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SECTION 300 SITE WORK AND EARTHWORK

310.00 GENERAL

All site work and excavation shall comply with the requirements of the STANDARDS AND SPECIFICATIONS and any special criteria established by the Town. The Director of Public Works, at a pre-design/pre-construction meeting, may establish special criteria. Site work shall be completed as detailed on the accepted engineering plans. Site work shall consist of demolition and removal of structures and obstructions; clearing and grubbing; overlot grading; subgrade preparation; removal of topsoil; site preparation; excavation and embankment; excavation, trenching, bedding and backfill of pipelines and service lines; excess excavation; borrow; and restoration and cleanup.

311.00 Local Laws, Ordinances and Codes

The Contractor shall comply with all current federal, state, county, and local laws, and codes pertaining to earthwork. The Contractor must obtain all necessary permits as required in Section 100, General Conditions, of these STANDARDS AND SPECIFICATIONS and/or any permits required by this Section prior to commencement of the work. The Contractor shall notify the Director of Public Works twenty-four (24) hours before the start of the work or when work is to be resumed following a delay.

312.00 Protection of Public Improvements

The Contractor shall be held responsible for the protection of public improvements as stated in Section 141.00, Protection of Public and Utility Interests, of these STANDARDS AND SPECIFICATIONS. It will be the Contractor's responsibility to replace all public improvements so damaged at his own expense. Street cuts are restricted according to Section 143.00 of these STANDARDS AND SPECIFICATIONS.

312.01 Operation of Existing Valves

The Public Works Department will operate all existing valves, blow-offs, and curb stops. **The Contractor will operate no valve or other control device on any existing system for any purpose unless authorized by the Town**.

312.02 Interruption of Services

Before starting site work, the Contractor shall plan and coordinate for the disconnection or interruption of all services such as water, sewer, cable T.V., telephone, gas, electric power and traffic. Disconnection and/or interruptions shall be made in accordance with the regulations of the utility that controls the supply of the service. Whenever the flow of traffic is affected, a Traffic Control Plan shall be provided in accordance with Section 141.08, Traffic Control, Barricades, and Warning Signs, of these STANDARDS AND SPECIFICATIONS.

The Public Works Department shall provide a representative to be on site to observe and approve the Contractor's disconnection or interruption of the water and sewer services. Seventy-two (72) hours prior to the interruption of service, the Contractor will notify the Town of his plan and schedule. Twenty-four (24) hours prior to the interruption of service, the Contractor will notify all users in writing with a hand delivered notification whose service will be interrupted in order for them to make provisions for necessary water storage. No line in service will be shut down for more than a four (4) hour period at one time. Prior approval by the Director of Public Works is required for all shutdowns.

312.03 Equipment Operated on Streets

Only pneumatic-tired equipment shall be permitted to operate over paved surfaces. The Contractor shall be responsible for any damage to the street surface resulting from his operation.

320.00 DEMOLITIONS AND REMOVAL OF STRUCTURES AND OBSTRUCTIONS

The Contractor shall remove, wholly or in part and satisfactorily dispose of all foundations, signs, structures, fences, old pavements, abandoned pipelines, traffic signal material and any other obstructions which are not designated to remain, except for utilities and for those items which other provisions have been made for removal. All salvable material shall be clearly marked by the Town and will be removed, without unnecessary damage, in sections or pieces that may be readily transported and will be stored in locations approved by the Director of Public Works. These materials may include, but shall not be limited to, manhole frames and covers, inlet grates, fence material, handrails, culverts, guardrail, walkway, roadway and parking appurtenances (traffic signals and attached hardware, including mast arms and span wire) and irrigation systems and appurtenances. The Contractor shall be required to replace any materials lost from improper storage methods or damaged by negligence. Removal of sign panel will include all work necessary to remove the panel and its attachment hardware from the existing installation. Concrete adhering to sign posts will be removed; pedestals and based will be removed to one foot (1') below the surrounding ground or subgrade.

