures to minimize pollutants in storm water runoff from the project.

It shall be the responsibility of the Contractor to select, implement and maintain Best Management Practices (BMPs) (including sediment and erosion control measures) to prevent potential pollutants from entering storm water. The project plans will specify the long term post construction storm water management measures, as required, that are to be used (i.e. retention basins, landscaping, etc.)

The Contractor shall be responsible for preparing the Storm Water Pollution Prevention Plan (SWPPP) for the project. This plan shall incorporate the post construction storm water management measures prescribed by the City and meet all of the requirements described in the Permit (available by calling ADEQ at 602-771-4449 or through the internet at <http://www.adeq.state.az.us/environ/water/permits/stormwater.html>)

The Flood Control District of Maricopa County has prepared a manual entitled "Drainage Design Manual for Maricopa County Arizona, Volume III, Erosion Control" to assist in the preparation of the SWPPP. It is available at the Flood Control District Office at 2801 West Durango Street, Phoenix, Arizona (602-506-1501). The U.S. Environmental Protection Agency (EPA) has published a guide entitled "Developing Your Stormwater Pollution Prevention Plan: A Guide For Construction Sites" (EPA 833-R-06-004). It is available from the National Service Center for Environmental Publications (NSCEP) at 800-490-9198 or through the internet at <http://www.epa.gov/nscep/>.

(B) Submittals:

The SWPPP shall be submitted to the City for approval at least 14 calendar days prior to issuance of the notice to proceed. The SWPPP will be reviewed by the City only to ensure that it includes the information required by the Permit. Development and compliance with other components of the SWPPP are solely the contractor's responsibility. The City's approval of the SWPPP applies only to its contents and is neither comprehensive nor does it make the City responsible for the contractor's noncompliance. The Contractor shall complete, certify and submit the NOI to the ADEQ with a copy to the City. The Contractor shall provide the City with a copy of their Authorization to Discharge from ADEQ before the start of construction.

This certification shall be received no later than three (3) working days prior to the Notice to Proceed. The ADEQ address is:

Surface Water Permits Unit (M05415B-3)  
ADEQ – Water Permits Section  
1110 W. Washington Street  
Phoenix, AZ 85007

(C) Contractor's Responsibilities

It shall be the contractor's responsibility to perform inspections of all storm water pollution control devices on the project in accordance with Permit requirements. The Contractor shall also be responsible for maintaining those devices in proper working order, including cleaning and/or repair. The Maricopa County Flood Control District provides access to real time rainfall information via the internet at <http://www.fcd.maricopa.gov/>.

All SWPPP reports required under this contract shall be made available to the public in accordance with the requirements of Section 308(b) of the Clean Water Act. The storm water regulations require that the records be maintained at the construction site or that notice be provided indicating where the records are kept.

No condition of the AZPDES Permit shall release the Contractor from any responsibilities or requirements under other environmental statutes or regulations.

Within 30 calendar days after completion of all work (including final stabilization when applicable), the Contractor shall complete, certify and submit a Notice of Termination (NOT) form to the ADEQ with a copy to the City, thereby terminating all AZPDES Permit coverage for the project.

(D) Payment:

There shall be no separate payment made to the Contractor for all material, labor, and other incidental costs relating to the provision, installation, and maintenance of items relating to this permit during project construction. Such incidental costs shall include:

- Preparing, updating, and changing the SWPPP
- Installation and maintenance of all structural and non-structural BMPs either identified in the SWPPP or specified by the City in the bid document,
- All clean-up and disposal costs associated with clean-up and repair following storm events and other runoff or releases on the project,
- Implementation and maintenance of other activities identified in the SWPPP (i.e. inspections, record keeping), and
- Preparation of the Notice of Intent and Notice of Termination.

**107.2.2 Air Quality Permit:**

(A) General Requirements: The Contractor shall comply with the Maricopa County Air Pollution Control Regulations, as revised July 6, 1993, governing construction activities. Under provisions of this regulation,

the Contractor shall be designated as permittee and shall be responsible for providing the necessary labor and materials, and for taking the appropriate measures, to assure compliance with the regulations. As the permittee, the Contractor is responsible for completing all documentation required by the regulation, including the following:

- (1) Application for Earth Moving Equipment Permits and Permits to Operate required by Rule 200 and Rule 310 of the above regulations.
- (2) Control Plan to prevent or minimize fugitive dust will be submitted with the completed Application for Permit.

Copies of permit applications and sample control plan formats may be obtained from the Maricopa County Environmental Management and Transportation Agency, Division of Air Pollution Control, 2406 South 24th Street, Suite 214, Phoenix, AZ 85034; telephone: 602-506-6700.

(B) Information Required for Inclusion in a Control Plan:

- (1) Name(s), address(es) and phone number(s) of person(s) responsible for the preparation and implementation of the Control Plan and responsible for the dust generating operations.
- (2) A plot plan of the site which describes:
  - (a) The total area of land surface to be disturbed and the total area of the entire project site, in acres;
  - (b) The operation(s) and activities to be carried out on the site;
  - (c) All actual and potential sources of fugitive dust emissions on the site;
  - (d) Delivery, transport and storage areas for the site, including types of materials stored and size of piles.
- (3) A description of:
  - (a) Reasonably available control measures or combination thereof to be applied during all periods of dust generating operations to each of the fugitive dust sources described on the plot plan. For each source identified at least one control measure must be implemented;
  - (b) Dust suppressants to be applied, including product specifications or label instructions for approved usage; the method, frequency and intensity of application; the type, number and capacity of application equipment; information on environmental impacts and approvals or certifications related to appropriate and safe use for ground applications;
  - (c) The specific surface treatment(s) and/or reasonably available control measures utilized to control material track-out and sedimentation where unpaved and/or access points join paved surfaces.
  - (d) For each fugitive dust source at least one auxiliary reasonably available control measure designated as a contingency measure shall be described in the original Control Plan. Should the original reasonable available control measure in the Control Plan prove ineffective, immediate, successful and effective implementation of the contingency measure shall obviate the requirement of submitting a revised Control Plan.

(C) Haul Trucks: The following requirements shall apply to the use and operation of any haul truck:

- (1) The cargo compartment of a haul truck shall be constructed and maintained so that no spillage or loss of bulk materials can occur from holes or other openings in the cargo compartment.
- (2) Any haul truck carrying bulk materials shall be properly loaded so that the freeboard is not less than three inches and be effectively covered with a tarp or other suitable enclosure in such a manner so as to prevent or minimize fugitive dust.
- (3) Any haul truck shall be cleaned or kept covered once emptied and/or between cargoes when the residual particulate matter remaining in the cargo space is capable of becoming fugitive dust.

(D) Submittals:

- (1) Preliminary copies of the Contractor's permit application and control plan shall be submitted to the Engineer at the time of the pre-construction conference. Any necessary revisions recommended by the Engineer will be made prior to submission to the County.
- (2) The Contractor shall submit the completed application and control plan to the County, at the above address, at least 48 hours prior to the projected start of construction.
- (3) Failure of the Contractor to obtain a signed Earth Moving Air Quality Permit from the County may result in delay of the start of construction. The Contractor shall submit a signed copy of the permit, with the control plan, to the Contract Administrator and maintain a copy in a conspicuous location at the construction site.

(E) Contractor's Responsibilities:

- (1) It is the Contractor's responsibility to apply Reasonably Available Control Measures (RACM) to all phases of construction activities to prevent or minimize the generation, emission, entrainment, suspension and/or airborne transport of fugitive dust. Typical RACM are identified in the Regulations, which may be obtained at the above address.
- (2) If the Contractor or Contract Administrator determines during construction activities that the initial control plan is inadequate, revisions to the plan will be made by the Contractor and submitted to the Engineer for approval.

(F) Payment: There shall be no separate payment made to the Contractor for material, labor, and other incidental costs relating to the provision, installation, and maintenance of items relating to this permit during project construction.

### **107.2.3 Marshalling Yard Permit:**

The Contractor is required to obtain a permit from the City when using vacant property to park and service equipment and store material for use on the Contract Agency construction contracts. This permit will conform to the requirements of MAG Subsection 107.6.1, including COS supplemental requirements.

*Modify the following subsections:*

**107.6.1 Contractor's Marshalling Yard:** *Add the following paragraphs before the first paragraph:*

The Contractor shall not store equipment, personal vehicles or materials within the right-of-way.

The Contractor shall obtain a permit from the City for marshalling areas they propose to use. Minimum requirements include the following:

**107.6.1.1 Contractor's Marshalling Yard when the Agency is the Contracting Party:** *Add the following paragraphs:*

(H) The Contractor shall notify adjacent property owners/residents of the proposed use.

(I) An appropriate distance from adjacent property will be set by the City on a case-by-case basis based on the size and type of equipment to be used on the project.

(J) A sight or sound barrier may be required if deemed necessary by the City.

**107.9 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE:** *Add the following paragraphs:*

All areas that are shown on the plans as Natural Area Open Space (NAOS) shall be staked and flagged prior to any grading activity. Inadvertently disturbed areas shall be revegetated with indigenous material in natural densities.

Native plants protected by City of Scottsdale Zoning Ordinance Sec. 7.500 shall not be disturbed without proper permit and approval. Protected native plants within the construction limits shall not be destroyed unless tagged with blue plastic tape in accordance with Chapter 46, Article V of the Scottsdale Revised Code.

The Contractor shall submit a revegetation and irrigation plan to the City Inspector within 14 days of the disturbance. Following City approval of the revegetation and irrigation plan, the Contractor shall repair the disturbed area within 14 days unless a time extension is granted by the Engineer.

**107.11 CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES:** *Add the following paragraphs:*

Existing in-service water valves, sewer manholes, or sewer clean-outs that are damaged during construction or are inaccessible due to construction shall be repaired or made accessible within seven (7) working days. If the deficiencies are not corrected within the prescribed time period, the necessary repairs will be affected by the City of Scottsdale at the expense of the Contractor.

The Contractor shall be responsible for the immediate repair and reporting of any damage to any traffic signal equipment. This shall include, but shall not be limited to, such items as: underground conduit, detectors, detector lead-in wiring, signal heads, signal poles, mast arms, cables, controller, and other signal-related equipment. Wire splicing will not be permitted. Modification of traffic signals for

construction shall require advance design and approval prior to the start of construction. All materials and installations shall conform to the latest Arizona Department of Transportation standard drawings and specifications for traffic signals, except as approved by the COS Traffic Engineering Director.

**SECTION 108  
COMMENCEMENT, PROSECUTION AND PROGRESS**

**108.2 SUBLETTING OF CONTRACT:** *Delete paragraph (E) and insert the following:*

- (E) On all City projects, the Contractor shall perform, with his own organization, work amounting to not less than 51% of the total contract cost.

**108.8 GUARANTEE AND WARRANTY PROVISIONS,** add the following:

The Contractor shall guarantee the irrigation work against defective workmanship and materials for a period of two years from the date of its final acceptance under the contract, ordinary wear and tear and unusual abuse or neglect excepted.

**PART 200 - EARTHWORK**

**SECTION 215  
EARTHWORK FOR OPEN CHANNELS**

**215.4 FILL AND BACKFILL:** *Delete the second sentence of the first paragraph and insert the following:*

However, stone, broken Portland cement concrete obtained from the project excavations will be permitted in the backfill or fill with the limitations as specified in MAG Section 211. Bituminous type pavement will not be permitted in backfill or fill.

## **PART 300 - STREETS AND RELATED WORK**

### **SECTION 321**

#### **PLACEMENT AND CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT**

##### **321.2 MATERIALS AND MANUFACTURE:** *Add the following paragraphs:*

All street sections without curb and gutter are required to have an Asphalt Pavement Safety Edge per Maricopa County Department of Transportation (McDOT) Standard Detail No. 2001 (dated 12/10).

Preservative seal on streets classified as residential and local collector shall be in accordance with MAG Section 718, Type D (polymer modified type B). Preservative seal shall be applied no earlier than 48 hours after completion of surface course paving, and no later than the end of the warranty period.

##### **321.4 APPLICATION OF TACK COAT:** *Modify the first paragraph to read as follows:*

A tack coat shall be applied to all existing and to each new course of asphalt concrete prior to the placing of a succeeding lift of asphalt concrete.

##### **321.5 MIX DESIGN:** *Delete the entire section and replace it with the following:*

All asphalt concrete pavement mix designs shall be on the East Valley Asphalt Committee's (EVAC) list of Approved Asphalt Mixes, latest edition, as posted at <http://www.scottsdaleaz.gov/streets> under "Qualified Products List for Street Construction".

##### **321.8.2 Joints:** *Modify the first and second paragraph to read as follows:*

Transverse joints, before a surface course is placed in contact with a cold transverse construction joint, the cold existing asphalt concrete shall be trimmed to a vertical face for its full depth exposing a fresh face. The fresh face shall be tack coated with two coats of emulsion as approved by the Engineer prior to placement of the new asphalt concrete. After placement and finishing the new asphalt concrete, both sides of the joint shall be dense and the joint shall be smooth and tight. The surface in the area of the joint shall not deviate more than ¼ inch from a 12-foot straightedge, when tested with the straightedge placed across the joint, parallel to the centerline.

Longitudinal joints of each asphalt course shall be staggered a minimum of 12 inches with relation to the longitudinal joint of the immediate underlying course's cold longitudinal construction joint. A tack coat shall be applied to all existing and to each new course of asphalt concrete prior to the placing of a succeeding lift of asphalt concrete.

##### **321.8.5 Smoothness:** *Delete the entire section and replace it with the following:*

The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section within the tolerances specified herein and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than one-fourth (¼) inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel or perpendicular to the centerline of the roadway. In addition to the smoothness requirements specified above, asphalt concrete pavement shall be true to the

grades shown or indicated on the plans and shall not vary more than 1/4-inch from the plan elevations.  
| Finish pavement grades adjacent to curbs shall be within 1/8-inch of the design elevation but in no case below the lip of the gutter.

**SECTION 336**  
**PAVEMENT MATCHING AND SURFACE REPLACEMENT**

**336.2.4.1 Permanent Pavement Replacement:** *Modify the ninth paragraph to read:*

The acceptable surface profile from the existing surface across a pavement replacement shall not vary more than ¼-inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel or perpendicular to the centerline of the roadway. When the width of the pavement replacement is greater than six (6) feet, compliance with the specification shall be measured by placing the straightedge a minimum of 4-feet overlapping the existing pavement. When the pavement replacement includes replacement of the roadway crown, the surface smoothness shall comply with requirements of Section 321.

**336.3 TYPES AND LOCATIONS OF PAVEMENT AND SURFACING REPLACEMENT**

*Add the following paragraph:*

The Contractor will be responsible to replace, at his own cost, any and all damaged pavement outside the pay limits, due to his construction activities on the project. This includes, but is not limited to, the replacement of newly cracked pavement, the replacement of existing cracked pavement where the cracks have been widened, the replacement of any chipped or missing pieces of pavement, and the replacement of any deformed pavement. The pavement will be sawcut at right angles to the roadway, to encompass the replacement areas.

**SECTION 340**  
**CONCRETE CURB, GUTTER, SIDEWALK, CURB RAMPS, DRIVEWAY**  
**AND ALLEY ENTRANCE**

**340.1 DESCRIPTION:** *Add the following sentence:*

All driveways, alley entrances and sidewalk ramps constructed in the City of Scottsdale shall be a minimum of 8 inches thick.

All sidewalks constructed adjacent to roll, ribbon, mountable curb or other curb which may be easily driven over, shall be a minimum of 5 inches thick.

All curb and sidewalk at curb returns shall be monolithically poured.

MAG Standard Detail 206, Concrete Scupper, shall be the basis of scupper construction unless prior approval is obtained from City staff.

**340.3 CONSTRUCTION METHODS:** *Is modified as follows:*

*Delete the last sentence of paragraph 10 and insert the following:*

Joints shall be constructed at all radius points, driveways, alley entrances, and at adjoining structures with a maximum interval of 50 feet between joints, and shall provide for complete separation of adjoining structures.

*Add the following paragraph between paragraphs 15 and 16 :*

Remove and replace any concrete that is broken, damaged, defective, or does not meet the requirements of this Section. Removal shall be from existing joint to existing joint. The assumed definition of damaged is any form of chip, spall, crack, defect or discoloration. During replacement, an additional piece of bituminous expansion joint material shall be placed along one side of the replacement piece, or at the City's discretion. Replacement shall be at no additional cost to the Contracting Agency. There will be no patching.

*Add the following paragraph between paragraphs 16 and 17 (Added text is highlighted.):*

In the event water is found ponded in the gutter to a depth greater than 1/2-inch, or on the adjacent asphalt pavement, the defect or defects shall be corrected in a manner acceptable to the Engineer without additional cost to the Contracting Agency.

**In addition to the straightedge requirements specified herein, all finish concrete elevations shall not deviate from the elevations shown on the plans, or indicated by typical sections or standard details referenced within the construction documents, by more than 1/4 inch as determined by the Engineer. Areas between elevations shown on the plans shall be straight graded or smoothly transitioned through a vertical curve in a manner approved by the Engineer or as otherwise indicated on the construction documents.**

**Sidewalk panels, all gutters, curbs, and aprons with cracks shall be replaced by the Contractor.**

Any section of the work deficient in depth or not conforming to the plans or specifications shall be removed and replaced by the Contractor at no additional cost to the Contracting Agency.

**340.5 MEASUREMENT:** *Delete the entire section and replace it with the following:*

Concrete curbs and gutters of the various types shown on the plans and in the proposal, will be measured along gutter flow line through inlets, catch basins, driveways, sidewalk ramps, etc., by the lineal foot to the nearest foot for each type, complete in place.

Concrete sidewalks, sidewalk ramps, driveways, alley intersections, valley gutters will be measured to the nearest square foot or as designated in the proposal complete in place. When concrete sidewalk, sidewalk ramps, driveways, alley intersections, valley gutters, and/or aprons are cut during trenching operations, the square foot measurement for payment will be in accordance with Section 336.

Detectable warnings shall not be measured for payment. Detectable warnings are considered integral to the walking surface that they form a part of and the cost is included in the related pay item.

**SECTION 342  
DECORATIVE PAVEMENT  
CONCRETE PAVEMENT STONE**

*MAG Section 342 DECORATIVE PAVEMENT CONCRETE PAVING STONE is deleted in its entirety and the following section substituted:*

**SECTION 342  
DECORATIVE PAVEMENT  
CONCRETE PAVING STONE**

**342.1 GENERAL:**

The Contractor shall furnish all the necessary labor, material, tools and equipment to complete the proper installation of the concrete pavers used in decorative pavement, medians or as otherwise noted in the Contract Documents. Pavers in cross walks shall not be installed. This includes furnishing a 10-foot straightedge to accomplish the level test specified for the finished decorative pavement.

The decorative pavement shall be true as to line and grade and installed to coincide and align with the adjacent work elevation. All edges shall be retained to secure the perimeter and sand laying course.

The Contractor shall construct a 5 feet x 5 feet square minimum sample area which will be inspected and approved by the Engineer prior to any other decorative pavement placement.

**342.2 MATERIALS:**

**342.2.1 Aggregate Base Course:** The ABC shall be aggregate base as per MAG Table 702.

**342.2.2 Concrete Header and Base Slab:** The header and base slab shall be Class A concrete as per MAG Section 725.

**342.2.3 Expansion Joint:** Expansion joint filler shall be premolded and comply with MAG Section 729 and ASTM D-1751.

**342.2.4 Sand Laying Course:** Shall be a concrete sand conforming to ASTM C-33 and meeting the following gradation.

<u>Sieve Size</u>	<u>3/8 inch</u>	<u>No. 4</u>	<u>No. 8</u>	<u>No. 100</u>	<u>No. 200</u>
% passing	100	93-100	61-100	1-12	0-7

**342.2.5 Concrete Pavers:** The concrete paver thickness shall be 3-1/8 inches (80 mm). Pavers shall be of an interlocking design conforming to ASTM C-936-82. Pavers shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. The pavers and materials used in their manufacture shall conform to the following:

(A) Compressive strength: Pavers shall have a minimum compressive strength of 8000 psi in accordance with ASTM C-140.

(B) Absorption: The average absorption shall not be greater than 5 percent, with no individual unit absorption greater than 7 percent.

(C) Cement - ASTM C-150 (Portland Cement).

(D) Aggregates: ASTM C-33 (washed, graded sand and rock, no expanded shale or lightweight aggregates).

(E) Other Constituents: Coloring pigments shall be applied integrally to the concrete. Air entraining admixtures, coloring pigments, integral water repellents, and finely ground silica shall be previously established as suitable for use in concrete and either shall conform to ASTM standards where applicable, or shall be shown by test or experience not to be detrimental to the concrete.

(F) The size, shape, design and color shall be as noted in the Contract Documents.

(G) The Contractor shall submit two samples of the whole paving stone to the Engineer for approval prior to any work.

(H) Length or width of units shall not differ by more than  $\pm 1/6$  inch ( $\pm 4.2$  mm) from approved samples. Heights of units shall not differ by more than  $\pm 1/8$  inch ( $\pm 3.2$  mm) from the specified standard dimension.

**342.2.6 Structural Metals:** Steel protection angles and bolts shall conform to the requirements of MAG Section 770.

**342.2.7 Reinforcing:** Welded wire fabric used as reinforcement in concrete shall conform to the requirements of MAG Subsection 727.3.

**342.2.8 Paint:** Paint color shall be Number 9 (Light Grey) and shall conform to the requirements of MAG Section 790.

### **342.3 CONSTRUCTION PROCEDURES:**

**342.3.1 Subgrade:** The subgrade shall be constructed true to grades and lines shown on the plans and compacted to a relative density of 95 percent as specified in MAG Section 301.

**342.3.2 Aggregate Base Course:** The aggregate base course shall be constructed true to grades and lines shown on the plans and compacted as specified in MAG Section 310. The surface of the ABC shall be tested with the 10 foot straightedge and shall not vary more than  $+1/8$  inch in 10 feet.

**342.3.3 Concrete Header and Base Slab:** The concrete header and base slab shall be of Class A concrete and reinforced with 6 x 6 inch wire mesh fabric (6 inches x 6 inches 1.4 x 1.4 WWF designation). Steel Protection Angles, L 3/8 inch x 3 inches x 3 inches shall be cast-in-place and set to final line and grade as indicated on the plans and shall not cross expansion or contraction joints.

Forms shall be thoroughly cleaned each time they are used, and shall be coated with a light oil, or other releasing agent of a type which will not discolor the concrete.

The concrete shall be thoroughly spaded away from the forms so that there will be no rock pockets next to the forms. The concrete may be compacted by mechanical vibrators approved by the Engineer. Tamping or vibrating shall continue until the mortar flushes to the surface, and the coarse aggregate is below the concrete surface.

All edges shall be shaped with a suitable tool so formed as to round the edges to a radius as indicated on the standard details.

