

City of Manzanita Street Excavation and Construction Standards

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- 4-Cast in place concrete gutters
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1 AGGREGATE BASES

1.0 DESCRIPTION:

This item includes all work necessary to furnish, place and compact one or more courses of aggregate base, sub-base, or leveling courses on a prepared subgrade within the designated limits. This item also includes crushed rock surfacing used for shoulder work and driveways.

1.1 MATERIALS:

1.1.01 Leveling course aggregate and shoulder rock shall be of the designated size 3/4 inch-0 and shall meet the requirements of ODOT Standard Specifications Subsection 2630.

1.1.02 Acceptance will be based on periodic samples of the material in place prior to compaction.

1.2 CONSTRUCTION:

1.2.01 Preparation of Foundation - All surfaces on which a base is to be constructed shall be firm at the time aggregate is placed thereon. No materials shall be placed on a soft, muddy, or frozen subgrade.

1.2.02 Placing - The Contractor shall haul, and deposit the material so as to provide a homogeneous mixture of unsegregated and uniformly dispersed materials as placed in position for compacting. The Contractor shall spread and strike off the material to the designated line, grade and transverse slope with surface texture of uniform appearance without segregation or fracture of material.

1.2.03 Compaction equipment used to compact aggregate bases shall be mechanical vibrators or impact tampers. All compaction equipment shall provide compaction of demonstrated equivalency to that of a standard steel wheel or pneumatic tire roller.

1.2.04 Density Requirements - The Contractor shall begin compaction of each layer as soon as practicable after the material is spread and continue until a density of not less than 95% of the maximum density has been achieved. Maximum density will be determined by AASHTO T180.

1.2.05 Surface Finish - The aggregate base surface shall be within 0.1 foot of the required grade, and when tested with a 10 foot straightedge shall not vary from the testing edge by more than 0.08 foot at any point.

2 ASPHALT CONCRETE PAVEMENT

2.0 DESCRIPTION:

This item includes all work necessary for the construction of hot mix asphalt concrete pavements upon prepared foundations or base surfaces. The Contractor shall provide submittal information to the City for approval on all materials, methods, equipment and HMAC mix design. Such submittal information shall be submitted a minimum of one (1) week prior to construction. Unless otherwise specified, the number of copies of submittal information that the Contractor shall submit shall be the number of copies that the Contractor requires to be returned plus one copy that will be retained by the City.

2.1 MATERIALS:

All materials shall meet the requirements of the ODOT *Standard Specifications*, 2002 edition, unless specifically noted herein.

2.1.01 Asphalt Cement, Additives and Aggregate shall meet the requirements of Section 00744, Hot Mixed Asphalt Concrete (HMAC), ODOT *Standard Specifications*, January 2002 edition, and the requirements of ODOT, *Standard Specifications for Asphalt Materials*, 2002 edition. Use PG 64-22 asphalt cement.

2.1.02 Mineral filler shall conform to the requirements of AASHTO M17. Collector dust may be used as mineral filler, in whole or in part, provided the dust or the resultant mineral filler mixture conforms to the above requirements.

2.1.03 Level 2 HMAC (class) of Concrete and Proportions of Materials - The asphalt concrete mixture shall be of the level (class) as shown on the plans (Level 2 if not shown elsewhere) and shall conform to the requirements of ODOT, *Standard Specifications for Asphalt Materials*, 2002 edition. The mix design shall be developed by the Contractor and shall meet Section 00744, Hot Mixed Asphalt Concrete (HMAC), ODOT *Standard Specifications*, January 2002 edition.

2.1.04 Tack coat asphalt shall be emulsified asphalt and meet the requirements of Section 00730, ODOT *Standard Specifications*, 2002 edition.