Where portions of structures are to be removed, the remaining parts shall be prepared to fit new construction. The work will be done in accordance with plan details and in such a manner that materials to be left in place will be protected from damage. The Contractor at his expense shall repair all damage to portions of structures that are to remain in place. Reinforcing steel, projecting from the remaining structure, shall be cleaned and aligned to provide bond with new extension. Dowels are to be securely grouted with approved grout. Depressions resulting from the removal of structures, footings, and other obstructions, shall be filled and compacted with clean fill materials so as to eliminate hazards of cave-in, accumulation and ponding of water.

Materials used in detour structures and supplied by the Contractor, shall be the property of the Contractor. After the detour is abandoned, he will completely remove the detour structure and will dispose of materials according to these STANDARDS AND SPECIFICATIONS.

Immediately following demolition and removal of rubbish from the site, provided additional work is not required, the Contractor shall grade the entire contract area by filling, compacting, and leveling the site to existing adjacent grades.

321.00 Bridges, Culverts and Other Drainage Structures

Bridges, culverts, and other drainage structures in use by traffic shall not be removed until the Director of Public Works in accordance with Section 141.08, General Conditions, of these STANDARDS AND SPECIFICATIONS, has approved a Traffic Control Plan.

Unless otherwise directed, the substructures of existing structures will be removed down to one (1) foot below natural stream bottom or ground surface. Where such portions of existing structures lie wholly or in part within the limits of a new structure, they will be removed as necessary to accommodate the construction of the proposed structure. Steel, pre-cast concrete and wood bridges shall be carefully dismantled without unnecessary damage. Steel members to be salvaged will be match-marked with waterproof paint.

322.00 Pipe

Unless otherwise provided, all pipe shall be carefully removed and cleaned; every precaution must be taken to avoid breaking or damaging the pipe. Pipes to be re-laid shall be removed and stored, when necessary, so that there will be no loss or damage before relaying.

Where culverts or sewers are to be left in place and plugged, the ends shall be filled with Type III concrete. Culvert and sewer ends are to be sufficiently filled to prevent future settlement of embankments.

When removing manholes, catch basins and inlets, any live sewer connected with these items will be properly reconnected, and satisfactory bypass service will be maintained during such operations.

323.00 Pavements, Sidewalks, Curbs, Etc.

All concrete or asphalt that is to remain shall have a straight, true line with a vertical face. Concrete or asphalt may be cut with a cutting wheel, jackhammer, or saw. If the Contractor cannot maintain a straight, true break line, the Director of Public Works will order sawing. The sawing shall be done carefully, and the Contractor, at his expense will repair all damages to the concrete or asphalt to remain in place. The minimum depth of saw cuts in concrete will be two (2) inches.

The Contractor shall be responsible for the cost of removal and replacement of all over break as determined by the Director of Public Works.

324.00 Disposal

The Contractor shall make all necessary arrangements for obtaining suitable disposal locations, and the cost involved will be included in the work. If disposal will be at other than established dumpsites, the Director of Public Works may require the Contractor to furnish written permission from the property owner on whose property the materials will be placed.

330.00 SITE PREPARATION

The Contractor shall complete all work necessary to satisfactorily prepare the site as shown on the accepted drawings and as specified herein. Following this preparation, the site shall be in such a condition as to easily continue with the next operation whether it is excavating, backfilling, or any other operations that are a part of the project. Site preparation includes clearing, grubbing, grading, tree and shrub removal, native grass stripping and removing and disposing of all debris within the limits of the project and such other areas as may be indicated on the plans or required by the work, except such objects as are designated to remain or are to be removed in accordance with other sections of these STANDARDS AND SPECIFICATIONS. This work shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

331.00 Clearing

The Town shall establish construction lines and designate all trees, shrubs, plants and other things that are to remain. The Contractor shall preserve all things designated to remain. Paint required for cut or scarred surfaces of trees or shrubs selected to remain will be an approved asphalt base paint, prepared especially for tree surgery.

Branches on trees or shrubs shall be removed as directed. Branches of trees extending over the roadbed must be trimmed to give a clear working area above the roadbed surface. All trimming shall be done in accordance with Section 1000 of these Standards and Specifications.