The concrete header face form shall not be removed before the concrete has taken the initial set and has sufficient strength to carry its own weight. The concrete header outer form shall not be removed until the concrete has hardened sufficiently to prevent any damage to the concrete. Any portion of concrete damaged while stripping forms shall be repaired or if the damage is severe, replaced at no additional cost to the Contracting Agency. The face and top of the concrete header shall be tested with a 10-foot straightedge or curve template, longitudinally along the surface. Any deviation in excess of 1/4 inch shall be corrected at no additional cost to the Contracting Agency.

Any section of the work deficient in depth or not conforming to the plans or specifications shall be removed and replaced by the Contractor at no additional cost to the Contracting Agency.

Finishing and curing of the concrete shall be done in the manner specified in MAG Section 505.

**342.3.4 Expansion and Construction Joints:** Premolded 1/2" joint filler strips, ASTM D-1751 per MAG Sec. 729, shall be placed 1/2" below the surface of the concrete, the full width of the expansion joint. The remainder of all joints shall be filled to the surface of the concrete with a premium-grade, high-performance, moisture-cured, single-component, polyurethane-based, non-sag elastomeric sealant, ASTM C-920, Type S, Grade NS, Class 25; Sikaflex-1a or equal.

Joints shall be constructed in a straight line and vertical plane perpendicular to the longitudinal line of the concrete header, except in cases of curved alignment when they will be constructed along the radial lines of the header. They shall be constructed to the full depth and width of the concrete header and base slab. Pavers shall be placed continuously over the expansion joints.

**342.3.5 Contraction Joints:** Contraction joints shall be constructed in a straight line and vertical plane perpendicular to the longitudinal line of the concrete header, except in cases of curved alignment when they will be constructed along the radial lines of the header. They shall be constructed to a depth of 1 inch with rounded edges and placed at 10 foot intervals. Contraction Joints shall be filled to the surface of the surrounding concrete with elastomeric sealant specified in 342.3.4.

**342.3.6 Painting:** Protection Angles shall be painted on all surfaces not in contact with concrete with one prime coat, a second coat and a finish coat. All painting shall be done after steel is fabricated and prior to installation.

**342.3.7 Sand Laying Course:** The maximum thickness of the sand course shall be 1 inch. Screeding boards shall be used to ensure a uniform thickness. The sand shall not be compacted, walked on or wet down. The sand course shall be treated with a pre-emergent herbicide, such as Surflan, or equal. The application of the herbicide shall be made no earlier than 4 hours prior to actual placement of the decorative pavement.

**342.3.8 Concrete Pavers:** The concrete pavers shall be clean and free of foreign materials before installation. Paving work shall be plumb, level and true to line and grade and shall be installed to properly coincide and align with adjacent work and elevations. All edges must be retained to secure the perimeter pavers and the sand laying course. The pavers shall be laid in such a manner that the desired pattern is maintained and joints between the pavers are as tight as possible.

The Contractor shall lay the pavers starting from the longest straight line and from a true 90 degree corner. The pavers shall be installed hand-tight and level on the undisturbed sand course in a manner that eliminates gaps between the stones and the edge retention header. String lines shall be used to hold all pattern lines true. The gaps at the edge of the paver surface shall be filled with pavers cut to fit. Cutting shall be accomplished to leave a clean edge to the traffic surface using a masonry saw cut.

After the pavers are in place, they shall be vibrated into the sand laying course using a vibrator capable of 3,000 to 5,000 pounds compaction force. This will require two passes at 90 degrees to each other. After vibration, approximately 1/4-inch of clean masonry sand containing at least 30 percent of 1/8-inch particles shall be placed over the paver surface, allowed to dry, and vibrated into the joints with additional vibrator passes and brushing so as to completely fill joints. Excess sand shall be swept from the surface.

The finished paver surface shall be tested longitudinally and transverse to the concrete header or curb with a 10-foot straightedge along the surface. Any deviation in excess of 1/8 inch shall be corrected at no additional cost to the Contracting Agency.

Any broken or damaged pavers shall be removed and replaced. Replacement pavers shall be tamped into place and the joints filled with masonry sand as specified herein. The completed installation shall be cleaned of all debris, surplus material and equipment.

**342.4 MEASUREMENT AND PAYMENT:**

Measurement will be by the square foot. Payment will be made at the unit bid price per square foot. This payment shall be full compensation for all labor, materials, tools and equipment required to complete the work for the concrete pavers, headers and base materials described herein and indicated in the standard details and contract documents.

**SECTION 343  
 EXPOSED AGGREGATE PAVING & ASPHALT PRINT PAVING**

*Add the following paragraphs to this section:*

**343.5 ASPHALT PRINT PAVING GENERAL**

The Contractor shall furnish all the necessary labor, material, tools, and equipment to complete the proper installation of the asphalt print paving used in decorative pavement, cross-walks, medians or as otherwise noted in the Contract Documents. This includes furnishing a 10-foot straight edge to accomplish the level test specified for the finished decorative pavement.

**343.6 MATERIALS:**

**343.6.1 Aggregate Base Course:** The ABC shall be aggregate base as per MAG Table 702.

**343.6.2 Asphalt Concrete Pavement:** Asphalt concrete pavements shall be MAG 321 and as specified in the Contract Documents.

**343.6.3 StreetBond Traffic Formula or approved alternate**

Characteristics	Test specification	Standard
Solids by volume (%)	ASTM D5201	53±3%
Solids by Weight (%)	ASTM D1351	75.5±2%
Density (lbs/gal)	ASTM D1475	14.6±0.2 (1.75 gr/l)
Flash Point	ASTM D3278	>200 <sup>0</sup> F (93 <sup>0</sup> C)
Percent Pigment (by weight Including cement)	ASTM D3723	62±2%
Sheen (85 <sup>0</sup> F)	ASTM D523	<3@85 <sup>0</sup> F

**343.6.4 StreetBond Sealer or approved alternate**

Characteristics	Test specification	Standard
Solids by volume (%)	ASTM D5201	24±3%
Solids by Weight (%)	ASTM D1353	27±2%
Density (lbs/gal)	ASTM D1475	8.59
Specific Gravity	ASTM D1475	1.03
Flash Point	ASTM D3278	>200 <sup>0</sup> F (93 <sup>0</sup> C)
VOC Coating	ASTM D3960	>200
Sheen (85 <sup>0</sup> F)	ASTM D523	>75@85 <sup>0</sup> F

**343.6.4 StreetBond Surfacing System or approved alternate**

Characteristics	Test specification	Standard
Tensile Strength	ASTM D412	>650 psi
Flexibility Mandrel (High)	ASTM D1737	Pass 1" @ 70 <sup>0</sup> F
Flexible Mandrel (Low)	ASTM D1737	Pass 2" @ 70 <sup>0</sup> F
Dry Time (to recoat)	ASTM D711	20 mins-4 hours
Dry Time (for Traffic)(75 <sup>0</sup> F/30%RH)	NA	≅80% Strength @6-8 hrs
Taber Abrasion (H-10)	ASTM D4060	<0.18 gr/1000 cycles

Adhesion (PLI) to an Asphalt Substrate	ASTM D4650	Cohesive failure of asphalt prior to adhesive failure
QUVΔE	ASTM G53	300 hours 2.35 CIE units
Hydrophobicity (3 Days)	ASTM D570	<12% wt. Gain
Shore Hardness	ASTM D 2240	80 D
Temperature Limits for Service	Dry, cured material	-30 <sup>0</sup> F to 160 <sup>0</sup> F
Surface Build	NA	20-25 mils (2 applications)
Color		Terracotta or as per plans

**343.7 CONSTRUCTION PROCEDURES**

**343.7.1 Surface Imprinting:** The contractor shall follow procedures detailed in the latest revision of StreetPrint Application Procedures as issued or as provided by the manufacturer of the approved alternate. The pattern shall be as shown on the Plans or as approved by the Engineer. Patterning shall begin once the asphalt has reached its final density and while there is still sufficient heat in the asphalt to permit imprinting. Patterning shall be achieved using steel rollers and/or vibratory plates and shall be of consistent depth. Maximum stamping depth shall be ½-inch.

**343.7.2 StreetBond Surfacing Systems or approved alternate:** Two applications of the StreetBond Traffic Formula in the color as indicated on the plans or approved by the Engineer shall be used. StreetBond Sealer or approved alternate shall be applied over the StreetBond Traffic Formula or approved alternate.

**343.7.2 Application of Asphalt Printing Paving:** The StreetBond Traffic Formula and StreetBond Sealer shall not be applied in temperatures below 45 °F and rising, or when precipitation can be expected within 24 hours. Installation shall be in accordance with the latest revision of the manufacturer’s procedures. The StreetBond Traffic Formula product shall be spray applied and broomed using a broom or brushes to cut in small areas where required. Once the StreetBond Traffic Formula products are fully dried, StreetBond Sealer shall be applied as a curing membrane. StreetBond Sealer shall be tinted using the resin from the StreetBond Traffic Formula product, spray applied and broomed into the surface. Care shall be taken to ensure that the entire surface is covered, including the imprinted surfaces. Sufficient masking shall be used to ensure that the surfacing products are applied only where specified. Maximum reheating of asphalt shall be 200 degrees F.

**343.8 MEASUREMENT AND PAYMENT:** This item will be measured and paid for at the contract price bid per square foot of Asphalt Printing Pavement. This bid price shall include all associated items of work involved in the asphalt printing pavement process.

**SECTION 345**  
**ADJUSTING FRAMES, COVERS, VALVE BOXES, METER BOXES**  
**AND PULL BOXES**

**345.3 ADJUSTING FRAMES:** *Add the following paragraphs:*

Manholes, monuments, valve boxes, and catch basins shall be adjusted to finished grade upon completion of paving, including slurry seals or related improvements in accordance with the following requirements:

Within paved areas, if the final grade of any surface treatment is more than 3/8" above or below the existing frame, cover, or grate, it shall be adjusted to match the final grade per COS Standard Detail No. 2270.

Manholes and valve boxes outside of paved areas shall be adjusted to 2 inches above finished grade and shall have a concrete collar per COS Standard Detail No. 2270.

Catch basins outside of paved area shall be adjusted so that ponding does not occur.

Monuments and brass caps shall be adjusted per COS Supplemental Specification Section 405 and COS Standard Detail 2120.

Manholes, monuments, valve boxes, and catch basins requiring adjustment and showing defects such as rocking lids, cracks, or missing material shall be replaced by the contractor.

Access frames and covers for curb opening catch basins shall be round per MAG 536-2.

When adjusting manhole frames, no more than 3 adjusting rings shall be permitted on the finished manhole riser. Bricks shall not be permitted as a material for adjusting rings.

**345.4 ADJUSTING VALVE BOXES:** *Add the following paragraph:*

All valve boxes shall be adjusted to finished grade upon completion of paving, including slurry seals or related improvements in accordance with the following requirements:

- (A) All valve boxes that will be within a pavement area when construction is completed shall have a pentagonally-bolted lid per MAG Standard Detail No. 391-1, Type "C" and a concrete collar per COS Standard Detail No. 2270. Any existing type "A" or type "B" boxes within these areas must be replaced with type "C" boxes.
- (B) Existing type "A" or type "B" valve boxes may remain within areas that will be outside of any pavement area when construction is completed, but must be adjusted to finished grade with a concrete collar per COS Standard Detail 2270.

**SECTION 350**  
**REMOVAL OF EXISTING IMPROVEMENTS**

**350.2 CONSTRUCTION METHODS:** *Add the following paragraphs:*

When roadway construction requires the removal or the revision of existing pavement striping or marking including adhesive from raised pavement markers (RPMs), it shall be the Contractor's responsibility to remove existing pavement striping or marking using diamond grinding. After removal, all area affected by the removal shall be resealed with a quick setting asphalt emulsion. Obliteration of pavement striping or marking will be allowed only when Type II slurry seal per MAG Section 332 is indicated in the contract documents or with written approval of the COS Traffic Engineering Division.

**350.4 PAYMENT:** *Add the following paragraphs:*

Removal or obliteration of pavement striping and marking shall be measured and paid as described herein. Striping will be in linear feet of equivalent four (4) inch wide stripes, excluding lengths of skips. Removal of pavement arrow, symbol or legend markings and RPMs will be measured each, or as designated in the bid schedule.

**SECTION 360**  
**TELECOMMUNICATIONS\_INSTALLATION**

**360.1 DESCRIPTION:** *Add the following paragraph:*

All telecommunications facilities and non-municipal utilities placed within public rights-of-way shall bear an identification plaque bearing the company name, address and phone number of the facility owner. The plaque shall be stamped or engraved with letters 1/8" minimum in height. The identification plaque shall be aluminum, stainless steel or other non-corrosive metal. The plaque shall be permanently attached with stainless steel screws or rivets. The plaque shall be visibly placed on the top or as near as practicable to the top of the facility (cabinet, junction box, etc.)

SAMPLE:

FOR QUESTIONS REGARDING THIS FACILITY  
PLEASE CONTACT:

NETLINK  
3930 E. WATKINS RD, SUITE 200  
PHOENIX, AZ 85034

## **PART 400 - RIGHT-OF-WAY AND TRAFFIC CONTROL**

### **SECTION 401 TRAFFIC CONTROL**

**401.5(A) ON BOND ISSUE AND BUDGET PROJECTS:** *Delete in its entirety.*

**401.5(B) ON IMPROVEMENT DISTRICT PROJECTS:** *Delete the subsection designation "(B) On Improvement District Projects" and delete the first paragraph which reads: "All existing traffic lanes on major streets ... unless otherwise specified in the special provisions."*

*Delete the seventh paragraph which reads: "The Traffic Engineering Department will reset all STOP, YIELD, and street name signs to permanent locations."*

*Combine the remaining paragraphs of 401.5(B) into the main body of 401.5 and add the following paragraphs:*

No work requiring the closure of arterial or collector traffic lanes shall be done between the hours of 7:00 A.M. to 9:00 A.M. and 4:00 P.M. to 6:00 P.M.. The roadway must be completely unobstructed during these hours. At other times, a minimum of one lane of traffic for each direction of travel shall remain open. All signs must be turned or removed from driver's sight when work is not being accomplished within the roadway. Any exceptions to this must be approved in advance, in writing, by the COS Transportation General Manager or his Designee.

Traffic control shall conform to the latest City of Phoenix Traffic Barricade Manual and/or as directed by the COS Traffic Engineering Division, COS Inspection Services, or MUTCD Manual.

A barricading plan shall be submitted to COS Inspection Services a minimum of 72 hours prior to any proposed partial or complete street closure. Work shall not commence on the portion of the project requiring street barricading until approval has been obtained in writing from both COS Inspection Services and Traffic Engineering Division.

Arrow panels are required during all barricade setups on roadways with posted speeds of 35mph or greater.

Uniformed off-duty law enforcement officers or flaggers, depending on the situation, are required where equipment is intermittently blocking or crossing a traffic lane, or where only one lane of traffic is available for two directions of travel or as directed by the Engineer.

Uniformed off-duty law enforcement officers require a minimum 72 hours notice prior to commencement of their service. Uniform off-duty law enforcement officers shall be used by the Contractor as directed by the Engineer, or when one or more of the following conditions are met:

- (A) Construction activities occur within 300 feet of a signalized intersection.
- (B) Turn restrictions are in place at signalized intersections.
- (C) At signalized intersections or the intersection of two major streets when two-way traffic is utilizing one side of a divided roadway.
- (D) Manual control of more than one lane or more than one approach is needed.

The Contractor shall use City of Scottsdale uniformed off-duty law enforcement officers whenever possible. If Scottsdale officers are not available, uniformed law enforcement officers from local agencies may be used in their place. The officers shall be knowledgeable of City of Scottsdale traffic control systems and their manual use. Whenever manual control of a traffic signal is anticipated or required the Contractor shall notify the Traffic Management Center at (480) 312-4325. A key for the traffic signal cabinet along with any special instruction shall be obtained from Field Services, 9191 E. San Salvador (480) 312-5620.

When the Contractor is utilizing the services of a uniformed off-duty law enforcement officer as required in this section, the officer shall:

- 1) Perform in a manner that favorably reflects on the City of Scottsdale.
- 2) Be actively working to control traffic within and around the intersection at all times while work is commencing.
- 3) When necessary, manually operate the signals in a safe and efficient manner that benefits pedestrians, vehicular traffic, and the Contractor.
- 4) Position themselves to have access to the traffic signal cabinet and maintain a full view of all approaching traffic and construction activities.

If at any time it is found that the officer is not performing these duties, the City of Scottsdale reserves the right to immediately shut down the project for the remainder of the day. If the work is shut down for this reason, the Contractor will not be compensated for any loss, nor shall any time extension be granted as a result of the shut down.

*Add the following section:*

**SECTION 402  
PAVEMENT MARKINGS AND SIGNING**

**402.1 GENERAL:**

The work under this item will provide the final striping and marking of all pavements and the installation of traffic control signs as described herein in accordance with COS Standard Details and as shown on the plans.

Any striping other than the replacement of pre-existing striping shall be done in accordance with a plan prepared by a registered Engineer and approved by COS Traffic Engineering.

All construction shall conform to Arizona Department of Transportation standard drawings and specifications unless otherwise specified in COS Standard Details, the "Manual on Uniform Traffic Control Devices (MUTCD)", latest edition, or as otherwise specified in the contract documents.

The requirements of the MUTCD apply to privately owned facilities where the public is able to travel without restrictions.

Prior to the installation of any permanent pavement markings the contractor shall be responsible for scheduling an on-site meeting with the COS Traffic Engineering Department to review pavement layout guide markings. The contractor's request for review of pavement layout guide markings shall be made no less than 48 hours in advance of the requested meeting time. Approval and sign-off of pavement layout guide markings by a COS Traffic Engineering representative must be obtained by the contractor prior to the installations of any permanent pavement markings.

**402.2 PAVEMENT MARKINGS:**

Permanent lane striping shall be 90 mil. extruded thermoplastic material, conforming to all requirements of ADOT Standard Specifications Section 704, latest edition. Crosswalks and stop lines shall be 90 mil extruded hot thermoplastic material conforming to ADOT Standard Specifications Section 704.

The actual width of the stripe shall be:

<u>Plan Width</u>	<u>Actual Width</u>
4 inches	4 to 4.5 inches
6 inches	6 to 6.5 inches
8 inches	8 to 9 inches
over 8 inches	+/- 1 inch

Pavement symbols, arrows and legends shall be preformed markings, Type I (Permanent) pavement tape conforming to all requirements of ADOT Standard Specifications Section 705, latest edition, unless noted otherwise on the plans. Tape shall meet or exceed the specifications of 3M 380-IES series and shall in addition meet or exceed applicable ADOT Specifications.

Painting shall be provided on all median noses and at temporary pavement marking locations where indicated on the plans and standard details. Reflectorized paint materials shall be white or yellow as noted and shall meet ADOT Standard Specifications Section 708. Glass beads shall be applied to all painted surfaces.

Raised pavement markers shall conform to requirements of ADOT Standard Specifications Section 706, latest edition.

Obliteration of any existing pavement markings required for new work shall be accomplished per COS Supplemental Specification Subsection 350.2.

#### **402.2.1 Measurement And Payment:**

Pavement striping and markings shall be measured and paid as described in the ADOT specifications. Striping will be in linear feet of equivalent four (4) inch wide stripes, excluding lengths of skips. Pavement symbols, arrows, legends and pavement markers will be measured each, as designated in the bid schedule. Costs for temporary markings and signs are not included in this item but will be included in the bid price for traffic control.

#### **402.3 SIGNING:**

**Sign Sheeting:** ASTM Type IV sheeting (minimum) shall be used for all warning, regulatory and street name signs. All advance street name and metro signs shall be proposed Type XI sheeting. School signs and their accompanying placards must be ASTM proposed Type XI fluorescent yellow green sheeting. Background and legends shall both meet Federal Highway Administration Standards. All sign sheeting shall carry a Manufacturer's guarantee not to lose more than 20 percent of initial reflectivity by the end of a 10-year period. If call for on plans to provide a anti graffiti overlay film, 3M 1160 or equivalent shall be used.

**Sign blanks:** Shall be chemically treated anodized aluminum and meet ASTM B449 specification for corrosion resistance. Sign blank thickness shall be 0.080, 0.091 (extruded) or 0.125 gauge in accordance with COS standard details.

**Typestyle:** Clearview Highway font shall be used on all signs. All text shall be properly centered on a sign blank in accordance with COS standard details.

**Sign Installation and Mounting:** Sign installations shall be made in a high quality manner. All signs shall be level within 2 degrees. Sign posts shall be perpendicular to level plus or minus 2 degrees. All traffic signs shown on the plans to be installed after the roadway improvements are completed and shall be mounted on square tubular sign posts as specified herein when existing street light poles cannot be used, due to spacing or lack thereof. Signs mounted on square tubular sign posts shall be secured to each post with a minimum of 2 each zinc plated 3/8-inch steel drive and flat washers. Signs mounted to street light poles and traffic signal poles shall be secured with a minimum of 2 each 3/4- inch type 201 stainless steel bands, brackets, bolts and washers. Sign mounting heights and offset from edge of roadway shall be in accordance with the MUTCD (Manual on Uniform Traffic Control Devices.)

**Workmanship:** All items shall be new; the material and workmanship shall be of the best quality for the purpose. The appearance of the sign face shall be uniform throughout and shall be free of wrinkles, gel,

hard spots, streaks, extrusion marks, air bubbles or blemishes that may impair the serviceability, detract from the general appearance or color-matching of the sign when viewed from a distance of twenty-five (25) feet. The finished sign shall be clean and free from all burrs, sharp edges and aluminum marks. Signs with any defects or damage that affect their appearance and serviceability will not be acceptable. No repairs shall be made to the sign face without the approval of the COS inspector.

**Sign Salvaging:** All existing signs shall be inventoried prior to roadway work. Signs which are not reused shall remain the property of the City and will be carefully removed and delivered to the COS Sign Shop at 9191 E. San Salvador Drive. The Contractor shall remove any existing concrete bases using care not to damage the post. Any signs that will be used at project completion shall be stored safely and protected against damage at the Contractor's job site and shall be leveled, squared and set in ground in accordance with COS anchoring specifications and in accordance with MUTCD height and offset specifications.

#### **402.3.1 Steel Square Tubular Sign Post Assembly:**

Sign posts shall be prepunched square tubing. The sign post assembly shall consist of the post (1-3/4 inch x 1-3/4 inch square tubing, length per sign type according to MUTCD), sleeve (2-1/4 inch x 2-1/4 inch x 12 inches long square tubing) and anchor (2 inch x 2 inch x 36 inches long square tubing).