2.2 CONSTRUCTION:

2.2.01 Foundation Preparation - All bases and foundations shall be constructed to the condition prescribed under the applicable specification for aggregate bases, Section 1. Broken or ragged edges of existing Portland cement concrete or bituminous surfaces underlying or abutting the new pavement shall be trimmed back to firm material. Contact surfaces of structures in the paving area shall be treated with an asphalt tack coat prior to placing the asphalt concrete. Underlying surfaces of Portland cement concrete and designated areas of asphalt-deficient, fine-cracked or spalled bituminous material shall be treated with an asphalt tack coat prior to placing the asphalt concrete.

2.2.02 Preparation and Acceptance of Foundation –Following the completion of the base rock on any/all projects, those streets may be used by the public for local vehicular traffic to abutting properties, with traffic operations on the aggregate base course. The City and or Paving Contractor shall inspect the aggregate base immediately prior to paving operations and make recommendations to the Engineer for additional work to prepare the aggregate base for the paving work. The Engineer will consider such recommendations and determine if additional work is necessary to prepare the aggregate base for the paving work.

2.2.03 Existing Pavement Surfaces - Existing pavement surfaces shall be cleaned of all loose material, dirt and dust by brooming, by flushing with water or by other approved methods. All vegetation on existing asphalt surfaces shall be removed by first burning with a torch followed by careful removal of the burned vegetation by scraping and brooming.

2.2.04 Weather Limitations - Asphalt concrete mixtures shall be placed on dry prepared surfaces when the air temperature in the shade and the surface temperature is 60°F (15°C) and warmer. However, the Engineer may permit the Contractor to begin paving work if the temperature is 55°F or above and rising, and in the judgment of the Engineer will be 60°F in a reasonable period of time. Placing any mixture during rain or other adverse weather conditions will not be permitted, except that mix in transit at the time these adverse conditions occur may be laid if the following conditions are met:

Mix is at proper temperature.

Mix is covered during transit.

Mix is placed on a foundation free of standing or flowing water.

2.2.05 Tack coat asphalt shall be applied to existing bituminous and Portland cement concrete surfaces prior to placing asphalt concrete. The application rate shall normally be within a range of 0.06 to 0.10 gallons per square yard of surface. Asphalt shall not be applied to any wet surfaces or when the air temperature is less than 60°F. The asphalt shall be applied by pressure-spray equipment capable of providing a uniform application at the prescribed rate. It shall be applied only so far in advance of the asphalt concrete paving operations as is necessary in order to provide a tacky surface upon which to place the asphalt concrete.

2.2.06 Hot Mix Asphalt Concrete Paving Operations – The HMAC paving operations shall meet the requirements of Section 00744 of ODOT *Standard Specifications*, 2002 edition.

2.2.07 Placing - Asphalt concrete shall be at a temperature of between 285°F and 300°F at the time it is placed. (If the submitted Job Mix Formula, temperature-viscosity curve of the asphalt cement supports a lower temperature, it will be allowed by the Engineer.) Asphalt Concrete shall be placed in panels of such width as to hold to a practical minimum the number of longitudinal joints required. The longitudinal joints in any panel shall offset those joints in underneath panels by not less than 6 inches. Special care shall be taken at longitudinal joints to provide the required bond and density. The placing of asphalt concrete shall be a continuous operation as nearly as practicable. If the capacity of the paving machine exceeds the capacity of the hauling vehicles, the paving machine shall be operated at a reduced uniform speed so as to maintain a continuous operation.

2.2.08 Overlay Paving shall be applied in a minimum of two lifts. The first lift shall be a leveling course, followed by a cover course or wearing course.

2.2.09 Compaction and Rolling - Longitudinal joints shall be rolled directly behind the paving machine. The first panel shall have vertical edges, and the abutting panel shall be tightly crowded against its edge. Material from the second panel shall be pushed over the surface of the first panel so as to develop an overlap of from 3 inches to 6 inches. Breakdown rolling shall immediately follow the rolling of the longitudinal joints and edges. Rollers shall be operated as close to the paving machine as necessary to obtain adequate density without causing undue displacement. The breakdown roller shall be operated with the drive roll or wheels nearest the paving machine. Exceptions may be made when working on steep slopes or superelevated curves. Roller wheels shall be kept moist with only enough water to avoid picking up the material. Rollers shall move at a uniform speed not to exceed 3 mph for steel wheeled rollers. Rollers shall be in good condition and capable of being reversed without backlash. The line of rolling shall not be suddenly changed nor the direction of rolling suddenly reversed. Any pronounced change in direction of the roller shall be made on stable material. If rolling causes displacement of the material, the affected areas shall be loosened and restored to the original grade with loose material before being re-rolled. Heavy equipment, including rollers, shall not be permitted to stand on finished surface before it has thoroughly cooled or set. The finished surface shall be true to line and grade, free of irregularities and roller wheel tracks.

