SECTION 31 23 36

EXCAVATION AND BACKFILL FOR WATER WORK

PART 1 – GENERAL

1.1 DESCRIPTION

A. Trench Excavation and Backfill:

1. The Contractor shall sawcut, excavate the trench to the dimensions specified to install 4–inch, 6–inch and 8–inch ductile iron pipes, remove and dispose of excavated materials; excavate bell holes or joint holes, provide; support, place and maintain all traffic routing and public safety requirements; support and protect adjoining properties and structures;, support and work around existing utilities; handle all drainage or ground water; remove and replace or relocate side sewers as required; furnish and place sand backfill; remove surplus materials; clean the site and perform all other Work necessary to complete water work, as indicated on the Drawings, on Bush Street between Mason Street and Stockton Street.

2. DPW Order No. 187,005, “Regulations for Excavating and Restoring Streets in San Francisco”, requires the replacement of one foot of concrete base on each side of the trench (T–trench) for trench width greater than 18 inches. This Contract requires trenches for 8–inch DIP main to be 18 inches wide and service trenches to be 12 inches. If the Contractor excavates water main and service trenches wider than 18 inches, the Contractor is responsible for the extra cost of the T–trench and any extra cost due to the 3–foot rule code requirement as a result of the T–trench.

3. The Contractor shall comply with DPW Order No. 184,350, “Establishing Regulations And Guidelines For The Evaluation and Construction Of New Curb Ramps Or Reconstruction/Upgrade Of Existing Curb Ramps And Additional Pedestrian Safety Improvements When Street Excavations Occur At the Angular Returns Or In The Crosswalk” for all excavation that occurs within a marked or unmarked crosswalks or at an angular return within the public right-of-way.

B. Additional Excavation and Backfill

1. Perform additional excavation outside of the prescribed trench areas as required by the City Representative, and furnish and place backfill materials. Work performed without the approval of the City will be at the sole risk and expense of the Contractor.

2. Additional excavation and backfill will also include the following:

   a. Exploratory excavations.

   b. Change of trench alignment.

   c. Increase of trench depth for the preparation of pipe bedding.

   d. Removal of subsurface obstacles.

   e. Removal of concrete pavement and concrete parking strips.

   f. Sidewalk.

   g. Expose existing water mains and services for connections.

C. For the purpose of payment, no distinction will be made between earth, rock, pavement, sidewalks, structures or other materials removed during excavation work.

1.2 RELATED SECTIONS

A. DPW Standard Specifications (SSDPWSF), revised November, 2000.

B. Section 01 55 26 – Traffic Control

C. Section 01 71 33 – Protection of Adjacent Construction

D. Section 32 12 16 – Asphalt Paving

E. Section 32 13 13 – Concrete Paving

F. Section 33 11 00 – Water Utility Distribution Piping

1.3 REFERENCES

A. ANSI/ASTM D698 – Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 kg) Rammer and 12 inch (304.8 mm) Drop.

B. ANSI/ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb (4.54 kg) Rammer and 18 inch (457 mm) Drop.

C. ANSI/ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

D. California Labor Code Section 6707 for excavations 5 feet or more in depth.

E. California Occupational Safety and Health Administration (Cal–OSHA) Code of Regulations.

F. DPW Order No. 187,005, “Regulations for Excavating and Restoring Streets in San Francisco”.

G. DPW Order No. 184,350, “Establishing Regulations And Guidelines For The Evaluation and Construction Of New Curb Ramps Or Reconstruction/Upgrade Of Existing Curb Ramps And Additional Pedestrian Safety Improvements When Street Excavations Occur At Angular Returns Or In The Crosswalk”.

1.4 SUBMITTALS

A. The Contractor shall submit samples of backfill materials specified in Part 2 below to the Inspection and Testing Agency hired and employed by the Contractor and approved by the City. The size of samples will be as required by the Inspection and Testing Agency.

B. If the Contractor intends to use a shoring plan, which varies from the Standards established by Cal–OSHA, the shoring plan will be prepared and signed by a licensed Civil Engineer in the State of California and submitted to the City Representative for approval at least fifteen (15) working days before the Contractor starts excavation. The City’s approval of the shoring plan does not relieve the Contractor of its responsibility of providing a safe shoring system. The Contractor shall be solely liable for any claims or injuries resulting from its shoring system. The Contractor shall not start excavation prior to the City’s approval of the shoring plan.

1.5 QUALITY CONTROL

A. The Contractor shall comply with the requirements of Section 01 45 00 – Quality Control.

B. The Contractor shall use equipment adequate in size, capacity and number to accomplish water work in a timely manner.

C. In addition to complying with requirements of governmental agencies having jurisdiction, the Contractor shall comply with the directions of the City Representative.

