SECTION 31 41 00

SHORING INSTALLATION

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Furnish all labor, materials, equipment, and all operations necessary for properly designing and constructing all shoring, lagging, underpinning and steel plating required for pipeline trenches and manhole structures, and to structurally support the new and existing pipelines and similar items at or adjacent to the Contract site as shown on the Drawings that are affected by the new work.

B. Provide shoring for calculated existing pipeline dead loads and live loads for parallel piping and crossing pipes. Existing pipelines shall be supported and monitored throughout the duration of the construction so as to prevent inducing excessive stresses on the pipelines, including their coating and lining.

C. The Contractor shall install an accepted shoring system for all vertical cut excavations 5 feet or more in depth. All shoring systems shall be designed and installed in accordance with Standards established by CAL/OSHA and in conformance with all other applicable rules and requirements.

D. All shoring materials and equipment shall be removed from the excavation prior to completion of the work.

E. The Contractor shall submit trenching and shoring plan and calculations prior to starting construction. The City Representative's acceptance of the shoring plans does not relieve the Contractor of his/her responsibility of providing safe shoring systems. The Contractor shall be solely liable for any claims or injuries resulting from his/her shoring system.

F. Installation of dewatering system as necessary to install the shoring.

1.2 RELATED SECTIONS

A. Section 01 71 33 – Protection of Adjacent Construction

B. Section 31 23 36 – Excavation, Backfilling and Compaction

1.3 REFERENCES

A. Shoring, lagging and underpinning work shall be designed and constructed in accordance with requirements having jurisdiction.

B. For construction operations, the requirements of CAL/OSHA shall be observed.

C. San Francisco Department of Public Works Standard Specifications- Latest Edition

D. Standard Specifications of Department of Transportation, State of California – Latest Edition

E. ASTM A328 – Standard Specification for Steel Sheet Piling

1.4 SUBMITTALS

A. SHORING DESIGN: Drawings and design calculations bearing the seal and signature of the Contractor's Professional Engineer, registered in the State of California, together with the specifications, proposed procedures, and sequences of the shoring system for the City Representative's review and acceptance prior to commencing any installation work.

B. DEWATERING PLAN: Drawings and schematics of proposed dewatering system that the Contractor will use, if applicable.

C. PROTECTION OF EXISTING UTILITY PLAN: Plan for working around existing utilities. The plan shall show the location of existing utilities and pipelines, pipe storage, spoil bank, exaction and pipe laying equipment, shoring system, and a description of how the work will proceed around the existing utilities.

1.5 QUALITY CONTROL

A. The shoring system designer shall have completed design of not less than five (5) successful earth support system projects of equal type, size, and complexity within the last five (5) years. City Representative will require the Contractor to submit job history in writing.

B. Contractor shall retain and pay for the services of a civil or structural engineer, licensed in the State of California, to design all aspects of shoring, lagging, piling/underpinning, steel plating for H-20 loading and deflection monitoring of the shoring system.

1. Design and construction of all shoring, steel plating, lagging, and underpinning is the responsibility of the Contractor.

2. Design, acceptance of authorities having jurisdiction, and construction of all shoring, steel plating, lagging, and underpinning is the exclusive responsibility of the Contractor.

PART 2 – PRODUCTS

2.1 SHEETING, SHEET PILING, LAGGING, PILING/UNDERPINNING

A. Materials for pipeline trench shoring system.

1. Steel sheet piling, if employed, shall be of rolled steel shapes of the continuous interlocking type forming a continuous wall when individual sheets are installed side by side. They shall be installed in a manner that their interlocking is kept continuous without separation at the joints. Sheet pilings, if used, shall not be installed by hard driving or pounding.
Propose and submit for acceptance a suitable installation method, which

will minimize the noise and vibrations. The interlocking sheet piling and all accessories shall conform to the requirements of ASTM Designation A328 Standard Specification for Steel Sheet Piling.

2. All timber, lumber, and structural steel employed for the trench supporting system, whether new or used, shall be sound and free from defects that might impair their strength.

3. Provide lagging over the full face of the excavation. Joints between pieces of lagging shall be tight to prevent loss of soil. Provide full face lagging all around penetrations through the lagging. Fill voids behind lagging with free-draining gravel or other material that will satisfy the design load assumptions for the excavation support and other requirements.

4. Except for bracing struts, allowable basic stresses for rolled steel sections, including sheet piling, may be increased by 20% for all temporary shoring structures. Allowable basic stresses for all temporary shoring structures shall be in accordance with the latest AISC Code. Allowable stresses for struts shall not exceed those allowed by the AISC code for permanent structures. All welds shall be designed according to AISC code without any increase in the allowable stresses for temporary structures. Lagging and all timber structures shall be designed using allowable stresses determined by National Design Specifications for Wood Construction, latest edition. The duration of the load shall not be taken as less than three (3) months.

PART 3 – EXECUTION

3.1 GENERAL

A. Supervision and Inspection: All phases of the shoring, steel plating, lagging or piling/underpinning work shall be done under the supervision of the Contractor's licensed civil or structural engineer responsible for its design and shall be in compliance with the Uniform Building Code and CAL/OSHA requirements.

B. Protect the existing conduits, pipelines and adjacent roadways requiring shoring, lagging and piling/underpinning from damage resulting from the construction under this Contract. The Contractor shall restore damaged existing pipelines (if any) expeditiously at no cost to the City.

C. Contractor's design engineer shall certify that the shoring, lagging, or piling/underpinning, etc, has been properly installed prior to continuing to perform other stages of construction. Any delay due to Contractor's inability to furnish such certification or acceptance from the City Representative shall not be ground for the Contractor for filing a claim.

D. Soldier piles and sheet piles, if employed, are to be removed after backfilling is complete unless shown otherwise on Drawings. Voids left by such removal shall be immediately backfilled with sand, class 2 aggregate base, CDF, concrete, or pressure injected grout, at no extra cost to the project. The Contractor shall meet the requirements to control settlements and shall plan his/her operations accordingly.

E. Lagging members, if employed, shall be installed in accordance with accepted design and in a manner, which will prevent the loss of ground. Where, in the judgment of the City Representative, the loss of ground cannot be prevented by wedging the lagging tight against the original ground, e.g., at the sandy non-cohesive soils, prevent the loss of ground by an accepted method. This shall not be a cause for changed condition or for claims for extra by the Contractor.

F. In excavations where sand or other non-cohesive materials are encountered, placing of the necessary lagging or sheet piles shall commence before a depth of five (5) feet is attained and thereafter, such lagging shall be driven or lowered progressively with the excavating activities in a manner such that the sides of the excavation will be completely covered and adequately supported.

G. If any sheet piling, lagging, or bracing, which has been installed, be in any way insufficient for its purpose, the Contractor shall immediately provide additional and adequate materials. The provision of any additional supports ordered by the City Representative shall in no way relieve the Contractor of his/her responsibility for the safety of the jobsite.

H. Soldier piles and lagging shall not be used in areas where groundwater intrusion is expected unless the use of soldier piles and lagging is reviewed and accepted in writing by the City Representative.

3.2 DISPOSAL

A. Upon completion of work, remove all shoring, lagging, and piling/underpinning materials from site as Contractor's property.

B. Clean up the work zone as necessary.

END OF SECTION