Breakdown and intermediate rolling and the rolling of longitudinal joints shall be performed until the entire surface of each course has been compacted by at least six coverages of the roller(s). Breakdown and intermediate compaction shall be completed before the HMAC temperature drops below 180°F, unless otherwise directed. Steel-wheeled rollers shall have a gross static weight of at least 8 tons. Vibratory rollers shall be equipped with amplitude and frequency controls capable of at least 2000 vibrations per minute, shall be specifically designed to compact HMAC and shall have a gross static weight of at least 8 tons.

Finish rolling shall be performed with additional coverages until all roller marks are eliminated. If steel-wheeled rollers are used for finish rolling, they shall have a gross static weight of at least 6 tons.

2.2.10 Pavement Smoothness – The Contractor shall furnish a 12 foot straightedge and/or 12 foot rolling straightedge, and test the wearing course as specified. Test with the 12 foot straightedge in travel lanes parallel to and perpendicular to the centerline, as directed by the City and/or Engineer. The pavement surface shall not vary by more than 1/4 inch. Additional testing may be required. Mark and repair all areas not meeting the surface tolerance in accordance with the requirements of Section 00744 of ODOT *Standard Specifications*, 2002 edition.

3 ADJUSTMENT OF EXISTING MANHOLES AND WATER VALVES

3.0 DESCRIPTION:

This item includes all work necessary for the adjustment of existing sewer and storm drain manholes to new finish grades with the use of cast iron paving riser rings.

3.1 MATERIALS:

3.1.01 Cast Iron Manhole Paving Grade Rings shall conform to the requirements of H20 Load Rating. All paving riser rings will be furnished by the Contractor and installed by the Contractor.

3.1.02 Precast Concrete Water Valve Boxes shall conform to the requirements of H20 Load Rating. All precast concrete water valve boxes as required for this project shall be furnished by the Contractor and installed by the Contractor.

3.1.03 Crushed Rock shall be of the designated size 3/4 inch-0 and shall meet the requirements of ODOT Standard Specifications Subsection 2630.

3.2 CONSTRUCTION:

3.2.01 Manhole Adjustment - Manholes shall be raised by adding on to the existing frames and adjusting the height as necessary to correspond to grade. Manholes shall be extended with cast iron paving rings where the existing slope across the manhole matches the finish grade slope.

3.2.02 Water Valve Box Adjustment - Precast concrete water valve boxes shall be raised by digging out the existing valve box and raising it to match the finish grade. The Contractor shall add and compact with mechanical compaction equipment such additional crushed rock as may be needed to fill the void resulting from lifting the valve box.

4 CAST-IN-PLACE CONCRETE GUTTER

4.0 DESCRIPTION:

This item includes the furnishing of all labor, materials and tools necessary to do all the plain and reinforced concrete work, including finishing.

4.1 MATERIALS:

4.1.01 Concrete shall be 6-sack transit-mixed concrete in accordance with ASTM C94. In no case will the use of concrete be permitted which has been mixed with water for more than 90 minutes prior to placing. Water content shall be controlled such that maximum slump by standard slump cone test, ASTM C143, shall not exceed 3 ½ inches.

