COPPER MOUNTAIN CONSOLIDATED METROPOLITAN DISTRICT

APPENDIX G - TECHNICAL SPECIFICATIONS

CMCMD

Adopted: December 2023

Contents

DIVISION 1: GENERAL REQUIREMENTS

SECTION 01340 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Submittal of all Shop Drawings and Product Data as required by the CMCMD (District) for all materials and products to be installed

B. Submit Shop Drawings and Product Data referenced in Construction Documents approved by the District for construction

C. Submittals will not be approved for Construction Documents which have not been approved by the District

1.2 RELATED SECTIONS

A. Section 01400—Quality Control

B. Section 01570—Traffic Regulation

C. Section 01610—Materials

D. Section 01720—Project Record Documents

E. Section 02200—Earthwork

F. Section 02500—Paving and Surfacing

G. Section 02607—Manholes and Covers

H. Section 02667—Site Water Lines

I. Section 02675—Disinfection of Water Distribution Systems

J. Section 02732—Site Sanitary Sewerage System

K. Section 02936—Seeding

L. Section 03001—Concrete

M. Section 03600—Grout

N. Section 07160—Bituminous Dampproofing

O. Section 15430—Plumbing Specialties

1.3 SUBMITTALS

A. General

1. All submittals must be complete and included as a set to the District

B. Shop Drawings—Drawings shall be presented in a clear and thorough manner:

1. Details shall be identified by reference to sheet and detail or schedule shown on Construction Drawings
2. Scale and Measurements: Make Drawings accurate to a scale with sufficient detail to show the kind, size, arrangement and function of component materials and devices
3. Minimum sheet size: 8 1/2" by 11"

C. Product Data—Preparation:

1. Clearly mark each copy to identify pertinent materials or products submitted for review
2. Show performance characteristics and capacities where applicable
3. Show dimensions and clearances required
4. Show wiring or piping diagrams and controls
5. Show external connections, anchorages, and supports required

D. Manufacturer's standard schematic drawings and diagrams:

1. Modify Drawings and diagrams to delete information which is not applicable to the Work and to the Construction Documents
2. Supplement standard information to provide information specifically applicable to the Work and to the Construction Documents

E. Certificate of Compliance:

1. Provided by manufacturer or supplier in lieu of detailed submittal data required
2. Certifies that product data or item identified in certificate is in total compliance with District requirements
3. Specifically identifies project name, manufacturer, supplier, contact name and contact phone number
4. States that there is no deviation from District requirements

1.4 DEVELOPER/CONTRACTOR RESPONSIBILITIES

A. Review Shop Drawings and Product Data prior to submission for accuracy and completeness

B. Determine and verify:

1. Field measurements
2. Field construction criteria
3. Catalog numbers and similar data
4. Conformance with specifications

C. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted

D. Verify that each item and the submittal for it conform in all respects with specified requirements of the Work and of the Construction Documents

E. Notify the District in writing, at time of submission, of any deviations in the submittals from requirements of the Construction Documents

1.5 SUBMISSION REQUIREMENTS

A. Make submittals promptly to facilitate review by the District prior to installation

B. Consecutively number all submittals. Assign a unique number for Shop Drawings, Product Data and other information required for individual specification sections. Each section may have more than one submittal number

C. Number of submittals required:

1. Shop Drawings and Product Data: Submit two copies which will be filed for reference when approved by the District

D. Accompany each submittal with a letter of transmittal showing all information required for identification and checking. Submittals shall contain:

1. Submittal number
2. The date of submission and the dates of any previous submissions
3. The Project title and number
4. Construction Project Identification
5. The names of:
    a. Developer/Contractor
    b. Supplier
    c. Manufacturer
6. Identification of the product, with the specification section number
7. Field dimensions, clearly identified as such
8. Relation to adjacent or critical features of the Work or materials
9. Applicable standards, such as ASTM or Federal Specification numbers
10. Identification of deviations from Construction Documents
11. Identification of revisions on resubmittals

E. Submittal log:

1. Maintain an accurate submittal log for the duration of the Work showing current status of all submittals at all times
2. Make the submittal log available to the District for review upon request

F. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received:

1. Partial submittals may be rejected as not complying with the provisions of the Construction Documents

G. Make submittals far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery

H. In scheduling, allow a minimum of 14 calendar days for review by the District following receipt of the submittal

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1.6 DISTRICT DUTIES

A. Review submittals with reasonable promptness and notify Developer/Contractor of discrepancies:

1. District's review shall not extend to construction methods, sequences, and safety techniques. No information regarding these items will be reviewed whether or not included in submittals
2. Maintain file of submittals for District use

B. Review Drawings and Product Data submitted only for general conformity with the Construction Documents

C. Consider and review only those deviations from the Construction Documents clearly identified as such in the submittals

1.7 RESUBMISSION REQUIREMENTS

A. Make any corrections or changes in the submittals required by the District and resubmit until approved

B. Transmit each resubmittal under new letter of transmittal. Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., 1, 1A, 1B, etc.)

C. Shop Drawings and Product Data:

1. Revise initial drawings or data and resubmit as specified for the initial submittal
2. Indicate any changes which have been made other than those requested by the District

D. Transmit, unreviewed, to Developer/Contractor all copies of submittals received directly from suppliers, manufacturers and subcontractors

1.8 PRODUCTS

Not Used

1.9 EXECUTION

Not Used

END OF SECTION

SECTION 01400 - QUALITY CONTROL

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Quality assurance and control of installation

B. Inspection and testing laboratory services and qualifications

C. Laboratory duties and limitations of authority of testing laboratory

D. Developer/Contractor responsibilities

E. Field testing

F. Testing and services schedule

1.2 RELATED SECTIONS

A. Section 01610—Materials

B. Section 01340—Shop Drawings, Product Data, and Samples

C. Section 01720—Project Record Documents

1.3 REFERENCES

A. Conform to District and reference standards by date of issue current on date of Construction Documents

B. Obtain copies of standards when required by the District or the Construction Documents

C. Where specified District and reference standards conflict with Construction Documents, request clarification from the District before proceeding

1.4 SUBMITTALS

A. Submit under provisions of Section 01340.

B. Provide copies of written reports for materials, products or tests as scheduled at the end of this section. Reference each report by respective section number.

C. Laboratory Qualifications—Provide statement of qualifications from testing firm and testing firm personnel for review and acceptance by the District.

D. Field Personnel Qualifications—Provide statement of qualifications for review and acceptance by the District for the following:

1. ACI certification.
2. Independent special inspector and testing as specified, or as required by the District.

E. Laboratory Test Reports—Provide written reports of each test and inspection to District. Each report shall include:

1. Date issued
2. Project title and number
3. Testing laboratory name, address and telephone number
4. Name and signature of laboratory inspector
5. Date and time of sampling or inspection
6. Record of temperature and weather conditions
7. Date of test
8. Identification of product and specification section
9. Location of sample or test in the Project
10. Type of inspection or test
11. Results of tests and compliance with Construction Documents
12. Interpretation of test results when requested by District

F. Field Test Reports: Provide reports detailing results of the tests. Indicate compliance or non-compliance with Construction Documents. Identify corrective action for materials and equipment which fails to pass field tests.

1.5 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality

B. Comply fully with manufacturer's instructions, including each step in sequence

C. Should manufacturer's instructions conflict with District standards or Construction Documents, request clarification from the District before proceeding

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship

E. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement

F. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Construction Documents

G. Certification of products: Respective sections of specifications

H. Testing, adjusting and balancing of equipment: Respective specification sections

I. Laboratory tests required and standards for testing: Respective specification sections

1.6 INSPECTION AND TESTING LABORATORY SERVICES

A. Developer/Contractor shall employ and pay for the services of an independent testing laboratory to perform all specified services and testing related to the design of mixes, materials and products for the District's review of proposed materials and products before, during and after incorporation in the Work and to retest materials and products which fail original test

B. Employment of the laboratory shall in no way relieve Developer/Contractor's obligations to perform the Work of the Construction Documents

C. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the District.

1.7 QUALIFICATION OF LABORATORY

A. Perform all tests to determine compliance with Contract Document by an independent commercial testing firm acceptable to the District.

B. Testing firm's laboratory: Staffed with experienced technicians, properly equipped and fully qualified to perform tests in accordance with specified standards

C. Meet basic requirements of ASTM E 329, "Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection" as applicable

D. Authorized to operate in the State in which the Project is located

E. Testing Equipment:

1. Calibrated at reasonable intervals by devices of accuracy traceable to either:
    a. National Institute of Standards and Technology
    b. Approved values of natural physical constants

1.8 LABORATORY DUTIES

A. Cooperate with the District and Developer/Contractor; provide qualified personnel after due notice

B. Perform specified inspections, sampling, and testing of materials and methods of construction:

1. Comply with specified standards
2. Ascertain compliance of materials with requirements of Contract Documents

C. Promptly notify the District and Developer/Contractor of observed irregularities or deficiencies of work or products

1.9 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Construction Documents
2. Approve or accept any portion of the Work
3. District employed laboratory shall not perform any duties of the Developer/Contractor

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1.10 DEVELOPER/CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel and provide access to Work

B. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete and other material mixes which require control by the testing laboratory

D. Furnish copies of product test reports as required

E. Furnish incidental labor and facilities:

1. To provide access to Work to be tested
2. To obtain and handle samples at the project site or at the source of the product to be tested
3. To facilitate inspections and tests
4. For storage and curing of test samples

F. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested:

1. Notify the District and independent firm 24 hours prior to expected time for operations requiring services to allow for scheduling of tests and laboratory assignment of personnel
2. Make arrangements with independent firm and pay for additional samples and tests required for Developer/Contractor's use

1.11 FIELD TESTING

A. Developer/Contractor shall pay all costs associated with field testing of materials and products as required in respective specification sections

B. Provide all required materials, labor, equipment, water, and power required for testing

C. Perform all tests in presence of the District and provide one copy of field test results to the District same day of tests

D. Repair with no additional compensation all materials and products which fail during testing

1.12 TESTING AND SERVICES SCHEDULE

A. Testing laboratory services shall be provided for, but shall not be limited to, the following:

SPECIFICATION SECTION	TYPE OF MATERIAL, EQUIPMENT OR SYSTEM
02200	Earthwork
02500	Paving and Surfacing
02675	Disinfection of Water Distribution Systems
03001	Concrete

1.13 FIELD TESTING

A. Field testing shall be provided for, but shall not be limited to, the following:

SPECIFICATION SECTION	TYPE OF MATERIAL, EQUIPMENT OR SYSTEM
02200	Earthwork
02500	Paving and Surfacing
02607	Manholes and Covers
02667	Site Water Lines
02675	Disinfection of Water Distribution Systems
02732	Site Sanitary Sewerage System
03001	Concrete

PART 2: PRODUCTS

Not Used

PART 3: EXECUTION

Not Used

END OF SECTION

SECTION 01570 - TRAFFIC REGULATION

PART 1: GENERAL

1.1 SECTION INCLUDES

A. General Requirements

B. Regulatory Requirements

C. Construction Parking Control

D. Flagmen

E. Flares and Lights

F. Haul Routes

G. Roadway Usage Between Operations

H. Traffic Signs and Signals

I. Removal

1.2 RELATED SECTIONS

A. Section 01340—Shop Drawings, Product Data, and Samples

1.3 GENERAL REQUIREMENTS

A. Unless otherwise authorized, keep at least one lane of traffic open at all times

B. When work is not in progress, keep all traffic lanes open

C. All traffic lanes shall be open during hours of darkness, weekends, and holidays

1.4 REGULATORY REQUIREMENTS

A. Conformance: “Manual on Uniform Traffic Control Devices,” U.S. Department of Transportation, Colorado Department of Transportation, or applicable statutory requirements of authority having jurisdiction

B. Operations on or about traffic areas and provisions for regulating traffic will be subject to the regulation of governmental agencies having jurisdiction over the affected areas

1.5 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and District's operations

B. Monitor parking of construction personnel's vehicles. Maintain vehicular access to and through parking areas

C. Prevent parking on or adjacent to access roads or in non-designated areas

1.6 FLAGMEN

A. Provide trained and equipped flagmen to regulate traffic when construction operations or traffic encroach on public traffic lanes

1.7 FLARES AND LIGHTS

A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic

1.8 HAUL ROUTES

A. Consult with authority having jurisdiction in establishing public thoroughfares to be used for haul routes and site access

B. Confine construction traffic to designated haul routes

C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic

1.9 ROADWAY USAGE BETWEEN OPERATIONS

A. At all times when work is not actually in progress, make open, passable, and maintain to traffic such portions of the Project and temporary roadways or portions thereof as may be agreed upon between Contractor and District and all other authorities or parties having jurisdiction over properties involved

1.10 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic

B. Install and operate traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations

C. Relocate as Work progresses, to maintain effective traffic control

D. Protect all roadways by effective barricades on which are placed warning signs

E. Provide barricades and warning signs for open trenches, other excavations and obstructions

F. Illuminate by means of warning lights all barricades and obstructions form sunset to sunrise

1.11 REMOVAL

A. Remove equipment and devices when no longer required

B. Repair damage caused by installation

C. Remove post settings to a depth of 2 feet

PART 2: PRODUCTS

Not Used

PART 3: EXECUTION

Not Used

END OF SECTION

SECTION 01610 - MATERIALS

PART 1: GENERAL

1.1 SECTION INCLUDES

A. General Requirements

B. Quality Assurance

C. Qualifications

D. Delivery, Storage, and Handling

E. Warranty

F. Materials

G. Fabrication and Manufacture

H. Examination

I. Installation

J. Adjusting and Cleaning

1.2 RELATED SECTIONS

A. Section 01340—Shop Drawings, Product Data and Samples

B. Section 01400—Quality Control

1.3 GENERAL REQUIREMENTS

A. The section applies to all materials provided for the Construction Project

B. The requirements of detailed specifications take precedence over this section in the event of an apparent conflict

C. Provide all new materials and equipment, except as specified or required by testing

D. Except for materials as specifically indicated or specified, materials removed from the existing systems shall not be used in the completed work

E. Do not use any material or equipment for any purpose other than that for which it is designed or specified

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified with number of years of documented experience as indicated within the section

B. Installer: Materials installed and placed in service by or under the guidance of qualified personnel having the knowledge and experience necessary for proper results. Where Developer/Contractor's or Subcontractor's employees are not properly qualified, such personnel shall be field representative of the material supplier

1.5 QUALITY ASSURANCE

A. Observation of performance tests by District:

1. If subsequent visits by District Engineer are required because of incomplete tests, retesting or subsequent tests, Developer/Contractor shall reimburse District for all costs

1.6 DELIVERY, STORAGE, AND HANDLING

A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site:

1. Deliver products in undamaged condition, in manufacturer's original container or packaging, with identifying labels intact and legible
2. Immediately on delivery, inspect shipments to assure compliance with requirements of approved Construction Documents and submittals and that products are properly protected and undamaged

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging

C. Preparation for shipment:

1. Package materials and equipment to facilitate handling and protect against damage during transit handling or storage
2. Tag or mark each item per the delivery schedule of the Shop Drawings
3. Include complete packing lists and bills of material with each shipment

D. Storage and protection:

1. Store immediately upon delivery
2. Store products in accord with manufacturer's instructions, with seals and labels intact and legible
3. Store fabricated products above the ground on blocking or skids to prevent soiling or staining
4. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation
5. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter
6. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions and free from damage or deterioration.
7. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed

1.7 WARRANTY

A. Warranty all materials and equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, leakage, breakage or other failure for a period of one year from the date of acceptance by the District

B. District reserves the right to require an extended warranty period for specific materials and equipment prior to acceptance by the District

PART 2: PRODUCTS

2.1 MATERIALS

A. Suitable for the service conditions

2.2 FABRICATION AND MANUFACTURE

A. Design, fabricate, and assemble in accordance with the best modern manufacturing and shop practices

B. Manufacture parts to standard sizes and gages

C. Two or more items of the same type shall be identical by the same manufacturer and interchangeable

PART 3: EXECUTION

3.1 EXAMINATION

A. Examine material for signs of pitting, rust decay, or other deleterious effects of storage. Do not install any materials showing such effects. Replace damaged materials with identical new materials

3.2 INSTALLATION

A. Handle, install, connect, clean, condition, and adjust products in strict accord with manufacturer's instructions and in conformity with specified requirements

3.3 ADJUSTMENT AND CLEANING

A. Perform all required adjustment tests, operation checks and other startup activities required

END OF SECTION

SECTION 01720 PROJECT RECORD DOCUMENTS

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Maintenance of record documents. Throughout progress of Work, maintain an accurate record of changes to the Construction Documents, and, upon completion of Work, transfer recorded changes to set of Record Documents

1.2 RELATED SECTIONS

A. Individual sections of Technical Specifications

1.3 SUBMITTALS

A. Comply with pertinent provisions under Section 01340

1.4 QUALITY ASSURANCE

A. Delegate the responsibility for maintenance of Record Documents to one person on Developer/Contractor's staff

B. Accuracy of records:

1. Thoroughly coordinate changes within Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show the change properly.
2. Accuracy of records shall be such that future search for items shown in the Construction Documents may rely reasonably on information obtained from approved Project Record Documents

1.5 DELIVERY, STORAGE, AND HANDLING

A. Maintain job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents

B. In the event of loss of recorded data, use means necessary to again secure the data for District's acceptance:

1. Such means shall include, if necessary in the opinion of the District, removal and replacement of concealing materials
2. In such case, provide replacement to the standards originally required by the Construction Documents

PART 2: PRODUCTS

Not Used

PART 3: EXECUTION

3.1 FINAL PROJECT RECORD DOCUMENTS

A. The purpose of final Project Record Documents is to provide factual information regarding all aspects of Work, both concealed and visible, to enable future modification of Work to proceed without lengthy and expensive site measurement, investigation, and examination

B. Acceptance of recorded data prior to transfer:

1. Following receipt of blueline copies for Final Record Documents, and prior to start of transfer of recorded data thereto, secure District's acceptance of all recorded data
2. Make required revisions