Hedges will be pulled or grubbed in such a manner as to assure complete and permanent removal. Sod not required to be removed, must be thoroughly disked before construction of embankment.

All surface objects and trees, stumps, roots and other protruding obstructions not designated to remain will be cleared and/or grubbed as required, except nonperishable solid objects which will be a minimum of two (2) feet below subgrade.

Except in areas to be excavated, stump holes and other holes from which obstructions are removed must be backfilled with suitable material and compacted in accordance with these STANDARDS AND SPECIFICATIONS.

The Contractor will scalp areas where excavation or embankment is to be made. Scalping will include the removal of material such as brush, roots, sod, grass, residue of agricultural crops, sawdust, and other vegetable matter from the surface of the ground.

Clearing shall be performed in a careful and orderly manner with due consideration and protection of adjoining property, the public and workmen. Any damage to streets, parking lots, utilities, plants, trees, buildings or structures on private property, or to bench marks and construction staking due to the negligence of the Contractor, shall be repaired and restored to its original condition by the Contractor at his expense. Those areas which are to be saved will be clearly staked or fenced off by the Contractor per the Town's instructions and it will be the Contractor's responsibility to ensure that these areas are not damaged during the construction process. Following completion of construction, should any of these trees, shrubs or sod require replacement, it shall be done at the Contractor's expense.

332.00 Grading

A Grading and Stormwater Quality Permit shall be required as specified in Section 151.00 of these STANDARDS AND SPECIFICATIONS.

A. If grading is in excess of 1 acre, additional requirements must be adhered to in accordance with the Town of Erie's Standards.

Upon completion of the work, the Contractor shall provide the following information:

A. An "as-graded" plan showing original ground surface elevations, as constructed ground surface elevations, lot drainage patterns, locations and elevations of all surface and subsurface drainage facilities.
B. A soil grading report prepared by the soils engineer including locations and elevations of field density tests, summaries of field and laboratory tests and any other substantiating data and comments on any changes made during grading and their effect on the recommendations made in the soils engineering report.
C. A geological report prepared by the engineering geologist including a final description of the geology of the site including any new information disclosed during the grading, and the effect of it on recommendations incorporated in the accepted grading plan.

All areas disturbed during grading operations shall have the final graded area hydro seeded or re-vegetated with native grasses in accordance with the requirements of the Town of Erie. Seeding must be completed within sixty- (60) days of the grading completion and no longer than one hundred eighty (180) days of the commencement of grading operations at the site.

The Contractor shall insure that the dust proofing requirements of Section 141.07, General Requirements, of these STANDARDS AND SPECIFICATIONS are strictly adhered to for the duration of the project.

Grading of filled and unfilled areas shall be to the lines and grades indicated on the accepted plans. Grading shall be performed in conjunction with all of the necessary clearing, grubbing, stripping, filling, and compacting operations to the satisfaction of the Town.

Grading shall be done by approved means. Areas adjacent to structures and other areas inaccessible to heavy grading equipment shall be graded by manual methods.

Final grading shall be performed in such a manner as to provide proper drainage. In no case shall drainage from the project site be so altered or controlled as to result in damage, or the potential for damage, to adjacent property or to any portion of the work executed under the project from erosion or flooding.

333.00 Disposal

The Contractor shall make all necessary arrangements for obtaining suitable disposal locations, and the cost involved will be included in the bid price. If disposal will be at other than established dump sites, the Director of Public Works may require the Contractor to furnish written permission from the property owner on whose property the materials and debris will be placed. Materials and debris shall be disposed of in a manner acceptable to the Director of Public Works. Burning shall not be permitted without prior written approval of the Director of Public Works and the county health department.

334.00 Topsoil

The Contractor shall salvage within the project limits, or acquire when needed, loose friable loam reasonably free of admixtures of subsoil, refuse, stumps, roots, rocks, brush, weeds, heavy clay, toxic substances or other material which would be detrimental to the proper development of vegetative growth.