4.2 CONSTRUCTION:

4.2.01 Placing - Concrete shall be placed in such a manner as to prevent segregation. Concrete shall be consolidated to the maximum practicable density, free from pockets of coarse aggregate and entrapped air, and closed snugly against all surfaces of forms and embedded materials. Consolidation of concrete in structures shall be by electric or pneumatic drive, immersion-type vibrators. Consolidation of all other concrete shall be by vibration, hand spading, rodding, or tamping. Mechanical vibration shall not be used to transport concrete.

4.2.02 Finishing of Concrete - After the concrete has been placed, consolidated, struck off, and leveled, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.

4.2.03 Minor defects - which are exposed to final view shall be filled with patching mortar mixed as dry as feasible, packed solid, and neatly finished to match adjoining surfaces.

4.2.04 Curing - Concrete shall be protected from premature drying, freezing, wash by drainage rains, snow, and from traffic and mechanical injury. Formed concrete surfaces shall be cured by leaving the forms in place for at least 7 days after placing. Concrete surfaces shall be water cured by spraying lightly with water as soon as the concrete has hardened enough to prevent damage from spraying, then covered completely with a plastic waterproof membrane. A curing compound approved by the Engineer and applied in accordance with manufacturer's instructions may be used in lieu of water curing.

4.3 QUALITY ASSURANCE:

4.3.01 Inspection of formwork and reinforcement by the City and/or Engineer will be required prior to concrete placing. The Contractor shall notify the City and/or Engineer 24 hours before each expected concrete pour.

5 CATCH BASINS & DRYWELLS

5.0 DESCRIPTION:

This item includes all work necessary for the construction of catch basins & drywells of the types and sizes required by the City.

5.1 MATERIALS:

5.1.01 Precast concrete catch basins shall conform to the requirements of ASTM C478.

5.1.02 Precast concrete top sections with cast iron frames and grates shall be used on all precast concrete catch basins. Cast iron frames and grates shall conform to the requirements of AASHTO M105, Class 30B.

5.1.03 Cast-in-place concrete units may be substituted for pre-cast units, at the option of the Contractor. The Contractor shall submit shop drawings for cast-in-place units to the City and Engineer for approval prior to installing cast-in-place units. Concrete shall conform to the requirements of ASTM C94. Compressive strength for poured in place concrete shall be not less than 3,000 p.s.i. at 28 days. Maximum size of aggregate shall be 3/4 inch. Slump shall be between 2 and 4 inches.

5.1.04 Drain rock for perforated drywell piping shall be railroad ballast rock which shall consist of uniformly graded 2 inches to 3 inches, rough edged aggregate.

5.1.05 Drywell Piping shall be a perforated corrugated high density polyethylene smooth

interior (HDPE) pipe and shall conform to the requirements of ASTM M294, Class II perforations, with perforation pattern "E" (circular). Stiffness of HDPE pipe and fittings shall conform to the requirements of ASTM D-2412 , ADS N-12, or approved equal.

5.1.06 Drainage fabric shall be nonwoven fabric made from bicomponent fibers of polypropylene and polyethylene. The fabric shall be non-biodegradable and inert to most soil chemicals, acids and alkalies over a PH range 3 to 12. Drainage fabric shall be Mirafi 140S or approved equal. Fabric shall have the properties of: a) water permeability coefficient of 0.1 cm/sec. b) fabric pore size of 70-100 Sieve. c) grab tensile strength of 125 lbs. d) trapezoid tear strength of 65 lbs. e) mullen burst strength of 125 psi.

5.2 CONSTRUCTION:

5.2.01 Excavation and backfill shall be in accordance with applicable portions of Section 6.

5.2.02 Precast concrete catch basins shall be installed according to the plans. The units shall be placed on a prepared bedding of 8 inches compacted thickness of 3/4 inch-minus crushed rock. Precast concrete units shall be set plumb and level. Riser sections shall be installed as needed with a full bed of mortar between all sections and the catch basin. The Contractor shall set the top unit in a full bed of mortar and shall adjust the top unit as needed to match the slope of the adjacent grade.