C. Transfer of data to Drawings:

1. Carefully transfer change data shown on job set of Record Drawings to the corresponding bluelines, coordinating the changes as required
2. Clearly indicate at each affected detail and other Drawing, a full description of changes made during construction, and the actual location of items to be located
3. Call attention to each entry by drawing a “cloud” around the area or areas affected
4. Make changes neatly, consistently, and with the proper media to assure longevity and legibility

D. Transfer of data to other Documents:

1. Any changes made to the Documents other than Drawings must be submitted to the District electronically. Only those Sections affected by changes are required to be resubmitted
2. If Documents other than Drawings have been kept clean during progress of Work, and if entries thereon have been orderly and acceptable to the District, the job set of those Documents other than Drawings will be approved as final Record Documents
3. If any such Document is not acceptable to the District, secure a new copy of Construction Documents and carefully transfer the changed data to the new copy for acceptance by the District

E. Review and submittal:

1. Submit completed set of Project Record Documents to the District as described above and under provisions of Section 01340
2. Participate in review meetings as required.
3. Make required changes and promptly deliver final Project Record Documents to the District

3.2 CHANGES SUBSEQUENT TO ACCEPTANCE

A. Contractor has no responsibility for recording changes in Work subsequent to Final Completion, except for changes resulting from Warranty work

END OF SECTION

DIVISION 2: SITE WORK

SECTION 02200 - EARTHWORK

PART 1: GENERAL

1.1 DESCRIPTION

A. Clearing, grubbing and site preparation

B. Removal and disposal of debris

C. Handling, storage, transportation, and disposal of excavated material

D. Sheeting, shoring, bracing and protection work

E. Pumping and dewatering as required or necessary

F. Backfilling

G. Pipe embedment

H. Construction of fills and embankments

I. Trench Stabilization

J. Final grading

K. Slope Stabilization

L. Erosion Control

M. Appurtenant work

1.2 RELATED SECTIONS

A. Section 01340—Shop Drawings, Product Data and Samples

B. Section 01400—Quality control

C. Section 02667—Site Water Lines

D. Section 02936—Seeding

E. Section 03001—Concrete

1.3 REFERENCES

A. ASTM C33—Concrete Aggregates

B. ASTM C136—Sieve Analysis of Fine and Coarse Aggregates

C. ASTM D1241—Material for Soil Aggregate Subbase, Base and Surface Courses

D. ASTM D698—Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))

E. ASTM D4253—Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table

F. ASTM D4254—Test Methods for Minimum Index Density and Unit Weights of Soils and Calculation of Relative Density

G. ASTM D6938—Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.4 SUBMITTALS

A. Submit under provisions of Section 01340

B. Product Data: Submit on all products or materials supplied herein

C. Test Reports: Indicate supplier, sieve analysis, optimum moisture content and density in accord and with ASTM D698, or ASTM D4253 and ASTM D4254 where appropriate for crushed rock or gravel pipe embedment and material for fills and embankment

1.5 REGULATORY REQUIREMENTS

A. Comply with all requirements of the Rules and Regulations for Copper Mountain Consolidated Metro District

B. Comply with all requirements of the "Erosion and Sediment Control During Construction" manual as established in the Summit County Engineering Division Storm Water Pollution Prevention Plan and Erosion Control Plan SWP and ECP Permit Application related to site grading and excavation work

C. Comply with all requirements established in the Colorado State Construction Dewatering Permit, including settling and treatment of dewatering flows, as required to prevent contamination of adjacent rivers, creeks, and drainage ways

D. Comply with all requirements of the Rules and Regulations for Copper Mountain Consolidated Metro District regarding operations in operating permit area and regarding removal and disposal of trees from excavation areas

1.6 ENVIRONMENTAL REQUIREMENTS

A. Protect adjacent structures and surrounding areas from damage during excavation, filling, and backfilling

B. Protect Work from erosion or other similar types of damage until the project has been completed

C. Do not backfill or construct fills during freezing weather. Backfill or construct fills only when temperature is 35 degrees F and rising

D. Do not use frozen materials, snow, or ice in any backfill or fill area

E. Do not backfill or construct fill on frozen surfaces

F. Protect excavated material from becoming frozen

G. Do not remove trees from outside excavation or fill areas unless authorized by the governing District; protect from permanent damage by construction activities

H. Provide temporary bridges for roadways, walkways, driveways, etc.

PART 2: PRODUCTS

2.1 MATERIALS

A. Classification of Excavated Materials:

1. None
2. Remove and handle excavated materials regardless of its type, character, composition, condition, or depth at no additional cost to District
3. Remove and handle excavated materials regardless of means, methods and techniques required, at no additional cost to District

B. Fills and Embankments:

1. To the max extent practical use excess earth from excavation for fills and embankments
2. Obtain additional material from borrow areas as necessary
3. Fill and embankment material acceptable to Engineer and/or a professionally licensed Geotechnical Engineer
4. No rocks or stones larger than 4 inches in greatest dimension in upper 12 inches of fill or embankment and free from brush, stumps, logs, roots, debris and organic and other deleterious materials
5. Where allowed, distribute rocks and stones through the fill to not interfere with compaction
6. Crushed rock or gravel: Graded 1-1/2 inch to No. 4, ASTM C33, free of dust, clay or trash

C. Topsoil:

1. Native material removed and stockpiled before excavation
2. Free from trash, debris, surface vegetation more than 6 inch high

D. Pipe Embedment and Trench Stabilization: Graded gravel

1. Rock 3/4 inch minus for PVC, DIP and Trench Stabilization

SIEVE SIZE (INCH)	PERCENT PASSING BY WEIGHT
1	100
3/4	90-100
1/2	20-55
3/8	0-15
#4	0-5

2. Rock 1 1/2 inch minus for DIP and Trench Stabilization

SIEVE SIZE (INCH)	PERCENT PASSING BY WEIGHT
2	100
1 1/2	90-100
1	20-55
3/4	0-15
3/8	0-5

3. Washed 3/8 inch pea gravel for PVC only
4. Rock for trench stabilization: As determined by professionally licensed Geotechnical Engineer

E. Compacted Trench Backfill:

1. Job excavated material finely divided, free of unacceptable debris, organic material, and stones larger than 6 inch in greatest dimension if well separated and arranged so as not to interfere with backfill compaction without masses of moist, stiff clay, or other deleterious material as determined by the District
2. Graded gravel: As specified for pipe embedment

F. Trench Cover:

1. Free of brush, debris and roots more than 1" in diameter
2. May contain rubble and detritus from rock excavation, stones and boulders if well separated and arranged so as not to interfere with backfill settlement
3. No stones larger than 4 inch in greatest dimension in upper 12 inches for trench cover

G. Compacted Structural Backfill:

1. Earth only, free of wood, grass, roots, broken concrete, stones, trash, or debris of any kind or uniformly graded borrow material acceptable to the District
2. Moisture content uniformly distributed and such that max density of compacted soil will be obtained

H. Flowable Backfill—Regular or quick set:

1. Maximum desired 28-day strength: 60 psi
2. Batch plant mix design based on cubic yards

COMPONENT	REGULAR FLOWABLE FILL	QUICK SET FLOWABLE FILL
CEMENT (TYPE II)	50 lbs.	47 lbs.
FLY ASH (CLASS F)	-0- lbs.	250 lbs.
SAND	1845 lbs.	1600 lbs.
ROCK/LIMESTONE (3/4" - #4)	1700 lbs.	1755 lbs.
WATER	325 lbs.	341 lbs.
ACCELERATOR (POZZ. 20)	-0- lbs.	23-1/2 ozs.
AEA (MB-VR)	-0- ozs.	45 ozs.

2.2 ACCESSORIES

A. Straw bales used for erosion control barriers: Wire or string wound and less than one year old. Do not use bales in an advanced state of deterioration regardless of age

B. Stakes for erosion control bales: No. 4 reinforcing steel or 2-inch x 2-inch wood stakes

C. Erosion Control Fabric: Straw or coconut fiber combination blanket for temporary protection of sloped areas; 3/8 inch maximum thickness:

1. “S 150” as manufactured by North American Green
2. “S2” as manufactured by Terra Tech
3. “ExcelsiorMat 1” as manufactured by RoLanka International, Inc.
4. Or approved equal

D. Silt Fence Fabric: Woven polypropylene

1. Mirafi 100X for “Envirofence” installations as manufactured by TC Mirafi
2. Or approved equal

PART 3: EXECUTION

3.1 EXAMINATION

A. Field verify the location of all underground utilities, pipelines and structures prior to excavation

3.2 PERFORMANCE - GENERAL

A. Perform Work in a safe and proper manner with appropriate precautions against hazard

B. Provide adequate working space and clearances for Work performed within excavations and for installation and removal of concrete forms

C. Do not undercut excavation faces for extended footings

D. Clean subgrades of loose material before concrete is placed thereon

E. Except as otherwise authorized, indicated, or specified, replace all material excavated below the bottom of concrete walls, footings, slabs on grade and foundations with concrete placed at the same time and monolithic with the concrete above

F. Except where exterior surfaces are to be dampproofed concrete structures that do not have footings that extend beyond the outside face of exterior walls may be placed directly against excavation faces without outer forms

3.3 PREPARATION

A. Clear site of roots, brush, and other objectionable material and debris where occupied by permanent construction

B. Clean and strip subgrade for fills and embankments of surface vegetation, sod, tree stumps and organic topsoil

C. Remove waste materials from site and dispose

D. Clean, as necessary, for access, stringing of pipeline materials and construction of pipelines and appurtenant structures within road right-of-ways

E. Remove debris, all trees, underbrush, stumps, roots and other combustible materials from site daily and dispose of off-site; on-site burning is not permitted

F. Do not use open burning

3.4 PRESERVATION OF TREES

A. Do not remove trees outside fill or excavated areas, except as authorized by the governing District, Agency or property owner

B. Protect trees left standing from permanent damage by construction operation

C. Trim standing trees as directed by the governing District

3.5 TOPSOIL

A. Remove and stockpile available topsoil to surface to a minimum depth of 4 inches all fills, embankments and other areas where the original topsoil will be covered or damaged

B. Import additional clean topsoil material to surface fill embankments, berms, and other areas with 4 inches of topsoil cover where original topsoil will be covered or damaged

C. At the completion of other Work in each area, place and grade topsoil to maintain gradient as required by the District

3.6 DEWATERING

A. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches, and other parts of the Work

B. Keep each excavation dry during subgrade preparation and continually thereafter until the structure to be built or the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result

C. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 12 inches below the bottom of the excavation

D. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property

E. Maintain all drainage pipes, keep clean and free of sediment during construction and final cleanup

3.7 SHEETING, SHORING AND BRACING

A. Provide proper and substantial sheeting, shoring, and bracing, as required, to prevent caving or sliding, to protect workmen and the Work, and to protect existing structures and facilities

B. Design and build sheeting, shoring, and bracing to withstand all loads that might be caused by earth movement or pressure, and to be rigid, maintaining shape and position under all circumstances

C. Do not pull trench sheeting before backfilling unless pipe strength is sufficient to carry trench loads based on trench width to the back of sheeting

D. Do not brace sheeting left in place against the pipe. Support brace sheeting in a manner that precludes concentrated loads or horizontal thrusts on pipe

E. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment is completed

F. When the District orders sheeting to remain permanently in place, payment will be negotiated on a per 100 square foot basis for sheeting left in place

3.8 TRENCH STABILIZATION

A. Thoroughly compact and consolidate subgrades for concrete structures, precast structures, and utility trench bottoms so they remain firm, dense and intact during required construction activities

B. Remove all mud and muck during excavation

C. Reinforce subgrades with crushed rock or gravel if they become mucky during construction activities

D. Finished elevation of stabilized subgrades are to be at or below subgrade elevations indicated on drawings

E. Allow no more than 1/2 inch depth of mud or muck to remain on trench bottoms when pipe bedding material is placed thereon

3.9 CRUSHED ROCK OR GRAVEL FILLS

A. Place on suitably prepared subgrade and compact

B. Compact by vibration

C. Where covered with concrete, grade gravel to required subgrade and cover with polyethylene film

3.10 ROADWAY EXCAVATION AND SUBGRADE PREPARATION

A. Excavate for roadways, drives and parking area per the lines, grades cross sections and dimensions indicated on Drawings or as required by the District

B. Excavate unsuitable material from the subgrade

C. After shaping, roll subgrade and compact to 95 percent of max density within 2 percent (+/-) optimum moisture content, ASTM D698, to a minimum depth of 6 inch

D. Reshape and wet as required

E. Remove soft or otherwise unsuitable material, and replace with suitable material

3.11 FILLS AND EMBANKMENTS

A. Level and roll subgrade so surface materials will be compacted and bond with the first layer of fill or embankment

B. Maximum uncompacted thickness of layer shall be field verified: Successfully demonstrate proposed method of placement to achieve specified compaction density. Continue to place and compact material in horizontal layers as demonstrated

C. Spread and level material deposited in piles and windrows before compacting

D. Thoroughly compact each layer by rolling or other means acceptable to the District to 95 percent of max density within 2 percent (+/-) optimum moisture content, ASTM D698

E. Alter compaction methods if material fails to meet specified density at no additional cost to the District

F. Where a trench passes through a fill or embankment, place and compact fill or embankment to 12 inch above the top of the pipe before excavating the trench

G. Add water and harrow, disc, blade, or otherwise work each layer to obtain the uniform moisture content and adequate compaction

H. For water containing embankments, use cutoff walls, concrete encasement or sand/clay mixture in lieu of ground or embedment for pipes passing through the embankment, acceptable to the District

3.12 FILLS AND EMBANKMENTS OVER STRUCTURES

A. Use methods which will not damage or overload structure

B. Use rubber tired vehicles to extent practicable

C. Do not use equipment with a loaded weight greater than 14,000 pounds

D. Operate equipment to prevent impact loads on structure

E. Distribute equipment loads with planks or a layer of earth or gravel 12 inch minimum, 18 inch max, thick

F. Do not pile earth or gravel more than 3 feet deep

G. Take special care to prevent damaging or disturbing roofing membrane, the drains, or granular fill material

3.13 BORROW AREA

A. Obtain material required to complete fills and embankments from areas indicated on the drawings or as directed by the District

B. The location, size, shape, depth, drainage, and surfacing of borrow pits shall be acceptable to the District

C. Make borrow pits regular in shape with graded and surfaced side and bottom slopes when completed

D. Cut side slopes not steeper than 1:1 and uniform for the entire length of any 1 side

E. Final grade disturbed areas of borrow to uniform slope

F. Use material free of debris and deleterious material

3.14 BLASTING

A. Comply with all laws, regulations, ordinances relative to the handling, storage and use of explosives and the protection of life and property

B. Confine all materials lifted by blasting to limits of excavation or trench area

C. Repair any damage caused by blasting

D. Separate rock which cannot be handled and compacted as earth for other excavated matter; do not mix with backfill or embankment materials

3.15 TRENCH EXCAVATION

A. Establish alignment and grade or elevation from offset stakes

B. Excavate trenches so pipes can be laid straight at uniform grade without dips or bumps, between the terminal elevations indicated on the drawings

C. Comply with pipe specification sections regarding vertical and horizontal alignment and max joint deflection

D. Where grades or elevations are not fixed on the drawings, excavate trenches to provide a minimum depth of backfill cover over the top of pipe:

1. 9 feet for water piping and water service lines
2. 6 feet for sewer piping unless otherwise approved by the District
3. Increase depth as required at vertical curves and for clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades

E. Measure pipe cover depth vertically from top of pipe to finished ground or surface elevation

F. Do not open more trench in advance of pipe laying than is necessary to expedite the Work; not more than the shorter of 200 feet or 1 block length

G. Except where tunneling is indicated on the Drawings, specified, or permitted by the District, excavate trenches by open cut from the surface

H. Limiting trench widths:

1. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, embedment
2. If needed to reduce earth loads to prevent sliding, cut banks back on slopes which extend not lower than 1 foot above the top of the pipe
3. Stipulated minimum clearances are minimum clear distances, not minimum average distances
4. Limiting trench widths and permissible clearances from 12 inches above top of pipe to trench bottom for installed pressure and non-pressure piping:

PIPE SIZE (INCH)	MINIMUM TRENCH WIDTH	MAXIMUM TRENCH WIDTH
4	1' - 6"	2' - 6"
6	1' - 6"	2' - 6"
8	1' - 8"	2' - 8"
10	2' - 0"	3' - 0"
12	2' - 0"	3' - 0"

I. If the width of the lower portion of the trench exceeds the max permitted, provide pipe of adequate strength, special pipe embedment, or arch concrete encasement as required by loading conditions and as determined by the District

J. Mechanical excavation:

1. Do not use where its operation would damage buildings, culverts, or other existing property, structures, or utilities above or below ground; hand excavate only in such areas
2. Use mechanical equipment of a type, design, and construction and operated so that:
   a. Rough trench bottom elevation can be controlled
   b. Uniform trench widths and vertical sidewalls are obtained from 1 foot above the top of the installed pipe to the bottom of the trench
   c. Trench alignment is such that pipe is accurately laid to specified alignment and is centered in the trench with adequate clearance between pipe and trench sidewalls
3. Do not undercut trench sidewalls
4. Recompact trench bottom disturbed by bucket teeth prior to placement of embedment material

K. Except as otherwise required, excavate trenches below the underside of pipes as indicated in the drawings to provide for installation of granular embedment pipe foundation material

L. Where in earth, trench bottoms for 6 inches and smaller pipe may be excavated below pipe subgrade and granular embedment provided or the trench may be graded to provide uniform and continuous support (between bell holes or end joints) of the installed pipe, Contractor's option

M. Whenever so directed by the District, excavate to such depth below a grade as the District directs and bring the trench bottom to grade with such material as directed by the District

N. Provide concrete, or other foundations made necessary by unstable soil as directed by the District

O. Excavate to provide adequate clearance for tools and methods of pipe installation

P. Do not allow any of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined

Q. Cuts in surface construction:

1. No larger than necessary to provide adequate working space
2. Cut a clean groove not less than 1-1/2 inch deep along each side of trench or around perimeter of excavation area
3. Remove pavement and base pavement to provide shoulder not less than 6 feet wide between cut edge and top edge of trench
4. Do not undercut trenches, resulting in bottom trench width greater than top widths
5. Make pavement cuts to and between straight or accurately marked curved lines parallel to trench centerline or limits of excavation
6. Remove pavement for connections to existing lines or structures only to the extent required for the installation, as determined by the District
7. Where the trench parallels the length of a concrete walk which is all or partially over the trench, remove and replace the entire walk
8. Where the trench crosses the drives, walks, curbs, or other surface construction, remove and replace the surface construction between saw cuts as specified for pavement