(A) Material: Tubing shall be roll formed of 12 gauge steel or of a gauge sufficient to supply a minimum yield strength of 40,000 psi. Tubing shall conform to the Standard Specifications for Cold-Rolled Carbon Steel sheets, commercial quality, ASTM A-570, Grade 33 for plain finish, and ASTM A-446, Grade A for galvanized finish.

(B) Finish:

(1) Galvanized: All steel tubing shall be given a hot dipped zinc (galvanized) coating conforming to ASTM A-525, G-90. All exterior, interior, and corner weld surfaces shall be thoroughly coated.

(2) Painted: Galvanized tubing shall be cleaned and phosphated prior to application of a powder coat finish. The tubing shall be coated with polyester powder bake/fused or electrodeposited to the galvanized surface. The color is Perma-Green per Federal Standard 595-A, color number 14109 (dark limit V).

(C) Shape: A cross section of the post shall be a square tube carefully rolled to size. Tubing shall be corner welded by high intensity resistance welding, in such a manner that neither the weld nor flash shall interfere with telescoping properties.

(D) Holes or Knockouts: Hole or knockout diameter shall be 7/16-inch plus or minus 1/64-inch on 1 inch centers, on all 4 sides of the post for its entire length. Holes or knockouts shall be on the center line of each side in true alignment and placed opposite and adjacent to each other. Tolerance on hole or knockout spacing is plus or minus 1/8-inch in 4 feet. The sleeve and post tubing shall have the first two sets of knock outs pre-punched on one end.

(E) Telescoping Properties: The finished post, sleeve and anchor shall be straight and have a smooth uniform finish. It shall be possible to telescope the post with each consecutive larger and smaller size of square tube, freely and for not less than 10 feet of their length without the necessity of matching any particular face to any other face. All ends shall be free from burrs and shall be cut square.

(F) Anchor/Sleeve Installation: The Contractor shall install the anchor/sleeve by driving with a pneumatic hammer.

(1) Pneumatic Hammer: The sign anchor and sleeve may be installed with a pneumatic hammer. The Contractor shall exercise extreme care to prevent deformation of the anchor tubing during installation. The sign post must be able to slide freely in and out of the anchor once it is in place.

#### **402.3.2 Advance Street Name Signs:**

(A) Material:

(1) ASTM proposed Type XI reflective sheeting shall be used. Background color of sign shall be green and the legend color shall be white. Sheeting shall carry a Manufactures' guarantee not to lose more than 20 percent of initial reflectivity by the end of a 10-year period.

(2) Sign imaging shall be created by applying an electronic cuttable translucent acrylic overlay film to the base reflective sheeting. Vinyl EC films are not acceptable. Screen printing with FHWA approved graffiti resistant inks may be used to create imaging. All Manufactures' requirements for matched components compatibility shall be strictly adhered to.

(3) Sign blanks shall be 0.080 gauge chemically treated aluminum. The sign width shall be a standard 18 inches. The sign length shall be variable and sized according to legend. The minimum length shall be 42 inches and maximum length shall be 72 inches.

(B) Sign Fabrication:

(1) All letters and numerals shall be Clearview Highway 2-W. The first letter in each name shall be 8-inch upper case. All other letters shall be 6-inch lower case. In the event that a street name length will not fit on the maximum 72-inch blank, the letters shall be changed to Clearview Highway 1-W. The street designation such as, Road, Street, etc., shall be abbreviated and may be down sized to a minimum of 4 inches. These adjustments are to be made only when the street name is of such length that it will not fit on a 72-inch blank.

(2) All street names shall be properly centered on a sign blank.

(C) Sign Installation:

(1) Sign installations shall be made in a high quality manner. All signs shall be level within 2 degrees. Sign poles shall be perpendicular to level plus or minus 2 degrees. Signs shall be installed at a height of 4 feet to the bottom of the sign.

(2) All signs shall be secured to each pole with no less than 4 each 3/8-inch steel drive rivets.

(3) Signs over 60 inches in length will require 3 sign posts, equally spaced and centered on the sign.

(4) All signs must be clean and free of any contaminant upon completion of installation.

(5) The Engineer shall designate all sign locations, away from trees and other vegetation that may obstruct visibility. Advance street name signs shall be placed in raised center medians when available. If raised center medians are not present advance street name signs shall be placed on the right hand side of the roadway.

#### **402.3.3 Street Name Signs:**

##### **(A) Materials:**

(1) ASTM Type IV reflective sheeting shall be used. Background color of sign shall be green and the legend color shall be white. Sheeting shall carry a Manufactures' guarantee not to lose more than 20 percent of initial reflectivity by the end of a 10-year period.

(2) Sign imaging shall be created by applying an electronic cuttable translucent acrylic overlay film to the base reflective sheeting. Vinyl EC films are not acceptable. Screen printing with FHWA approved graffiti resistant inks may be used to create imaging. All Manufactures' requirements for matched components compatibility shall be strictly adhered to.

(3) Sign blanks shall be 9 inch 0.091 gauge extruded chemically treated aluminum for street name sign detail No.2134-1.

(4) Sign blanks shall be 12 inch 0.125 gauge flat chemically treated aluminum for street name sign detail No.2134-2.

##### **(B) Sign Fabrication:**

(1) All letters and numerals shall be Clearview Highway 2-W. All text shall be properly centered on the sign blank in accordance with COS standard details. Sign layout shall be in accordance with COS details 2134-1, 2134-2.

##### **(C) Sign Installation:**

(1) Sign installations shall be made in a high quality manner. All signs shall be level within 2 degrees. Sign poles shall be perpendicular to level plus or minus 2 degrees.

(2) All signs shall be secured to each pole with 1-3/4 inch cast aluminum square caps, tees and crosses secured with 5/16 inch set screws.

(3) All signs must be clean and free of any contaminant upon completion of installation.

(4) The Engineer shall designate all sign locations, away from trees and other vegetation that may obstruct visibility.

#### **402.3.4 Metro Street Signs**

##### **(A) Materials:**

(1) ASTM proposed Type XI reflective sheeting shall be used. Background color of sign shall be green and the legend color shall be white. Sheeting shall carry a Manufactures' guarantee not to lose more than 20 percent of initial reflectivity by the end of a 10-year period.

(2) Sign imaging shall be created by applying an electronic cuttable translucent acrylic overlay film to the base reflective sheeting. Vinyl EC films are not acceptable. Screen printing with FHWA approved graffiti resistant inks may be used to create imaging. All Manufactures' requirements for matched components compatibility shall be strictly adhered to

(3) Sign blanks shall be 0.125 gauge chemically treated aluminum. The sign width shall be a standard 24 inches. The sign length shall be variable and sized according to legend. The minimum length shall be 60 inches and maximum length shall be 84 inches. In limited cases, the use of 18 inch width sign blanks may be permitted when approved in writing by a COS Traffic Operations Sign & Markings Department Representative. The use of 18 inch sign blanks are reserved for use in identifying smaller residential streets and private driveways or if mast arm size and weight restrictions will not support 24 inch sign blanks. The 18 inch width sign blank shall be .125 gauge chemically treated aluminum and vary in length according to sign legend. The minimum length shall be 48 inches and maximum length shall be 72 inches.

(B) Sign Fabrication:

(1) All letters and numerals shall be Clearview Highway 3-W. The first letter in each name shall be 10-inch upper and lower case. All other letters shall be 6-inch lower case. In the event that a street name length will not fit on the maximum 84-inch blank, the letters shall be changed to Clearview Highway 2-W. The street designation such as, Road, Street, etc., shall be abbreviated and may be down sized to a minimum of 5 inches. These adjustments are to be made only when the street name is of such length that it will not fit on an 84-inch blank. Sign layout shall be in accordance with COS details No.2134-3 and 2134-4.

(C) Metro Sign Installation:

(1) The contactor shall be responsible for providing and installing all overhead signs including Regulatory, Warning, Information and Metro Street name signs on traffic signal poles and mast arms.

(2) The COS Traffic Operations Division shall be responsible for providing the contractor with mast arm mounting brackets used in the installment of 24 inch free-swinging overhead Metro Street Name signs. The contractor shall be responsible for supplying all required  $\frac{3}{4}$ -inch type 201stainless steel band and stainless steel hardware used in the attachment of signs and brackets to traffic signal poles and street lights. The 24-inch metro signs require 2 separate bands for each bracket attachment. The 18-inch metro signs shall be attached using a minimum of 3 evenly spaced bands along the length of the sign. The 2 outer bands shall be placed no more than 1 foot in from the sign edges.

For approved equals and further material specification details, please call the COS Traffic Operations Signs & Markings Department at 480-312-5623 or 480-312-5646.

For questions on site plans or to schedule field review of pavement marking layout prior to installation, please call the COS Traffic Engineering Department at 480-312-7696.

**402.3.5 Measurement and Payment:**

All signing will be measured as the total square footage of reflective signing material and linear footage of square tubular steel sign post material. Sign mounting hardware shall be included in the square foot price of the sign. Sign anchor/sleeve assemblies will be measured as each. Each assembly will be considered to include a single anchor and a single sleeve.

Metro street signing will be measured as a complete assembly, including all mounting hardware, for each sign installed as described herein.

Payment for signing will be at the unit costs as indicated in the bid schedule and will be considered full compensation for the work as described herein and as shown on the plans.

*Add the following section:*

**SECTION 403  
TRAFFIC SIGNALIZATION**

**403.1 DESCRIPTION:**

This specification describes the general requirements for traffic signal equipment to be installed within, or supplied to, the City of Scottsdale.

**403.2 GENERAL REQUIREMENTS:**

(A) All traffic signals and lighting equipment shall conform to the following documents, where applicable, in addition to meeting the requirements of this specification:

- Arizona Department of Transportation, Standard Specifications for Road and Bridge Construction: Latest revision
- Arizona Department of Transportation, Traffic Signals and Lighting, Standard Drawings: Latest revision
- California Department of Transportation, Traffic Signal Control Equipment Specifications: Latest revision
- International Municipal Signal Association (IMSA), Wire and Cable Specifications: Latest revision
- National Electrical Manufacturers Association, Traffic Control Systems, Standards Publications: Latest revision
- U.S.D.O.T. / F.H.W.A., Manual on Uniform Traffic Control Devices: Latest revision
- American Association of State Highway and Transportation Officials, Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals: Latest revision
- U.S.D.O.T. / F.H.W.A., Type 170 Traffic Signal Controller System - Hardware Specification: 1978
- COS Design Standards and Policies Manual, Latest edition.
- COS Traffic Signal Special Requirements Manual, Latest edition.
- COS Traffic Engineering Division Qualified Products List, Latest version.

(B) All traffic signal poles with pedestrian push button assemblies shall be wheel chair accessible. A four (4) foot wide concrete access ramp and landing per A.D.A. requirements shall be provided to poles which are not placed immediately adjacent to sidewalks. Pedestrian push button assemblies shall be mounted no higher than 42" above the adjacent sidewalk or ramp elevation. All pedestrian push buttons shall be A.D.A. compliant.

(C) Personnel Requirement and Notification: All traffic signal construction must be staffed with two or more IMSA Level II Traffic Signal Technicians during all wiring and/or turn on phases of construction or one ISMA Level II Technician and one ISMA Level I Technician at the discretion of the COS Traffic Signal Manager. Prior to the start of construction, written proof of technician certification must be delivered to the COS Traffic Signal Manager along with company name, contact name, phone number, job location and estimated start date. The COS Traffic Signal Section can be reached by phone at (480)312-5637, by FAX at (480)312-5539, or by mail at 9191 E. San Salvador, Scottsdale, AZ 85258.

(D) Inspection Request Notification: In addition to normal inspection request procedures, the Contractor must FAX an inspection request to the COS Traffic Signal Manager at least 3 working days prior to the completion of each of the following inspection points:

- 1) Pre-Construction Conference
- 2) Concrete pour
- 3) Backfill of conduit runs
- 4) Pole run and/or underground wire pulls
- 5) Cabinet installation and wiring
- 6) Signal turn-on

FAXed inspection request shall contain all information stated in section 403.2(C) except proof of technician certification. Information shall be FAXed using COS Inspection Request Form which can be found at the COS Internet website below.

COS Traffic Signal Special Requirements Manual, Latest Edition can be obtained from the COS Signal Supervisor or can be found on the COS Internet website at <http://www.scottsdaleaz.gov/Design/TrafficSignalSpecs/>. This manual should be reviewed prior to beginning any signal construction and will help signal contractors to avoid rework.

(E) PEDESTRIAN SIGNALS

- a. Contractors building signals in high pedestrian areas of Scottsdale shall install audio crosswalk devices into pedestrian units. Audible indications shall be “Cuckoo” for North-South 800 Hz & 1200 Hz repeating approximately every 1.5 seconds and “Chirp” for East-West 2000 Hz which repeats approximately every one-second. Devices shall be wired to the “WALK” indication.
- b. Pedestrian signals shall be “LED”, 9-inches in height, have bottom hinges, and consist of the international “man/hand” symbol.

(F) ELECTRIC SERVICE CABINETS

- a. All electrical service cabinets must meet APS and SRP requirements and must include Photocell Eye, Luminaire contactor and Auto/Test switch. All cabinets shall have detachable base and match existing COS cabinets.
- b. The electric service cabinet shall be “MEYERS” model MEUGL-W/TB or approved equivalent. The service address shall be permanently attached to the electric service cabinet. Electric service shall include photocell eye, luminaire contactor, and auto/test switch.

(G) CONTROLLER CABINET AND CONTROLLER UNIT

- a. The controller unit shall be model ASC/3 RM and shall be compliant with the cabinet currently installed and operational in the City.
- b. The controller unit shall have state-of-the-art manufacturing and design for reliability, maintainability, and cost-effectiveness.
- c. The controller unit shall support advanced controller, coordinator, and preemptor features
- d. The controller unit shall Ethernet support for 100 Base T networks.
- e. The controller unit shall have a 16 x 40 LCD display with adjustable contrast.
- f. The controller software shall support for *Centracs*<sup>™</sup>, *icons*<sup>®</sup>, *Aries*<sup>®</sup>, and any NTCIP 1202 compliant applications.

- g. The controller software, database, and upgrades shall be easily downloaded from a laptop
- h. The controller unit shall support a user-programmable default database
- i. The controller unit shall have a Data key for backup and restore capabilities
- j. The controller shall provide an updated rack mount hardware design that allows it to serve as the traffic control platform for present and future traffic management environments. This shall be accomplished through Caltrans C1 platform (33x type cabinet compatibility) or NEMA SDLC connectivity and NTCIP communications compliance.
- k. All firmware in the controller unit shall be stored in flash memory. This allows for quick and easy software updates in the field without changing hardware. The controller's firmware shall be easily updated in the background while the intersection remains in operation. Once updated, the controller only needs to be power-cycled to allow the new firmware to take control.
- l. The majority of the electronic components of the controller unit shall be contained on one easy-to-replace module.
- m. The controller unit shall use a 16 lines x 40 characters Liquid Crystal Display LCD module. In addition, a display heater shall be supplied that enhances the display performance in temperatures below 0° F (-18° C).
- n. The controller unit shall support the Caltrans C1/C11 cabinet interface. It shall provide compatibility to all standard Caltrans 332/336 configurations, but can also be configured for any Caltrans 33x (i.e. 303, 330, etc.) controller cabinets using the ASC/3 I/O Configurator (Mapper Utility). The Caltrans specified C11 connector is also mapped to provide 8 phase red outputs and 20 vehicle detector inputs. The controller unit *shall* work with any standard 2010 Conflict Monitor.
- o. The controller unit shall also support Synchronous Data Link Communications (SDLC) Port 1 cabinet interface for a TS2 type 1 operation. The controller unit shall also provide an I/O mode for controlling all inputs and outputs over a high-speed SDLC Serial Bus (Port 1) with digital addressing that simplifies cabinet wiring. This bus also interfaces directly to a TS2 Malfunction Management Unit (MMU) for enhanced intersection monitoring.
- p. The controller unit shall come standard with an Ethernet port and Date Key socket.
- q. The controller unit shall support an optional card can be provided for twisted-pair copper (FSK) or serial (RS232) system interconnect.
- r. The controller unit shall provide the standard NTCIP functions.
- s. In addition to the standard NTCIP functions, the controller unit shall provide:
  - 16 phases, 8 configurable concurrent groups in 4 timing rings
  - 16 timed vehicle overlaps
  - 16 pedestrian phases that can be configured as pedestrian overlaps
  - Exclusive pedestrian operation
  - Soft vehicle recall
  - Conditional service
  - Dynamic max operation
  - Bike minimum green, second walk, and pedestrian clear times, plus a walk and pedestrian clearance maximum
  - Advanced walk
  - Pedestrian clear protect
  - Red maximum
  - Vehicle extension 2
  - Guaranteed minimum green, walk, pedestrian clear, yellow, red, red revert, and overlap green

- Redundant monitoring of the MMU status to enhance intersection monitoring
  - 4 timing plans selectable on TOD or coordination plan basis or for one cycle following preemption
  - Powerful logic processor
- t. The controller unit shall provide the following coordination features:
- 120 coordination patterns, each with its own cycle, offsets and split plan selection
  - 120 split plans, each with its own coordinated phases, vehicle and pedestrian recall and phase omits
  - Offset and split entries when entered are displayed in percent or seconds
  - Automatic permissive periods
  - Fixed or floating force-off
  - Crossing arterial coordination
  - Quick-sync feature
- u. Ten preemption sequences whereby each shall be configured as priority, first-come-first-serve, or bus preemption operation
- v. Preemption shall provide interlock to provide added monitoring safety.
- w. The controller unit shall provide the following time of day features:
- 200 schedule programs, configurable for any combination of months, days of the week, and days of the month
  - 36 fixed or floating exception day programs that override the day plan event on a specific day
  - 50 day plan events that can use any of the 100 action plans
  - 100 action plans that can be used by any of the 50 day plans
- x. The controller's status display shall provide keyboard selection of detailed dynamic status displays for each of the main controller unit functions including: controller, coordinator, preemptor, time base, detectors, and MMU.
- y. The controller unit shall provide the following time of day features:
- 64 vehicle detectors
  - 16 system or speed detectors
  - Unique detector types and operation
  - Individually assignable to phase and functions
  - Lock/non-lock function by detector
  - 4 detector plans
  - 4 detector diagnostics plans
  - Logging of volume and/or occupancy assignable by detector
  - 4 pedestrian diagnostic plans
- z. The controller unit shall provide separate buffers for detector activity, detector failures, controller events, and MMU events. Logged data can be viewed on front panel, retrieved via RS-232 terminal port, or transferred via telemetry to a traffic management center.
- aa. The controller unit shall provide compatible with KMC-10,000 or *ASC/2M-1000* zone masters and *icons* or *Aries* systems.

(H) CABINET FOUNDATIONS

- a. If foundations are removed, they shall be removed to at least 12 inches below grade or as directed by the COS inspector.
- b. The electrical service cabinet shall project 12 to 18 inches above the adjacent ultimate ground elevation. The controller cabinet shall project above grade and have 12" base extender mounted. The cabinet foundations shall extend 32 to 36 inches below the adjacent ultimate ground elevation. Both foundations shall have a "technician pad" which shall be the width of the foundation extending 24" from base and be 4" above grade.
- c. Both cabinet and foundations shall have 4" above grade "tech pads" installed in front.

(I) SIGNAL HEADS

- a. All indications shall be "LED" type lamps. All pedestrian indications shall also be "LED" type lamps.
- b. LEDs, (circular, arrows and pedestrian modules), shall conform to ITE LED Vehicle Traffic Control Signal Modules Specification.
- c. Signal heads shall be reinforced polycarbonate with ribbed or fiberglass reinforcement and lenses must be glass.
- d. Heads and mounting brackets shall be black.

(J) CONDUIT & CONDUCTORS

- a. Galvanized conduit shall be used for exposed, aboveground runs through the first sweep below grade.
- b. Warning tape shall be placed in all trenches 12 inches below final grade.
- c. Expansion joints shall be used every 50 feet.
- d. Schedule 40 PVC shall be used except for service runs above ground.
- e. All cables must be taped and color-coded as shown in the tables below. Detector and pre-emption wires should be taped the same as the signal wires. Spares shall be taped brown. Telecommunication cable shall be taped orange.

If there are only 4 phases, use the first cable colors with no tape around the cables. If 8 phases are used, use the first and second cable colors but tape the second cables white. Each individual conductor in the cables gets taped regardless of whether 4 or 8 phases are used.

First Cable Colors

<b>PHASE</b>	<b>RED INDICATION</b>	<b>YELLOW INDICATION</b>	<b>GREEN INDICATION</b>
1	Solid Red	Solid Orange	Solid Green
2	Black Traced Red	Black Traced Orange	Black Traced Green
3	White traced Red	White Traced Blue	White Traced Green
4	Green Traced Red	Red Traced Orange	Red Traced Blue
<b>PHASE</b>	<b>DON'T WALK</b>	<b>WALK</b>	
2 Pedestrian	Solid Black	Solid Blue	
4 Pedestrian	White Traced Black	Black Traced Blue	
2 Push Button	Red Traced White		
4 Push Button	Red Traced Black		
Push Button Neutral	Solid White		
Spare	Black Traced White		

Second Cable Colors—Place a WHITE piece of tape around each CABLE

<b>PHASE</b>	<b>RED INDICATION</b>	<b>YELLOW INDICATION</b>	<b>GREEN INDICATION</b>
5	Solid Red	Solid Orange	Solid Green
6	Black Traced Red	Black Traced Orange	Black Traced Green
7	White traced Red	White Traced Blue	White Traced Green
8	Green Traced Red	Red Traced Orange	Red Traced Blue
<b>PHASE</b>	<b>DON'T WALK</b>	<b>WALK</b>	
6 Pedestrian	Solid Black	Solid Blue	
8 Pedestrian	White Traced Black	Black Traced Blue	
6 Push Button	Red Traced White		
8 Push Button	Red Traced Black		
Push Button Neutral	Solid White		
Spare	Black Traced White		

Tape Colors—Place the appropriate color tape around each PHASE SET

<b>NB</b>	<b>SB</b>	<b>EB</b>	<b>WB</b>
Red	Yellow	Green	Blue
<b>NBLT</b>	<b>SBLT</b>	<b>EBLT</b>	<b>WBLT</b>
Red + White	Yellow + White	Green + White	Blue + White
<b>NBRT</b>	<b>SBRT</b>	<b>EBRT</b>	<b>WBRT</b>
Red + Black	Yellow + Black	Green + Black	Blue + Black

**(K) PULL BOXES**

- a. All pull boxes shall be marked "TRAFFIC SIGNAL" on the lid. Pull box lids shall be fiber composite type.
- b. Only pull boxes ADOT #5 and ADOT #7 shall be used.
- c. Concrete pull boxes with steel covers shall be used in all dirt areas and in sidewalks. Placement of pull boxes in sidewalks shall be avoided whenever possible.

