

ITEM 431

JACKING, BORING OR TUNNELING PIPE

431.1 Description. This item shall govern for the furnishing and installation of pipe by the methods of jacking, boring or tunneling as shown on the plans and in conformity with this specification.

431.2 Materials. Pipe may be corrugated metal pipe conforming to the Item, "Corrugated Metal Pipe" or the Item 460, "Reinforced Concrete Pipe", of the size, type and class specified on the plans.

431.3 Construction Requirements. Where pipe is required to be installed under railroad embankments or under highways, streets or other facilities by jacking, boring or tunneling method, construction shall be made in a manner that will not interfere with the operation of the railroad, highway or other facility and will not weaken or damage any embankment or structure. During construction operations, barricades and lights to safeguard traffic and pedestrians shall be furnished and maintained, as directed by the Engineer, until such time as the backfill has been completed and then shall be removed from the site.

The drilling of pilot holes for the alignment of pipe prior to its installation by jacking, boring or tunneling will not be required, unless indicated on the plans or by special provisions. The drilling of pilot holes, when required, will be considered as incidental work and the cost thereof shall be included in the contract pay items.

The Contractor shall take the proper precautions to avoid excavating earth beyond the limits of excavation shown on the plans.

All damages by excavating, either to surface or sub-surface structures, shall be repaired or replaced by the Contractor at his own cost and expense.

The removal of any obstruction that may be found to conflict with the placing of the pipe will not be measured for payment or paid for as a separate contract pay item. The removal of such obstruction will be included in the contract pay items.

The Contractor shall dispose of all surplus materials at his own cost and expense.

431.4 Jacking. If the grade of the pipe at the jacking end is below the ground surface, suitable pits or trenches shall be excavated for the purpose of conducting the jacking operations and for placing end joints of the pipe.

This excavation shall not be carried to a greater depth than is required for placing of the guide and jacking timbers.

At the other end of the pipe, an approach trench shall be excavated accurately to grade. All open trenches shall be braced and shored in such a manner as will adequately prevent caving or sliding of the walls into the open trench.

Heavy duty jacks suitable for forcing the pipe through the embankment shall be provided. In operating jacks, even pressure shall be applied to all jacks used. A suitable jacking pressure shall be applied to all jacks used. A suitable jacking head not less than 6-inches larger than the outside diameter of the pipe, usually of timber and suitable bracing between jacks and jacking head shall be provided so that pressure will be applied to the pipe uniformly around the ring of the pipe. The jacking head shall be of such weight and dimensions that it will not bend or deflect when full pressure is applied at the jack. The jacking head shall be provided with an opening for the removal of excavated material as the jacking proceeds. A suitable jacking frame or backstop shall be provided. The pipe to be jacked shall be set on guides which are straight and securely braced together in such manner to support the section of the pipe and to direct it in the proper line and grade. All timber and other materials used in the construction of the jacking assembly will be of such quality and dimensions that they will withstand all stresses to which they are subjected in such a manner as to insure even pressures on the pipe during jacking operations. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe.

As the jacking proceeds, the embankment material shall be excavated slightly in advance of the pipe in such a manner to avoid making the excavation larger than the outside diameter of the pipe, with the excavated material being removed through the pipe. The excavation for the underside of the pipe, for at least one third of the circumference of the pipe, shall conform to the contour and grade of the pipe. The excavation for the top half of the pipe shall conform closely to the outside diameter of the pipe and a clearance greater than 2-inches will not be permitted.

The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material, but it shall not exceed 2-feet in any case. The pipe, preferably, shall be jacked from the low or downstream end. Lateral or vertical variation in the final position of the pipe from the line and grade established by the Engineer will be permitted only to the extent of 1-inch per 10-feet, provided that such variation shall be regular and only in one direction and that the final grade of flow line shall be in the direction indicated on the plans.

If the Contractor desires, he may use a cutting edge of steel plate around the head end of the pipe extending a short distance beyond the end of the pipe with inside angles or logs to keep the cutting edge from slipping back onto the pipe.

When jacking of the pipe is once begun, the operations shall be carried on without interruption insofar as practicable, to prevent the pipe from being set

firmly in the embankment. Any pipe damaged in the jacking operations shall be removed and replaced by the Contractor at his expense.

The pits or trenches excavated to facilitate jacking operations shall be backfilled immediately after the jacking of the pipe has been completed.

431.5 Boring. The boring shall proceed from a pit provided for the boring equipment and workmen. Excavation for pits and installation of shoring shall be as outlined under jacking. The location of the pit shall meet the approval of the Engineer. The hole shall be bored with a suitable mining machine designed to produce a smooth, straight shaft and so operated that the completed shaft will be at the established line and grade. The size of the bored hole shall not exceed the outside diameter of the pipe to be installed more than 1-inch. The use of water or other fluids in connection with the boring operation will not be permitted, except when boring through rock and then only to the extent necessary to lubricate the cuttings; jetting will not be permitted.

In unconsolidated soil formations, a gel-forming colloidal drilling fluid consisting of at least 10% high grade carefully processed bentonite may be used to consolidate cuttings of the bit, seal the walls of the hole and furnish lubrication for subsequent removal of cuttings and installation of the pipe immediately thereafter.

The allowable variation from line and grade shall be as specified under "Jacking". Overcutting in excess of one inch shall be remedied by pressure grouting the entire length of the installation.

431.6 Tunneling. Where the characteristics of the soil or the size of the proposed conduit make the use of tunneling more satisfactory than jacking or boring, or where called for on the plans, a tunneling method may be used.

The excavation for pits and the installation of shoring shall be as outlined under "Jacking". The lining of the tunnel shall be of steel of sufficient strength to support the overburden. The Contractor shall submit his proposed liner method to the Engineer for approval. Approval by the Engineer shall not relieve the Contractor of the responsibility for the adequacy of the liner method.

The space between the liner plate and the limits of excavation shall be pressure grouted or mud jacked. Access holes for placing concrete shall be spaced at maximum intervals of 10 feet.

431.7 Joints. If corrugated metal pipe is used, joints may be made by field bolting or by connection bands, whichever is feasible. If reinforced concrete pipe is used, where feasible, joints shall be mortared on the inside.

431.8 Measurement. Jacking, boring or tunneling pipe will be measured by the **linear foot** of pipe, complete in place.

Such measurement shall be made between the ends of the pipe, along the flow line, as installed.

- 431.9 Payment. The work performed and materials furnished as prescribed by this item, measured as provided under "Measurement" will be paid for at the unit price bid per **linear foot** for "Jacking or Boring Pipe" or "Jacking, Boring or Tunneling Pipe" as the case may be, of the type, size and class specified on the plans, which price shall be full compensation for furnishing all materials, pipe liner materials required for tunnel operations, and for furnishing and placing all other materials including concrete backfill; for all jacking, boring, tunneling, excavation and backfill; for all sheeting, shoring, bracing and drainage; for disposal of all surplus materials; and for all labor, tools, equipment and incidentals necessary to complete the work, all in accordance with these plans and the specifications.

END OF ITEM 431