3.16 PIPE EMBEDMENT

A. Embed pipes above and below the bottom of pipe as indicated in the Drawings and as specified

B. Spread and surface grade granular embedment to provide continuous and uniform support beneath pipe at all points between pipe joints

C. After grading, aligning, and placing pipe in final position, and shoring home, deposit and compact sufficient embedment under and around each side of the pipe and to hold the pipe in proper position and alignment during subsequent operations

D. Place and compact embedment material uniformly and simultaneously on both sides of pipe to prevent lateral displacement

E. Compacted embedment:

1. Compact to 95 percent max density as determined by ASTM D698
2. Compact to 70 percent relative density ASTM D4253/D4254
3. Crushed rock or graded gravel. Vibrate embedment above the bottom of pipe with mechanical probe type vibrator

3.17 TRENCH BACKFILL

A. Compacted backfill:

1. For full depth of trench above embedment
2. Beneath pavements, surfacing, driveways, curbs, gutters, walks or other surface construction or structures
3. In street or highway shoulders
4. In established sodded areas
5. Beneath fills and embankments

B. Where the trench for 1 pipe passes beneath the trench of another pipe, compact the backfill for the lower trench to the bottom of the upper trench

C. Maximum uncompacted thickness of layers and method of placement shall be field verified: Successfully demonstrate to the District proposed method of placement to achieve specified compaction density. Continue to place and compact material in horizontal layers as demonstrated

D. Use methods and equipment appropriate to the material to be compacted to prevent transmission of damaging shocks to pipe

E. Compact to 95 percent of max density within 2 percent (+/-) optimum moisture content per ASTM D698 or to an equivalent percent relative density per ASTM D4253/D4254 when appropriate

F. Graded gravel:

1. Deposit in uniform layers of 12 inch max uncompacted thickness
2. Compact with suitable vibrating roller or platform vibrator to not less than 70 percent relative density per ASTM D4253/D4254

G. Uncompacted backfill:

1. Compaction of backfill above pipe embedment in locations other than those specified, is required only to prevent future settlement
2. May be placed by any method acceptable to the District which will not impose excessive concentrated or unbalanced loads, shock, or impact on, and will not result in displacement of installed pipe
3. Do not drop compact masses of stiff clay or other consolidated material more than 5 feet into trench unless cushioned by 2 feet minimum of loose backfill above pipe embedment

H. Finish the top portion of backfill with at least 4 inch of topsoil corresponding to, or better than, that underlying adjoining sodded areas

3.18 STRUCTURAL BACKFILL

A. Maximum uncompacted thickness of layers and method of placement shall be field verified: Successfully demonstrate to the District proposed method of placement to achieve specified compaction density. Continue to place and compact material in horizontal layers as demonstrated

B. Compact with mechanical, platform-type tampers

C. Minimum density of 95 percent within 2 percent (+/-) optimum moisture content as determined by ASTM D698

D. Use roller for compaction if necessary to prevent damage to structure and desired density can be obtained

E. Compaction by inundation by water not permitted

F. If trench passes through a structure backfill, compact backfill to an elevation of 12 inches above top of pipe before trenching

G. Do not deposit or compact tamped or otherwise mechanically compacted backfill in water

H. Take particular care to compact backfill which will be beneath slabs, pipes, drives, roads, parking areas, curb, gutters or other surface construction

3.19 DRAINAGE MAINTENANCE

A. Do not backfill trenches across roadways, drives, walks or other trafficways adjacent to drainage ditches or water courses prior to backfilling the trench on the upstream side of the trafficway to prevent impounding water after pipe is laid

B. Backfill so that water does not accumulate in unfilled or partially filled trenches

C. Remove materials deposited in roadway ditches or other water courses crossed by the trench line immediately after backfilling is completed and restore ditches and water courses to original section, grade, and contours

D. Do not obstruct surface drainage any longer than necessary

E. Provide and maintain temporary bridges and other structures across unfilled trenches as required to maintain traffic

3.20 PROTECTION OF TRENCH BACKFILL

A. Where trenches are constructed in ditches or other water courses, protect backfill from erosion

B. Install ditch checks where the ditch grade exceeds 1 percent:

1. Minimum depth: 2 feet below the original ditch or water course bottom for the full bottom width
2. Minimum width: 18 inches into the side slopes
3. Minimum thickness: 12 inches

3.21 DISPOSAL OF EXCESS EXCAVATED MATERIALS

A. Use excess excavated materials in fills and embankments as indicated on the drawings to the extent needed

B. Dispose of suitable excess excavated materials at locations on the site directed by the District

C. Remove unused suitable material from the site and dispose of it

D. Remove debris, junk, broken concrete, broken asphalt, rock, stones, stumps, logs, roots, and other unsuitable material from the site and dispose of it

E. Except as otherwise permitted, dispose of excess excavated materials away from the site of the Work or as directed by the District

F. Distribute excess earth from excavations located in unimproved property directly over the pipe trench and within the pipeline right-of-way to a max depth of 6 inch above the original ground surface elevation at and across the trench and sloping uniformly each way:

1. Carefully finish material thus wasted with a drag, blade machine, or other suitable tool to a smooth, uniform surface without obstructing drainage at any point
2. Do not waste excess excavated material in the above manner where the trench lines crosses or is within a railroad, public road, or highway right-of-way

3.22 FINAL GRADING

A. After completion of all other outside Work and after backfilling is completed and settled, bring to grade at the indicated elevations, slopes, contours and all areas adjacent to the site to be graded

B. Graders and other power equipment may be used for final grading and slope dressing if the result is uniform and equivalent to hand work

C. Grade all surfaces for effective drainage

D. Provide a 2 percent minimum slope except as otherwise required

E. Grade surface to maintain minimum gradient where indicated or required by the District

3.23 SLOPE STABILIZATION

A. Seed disturbed areas under provisions of Section 02936.

B. Cover seeded slopes with erosion control fabric where grade is 3H to 1V or greater and where indicated on the Drawings.

C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 6 inch overlap minimum of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

D. Secure outside edges and overlaps at 48 inch intervals with 4-inch to 6-inch U-shaped type pins or wooden stakes depending on ground condition.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

G. Maintain integrity of erosion control fabric until seed germination. If seed is washed out before germination, fertilize, reseed and restore affected areas.

3.24 STRAW BALE EROSION CONTROL BARRIERS

A. Place straw bale erosion control barriers where required by the Permit and where directed by the District.

B. Field locate straw bales along slopes, next to water courses and downstream of disturbed areas to prevent surface runoff from eroding areas disturbed by Contractor during construction, to minimize the transport of suspended solids downstream or into adjacent streams, canals or ditches and to protect newly seeded areas.

C. Install each bale with wire binding oriented around the bale rather than on top of the bale. Stake each bale twice with reinforcing steel or wood stakes deep enough into the ground to securely anchor the bale.

D. Maintain and replace bales as required for an effective erosion control barrier until satisfactory uniform plant growth is established as defined herein.

3.25 STORMWATER MANAGEMENT PLAN

A. Submit General Permit Application to CDPHE for stormwater discharges associated with construction activity and comply with all conditions of the permit

B. Obtain form for permit application from CDPHE

C. Submit two copies of Stormwater Management Plan for review by the District

3.26 SETTLEMENT

A. Warranty for settlement of all fills, embankments, and backfills is stipulated in the General Conditions from final completion of Contract under which Work is performed

B. Repair or replace within 30 days after notice from the District

3.27 FIELD QUALITY CONTROL

A. Provide under provisions of Section 01400

B. Coordinate and pay for all tests to determine compliance of in-place and backfill materials and compaction in accordance with the specifications

C. Fills and Embankment:

1. Two moisture-density relationship tests, ASTM D698, on each type of fill material
2. One in-place compaction test for each 1000 sf and at every 1.5 feet of vertical lift of material placed or as directed by the District

D. Pipe Embedment and Backfill:

1. Two initial gradation tests for each type of material plus 1 additional test for 500 cubic yards of each material
2. Two moisture-density relationship tests, ASTM D698, or 2 relative density tests, ASTM D4253/D4254, as appropriate for each type of embedment on backfill material proposed, except granular embedment material
3. One in-place compaction test every 200 lineal feet of trench in the compacted embedment zone and at every 1.5 feet of vertical lift of backfill materials, ASTM D6938 or as directed by the District
4. One in-place compaction test near top of trench for trench depth of 2 feet or less, ASTM D6938
5. Five (5) additional in-place compaction tests at the discretion of the District, ASTM D6938

END OF SECTION

SECTION 02500 - PAVING AND SURFACING

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Aggregate base and asphaltic concrete for roads and parking areas

1.2 RELATED SECTIONS

A. Section 01340—Shop Drawings, Product Data and Samples

B. Section 01400—Quality Control

C. Section 01570—Traffic Regulation

D. Section 02200—Earthwork

1.3 REFERENCES

A. ASTM C29—Bulk Density ("Unit Weight") and Voids in Aggregate

B. ASTM C88—Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

C. ASTM C117—Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing

D. ASTM C128—Density, Relative Density (Specific Gravity), and Adsorption of Fine Aggregate

E. ASTM C136—Sieve Analysis of Fine and Coarse Aggregates

F. ASTM C131—Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

G. ASTM D4—Bitumen Content

H. ASTM D5—Penetration of Bituminous Materials

I. ASTM D70—Density of Semi-Solid Bituminous Materials

J. ASTM D93—Flash Point by Density-Martens Closed Tester

K. ASTM D113—Ductility of Bituminous Materials

L. ASTM D1188—Bulk Specific Gravity of Compacted Bituminous Mixtures Using Coated Samples

M. ASTM D1241—Materials for Soil-Aggregate Subbase, Base, and Surface Courses

N. ASTM D2041—Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

O. ASTM D2172—Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

P. ASTM D2419—Sand Equivalent Value of Soils and Fine Aggregate

Q. ASTM D946—Penetration-Graded Asphalt Cement for Use in Pavement Construction

R. ASTM D692—Course Aggregate for Bituminous Paving Mixtures

S. ASTM D1073—Fine Aggregate for Bituminous Paving Mixtures

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T. ASTM D2026—Cutback Asphalt (Slow-Curing Type)

U. ASTM D2170—Kinematic Viscosity of Asphalts (Bitumens)

V. ASTM D2489—Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures

W. ASTM D4215—Cold-Mixed, Cold-Laid Bituminous Paving Mixtures

X. ASTM D6927—Marshall Stability and Flow of Bituminous Mixtures

Y. CDOT—Standard Specifications for Road and Bridge Construction

Z. AI MS2—Mix Design Method for Asphalt Concrete and Other Hot Mix Types -The Asphaltic Institute (AI)

1.4 SUBMITTALS

A. Submit under provisions of Section 01340

B. Samples: Provide samples of materials for laboratory testing and job-mix design

C. Test Reports—Submit laboratory reports for following materials tests:

1. Coarse and fine aggregate from each material source and each required grading:
   a. Sieve analysis: ASTM C136 (AASHTO T27)
   b. Unit weight of slag: ASTM C29 (AASHTO T19)
   c. Soundness: ASTM C88 (AASHTO T104) for surface course aggregates only
   d. Sand equivalent: ASTM D2419 (AASHTO T176)
   e. Abrasion of coarse aggregate: ASTM C131 (AASHTO T96), for surface course aggregates only
2. Asphalt cement for each penetration grade:
   a. Penetration: ASTM D5 (AASHTO T49)
   b. Viscosity (Kinematic): ASTM D2170
   c. Flash Point: ASTM D93 (AASHTO T48)
   d. Ductility: ASTM D113 (AASHTO T51)
   e. Solubility: ASTM D4 (AASHTO T44)
   f. Specific gravity: ASTM D70 (AASHTO T166)
3. Job-mix design mixtures for each material or grade:
   a. Bulk specific gravity for fine aggregate: ASTM C128 (AASHTO T84)
4. Uncompacted asphalt concrete mix: Maximum specific gravity ASTM D2041 (AASHTO T209)
5. Compacted asphalt concrete mix:
   a. Bulk density: ASTM D1188 (AASHTO T166)
   b. Marshall stability and flow: ASTM D6927
6. Density and void analysis:
   a. Provide each series of asphaltic concrete mixture test specimens, in accordance with MS2
   b. Use Marshall method of mix design unless otherwise directed or acceptable to the District

7. Sampling and testing of asphaltic concrete mixtures for quality control during paving operations:
    a. Uncompacted asphaltic concrete mix:
        1) Asphalt cement content: ASTM D2172 (AASHTO T164)
        2) Penetration of recovered asphaltic cement: ASTM D5 (AASHTO T49)
        3) Ductibility of recovered asphaltic cement: ASTM D113 (AASHTO T51)
    b. Compacted asphaltic concrete mix:
        1) Bulk density: ASTM D1188 (AASHTO T166)
        2) Marshall stability and flow: ASTM D6927
    c. Perform at least one test for each day's paving

1.5 ENVIRONMENTAL REQUIREMENTS

A. In general, work specified within this section will be performed during the year from April to September unless otherwise authorized by the District in writing.

B. Do not apply when underlying surface is muddy, frozen or wet

C. Comply with CDOT Table 401-3 on placement temperatures for asphaltic concrete

D. Do not place by hand or motor grader asphaltic concrete courses when temperature is below 60 degrees F and falling

E. Do not apply pavement marking paint within 8 hours of fog or rain or when below 40 degrees F

F. Maintain vehicular and pedestrian traffic during paving operations

G. Provide flagmen, barricades, warning signs, and warning lights for movement of traffic and safety and to cause the least interruption of work in accordance with Section 01570

PART 2: PRODUCTS

2.1 MATERIALS

A. Aggregate base:

1. Sound, angular crushed stone, crushed gravel, or crushed slag, and sand, stone, or slag screenings: ASTM D1241, Type I
2. Gradation: Class B

B. Tack coat: Emulsified asphalt, CSS-1 or CSS-1h

C. Asphaltic cement: ASTM D946, grade determined by design mix

D. Aggregate for asphaltic concrete—General:

1. Sound, angular crushed stone, crushed gravel, or crushed slag: ASTM D692
2. Sand, stone, or slag screening: ASTM D1073
3. Provide aggregate in gradations for various courses to comply with state highway standards, C or CX, Colorado Department of Transportation, ASTM C136
4. Percent wear: ASTM C131, less than 45 for aggregates retained in #10 sieve

E. Base course aggregates for asphaltic concrete:

1. Uncrushed gravel may be used in mixture if it meets design criteria specified
2. Provide uniform quality combined aggregates with a minimum sand equivalent value:
   a. 35 for light and medium traffic areas
   b. 40 for heavy traffic areas

F. Surface course aggregates for asphaltic concrete:

1. Provide natural sand, unless sand prepared from stone, slag, or gravel or combinations are required to suit local conditions.
2. Provide uniform quality combined aggregate with a minimum sand equivalent value:
   a. 40 for light and medium traffic areas
   b. 50 for heavy traffic areas

G. Pavement marking paint: Conforming to Federal Standard—FS TT-P-115, Type I-Alkyd

H. Chip and seal coat aggregate:

1. Sound, angular crushed stone or gravel
2. Percent wear: ASTM C131, less than 40
3. Minimum of 90 percent of aggregate retained in #4 sieve, one fractured face
4. Retained bituminous film: AASHTO T182, 95 percent minimum
5. Graded in accordance with ASTM C136 within the following limits:

SIEVE SIZE	PERCENT PASSING
1/2 inch	100
3/8 inch	55-85
No. 4	0-10
No. 8	0-04
No. 200	0-02

2.2 MIXES

A. Determine design mix based upon aggregates furnished:

1. Test mix by independent laboratory at Contractor's expense
2. Grade dependent on temperature during placement
3. Indicate maximum allowable moisture content of aggregates
4. Acceptable to the District

PART 3: EXECUTION

3.1 PREPARATION

A. Aggregate base course:

1. Check subgrade for conformity with elevations and section immediately before placing aggregate base material

2. Place aggregate base material in compacted layers not more than 6 inches thick, unless continuing tests indicate the required results are being obtained with thicker layers
3. In no case will more than 12 inches of compacted base be placed in one lift
4. Spread, shape, and compact all aggregate base material deposited on the subgrade during the same day
5. Compact aggregate base course material to not less than 95 percent of maximum density: ASTM D698
6. Test density of compacted aggregate base course: ASTM D6938
7. Conduct 1 test for each 2500 square yards of in-place material, but in no case not less than 1 for each layer

B. Loose and foreign material:

1. Remove loose and foreign material from compacted subbase surface immediately before application of paving

C. Tack coat:

1. Dilute material with equal parts of water and apply to contact surfaces of previously constructed asphaltic concrete or Portland cement concrete and surfaces
2. Apply at rate of 0.05 to 0.15 gallons per square yard of surface
3. Apply tack coat by brush to contact surfaces of curbs, gutters, manholes, and other structures projecting into or abutting asphaltic concrete pavement
4. Allow surfaces to dry until material is at condition of tackiness to receive pavement
5. Where asphaltic concrete will adhere to surface, tack coat may be eliminated by the District

D. Chip and seal coat:

1. Apply aggregate at rate of 16-20 pounds per square yard
2. Apply asphaltic emulsion at rate of 0.35-0.50 gallons per square yard
3. Allow surfaces to dry until material is at condition to receive traffic

3.2 RING/FRAME ADJUSTMENTS

A. Set manhole ring/frames of subsurface structures to final grade as a of this work, include existing ring/frames and new ring/frames furnished under other work of project

B. Placing ring/frames:

1. Surround ring/frames set to elevation with a ring of compacted asphaltic concrete base prior to paving
2. Place asphaltic concrete mixture up to 1 inch below top of ring/frame, slope to grade, and compact by hand tamping