**(L) LIGHTING**

- a. Luminaire wire connections shall only be made in pull boxes and not brought into the signal controller cabinet.
- b. Intersection lighting shall be 120 volt, 250 watt, two door, 90-degree cutoff with filter. Luminaires shall include one photocell for each luminaire.

**(M) UPS** – Some intersections will be equipped with an uninterruptible power supply (UPS) as directed by COS Traffic Engineering or Traffic Operations. At locations with a UPS, all indications including yellow pedestrian indications shall be "LED" type. UPS foundation shall meet same requirements as cabinet foundations.

**403.3 MATERIALS:**

**403.3.1 Traffic Signal Structures:**

**(A) General:** A traffic signal structure is defined as a complete pole and mast arm assembly attached to a concrete foundation for the purpose of supporting traffic signals, street lights, and signs. The traffic signal structure shall as a minimum consist of the following parts:

- pole shaft
- signal mast arm
- luminary mast arm (if required)
- foundation anchor bolts plus hardware
- mast arm pole connecting hardware
- top cap hardware
- pole hardware
- concrete foundation and steel reinforcing (if required)
- protective coating

**(B) Qualified Products List (QPL)**

- (1) A City of Scottsdale Qualified Products List has been established for traffic signal structures.
- (2) Contractors are not required to submit documentation on qualified products for review by the City.
- (3) All Contractors bidding traffic signal structures which are not on the City QPL are required to submit the following documentation for City review:

- (a) Traffic signal structure drawings.
  - (b) Traffic signal structure specifications.
  - (c) Traffic signal structure load calculations (based on the maximum City loading) and a letter signed and stamped by a Professional Engineer registered in the state of Arizona stating that the signal structure will safely support the maximum loading as described by the City.
  - (d) Documentation of all deviations from ADOT specifications.
  - (e) Recommended foundation designs and specifications for all traffic signal structures, except the ADOT / Scottsdale standardized traffic signal structures.
- (C) Traffic Signal Structures ADOT/Scottsdale - The base specification and warranty requirements for the ADOT /Scottsdale traffic signal structure shall be:
- Arizona Department of Transportation, Standard Specification for Road and Bridge Construction: Latest Revision.
  - Arizona Department of Transportation, Traffic Signals and Lighting, Standard Drawings: Latest Revision.

**SECTION 405**  
**SURVEY MONUMENTS**

**405.1 DESCRIPTION:** *Add the following paragraphs:*

Control monuments (survey markers, brass caps, or center line monuments) that will be disturbed as a result of construction will be identified in a “Results of Survey” sealed and recorded by a Registered Land Surveyor prior to commencement of work.

Upon completion of the installation, the monument will be “Set” per COS Standard Detail 2120 by a Registered Land Surveyor and the original “Results of Survey” for the project amended to reflect the new control information. The amended document will be recorded and submitted to the City of Scottsdale Inspector along with any required “as-builts” drawings for the project before the Letter of Acceptance is issued.

**405.3 CONSTRUCTION:** *Delete the entire section and replace it with the following:*

The location of all monuments will be established by a Registered Land Surveyor for construction by the contractor. The monument will be constructed by the contractor so that the reference point will fall within a 1 inch circle in the center of the brass cap.

Right-of-way monuments shall be set firmly and vertically in the ground to the depth described in COS Detail #2120.

The tops of survey monument covers shall be set flush with the pavement surface.

Survey monument frames shall be set in position after the first course of asphalt concrete.

The “Amended Results of Survey” will be completed no sooner than one week after the final asphalt course has been applied and the control monuments have been subjected to traffic or at the discretion of the Inspector.

**SECTION 425**  
**TOPSOILS**

**425.3 CONSTRUCTION METHODS:** *add the following:*

1. Reuse surface soil stockpiled on the site for planter and turf areas. Import topsoil as necessary.
2. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.
3. For turf areas mix topsoil with recommended amounts of fertilizer and 1/10 (by volume) Dakota peat mulch or approved equal. Delay mixing fertilizer if planting does not follow placing of planting soil within few days.

**SECTION 430  
LANDSCAPING AND PLANTING**

**430.2 GENERAL:** *Delete the last paragraph and replace with:*

See Section 102.6 for additional requirements on Landscape Contractor.

Finish grade shall conform to COS Detail 2210.

Observation Schedule:

Contractor shall notify the Owner's Representative from COS Parks Department in advance for the following observations according to the time indicated:

1. Pre-construction job conference – Seven (7) days
2. Grading completion – 48 hours
3. Landscape edging installation/placement – 48 hours
4. Plant delivery and inspection – 48 hours
5. Plant installation – 48 hours
6. Turf area soil preparation/grading – 48 hours
7. Turf delivery and installation – 48 hours
8. Pre-emergent application – 48 hours
9. Decomposed/stabilized granite installation – 48 hours
10. Final observation – Seven (7) days

**430.3 LAWN AREAS:** *Delete Section 430.3 in its entirety and replace with the following:*

The Engineer shall inspect and approve these areas prior to planting. The Contractor shall coordinate installation of planting material during normal planting seasons for each plant material required.

Turf Installation Schedule:

October-March – Overseeded Bermuda Sod.

March-October 1 – Bermuda Sod.

June 1-June 15 -Hybrid Stolens for areas which will be overseeded.

June 1-July 15 – Selected Bermuda seed type or Hybrid Stolens if turf will not be overseeded.

August 1 – September 30 – No Sod to be installed until overseeded Bermuda Sod is available.

**430.3.1 Passive Turf Areas:**

1. Limit subgrade preparation to areas that will be planted in the immediate future.
2. Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1” in any dimension and sticks, roots, rubbish, and other extraneous debris.
3. Spread decomposed organic mulch to a depth of 4 to 6 inches and incorporate into subgrade by mechanical means either with a tiller or rodarion and water settle.

4. Grade turf area to a smooth, even surface with loose, uniformly fine texture. Water settle, rake, remove ridges, and fill depressions to meet final grade. Remove trash, debris, stones larger than 1 inch in any dimension, and other objects that may interfere with planting or maintenance operations.
5. Apply fertilizer as specified for type of turf material installed.
6. Moisten prepared turf areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

#### **430.3.2 Sports Turf Areas:**

1. Imported soil shall be tested prior to import and incorporated into existing soil.
2. Grade Verification: A certified survey shall be performed at 25-foot centers to verify grade and elevation of the subgrade to within a tolerance of plus or minus 1/8" from design.
3. Limit subgrade preparation to areas that will be planted in the immediate future.
4. Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1" inch in any dimension and sticks, roots, rubbish, and other extraneous materials.
5. Spread decomposed organic mulch to a minimum depth of 4 to 6 inches and incorporate into subgrade by mechanical means either with a tiller or rododarium and water settle.
6. Laser grade (plus/minus 1/8", slope no greater than 1%) turf area to a smooth, even surface with loose, uniformly fine texture. Water settle, rake, remove ridges, and fill depressions to meet final grade. Remove trash, debris, stones larger than 1 inch in any dimension, and other objects that may interfere with planting or maintenance operations.
7. A certified survey by an Arizona Registered Land Surveyor shall be performed at 25-foot centers to verify grades and elevations of the rootzone material. Finish grades and material depths shall be verified utilizing laser operated survey instruments and verified by City Inspector.
8. Apply fertilizer as specified for type of material installed.
9. Moisten prepared turf areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
10. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

#### **430.3.3 Hydro-seeding Turf Areas:**

Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydro-seed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.

Mix slurry with non-asphaltic tackifier. Apply slurry uniformly to all areas to be seeded in a 2-step process. Apply first slurry application at the minimum rate of 500 lbs. per acre dry weight but not less than the rate required to obtain specified seed-sowing rate. Apply slurry cover coat of fiber mulch at a rate of 1000 lbs. per acre.

Hydro-seed mixture shall contain the following:

<u>Material:</u>	<u>Quantity:</u>
<u>Seed</u>	<u>2 lbs. per 1,000 SF.</u>
<u>Fertilizer</u>	<u>As indicated by Laboratory Analysis</u>
<u>Wood Fiber</u>	<u>1,500 lbs. per acre</u>

#### **430.3.4 Grow In Maintenance:**

Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than 90 days from date of Substantial Completion.

Perform all operations necessary to maintain the turf area through the date of Substantial Completion. At that time an extended maintenance agreement may or may not be negotiated at the Owner's request. Installer and Contractor shall be on-site to direct all subcontractors during this period.

Minimum Requirements: The following list of items represents the minimum operations necessary to maintain turf area during the installation period. Prepare and present to the Owner and Engineer, in writing, a maintenance schedule prior to installation for consideration. Representative schedule items shall include, but not be limited to the following:

Mowing: Grass shall be maintained to a neat uniform appearance using only clean, sharp, non-contaminated equipment. Grass shall be maintained to a uniform height as specified by COS Parks Department. Remove grass clippings only when an unsightly condition will occur. Frequency will be a minimum of two times per week dependent on the removal of no more than 1/3 of the blade height at any one time to maintain the desired grass height. Mowing pattern will vary with each cut.

Controller shall be set for appropriate watering intervals per approval of Owners' Representative from COS Parks Department. Contractor shall demonstrate the operation of the system and its controls in the presence of the Owners' Representative.

#### **430.3.5 Sequencing/Completion/Observation:**

Completion and observations shall be separated into two phases, "Initial Completion" and "Substantial Completion." Initial Completion: Scheduled date for initial completion shall be at least 30 calendar days before substantial completion. Notify the Owner in writing, seven days prior to scheduled date for observation for "Initial Completion." The Owner shall provide a list of items necessary for completion to obtain "Substantial Completion". To be considered "Initially Complete" the following items shall be provided by Contractor:

1. Rootzone in place and set to grade.
2. Irrigation system tested, installed and adjusted.
3. Submit all "as-builts" certified by an Arizona registered land surveyor for review by the project engineer before stolons, sod or seed is applied
4. Stolons, sod and seeded areas, as approved by Owner, shall have uniform coverage.
5. Sod areas laid, joints and seams filled so as to appear seamless. Any sod burn discoloration in an individual roll shall be replaced.
6. One top-dressing application over entire surface complete (sod only).

Substantial Completion: The Contractor shall notify the Engineer and Owner in writing, seven days prior to a requested date for a site observation to meet "Substantial Completion." To be considered "Substantially Complete" the following items shall be provided:

1. All "Initial Completion" punch list items are complete.
2. In addition to top dressings as required in "Initial Completion" a minimum of one top dressing (sod only) performed on total grass surfaces once turf is established and approved by Owner.
3. Root depth of 3-1/2 inch averaged over the entire area as determined by 8 core samples equally representative of the area as determined by the Engineer and Owners' Representative.
4. Stolonized, sodded and seeded areas shall be void of bare or dead spots, and shall provide 100% established turf coverage. All areas missed will be filled in with washed hybrid Bermuda sod or as otherwise approved by COS Parks Department to maintain installation schedule
5. Absence of all joints and cracks in sod installation as to appear "seamless." Dense, green, consistent grass void of any bare or patchy areas.
6. Smooth, level surface set to grading tolerances.
7. Written warranties/guarantees.
8. Grass maintained at uniform height and mowed with equipment as specified by COS Parks Department.
9. All grass edges to be cut in crisp, straight lines as depicted on the drawings.
10. Subcontractor shall coordinate and make all appropriate provisions with the General Contractor and the City of Scottsdale (COS) to maintain turf areas until the established date(s) of transfer of maintenance responsibility to the COS occur.

#### **430.3.6 Hydro-seeding Restoration Areas:**

After finish grade has been established, raked and accepted by the Owner's Representative, the seed mix shall by hydro seeded.

Following materials shall be combined to form a seed mulch mixture for hydro seeded applications.

1. Seed mix
2. Binder
3. Wood Fiber Mulch
4. Sufficient water to form a homogenous mixture capable of being applied by commercial hydro-mulching equipment.

Hydro seeding which is deposited on adjacent trees and shrubs, roadways, in drain ditches, on structures, and upon any area where seeding is not specified or which is placed in excessive depths on seeding areas shall be removed.

Seeding areas flooded or eroded as a result of irrigation shall be repaired, reseeded, and re-fertilized by the Contractor at his expense.

#### **Care During Construction:**

The Contractor shall be responsible for protecting and caring for seeded areas until final

acceptance of the work and shall repair, at his expense, any damage to seeded areas caused by pedestrian or vehicular traffic, erosion due to excessive water application or other causes. A temporary aboveground irrigation system shall be designed, installed and maintained by the Contractor to germinate and establish native seeding (the use of a water truck for this purpose is not acceptable). A temporary irrigation controller capable of providing a minimum of six irrigation run cycles per day will need to be installed along with temporary remote control valves.

Germination:

1. Under favorable conditions, most non-dormant desert seeds will germinate in 7 to 10 days with constant available moisture. Watering should not be so much that it runs off or puddles. Frequent light applications of water are generally needed for good germination results. It will probably be necessary to irrigate several times per day if it is hot, windy, or the soil is well drained or sloped. Irrigation 4 to 6 times per day is not uncommon. Irrigation should be checked daily for runoff and drying between cycles. Careful attention by the Contractor is required because too wet or too dry of conditions will affect germination.
2. Following germination of approximately 80% of the Pure Live Seed, or as accepted by the Owner, the Contractor shall request start of the Native Seed establishment period. The establishment period shall be for 90 days from the start date set by the Owner.
3. Establishment: Establishment is considered to be after germination and before plant maturity. Water during the establishment period shall be that of gradual decrease in water application. The intent is to provide water in soil profiles where it is retained and where root growth occurs. Decreasing the water frequency allows for natural characteristics of drought tolerance to develop.
4. The Contractor shall inspect the ground closely as soon as plants have emerged, as many seedlings are small and inconspicuous. Adjust water frequency accordingly. Inspection of plants and soil will determine the watering requirements during the establishment period. Overwatered plants may appear yellow due to nutrient deficiency or very lush with excess growth. Overwatered plants will not develop drought resistance.
6. The Contractor shall be responsible to re-apply hydromulch and seed until establishment is acceptable to the Owner based on 40% of the germinated plants surviving with no increase costs to the Contract. Maintenance of Native seed areas shall be concurrent with establishment of these areas.

**430.3.7 Sod Installation:**

Sod will be in accordance with Section 795.8.6

Pre-sod Fertilization:

Immediately prior to laying sod and after preparation of the rootzone is complete, incorporate into the upper 1-2 inches of the rootzone a fertilizer with the following ratios: 1 lb. actual P2O5 of 0-45-0 per

1000 sq. ft.. Verify types and ratio with COS Parks Department and Testing Agent prior to application. This fertilization shall only be installed according to the amount of sod to be laid on that day.

Laying Sod:

The entire area shall be approved by the Engineer prior to laying sod. Areas to receive sod shall be firm and the irrigation system shall be operational. Lay sod within 18 hours from time of stripping. Sod not placed within 24 hours will be rejected. Lay sod to form a solid mass with tightly fitted joints using standard 42 inch wide rolls. Overlap all ends or wherever a break in the big roll occurs. Trim to butt tight. Butt sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Sod lengths shall be installed and trimmed so that they outline infield skinned areas, track areas or headers. Work from plywood boards when necessary to avoid damage to finish grade. Tamp and roll lightly to ensure contact with subgrade. If plastic mesh was used to help harvest big roll sod, this material shall be removed prior to field installation. Contractor should take care not to rut or damage big roll sod with tires or tracks from the sod machine.

Patching:

All patches necessary to fill in undesirable areas shall be a minimum size of 12 inches in length, and width to match that of the roll. Patches shall be of the same source and type as the original installation and shall be installed at specified finish grade and watered in firm.

Filling Joints:

After laying and rolling of sod, fill joints and seams with approved USGA grade sand mixture approved by COS Parks Department. Broom or sweep excess material to avoid smothering grass. Sod areas requiring more than 1/4 inch of top dress to meet specified grade shall be lifted. USGA grade sand shall be added below the sod area and thoroughly compacted prior to the re-installation of the sod area. Thoroughly walk all seams to verify that all have been filled and that all low or irregular areas have been brought to specified grade tolerances.

Rolling Sod:

After sod installation and filling joints, the entire area shall be rolled with a 500 pound roller working north/south and east/west. During this process, water shall be sufficient to guarantee good plant to soil contact.

Top Dressing:

Two lifts of 1/4 inch will be required using the same USGA grade sand as specified previously. An additional top dressing may be required to ensure a smooth and safe surface. Care shall be used to avoid smothering sod.

Rootzone:

Monitor and repair surface grading as needed due to erosion from irrigation and/or rainfall so as to maintain specified grading tolerance. Additional sod to be added as needed to establish 100% turf coverage.

**430.3.8 Stolon Installation:**

Pre-Stolon Fertilization: Immediately prior to broadcasting stolons and after preparation of the rootzone is complete, incorporate into the upper 1-2 inches of the rootzone a fertilizer with the following ratios:

1. 1 pound actual N of 6-20-20 per 1000 sq. ft.
2. Apply 1 pound actual product 21-7-14 turf Royale or approved equal every 2 weeks.
3. After 30 days, supplement with foliar application of Miller Fertilizer or approved equal 20-20-20.
4. Verify types and ratio with COS Parks Department representative and Testing Agent prior to application.
5. This fertilization shall only be installed according to the amount of stolons to be laid on that day.

Plant stolons within 18 hours of harvesting. Broadcast stolons uniformly over prepared surface at a minimum rate of 600 bushels of stolons per acre onto lightly moistened soil. Water stolons immediately after planting, keep moist by frequent watering until well rooted.

**430.4 DECOMPOSED GRANITE AREA:** *Add the following paragraphs:*

Polyethylene film shall not be placed under decomposed granite area, and decomposed granite shall not be compacted. Granite shall not be placed within 2 inches of trunks or stems. See COS Det. 2620-1.

After area has been cleared of trash, debris, stones larger than 1” in any dimension, a pre-emergence control, such as Dinitroaniline, Isoxaben, Oryzalin families, shall be applied in accordance with the manufacturer's recommendations by a licensed applicator, registered with State of Arizona Office of Pest Management. After decomposed granite installation a second treatment with pre-emergence control will be accomplished.

The Contractor shall provide a certificate of application/spray log to Owner’s Representative, stating company name, date, job location, herbicide type used, application rate, number of gallons used, size of area treated and applicators license number.

**430.5.2 Plant Inspection Prior to Delivery to the Project Site:** *Delete this section in its entirety, and replace with the following:*

Trees and Shrubs: Protect bark, branches, and root systems from sunburn, drying, sweating, whipping, and other handling and tying damage. Do not prune before delivery except as approved by Engineer. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery of all plant material, this includes flatbed semi-trailer.

After delivery of all species to the project site, the Contractor shall make the necessary arrangement with the Engineer for an inspection of the plant material at the onsite location. Any plants found to be unsuitable in growth or condition or which are not true to name shall be removed and replaced with acceptable plants.

**430.5.3 Plant Protection after Delivery to the Project Site:** *Add the following paragraphs:*

Protect landscaping from damage due to landscape operations, operations by other contractors and trades, trespassers, and acts of nature (frost, storm, wind damage).

Deliver trees, shrubs, ground covers, and flatted plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist. Contractor is responsible for providing water to plant material on site.

1. Do not remove container-grown stock from containers before time of planting.
2. Water root systems of trees and shrubs stored on site. Water as often as necessary to maintain root systems in a moist condition.

**430.5.6 Shrub and Tree Pits:** *Delete this section in its entirety, and replace with the following:*

Pits and trenches shall be excavated with vertical sides and with bottom of excavation on level of undisturbed soil. When conditions detrimental to plant growth are encountered, such as rubble, fill, adverse drainage conditions, or obstructions, notify Engineer before planting.

Planting pits and backfill shall be per COS Details 2620-1&2. It must be large enough to permit handling and planting without injury or breakage of the root ball or root system.

Test the drainage of 1/4th of all plant pits by filling excavations with water. Water retained in the pits for more than 24 hours shall be brought to the attention to Engineer. Contractor shall submit in writing a proposal for correction for approval prior to proceeding with work.

Set container-grown stock plumb and in center of pit or trench with top of ball level or slightly raised above adjacent finish grades as indicated.

1. Carefully remove containers so as not to damage root balls.
2. Center and place stock on undisturbed soil at bottom of plant pit
3. Place native soil backfill around root ball in layers, tamping to settle backfill. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.
4. "Arbor Gard" or approved equal tree trunk protectors shall be installed on all trees planted in turf areas.
5. "Jobes" or approved equal tree trunk wrap shall be installed on all trees with the exception of salvaged trees or as approved by the COS Parks Department.
6. Apply slow release fertilizer to surface away from trunk per manufacturer's specifications.
7. Trees in turf areas require drip irrigation for supplemental watering.

*Add the following sections 430.5.7 & 430.5.8:*

**430.5.7 Tree and Shrub Staking:**

Upright Staking and Tying: Stake trees per COS Std. Detail 2620-1. Stake trees of less than 2-inch caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree. Stakes shall not chafe branches.

**430.5.8 Desert Pavement:**

Desert Pavement from stockpiles shall be spaced to a depth of 2 inches in all areas disturbed by grading and not receiving other ground treatment. The finished appearance shall be that of the surrounding natural desert. Pre-emergent shall not be applied in desert pavement areas.

Desert Restoration:

Seed mixture shall be as approved by COS Parks Department and applied with wood fiber mulch slurry at 4.5 to 6 lbs. per acre. Increased amounts of seed types per acre may be applied upon approval from Owners Representative if one or several types of seed are not available.

Desert Pavement Binder shall be a free flowing, non-corrosive powder produced from natural plant gum of Plantago Insulares (Indian Wheat) such as Muciloid Tac or approved equal and shall be applied at 40 lbs. per acre on slopes less than 3:1 and 80 lbs. per acre on slopes 3 to 1 and above.

Wood Fiber Mulch shall conform to **Section 795.8.5** and shall be applied at 2000 lbs. per acre

**430.6 HEADER INSTALLATION:** *Delete this section in its entirety and replace with the following paragraph:*

Headers shall be installed per COS Standard Detail 2622 at the location and grades as shown on the plans prior to planting operations or as approved by the Engineer.

**430.8 PLANT GUARANTEE AND MAINTENANCE:** *Add the following:*

Special Warranty: Warrant living plant material for a period of one year after date of Final Completion against defects including death and unsatisfactory growth, except for defects resulting from neglect or abuse by Owner, abnormal weather conditions unusual for warranty period or incidents that are beyond Contractor's control.

Plants to be replaced shall be in kind size as specified in original design.

**430.9 PLANT ESTABLISHMENT PERIOD: Add the following:**

The plant establishment period shall be for a period of 90 calendar days. Upon completion of the inspection, the Contractor shall correct conditions listed on a detailed punch-list, that are either in conflict with the contract documents, specifications or details. Once items on a punch-list have been completed to the Engineer's satisfaction, the project shall be accepted in writing, setting the effective beginning date for plant establishment.