D. The design engineer for excavation support systems will be a licensed Civil or Structural Engineer in the State of California, and will be experienced in providing successful engineering services for excavation support systems and dewatering work similar in extent to that required for this Contract.

E. The design engineer for excavation support systems and dewatering work will perform structural observations and provide a letter stating that the shoring work is in accordance with his/her design.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Import Backfill

1. All import backfill materials will be furnished and placed in accordance with the requirements of Section 703 of the DPW Standard Specifications, except as indicated herein.

2. All import backfill materials will consist of dune sand or equivalent, free from rock, concrete, organic materials and other objectionable materials. Import backfill materials will have 100% passing the 3/8” sieve size, 93% to 100% passing the No. 4 sieve size and 0% to 10% passing the No. 200 sieve size. Samples will be submitted to and approved by the San Francisco Public Works’ Material Testing Laboratory, located at 2027 Newcomb Avenue prior to placement. Unacceptable materials will be immediately removed from the site.

B. Reuse of Excavated Soils as Backfill

1. The Contractor shall be allowed to use native sand from trench excavation for backfill materials. Sand to be reused must not contain asphalt, uncrushed concrete, bentonite, bay mud, clay, bricks, cobblestones, rocks, rubble, scrap metal, debris, contaminated soils, vegetation, wood, debris, obstructions and other organic, unsound or deleterious matter. Unsuitable materials will be removed from the site properly as the Contractor’s property.

PART 3 – EXECUTION

3.1 LAYING OUT OF WORK

A. The Contractor shall employ a California licensed surveyor to properly lay out all grades and stakes preparatory to starting excavation and grading. The Contractor is responsible for accurately locating all levels, setting all stakes and protecting stakes against damage by equipment during the Work.

3.2 BENCH MARK AND MONUMENTS

A. Before any Work starts, the surveyor will check all existing monuments, benchmarks and property corners.

B. The Contractor is responsible for the establishment of grade stakes and the maintenance of such grade stakes.

3.3 DEWATERING

A. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the structures and/or pipes to be built have been completed to such extent that they will not be floated or otherwise damaged by allowing water to accumulate in the excavation or levels to return to natural ground water elevations.

B. The Contractor shall furnish all materials and equipment, and perform all Work required to install and maintain the drainage systems that the Contractor proposes for handling ground water and surface water encountered during construction of structures and water main pipe lines.

C. All permits for disposal of dewatering drainage will be acquired and all fees paid by the Contractor. The Contractor shall submit its water disposal plans for approval by the City.

3.4 SHORING

A. The term “shoring” as used in relation to excavation, will include all structures used to temporarily support the earth adjacent to any excavation.

1. The Contractor shall furnish, place and maintain all shoring necessary to support the sides of any excavation and to prevent any movement, which may endanger the proposed structures or injure persons. Provisions for protection from caving ground do not relieve the Contractor from the requirements of maintaining safety in all operations performed by its subcontractors.

2. The manner of shoring or bracing excavations will be in accordance with the approved shoring plans, current requirements of the California Labor Code Section 6707, and with the rules, orders and regulations of the California Code of Regulations, Title 8, Chapter 4.

3. For connections to be done by SFWD crews, solid shoring is required for the excavation hole regardless of the depth.

4. Wherever, in the opinion of the City Representative, sufficient or proper shoring has not been provided, the Contractor shall, on demand, furnish additional shoring but neither compliance with such demand nor failure of the City Representative to make such demand will relieve or release the Contractor from its responsibility for the sufficiency of the shoring.

5. The Contractor is responsible for any injury occurring to persons or property or to the Work due directly or indirectly to improper or insufficient shoring or to the replacement or removal of shoring.

6. Unless otherwise permitted or directed by the City Representative, shoring may be removed from the excavation before backfilling, to the greatest extent

practicable and consistent with safety.

3.5 PAVEMENT EXCAVATION

A. The removal of pavement, sidewalk and other roadway structures will be in accordance with Section 701 of the DPW Standard Specifications and DPW Order No. 187,005, “Regulations for Excavating and Restoring Streets in San Francisco”, except as indicated herein. The use of a saw may be omitted on approval of the City Engineer in streets where the existing pavement is due to be reconstructed or is in visibly poor condition.

3.6 TRENCH EXCAVATION

A. All trench excavations will be performed in accordance with Section 702 of the DPW Standard Specifications and DPW Order No. 187,005, “Regulations for Excavating and Restoring Streets in San Francisco”, except as indicated herein.