C. Adjust frames to proper position to meet paving

D. If permanent covers are not in place, provide temporary covers over openings until completion of rolling operations

E. Set ring/frames to grade, flush with surface of adjacent pavement

3.3 PREPARING THE MIXTURE

A. Comply with ASTM D4215 for material storage, control, and mixing and for plant equipment and operation

B. Stockpile:

1. Keep each component of the various sized combined aggregates in separate stockpiles
2. Maintain stockpiles so that separate aggregate sizes will not be intermixed and to prevent segregation

C. Heating:

1. Heat the asphaltic cement at the mixing plant to viscosity at which it can be uniformly distributed throughout mixture
2. Use lowest possible temperature to suite temperature viscosity characteristics of asphalt
3. Do not exceed 350 degrees F

D. Aggregate:

1. Heat-dry aggregates to moisture content of not more than maximum allowable percentage for design mix
2. Deliver to mixer at recommended temperature to suite penetration grade and viscosity characteristics of asphaltic cement, ambient temperature, and workability of mixture
3. Accurately weigh or measure dry aggregates and weigh or meter asphaltic cement to comply with job-mix formula requirements

E. Mix aggregate and asphalt cement to achieve 90-95 percent coated particles for base mixtures and 85-90 percent coated particles for surface mixture, per ASTM D2489

F. Transporting:

1. From mixing site in trucks having tight, clean compartments
2. Coat hauling compartments with lime-water mixture to prevent sticking
3. Elevate and drain compartment of excess solution before loading mix
4. Provide covers over asphaltic concrete mixture to protect from weather and to prevent loss of heat
5. During periods of cold weather or for long distance deliveries, provide insulation around entire truck bed surfaces

3.4 EQUIPMENT

A. Bituminous Pavers: Self-propelled, spreads without tearing surfaces, and controls pavement edges to true lines without use of stationary forms

B. Rolling Equipment:

1. Pneumatic-tired roller
2. Two or three-wheeled steel roller

C. Hand Tools: Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools

3.5 PLACING THE MIX

A. Place asphaltic concrete mixture on prepared surface, spread and strike-off using paving machine

B. Complete placement over full width of section on each day's run

C. Minimum temperature of 225 degrees F at time of placement

D. Inaccessible and small areas may be placed by hand

E. Conform to the grade, cross section, finish thickness, and density indicated

F. Paver placing:

1. Unless otherwise directed, being placing along centerline of areas in crowned section and at high side on one-way slope and in direction of traffic flow
2. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips
3. Complete base courses before placing surface courses
4. Place mixture in continuous operation as practicable

G. Hand placing:

1. Spread, tamp, and finish mixing using hand tools in areas where machine spreading is not possible as acceptable to the District
2. Place mixture at a rate that will insure handling and compaction before mixture becomes cooler than acceptable working temperature

H. Joints:

1. Construct transverse joint at right angles to centerline when operations are suspended long enough for mixture to chill
2. Construct joints to have same texture, density, and smoothness as adjacent sections of asphalt concrete course
3. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat
4. Offset transverse joints in succeeding courses not less than 24 inches
5. Cut back edge of previously placed course to expose an even, vertical surface for full course thickness
6. Offset longitudinal joints in succeeding courses not less than 6 inches
7. When the edges of longitudinal joints are irregular, honeycombed or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface for full course thickness
8. Wearing course constructed in even number of strips; place 1 longitudinal joint on centerline of road
9. Wearing course constructed in odd number of strips; place the centerline of 1 strip on centerline of road

I. Curbs: Finish surface high adjacent to curb so when compacted surface is slightly higher than edge of curb and flashing

3.6 COMPACTING THE MIX

A. Provide rollers to obtain the required pavement density

B. Begin rolling operations when the mixture will bear weight of roller without excess displacement

C. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set

D. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers

E. Start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs

F. Do not roll centers of sections first under any circumstances

G. Breakdown rolling:

1. Accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and outside edge
2. Operate rollers as close as possible to paver without causing pavement displacement
3. Check crown, grade, and smoothness after breakdown rolling
4. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling

H. Second rolling:

1. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction
2. Continue second rolling until mixture has been thoroughly compacted

I. Finish rolling:

1. Perform finish rolling while mixture is still warm enough for removal of roller marks
2. Continue rolling until roller marks are eliminated and course has attained specified density

3.7 PAVEMENT REPAIR AND SEALING

A. Patching:

1. Remove and replace defective areas
2. Cut-out and fill with fresh, hot asphaltic concrete
3. Compact by rolling to specified surface density and smoothness
4. Remove deficient areas for full depth of course
5. Cut sides perpendicular and parallel to direction of traffic with edges vertical
6. Apply tack coat to exposed surfaces before placing new asphaltic concrete mixture

B. Chip and seal all paving and patching upon project completion

3.8 MARKING ASPHALTIC CONCRETE PAVEMENT

A. Remove dirt, sand, gravel and oil

B. Allow asphaltic concrete to cure before painting

C. Apply paint with pressurized, self-contained paint machine

D. Apply in straight line 2-6 inches wide

E. Lay out markings with guide lines, templates and forms

F. Apply at 1 gallon per 105 (+5) square foot

G. Provide qualified technician for supervision

3.9 FIELD QUALITY CONTROL

A. Test in-place for density, thickness, and surface smoothness

B. Final surfaces of uniform texture, conforming to required grades and cross sections

C. Take not less than 4 inch diameter pavement specimens for each completed course from locations as directed by the District

D. Repair holes from test specimens as specified for patching defective work

E. Minimum acceptable density of in-place course materials is 94—96 percent of the recorded laboratory specimen density

F. Thickness—Variations from drawings:

1. Base course: 1/2 inch +
2. Surface course: 1/2 inch +

G. Surface smoothness:

1. Test using a 10 foot straight edge applied parallel to direction of drainage
2. 1/4 inch per foot from nearest point of contact
3. Do not permit pockets or depressions where water may pool

3.10 CLEANING

A. After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of the District

3.11 PROTECTION OF FINISHED WORK

A. After final rolling, do not permit vehicular traffic on asphaltic concrete pavement until it has cooled and hardened and in no case sooner than 6 hours

B. Provide barricades and warning devices as required to protect pavement and the general public in accordance with Section 01570

C. Cover openings of structure in the area of paving until permanent coverings are placed

END OF SECTION

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SECTION 02607 - MANHOLES AND COVERS

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Precast concrete manhole sections with tongue and groove joints, transition, ring, cover, and accessories

1.2 RELATED SECTIONS

A. Section 01340—Shop Drawings, Product Data and Samples

B. Section 01400—Quality Control

C. Section 02200—Earthwork

D. Section 03001—Concrete

E. Section 03600—Grout

F. Section 07160—Bituminous Dampproofing

1.3 REFERENCES

A. ASTM A48—Gray Iron Castings

B. ASTM A185—Steel Welded Wire Reinforcement, Plain, for Concrete

C. ASTM A615—Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

D. ASTM C33—Concrete Aggregates

E. ASTM C150—Portland Cement

F. ASTM C478—Precast Reinforced Concrete Manhole Sections

G. ASTM C913—Precast Concrete Water and Wastewater Structures

H. ASTM D2240—Rubber Property—Durometer Hardness

1.4 SUBMITTALS

A. Submit under provisions of Section 01340

B. Shop Drawings: Indicate manhole locations, rim elevations, piping, sizes, orientations, and elevations of penetrations

C. Product Data: Provide manhole covers, steps, component construction, features, configuration, and dimensions.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum 5 years experience

1.6 ENVIRONMENTAL REQUIREMENTS

A. Product suitable for use with wastewater or surface runoff

B. Water temperature: Range 5 degrees C to 20 degrees C

PART 2: PRODUCTS

2.1 MATERIALS

A. Concrete—Section 03001 except as modified herein:

1. Minimum compressive strength: 3500 psi at 28 days
2. Cement: ASTM C150, Portland Cement, Type II
3. Aggregates: ASTM C33, free of deleterious substances

B. Precast sections:

1. Specifications: ASTM C478
2. Minimum wall thickness: 5 inch
3. Reinforcement: Welded wire fabric, ASTM A185
4. Grade rings as required
5. Precast base and first barrel section cast monolithically

C. Performed plastic gaskets:

1. Diameter: 1-1/2 inch for 48 inch manhole; 2 inch for 60 inch manholes and larger
2. Acceptable Manufacturers:
   a. “Rub'r-Nek,” Henry Co.
   b. “Kent Seal No. 2,” Hamilton-Kent Manufacturing Co.
   c. “Ram-Nek” is not acceptable
   d. Or approved equal

D. Pipe penetration seals for precast sections:

1. Neoprene rubber pipe penetration gaskets, #40 durometer A, ASTM D2240 and adjustable stainless steel pipe clamps, “A-Lok” or approved equal

E. Manhole steps: Steel bar, 1/2 inch Grade 60, drop-front type with polypropylene coating applied by manufacturer, Type MA Industries Inc. “PS2-PFS” or approved equal

F. Manhole rings and covers:

1. Cast iron, heavy duty traffic type, ASTM A48, Class 30B. Grind bearing surfaces to ensure flat, true surfaces
2. Covers to seat at all points on ring
3. Lettered “SEWER” or “WATER” in 2 inch high flush letters as required
4. Neenah R1798, for water applications or approved equal
5. Neenah R1706 for sewer applications or approved equal

G. Manhole height adjustment: Use HDPE adjusting rings as manufactured by Ladtech, Inc or approved equal

H. Rock Subbase: 1 1/2 inch minus well-graded gravel. Comply with provisions for pipe embedment in Section 02200

I. Water: Clean and free of deleterious substances

J. Grout: Provide under provisions of Section 03600

2.2 FABRICATION

A. Manhole section:

1. Minimum manhole inside diam: 48 inch and 60 inch where indicated
2. Provide eccentric cones for all manholes except where indicated otherwise
3. Cones: Same or greater reinforcement and wall thickness as manhole section
4. Manhole steps: 12 inch on center, vertical alignment above largest open area or bench
5. Joints: Keylock type with double mastic gaskets, each joint to set equally and tightly
6. Manhole opening: Minimum 24 inch clear
7. Drop structure: As indicated by standard detail

PART 3: EXECUTION

3.1 EXAMINATION

A. Verify items provided by other section of Work are properly sized and located

B. Verify that built-in items are in proper location, ready for roughing into Work

C. Verify excavation for manholes is correct

3.2 PREPARATION

A. Excavation and Backfill: Refer to Section 02200 for requirements

B. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections

C. Rock Subbase: Remove water, excavate, and place 1-1/2 inch rock 6 inch minimum depth, vibrate for compaction

3.3 PLACING MANHOLE SECTIONS

A. Place manhole sections plumb and level, trim to correct elevations

B. Clean ends of sections and place double mastic gasket

C. Fill outside of joint completely with non-shrink grout and trowel smooth

D. Cure non-shrink grout using approved methods outlined in Section 03600

E. Set cover rings and covers with slight tip to match cross slope of paved or finished surfaces

F. Completed manholes shall be rigid and watertight

G. Coordinate with other Sections of Work to provide correct size, shape, and location

3.4 PREFORMED GASKETS

A. Remove and replace manhole sections which have chipped or cracked joints

B. Thoroughly clean section joints

C. Install gasket in conformance with manufacturer's instructions

D. Only use primer furnished by gasket manufacturer

3.5 MANHOLE INVERTS

A. Place concrete in bottom of manhole and form smooth transition. Trowel smooth and brush for non-skid finish. Slope bench 1 inch per foot for drainage to invert

B. Invert shape to conform to radius of pipe it connects

C. Remove all rough sections or sharp edges which tend to obstruct flow or cause material to snag

D. Construct in conformance with standard details

E. Remove all excess grout or concrete from invert

3.6 DROP ASSEMBLIES

A. Construct as shown per District standard details

3.7 FLEXIBLE JOINTS

A. Provide joint in rigid sewer pipe less than 2 feet from manhole

B. Where last joint to manhole is more than 2 feet away, place concrete cradle under pipe from within 2 feet of MH to last joint

3.8 PIPE STUBOUTS FOR PRESENT AND FUTURE SERVICE CONNECTIONS

A. Install service stubouts where shown on Drawings

B. Place stubouts in base of manhole and form smooth invert

C. Maximum length: 12 inch outside manhole wall

D. Place watertight plastic gasket plug in all stubouts

E. Brace plug against blow-off

F. Match pipe crown of service connection with pipe crown of outlet pipe

3.9 PERMANENT PLUGS

A. Thoroughly clean contact surfaces of pipes to be abandoned or cut off

B. Pipes 18 inch diam and less: Place 18 inch deep concrete plug

C. Pipes greater than 18 inch diam: Plugs can be cast-in-place concrete with outside face plastered with non-shrink grout

D. Plugs: Watertight and capable of withstanding all pressures

3.10 TEMPORARY PLUGS

A. Install 1/2 inch plywood plugs in joint

B. Make water tight as required by the District

C. Backfill against plug

3.11 MANHOLE RINGS AND COVERS

A. Place rings in bed of non-shrink grout on top of manholes

B. Ensure no infiltration will enter manhole at this location

C. Carry non-shrink grout over flange of ring

D. Set top of ring flush with all surfaces subject to foot and vehicular traffic or as required by local jurisdiction

E. Set top of ring 6 inches above surfaces in open, untraveled areas

F. Use precast grade rings for height adjustment

3.12 MANHOLES OVER EXISTING SEWERS

A. Construct manhole base and install manhole sections as described herein

B. Maintain flow at all times

C. Prior approval of proposed method for maintaining flow must be obtained from the District

D. Break out crown of existing pipe and make invert

E. Cover the edges of the broken pipe with mortar and trowel smooth to the new invert

F. Provide cover over invert so debris does not enter existing pipe lines

3.13 CONNECTION TO EXISTING MANHOLES

A. Maintain flow at all times

B. Prior approval of proposed method for maintaining flow must be obtained from the District

C. Concrete core into existing manhole and reform invert to provide smooth flow transition

D. Cover area around new pipe with non-shrink grout and or waterstop gasket to ensure a watertight structure

E. Make connection during low flow periods

3.14 EXTERIOR DAMPPROOFING

A. Dampproof all exterior surfaces of manholes after installation under provisions of Section 07160

B. Apply exterior bituthane wrap, “Ice and Shield” as manufactured by Grace or approved equal.

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3.15 FIELD TESTING

A. Test all manholes:

1. Vacuum test:
   a. Plug all inlets and outlets in such a manner as to prevent displacement of plugs
   b. Install and operate vacuum tester head assembly in accordance with equipment specifications and manufacturer instructions
   c. Attach the vacuum pump assembly to the proper connection on the test head assembly. Make sure the vacuum inlet/outlet valve is in the closed position
   d. Inflate the sealing element to twice the test pressure to be used. Do not over inflate
   e. Start the vacuum pump assembly engine and allow preset RPM to stabilize
   f. Open the inlet/outlet ball valve and evacuate the manhole to 5"Hg. (mercury).
   g. Close vacuum inlet/outlet ball valve, disconnect vacuum pump, and monitor vacuum. Record time for vacuum to drop to 3"Hg
   h. Acceptance for 5 ft diameter manhole is when the time to drop from 5"Hg to 4"Hg meets or exceeds requirements as defined below:

MAXIMUM ALLOWABLE VACUUM DROP

MANHOLE DEPTH Rim to Invert	DIAMETER In Feet	TIME TO DROP 1 inch Mercury
10 ft. or less	5	150 seconds
10 ft. to 15 ft.	5	180 seconds
15 ft. to 25 ft.	5	210 seconds

   i. Adjust time to drop from 5"Hg to 4"Hg for other manhole diameters as follows:
      1) 4 foot diameter MH: Subtract 30 seconds
      2) 6 feet diameter MH: Add 30 seconds
   j. Repair all manholes that fail leakage test and retest until manhole passes test at no additional cost
   k. If joint mastic or gasket is displaced during vacuum test, disassemble manhole and replace seal

B. Test all manholes immediately after assembly and before backfilling. Remove standing water in excavation which may affect test accuracy

C. Conduct final test after backfilling

D. Perform all testing in presence of the District

END OF SECTION

SECTION 02667 - SITE WATER LINES

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Pipe and fittings for site water distribution system

B. Valves and fire hydrants

1.2 RELATED SECTIONS

A. Section 01340—Shop Drawings, Product Data and Samples

B. Section 01400—Quality Control

C. Section 01610—Materials

D. Section 01720—Project Record Documents

E. Section 02200—Earthwork

F. Section 02607—Manholes and Covers

G. Section 02675—Disinfection of Water Distribution Systems

H. Section 15430—Plumbing Specialties

1.3 REFERENCES

A. ASME B16.18—Cast Copper Alloy Solder Joint Pressure Fittings

B. ASME B16.22—Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

C. ANSI B31.9—Building Service Piping

D. AWS A5.8—Brazing Filler Metal

E. AWWA C104— Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

F. AWWA C110—Ductile-Iron and Gray-Iron Fittings, 3 Inch through 48 Inch, for Water and Other Liquids

G. AWWA C111— Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings

H. AWWA C115—Flanged Ductile-Iron Pipe with Threaded Flanges

I. AWWA C150—Thickness Design of Ductile-Iron Pipe

J. AWWA C151—Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids

K. AWWA C153—Ductile-Iron Compact Fittings, 3 Inch through 12 Inch, for Water and Other Liquids

L. AWWA C500—Gate Valves, 3 through 48 in NPS, for Water and Sewage Systems

M. AWWA C502—Dry Barrel Fire Hydrants

N. AWWA C504—Rubber Seated Butterfly Valves

O. AWWA C508—Swing-Check Valves for Waterworks Service, 2 in through 24 in NPS

P. AWWA C509—Resilient Seated Gate Valves 3 in through 12 in NPS, for Water and Sewage Systems

Q. AWWA C550—Protective Interior Coatings for Valves and Hydrants

R. AWWA C600—Installation of Ductile-Iron Water Mains and Appurtenances

S. ASTM B88—Seamless Copper Water Tube

T. NSF 61—Drinking Water System Components - Health Effects

U. UL 246—Hydrants for Fire - Protection Service

1.4 SYSTEM DESCRIPTION

A. Provide piping complete with all fittings, jointing materials, supports, anchors, joint restraint system and necessary appurtenances for watertight, fully operational water distribution lines