Site shall be visited/checked and maintained a minimum of once per week during the establishment period. Granite areas shall be raked as needed to maintain a smooth and level appearance. Vandalism and graffiti damage shall be repaired and removed as approved by Engineer. The Contractor is responsible for irrigating the plant material. Maintain trees, shrubs and groundcovers by weeding, tightening wires, repairing stakes, resetting to proper grades or vertical position and other operations as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Area shall be weed free through the use of herbicides, pre-emergent, physical means or any combination thereof. Shrubs shall be maintained off and behind all sidewalks and curbs. Tree canopies shall be maintained a minimum height of 13' 6" over roadways and 8' over pathways and sidewalks. Plants located within traffic sight visibility triangles shall be maintained at a height no greater than 18". Prune, thin, and shape trees and shrubs according to ANSI standard A-300.

Protect landscaping from damage due to landscape operations, operations by other contractors and trades, trespassers and acts of nature (frost, storm, wind damage and wildlife). The Contractor shall provide written warranties/guarantees.

**430.9.1 Existing Tree Protection:**

Tree Protection Zone – Area surrounding individual trees or groups of trees to remain during construction and defined by the drip line of individual trees or the perimeter drip line of groups of trees unless otherwise indicated. Fertilizer shall be per Section 795.3.

A. Submittals:

1. Tree Pruning Schedule – Written schedule from certified arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
2. Qualification Data – For tree service firm and arborist.
3. Shop drawing showing proposed temporary irrigation system including timer, controls, heads and other fixtures for approval by Owner's Representative.
4. Certification from arborist certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
5. Maintenance recommendations from arborist for care and protection of trees affected by construction during and after completion of work.

B. Quality Assurance:

1. Tree Service Firm Qualifications – An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for the project and

that will assign an experienced, qualified arborist to the project site during execution of tree protection and trimming.

2. Arborist Qualifications – An arborist certified by International Society of Arboriculture

#### C. Tree Protection Fencing

1. Fence shall be standard galvanized chain link fencing (MAG standard material, 4 feet height) or polyethylene construction safety fence (4 feet height) supported by posts driven in the ground, concrete anchors or metal braces.
2. Install continuous tree protection fencing to all trees to remain as staked and approved by arborist or Owner's Representative.
3. Fencing shall remain in place during the progress of work and shall only be removed when heavy construction work (such as paving, structures, earthwork, etc.) is completed and final landscape and irrigation work is started. Submit schedule for removal of fencing to Owner's Representative for approval.
4. No construction activity, including equipment and material storage, shall be allowed within boundaries of tree protection fencing.

#### D. Re-grading

1. Grade Lowering – Where new finish grade is indicated below existing grade around trees, slope grade beyond tree protection zones. Maintain existing grades within tree protection zones.
2. Grade Raising – If new finish grade is indicated above existing grade within tree protection zones, the arborist shall submit in writing a proposal for correction to the contractor and Owner's Representative for approval before proceeding with work.

#### E. Cutting Roots within the Root Zone

1. Obtain arborist's and Owner's Representative's authorization in writing prior to the start of any work within the tree protection zone. Whenever possible, excavation within the drip line or under foliage canopy of existing trees shall be avoided. Where it is necessary to excavate adjacent to existing trees (within the tree protection zone), the Contractor shall use all possible care to avoid injury to trees and tree roots. Excavation in areas where it is reasonably anticipated there to be roots two inches and larger in diameter shall be done by hand. All roots two inches and larger in diameter shall be tunneled under and any roots exposed during tunneling shall be covered with wet burlap to prevent damage and excessive dehydration. Roots that are directly in the path of pipe or conduit shall be brought to the attention of the arborist and Owner's Representative for remediation. Where trenching machinery is operated close to trees having roots small than two inches in diameter, the wall of the trench adjacent to the tree shall have the severed roots trimmed by hand, making clean cuts to the severed root ends. Trenches adjacent to trees should be closed within 24 hours, and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with wet burlap until the trench is closed. Backfill material for trenches containing severed roots shall be a mixture of one half native soil and one half organic mulch. All burlap used for shading and protection shall be removed from trenches prior to closure.

#### F. Tree Care

1. Contractor shall be fully responsible for the protection, care and healthy growth of existing trees to remain on site. Protect existing trees and other vegetation against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, compaction of soil through foot, vehicular traffic, or parking of vehicles within drip line. Provide temporary guard fencing to protect trees and vegetation to be left standing.
2. Contractor shall maintain tree protection zones free of weeds and trash.
3. Contractor shall not allow fires within tree protection zones.
4. The contractor shall provide all care including watering, fertilizing, control of insect infestations and disease, and physical protection until Final Acceptance. Water trees and other vegetation to remain within the Contractor's limits of construction area as indicated on the Drawings as required to maintain their health during course of construction operations.
5. Fertilizers and soil amendments shall be applied within the drip line of all trees (the area covered by the tree's branches) per arborist's instruction and approval from Owner's Representative at manufacturer's recommended rate.
6. Contractor shall provide to arborist and Owner's Representative a signed certification of type of fertilizer/soil amendment applied and rate of application.

#### G. Temporary Irrigation

1. Temporary irrigation shall be applied to each tree and shrub within the protection zone as required to maintain healthy plant growth.
2. Irrigation may be delivered by flooding or drip irrigation.
3. Contractor shall be responsible for establishing a water supply for temporary irrigation.
4. Temporary irrigation of all trees shall commence five working days after the Contractor's receipt of the Notice to Proceed, and shall be in operation until the permanent irrigation system is in place and fully operational. The contractor shall remain responsible for effective sustained tree watering until Final Acceptance with or without the use of the permanent irrigation system.

#### H. Tree Pruning

1. Certified arborist or ISA certified tree worker shall prune trees to remain that are affected by temporary and permanent construction
2. Branches shall be cut with sharp pruning instruments; do not break or chop.
3. Contractor shall remove pruned tree branches and dispose of off-site

#### I. Tree Repair and Replacement

1. Tree damage by construction operations shall be promptly repaired within 24 hours. Treat damaged trunks, limbs and roots according to arborist's written instructions.
2. Contractor shall remove and replace trees indicated to remain that die or are damaged during construction operations that arborist determines are incapable of restoring to

normal growth pattern. Contractor shall provide new trees of same size and species as those being replaced or as approved by Owner's Representative.

J. Penalties

1. Damage to existing trees to remain due to actions or neglect by the Contractor is not allowed. The Contractor shall be charged for the replacement value of existing trees severely damaged or killed, caused by mechanical damage, neglect or negligence at a dollar rate per trunk caliper inch as determined by arborist and Owner's Representative or replace the damaged plant with a new one of the same size, quality and variety at no cost to the Owner. This shall be the sole decision of the Owner's staff arborist

**430.9.2 SOIL STABILIZER**

"Stabilizer" binder shall be applied to pavement areas indicated on the plans. The work consists of subgrade preparation, blending and placement of soil stabilizer, watering and compaction.

Soil stabilizer shall meet the requirements of Section 795.8.7. Application shall be per manufacturer's specifications unless otherwise approved by COS Parks Department.

**SECTION 440**  
**SPRINKLER IRRIGATION SYSTEM INSTALLATION**

**440.2 GENERAL:** *Replace the third paragraph with the following:*

Prior to final inspection, the Contractor shall submit one set of corrected, as-built drawings and one digital copy of as-built drawings in pdf format showing the location of all pipe, valves, wiring, and utility services. Items revised on as-built plans shall be dimensioned from two permanent points of reference.

Maintenance period shall be for 90 days.

Contractor shall be responsible for notifying the Owner's Representative from COS Parks Department in advance for the following observations according to the time indicated:

1. Pre-construction job conference – Seven (7) days.
2. Sleeving Installation – 48 hours
3. Pressure supply line installation and testing – 48 hours.
4. Control wire and valve installation – 48 hours.
5. Emitter and distribution line placement – 48 hours.
6. Lateral line and sprinkler / emitter installation – 48 hours.
7. Coverage test – 48 hours.
8. Automatic controller installation – 48 hours.
9. Final observation – Seven (7) days.

**440.3 MATERIALS:** *Add the following paragraph:*

Contractor shall furnish quantity of extra materials to the Contracting Agency:

1. Quick Couplers: One unit of each size installed.
2. Sprinklers Heads, Emitters, Drip Tube, and Devices: 10 percent of amount of each type installed.
3. Valve Keys: One unit of each type key-operated, control valve installed.
4. Quick-Coupler Hose Swivels and Operating Keys: 25 percent of amount of each type installed.
5. Solar irrigation controllers: One controller programming/access key per project.

**440.4 LANDSCAPE IRRIGATION SYSTEM REMOVAL AND RESTORATION:** *Add the following paragraph:*

The reuse of existing material shall be approved by the Engineer.

**440.5 TRENCH EXCAVATION AND BACKFILL:** *Add the following paragraphs:*

Before trenching, contractor shall verify the actual final grade is at (+-) 1". Pipe shall have continuous support on bottom of trench. Trenching excavation shall follow layout indicated on drawings and as noted. If the bottom of a pipe trench excavation is found to consist of rock, caliche, or any other material that, by reason of its hardness, cannot be excavated to give a uniform bearing surface, said rock or other material shall be removed for at least four inches (4") below the specified trench depth, and be refilled to specified trench depth with sand or similar material thoroughly tamped into place.

Backfill shall be in 6" lifts with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.

A fine granular material backfill will be initially placed on all lines to a depth of 4" over the top of the pipe. No foreign matter larger than 1" (as per Trench Detail 2642) in size will be permitted in the initial backfill on top of pipe. All trenches will be water settled. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, turf or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.

Where trenching machinery is operated close to trees having roots smaller than two inches in diameter, the wall of the trench adjacent to the tree shall have the severed roots trimmed by hand, making clean cuts to the severed root ends. Trenches adjacent to trees should be closed within 24 hours, and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap until the trench is closed.

The minimum depth of cover over pipelines and conduits shall be as follows:

- (A) Electrical conduit and control wires - 24 inches
- (B) Waterlines continuously pressurized - 24 inches
- (C) Lateral sprinkler lines - 12 inches (Lateral with rotary turf heads – 16 inches)
- (D) Plastic lines under pavement - 24 inches
- (E) Spare sleeves – 24 inches.

**440.6 PIPE INSTALLATION:** *Add the following paragraphs:*

Piping 3" and under shall be SDR solvent weld.

Thrust blocks shall be installed in accordance with COS Standard Detail 2643 for the continuously pressurized run on the supply side of Control Valves. When restrained joints are specified to resist thrust forces, blocking is not required. Piping over 3" shall be restrained with ductile iron mechanical joints with Megalug joint restraints. Casketed piping installed inside a sleeve shall have bell end restraint harnesses or field lock gasket at each pipe joint throughout entire length of pipe inside sleeve.

Cross type fittings shall not be installed.

Sleeves shall be installed for all piping and wiring under existing or new concrete and asphalt. Under Roadways a 4 inch ductile iron pipe sleeve shall be installed for irrigation main line and wires as well as one 4" schedule 40 PVC spare sleeve. One 4" ductile iron sleeve shall be installed for tree and shrub lateral piping under roadways as well as one 4" schedule 40 PVC spare sleeve. Under other hardscape than roadways, sleeves shall be 2 times the diameter of the pipe being sleeved. Sleeves shall extend a

minimum of 12 inches beyond all walks, curbs, pavement and hardscape and the ends shall be securely taped closed. One additional sleeve shall be installed with ends taped for future use, sized to match the largest required sleeve. Sleeves shall be staggered and offset so that sleeve use is not obstructed by other pipes.

A detectable tape shall be installed 12 inches above the top of pipe on all continuously pressurized main lines and shall conform to COS Supplements to MAG Section 757.7.

All lines shall have a minimum clearance of 12 inches from lines of other trades, and outside edge of rootball.

**440.7 VALVES, VALVE BOXES, AND SPECIAL EQUIPMENT INSTALLATION:** *Add the following paragraphs:*

Irrigation system shall be connected to water supply points of connection using an approved reduced pressure principle backflow prevention assembly installed per the COS Standard Details 2353 and 2354 inside a lockable steel enclosure. Backflow prevention assemblies must be tested for proper operation before being put into service by a properly licensed and certified backflow tester that is recognized by the City of Scottsdale.

Master valves shall be installed on all irrigation mainlines. Isolation valves 1-1/2 inch and smaller shall be ball valves and isolation valves 2 inches and larger shall be gate valves. Valves shall be installed next to sidewalks when practical. For sports field applications, valves shall be located outside field of play. Remote control valves shall not be located within hardscape. Valve boxes shall be installed per COS Standard Details. 3-inch and larger master valves and valves in a paved area shall have H-20 rated valve boxes.

Garden valves and hose bibs shall not be installed within City of Scottsdale right-of-way and parks.

**440.8 SPRINKLER HEAD INSTALLATION AND ADJUSTMENT:** *Add the following paragraphs:*

(B) Riser units shall be fabricated in accordance with COS Std. Details 2644, 2645 and 2646. Swing joints for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.

(C) The Contractor shall make sprinkler head adjustments prior to planting. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans. On slopes, heads shall be angled for optimum coverage.

Prior to planting, the Contractor shall adjust the irrigation equipment to provide proper and adequate coverage and prevent overspray onto walks, roadways, and buildings as much as possible.

**440.9 AUTOMATIC CONTROL SYSTEM INSTALLATION:** *Add the following paragraphs:*

Control Systems shall be constructed in accordance with COS standard Details 2631, 2632, 2633, 2634, 2635-1&2. All wiring shall be installed per COS Standard Detail 2642. All pilot or "hot" wires are to be of one color and all common wires are to be of white color. Where continuous pressure supply piping is installed without control wiring, a 14 gauge minimum size tracking wire shall be installed. All remote control valve wiring not installed with mainline pipe shall be installed in a minimum 2-inch diameter schedule 40 grey electrical conduit or as approved. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of the Engineer. Where more than one wire is placed in a trench, the wiring shall be taped together in bundle at intervals of 10 feet. A 20-inch loose loop shall be provided at all changes in direction over 30°.

Contractor shall provide three Mylar coated operational charts to owner's representative from COS Parks Department. Charts shall contain the valve station number, location and description of operation (Drip – Trees/Shrubs, Turf – 180/360 degree pop-ups or rotors).

**440.10 FLUSHING AND TESTING:** *Add the following paragraphs:*

Pipeline Pressure Test shall be performed for the continuously pressurized run on the supply side of Control Valves and all lateral pipe lines under pavement. Constant test pressure and the duration of the test are as follows:

Mains 2 hours at 150 psi.

Laterals (under pavement only) 2 hours at 150 psi.

The entire sprinkler irrigation system shall be under full automatic operation for a period of seven days prior to any planting.

**PART 600 - WATER AND SEWER**

**SECTION 601  
TRENCH EXCAVATION, BACKFILLING AND COMPACTION**

**601.1 DESCRIPTION:** *Replace the third paragraph with the following:*

All trench foundation, bedding, haunching, initial and final backfill shall be in accordance with COS Standard Detail 2201.

**601.2.3 Trench Grade:** *Modify the second sentence of the first paragraph to read as follows (Modified text is highlighted):*

On water main projects, elevation stakes will be furnished **for waterlines 12 inches or more in diameter.**

*Modify the first sentence of the second paragraph to read as follows:*

For all pipe, the Contractor shall excavate for and provide a bedding at least four inches thick or 1/12 the O.D. of the pipe barrel whichever is greater.

**601.2.5 Over-excavation:** *Add the following paragraph:*

For PVC and HDPE sewer pipe trenches over-excavated in excess of 0.30 feet, Class I, II, or III material shall be provided as bedding (see ASTM D-2321). This bedding material shall be compacted within a range of +2 percent to -4 percent of optimum moisture content to a minimum 90 percent density.

*Add the following subsections:*

**601.3.5 Utility/Water Line Crossings: Locator Strips**

Primary electrical conductors, natural gas, or fiber optic telephone lines shall not be allowed to cross above water lines unless approved in writing by the COS Water Resources Department.

If a primary electrical conductor, natural gas, or fiber optic telephone line is allowed to cross above a water line, then double utility locator strips (one representing each utility) shall be provided.

The required utility locator strips shall be a minimum six inches wide, color coded for the appropriate utility, and shall be laid in a criss-crossing pattern along both the water line and the over-crossing utility alignments. The horizontal placement of the utility locator strips shall be along the centerline of the alignments. The vertical placement of the utility locator strips shall be at an elevation one foot above the over-crossing electrical/natural gas/fiber optic line. The utility locator strips shall extend six feet on both sides of the point of intersection for both the water line and the over-crossing utility line. The requirement of placing criss-crossing locator strips may be waived by the COS Water Resources Department if locator strip placement requires trenching in pre-existing pavement.

**601.3.6 Water Lines: Marking Tape**

Pipe marking tape shall be installed over all water lines. Pipe marking tape shall be a minimum 4 mil thick, six inches wide, inert polyethylene plastic that is impervious to all known alkalis, acids, chemical reagents and solvents likely to be encountered in the soil.

Marking tape shall be blue in color with the following message printed thereon: "POTABLE WATER LINE". The tape message shall be imprinted continuously over the entire length in permanent black lettering with the message spacing not to exceed 18 inches. The lettering shall be a minimum 1 1/2 inches high. The spacing between the individual words of the message shall not exceed three inches.

Marking tape shall be buried 24 inches below the surface over the center of the pipe. The backfill shall be sufficiently leveled so that the tape is installed on a flat surface. The tape shall be centered in the trench with the printed side up.

**601.4.2 Bedding:** *Delete this section in its entirety and replace with the following:*

Bedding is the material upon which a pipe is to be placed. Bedding shall be Select Material Type B or Aggregate Base as per MAG Table 702-1, or granular material free of broken concrete, broken or recycled pavement, wood or other deleterious material. For projects within the R/W, material shall be mechanically compacted. No water consolidation shall be allowed within the R/W. Moisture content shall be within a range of +2 percent to -4 percent of the optimum moisture content prior to placing the material in the trench.

**601.4.3 Haunching:** *Delete this section in its entirety and replace with the following:*

Haunching is the material placed between the bedding and springline. Haunching shall be Select Material Type B or Aggregate Base as per MAG Table 702-1, or granular material free of broken concrete, broken or recycled pavement, wood or other deleterious material. For projects within the R/W, lift thickness shall not exceed 8 inches and shall be mechanically compacted. No water consolidation shall be allowed within the R/W. Moisture content shall be within a range of +2 percent to -4 percent of the optimum moisture content prior to placing the material in the trench.

**601.4.4 Initial Backfill:** *Delete this section in its entirety and replace with the following:*

The material placed between the springline to 12 inches above top of pipe. Initial backfill shall be Select Material Type B or Aggregate Base as per MAG Table 702-1, or granular material containing no pieces larger than 1 1/2 inches and free of broken concrete, broken or recycled pavement, wood or other deleterious material. For projects within the R/W, lift thickness shall not exceed 8 inches and shall be mechanically compacted. No water consolidation shall be allowed within the R/W. Moisture content shall be within a range of +2 percent to -4 percent of the optimum moisture content prior to placing the material in the trench.

**601.4.5 Final Backfill:** *Modify the first sentence in the third paragraph to read:*

Backfill under street pavement shall be constructed per COS Supplemental Detail 2201.

*Add the following paragraph:*

For projects within the R/W, lift thickness shall not exceed 8 inches and shall be mechanically compacted. No water consolidation shall be allowed within the R/W. Moisture content shall be within a range of +2 percent to -4 percent of the optimum moisture content prior to placing the material in the trench.

| **601.4.6 Compaction Densities:** *Add the following paragraphs:*

| For sewer lines, compaction tests in the bedding, haunching and the backfill zone shall be conducted at intervals specified by the COS Field Engineering Manager or designated representative.

| For all PVC and HDPE sewer pipe, alignment and initial consolidation of bedding and haunching up to the springline of the pipe shall be accomplished and approved by the inspector before succeeding layers are placed. Final compaction may be accomplished as part of the compaction of the succeeding layer with the approval of the COS Field Engineering Manager or designated representative.

| **601.4.8 Granular Material and Native Backfill Material:** *Modify the first sentence of this paragraph to read as follows (Modified text is highlighted):*

For purposes of this specification, granular material shall mean material for which the sum of the plasticity index and the percent of the material passing a No. 200 sieve shall not exceed 23. **For PVC sewer pipe only, the percent of the material passing a No. 200 sieve may exceed 12 percent only when the plasticity index does not exceed 6.**

**SECTION 610**  
**WATER LINE CONSTRUCTION**

**610.3 MATERIALS:** *Add the following paragraph:*

Polyethylene and polybutylene material shall not be used in any water system installation.

**610.4 CONSTRUCTION METHODS:** *Add the following paragraph:*

All horizontal water line deflections and changes in pipe material shall be marked with electronic locators which shall be self-leveling type, operate at a frequency of 145.7 kHz and be capable of detection to a depth of 4 feet.

Existing fittings, service connections and related appurtenances on lines across the frontage of a development, which are not utilized by the development, shall be removed by the contractor.

When removing fittings, a minimum 3-foot section of pipe shall be cut and removed. If the existing pipe is ACP or PVC and removed fitting is within six feet of a joint, then that short section of pipe is to be removed as well. All pipe replacement shall be ductile iron.

*Add the following subsection:*

**610.4.6 Electrolysis Test Stations:**

The Contractor shall furnish all materials and perform all work for installing a corrosion monitoring system for all buried concrete cylinder pipelines.

(A) Materials and Construction Methods:

Four-wire insulating test stations shall be installed at all insulating fittings where shown on the plans, with two wires installed on each side of the insulating fittings.

Wires for corrosion monitoring points shall be minimum AWG No. 8 insulated with HMW/PE insulation. Wires shall be sized such that they may be used for any and all of the field tests specified.

Thermite weld connections, as shown, specified or directed by the Engineer, shall be made with thermite weld kits specifically designed by the manufacturer for such applications. Thermite welds shall be a maximum 15-gram charge.

As an option to thermite weld connections, E70XX electrode welds may be used. The E70XX electrode weld shall be installed in accordance with the pipe manufacturer's instructions.

When connecting test lead conductors by the use of thermite weld equipment to concrete cylinder pipe or steel pipe, the pipe surface shall be cleaned by scraping, filing, or wire brushing to produce a clean, bright surface. The thermite weld shall be installed in accordance with the manufacturer's instructions and as indicated. Upon completion of the thermite weld, but before the application of the cement-mortar coating, the Contractor shall strike the weld with two sharp blows from a brass hammer. All defective welds shall be replaced by the Contractor.

Valve boxes shall be Brooks 1-RT, or equal, with cast iron cover marked "C.P. Test" and shall be provided with pentagonally bolted lids.