Topsoil shall not be placed until the areas to be covered have been properly prepared and grading operations in the area have been completed. Topsoil shall be placed and spread at locations and to the thickness shown on the plans and shall be keyed to the underlying material.

340.00 EARTHWORK

This work shall consist of excavation, disposal, shaping or compaction of all material encountered within the limits of the project, including but not limited to excavation of ditches and channels, surface boulders, muck, rock, concrete foundations, slabs, stripping, etc. Excavation will be performed to the line and grade and typical cross sections indicated on accepted plans or as required by the Director of Public Works.

Excavation, dewatering, sheeting, and bracing shall be carried out in such a manner as to eliminate any possibility of undermining or disturbing the foundation of any existing structures or any work previously completed.

This Section does not include any work that is related to trenching, backfilling and compacting (refer to Section 350.00 of these STANDARDS AND SPECIFICATIONS).

Should the project warrant, the Director of Public Works might require the Contractor to provide an earth-moving diagram and haul routes.

340.01 Definitions

Bedding material - material that is installed under pipelines (other than sanitary sewer and water lines), riprap, low flow channel or any other place considered necessary by the Director of Public Works. The thickness of this material will be as shown on the accepted plans and will normally be six (6) inches under structures and three (3) inches under the bell of any pipe. Bedding material shall meet the gradation of CDOT "No.67 Coarse Aggregate" as specified in Section 703.02 in the latest edition of the CDOT "Standard Specifications for Road and Bridge Construction".

Borrow - backfill or embankment material that must be acquired from designated borrow areas to make up the deficient areas that cannot be completed from excavation within work limits. All sources of borrow material must be approved by the Director of Public Works.

Embankment fill - earthwork consisting of embankments, including preparation of the area upon which they are to be placed, dikes within or outside right-of-way, placing and compacting of approved material within areas where unsuitable materials have been removed, and placing and compacting of embankment materials in holes, pits and other depressions to lines and grades shown on the accepted plans. Only suitable materials shall be used in construction of embankments and backfills.

Proof rolling - the application of test loads over a sub-grade surface by means of a heavy pneumatic-tired vehicle to locate weak areas in sub grade. See Section 344.00 for specifications.

Rock excavation - Igneous, metamorphic or sedimentary rock formations that cannot be excavated with a D-9 tractor in good repair with a single hydraulic ripper.

Stabilization material - material that is to be placed in areas of over excavation of unsuitable material, or in areas of high water table to stabilize the unsuitable material. Stabilization material shall meet the gradation of "No. 4 Coarse Aggregate" as specified in Section 703.02 of the CDOT "Standard Specifications for Road and Bridge Construction".

Structure backfill - earthen material that is installed around and over any structure as illustrated on the accepted plans. Imported structure backfill (Class I) shall meet the general gradation of "Class 1 Structure Backfill Material" as specified in Section 703.08 of the CDOT "Standard Specifications for Road and Bridge Construction". On site Class 2 structure backfill shall also meet the requirements of Section 703.08 of the CDOT Specifications for Road and Bridge Construction.

Structure excavation - excavation of any and all materials over an area extending three (3) feet out from the outer most bottom edge of a proposed structure, up to existing grade or top of proposed grade (whichever comes first) at a one to one (1:1) slope. Rock formations within this area that can be removed by ripping with a D-9 tractor in good repair with a single hydraulic ripper shall be considered structure excavation.

Suitable material - any earthen material consisting of on-site or similar non-organic sands, gravels, clays, silts and mixtures thereof with a maximum size of six (6) inches. Bedrock that breaks down to specified soil types and sizes during excavation hauling and placement may be considered as suitable material.

Unclassified excavation - any and all earthen materials encountered, including rocks and boulders, during construction. Rock formations that can be removed by ripping with a D-9 tractor in good repair with a single hydraulic ripper are considered as unclassified excavation.

Unsuitable material - any earthen material containing vegetable or organic silt, topsoil, frozen materials, trees, stumps, certain man made deposits, or industrial waste, sludge or landfill, or other undesirable materials.