1.5 SUBMITTALS

A. Submit under provisions of Section 01340

B. Shop Drawings: Provide piping layout fabrication and assembly drawings with fitting dimensions. Provide sufficient information to verify compliance with specifications

C. Product Data: Provide data on pipe materials, pipe fittings, joint restraint system, valves and accessories. Provide manufacturer's catalog information with dimensions, material and assembled weight. Indicate pressure ratings for pipe, valves and hydrants

D. Manufacturer's Certificate: Certify that pipe products meet or exceed specified requirements

E. Test Reports: Submit reports of field pressure tests and disinfection

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01720

B. Accurately record actual locations of piping mains, valves, connections, and top of pipe elevations

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with Copper Mountain Consolidated Metro District Standards and specifications as specified herein

B. Manufacturer's name and pressure rating marked on piping, valves and hydrants

1.8 REGULATORY REQUIREMENTS

A. Conform to all municipal codes and ordinances, laws and regulations of the State to prevent cross-connections by providing backflow prevention devices where required

B. In case of apparent conflict, State and local requirements govern over these Specifications

C. In absence of State and local regulations, Uniform Plumbing Code applies

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01610

B. Deliver and store valves and accessories in shipping containers with labeling in place in accordance with AWWA C500

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation

D. Seal valve ends to prevent entry of foreign materials into valve body

E. During loading, transporting and unloading, exercise care to prevent damage to material:

1. Use nylon slings only
2. Do not drop pipe or fittings
3. Do not roll or skid against pipe already on ground
4. Repair any damage done to coating or lining
5. Handle per manufacturer's recommendations
6. Store rubber gaskets in cool dark location
7. Store all material on wood pallets or timbers

F. Adequately tag or otherwise mark all piping and fittings as to size

PART 2: PRODUCTS

2.1 MANUFACTURERS - DUCTILE IRON PIPE AND FITTINGS

A. Griffin Pipe Products Company

B. U.S. Pipe

C. Tyler Pipe/Utilities Division

D. Or approved equal

2.2 DUCTILE IRON PIPE

A. ANSI A21.51/AWWA C151—As listed below except as otherwise specified or indicated on Drawings:

1. Where fitted with push-on joints, mechanical joints or mechanical joints with joint restraint device or restrained joints: Special Thickness Class 52, 4–12 inches
2. Where fitted with flanged or restrained joints: Special Thickness Class 53

B. Fittings:

1. Flanged Joint: Ductile iron, ANSI A21.10/AWWA C110
   a. 12 inch and below: 250 psi rating
2. Mechanical Joint: Ductile iron, ANSI A 21.53/AWWA C153
   a. 12 inch and below: Pressure class 350
   b. Compact fitting

C. Joints:

1. Mechanical joints:
   a. Bolts and nuts: High strength, low alloy steel, EBAA Iron Sales, Inc., "MEGA-LUG". No substitutions
2. Push-on joints: ANSI A21.11/AWWA C111, except gaskets shall be neoprene or other synthetic rubber. Natural rubber is not acceptable:
   a. Lubricant: Heavy vegetable soap solution suitable for potable water contact
   b. Pressure rated 350 psi
3. Restrained push-on lock joints:
   a. 24 inch and below: , U.S. Pipe "Field-Lok", or approved equal
4. Threaded connections: ANSI B1.20.3 NPT, Boss or tapping saddle at all tapped connections
5. Mechanical couplings: Smith Blair "411" or approved equal
6. Flanged coupling adapters:
   a. 12 inch and under: Smith Blair "Type 912 (Old style) or approved equal
   b. Working pressure: 250 psi
7. Mechanical joint with restraint device:
   a. Multiple wedging action or 360 degrees serration lock engagement type
   b. Twist off nuts used to insure proper actuating of the restraining device or nuts and bolts torqued to requirements of manufacturer
   c. Working pressure rated at same pressure as pipe
   d. EBAA Iron Sales, Inc., MEGA LUG 1100 Series at MJ fittings
8. Push-on joint with restraint device:
   a. Multiple wedging action or 360 degrees serration lock engagement type restraint ring with bell ring and tie bolts
   b. Twist off nuts used to insure proper actuating of the restraining device or nuts and bolts torqued to requirements of manufacturer
   c. Working pressure rated at same pressure as pipe
   d. EBAA Iron Sales, Inc., MEGA LUG 1100 Series with Bell Restraint Harness or Uni-Flange Corporation, 1390 Series
9. Joint accessories:
   a. Electrical conductivity bonding: No. 4 copper wire
   b. Wire to pipe welding (field): CAD WELD
   c. Pipe welded protective caps: Royston "Handy Cap 2", or approved equal

2.3 GATE VALVES - 3 INCHES THROUGH 12 INCHES

A. Manufacturers:

1. Mueller Company - Model Series 2360
2. No Substitutions

B. AWWA C509, Iron body, bronze trim, two O-ring stem seals, non-rising stem with square nut, single wedge, resilient seat, mechanical joint ends, extension stem, and extension valve box, max working pressure of 250 psi

C. Rotation: Counter clockwise to open with the word "OPEN" and an arrow indicating the direction to open cast on valve body or operating nut

2.4 BALL VALVES - UP TO 2 INCHES

A. Manufacturers:

1. Nibco Model T-590-Y
2. Or approved equal

B. Bronze body, bronze ball, TFE seats and stem seals, operating with handle, NPT inlet end, NPT outlet

2.5 HYDRANT

A. Manufacturers:

1. Mueller Company - Super Centurion 250 Model A-423
2. No substitutions

B. Hydrant: AWWA C502, UL 246, dry barrel type, inside dimension of 7 inches minimum, with minimum 5 inches diameter valve seat opening; minimum net water area of barrel not less than 190 percent of valve opening; 6 inch bell or mechanical joint inlet connection with accessories, gland bolts, and gaskets, max working pressure of 250 psi

C. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length

D. Hose and Steamer Connection: Match sizes with District Fire Department, two hose nozzles and one pumper nozzle

E. Finish: Primer and two coats of enamel to color required by District Fire Department

2.6 AIR AND VACUUM RELIEF VALVES - 3 INCHES AND SMALLER

A. APCO 2 inch valve, Series 145C, as manufactured by Valve and Primer Corporation or approved equal

B. Combination, single body, integral type, air release and vacuum relief valves, max working pressure of 250 psi

2.7 DOMESTIC , COMMERCIAL AND IRRIGATION METERS

A. Manufacturer:

1. Badger Meter, Inc.
    a. Meter: E-Series Ultrasonic Flow
    b. Endpoint: Orion Celluar
2. Metron-Farnier, Inc.
    a. Meter: Spectrum Single-Jets with innov8-VN register
    b. Endpoint: Cellular-Enabled

2.8 BEDDING MATERIALS

A. Bedding: As specified in Section 02200

2.9 ACCESSORIES

A. Provide two operating keys for buried valves

B. Valve boxes for all buried valves, depth as required for valve

1. Cast iron extension sleeve type with boxes and covers
2. Minimum diameter: 5 inch
3. Minimum thickness: 3/16 inch
4. Box, cover, and base coated by dipping in asphalt varnish
5. An appropriate word designating the valve service on the cover
6. Series 6850 and 6860 as manufactured by Tyler Union or approved equal

C. Concrete for thrust blocks: Concrete type specified in Section 03001

D. Corporation stops with flared connections and Valves: 3/4" to 2", ," Mueller "300 Ball", A.Y. McDonald Mfg. Co. "Series 4701B"or approved equal

E. Curb Stops with flared connections: 3/4" to 2", Mueller "300 Ball", A.Y. McDonald Mfg. Co "Series 6104" or approved equal

F. Curb stop box:

1. 2-inch and smaller: McDonald "5601L" or approved equal
2. 4 1/2", Tyler Series 6850, or approved equal

G. Service saddles: Ductile iron with double stainless steel strap and rubber sealing gasket, max working pressure of 250 psi, Mueller "DR2S", Romac Industries, Inc. "Style 202N", or approved equal

H. Tapping sleeves and valves (Use and location as approved by the District):

1. Tapping Sleeves: Stainless steel body with SST type 304 bolts, as manufactured by Mueller, no substitutions
2. Tapping valve: Resilient seated gate valve, model "T-2360" as manufactured by Mueller, no substitutions

I. Water Service Marker Post: 8 foot long pressure treated 4 x 4 with exposed length of 4 x 4 spray painted blue

2.10 CORROSION CONTROL

A. Shop paint all ferrous metal surfaces of valves and accessories, both interior and exterior for corrosion protection.

B. Manufacturer's standard paint will be acceptable if it is functionally equivalent and compatible with specified field coatings

C. Exterior coal tar or coal tar epoxy coating for all exterior, all buried ductile iron or steel surfaces: Manufacturer's Standard, 20 mils minimum

D. Ductile-iron Pipe and Fittings Shop lining: Cement-lined, AWWA C104/C205

PART 3: EXECUTION

3.1 EXAMINATION

A. Carefully examine pipe and fittings for cracks, damage to linings, and other defects prior to installation

B. Remove all defective pipe from site and replace

C. Examine areas for weak or structural defects or deviations beyond allowable tolerances for piping clearances that adversely affect excavation and quality of Work

D. Start installation only when conditions are satisfactory

3.2 PREPARATION

A. Ream pipe and tube ends and remove burrs

B. Remove scale and dirt, on inside and outside, before assembly

C. Prepare pipe connections to equipment with flanges or unions

D. Thoroughly inspect and clean interior of fire hydrants. Open and close hydrant to insure parts are in working order, the valves seat properly and the drain valve operates

E. Check packing gland and gland nut of fire hydrant for proper installation

F. Cut and bevel ends of metallic pipe

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 02200 for work of this Section. Do not disturb trench bottom during excavation. Hand trim excavation for accurate placement of pipe to elevations indicated

B. Place bedding material at trench bottom, level fill materials in one continuous layer, of approximately 12 inches

C. Consolidate or compact to 95 percent in accordance with Section 02200

3.4 INSTALLATION - PIPE

A. Install as specified or in accordance with the manufacturer's instructions

B. Cutting Pipe:

1. Cut pipe to measurement taken at the site, not from the drawings
2. Cut pipe neatly without damage to pipe or cement lining
3. Cut smooth, straight, and at right angles to pipe axis
4. Dress and bevel end of cut pipe to remove roughness and sharp corners
5. Cut ductile iron pipe with saw or abrasive wheel

C. Provide an isolation or shutoff valve and union at the water connections to each fixture and unit of equipment, whether shown on the drawings or not

D. Maintain separation of water main from storm or sewer lines in accordance with the Colorado Department of Public Health and Environment: 10 feet minimum

E. Group piping with other site piping work whenever practical

F. Install pipe to lines and grades shown on the Drawings to within tolerance of 3 inches. Adjust to maintain minimum depth of bury and maintain minimum grade for drainage and also allow for all air to be released at high points

G. Install ductile iron piping and fittings to AWWA C600

H. Route pipe in straight line

I. Install pipe to allow for expansion and contraction without stressing pipe or joints

J. Install access fittings to permit disinfection of water system performed under Section 02675 subject to approval by the District

K. Slope water pipe and position drain at low points

L. Provide full support of pipe barrel over its entire length

M. Place and tamp bedding under haunches of pipe up to spring line in previously dug bell holes

N. Protect from lateral displacement by placing embedment evenly on both sides of pipe

O. Do not lay pipe in water. Maintain groundwater level a minimum of 12 inches below pipe to be installed. Do not lay pipe under unsuitable weather or trench conditions

P. Lay pipe with bell ends facing the direction of laying except when Engineer authorizes reverse laying

Q. Form and place concrete for thrust blocks at each elbow or change of direction of pipe main

R. Establish elevations of buried piping to ensure not less than 9.0 feet of cover

S. Backfill trench in accordance with Section 02200

T. Install water main marker strip in trench above all water mains

U. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system

3.5 INSTALLATION - VALVES AND HYDRANTS

A. Install valves, hydrants, and accessories in accordance with the manufacturer's instructions

B. Set valves on solid bearing

C. Center and plumb valve box over valve. Set box cover flush with finished grade. Evenly fill around box and thoroughly compact on all sides

D. Extend stem to within 6 inches of final grade. Provide spacers to center stem in valve box

E. Set hydrants plumb and locate pumper nozzle perpendicular to roadway

F. Set hydrants to grade, with nozzles at least 18 inches above ground

G. Locate control valve 6 to 8 feet away from hydrant

H. Provide a drainage pit with 1/2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to any sewer

I. Pipe exhaust of air release valves to suitable disposal point

3.6 INSTALLATION – WATER SERVICES

A. Install as specified herein for installation of pipe, and in accordance with standard details

B. Establish elevations of buried water services to ensure not less than 9.0 feet of cover

C. Mark location of each water service corporation stop or isolation valve with 4 x 4. Set 4 x 4 to expose a minimum of 4 feet

3.7 JOINTS

A. Connect piping in accordance with manufacturer’s instructions

B. Install joint conductor for electrical continuity per manufacturer’s instructions: CAD WELD

C. Determine maximum length of pipe that can be used without exceeding allowable deflection at joint, coupling, or fitting

D. Maximum deflection at mechanical couplings per manufacturer instructions

E. Maximum deflection at a joint: Per manufacturer instructions, but not more than 3-1/2 inches except where approved by District

3.8 CONCRETE ENCASEMENT

A. Provide as required by standard Drawings

B. Suitably support and block pipe and anchor against flotation

3.9 CONNECTION TO EXISTING PIPELINES

A. Make connections between new and existing piping with suitable fittings

B. Schedule connection to minimize inconvenience to the District and customers and as authorized by the District

C. Provide facilities for adequate dewatering, dechlorination and disposal of water from dewatered line and excavations without damage to adjacent property

D. Potable water lines:

1. Take special care to prevent contamination
2. Do not permit trench water, mud, or other contaminating substances in lines
3. Thoroughly clean the interior of pipe, fittings and valves and swab with or dip into a 200 mg/l chlorine solution

3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 02675

3.11 PROTECTIVE COATING

A. Field coating and touch up of exposed metal surfaces not protected by tape wrap or for surfaces previously coated by manufacturer:

1. Coat all steel clamp rods, bolts, and other metal accessories used in tapping saddles, anchorages, follower rings and bolts or joint harnesses subject to submergence, buried, or in vaults and not concrete encased, including pipe fittings and bolts in polyethylene tube encasement
2. Apply 1 coat of coal tar epoxy paint to clean, dry primed metal surfaces. Apply coat and let dry before wrapping in polyethylene encasement
3. Surface prep and apply touch up coating to all damaged surfaces before wrapping in polyethylene encasement or as directed by the District

3.12 ERECTION TOLERANCES

A. Establish invert elevations, slopes for drainage to 1/4 inch per foot , two percent minimum but never less than 1/8 per inch per foot. Maintain minimum gradients for drainage

B. Slope exposed water piping and install to drain at low points

3.13 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400

B. Test each line at the Contractor's expense in the presence and to the satisfaction of the District

C. Provide all necessary pumping equipment, piping connections, pressure gauges with maximum of 5 psi increments, and other required equipment, facilities, and materials

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to the District

E. Wet Tap Test: Test at wet tap location, air test pressure at 180 psi for 15 minutes

F. Hydrostatic Test Conditions: At lowest point in the line or section under test

SERVICE	TEST PRESSURE	TEST MEDIUM	PIPE SYSTEM
Water Supply	250 psi or 1.5 x Working Pressure	water	water distribution and transmission

G. Procedure:

1. Disconnect all fixture devices and other accessories which may be damaged by the specified test pressure
2. Plug or cap ends as required
3. Bleed system to eliminate all air from system
4. No testing before concrete thrust blocks have adequate curing time to reach design strength, 7 days minimum
5. Notify District 48 hours prior to testing
6. Test for 2 hours with no more than 5 psi loss in pressure
7. Structure test so as to test all intermediate valves in tested section, test all line valves by pressurizing upstream to test pressure and relieving downstream pressure, valves must maintain test pressure in each valved pipe line segment, maximum 1000 feet
8. Leakage is the quantity of water added to a test section to maintain test pressure + 5 psi:
    a. L = S x D x (P)0.5 133,200
       L = allowable leakage, in gallons per hour
       S = length of pipe tested, in feet
       D = nominal diameter of the pipe, in inches
       P = avg. test pressure during the test, in psi (gauge)
    b. All visible leaks shall be stopped to the satisfaction of the District
    c. All water used for pressure testing must be potable and delivered in acceptable containers
9. All joints located in visible interior or exterior locations shall be watertight and free of leaks
10. Length of pipe in visible interior or exterior locations shall not be included in calculation of allowable leakage quantity
11. Immediately locate and replace all pipe fittings, valves, pipe joints, and other materials found to be defective with new and acceptable material

H. District will only provide water for initial filling and testing of pipeline

I. Contractor will provide water for additional testing. If water is purchased from the District, cost of water is at the standard bulk rate

J. Flush all lines thoroughly before disinfection in accordance with Section 02675

K. When testing against a closed valve connected to an existing potable water system, complete flushing and passing disinfection tests per Section 02675 prior to conducting hydrostatic pressure test

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3.14 CLEANING AND DRAINING

A. The inside of all pipe, valves, and fittings shall be smooth, clean, and free from blisters, loose mill scale, sand, and dirt when connected

B. Wire brush, if necessary, wipe clean and keep joint contact surfaces clean until connection is complete

END OF SECTION

SECTION 02675 - DISINFECTION OF WATER DISTRIBUTION SYSTEMS

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Disinfection of potable water distribution lines

B. Dechlorination of chlorinated discharge from distribution lines after disinfection

C. Testing and reporting results

1.2 RELATED SECTIONS

A. Section 01340—Shop Drawings, Product Data and Samples

B. Section 01400—Quality Control

C. Section 01720—Project Record Documents

D. Section 02667—Site Water Lines

1.3 REFERENCES

A. ANSI/AWWA B300—Standard for Hypochlorites

B. ANSI/AWWA C651—Standard for Disinfecting Water Mains

C. NSF 60—Drinking Water Treatment Chemicals - Health Effects

D. NSF 61—Drinking Water System Components - Health Effects

1.4 SUBMITTALS

A. Test Reports: Indicate results comparative to specified requirements

B. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements

C. Disinfection method and disposal plan for highly chlorinated water

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01720

B. Disinfection report; record:

1. Type and form of disinfectant used
2. Date and time of disinfectant injection start and time of completion
3. Test locations
4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested
5. Date and time of flushing start and completion
6. Disinfectant residual after flushing in ppm for each outlet tested

C. Bacteriological report; record:

1. Date issued, project name, and testing laboratory name, address, and telephone number
2. Time and date of water sample collection
3. Name of person collecting samples
4. Test locations
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested
6. Coliform bacteria test results for each outlet tested
7. Certification that water conforms, or fails to conform, to bacterial standards of Colorado Department of Public Health and Environment
8. Bacteriologist's signature and authority

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ANSI/AWWA C651

1.7 QUALIFICATIONS

A. Testing Laboratory: Laboratory specializing in testing potable water systems, certified by the State of Colorado

1.8 REGULATORY REQUIREMENTS

A. Conform to local code or state regulation for performing the work of this Section

PART 2: PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: ANSI/AWWA B300, Hypochlorite.