B. In accordance with the rules and regulations adopted by DPW, the trench length of all street openings will not exceed the length of one block in any three (3) block section without the special permission from the MTA. The amount of excavated trench in excess of pipe laid will not exceed 200 linear feet at the end of each working day.

C. The depth of a trench as specified is below the gutter grade. The gutter grade will be defined as the existing gutter grade or 6 inches below the official grade (grade at top of curb as established by the San Francisco Board of Supervisors), whichever is lower. The section of trench above the gutter grade will be included in the cost of the excavation per linear foot of trench and no additional payment will be allowed for that section of trench cut from the present ground surface to the gutter grade. Where the existing pavement elevation is below the gutter grade, the depth of the trench will be measured from the existing pavement grade.

D. The trench will be excavated so that the barrel of the pipe will have an even bearing along its entire length, and with sufficient clearance provided for any necessary operations in connection with the laying of the pipe. Bell holes will be excavated for each pipe bell or joint.

3.7 REMOVAL AND INSTALLATION OF METER BOX

A. Sawcuts in sidewalks will be made along existing rectangular flag lines. Sawcuts will be of sufficient size to provide a neat, regular and vertical edge after removal of the pavement flags but will not be less than 1–1/2 inches in depth. If the Contractor damages the sidewalk outside of the flag being removed, the Contractor ,at its expense, shall replace the entire damaged flag in accordance with Section 204 of the DPW Standard Specifications.

B. Meter boxes removed in salvable condition will be reinstalled whenever feasible.

3.8 PROTECTION OF EXISTING STRUCTURES

A. The trench will be excavated in a manner to avoid existing structures, property and other obstructions encountered during the progress of the Work. The Contractor shall support, protect, maintain and provide for the safe operation and use of all such structures and property so encountered. If the Contractor damages any structure or property during the Work, the Contractor shall immediately notify the appropriate owners or authorities and arrange for the immediate repair of the same at the Contractor’s expense.

B. The Contractor shall maintain access to adjacent areas and properties at all times.

C. When side sewers are encountered that interfere with the laying of the pipe lines, the City Representative will direct the Contractor to remove and replace or relocate such side sewers as required during the Work. Removed side sewers will be reconstructed in accordance with the DPW Standard Specifications. Wherever the City Representative determines that the removal and replacement or relocation of side sewers is infeasible, the Contractor may be directed to adjust the grade of the pipe line to avoid such side sewers.

D. Where the proposed water main crosses under street car, cable car or railroad tracks, the tracks must be properly supported in a manner required by the owner and approved by the City. The Contractor shall submit detailed drawings and specifications delineating the method of support approved by the track owners.

E. Supporting, working around and protecting of all utility facilities owned and operated by the City will be considered as Incidental Work in accordance with Document 00 73 20 – Existing Utility Facilities and Document 00 73 21 – Utility Crossing Specifications.

3.9 ADDITIONAL EXCAVATION

A. Exploratory Excavations: The Contractor shall conduct exploratory excavations to locate existing utilities for potential horizontal and potential vertical conflicts (refer to Section 01 71 33 – Protection of Adjacent Construction) with excavations methods meeting California Government Code 4216.

B. Increase Trench Depth for Preparation of Pipe Bedding: Where ordered by the City Representative, the Contractor shall excavate the trench to a depth of at least 3 inches below the prescribed trench depths and shall place a uniform layer of sand over the bottom of the trench at such locations prior to installing the pipe.

C. Removal of Subsurface Obstacles

1. While excavating for the Work, the Contractor may encounter subsurface obstacles such as man made structures not apparent prior to the bid date and/or field conditions differing substantially from those normally encountered and recognized as inherent to the Work, or existing pavement in excess of 14 inches in depth, or abandoned pavement sections below the existing pavement, or abandoned MUNI track facilities such as cable car concrete yokes, concrete piers, concrete conduits, wooden ties beneath the pavement. The Contractor shall remove such subsurface obstacles to the extent necessary to complete the Work, when such excavation is directed and approved by the City Representative. This Work will be paid for as additional excavation in the quantity equal to the volume of subsurface obstacles removed.

2. The removal of any other subsurface structures and materials will be paid for under other appropriate bid items, if such bid items exist, or will be considered as Incidental Work.

D. Removal of Concrete Pavement and Concrete Parking Strip: When the Work involves water main replacement in streets having concrete pavement or concrete parking strip, the entire slab or parking strip affected will be sawcut and excavated entirely to construction joints, and the Contractor shall furnish and install the backfill materials required to prepare the subbase for the new concrete pavement or parking strip.