(B) Field Tests:

(1) Field tests shall be performed by the Contractor as required to determine the following:

- Pipeline electrical conductivity.
- Effectiveness of insulating joints.
- Metering point integrity.
- Presence of stray D/C current on the pipeline.
- Initial pipe-to-soil potential.

All test data shall be submitted for approval.

(2) The buried pipelines shall be tested for electrical continuity and dielectric isolation from other structures and pipelines after all connections have been made. The testing procedure shall be as follows:

(a) The test shall be conducted by measuring response of the pipe to the application of cathodic protection test current with an auxiliary ground at a minimum of 10 feet from the pipeline. The positive terminal of the portable test rectifier unit shall be connected to the auxiliary ground. The negative terminal shall be connected to the pipeline at a test station. The test rectifier shall be energized with A/C power and shall be adjusted to provide sufficient D/C current to obtain adequate pipe-to-soil potential shifts along the pipeline for performing the tests. A current interrupter shall be inserted in the test rectifier circuit so that the rectifier is turned "OFF" and "ON" automatically. A set of "NATIVE" potentials shall be obtained prior to the application of the test current.

(b) Measurements of the pipe-to-soil potential shall be made with the test current turned both off and on. The pipe-to-soil potential shall be measured at representative locations along the full lengths of the pipeline to be tested. In addition, potential measurements shall be taken across the dielectric insulating fittings. The pipe-to-soil potentials shall be measured with a potentiometer/voltmeter circuit of a multi-combination meter and with respect to portable copper sulfate reference electrode placed at grade. Contact to the pipe for obtaining potential measurements shall be made at test stations previously installed during construction for that purpose.

(c) If the pipe-to-soil potential is made more positive by application of the test current, electrical discontinuity of the pipeline is indicated between that point and the point at which the test rectifier negative connection was made.

(d) If the pipe-to-soil potential is made more negative by application of the test current, electrical continuity of the pipeline is indicated between that point and the point at which the test rectifier negative connection was made. The magnitude of negative shifts will be analyzed to determine if the degree of electrical continuity is consistent with the specified requirements for joint bonding.

(e) Dielectric isolation across insulating fittings shall be indicated by the pipe-to-soil being more positive or insignificant differences in the pipe-to-soil potentials across the fittings with the application of the test current.

(f) Multiple test set-ups will be necessary so that the full length of the pipeline is demonstrated to be electrically continuous and dielectrically isolated from other structures.

**610.6.1 General:** *Add the following sentence:*

At a minimum, corrosion protection shall be provided using appropriately color-coded polyethylene protection wrap per AWWA C105 on all ductile iron pipe. Color code shall be as follows: purple for non-potable water, green for sewer, and blue for potable water.

**610.7 VALVES:** *Add the following paragraphs:*

Water line air release and vacuum valves (blow-off valves) shall not be constructed in driveways, sidewalks, pathways, washes or retention/detention areas unless approved by the City.

**610.8 MANHOLES AND VAULTS:** *Delete this section in its entirety and replace with the following.:*

Construction shall consist of furnishing all materials and constructing manholes or vaults complete and in place, as detailed, including foundation walls, access steps, frames, covers, and any incidentals thereto, at the location shown on the plans.

Vaults shall be constructed of reinforced concrete conforming to MAG Section 725 and of concrete pipe conforming to ASTM C-76, Wall A or B. Vaults shall be kept moist 7 days before backfilling.

Manholes shall be constructed to conform to the requirements of MAG Section 625, as supplemented by COS Section 625, and the COS Standard Details, except as modified below.

Water manhole frames shall be “Pamrex” as manufactured by Saint-Gobain or an approved equal. Frames and covers shall be manufactured from ductile iron and be capable of withstanding a test load of 80,000 pounds. Covers shall be hinged and incorporate a 90 degree blocking system to prevent accidental closure, be one man operable using standard tools, and come equipped with a locking mechanism. Frames shall be circular, incorporate a sealing ring, and be available in a 24-inch, 32-inch, or 36-inch opening as specified on the plans. The flange shall incorporate bedding slots and bolt holes. All components shall be black coated. The cover shall be stamped “Water”.

**610.9 FIRE HYDRANTS:** *Add the following paragraph:*

Fire hydrants shall not be constructed in driveways, sidewalks, washes, or retention/detention areas unless approved by the City.

Minimum distance allowable between the centerline of the lowest nozzle and ground line is 18 inches.

Installation shall be in accordance with MAG Standard Detail 360 and testing shall be according to AWWA Standards.

The hydrant shall be suitable for installation in a 42-inch depth of trench (3.5 foot bury hydrant). The use of Gradelok connector pipe as manufactured by Assured Flow Sales, Inc. or approved equal shall be required when main depths exceed 42 inches. Not more than one 6-inch fire hydrant extension shall be installed for any hydrant. Should the ground line adjacent to an existing fire hydrant change due to landscaping and/or construction, the Contractor shall be responsible for adjusting the hydrant to meet the specifications outlined in MAG Standard Detail 360. Adjustments shall not exceed one 6-inch extension on an existing hydrant. For adjustments in excess of 6 inches, the use of Gradelok connector pipe or approved equal shall be required. In applications of excessive depth, vertical entry hydrants approved by Water Operations are acceptable.

**610.11 CONNECTION TO EXISTING MAINS:** *Add the following paragraphs:*

COS Inspection Services (telephone (480)312-5750) shall be contacted 48 hours prior to all water system shutdowns. The Contractor shall have all materials and equipment necessary to do the work at the jobsite prior to the shutdown occurring. The Contractor shall be responsible for providing a written notice of the proposed shutdown to all affected water customers a minimum of 24 hours in advance except in an emergency.

Ties into existing PVC water mains shall be accomplished by installing a stainless steel tapping sleeve and valve. Cast iron tees may be used with City approval. Fittings cut into ACP or PVC pipe within six feet of another fitting or joint will require the short section of pipe to be removed and replaced with ductile iron pipe.

All valve boxes shall be adjustable cast iron with pentagonally-bolted lids per MAG Standard Detail No. 391-1-C and COS Standard Detail 2270 unless specified otherwise on the plans.

Stainless steel tapping sleeves shall be 360 degree, full circle tapping sleeves and shall conform to COS Supplemental Specification Section 630.

**610.13 METER SERVICE CONNECTIONS:** *Add the following paragraphs:*

Water meters shall not be constructed in driveways sidewalks, washes or retention/detention areas unless approved by the City.

All water service lines constructed under existing pavement shall be installed by mechanical/pneumatic underground boring unless otherwise approved by the COS Transportation Maintenance Director. Water boring is not allowed for construction of water service lines under existing pavement.

Polyethylene and polybutylene material shall not be used in any water system installation.

Pack joint meter stops and corp stops shall be used exclusively.

| **610.16 MEASUREMENT AND PAYMENT:** *Add the following paragraph:*

(I) Measurement and payment for electrolysis test stations shall be per each test station as furnished and installed per the plans, including all excavation, backfill, wiring, field testing, valve box and cover, and all appurtenant work.

**SECTION 611**  
**WATER, SEWER AND STORM DRAIN TESTING**

**611.1 HYDROSTATIC TESTING:** *Add the following paragraph:*

All ductile iron pipe and concrete cylinder pipe installations shall be corrosion protected. Final acceptance of the work shall not be given until entire system continuity/protection is shown to exist and is accepted by the COS Water Resources Department.

*Modify the first sentence of Paragraph (A) to read as follows:*

**(A) Pressure Testing:** The test pressure shall be at least 125% of the design pressure, or 200 psi, whichever is greater.

**611.2.3 Methods of Applying Chlorine:** *Add the following paragraph:*

Dry powdered calcium hypochlorite compounds shall not be placed within pipelines during construction.

**611.2.11 Final Flushing, Sampling and Testing:** *Delete the second paragraph and replace it with the following paragraph:*

Notify the COS Water Quality Representative (telephone (602) 320-6756) when a water system is ready to have bacterial samples taken to determine whether disinfection has been adequate. The samples are collected by the COS Water Quality Division, Monday thru Thursday only.

**611.3 SEWER LINE TESTING:**

**(D) Closed Circuit T.V. Inspection:** *Delete this sub-section in its entirety and replace with the following paragraph:*

All new sewer lines shall receive a final inspection by video viewing and taping. Defects will require correction and reinspection, the second and any subsequent video-taped inspections shall be at the contractor's expense. All video tapes become the property of the City of Scottsdale Water Resources Department, Operations Division.

*Add the following subsection:*

**(E) Sewer Force Main Testing:**

Prior to issuance of Certificate to Operate, all force mains shall be pressure tested.

Preparatory to testing, the section of the pipeline to be tested shall be filled with water and placed under a slight pressure for at least forty-eight (48) hours. The pipeline shall then be brought up to one hundred fifty (150) psi or to one hundred twenty-five (125) percent of maximum system operating pressure, whichever is greater, and shall be maintained on the section under test for a period of not less than four (4) hours with no (0) leakage.

**SECTION 615**  
**SANITARY SEWER LINE CONSTRUCTION**

**615.1 DESCRIPTION:** *Add the following paragraph:*

All ductile iron sanitary sewer pipe shall be line in accordance with COS Section 751.

**615.3 TRENCHING:** *Add the following paragraph:*

Separate inspections by the City may be required for trench bottom preparation and for haunch consolidation.

**615.8 SANITARY SEWER SERVICE TAPS:** *Add the following paragraphs:*

All taps shall be the 45-degree wye type. All sanitary sewer service taps constructed with a wye shall be marked with electronic locators. Electronic ball locators shall be four-inch diameter, self-leveling type, operating at a frequency of 121.6 kHz and be capable of detection to a depth of 5 feet. Color of the electronic locator shall be green.

All taps to existing sanitary sewer lines shall be made using molded or flexible tap saddles and stainless steel clamps conforming to Section 745.5 or new wyes installed with flexible non-shear reinforced couplings. 4-inch service connections to existing sanitary sewer pipes shall be core drilled. 6-inch sewer service connections to existing 8-inch PVC and VCP sanitary sewer lines shall require cutting in a new wye. 6-inch sewer service connections to existing 10 and 12-inch diameter sanitary sewer lines shall be core drilled. All core drilling shall occur at ten o'clock or two o'clock on the sanitary sewer pipe. Installed saddle assemblies shall be backfilled with 1-sack ABC slurry conforming to MAG Section 728 to the top of the existing sanitary sewer pipe.

The sealed end of sanitary sewer taps at property lines shall be marked with a 2 inch x 4 inch x 30 inch long wooden stake or metal stud. The stake shall be driven firmly into the ground exposing a minimum of 12 inches of the stake. The stake shall be labeled to indicate "sewer tap".

**615.11 BACKFILLING:** *Add the following paragraph:*

Completed sanitary sewer lines shall not be backfilled until inspected and approved by the COS Field Engineering Manager or designed representative.

*Add the following Section:*

**SECTION 619  
PRECAST REINFORCED CONCRETE BOX SECTIONS**

**619.1 GENERAL:**

This specification covers the furnishing and placing of precast reinforced concrete box sections for use in the conveyance of storm waters under low hydrostatic heads.

**619.2 MATERIALS:**

(A) Precast reinforced concrete box sections shall conform to the specifications of AASHTO Designation M259 or M273, as controlled by the amount of cover indicated on the plans.

(B) Mortar shall consist of one part portland cement and two parts sand, by volume. The quantity of water in the mixture shall be sufficient to produce a soft workable mortar, but in no case shall exceed a water-cement ratio of 0.53. Sand shall conform to MAG Section 701 and portland cement shall conform to MAG Section 725.

(C) Preformed joint material shall conform to the requirements of AASHTO Designation M 198, Type B.

(D) Bedding material shall conform to the requirements of MAG Section 702, aggregate base course material.

**619.3 SHOP DRAWINGS:**

The Contractor shall submit shop drawings of any specially fabricated sections for the Engineer to review and approve prior to the start of any work.

**619.4 SHIPPING AND HANDLING:**

Concrete boxes shall be carefully handled during loading, transport, unloading and laying. Boxes which show defects due to handling shall be rejected at the site of installation regardless of any prior acceptance. Any box which is cracked, chipped, spalled or damaged shall be removed from the work site.

**619.5 CONSTRUCTION METHODS:**

(A) Excavation and backfill: Shall be in accordance with MAG Section 206 except as modified herein.

A two (2) inch minimum granular bedding material shall be constructed to provide uniform support for the full length and width of each section. Granular material shall be aggregate base course meeting the specifications of MAG Section 702.2.2.

Structural backfill shall not be placed until the installation has been inspected by the Engineer and approved for backfilling.

(B) Laying of sections: Placing of the sections shall begin at the downstream end of the line. The grooved ends of the box segments shall be in full contact with the prepared bedding. The box segments shall be checked of for grade and alignment at the time of joining the sections. Box segments shall be joined such that the inside faces are flush and even.

Lift holes shall be plugged with mortar and finished smooth and flush with the inside face of the box section.

(C) Joints: Unless otherwise specified on the plans the Contractor shall have the following options for making joints:

(1) Cold applied preformed gaskets: Joints for precast boxes shall be sealed with a flexible, watertight, preformed joint material. Installation shall be per the manufacturer's instructions and recommendations. The joint material shall be protected by a suitable wrapper so designed that when removed at the proper time, the material will maintain its integrity. The size and application of the preformed joint material shall be per the precast box manufacturer's recommendations and shall be sufficient to obtain a visible squeeze out.

(2) Mortar joints: The section ends shall be cleaned and wetted before making the joint. The lower half of the bell or groove and the upper half of the tongue or spigot shall be plastered with mortar. Maximum allowable gap tolerance between joints shall be three-fourths (3/4) inch. Any resulting annular space shall be filled with mortar and finished flush with the inside faces of the box.

Exterior joints shall be beaded semi-circular one (1) inch to each side of the tongue and groove joint or beveled to form a forty-five (45) degree joint between the outer edge of the bell and spigot.

Mortar joints shall be cured by keeping them wet for at least forty-eight (48) hours or until the exterior joints are backfilled, whichever comes first. No joints shall be constructed when the temperature is at or below forty (40) degrees F. Mortared joints shall be protected against freezing for at least forty-eight (48) hours.

(D) Alignment and grade: Each precast section shall be checked for alignment and grade. The interior of the boxes shall be kept free of debris and foreign material as the box laying progresses and shall be left clean at the completion of the work.

Any box which is not in true alignment or on grade, or shows signs of undue settlement or damage after setting shall be taken up and re-laid at the Contractor's expense.

Horizontal or vertical joint deflection shall not exceed the manufacturer's recommendations. Changes in alignment, in excess of those obtainable by allowable joint deflections, shall be made by special manufactured beveled sections or concrete junction structures as detailed on the plans.

#### **619.5.1 Repair**

Fine cracks and checks on the surface of a member which do not extend to the plane of the nearest reinforcement shall not be cause for rejection unless they are numerous and extensive as determined solely by the Engineer. Cracks which extend into the plane of reinforcement, but are otherwise acceptable, may be repaired by a method acceptable to the Engineer.

**619.6 MEASUREMENT:**

Precast reinforced concrete box sections shall be measured in number of linear feet horizontally along the box centerline from end to end.

**619.8 PAYMENT:**

Payment will be made at the contract unit price bid per linear foot to the nearest foot for each size of precast reinforced concrete box installed, which shall be full compensation for the item complete and in place as described herein and on the plans.

**SECTION 620**  
**CAST-IN-PLACE CONCRETE PIPE**

*MAG Section 620 CAST-IN-PLACE CONCRETE PIPE is deleted in its entirety and the following section substituted:*

**SECTION 620**  
**CAST-IN-PLACE CONCRETE PIPE**

**620.1 GENERAL:**

This specification covers cast-in-place non-reinforced concrete pipe (CIPP) intended for use as storm sewers or irrigation lines. CIPP is conduit made of portland cement concrete cast monolithically in a properly prepared trench, using equipment specifically designed for this purpose. The type of equipment to be used by the Contractor must be approved by the Engineer and the Contractor may be required to furnish evidence of the successful use of this equipment on prior work. CIPP will be placed only:

- (A) By experienced operators. The Engineer will be the sole judge as to experience level.
- (B) In the presence of the Engineer or designated representative.
- (C) In ground capable of standing unsupported from the bottom of the trench to the top of the pipe without sloughing.
- (D) In fill when it can be demonstrated to the satisfaction of the Engineer that the fill will adequately support the pipe.
- (E) When designated as an allowable storm sewer pipe material in the project specifications. This designation is no warranty, expressed or implied, that conditions will be suitable for the use of CIPP. Any costs incurred and/or time required to provide suitable conditions or to substitute an alternate pipe acceptable to the Engineer, in whole or in part, shall be the responsibility of the Contractor. CIPP will not be placed at locations where other materials have been specifically shown or noted on the plans.

**620.2 MATERIALS:**

**620.2.1** Cement shall be ASTM C-150, Type II, low alkali as per MAG Section 725.

**620.2.2** Sand aggregate used for concrete and mortar shall conform to MAG Section 701. Maximum size of the aggregate shall not be greater than 1/3 of the minimum wall thickness up to and including a wall thickness of 4-1/2 inches (114 mm). The maximum aggregate size is 1-1/2 inches (38 mm).

**620.2.3** Water used for concrete and for curing the pipe shall be as per MAG Section 725.

**620.2.4** Concrete shall be Class A in accordance with MAG Section 725. Slump shall be the minimum required for satisfactory placement of the concrete by the equipment used by the Contractor. The slump shall not exceed 3 inches (75 mm).

**620.2.5** Bonding mortar shall consist of two (2) or more parts of cement to three (3) parts of sand by volume.

### **620.3 CONSTRUCTION METHODS:**

**620.3.1 Excavation:** The trench will be neatly excavated with vertical sides and semi-circular bottom. The trench shall be shaped to form the bottom outside of the pipe on the alignment and to the grades specified in the plans. Departure from and return to the established grade for the finished trench and the invert of the installed pipe shall not exceed 1 inch (25 mm) per 10 linear feet (3 M) with a maximum allowable departure of 0.10 feet (30 mm). Departure from and return to specified alignment for the trench and pipe shall not exceed the allowable tolerances specified for the grade. The bottom of the trench, hereinafter known as the trench form, will be shaped to provide full, firm, and uniform support by undisturbed earth or compacted fill for at least the bottom 210 degrees of the pipe. Density of the fill shall be at least five percent (5%) greater than the natural in place soil, but in no case less than 85 percent (85%) when tested in accordance with AASHTO T-99, Method A and T-191 or ASTM D-2922 and D-3017.

When it is necessary to install the pipe in rocky areas, the rock will be removed and replaced with suitable fill material compacted to proper density. The rock will be over-excavated to leave a 6-inch (150 mm) minimum compacted soil cushion between the rock and the pipe. For construction accuracy, areas left void by rock removal will be completely filled with compacted material, then trenched for the pipe as though natural ground.

If the rock below the pipe subgrade is fractured or fragmented or if it consists of large cobblestones or boulders, the replacement fill material will be carefully selected to insure that it is of such gradation that it will not be removed downward by fluctuation of the water table. In no case will expansive soils be used for fill. A similar procedure of over-excavation, backfill, compaction, and retrenching will be used where sloughing sand or where soft or spongy soil conditions are encountered. When expansive clays are encountered, they will be thoroughly moistened by ponding, to completely expand the soil, and the moisture maintained until the concrete is placed. The Contractor may substitute non-reinforced or reinforced concrete pipe for CIPP in these unsuitable areas. There will be no additional payment for this substitution.

Excavated trench shall be checked for compliance with requirements for grade and alignment prior to placement of concrete. The Contractor shall submit proposed method of grade and alignment control and checking of same for conformance with specifications to the Engineer for approval prior to start of work. The Contractor shall supply manpower, equipment and materials, as are required, to provide and confirm compliance with grade and alignment requirements. This is a non-pay item and all costs incurred shall be included in the bid item(s) for the pipe installation.

**620.3.2 Placement:** At the time of concrete placement, all soil in the trench will be adequately moistened so that water is not drawn from the freshly placed concrete. However, the trench form will be completely free of water, mud, and debris. All forming devices, including the slipforms and hopper of the placement device, shall be thoroughly moistened.

Concrete shall not be placed when temperature of the concrete exceeds 90 degrees Fahrenheit (32 Celsius) or is less than 50 degrees Fahrenheit (10 Celsius). The soil adjacent to the trench shall be at a temperature above freezing.

The pipe shall be constructed in one placement, the entire cross-section being placed monolithically. Inside forms shall be sufficiently rigid to withstand consolidation of the fresh concrete. Placement shall be such as to produce a thoroughly consolidated homogeneous concrete mixture conforming to the test requirements of this specification. Effective consolidation means shall be applied to the fresh concrete over the entire circumference and from within the pipe shell. Consolidation means shall be capable of effectively placing and consolidating fresh concrete at production speeds. Methods of consolidating shall be capable of building up sufficient pressure to effectively bond the concrete to the surrounding earth and to keep loose sand, mud, and water out of the pipe shell.

Under no circumstances will the Contractor be allowed to continue the pipe installation if the vibrators of the cast-in-place machine are inoperable. Portable vibrators or 'stingers' shall only be used to supplement internal vibrators on the machine and not as a sole source to consolidate and distribute the concrete mix.

The Contractor shall make provisions for removing sloughed material, debris and any foreign objects from the trench before and during placement of concrete such that buildup of material does not occur ahead of the machine. In addition, small transverse trenches shall be dug across trench bottom, at distances not to exceed 25 linear feet, to receive soil buildup pushed ahead of the slipform.

(A) Construction Joints - When pipe placement stops in excess of ninety (90) minutes, a construction joint shall be formed. The ends of the pipe that are to be butt contact shall be left in rough condition with a slope between 20 and 45 degrees. Number 4 reinforcing bars shall be embedded 12 inches in the previous pour and 12 inches into the next pour and shall be placed 12 inches on center for pipe 42 inches in diameter or less and shall be placed 18 inches on center for pipe diameters in excess of 42 inches.

Immediately before resuming concrete placement, the surfaces to be bonded shall be cleaned of all laitance, coatings, foreign materials, and loose or defective concrete, thoroughly wetted and coated with a layer of bonding mortar per subsection 620.2.5, contained herein, approximately 1/4 inch (6 mm) thick. In lieu of the bonding mortar, neat cement paste may be thoroughly scrubbed onto the wet surface of the previously placed concrete.

For a joint that may be used for connection to another pipe or structure, a joint shall be made by squaring off the end of the pipe. An excavation shall be made along the sides and bottom of the cast-in-place pipe, for any diameter, to permit casting of a concrete collar having a minimum thickness of 1-1/4 times the pipe wall thickness and lapping the joint by at least 2 times the wall thickness.

The outside top of all joints shall be capped for the entire width of the pipe that is exposed, that is between the earth walls of the excavated trench. This cap shall have a minimum thickness equal to the wall thickness of the pipe and shall lap the joint, both upstream and downstream from the joint by at least twice the wall thickness of the pipe. A cap as described is required regardless of pipe size.