PART 3: EXECUTION

3.1 EXAMINATION

A. Verify that piping system has been cleaned, free of debris and inspected to the satisfaction of the District before filling the pipe with water.

B. Perform scheduling and disinfection activity with start-up, testing, adjusting and balancing, demonstration procedures, including coordination with related systems

C. Complete disinfection before pressure (hydrostatic) testing

3.2 DISINFECTION AND PRESSURE TESTING

A. Provide and attach required equipment to perform the work of this Section

B. Prior to starting work, verify system is complete, flushed and clean for proper sanitary conditions.

C. Attach chlorine tablets to the inside top of pipe with an approved adhesive certified to NSF Standard 61 such as Permatres RTV Clear silicon adhesive sealant, or approved equal, prior to pipe installation in the trench.

D. Dosage shall be calculated for a 100 mg/l residual. For calculating the weight of chlorine required see Table 1 below:

TABLE 1. MINIMUM NUMBER OF HYPOCHLORITE TABLETS OF 7 STRENGTH (5 AVAILABLE CHLORINE) FOR A DOSE OF 100 MG/L

	PIPE DIAMETER (INCHES)				
LENGTH OF PIPE SECTION (Feet)	4"	6"	8"	10"	12"
13' or less	2	3	3	5	8
18'	2	3	5	8	9
20'	2	3	5	8	11

E. Bleed water from outlets to ensure distribution and test for disinfectant residual

F. Maintain disinfectant in system for 24 hours

G. If final disinfectant residual tests less than 25 mg/l, repeat treatment

H. Flush, circulate and clean until residual equal to that of incoming water or 0.5 mg/l is achieved; use municipal domestic water provided by the District

I. Take samples no sooner than 24 hours after flushing, from outlets and from water entry, and analyze

J. Replace permanent system devices removed for disinfection

K. One sample per 1000 feet of pipe, one sample per pipe line branch, and one sample of source water. Contractor to provide sampling corps and piping as required to obtain samples

L. Failing bacteriological test:

1. Contractor to flush pipeline and resample
2. If second test fails, Contractor to rechlorinate line by continuous feed, per AWWA C651, Section 5. Pipeline to be reflushed and retested

M. Dispose of highly chlorinated test water by dechlorination or other methods in a safe manner and in conformance with the District and National Discharge Elimination System Permit. Submit proposed disposal plan to District for review and approval

N. Pressure test system under provisions of Section 02667. Repair leaks and retest for disinfection

3.3 QUALITY CONTROL

A. Pay all costs for bacteriological tests and analysis of treated water except where indicated otherwise

B. Meter water usage and pay all costs for all retesting in accordance with current District rates

END OF SECTION

SECTION 02732 - SITE SANITARY SEWERAGE SYSTEM

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Sanitary sewerage piping, fittings, accessories and bedding

B. Connection of building sanitary system to District collection system

C. Cleanout access, and accessories

1.2 RELATED SECTIONS

A. Section 01340—Shop Drawings, Product Data and Samples

B. Section 01400—Quality Control

C. Section 01720—Project Record Documents

D. Section 02200—Earthwork

E. Section 02607—Manholes and Covers

F. Section 03001—Concrete

G. Section 03600—Grout

1.3 REFERENCES

A. ASTM D698—Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)

B. ASTM D1784—Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

C. ASTM D2321—Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

D. ASTM D3034—Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

E. ASTM D3212—Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

F. ASTM D6938—In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

G. ASTM F477—Elastomeric Seals (Gaskets) for Joining Plastic Pipe

H. ASTM F679—Polyvinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings

1.4 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations

1.5 SUBMITTALS

A. Submit under provisions of Section 01340

B. Product Data: Provide data indicating pipe, pipe accessories, and standard dimensions

C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements

1.6 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 01720

B. Accurately record location of pipe, pipe fittings, connections, cleanouts, invert elevations and coordinates at each pipe run entrance and exit including all manholes. Horizontal and vertical as-built elevations are required for all pipe joints. Vertical tolerance: ½ inch; horizontal tolerance: 6 inch

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities

1.7 REGULATORY REQUIREMENTS

A. Conform to Copper Mountain Consolidated Metro District Rules and Regulations for materials and installation of the Work of this section

1.8 FIELD MEASUREMENTS

A. Verify that field measurements and elevations are as indicated

1.9 COORDINATION

A. Coordinate the Work with termination of sanitary sewer connection outside building, connection to District sewer utility service with the Copper Mountain Consolidated Metro District

PART 2: PRODUCTS

2.1 MANUFACTURERS

A. J-M Manufacturing Company Inc.

B. Certainteed Corporation

C. Or approved equal

2.2 MATERIALS

A. Sanitary sewer pipe and fittings, large diameter PVC:

1. 18 through 48 inch, ASTM F679, T-1 Wall, SDR 35
2. Cell classification: ASTM D1784
   a. Pipe: 12364
   b. Fittings: 12454
3. Pipe length: 14 or 20 feet standard manufactured length for construction

B. Sanitary sewer pipe and fittings:

1. 4 through 15 inch, ASTM D3034, SDR35/SDR26, as specified on Drawings
2. Cell classification: ASTM D1784, 12454
3. Pipe length: 14 or 20 feet standard manufactured length for construction

C. Site drainage pipe and fittings:

1. 6 through 15 inch, ASTM D3034, SDR 26
2. Cell classification: ASTM D1784, 12454
3. Pipe length: 14 to 20 feet standard manufactured length for construction

D. Joints:

1. Integral bell, ball-and-spigot rubber gasketed joint, ASTM D3212 and F477
2. Internally cast bell with one sealing ring
3. Designed to hold pipe in alignment, provide flexibility, separate the ends of pipe lengths, resist applied earth pressures, and provide fluid tightness
4. Rubber rings: ASTM D3212 and F477

2.3 CLEANOUTS

A. Lid and Frame—Cast iron construction, hinged lid:

1. Lid Design: Open checkerboard grill
2. Nominal Lid and Frame Size: 26 inches

2.4 BEDDING MATERIALS

A. Bedding: Provide bedding as specified in Section 02200

2.5 ACCESSORIES

A. Sewer Service Marker Post: 8 foot long pressure treated 4 x 4 with exposed length of 4 x 4 spray painted green

B. Rebar: #4 rebar from end of service to 1 foot below finished grade

2.6 SOURCE QUALITY CONTROL

A. Identification Marks: Clearly and permanently marked at not greater than 5 foot intervals with pipe diameter, PVC cell classification, manufacturer, plant, shift, ASTM, SDR (SCHD)

B. Testing per ASTM D3034:

1. Test products not manufactured in the U.S. at an acceptable laboratory in the U.S.

PART 3: EXECUTION

3.1 EXAMINATION

A. Examine pipe and fittings and do not use individual sections containing cracks, dents, abrasions, and other defects. Remove defective material from the site

B. Mark rejected pipe and remove from the site

C. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with coarse aggregate

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction

C. Cutting:

1. Cut and bevel ends in accordance with manufacturer's standard instructions
2. Machine cut ends smooth and square to proper dimensions
3. Do not cut with a cold chisel, iron pipe cutter, or any other method that may fracture the pipe or leave ragged, uneven edges
4. Remove burrs and wipe off all dust and dirt from jointing surfaces

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 02200 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated

B. Place minimum of 4 inches of bedding material at trench bottom, level and consolidate materials in accordance with Section 02200

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321 and manufacturer's instructions. Seal joints watertight

B. Inspect pipe and accessories for defects before lowering into trench. Replace all defective, damaged or unsound pipe

C. Remove all dirt and foreign material from the inside of pipe before laying

D. Check bedding for firmness and uniformity of surface immediately before laying each section of pipe

E. Carefully lower pipe, fittings, valves, and accessories into the trench with derricks, ropes, and other suitable equipment to prevent damage

F. Do not dump or drop pipe or accessories into trench

G. Lay pipe to slope gradients noted on drawings:

1. Closely joint to form a smooth flow line

H. Provide full support of pipe barrel over its entire length

I. Place and tamp bedding under haunches of pipe up to spring line in previously dug bell holes

J. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches compacted to 95 percent

K. Utilize implements, tools, and facilities per manufacturer instructions

L. Keep pipe clean during and after laying

M. Close all open ends with watertight expandable type sewer plugs or test plugs

N. Remove and relay any pipe which has floated

O. Do not lay pipe when:

1. There is water in the trench
2. Trench conditions are unsuitable
3. Weather conditions are unsuitable

P. Use acceptable adaptors at manhole and structure connections to provide a watertight seal and flexibility; provide a short length of pipe outside each connection

Q. Refer to Section 02200 for trenching requirements. Do not displace or damage pipe when compacting

R. Refer to Section 02607 for manhole requirements

S. Connect to building sanitary sewer outlet and District sewer system

3.5 INSTALLATION – SEWER SERVICES

A. Install as specified herein for installation of pipe and in accordance with standard details

B. Securely cap end of each sewer service air-tight

C. Mark location of end of each sewer service with #4 rebar and 4 x 4. Set 4 x 4 to expose a minimum of 4 feet

3.6 JOINTING

A. Assemble in accordance with the manufacturer's instructions

B. Wipe clean pipe ends, gasket and gasket groove before inserting gasket

C. Apply lubricant furnished by the pipe manufacturer to the gasket and the outside of the spigot end

D. Utilize assembly tool per manufacturer instructions to center the sleeve over the spigot end

E. Insert the spigot end to the reference mark

F. Check gasket location after assembly with a suitable gage:

1. Gasket locations to be the distance form the sleeve and recommended by the coupling manufacturer for their full circumference
2. If not within the required limits, disassemble and reassemble the joint

3.7 FITTINGS

A. Install utilizing standard methods

B. Lower into trench with rope, cable, chain, or other means to prevent damage

C. Attach rope, cable or chain around the exterior

D. Do not attach rope, cable, or chain through the interior

E. Carefully connect to pipe or other facility

F. Check joint to insure a sound and proper joint

3.8 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections

C. Establish elevations and pipe inverts for inlets and outlets as indicated

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated

3.9 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400

B. Request inspection prior to and immediately after placing bedding

C. Compaction testing will be performed in accordance with ANSI/ASTM D698, ASTM D6938

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to the District

E. Air test:

1. Perform an air test on each reach of sewer or drain pipe between manholes:

    a. Test the first reach prior to installing any of the remaining pipe
    b. Provide all necessary piping between the reach to be tested together with all required materials and equipment
    c. Methods used, scheduling, and duration of tests shall be acceptable to Engineer
    d. Low pressure air testing 100 percent of system:

        1) Submit complete information to Engineer for review describing the proposed test method of water exfiltration testing manholes before beginning air testing
        2) Preparation for tests: Flush and clean the sewer line prior to testing in order to wet the pipe surfaces and produce more consistent results. Plug and brace all openings in the main sewer line and the upper connections. Check all pipe plugs with a soap solution to detect any air leakage. If leaks are found, release the air pressure, eliminate the leaks and start the test procedure over again
        3) Procedure of test: Add air until the internal pressure of the sewer line is raised to approximately 4.0 psi gage at which time the flow of air shall be reduced and the pressure maintained between 3.5 and 4.5 psi gage for a sufficient time to allow the air temperature to come to equilibrium with the temperature of the pipe

4) After the temperature has stabilized, permit the pressure to drop to 3.5 psi gage in excess of the ground water pressure above the top of the sewer, at which time a stop watch or a sweep second hand watch shall be used to determine the time lapse required for the air pressure to drop to 3.0 psi gage
5) The time elapsed shall not be less than the following:

PIPE SIZE (INCHES)	TIME (SEC)
6 through 15	2.67 x length of pipe in ft.
18 through 24	6.84 x length of pipe in ft.

6) Brace all plugs sufficiently to prevent blowouts and vent the pipeline completely before attempting to remove the plugs
7) Provide pressurizing equipment with a relief valve set at 5 psi to avoid over pressurizing and damaging an otherwise acceptable line
8) Conduct exfiltration tests on each manhole, leakage as per exfiltration allowable leakage for manhole

e. Conduct smoke tests to detect leaks if exfiltration or air tests fail to meet specified limits
f. Manholes and pipe lines shall not have any visible leaks or damp spots
g. Repair and retest lines that fail tests until satisfactory results are obtained

F. Lamp Test:

1. Each section between manholes will be lamped by the District
2. Contractor shall furnish suitable assistants to help the District
3. A minimum of 95 percent of a true circle will be required in the lamp tests to indicate a properly constructed sewer line
4. Repair any sections not passing the lamp test

G. Infiltration Test:

1. At any time prior to expiration of the correction period, infiltration exceeds 50 gallons per inch of nominal diameter per mile per day, locate the leaks and make repairs
2. If results of infiltration test are not acceptable, perform TV inspection of the reach in question at the discretion of the District

H. Pipe Deflection test:

1. If results of lamp test are not acceptable, perform pipe deflection test at the discretion of the District
2. No sooner than 30 days after placement and compaction of backfill, but prior to placement of permanent surface materials, clean and mandrel each line to detect obstructions (deflections, joint offsets, lateral pipe intrusions, etc.)
3. Use a rigid mandrel with diameter of at least 95 percent of the pipe's specified average inside diameter and a length of the mandrel circular portion at least equal to the nominal pipe diameter

4. Maximum allowable deflection is 5 percent of the base internal diameter
5. Pull the mandrel through the pipe by hand
6. Relay or replace all pipe exceeding the 5 percent deflection at no additional cost to the District
7. Retest repaired sections
8. Maximum allowable deflection at end of one year correction period, 7-1/2 percent of the base internal diameter tested in the same manner. Uncover and repair sections exceeding the allowable deflection

END OF SECTION

SECTION 02936 - SEEDING

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Soil preparation

B. Seeding, mulching and fertilizer

C. Erosion control barriers

D. Seed protection and slope stabilization

E. Maintenance

1.2 RELATED SECTIONS

A. Section 01340—Shop Drawings, Product Data and Samples

B. Section 02200—Earthwork

1.3 REFERENCES

A. FS O-F-241—Fertilizers, Mixed, Commercial

B. American Association of Nurserymen—Standardized Plant Names

1.4 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass

1.5 SUBMITTALS

A. Submit under provisions of Section 01340

B. Product Data: Live Seed analyses for grass mixtures not more than 9 months old including percent of live seed, germination, all crop seeds in excess of 1 percent, inerts and weeds

1.6 QUALITY ASSURANCE

A. Provide seed mixture in tagged containers showing percentage of each seed species in the mix, year of production, net weight, date of packaging, and location of packaging

B. Provide a certificate of the PLS test of the grass seed intended for the project

C. Provide a copy of the analysis of the mulch to the District prior to application

D. Provide certification from suppliers that laboratory and field testing of hydro mulch product meets all of the requirements pertaining to wood cellulose fiber mulch

1.7 QUALIFICATIONS

A. Applicator—Company specializing in performing work of this section:

1. Experienced with type, elevation, topography and scale of work specified
2. Adequate equipment and personnel to perform work

1.8 REGULATORY REQUIREMENTS

A. Comply with codes and ordinances of local regulatory agencies for fertilizer and herbicide composition and regulations of State of Colorado

B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01610

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not prepare or seed frozen soils

B. Do not water saturated soils

C. Perform seeding and planting only after preceding work establishing final ground surface is completed

D. Do not mulch over seeded areas when wind exceeds 15 mph

E. Conduct minimum of two (2) soil tests to confirm fertilizer type and application rates

1.11 MAINTENANCE SERVICE

A. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition

B. Manage irrigation applications to insure proper seed germination and growth of the grass

1.12 WARRANTY

A. All plant material and work accomplished under this section shall be guaranteed to provide a uniform stand of grass acceptable to the District at the end of a one (1) year time period from the completion of the Seeding and Erosion Control work

PART 2: PRODUCTS

2.1 SEED SUPPLIERS

A. Suppliers:

1. Arkansas Valley Seed Company
2. Or approved substitution

2.2 RECLAMATION MIXTURE

A. Mountain Mix—Adapted to higher elevations, mountain pasture and meadows as well as soil stabilization for ski slopes and construction sites:

1. Cereal Rye: 20%
2. Perennial Rye: 20%
3. Kentucky Bluegrass: 19%
4. Mountain Brome: 15%
5. Orchardgrass: 15%
6. Timothy: 10%
7. Manchar Smooth Brome: 10%
8. Alsike Clover: 1%
9. Seeding Rate:
    a. Drilled: 15 to 20 lbs/acre
    b. Broadcast: 20 to 25 lbs/acre

B. Dryland Pasture Mix—Elevations of 3,000 to 10,000 feet, drought tolerant grasses. For areas not receiving regular irrigation:

1. Lincoln Smooth Brome: 20%
2. Oahe Intermediate Wheat grass: 20%
3. Dahurian Wildrye: 15%
4. Paiute Orchardgrass: 15%
5. Tetraploid Perennial Ryegrass: 10%
6. Hycrest Crested Wheatgrass: 10%
7. Revenue Slender Wheatgrass: 10%
8. Seeding Rate:
    a. Drilled: 15 to 20 lbs/acre
    b. Broadcast: 20 to 25 lbs/acre