5.2.03 Cast-in-place units may be used, at the option of the Contractor, provided that the Engineer, prior to construction, approves all details of construction. The units shall be placed on a prepared bedding of 8 inches compacted thickness of rock. Forms shall be tight and well braced. The concrete shall be consolidated by mechanical vibration, hand spading, rodding, or tamping. Screed the top surface of exposed surfaces to a smooth even surface. Finish exposed edges with a steel edging tool followed by broom finish.

5.2.04 Pipe connections shall be smoothly finished with the inside surface of the catch basin wall, and shall not project into the catch basin opening.

6 TRENCH EXCAVATION, BEDDING AND BACKFILL

6.0 DESCRIPTION:

This item includes all work necessary for trench excavation, trench foundation, pipe bedding, pipe zone, trench backfill, and surface removal and replacement.

6.0.01 Trench excavation is defined as the removal of all material encountered in the trench to the depths as shown or as directed. Trench excavation shall be classified as common excavation.

6.0.02 Trench foundation is defined as the bottom of the trench on which the pipe bedding is to lay and is responsible for the support of the pipe.

6.0.03 Pipe bedding is defined as the furnishing and placing of specified materials on the trench foundation so as to uniformly support the barrel of the pipe. The total bedding

depth shall extend from a point 6 inches below the barrel of the pipe to the horizontal centerline of the pipe.

6.0.04 The initial backfill is defined as the full width of the trench from the top of the bedding to a point 12 inches above the top outside surface of the barrel of the pipe.

6.0.05 Trench backfill is defined as the furnishing, placing and compacting of material in the trench between the top of the initial backfill material and the bottom of the pavement base rock, ground surface, or surface material as directed.

6.1 MATERIAL:

6.1.01 The trench foundation shall be undisturbed native material in all areas except where ground water or other conditions exist, and in the opinion of the City and/or Engineer, the native material is such that it cannot support the pipe. In those conditions, an extra work order will be issued and excavation shall be included to additional depths as required by the Engineer and backfilled with select trench foundation material which shall be 1½ inch-minus crushed rock.

6.1.02 Pipe bedding material shall consist of native beach sand, free of humus, organic matter, vegetative matter, frozen material, clods, sticks and debris and containing no stone having a dimension greater than 1½ inches. The materials shall predominate in the fine sizes and in place, shall present no isolated points or areas or larger stones which would cause fracture or denting of the structure or subject it to undue stress. When, in the opinion of the Engineer, the native material is unsuitable for pipe bedding, an extra work order will be issued and select pipe bedding material shall be used which shall be clean pea gravel or crushed rock with a maximum size of ¾ inch, uniformly graded from coarse to fine. All pipe bedding materials shall be subject to the City's and/or Engineer's approval.

6.1.03 The initial backfill material shall consist of native beach sand, free of humus, organic matter, vegetative matter, frozen material, clods, sticks and debris and containing no stone having a dimension greater than 1½ inches. The materials shall predominate in the fine sizes and in place, shall present no isolated points or areas or larger stones which would cause fracture or denting of the structure or subject it to undue stress. When, in the opinion of the Engineer, the native material is unsuitable for initial backfill, an extra work order will be issued and select initial backfill material shall be used which shall be select pipe bedding material, as described above. All initial backfill materials shall be subject to the City's and/or Engineer's approval.

6.1.04 Trench backfill shall be native beach sand, free of humus, organic matter, vegetative matter, frozen material, clods, sticks and debris and containing no stone having a dimension greater than 1½ inches which, in the opinion of the Engineer, meets the desired characteristic required for the specific surface loading or other criteria of the backfill zone. When, in the opinion of the City and/or Engineer, the native material is unsuitable for trench backfill, an extra work order will be issued and select trench backfill material shall be used which shall be pit-run or river-run rock, maximum aggregate size ¾ inches, with sufficient fine material to act as binder but no excess earth.

6.2 CONSTRUCTION:

6.2.01 Trench Excavation:

6.2.01A General - All trench excavation and backfill shall conform to any and all specifications of any controlling regulatory agency under which the work is being performed. Pipelines shall be constructed in continuous open trench except that, in special locations, short tunnels or the cut and tunnel method of excavation may be used under specific instructions of the City and/or Engineer. The City and/or Engineer may require the use of tunnels to pass obstructions or to minimize traffic interference.