(B) Pipe Dimensions and Tolerances:

(1) The internal diameter of the pipe at any point shall not be less than 95 percent of the nominal diameter, and the average of any four (4) measurements of the internal diameter made at 45 degree intervals shall not be less than the nominal diameter.

(2) Pipe Wall Thickness:

- (a) For pipe less than 15 inches (381 mm) inside diameter, the minimum wall thickness shall be 2 inches (50 mm).
- (b) For pipe with an inside diameter of 15 inches (381 mm) to 24 inches (610 mm) the minimum wall thickness shall be 2-1/2 inches (63 mm).
- (c) For pipe exceeding 24 inches (610 mm) inside diameter, the minimum wall thickness shall be 1/12 of the inside diameter plus 1/2 inch (13 mm).

(3) Offsets at form laps and horizontal edges shall not exceed 1/2 inch (13 mm) for pipe having inside diameter not greater than 42 inches (approximately 1 M); 3/4 inch (19 mm) for pipe having inside diameter greater than 42 inches, but not greater than 72 inches (approximately 1.8 M) and 1 inch (25 mm) for pipe having inside diameter greater than 72 inches.

(C) Pipe Placement:

- (1) It is essential that concrete placement be done in a smooth and steady manner with as few starts and stops as is possible. The Contractor shall schedule materials and operate the pipe machine at speeds and in a manner that will achieve this.
- (2) The Contractor shall provide an anchoring system for pull of the machine in a manner which will provide the least probability of causing deviations in grade and/or alignment. Adjustments to or modifications in anchoring system, when required in the opinion of the Engineer, shall be made at no additional cost to the project.

**620.3.3 Curing and Backfilling**

The Contractor shall be responsible for proper curing of the concrete and backfilling the trench to an even grade. Final backfill and compaction shall not be started until concrete has developed a compressive strength of at least 2500 psi (17.3 MPa). The pipe shall be checked for grade, alignment and thickness prior to backfilling. Backfill and ABC slurry shall conform to the requirements of COS Standard Detail No. 2201, or as specified on the plans. Curing shall be performed on such a manner as to prevent the premature drying of the concrete. The Contractor shall use the method described below.

Polyethylene film complying with ASTM C-171, nominal thickness 0.0015 inches (0.038 mm), shall be placed on the exposed top surface of the pipe immediately after the pipe is cast. The film shall be anchored in place with loose soil to assure continuous, adequate curing.

A humid atmosphere within the pipe, as evidenced by condensation on the interior surface shall be maintained for at least seven (7) days following placement, except for a maximum period of 24 hours allowed for removing forms and making repairs. To prevent air drafts which may dry the pipe and to maintain a humid atmosphere inside the pipe, all openings, ends, manholes, and connector pipes shall be kept closed or securely covered, except when actual work is in progress on the inside of the pipe. The pipeline shall be partially filled with water during the curing period when work is not being performed on the inside of the pipe.

#### **620.3.4 Repair**

Immediately after removal of the forms, the inside of the pipeline will be inspected for required repairs and conformance with all dimensional requirements including alignment and grade.

The Engineer shall be the sole judge as to the repairability of the deficiencies. Those sections of pipeline which are judged to be non-repairable or which are not within required dimensional tolerances, including alignment and grade, shall be removed and replaced.

When concrete placement is done by a method requiring the use of metal inner forms, the Contractor shall schedule work forces, by extended, staggered or multiple shifts, as required, to provide for removal of forms within 4 to 6 hours of placement of concrete and start of repairing, patching and finishing of pipeline to conform with specification requirements.

When concrete placement is done by methods using pneumatically inflated inner liner, the Contractor shall schedule work forces, by extended, staggered or multiple shifts, as required, to provide for removal of the pneumatic inner liner within 12 hours of placement of concrete and start of repairing, patching and finishing of pipeline to conform with specification requirements.

All rock pockets, non-longitudinal cracks or indentations shall be cleaned out, moistened and filled with 1:2 cement grout or approved epoxy material. Except where, in the opinion of the Engineer, the width and/or length of the crack may indicate a structural deficiency, repairs shall be made as required for longitudinal cracks.

At the discretion of the Engineer, longitudinal cracks exceeding 0.01 inches (0.25 mm) in width and 12 inches (305 mm) in length may be cause for rejection and removal of that portion of the pipe. Subject to the approval of the Engineer, cracks may be repaired using a pressure applied epoxy compound capable of providing structural correction to the area in addition to sealing the void. A longitudinal crack shall be defined as one which the general direction of a 30 degree angle or less with the alignment of the pipe.

Irrespective of concrete placement method, all repairs, patches and finishing shall be completed within 24 hours of concrete placement.

The Contractor, prior to start of concrete placement on project shall submit a written schedule of proposed work activities and work time schedules for the Engineer's review and approval. No time schedule requiring overtime by the Engineer's staff is authorized without specific written approval of the Engineer.

Compliance with this section is a non-pay item and any costs incurred shall be included in the bid proposal item(s) for the pipe.

#### **620.3.5 Finishing**

Except for the form offsets, the interior surface of the pipe shall be equivalent to or better than a wood float finish. Form offsets shall be trimmed so as to provide a reasonably tapered slope from surface to surface. The bottom of the pipe below the metal forms shall be finished in a workmanlike manner and shall conform to the general circular circumference of the pipe without sags, dips and humps. All extraneous concrete shall be removed from the interior surface.

#### **620.4 TESTS:**

Random tests shall be made of the wall thickness at the top, bottom and sides, approximately every 100 feet, on a daily basis by probes through fresh concrete or small holes drilled through the concrete. Holes shall be properly and permanently closed and sealed, flush with the inside surface of the pipe, after measurements are made, in accordance with the requirements of the fifth paragraph of Subsection 620.3.4, contained herein.

The Contracting Agency shall take and test concrete test cylinders per MAG Section 725 for compressive strength testing at 14 and 28 days. Should the Contractor desire to backfill prior to 14 days, it shall be the Contractor's responsibility to schedule, and pay for, any additional concrete test cylinders and provide results to the Contracting agency. Only concrete test results from a certified testing lab, indicating the concrete has developed the minimum 2500 psi compressive strength required herein shall be accepted as justification for allowing backfilling prior to the receipt of the Contracting Agency's concrete test results. Backfilling shall not take place until approved by the COS Field Engineering Manager or designated representative.

If the 14 or 28 day cylinder tests indicate that the concrete does not meet the specified strength requirements, cores shall be taken from the same section of concrete represented by the faulty test cylinder under the supervision of the Engineer. The concrete should be at least 14 days old before the core specimens are taken. The diameter of the core specimens for the determination of compressive strength should be at least three (3) times the maximum nominal size of the coarse aggregate used and must be at least twice the maximum nominal size of coarse aggregate.

The length of the specimen, when capped, should be twice the core diameter. A core having a maximum height of less than 95 percent of its diameter before capping or a height less than its diameter after capping shall not be tested.

If cores are taken, the Contractor shall patch all core holes in such a manner that the patch will be permanent, will not leak, and will have a smooth interior finish flush with the interior surface of the pipe. Procedures and payment for coring shall be in accordance with applicable portions of MAG Section 725.

The Engineer will evaluate the test results and provide a final decision as to any required corrective action.

#### **620.5 MEASUREMENT:**

Measurement of cast-in-place concrete pipe will be the number of linear feet of pipe measured horizontally along the pipe axis from end to end of pipe. At changes in diameter, the measurement shall be to center of manhole or transition.

**620.6 PAYMENT:**

Payment will be made at the contract unit price bid per linear foot to the nearest foot for each size of pipe and shall be compensation in full for furnishing and installing the cast-in-place concrete pipe as specified, including removal of obstructions, excavation, backfilling, compacting, testing, and all incidental costs not specifically covered in other items in the proposal.

No separate payment will be made for prefabricated tees, fittings and/or lateral pipe connections, the costs of which shall be included in the price per linear foot of storm drain line.

**SECTION 621**  
**CORRUGATED METAL PIPE AND ARCHES**

**621.1 DESCRIPTION:** *Add pipe classification Type IR to AASHTO Designation M-36.*

**621.2 MATERIALS:** *Add the following:*

All prefabricated fittings for lateral pipes shall be welded fittings.

Rubber "O" ring gaskets shall conform to the requirements of ASTM C-361. Sleeve gaskets shall be a closed cell rubber in accordance with ASTM D-1056, grade SCE 43.

*Add the following subsection:*

**621.2.1 Material Handling:**

The Contractor is responsible for seeing that the pipe arrives and is installed undamaged.

During loading, transportation, unloading, storage and laying, every precaution shall be taken to prevent damage to the corrugated pipe, linings and coatings. Approved slings of nylon or other suitable material which will minimize point loading and coating abrasion shall be used during all handling operations and to install the pipe in trenches. The straps of the slings shall be spaced closely so as to ensure a minimum deflection in the pipe to preserve the integrity of the mortar lining. Under no circumstances shall holes be made in the pipe for lifting purposes.

Open ends of shop-applied, mortar lined pipe shall be tightly sealed using polyethylene plastic wrap with a minimum thickness of 6-mil. The ends of the pipe shall remain tightly sealed for a period of time as determined by the mortar applicator to adequately cure prior to shipment. Any damage to the lining or coating occurring at any point in transit or during installation shall be repaired as described in COS Subsection 760.6 if, in the opinion of the City, a satisfactory repair can be made. Otherwise, the damaged section shall be removed from the job site and replaced at the expense of the Contractor.

**621.3 INSTALLATION:** *Delete the first sentence and insert the following:*

Pipe trenching and bedding shall conform to the requirements of MAG Section 601 as modified by COS Section 601.

**621.3.1 Joints:** *Add the following:*

Metal pipe shall be joined using annular corrugated or hugger type metal bands locking in at least one annular corrugation and shall be installed to form a watertight joint. Annular corrugated bands shall use a 1/4-inch thick rubber sleeve gasket the same width as the band. Hugger type metal bands shall use an "O" ring gasket placed in the first annular corrugation of the pipe.

Coupling bands shall conform to COS Subsection 760.4.

Coupling bands shall be evenly drawn together by a minimum of two 1/2-inch diameter galvanized bolts through the use of a bar and strap assembly suitably welded to the band. "O" ring gaskets shall be compressed by tightening the coupling band in accordance with the manufacturer's installation instructions.

Annular joints on concrete lined pipe shall be mortared to a smooth steel trowel finish. Annular joints in smooth metal lined corrugated metal pipe shall be filled after couplings are secured with an appropriate compound approved by the Engineer.

Other methods of joining may be used subject to approval of the Engineer.

**SECTION 625**  
**MANHOLE CONSTRUCTION AND DROP SEWER CONNECTIONS**

**625.1.2 Drop Sewer Manholes:** *Add the following sentence:*

For installations of MAG Standard Detail No. 426, Type A, change 2.5 feet minimum to read 1 pipe diameter.

**625.2 Materials:** *Add new section.*

Epoxy Coatings shall be Sauereisen "SewerGard No. 210", Somay "Plasite 5371", Raven "405", Neopoxy NPR-5300, or approved equal.

**625.3.1 Manholes:** *Add the following paragraphs:*

Sections of pipe connected to manholes shall be no longer than five (5) feet to minimize adverse impacts to the sewer line due to settlement of the manhole.

When concrete adjustment rings are used for sewer manhole installations, the rings must be sealed on the inside using grout, "Ram-Nec", or approved equal. No more than three (3) adjustment rings shall be permitted on a manhole riser. When sewer manholes are lined/coated, the adjustment rings shall also be lined/coated. Any existing sewer manholes that are adjusted for new construction shall have the adjustment rings relined/coated and the lining/coating shall be continuous between the manhole barrel and the adjustment rings. All linings/coatings shall be tested using the Holiday test for discontinuities.

Manholes outside of vehicle travel lanes shall be adjusted to 1-1/2 inches above finished grade. All manholes shall have a concrete collar around the ring and cover per COS Standard Detail No. 2270.

All manhole barrels will be sealed at the base with "Ram-Nec" or approved equal.

Approved water stop ring for manhole base and pipe penetrations is "Adeka" MC-2005T for pipe diameters 24 inches or less and "Adeka" MC-2010M for pipe diameters greater than 24 inches, or approved equal.

Epoxy Coatings: 100% solids monolithic coating systems shall be trowel applied per the manufacturer's instructions. Coatings for bases shall have a non-skid surface. Surfaces to be Epoxy coated shall cure for a minimum of 28 days and shall not have received any type of curing agent or sealer. Remove all oil, grease, foreign contaminants and loose laitance prior to the application of the epoxy coating. Sandblasting with fine silica sand to a desired texture equivalent to 40 to 60 grit sandpaper insuring the removal of any and all glaze is required. Hydro blasting is acceptable if first approved by the City Inspector.

*Add the following subsection:*

**625.3.3 Manhole Testing:** All manholes installed shall be tested by exfiltration testing or by vacuum testing. Exfiltration testing shall be performed in accordance with MAG Section 615.10(B) and Arizona Department of Environmental Quality (ADEQ) Engineering Bulletin No. 11, Chapter 4, Section B. Exfiltration from manholes shall be limited to 0.1 gallons per hour per vertical foot. Manholes shall be exfiltrated tested for a period of 24 hours.

Vacuum testing shall be performed in accordance with ASTM C 1244. Vacuum testing shall be performed at the top of the manhole cone for manholes located in of paved areas. Manholes outside of paved areas shall be vacuum tested at the ring and cover. A vacuum of 10 inches of mercury negative pressure shall be drawn on the manhole. The time shall be measured for the vacuum to drop to 9 inches of mercury negative pressure. The manhole shall pass the vacuum test if the time for the vacuum reading to from 10 inches of mercury negative pressure meets or exceeds the following values.

Manhole Depth	Minimum Test Duration (Seconds) - 48" Diameter Manhole	Minimum Test Duration (Seconds) - 60" Diameter Manhole
10 ft. or less	60	75
Greater than 10 ft. to 15 ft.	72	90
Greater than 15 ft.	84	105

If manhole joint compound is pulled out during the vacuum test, the manhole shall be disassembled and the joint repaired or replaced, as necessary. The vacuum test shall then be repeated until the manhole passed the test or the manhole is tested and passes the standard exfiltration referenced above.

Testing of sanitary sewer manholes is considered incidental to the price bid for manhole installation and no additional payment shall be made.

**SECTION 630**  
**TAPPING SLEEVES, VALVES AND VALVE BOXES ON WATER LINES**

**630.3.1 General:** *Add the following sentence to this paragraph:*

All gate valves shall be provided with low-zinc stems.

**630.4.2 Tapping Sleeves:** *Add the following paragraph (C):*

(C) Ties into existing PVC water mains shall be accomplished by installing a stainless steel tapping sleeve and valve. Cast iron tees may be used with City approval. Stainless steel tapping sleeves shall be 360 degree, full circle tapping sleeves and shall conform to the following specifications:

- (1) Body - Stainless Steel Type 304, 14 gauge.
- (2) Flanged Outlet - Stainless Steel Type 304 pipe or tube, Schedule 10 AWWA C-207, Class D, ANSI 150 PSI drilling recessed for tapping.
- (3) Gasket - 1/4 inch thick,  $\pm 0.03$  inch, permanently attached to sleeve.
- (4) Test Plug - 3/4 inch, 304 Stainless Steel or Bronze.
- (5) Nuts & Bolts - Stainless Steel 18-8, type 304, Minimum 4 Bolt Pattern Required.

Installation of Kennedy Square Seal and Rich Corey tapping sleeves is prohibited on City of Scottsdale water lines.

**630.5 BUTTERFLY VALVES:** *Add the following paragraph:*

Butterfly valves will be allowed only for valves 16 inches and larger. All butterfly valves will be tested for proper adjustment. The valve operator shall be accessibly located within a standard manhole per COS Standard Detail No. 2305-1. The manhole cover shall be stamped "City of Scottsdale Water".

*Delete paragraph 630.5 BUTTERFLY VALVES: (B) 3 INCHES THROUGH 12 INCHES: in its entirety.*

**SECTION 631**  
**WATER TAPS AND METER SERVICE CONNECTIONS**

**631.2 MATERIALS:** *Add the following paragraph:*

Pack joint meter stops or corp stops shall be used exclusively.

Polyethylene and polybutylene material shall not be used in any water system installation.

**631.3.1 General:** *Add the following paragraphs:*

Water taps and meter service connections shall be installed in accordance with COS Standard Detail No. 2330. All taps made to existing water lines shall be done by authorized City personnel, or by a Contractor authorized by the City.

Water meters shall not be constructed in driveways sidewalks, washes or retention/detention areas unless approved by the City.

All water service lines constructed under existing pavement shall be installed by mechanical/pneumatic underground boring unless otherwise approved by the COS Transportation Maintenance Director. Water boring is not allowed for construction of water service lines under existing pavement.

**631.6 INSPECTION:** *Add the following paragraph:*

The location of newly constructed water service lines shall be marked with a 2-inch x 4-inch x 30-inch long wooden stake. The stake shall be driven firmly into the ground exposing a minimum of 12 inches of the stake. The stake shall be labeled to indicate "water service".

**PART 700 - MATERIALS**

**SECTION 710  
ASPHALT CONCRETE**

**710.1 GENERAL:** *Add the following paragraph:*

Mixes shall be designated as “R” type (such as R  $\frac{1}{2}$ ”, R  $\frac{3}{4}$ ”, etc.) conforming to low traffic design criteria, or “A” type (such as A  $\frac{1}{2}$ ”, A  $\frac{3}{4}$ ”, etc.) conforming to medium and high traffic design criteria.

**SECTION 715  
SLURRY SEAL MATERIALS**

**TABLE 715-1:** *Make the following revision:*

For TYPE II Slurry Seal Aggregate, the minimum application rate shall be 17 Pounds of Aggregate per Square Yard.

**SECTION 736**  
**NON-REINFORCED CONCRETE PIPE**

**736.1 GENERAL:** *Add the following paragraph to this section.*

Prefabricated non-reinforced concrete pipe shall not be allowed for use as a storm drain or culvert material unless specifically approved by the Engineer and by the Transportation Department.

**SECTION 738  
HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS FOR  
STORM DRAIN AND SANITARY SEWER**

*MAG Section 738 HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS FOR STORM DRAIN AND SANITARY SEWER is hereby deleted in its entirety and the following Section substituted:*

**SECTION 738  
HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS FOR  
STORM DRAIN**

**738.1 GENERAL:**

This specification covers the requirements of profile wall and corrugated high density polyethylene (HDPE) pipe manufactured per ASTM F-2562 (24"-60"), AASHTO M-252 (4"-10") (Type S), M-294 (12"-48") (Type S), and the AASHTO Interim Specification for smooth interior/smooth exterior (54"-60") (Type S or D) pipe for gravity flow storm drains. The HDPE pipe will be in sizes (4"-60") as shown on the plans.

Written approval for the use of HDPE pipe shall be obtained from the Transportation Planning Division for storm sewers and culverts.

**738.2 MATERIALS:**

**738.2.1 Base Material Composition:** Pipe base material shall be made from HDPE plastic compounds meeting the requirements of cell classification PE 335420C or higher cell classification in accordance with ASTM D-3350. Profile wall pipe base material shall comply with the requirements of ASTM F-2562, AASHTO M-252 (Type S) or M-294 (Type S).

**738.2.2 Other Pipe Materials:** Materials other than those specified under Base Materials shall comply with ASTM F-2562, AASHTO M-294 or M-252.

**738.2.3 Gaskets:** Rubber gasket shall be manufactured from rubber, synthetic elastomer or a blend of both and shall comply with the physical requirements of ASTM F-477 for water tight joints.

**738.2.4 Thermal Welding Material:** The HDPE material used for thermally welding the pipe materials shall be compatible with the base material.

**738.2.5 Lubricant:** The lubricant used for assembly shall comply with the manufacturer's recommendations and have no detrimental effect on the gasket or pipe.

**738.3 JOINING SYSTEMS:**

**738.3.1 Joint Type:** Joints for pipe and fittings shall be either a) an integrally formed bell and spigot gasketed joint; b) a thermo-molded coupling gasketed joint; or c) an externally corrugated gasketed coupling for soil tight applications.

Joints a) and b) shall provide a seal against exfiltration and infiltration under low pressure. For the purposes of this specification, low pressure is defined as twenty-five (25) feet of water column or less for ASTM F-894 pipe and five (5) feet of water column or less for AASHTO designated pipe. All surfaces of the joint

upon which the gasket may bear shall be smooth and free of any imperfections which could adversely affect sealability.

The assembly of the gasketed joints shall be in accordance with the manufacturer’s recommendations. All pipe using joints a) and b) above shall have a homing mark on the spigot end to indicate proper penetration when the joint is assembled.

Whenever corrugated HDPE pipe is interfaced with concrete or concrete structures, a heavy coat of “Noah’s” pitch shall be applied around the pipe to be in contact with the concrete. “Ram-Nek” or approved equal, shall then be wrapped around the pipe over the “Noah’s” pitch prior to placement of the concrete. A waterstop gasket may be used only after written approval is obtained from the City.

**738.4 FITTINGS AND MANHOLES:**

Fittings for corrugated HDPE pipe may include tees, wyes, elbows, plugs, caps, adapters, and reducers. Fittings shall be joined in accordance with Section 738.3. A waterstop gasket shall be provided on any manhole entry or connection to reduce infiltration and exfiltration. Where precast manholes are used, entrance hole must be large enough to allow for proper grouting around the gasket. A non-shrink grout shall be used for grouting.

**738.5 CERTIFICATION:**

The manufacturer shall furnish a certification that all materials delivered shall comply with the requirements of AASHTO M-252 or M-294 or the Interim AASHTO Specification for corrugated smooth interior/exterior 54 inch and 60 inch HDPE pipe or ASTM F-2562. The certification shall be provided to the Transportation Planning Division in the case of storm sewer or culvert pipe.

**738.6 DIMENSIONS AND TOLERANCES:**

Pipe dimensions shall comply with the dimensions given in ASTM F-2562, AASHTO M-252, M-294, or the Interim Specifications for corrugated smooth interior/exterior 54 inch and 60 inch HDPE pipe. Pipe not complying with the specified tolerances shall be marked with paint on its interior and exterior and immediately removed from the project site.

The minimum pipe stiffness shall comply with the following:

Diameter (inches)	Minimum Pipe Stiffness (psi)	Diameter (inches)	Minimum Pipe Stiffness (inches)
12 or less	50	36	22
15	42	42	20
18	40	48	18
24	34	54	14
30	28	60	12

Markings on the pipe shall be ASTM F-2562, AASHTO M-294, M-252 or MP7-98.

**738.7 CARE OF PIPE AND MATERIALS:**

Pipe that is gouged, marred, or scratched forming a clear depression shall not be installed and shall be removed.