C. Compensate for percentage of purity and germination by furnishing sufficient additional seed to equal the specified pure live seed product. The formula for determining the quantity of pure live seed (PLS) shall be:

Pounds of Seed (Bulk) X Purity X Germination = Pounds of Pure Live Seed (PLS)

2.3 SOIL ADDITIVES (FERTILIZER)

A. Mycorrhizal Inoculum:

1. Arbuscular Micorrhizal Inculum, AM 120 as supplied by Reforestation Technologies International (800-784-4769) or approved equal

2.4 MULCH

A. Where required by the Contract Documents, Provide mulching material consisting of weed free grass hay. Hay in a state of advanced decomposition will not be approved

B. Do not use hay that is musty, moldy, decayed, caked or of otherwise low quality. At least 75% of the mulch by weight shall be ten (10) inches or more in length

2.5 HYDRO MULCH

A. Provide wood cellulose fiber for hydro mulching without any substance or factor which might inhibit germination or growth of grass seed

B. Dye the fiber an appropriate color to allow metering of its application

C. Wood cellulose fibers: Evenly dispersed and suspended when agitated in water and form a blotter-like ground cover when sprayed uniformly on the surface of the soil, readily absorbs water and allows infiltration to the underlying soil

D. Weight specifications from suppliers, and for all applications: Refer only to air dry weight of the fiber, a standard equivalent to ten (10%) percent moisture content

E. Supply mulch material in packages having a gross weight not in excess of one-hundred (100) pounds, and marked by the manufacturer to show the air dry weight content

F. Provide Mat-Blend mulch as manufactured by Mat Inc. or approved equal

2.6 TOPSOIL

A. Select onsite topsoil: Earth material of loose friable loam reasonably free of admixtures of subsoil, refuse stumps, roots, rocks, brush, weeds or other material which can be detrimental to the proper development of site revegetation

2.7 ACCESSORIES

A. Provide erosion control barriers in accordance with Section 02200

B. Straw bales used for erosion control barriers: Wire or string wound and less than one year old. Do not use bales in an advanced state of deterioration regardless of age

C. Stakes for erosion control bales: No. 4 reinforcing steel or 2-inch x 2-inch wood stakes

D. Erosion Control Fabric: Provide in accordance with Section 02200

E. Silt Fence: Provide in accordance with Section 02200

F. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass

PART 3: EXECUTION

3.1 GENERAL

A. Seed all areas disturbed by construction

B. Pattern for seeding and mulching, and fertilization as required by field conditions. In no case shall revegetation occur within 30 days of the application of a chemical weed control substance

3.2 SOIL PREPARATION

A. Harrow and scarify soil to a depth of 4 inches by mechanical and hand methods in order to establish a uniform and acceptable seed bed surface. Areas that have been eroded or rutted to a degree will require the placement of topsoil, graded and compacted to a uniform and acceptable seed bed surface

B. Uniformly place and spread topsoil removed during grubbing. Provide minimum thickness of 2-inches above the surrounding finished grade. Key topsoil to the underlying and surrounding material by the use of harrows, rollers or other equipment suitable for the purpose

C. Apply water to the topsoil for compaction purposes in a fine spray by nozzles in such a manner that it will not wash or erode the newly placed soil

D. Exercise care during soil preparation on all embankments so as not to disturb established ground cover. Areas disturbed during the soil preparation will be fertilized, seeded and mulched at the discretion of the District in accordance with these documents

3.3 FERTILIZATION

A. Application Rates: 60 pounds per acre or 1.4 pounds per square foot

B. Apply to all disturbed soil reclamation areas

C. Application Methods:

1. Broadcast and till: Evenly distribute across seedbed after seed application. Cover exposed seed and inoculum by hand raking and/or application of an organic top dressing. Do not leave inoculum exposed to sunlight for more than four hours
2. Seed drilling: Incorporate into soil at a depth range at or below the seed. Apply either as soil is tilled for final time prior to smoothing seedbed or immediately before drilling of seed commences. Do not leave inoculum exposed to sunlight for more than four hours
3. Hydroseeding: Apply in a first pass with seed. A second pass with hydromulch to cover exposed seed and inoculum is remmended

D. Do not proceed with fertilization in adverse weather and unsuitable ground conditions. Examples of these respective conditions may be wind, precipitation, frozen and untillable ground or conditions detrimental to the effectiveness of the application

E. Apply fertilizer in a manner to assure uniform distribution

F. In cases where work progress is stopped due to the above conditions, fertilization will begin again, when appropriate conditions exist. The application will begin again with a reasonable overlapping of the previously applied area

3.4 SEEDING

A. All seeding shall be installed by the drilling method

B. Do not proceed with seeding in adverse weather and unsuitable ground conditions. Examples of these respective conditions may be wind, precipitation, frozen or untillable ground or conditions detrimental to the effectiveness of the application. All seeding shall be performed between April 1st and October 1st, of the calendar year of construction.

3.5 DRILLING

A. Accomplish seeding by means of an approved power drawn drill, followed by drag chains. The grass drill should be equipped with a satisfactory feeding mechanism, agitation, and double disk furrow openers. Equip drills with depth bands set to maintain a planting depth of approximately 1/2 inch and shall be set to space rows not more than 7 inches apart

B. If inspections indicate that strips wider than the specified space between the rows planted have been left or other areas skipped, the District will require immediate resowing of seed in such areas at the Contractor's expense. The seeding mixture shown in the Materials Section applies at a pure live seed rate per acre

3.6 HAND SEEDING (AS APPROVED BY THE DISTRICT FOR AREAS INACCESSIBLE FOR DRILLING)

A. In certain areas where access is limited, seeding may be accomplished by hand broadcasting seed over the area. Special care shall be taken to assure the proper seeding rate is used on these areas. After broadcasting of the seed has been accomplished, the seed shall be raked into the soil to a depth of 1/4" to 3/4" and rolled. The seeding mixture shown in the Materials Section applies at twice the pure live seed (PSL) rate per acre

3.7 MULCHING

A. Mulch and or hydro mulch will be applied to areas seeded. All other areas are to be mulched by mechanical or hand methods depending on the accessibility of equipment. All new seeded areas, except areas to be hydro mulched , shall be mulched and crimped within 24 hours after seeding. Areas not mulched and crimped within 24 hours after seeding will be reseeded in accordance with the specified seed mix at the Contractor's expense prior to mulching and crimping

B. Hydro mulch is required for all areas with a slope equal to or greater than 4:1

C. Apply a uniform layer of straw mulch to newly seeded areas at the rate of 2 tons per acre, crimped with a crimper or other approved methods, or a uniform slurry mixture of cellulose fiber mulch if seeded hydraulically

D. Do not hydraulic mulch in the presence of free surface water. Apply wood cellulose fiber mulch at the rate of 1,800 pounds per acre

3.8 AREAS TO BE RESEEDED

A. Reseed all areas that are damaged or disturbed by the Contractor's activities and construction staging area according to these Specifications

3.9 MAINTENANCE

A. Fertilize the seeded areas once a uniform stand of grass has been established

B. Maintain seeded areas until there is an acceptable uniform plant growth. Reseed areas that are not producing a uniform plant growth within five (5) weeks following seeding. Acceptable uniform plant growth shall be defined as that time when the scattered bare spots, not greater than 1 square foot in area, do not exceed three (3%) of the seeded area

C. Areas that are seeded late in the fall planting season which are not producing acceptable uniform plant growth, as described above, shall be reseeded during the following spring planting season. If such a condition exists, and the Contractor has diligently, in the opinion of the District, pursued the performance of his work, the District at his option, may extend the contract completion date and reduce contract retainage. Retainage may be reduced to less than five (5%) percent of the total contract amount, but shall be at least two (2) times the estimated cost of obtaining the required growth in the indicated areas, plus areas which are susceptible to damage by winter kill, washout or other causes

3.10 STRAW BALE EROSION CONTROL BARRIERS AND SILT FENCE

A. Install straw bale erosion control barriers and silt fence in accordance with Section 02200

3.11 SEED PROTECTION AND SLOPE STABILIZATION

A. Cover seeded slopes with erosion control fabric in accordance with Section 02200

END OF SECTION

DIVISION 3: CONCRETE

SECTION 03001 - CONCRETE

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place concrete, concrete encasement

B. Reinforcing steel

C. Forms

D. Concrete accessories

1.2 RELATED SECTIONS

A. Section 01340—Shop Drawings, Product Data and Samples

B. Section 01400—Quality Control

C. Section 02607—Manholes and Covers

D. Section 02667—Site Water Lines

E. Section 03600—Grout

1.3 REFERENCES

A. ACI 214—Recommended Practice for Evaluation of Strength Test Results of Concrete

B. ACI 301—Specifications for Structural Concrete

C. ACI 304—Measuring, Mixing, Transporting and Placing Concrete

D. ACI 305.1—Standard Specification for Hot Weather Concreting

E. ACI 305R—Guide to Hot Weather Concreting

F. ACI 306.1—Standard Specification for Cold Weather Concreting

G. ACI 306R—Guide to Cold Weather Concreting

H. ACI 308—Standard Practice for Curing Concrete

I. ACI 318—Building Code Requirements for Structural Concrete

J. ACI 347—Guide to Formwork for Concrete

K. ASTM A82—Steel Wire, Plain, for Concrete Reinforcement

L. ASTM A615—Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

M. ASTM A185—Steel Welded Wire Reinforcement, Plain, for Concrete

N. ASTM C31—Making and Curing Concrete Test Specimens in the Field

O. ASTM C39—Compressive Strength of Cylindrical Concrete Specimens

P. ASTM C143—Slump of Hydraulic Cement Concrete

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Q. ASTM C33—Concrete Aggregates

R. ASTM C94—Ready-Mixed Concrete

S. ASTM C150—Portland Cement

T. ASTM C171—Sheet Materials for Curing Concrete

U. ASTM C260—Air-Entraining Admixtures for Concrete

V. ASTM C309—Liquid Membrane-Forming Compounds for Curing Concrete

W. ASTM C494—Chemical Admixtures for Concrete

X. ASTM C618—Coal Fly Ash and Raw or Calcinated Natural Pozzolan for Use in Concrete

Y. ASTM D1751 —Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

Z. ASTM D2103—Polyethylene Film and Sheeting

AA. CRSI—Concrete Reinforcing Steel Institute - Manual of Standard Practice

BB. CRSI PRB—Placing Reinforcing Bars

CC. FED PS1—Construction and Industrial Plywood

1.4 PERFORMANCE TOLERANCES

A. Confirm to ACI 301 and ACI 347, as modified herein. In case of conflict, ACI 347 governs over ACI 301

1.5 SUBMITTALS

A. Submit under provisions of Section 01340

B. Shop Drawings: Reinforcing bar lists, fabrication and placement drawings

C. Product Data—Provide sufficient information on mix design and products specified to verify compliance with specifications:

1. Existing data on proposed design mixes, certified and complete

1.6 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301

B. Acquire cement and aggregate from same source for all work

1.7 DELIVERY, STORAGE, AND HANDLING

A. Reinforcing steel: Store on supports which will keep it from contact with the ground and cover

B. Rubber and plastic materials: Store in a cool place, do not expose to direct sunlight

C. Prepare a delivery ticket for each load of ready-mixed concrete

D. Truck operator shall hand ticket to Engineer at the time of delivery with ticket to show:

1. Quantity delivered
2. Actual quantity of each material in batch
3. Outdoor temp in the shade
4. Time at which cement was added
5. Numerical sequence of the delivery
6. Quantity of water that can be added in the field based on mix design

PART 2: PRODUCTS

2.1 FORMS

A. Plywood: FED PS1, waterproof resin-bonded, exterior type Douglas Fir; face adjacent to concrete Grade B or better

B. Lumber: Straight, uniform width and thickness: and free from knots, offsets, holes, dents, and other surface defects

C. Chamfer strips: Clear, white pine, surface against concrete planed

D. Form coating: L & M Construction Chemicals Inc. "Debond", Dayton Superior "Clean Strip J1EF", Nox-Crete "Nox-Crete Form Coating EB", or approved equal

E. Form ties: Removable end, permanently embedded body types with waterstops not requiring auxiliary spreaders, with cones on outer ends, embedded portion 1 inch minimum back from concrete face. If not provided with threaded ends, constructed for breaking off ends without damage to concrete. Burke Company "Burke Penta-Tie System" or approved equal.

2.2 REINFORCING STEEL

A. Bars: ASTM A615, Grade 60

B. Welded wire fabric: ASTM A185 or A497

C. Bar supports: PS 7; CRSI Class B or E, fabricated from galvanized wire having PVC coated legs

2.3 CONCRETE

A. Cement: ASTM C150, Type II

B. Fly ash: ASTM C618, Class F or Class F, except loss on ignition not more than 5%

C. Fine aggregate: Clean, natural sand, ASTM C33; no manufactured or artificial sand

D. Coarse aggregate: Crushed rock, natural gravel, or other inert granular material, ASTM C33 except clay and shale particles no more than 1%

E. Water: Clean and free of deleterious substances

F. Admixtures:

1. Air entraining agent: ASTM C260; Master Builders (BASF) “MB-VR”, Sika Chemical “AEA”, or approved equal

2.4 ACCESSORIES

A. Polyethylene film: ASTM C171, ASTM D2103 6 mil

B. Expansion Joint Filler: ASTM D1751, asphalt impregnated fiber board glass fiber, 1/2 inch thickness unless indicated otherwise

C. Waterstop: Metal, 14 Ga, not galvanized or coated, 8 inches minimum

D. Vapor barrier: Polyethylene coated reinforced paper, BSK “Sisalkraft 822” or approved equal

2.5 MIX

A. Design concrete mix within the limits specified

B. Comply with ASTM C94

C. Maximum Aggregate Size: 1 inch

D. Water Content: No more than 35 gal per cu yd or the equivalent cement weight if fly ash is added

E. Slump: 4 inch maximum:

1. As low as possible consistent with proper handling and thorough compaction

F. Volumetric Air Content: 6% + 1% after placement:

1. Air may be omitted from interior slabs to be trowel finished

G. Strength: Compressive strength as determined by ASTM C39: 3000 psi minimum at 28 days

H. Consistency: Uniform slump, suitable for the placement conditions with aggregate floating uniformly throughout the concrete mass, flowing sluggishly when vibrated or spaded

I. Adjust mix as required to meet specifications and specific job conditions as directed by the District

PART 3: EXECUTION

3.1 EXAMINATION

A. Verify requirements for concrete cover over reinforcement

B. Verify that anchors, seats, plates, reinforcement and other items to be encased into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete

3.2 FORMS

A. Design to produce hardened concrete to the shape, lines, and dimensions indicated on the drawings

B. Conform to ACI 347 as modified herein

C. Surfaces exposed to view:

1. Prefabricated plywood panel forms, job-built plywood forms, or forms lined with plywood or fiberboard
2. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned
3. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas
4. Maximum deviation from a true plane: 1/8 inch within 6 feet

D. Plywood or lined forms are not required for surface normally submerged or not normally exposed to view

E. Other type of forms may be used for surfaces not restricted to plywood or lined forms as backing for form lining

F. Provide forms above all extended footings; flat segmental forms, 2 foot maximum width, may be used for curved surfaces 25 feet minimum diameter

G. Provide polyethylene film to protect concrete from water loss when placing concrete against gravel or crushed rock not containing 25 percent minimum material passing a No. 4 sieve, lap joint 4 inches

H. When placing concrete against rock, remove all loose pieces of rock and clean exposed surface with high pressure hose

I. Provide substantial forms sufficiently tight to prevent leakage of concrete

J. Brace or tie forms to maintain desired position, shape, and alignment during and after concrete placement

K. Size and space wailers, studs, internal ties and other form supports so proper working stresses are not exceeded

L. Where the top of a wall will be exposed to weathering, stop form on at least 1 side at true line and grade

M. Locations to be finished to a specified elevation, slope, or contour, bring form to true line and grade and provide a wooden guide strip at the proper location in the forms for finishing the top surface with a screed or template

N. Install form ties on exposed surfaces in uniformly spaced vertical and horizontal rows

O. Provide chamfer strips to bevel salient edges and corners. Do not provide for top edges of walls and slabs to be tooled or for edges to be buried

P. Do not remove or disturb until concrete has attained sufficient strength to safely support all dead and live loads

Q. Maintain forms in place for a minimum of 40 hours or for length of curing time in accordance with ACI 306.1/306R when temperature is 45 degrees F and below

R. Remove forms carefully to prevent surface gouging, corner or edge breakage and other damage

3.3 REINFORCING STEEL

A. Accurately position reinforcing steel on supports, spacers, hangers, or other reinforcing steel

B. Secure with wire ties or suitable clips

C. Where reinforcement is placed in 2 layers, place bars in upper layer directly above bars in lower layer

3.4 EMBEDMENTS

A. Accurately position and securely anchor in forms, anchor bolts, steel shapes, sleeves, masonry anchorages, and other materials to be embedded in concrete

B. Anchor bolts:

1. Unless installed in pipe sleeves, provide sufficient threads on anchor bolts to permit a nut on the concrete side of the form or template
2. Install a second nut on the other side of the form or template
3. Adjust the nuts to hold the bolt rigidly in the proper position

C. Clean embedments before installation

D. Clean concrete spatter and other foreign substances from surfaces not in contact with concrete

3.5 PLACING CONCRETE

A. Place concrete in accordance with ACI 304

B. Notify the District not less than 24 hrs in advance of the times and places at which contractor intends to place concrete

C. Predetermine limits at each pour and place all concrete within limits of pour in one continuous operation

D. Rigidly secure forms, reinforcing steel, embedment, and anchor bolts in proper position

E. Remove all mud, water, ice, snow, frozen material, and debris from space to be occupied by concrete

F. Clean surfaces encrusted with dried concrete from previous concrete operations

G. Convey to the point of final deposit by methods which will prevent separation or loss of ingredients

H. Place concrete in final position without being moved laterally more than 5 feet

I. Place concrete in approximately horizontal layers of proper depth for proper compaction, not more than 2 feet

J. Place subsequent layer while the preceding layer is still plastic

K. Fill form at a rate not less than 2 feet per hour

L. Top finish concrete when thoroughly settled

M. Remove all laitance, debris, and surplus water from the tops of the forms by screeding, scraping or other effective means