340.02 Grading Tolerances

All earthwork shall be carried out in such a manner that final grades, after excavation, compaction of backfill, placement of rip rap, and construction of channel lining, etc. shall conform to those illustrated by design cross sections. The final earthwork shall be considered acceptable, providing all final grade elevations do not vary from the designed elevations by more than the following:

A. 0.3 feet at the top of any embankment where a cut side slope intersects the existing grade.
B. 0.5 feet in all portions of the site not included in item A above.

340.03 Backfill and Embankment Material

Any suitable material or borrow as defined above. Free running water shall be drained from materials before placement.

341.00 Excavation

All excavated areas will be graded in a manner that will permit adequate drainage, will not disturb material outside the limits of slopes and will be within the tolerances noted in Section 340.02 of these STANDARDS AND SPECIFICATIONS. When practical, all suitable material removed from the excavation will be used in the formation of embankments, for backfilling, and for other purposes. Materials that are considered unsuitable material (including rock) or surplus by the Director of Public Works shall be disposed of by the Contractor at his expense, in accordance with Section 324.00 and 333.00 of these STANDARDS AND SPECIFICATIONS.

All water pumped or drained from the work shall be disposed of in a manner satisfactory to the Director of Public Works, without undue interference with other work or damage to pavements, other surfaces, or property.

341.01 Excess Excavation

If in the opinion of the Director of Public Works, the material at or below the depth to which excavation for structures would normally be carried is unsuitable for the required installation, it shall be removed to such widths and depths as directed by the Director of Public Works and shall be replaced with stabilization material.

Where the bottom of the excavation, by error of the Contractor, have been taken to a depth greater than the depth specified, shown on the accepted plans or directed by the Director of Public Works, said condition shall be corrected by refilling to the proper grade with structure backfill. Should this backfill for over excavation occur in areas of high groundwater, and then the backfill material shall e stabilization material. The Director of Public Works shall approve all measures taken to rectify conditions caused by over excavation, and the cost resulting from such measures shall be borne by the Contractor.

If, through failure or neglect of the Contractor to conduct the excavation work in a proper manner, the surface of the subgrade is in an unsuitable condition for proceeding with construction, the Contractor shall, at his own expense, remove the unstable material and replace it with recycled concrete, structure backfill, or other approved material so that the condition of the subgrade meets with the approval of the Director of Public Works before any work is placed thereon. Failure of the Contractor to control surface or groundwater adequately, premature excavation at the work site, or other manifestations of the Contractor's neglect or improper conduct of work, as determined by the Director of Public Works, shall be grounds for requiring removal and replacement of unsuitable subgrade without additional compensation.

341.02 Excavation Near Existing Structures and Utilities

The Contractor's attention is directed to the fact that underground utilities may exist within or immediately adjacent to the areas of proposed construction. Where possible, these utilities are indicated on the accepted plans; however, all of the services may not have been shown on the accepted plans, and the completeness and accuracy of the information presented is unverified and without guarantee. This information is supplied for the purpose of providing the Contractor with an indication as to the approximate locations of utilities at the work areas so that he will be made aware of probable obstructions and the extent to which these may affect construction.

All utility lines shall be located on the ground with location equipment well ahead of the work at all times. All such locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground. The Contractor at no extra cost shall provide all such work.

342.00 Protection of Existing Structures and Utilities

All existing poles, pipes, wire, fences, curbs, property line markers, and other structures that, in the opinion of the Director of Public Works, must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the Contractor. In case of damage, the Contractor shall notify the property owner so that proper steps may be taken to repair any and all damage done. When the property owners do not wish to make the repairs themselves, the Contractor shall repair all damage; or if not promptly done by him, the Town may have the repairs made at the expense of the Contractor.

All utility services shall be supported by suitable means so that services do not fail during construction or when tamping and settling occur.

The Contractor shall be compensated for any additional work involved whenever a utility or underground structure that had not been previously anticipated is so encountered longitudinally within the excavation limits so as to severely hinder normal excavation and construction methods. The Town shall establish the cost of such work and the Contractor through a "Change Order" before any additional work is performed.