E. Sidewalk: When removing and installing meter boxes the Contractor shall sawcut, excavate and remove the concrete sidewalk within the prescribed flag lines and/or as directed by the City Representative, and furnish and install the backfill materials required to prepare the subbase for the new concrete sidewalk and meter boxes.

F. Expose Existing Water Mains and Services for Connections: The Contractor shall excavate and expose existing water mains and services as directed by the City Representative for water main and service connections and disconnection work by the San Francisco Water Department (SFWD). The Contractor shall cover the excavations with steel plates. During the Contractor's normal working hours, the Contractor shall remove and replace the steel plates, and provide traffic control to accommodate the Work by SFWD crews. All Work necessary for SFWD crews will be considered as Incidental Work.

3.10 MAINTENANCE AND PROTECTION OF SUBSURFACE UTILITIES, OTHER STRUCTURES AND AREAS

A. Known locations of underground utilities and structures are indicated on the Drawings. The Contractor shall determine exact locations of underground utilities and structures sufficiently in advance of excavation to allow adjustment of alignment and elevation.

B. Excavation and other Work under or adjacent to underground pipes and conduits or other structures will be conducted and maintained in such a manner so as not to disrupt or interfere with the safe operations and use of such structures. The Contractor shall prosecute the work in such a manner as not to damage any private or public properties.

C. If any such structures or property is damaged during the Work, the Contractor shall immediately notify the City Representative and proper authorities or owners, and shall arrange for the immediate repair of same in accordance with the applicable provisions of these Specifications, at the Contractor's expense.

3.11 UNDERGROUND OBSTRUCTIONS

A. Any data shown on the Drawings, or imparted to the Contractor by the City Representative, relative to location, dimensions, type or character of pipes, conduits, and/or other structures along or across the line of the pipe, are based on information obtained from field surveys and the owners of such structures. The City assumes no responsibility for the accuracy or completeness of such data, which are offered solely for the convenience of the Contractor and must be checked by the Contractor to its satisfaction. The Contractor shall assume full responsibility and shall make no claim against the City on account of any damage to any pipes, conduits and/or other structures or for any inconvenience or added cost to performing the Work, which may be attributed in any degree to the inaccuracy of information furnished relative to the location of such structures, or for failure thereto.

3.12 DISPOSAL OF MATERIALS

A. Unsuitable excavated materials for backfill, including large sizes of rock, cemented materials, boulders, broken concrete, asphalt and other materials will be removed and disposed of at the Contractor's expense at a waste disposal or landfill site conforming to all County, State and Federal regulations.

3.13 BACKFILL OF TRENCHES

A. All trench backfill will be in accordance with Section 701 of the DPW Standard Specifications and DPW Order No. 187,005, "Regulations for Excavating and Restoring Streets in San Francisco", except as indicated herein. All compaction will be in accordance with Section 707 of the DPW Standard Specifications, except as indicated herein.

B. Prior to backfilling, the trench will be cleared of all wood, debris and loose soil.

C. Backfill materials will not be dropped directly on the pipe.

D. The Contractor shall carefully remove the shoring and bracing system using methods that will minimize caving. Metal sheet piling, sheeting and bracing will not be left in place.

E. Low points along the pipe trench will not be backfilled until all backfill at adjacent higher elevations has been completed. Water collecting at the low points will be removed by pumping or other approved means.

F. Preparation of Pipe Bedding: Whenever directed by the City Representative, the Contractor shall excavate the trench to 4 inches below the prescribed trench depths and shall place a 4–inch uniform layer of import sand over the bottom of the trench to provide continuous support for the pipe prior to installing the pipe. The pipe bedding import sand will be compacted with approved plate–type vibrating equipment before pipe installation. Bell holes will be excavated for each pipe bell or joint.

G. The level of the backfill on either side of the pipe barrel will be brought up to the same approximate elevation simultaneously.

H. Backfill will be made in two (2) equal lifts from the pipe bedding up to the concrete base level using only hand–operated motor driven plate type vibrating equipment. Compaction by saturating with water is not permitted.

I. Each lift of backfill materials will be satisfactorily compacted before placing the next lift.

J. The last lift will be tested for a relative compaction of not less than 95%.

K. Tests of relative compaction, including determination of optimum moisture content and maximum density of backfill will be made in accordance with ASTM D1557 and ASTM D6938. Laboratory maximum dry density will be determined in accordance with ASTM D1557. Field in–place density and moisture will be determined in accordance with ASTM D6938. As stated herein, the term “relative compaction” means the percentage ratio of the field–compacted dry density to the maximum dry density obtainable by compaction at optimum moisture content.

L. At the time of compaction, the moisture content of backfill materials will be such that the required relative compaction will be obtained.

END OF SECTION