N. Overfill the forms for walls whose tops will be exposed to the weather and screed off the excess after the concrete has settled

O. Provide vertical construction joints as required to comply with these requirements

3.6 COMPACTION

A. Thoroughly compact concrete during and immediately after placement

B. Work concrete around all reinforcements and embedments and into the corners of the forms

C. Use mechanical vibrators which will maintain 9,000 cycles per minutes when immersed in the concrete, 1 1/2 hp motor minimum

3.7 COLD WEATHER CONCRETING

A. Conform to ACI 306R, except as modified herein

B. Minimum concrete temp at the time of mixing:

OUTDOOR TEMP AT PLACEMENT (IN SHADE)	CONCRETE TEMP AT MIXING
Below 30 degrees F	70 degrees F
Between 30 degrees F and 45 degrees F	60 degrees F
Above 45 degrees F	45 degrees F

C. Do not place heated concrete which is warmer than 80 degrees F

D. If freezing temp are expected during curing, maintain the concrete temp at or above 50 degrees F for 5 days or 70 degrees F for 3 days with forms in place

E. Do not allow concrete to cool suddenly

3.8 HOT WEATHER CONCRETING

A. Conform to ACI 305R, except as modified herein

B. At air temp of 90 degrees F and above keep concrete as cool as possible during placement and curing

C. Do not allow concrete temperature to exceed 70 degrees F at placement

D. Prevent plastic shrinkage cracking due to rapid evaporation of moisture

E. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 lbs per sq ft per hr as determined from ACI 305.1, Fig 2.1.4

3.9 WATERTIGHT JOINTS

A. Provide watertight joints with metal waterstops at walls and bottom slabs of valve vaults where below finished grade and in contact with backfill or subgrade material on the opposite side

B. Install continuous metal waterstops through the length of the construction joint which are clean and free of coatings to insure a strong bond with concrete

C. Provide lap junctions between adjacent sections a minimum of 5 inches. Securely bolt or weld together

D. Maintain in proper position until surrounding concrete is deposited and compacted

3.10 CONSTRUCTION JOINTS

A. As indicated on the drawings or designated by the District

3.11 FINISHING UNFORMED SURFACES

A. Float finish buried or permanently submerged concrete not forming an integral of a structure except as required to attain surface elevations, contours and freedom from laitance

B. Screed and initial float finish followed by additional floating, and troweling as required, all other surfaces

C. Screeding:

1. Screed concrete surfaces to the proper elevation and contours with all aggregates completely embedded in mortar
2. Surface free of irregularities of height or depth more than 1/4 inch measured from a 10 foot straightedge

D. Broom finish:

1. Broom finish exterior slabs and manhole benches
2. Broom after second floating and at right angles to normal traffic

3.12 CURING AND PROTECTION

A. Protect concrete from moisture loss at relatively constant temperature for at least 7 days after placement except that the time period for curing by saturation for concrete being protected from low temp shall be 1 day less than the duration of low temp protection

B. Cure concrete by methods which will keep concrete surfaces adequately wet during curing, in accordance with ACI 308

C. Water curing:

1. Begin water saturation as quickly as possible after initial set
2. Regulate water application to provide complete surface coverage with a minimum of runoff
3. Interrupt the application of water to walls for grout cleaning only over the area being cleaned at the time and do not permit the surface to become dry during such an interruption

D. Membrane curing:

1. Membrane curing compound may be used in lieu of water curing on concrete which will not be covered later with mortar or concrete
2. Spray apply membrane curing compound at not more than:
   a. General use: 300 sf per gal recommended
3. Cover unformed surfaces within 30 minutes of final finishing
4. If forms are removed before the end of the curing period, immediately apply curing compound to the formed surface before they dry out
5. Protect curing compound against abrasion during the curing period

E. Film curing:

1. Polyethylene sheeting may be used in lieu of water curing on concrete which will be covered or hidden from view
2. Begin film curing as quickly after initial set of the concrete as possible
3. Completely cover the surfaces with polyethylene sheeting
4. Overlap the sheeting edges for sealing and anchorage
5. Seal joints between sheets
6. Promptly repair tears, holes, and other damage
7. Anchor covering continuously at edges and on the surfaces as required to prevent billowing

3.13 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements

B. Repair or replacement of defective concrete will be determined by the District

C. Repair defects in formed concrete surfaces within 24 hours of removing forms

D. Replace defective concrete within 48 hrs

E. Cut out and remove to sound concrete honeycombed or otherwise defective concrete

F. Cut edges square to avoid feathering

G. Comply with Chapter 9, ACI 301

H. Perform repair work so as not to interfere with thorough curing of adjacent concrete

I. Adequately cure repair work

3.14 FINISHING FORMED SURFACES

A. Remove fins and other surface projections from all formed surfaces except exterior surfaces that will be in contact with earth backfill and are not specified to be dampproofed

B. Use a power grinder, if necessary, to remove projections and provide a flush surface

C. Remove fins and fill tie hole on surfaces exposed to view:

1. Clean, dry and fill tie holes with epoxy grout
2. Finish flush to match the texture of adjacent concrete

D. Grout cleaning under provisions of Chapter 10, ACI 301

1. Grout clean surfaces exposed to view to produce a smooth uniform surface free of marks, voids, surface glaze and cement dust
2. Use nonshrink grout mix with bonding agent. Dampen surface and apply with cork or rubber float

3.15 FIELD QUALITY CONTROL

A. Perform all field and compressive strength tests to determine compliance of concrete materials in accordance with the specifications except as indicated otherwise under provisions of Section 01400

B. Field Control Test:

1. Tests by ACI certified technician
2. Make tests in presence of the District
3. Provide all equipment, supplies, and the services of one or more employees, as required
4. The test frequencies specified are minimum. Additional tests may be performed as required by the job conditions

C. Slump: Test a sample from each truck load in accordance with ASTM C143 if requested by the District and when making test cylinders

D. Air Content: Test a sample from each truck load if requested by the District and when making test cylinders

E. Compression Tests:

1. Make one set of 4 cylinders each day when up to 25 cu yds have been placed or as required by the District
2. Make one additional set of 4 cylinders for each additional 25 cu yds or each major pour placed in one day or as required by the District
3. Test two cylinders in each set at 28 days. The other two cylinders to be used as directed by the District at any time
4. The District will evaluate in accordance with ACI 214 and 318
5. Make, cure, store, and deliver cylinders in accordance with ASTM C31
6. Test in accordance with ASTM C39

7. Mark or tag each set of test cylinders with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the delivery truck or batch number, the air content, and the slump

F. Storage Facilities for Concrete Test Cylinders:

1. Including water necessary, a specially prepared box with high-low thermometer and thermostatically controlled heating devices in accordance with ASTM C31

G. Failure of Test Cylinder Results:

1. Upon failure of 28-day test cylinder results, the District may require the Contractor, at his expense, to obtain and test at least three 4-inch diameter cored samples from area in question
2. Concrete will be considered adequate if average of three core tests is at least 85 percent of, and if no single core is less than 75 percent of, the specified 28-day strength
3. In the event an area is found to be structurally unsound, the District may order removal and replacement of concrete as required. The cost of the core tests and removal and replacement of defective concrete shall be borne by the Contractor
4. Fill all core holes as specified for repairing defective concrete

END OF SECTION

SECTION 03600 - GROUT

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Patching cavities in concrete

B. Other grouting specified or indicated on drawings

1.2 RELATED SECTIONS

A. Section 02607—Manholes and Covers

B. Section 02667—Site Water Lines

C. Section 03001—Concrete

1.3 REFERENCES

A. ASTM C109—Compressive Strength of Hydraulic Cement Mortar (Using 2-in. Cube Specimens)

B. ASTM C157—Length Change of Hardened Hydraulic-Cement Mortar and Concrete

C. ASTM C191—Time of Setting of Hydraulic Cement by Vicat Needle

1.4 SUBMITTALS

A. Submit under provisions of Section 01340

B. Product Data: Provide manufacturer's catalog sheet for material indicating test data and physical properties

1.5 QUALITY ASSURANCE

A. Conform to applicable industry standard, Corps of Engineers, Specification CRD-C 621 - Specification for non-shrink grout

PART 2: PRODUCTS

2.1 MANUFACTURERS

A. Non-Shrink, Non-Metallic Grout

1. Master Builders - Masterflow 928
2. L & M Inc. - Crystex
3. Sika - SikaGrout 212
4. Or approved equal

B. Epoxy/Grout Adhesive

1. Master Builders – Concresive 1380
2. Sika - Sikadur 32 Hi-Mod
3. Or approved equal

C. Latex Bonding Agent

1. MR Meadows - Intralok Bonding Agent
2. Or approved equal

2.2 MATERIALS

A. Non-Shrink, Non-Metallic Grout: Factory premixed compound consisting of non- metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 4000 psi in one day and 8000 psi in 7 days

B. Epoxy Grout—Three Component Epoxy Resin System:

1. Two liquid epoxy components
2. One inert aggregate filtered component
3. Each component furnished in separate package for mixing at job site

C. Water: Clean and free from deleterious substances

D. Latex Bonding Agent: Acrylic liquid compound readily mixable as an admixture to grout

PART 3: EXECUTION

3.1 PREPARATION

A. Non-Shrink, Non-Metallic Grout:

1. Clean concrete surface to receive grout
2. Saturate concrete with water for 24 hrs prior to grouting and remove excess water just prior to placing grout
3. Cold weather conditions:
   a. Warm concrete, substrate and base plate to 40 deg F, or above; store grout in warm area
   b. Follow manufacturer's recommendations for cold weather application
4. Hot weather conditions:
   a. Use cold mixing water and cool base plate if possible; store grout in cool area
   b. Follow manufacturer's recommendations for hot weather application
5. Apply to clean, sound surface
6. Apply latex bonding agent to hardened concrete surfaces as indicated or as directed by the District

B. Epoxy Grout: Apply only to clean, dry, sound surface

3.2 APPLICATION

A. Non-Shrink, Non-Metallic Grout:

1. Mix in a mechanical mixer with latex bonding agent
2. Use no more water than necessary to produce flowable grout
3. Provide expansion joints on long pours
4. Provide air vents where necessary to eliminate air pockets
5. Place in accordance with manufacturer's instructions

6. Completely fill all spaces and cavities below the top of baseplates
7. Provide forms where baseplates and bedplates do not confine grout
8. Where exposed to view finish grout edges smooth
9. Except where a slope is indicated on the drawings, finish edges flush at the baseplate, bedplate, member or piece of equipment
10. Protect against rapid moisture loss by immediately covering with wet rags and polyethylene sheets or curing compound
11. Wet cure grout for 7 days, minimum
12. Maintain the temperature at a minimum of 40 deg F until grout reaches 3000 psi
13. After placement of grout, eliminate excessive external vibration

B. Epoxy Grout:

1. Mix and place in accordance with manufacturer's instructions
2. Completely fill all cavities and spaces around dowels and anchors without voids
3. Obtain manufacturer's field technical assistance as required to insure proper placement

3.3 SCHEDULE

A. Non-Shrink, Non-Metallic Grout: General Use

1. Manhole rings
2. Manhole lift holes and joints
3. Where indicated by standard details

B. Epoxy Grout:

1. Grouting of dowels and anchor bolts into existing concrete
2. Where indicated by standard details

END OF SECTION

DIVISION 7: THERMAL AND MOISTURE PROTECTION

SECTION 07160 - BITUMINOUS DAMPPROOFING

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Bituminous type dampproofing of precast concrete manholes

1.2 RELATED SECTIONS

A. Section 01340—Shop Drawings, Product Data and Samplers

B. Section 02607—Manholes and Covers

C. Section 03001—Concrete

1.3 SUBMITTALS

A. Submit under provisions of Section 01340

B. Product Data: Provide data, certificates, and material safety data sheets on dampproofing product. Label submittal with type and intended use

C. Manufacturer's Instructions: Indicate special surface preparation procedure, substitute conditions requiring special attention

PART 2: PRODUCTS

2.1 MANUFACTURERS

A. Semi-Mastic Dampproofing

1. Sonneborn - Hydrocide 700B
2. W.R. Meadows - Sealmastic Type 2
3. Or approved equal

PART 3: EXECUTION

3.1 EXAMINATION

A. Verify that surface substrate conditions are ready to receive work as instructed by the product manufacturer

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop applied primer for compatibility with subsequent cover materials.

D. Do not proceed with surface preparation or coating application until conditions are suitable.

3.2 PREPARATION

A. Apply dampproofing to clean, dry surfaces:

1. Remove dirt, dust, sand, grit, mud, oil, grease, and other foreign matter
2. Protect surfaces not to be coated from contamination, discoloration or other damage with drop cloths or other suitable methods

B. Do not add any adulterants or unauthorized thinners

C. Thoroughly mix each time paint withdrawn from container

D. Keep containers closed tightly except while paint is withdrawn

E. Thinning only permitted to obtain recommended coverage at lower application temperatures

3.3 APPLICATION - GENERAL

A. Apply products in accordance with manufacturer's recommendations

B. Do not apply initial coating until moisture content of surface is within moisture limitations of coating manufacturer

C. Apply paint with suitable brushes, rollers, or spraying equipment:

1. Rate of application shall not exceed that as recommended by paint manufacturer for the surface involved
2. Keep brushes, rollers, and spraying equipment clean, dry, free from contaminants and suitable for the finish required

D. Comply with recommendation of product manufacturer for drying time between succeeding coats

E. Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paint, and skipped or missed areas

F. Make edges of coating adjoining other materials or colors clean and sharp with no overlapping

G. Do not permit coating to get on top of concrete walls or on exposed wall surfaces above specified limits

H. Do not use Benzol or other volatile toxic solvents for thinning coating

I. Provide adequate forced ventilation when applying coating in enclosed spaces to:

1. Remove all vapors from solvents as rapidly as produced
2. Insure that workers are adequately protected

J. Inspection:

1. Do not apply additional coats until completed coat has been inspected by the Engineer
2. Only inspected coats of paint will be considered in determining number of coats applied

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3.4 APPLICATION - DAMPPROOFING

A. Apply in two coats with high pile rollers, brush or air spray equipment recommended by manufacturer

B. Do not use benzol or other volatile toxic solvents for thinning coating

C. Application Rate—15-18 square feet per gallon (1/8 inch total thickness):

   1. Application rate may vary with manufacturer

D. Apply only when surface of concrete is clean, dry and when temperatures are 40 degrees F and rising

E. Apply in a continuous, unbroken film, free of pinholes

F. Do not apply when temperatures less than 35 degrees F are anticipated.

G. Do not apply in rain or when rain is threatening.

H. Backfill in accordance with manufacturer's recommendations.

3.5 SCHEDULE

A. Semi-Mastic Dampproofing—Buried Surfaces:

   1. All exterior wall surfaces of precast manholes in contact with earth or backfill below finished grade. Include exterior surfaces of sump.

END OF SECTION

DIVISION 15: MECHANICAL

SECTION 15430 - PLUMBING SPECIALTIES

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Backflow preventers for domestic, commercial, fire and irrigation systems

1.2 RELATED SECTIONS

A. Section 02667—Site Water Lines

B. Section 03001—Concrete

1.3 REFERENCES

A. ANSI/ASME B1.20.1—Pipe Threads, General Purpose (Inch)

B. ANSI/ASME B16.1—Cast Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250

C. ANSI/ASSE 1013—Backflow Preventers, Reduced Pressure Principle

D. ASTM A536—Ductile Iron Castings

E. ASTM B584—Copper Alloy Sand Castings for General Applications

1.4 SUBMITTALS

A. Submit under provisions of Section 01340

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes

C. Produce Data: Provide component sizes, rough-in requirements, service sizes, connections to other equipment and piping and finishes

D. Manufacturer's Installation Instructions: Indicate assembly and support requirements

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01720

B. Record actual locations of equipment, cleanouts and backflow preventers

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for installation of backflow prevention device

B. Provide certificate of compliance from authority having jurisdiction indicating approval of installation and testing of backflow prevention device

1.7 QUALITY ASSURANCE

A. Comply with District Cross-Connection Control requirements

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions

B. Accept specialties on site in original factory packaging. Inspect for damage

PART 2: PRODUCTS

2.1 BACKFLOW PREVENTERS

A. Manufacturers:

1. Zurn/Wilkins
2. Febco
3. Or approved equal

B. Materials:

1. 2-inches and smaller:
   a. Cast bronze, ASTM B584 body with stainless steel internal parts and springs
   b. Two independently operated spring-loaded center guided check valves
   c. Diaphragm type differential pressure relief valve located between check valves
   d. Third check valve which opens under back pressure in case of diaphragm failure
   e. Non-threaded vent outlet
   f. All assembled with two shutoff full port resilient seated ball valves and four resilient seated ball valve test cocks
2. 4-inches to 6-inches:
   a. Fusion bonded epoxy coated cast iron, ASTM A536 Grade 4 body with bronze and stainless steel internal parts and stainless steel springs
   b. Two independently operated spring-loaded center guided check valves
   c. Diaphragm type differential pressure relief valve located between check valves
   d. Third check valve which opens under back pressure in case of diaphragm failure
   e. Non-threaded vent outlet
   f. Assembled with two shutoff non rising stem gate valves, and four full port resilient seated ball valve test cocks

C. Maximum working pressure: 175 psi

D. Hydrostatic test pressure: 350 psi

E. End connections:

1. 2-inches and smaller:
   a. Threaded ANSI/ASME B1.20.1
2. 4 -inches to 6-inches:
   a. Flanged ANSI/ASME B16.1, Class 125 cast iron
   b. Raised or plain faced

2.2 ACCESSORIES

A. Reduced Pressure Principle Backflow Preventers:

1. 2-inches and smaller: Interior installation accessories include air gap adapter and integral battery monitor switch

PART 3: EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and in an area not subject to flooding

B. Pipe relief from backflow preventer to nearest drain

C. Coordinate with plumbing piping work to achieve acceptable operating system

END OF SECTION