342.01 Relocation and Replacement of Existing Structures and Utilities

If, in the course of construction, the Contractor encounters utility services and/or structures of any kind not indicated on the plans, or otherwise provided for, which encroach upon or are encountered near and substantially parallel to the edge of the excavation and which, in the opinion of the Director of Public Works, will impede progress to such an extent that satisfactory construction cannot proceed, they shall be relocated or removed, later to be restored or replaced as follows:

A. Whenever the Contractor encounters any of the conditions as described above and is so ordered in writing, he shall do the whole of or such portions of the work as directed; change the location of, remove and later restore, or replace such structures; assist the Owner thereof in so doing. For such work the contractor shall be issued a change order for extra work.
B. In removing existing pipes, or structures or utilities as described above, the Contractor shall use care to avoid damage to materials, and the Director of Public Works shall include for payment only those new materials which, in his judgment, are necessary to replace those unavoidably damaged.

When fences interfere with the Contractor's operations, he may remove and, unless otherwise specified, later restore them to a condition at least as good as that in which they were found immediately before the work was begun, all without additional compensation. The restoration of fences shall be done as promptly as possible and not left until the end of the construction period.

343.00 Excavated Material

Excavated material shall be placed so as to minimize the inconvenience to occupants traveling on streets and driveways or adjoining properties. Excavated material shall not be deposited on private property unless written consent of the property owner(s) has been filed with the Director of Public Works.

It is expressly understood that no excavated materials shall be removed from the site of the work or disposed of by the Contractor except as directed or approved by the Director of Public Works, or as noted below.

Suitable excavated material shall be used as backfill, fill for embankments, or other parts of the work in accordance with the appropriate sections of these STANDARDS AND SPECIFICATIONS.

Disposal of surplus material shall be in accordance with Section 324.00 and 333.00 of these STANDARDS AND SPECIFICATIONS.

344.00 Proof Rolling

Proof rolling may be required to determine whether certain areas of subgrade meet compaction requirements. Where required by the Director of Public Works, proof rolling shall be carried out as designated with a water truck loaded to a minimum of 36,000 lb. No separate payment shall be made for proof rolling operations.

Areas of subgrade exposed and not previously disturbed but found to be weak and/or to fail the test shall, at the direction of the Director of Public Works, be excavated, scarified, wetted if necessary, and recompacted with suitable backfill material to the requirements for density and moisture. The Contractor shall be compensated for this work either at applicable unit bid prices or by change order.

Areas of subgrade already worked but upon proof rolling are found to be weak and/or fail the test shall be ripped, scarified, wetted if necessary, and recompacted to requirements for density and moisture at the Contractor's expense.

345.00 Embankment Fill

Earth fill shall be constructed in accordance with this Section, including placing and compacting of all embankment material, and all related work as required to ensure proper bond of materials with previously placed embankment.

No material shall be placed in any section of embankment until the foundation for that section has been cleared, stripped, and dewatered and compacted in accordance with these STANDARDS AND SPECIFICATIONS.

The suitability of each part of the foundation for placing embankment material thereon and of all materials for use in the embankment construction will be as determined by the Director of Public Works or the projects' Soils Engineer. All materials shall be placed and compacted in approximately horizontal layers of the specified thickness

After subgrade has satisfactorily been prepared, the fill material shall be placed and compacted thereon and built-up in successive layers until the required elevation is reached. Fill shall be placed within the lines and grades shown on the accepted plans or as directed by the Director of Public Works. No fill shall be placed on frozen surfaces, nor shall the fill material contain snow, ice, or other frozen materials.

Fill for embankment shall be a homogenous mixture of stockpiled suitable material. The characteristics of the material shall be in accordance with that of suitable material as defined in Section 340.01 of these STANDARDS AND SPECIFICATIONS.

The filling operation shall begin in the deepest part of the area to be filled and fill shall be brought up in essentially level lifts. Fill shall be placed in layers by an approved method. The entire surface

of the work shall be maintained free from ruts and in a condition that will permit construction equipment to travel over any section readily.