6.2.01B Open Trench Limit - The length of open trench excavated shall always be kept to a minimum. The City and/or Engineer shall be the judge of the amount of open trench allowed based upon work conditions of the area. In normal cases, the open trench length shall not exceed 100 feet. Related trench construction such as crushed rock surface restoration, concrete restoration, etc. shall normally be completed within 300 feet of the open trench limit unless otherwise instructed by the City and/or Engineer.

6.2.01C Trench Width - It is the intent of these specifications that the trench width at the surface of the ground be kept to a minimum necessary to install the pipe in a safe manner. In all cases, trenches must be of sufficient width to allow for shoring and permit proper joining of the pipe and backfilling of material along the sides of the pipe. The minimum trench width, in the pipe zone shall be the outside diameter of the pipe plus 12 inches. No maximum width of trench at the top of the pipe will be specified herein. When required by design, it will be shown on the plans. If the maximum width shown is exceeded by the Contractor without written authorization, the Contractor will be required, at no expense to the City, to provide pipe of a higher strength designation, a higher class of bedding, or both, as approved. Excavation for manholes and other structures shall be wide enough to provide a minimum 12 inches between the structure surface and the sides of the excavation. The Contractor shall confine the top width of the trench to right of ways or easements. Special written agreements to extend the width may be made with the affected property Owner, provided such agreement is first approved by the City and/or Engineer. The Contractor shall take all necessary precautions to avoid damage to properties, structures and utilities adjacent to the trench.

6.2.01D Grade - The Contractor shall excavate the trench to the lines and grades as shown or established by the Engineer, with proper allowance for pipe thickness, pipe bedding and foundation stabilization as required. The subgrade upon which the bedding is to be placed shall be firm, undisturbed and true to grade. If the trench is over-excavated, the Contractor shall restore to grade with material of the type specified for pipe bedding at no expense to the City and place the material over the full width of the trench in compacted layers not exceeding 6 inches deep to the established grade with allowance for the pipe bedding.

6.2.01E Disposal of Excess Material - The Contractor shall dispose of all excess material not required elsewhere on the project, make arrangements for disposal

and bear all cost related thereto.

6.2.01F Shoring - Unless otherwise provided in the special provisions, the Contractor shall provide all materials, labor and equipment necessary to adequately shore trenches to protect the work, existing property, utilities, pavement, etc., and to provide safe working conditions in the trench. The method of shoring shall be according to the Contractor's design. The Contractor may elect to use a combination of shoring and overbreak, tunneling, boring, sliding trench shields or other methods of accomplishing the work, provided the method conforms to all applicable local, state and federal safety codes. Removal of any cribbing and sheeting from the trench shall be accomplished in such a manner as to fulfill the above requirements. Damages resulting from improper cribbing or from failure to crib shall be the sole responsibility of the Contractor. Cribbing will not be a pay item and the cost thereof shall be included in the unit contract price for "Install Water Main", "Install Storm Drainage Pipe" or "Install Sewer Main," as applicable. That portion of cribbing or sheeting extending below the crown elevation of flexible pipe shall be left in place unless satisfactory means of reconsolidating bedding or side support, disturbed by cribbing or sheeting removal, can be demonstrated. If a moveable box is used in lieu of cribbing or sheeting and the bottom cannot be kept above the crown elevation of flexible pipe, the bedding or side support shall be carefully reconsolidated behind the movable box prior to placing backfill. The use of horizontal strutting below the barrel of pipe or the use of the pipe as support for trench bracing will not be permitted.

6.2.01G Location of Excavated Material - Excavated material shall be placed at locations and in such a manner that it does not interfere with the function of existing drainage facilities.