**SECTION 745**  
**PVC SEWER PIPE AND FITTINGS**

**745.1 GENERAL:** *Delete this paragraph in its entirety and replace it with the following paragraphs.*

This specification covers the requirements of polyvinyl chloride (PVC) plastic sewer and storm drain pipe and fittings for gravity flow sewers, force mains, building connections, and gravity flow storm drains.

PVC sewer pipe, fittings, couplings, and joints for gravity systems up to 15 inches in diameter shall be in conformance with the requirements of ASTM D-3034, SDR-35, 46 psi stiffness factor, except as modified herein. PVC sewer and storm drain pipe, fittings, couplings, and joints for gravity systems from 18 inches to 27 inches in diameter shall be in conformance with ASTM F-679, T-1 wall thickness, 46 psi stiffness factor

PVC sewer pipe, fittings, couplings and joints for pressurized systems from 1 ½ inches in diameter to 3 inches in diameter shall be in conformance with the requirements of ASTM D-1784, cell classification 12454, ASTM D-1785 schedule 80 plastic pipe, and ASTM D-2467 plastic fittings.

PVC sewer pipe, fittings, coupling and joints for pressurized or restrained joint systems from 4 inches in diameter up to 12 inches in diameter shall be in conformance with the requirements of AWWA C900, DR-18. PVC sewer pipe, fittings, coupling and joints for pressurized or restrained joint systems from 14 inches up to 36 inches in diameter shall be in conformance with the requirements of AWWA C905, DR-18 (14 and 16 inch) or DR-21 (18 inch to 36 inch).

**745.4 FITTINGS:** *Add the following paragraph:*

Service saddles shall be molded plastic conforming to ASTM-D3034 and F-1336, high durometer PVC per Fernco Flexible tap saddle with pressure kit, EPDM rubber per Mission T-Flex Sewer Saddles, or approved equals. All saddles shall be installed using Series 300 stainless steel bands. Service saddles shall conform to the outside diameter of the existing sanitary sewer pipe and shall be leak proof, root proof and resistant to chemicals, fungus and sewer gasses.

Flexible non-shear reinforced couplings for VCP shall conform to ASTM C-1173. Rigid slip couplings – gasketed slip repair coupling for PVC pipe shall conform to ASTM D-3034.

**745.5 CERTIFICATION:** *Add the following paragraph:*

For pressurized or restrained joint systems, furnish a certificate from the pipe manufacturer certifying the pipe and fittings meet the requirements of NSF Standard 14, ASTM D-1784, ASTM D-1785, and ASTM D-2467, or AWWA C900, or AWWA C905.

*Add the following Section:*

**SECTION 751  
DUCTILE IRON SEWER PIPE**

**751.1 GENERAL:**

Ductile iron gravity sewer pipe shall be in accordance with ASTM A-746. All pipe shall be lined using a cured in place pipe (CIPP) conforming to the requirements of Section 750.3.

Ductile iron sewer pipe operating under pressure shall be designed in accordance with AWWA C150 and shall be manufactured in accordance with AWWA C151. The pressure class shall be as designated on the plans or in the special provisions.

**751.2 JOINT REQUIREMENTS:**

Push-on joints for ductile iron sewer pipe shall conform to AWWA C111 and shall include synthetic rubber gaskets and lubricant.

Mechanical joints for ductile iron sewer pipe shall conform to AWWA C111 and shall include cast iron glands, synthetic rubber gaskets, and T-head bolts and nuts.

Flanged joints ductile iron sewer pipe shall be as detailed on the plans or as designated in the special provisions.

Restrained Joints: When noted on plans or approved by the Engineer, joints for push-on or mechanical jointed ductile pipe may be modified to provide a fully restrained joint. These modifications to push-on and mechanical joints, including but not limited to segmented or special glands and split sleeves, shall conform to AWWA C111. The Engineer shall review and/or approve each manufacturer's modifications to the joint. Upon request of the Engineer, the manufacturer of the modified joint shall provide test data showing compliance with AWWA C111.

**751.3 SANITARY SEWER PIPE LINING:**

Ductile iron pipe used in sanitary sewer systems shall be lined using a cured in place pipe (CIPP) liner. Acceptable CIPP lining systems include isophthalic polyester resin as installed by Insituform, epoxy vinyl ester resin as installed by Inliner, reinforced fiberglass liner as installed by Reline America, or approved equals.

**SECTION 756**  
**DRY BARREL FIRE HYDRANTS**

**756.3 HYDRANTS:** *Delete the text in this subsection in its entirety and replace it with the following:*

All fire hydrants furnished to, or installed in, the City shall conform to the following specifications:

- (1) Hydrants shall be designed, manufactured, installed and tested in compliance with the latest edition of AWWA. C-502 Standard for Dry-Barrel Fire Hydrants, as published by the American Water Works Association.
- (2) Hydrants shall be designed to operate at the maximum pressure of the line, and tested at the same p.s.i. as the main line.
- (3) Hydrants shall be of the break flange traffic model type with a replaceable breakable unit immediately above the ground line for minimizing repairs due to traffic damage.
- (4) Hydrants shall be of the compression type. Construction such that the main valve closes with the water pressure to assure no loss of water in the event of damage to the upper portion of the fire hydrant.
- (5) Main valve opening shall have a minimum of diameter of 5 1/4 inch to assure optimum flow. The inside diameter of the barrel shall be a minimum of 7 inches. Facing of the main valve against the seats shall be synthetic rubber or balata.
- (6) Hydrants shall be of the drop top design with O-ring seals to insure that the operating threads will be protected from water entry. Dry top design to include factory lubricated operating mechanism which allows supplemental lubricant to be added in the field without removal of the top section. Standard lubricant shall be either oil or grease, suitable for a temperature range of 40 degrees to 150 degrees F.
- (7) All hydrants shall have a weather shield at the operating nut to protect the clearance area between the top casting and the operating nut.
- (8) The operating nut shall be one-piece bronze casting, both the operating nut and the nozzle cap nuts to be National Standard Pentagon in shape and measure 1 1/2 inch from point of flat at the base of the nut. Nozzle caps to be provided with rubber gaskets.
- (9) Hydrants shall have two 2 1/2 inch diameter hose nozzles with National Standard Fire Hose Coupling Screw Threads, and one 4 1/2 inch diameter pumper nozzle with National Standard Threads. Both the Pumper and Hose Nozzle shall be threaded and locked into place with "O" rings used as pressure seals. The use of caulked type nozzles is prohibited.
- (10) Hydrant nozzle section shall be capable of rotation through 360 degrees with respect to the standpipe to allow the positioning of the hose or pumper nozzles.
- (11) Hydrant shall have identification mark indicating direction of opening right to left (counter clockwise).

(12) Hydrants shall have permanent markings identifying the manufacturer name, size of main valve opening, and year of manufacture.

(13) Hydrants shall have an automatic drain that is operated by the main valve rod. Drain valve is to open as the main valve is closed and close as the main valve is opened. Drain valve systems shall be fully automatic. Port and seats of drain valve to be bronze.

(14) The outside of the hydrant top section shall be painted a minimum of one coat of primer and two finished coats of chrome yellow enamel.

(15) The shoe of the hydrant shall be provided with a mechanical joint connection, 6 inch in size. All interior ferrous surfaces of the shoe exposed to continuous fluid flow (including the valve plate and cup nut) shall be epoxy coated to a minimum dry thickness of 6 mils. Epoxy coating shall be factory applied by an electrostatic or thermosetting process in accordance with the manufacturers printed instructions. The epoxy material used shall be 100 percent powder epoxy or liquid epoxy that conforms to the requirements of AWWA C550 and to the prevailing requirements of the Food and Drug Administration and of the Environmental Protection Agency.

(16) The hydrant shall have bronze valve seat and shall be threaded into bronze drain ring or shoe bushing to prevent electrolysis between these components.

(17) Hydrants shall be designed to permit the use of extension sections and allow all parts to be removable from ground level without requiring excavation of the hydrant.

(18) The friction loss must be guaranteed by the manufacturer to satisfy the following table:

(19) *Pour a PCC Collar around the fire hydrant barrel in accordance with AWWA Standard M 17 as shown in COS Standard 2366.*

**756.4 MANUFACTURER:** *Modify table 756-1 as follows:*

**TABLE 756-1  
 MAXIMUM PERMISSIBLE LOSS OF HEAD FOR HYDRANTS**

No. of Outlet Nozzles	Nom. Diam. of Outlet	Total Flow From Outlet Nozzles GPM	Maximum Permissible Head Loss PSI
2	2 1/2"	500	2.0
1	4 1/2"	600	2.5

*Add the following Subsection:*

**756.7 CERTIFICATION**

The Contractor shall provide, to the City, manufacturer certifications attesting the fire hydrants as shown on the submitted product data sheets meet the requirements of this specification.

**SECTION 757**  
**SPRINKLER IRRIGATION SYSTEM**

**757.2.2 Plastic Pipe:** *Add the following paragraph:*

PVC 1120 to 1220, SDR 14, pressure rated at not less than 200 psi shall be used on the supply side of Control Valves.

**757.2.3 Pipe Fittings and Couplings:** *Add the following sentence:*

PVC solvent-weld fittings shall be Schedule 80, 1-2, II-I NSF approved conforming to ASTM D2467.

**757.2.4 Solvent Cement:** *Add the following paragraph:*

Solvent cement for PVC solvent weld pipe and fittings shall be as manufactured by “Weld-On” Type 721 or approved equal. Solvent primer for PVC solvent weld pipes shall be purple all-purpose primer, Type P-70.

**757.3.2 Gate Valves:** *Add the following paragraph:*

Shall be iron body, rubber encapsulated resilient wedge and shall conform to specifications of American Water Works Association Standard C509 and shall have 2 inch square operating nut with arrow cast in metal indicating direction of opening.

**757.3.3 Manual Control Valves:** *Add the following paragraph:*

Ball valves 2 piece and constructed of forged brass body and end adapter. Ball shall be full port, chrome plated brass. Seats and stem packing shall be virgin PTFE. Stem shall be brass with adjustable stem packing nut threaded to body to prevent stem leakage if lever is removed. Ball valves shall be rated 600 psi WOG and 150 psi WSP shall be equal to WATTS FBV-3.

**757.3.4 Electrical Remote Control Valves:** *Add the following paragraph:*

Electric Remote Control Valve shall be Hunter IBV or approved equal. Each control valve installed shall have a valve ID tag (‘Christy’ type or approved equal) attached to the valve flow stem denoting the corresponding station number. The tag shall be attached to the valve stem with #10 gauge minimum non-insulated copper wire. The ID tag shall be marked “T” for tree, “S” for shrub or “C” for cactus.

**757.3.6 Quick-Coupling Valves and Assemblies:** *Add the following sentence:*

Key size and type shall be 1” or #44.

**757.3.7 Valve Boxes:** *Add the following sentence:*

Boxes shall be Carson/Brooks or approved equal with locking “T” style cover supplied with stainless steel bolts. Minimum size shall be 16" x 12" x 12" outside dimension.

**757.5 SPRINKLER EQUIPMENT:** *Add the following sentence:*

Emitters shall have a discharge of 2 gallons per hour (for trees) and 1 gallon per hour (for shrubs) under pressure of 30 pounds per square inch.

**757.6.3 Controller Unit:** *Add the following paragraphs:*

Solar controllers shall only be installed with prior written consent by the Owner's Representative from COS Parks Department.

Only DIG / Leit 4000 (4, 6 and 10 station), X or XR (10 to 28 station) series solar controllers shall be installed per COS Std. Details 2635-1 and 2635-2.

Install wire, connectors, sealant, solenoids, adapters and security enclosure per manufacturer's instructions.

Final location of solar controllers shall be approved by the Owner's Representative from COS Parks Department.

Programming/access key shall be supplied with the controller

*Add the following paragraphs new section:*

**757.7 DETECTABLE TAPE:**

Detectable tape shall consist of 0.4mil thick solid foil core, encased in a protective plastic jacket that is resistant to alkalis, acids and other destructive elements commonly found in soil. The lamination shall have sufficient strength that the layers cannot be separated by hand. The total composite thickness shall be 4.3 mils minimum. The foil core is to be visible to ensure continuity.

Detectable tape shall have a minimum tensile strength of 63 lbs. in the machine direction and 68 lbs. in the transverse direction per three-inch strip.

A continuous warning message "Non-Potable", repeated every 16 to 36 inches, shall be imprinted on the tape surface. The tape shall be colored: designating the code appropriate to the type of line which the tape is protecting with name brand facing up to indicate location.

**SECTION 760**  
**COATING CORRUGATED METAL PIPE AND ARCHES**

**760.2 MATERIALS:** *Delete text of subsection and insert the following:*

Corrugated metal products covered by this specification shall be either plain galvanized conforming to the requirements of AASHTO Designation M-218 or aluminized conforming to the requirements of AASHTO Designation M-274, except as modified herein.

Bituminous coatings will not be allowed.

AASHTO M-190 will be modified to include Type E pipe.

Type E pipe - Corrugated metal pipe with Smooth Metal Liner: This pipe shall be manufactured per AASHTO M-36, Type IA except that the lock seam shall be on the tangent of the helical corrugation. The minimum thickness of the pipe shell shall be as required to support the external load with no credit for load carrying given to the liner. The minimum thickness for the liner shall be 18-gage (0.052 inch).

Concrete lined corrugated metal pipe shall conform to the requirements of ASTM A-849, except as modified herein.

(A) Composition - concrete for the lining shall be composed of cement, fine aggregate and water that are well-mixed and of such consistency as to produce a dense, homogenous, non-segregated lining.

(B) Cement - Portland cement shall conform to the requirements of ASTM C-150 Type II, low alkali.

(C) Aggregates - aggregate shall conform to MAG Section 701.

(D) Mixture - the aggregate shall be sized, graded, proportioned and thoroughly mixed with such proportions of cement and water as will produce a homogenous concrete mixture of such quality that the pipe will conform to the design requirements of this specification. In no case, however, shall the proportions of Portland cement, blended cement or Portland cement plus pozzolanic admixture be less than 564 lb./cu. yd. of concrete.

**760.3 BASE METAL, SPALTER AND FABRICATION:** *Add the following paragraphs:*

Concrete Lined Corrugated Metal Pipe: The following items in addition to those described in Helically Corrugated Metal Pipe apply. The lining shall have a minimum thickness of 1/4 inch above the crest of the corrugations. The lining shall be plant applied by a machine traveling through a stationary pipe. The rate of travel of the machine and the rate of concrete placement shall be mechanically regulated so as to produce a homogenous non-segregated lining throughout. The lining machine shall also mechanically trowel the concrete lining as the unit moves through the pipe.

Each metal pipe section shall be fabricated with a minimum of two annular re-rolled corrugations at each end for the purpose of joining the pipes with an approved coupling band. Smooth metal lined corrugated metal pipe shall be re-rolled with liner intact to crimp the liner and shell in the annular configuration.

**760.4 COUPLING BANDS:** *Delete text of subsection and add the following:*

Fabricated coupling bands shall meet the requirements of AASHTO M-36, except as modified herein. Metal bands may be manufactured of material two gages lighter than that gage specified for the pipe to a minimum thickness of 0.064 inch (16 gage).

Coupling bands shall be one-piece for all pipe diameters to 48 inches. Pipe diameters larger than 48 inches shall use two-piece coupling bands. Coupling bands shall be a minimum 10 1/2 inches wide, formed with a minimum of two annular corrugations that are spaced to provide nesting of the second annular corrugation of each pipe.

*Add the following subsection:*

**760.6 REPAIRS:**

Concrete Lined Corrugated Metal Pipe - The pipe shall be inspected for cracks after all backfilling of the pipe trench has been completed and accepted. The type of material used for crack repairs shall be submitted to the Engineer for approval prior to the start of any corrective work. Spalling, separations or offsets in the lining shall be repaired by approved methods using epoxy materials.

All cracks, any part of which is 1/16 inch or more in width shall be repaired for their entire length. The crack shall be filled with an approved epoxy joint filling material that will bond the two faces of the crack. The finished interior surface of the pipe at the location where cracks are repaired shall be cleaned with any extraneous material removed, such that the surface matches the adjacent mechanically trowelled surface.

**SECTION 795**  
**LANDSCAPE MATERIAL**

**795.2 TOPSOILS:** *Add the following paragraph:*

Soil texture shall be as follows: sand 60%-90%, clay 10%-20%, silt 10%-20%. The soil shall be classified as loamy sand or sandy loam. Volume of stones, cinders, slag, or extraneous material shall not exceed five percent.

**795.3 SOIL FERTILIZING MATERIAL:** *Add the following paragraphs:*

Superphosphate: Homogenous commercial 0-45-0, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.

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-form, phosphorous, and potassium in the following composition:

1. Composition: 1 lb per 1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

Slow-Release Fertilizer: Granular fertilizer consisting of 50% water-insoluble nitrogen, phosphorus, and potassium in homogenous composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

Tree and shrub fertilizer shall be a complete, commercially available inorganic material. Fertilizer shall contain sulfur coated slow release components and applied at the surface per manufacturers specifications. Approved ratios are 12-6-8 or 14-14-14.

**795.5 CHEMICAL SOIL CONDITIONER:** *Delete the second paragraph:*

**795.6 SEEDS:** *Add the following paragraph:*

Seed Mixture for turf shall be Bermuda Triangle (mix of Sultan, Sidney and Yuma), 80% minimum germination, 85% minimum pure live seed, 0.5 % maximum weed seed as approved by COS Parks Department.

**795.7.1 General:** *Add the following sentence:*

All landscape stock shall conform to ANSI Z60.1.

**795.7.3 Trees:** *Delete section in its entirety, and replace with the following:*

Measure trees according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

**Sections 795.8.1 thru 795.8.3:** *Delete these sections in their entirety and replace with the following:*

**795.8.1 Upright Stakes:** Comply with COS Parks Department Planting Detail 2620-1, round 2 inch, pressure-preservative-treated lodge poles, free of knots, holes and other defects.

**795.8.2 Tie Wire and Chafing Guard:** ASTM A 641 (ASTM A 641M), Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch (2.7 mm) in diameter and the cover for this wire shall be reinforced rubber or plastic hose at least 1/2 inch (13 mm) in diameter, black, cut to lengths required to protect tree trunks from damage.

**795.8.3 Granite Boulders:** Boulders shall be surface select, free of equipment marks and cracks. Size as indicated on the drawings.

**Sections 795.8.5 thru 795.8.7:** *Add the following sections:*

**795.8.5 Mulches:**

- A. Peat Mulch: Provide Dakota peat moss in natural, shredded, or granulated form, of fine texture, with a pH range of 4 to 6 and a water-absorbing capacity of 1100 to 2000 percent.
- B. Wood Fiber Mulch: Biodegradable dyed-wood cellulose-fiber mulch, nontoxic, free of plant growth- or germination-inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- C. Asphalt Emulsion Tackifier: Asphalt emulsion, ASTM D 977, Grade SS-1, nontoxic and free of plant growth- or germination-inhibitors.
- D. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application, nontoxic and free of plant growth- or germination-inhibitors.

E. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:

1. Type: Decomposed granite.
2. Size Range: 1/2 inch screened.
3. Color: Readily available natural gravel color range, similar to naturally occurring onsite materials. Color shall be approved by COS Parks Department prior to installation.

**795.8.6 Sod:**

Hybrid Bermuda 328, Tifway 419, or as approved by COS Parks Department. When overseeded with perennial rye winter grass, the variety shall be approved by COS Parks Department.

1. Sod shall be 3/4 inch thick.
2. Sod shall be big-roll cut in widths of greater than or equal to 42 inches, minimum lengths of 50 feet or as approved by COS Parks Department.
3. Edges shall be cut at 90-degree angles. Torn or uneven ends are unacceptable.
4. Sod shall not break apart when handled and be moist and fresh upon arrival to site.
5. Sod shall be mowed prior to cutting.
6. Sod shall be scrim free during installation.
7. Sod shall be grown in a sand/soil based medium as approved by COS Parks Department on an Arizona Sod farm.
8. Sod shall be 12-18 months old.
9. Sod shall be true of species
10. Sod shall be free from any objectionable weeds and/or grasses.

**795.8.7 Soil Stabilizer:**

1. Stabilizer" binder or approved equal by COS Parks Department as manufactured by Stabilizer Solutions Inc, 33 South 28th St. Phoenix, Arizona 85018, (602) 225-5900.

2. Ballfield infield mix shall be “Stabilizer Pro-Red” or approved equal by COS Parks Department. The Coral fines must meet the USDA particle size analysis in the range as follows for the infield mix:

	<u>ACCEPTABLE RANGE</u>
<u>GRAVEL</u>	<u>0 – 2.0%</u>
<u>COARSE</u>	<u>30 – 35%</u>
<u>MEDIUM FINE SAND</u>	<u>45 – 50%</u>
<u>SILT AND CLAY</u>	<u>15 – 20%</u>
<u>BULK DENSITY</u>	<u>1.5</u>
<u>STABILIZER BINDER ORGANIC MATTER</u>	<u>1.0% T</u>
<u>OTAL PORE SPACE</u>	<u>41</u>
<u>UNIFORMITY COEFFICIENT CU</u>	<u>5.0</u>

3. Ballfield mound and homeplate mix will be blended with “Stabilizer” binder (or approved equal by COS Parks Department), clay and Coral fines per manufacturers specifications. Mixture must meet USDA particle size analysis as follows:

	<u>MOUND AND HOMEPLATE MIX</u>
	<u>RANGE</u>
<u>GRAVEL</u>	<u>0 – 2”</u>
<u>VERY COURSE</u>	<u>20 – 25%</u>
<u>COARSE</u>	<u>20 – 25%</u>
<u>MEDIUM AND FINE</u>	<u>25 – 30%</u>
<u>SILT AND CLAY</u>	<u>50 – 60%</u>
<u>STABILIZER CONTENT 12 LBS. PER TON</u>	<u>0.6%</u>

4. Ballfield warning track and pathway/pavement areas as shown on the plans shall be “Stabilizer StaLoc” or approved equal by COS Parks Department. Crushed stone shall consist of inert materials that are hard, durable, with stone free from surface coatings and deleterious materials. Gradation requirements shall be as follows:

<u>U.S. Sieve No.</u>	<u>Percent Passing by Weight</u>
<u># 1/2-inch</u>	<u>98 – 100</u>
<u># 3/8-inch</u>	<u>90 – 100</u>
<u># 4</u>	<u>65 – 80</u>
<u># 8</u>	<u>48 – 63</u>
<u># 16</u>	<u>40 – 49</u>
<u># 30</u>	<u>30 – 40</u>
<u># 50</u>	<u>20 – 27</u>
<u># 100</u>	<u>10 – 18</u>
<u># 200</u>	<u>10 - 12</u>