6.2.02 Dewatering - The Contractor shall provide and maintain ample means and devices with which to promptly remove and dispose of all water entering the trench excavation during the time the trench is being prepared for the pipe laying, during the laying of the pipe and until the backfill at the pipe zone has been completed. The Contractor shall dispose of the water in a suitable manner without damage to adjacent property. Groundwater shall be controlled such that softening of the bottom of excavations or formation of "quick" conditions or "boils" during excavation shall be prevented. Where the native trench material is sand, the Contractor shall use appropriate trench dewatering methods such that running sand, moving sand and "quick" sand conditions are prevented at the bottom of the excavation. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils and so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property. Dewatering of the trench by conventional trash pumps set in the trench shall be considered as incidental to, and all costs included in, the various contract pay items in the proposal. When, in the opinion of the Engineer, conventional trash pumps do not adequately dewater the trench, an extra work order will be issued for the use of vacuum dewatering equipment.

6.2.03 Trench Foundation - When, in the judgment of the Engineer, the existing material in the bottom of the trench is unsuitable for supporting the pipe, the Contractor shall excavate below the pipe, as directed by the City and/or Engineer. The Contractor shall backfill the trench to subgrade of the pipe bedding, with

select trench foundation material over the full width of the trench and compact in layers not exceeding 6 inches deep to the required grade. Where the native trench material is sand, no trench foundation materials will be authorized by the Engineer on account of water entering the trench excavation. In such case, the Contractor shall stabilize the native sand trench foundation with adequately designed dewatering systems in accordance with Subsection 6.2.02.

6.2.04 Pipe Bedding consists of leveling the bottom of the trench or the top of the foundation material and placing bedding material to the horizontal centerline of the pipe. Bedding material shall be as specified here in before and placed in at least two lifts. Place the first lift to provide the minimum 6 inch depth of bedding material as shown on the plan before the pipe is installed. The Contractor shall spread the bedding smoothly to proper grade so that the pipe is uniformly supported along the barrel and excavate bell holes at each joint to permit proper assembly and inspection of the entire joint. Bedding under the pipe shall provide a firm, unyielding support along the entire pipe length. The Contractor shall place subsequent lifts of not more than 6 inches in thickness up to the horizontal centerline of the pipe, bring lifts up together on both sides of the pipe and carefully work under the pipe haunches by slicing with a shovel, tamping or other approved procedure. Particular attention must be given to the area from the flow line to the horizontal centerline of the pipe or top of bedding to insure that firm support is obtained to prevent any lateral movement of the pipe during the final backfilling of the pipe zone. Pipe bedding shall be placed the full width of the trench.

6.2.05 Initial Backfill - The Contractor shall place the specified initial backfill material carefully around the pipe in 6 inch layers and thoroughly hand tamp with approved tamping sticks supplemented by "Walking In" and from movement either horizontally or vertically during placement and compaction of initial backfill material. Mechanical compactors shall not be utilized in placement of the initial backfill material.

6.2.06 Trench Backfill - The City and/or Engineer will sample excavated material to determine the suitability of the native beach sand for backfill use. If the native beach sand backfill is found to be compactable and within the tolerance range of the moisture content, the Contractor will be allowed to use it for trench backfill. The Contractor shall take reasonable precautions to prevent excavated material from becoming saturated beyond the critical moisture limits and replace any saturated native material with other approved native material at no expense to the City. When, in the opinion of the City and/or Engineer, the excavated material is unsuitable for trench backfill by reason of pre-existing moisture content or other undesirable physical characteristics, the Contractor shall use suitable excess excavated material at the direction of the City and/or Engineer. The Contractor shall backfill the trench above the pipe zone to the final surface grade, or subgrade, as shown on the plans, in lifts not to exceed 12-inch loose depth. The Contractor shall compact each lift to a minimum of 95% of the maximum density as determined by AASHTO T99, Method D. Any subsequent settlement of the trench during the warranty period shall be considered to be the result of improper compaction and shall be promptly corrected. The Contractor shall compact and rake the soil to match the ground surface elevation adjacent to the trench and maintain the surface of the backfilled trench level with the existing grade until the entire project is accepted by the City and/or Engineer.