The lifts may be discontinued, providing that the slopes of the bonding surfaces of adjoining portions of embankment shall not be steeper than 10:1 (horizontal to vertical). Previously placed material shall be moistened in such a manner and to such depths as will ensure a satisfactory bonding surface with a new material.

The Contractor shall maintain the embankment in a manner satisfactory to the Director of Public Works until the Town has given final acceptance of all work.

Previously sprinkling, if required, to insure proper bond and compaction, shall moisten placed, or new materials. No compacting shall be done when the material is too wet, causing yielding. If the compacted surface of the fill layer is determined to be too smooth to provide an adequate bond with the succeeding layer, the surface shall be loosened by harrowing or by some other approved method before placement of the succeeding layer.

Excavated materials, which the Contractor desires to use for embankment, and which are otherwise suitable for embankment, except that, when excavated are too wet for immediate compaction, shall be dried such as to permit them to be placed in the embankment at the proper moisture content. No additional payment will be made for adding moisture to materials, whether added on fill, or for stockpiling, re-handling, or drying materials for use in the embankment.

The moisture content of the embankment prior to, and during, compaction shall be distributed uniformly throughout each layer of material. The placement moisture content for all materials shall be as noted below.

The Contractor will be responsible for insuring that compaction tests will be made when the Contractor has determined that he has properly compacted the embankment. Testing shall be completed in accordance with Section 354.00 of these STANDARDS AND SPECIFICATIONS.

All embankment fill shall be compacted to the percent of relative compaction shown in Table 345.00-1 and will be equal to or greater than the minimum values shown for the various types of soil. The moisture content will be maintained within ± three percent (3%) of optimum moisture for A-1 through A-5 materials and optimum to 3% above for A-6 and A-7-6 materials during compaction. Each project shall have a soils report and specifications designed for that project, site specific.

TABLE 345.00-1

Soil Classification (AASHTO M 145)	AASHTO T 99 Min. Standard Proctor Relative Compaction (Percent)	AASHTO T 180 Min. Modified Proctor Relative Compaction (Percent)
A - 1	100	95

A – 3	100	95
A - 2 - 4	100	95
A - 2 - 5	100	N/A
All Others	95	N/A

If at any time the Director of Public Works judges that the degree of compaction being obtained is insufficient, he may halt operations and order that compaction tests be taken at his direction. Areas found deficient in degree of compaction shall be recompacted and regraded, if necessary. Failed compaction tests, when ordered by the Director of Public Works, shall be paid for by the Contractor.

345.01 Structure Backfill

Structure backfill material shall be used to backfill behind reinforced concrete structures as illustrated on the accepted plans. Structure backfill shall comply with material as described in Section 340.01 of these STANDARDS AND SPECIFICATIONS. In addition, this material shall have a liquid limit not exceeding 35 and a plasticity index of not over 15 when determined in conformity with AASHTO T 89 and T 90.

Areas adjacent to structures and other areas inaccessible to mobile compaction equipment shall be compacted with suitable power-drive hand tampers or other acceptable devices. Compaction by the latter method shall be done in six- (6) inch layers, unless otherwise directed by the Director of Public Works.

Backfilling shall consist of placing materials in horizontal, uniform layers brought up uniformly on all sides of the structure.

Backfill material shall not be deposited against the back of concrete abutments, concrete retaining walls, or the outside of cast-in-place concrete structures until the concrete has developed a strength of not less than 2,500 pounds PSI in compression. Backfill placed within two (2) feet of any structure shall be covered up evenly on all sides to avoid unequal lateral pressures.

Compaction equipment or methods that produce horizontal or vertical earth pressures which may cause excessive displacement or may damage structures, shall not be used.

Unless otherwise indicated on the accepted plans or directed by the Director of Public Works, all sheeting and the Contractor prior to backfilling shall remove bracing used in making structure excavation.

THE EXCESSIVE USE OF WATER DURING BACKFILLING OPERATIONS WILL NOT BE PERMITTED.

No compacting shall be done when material is too wet to be compacted properly; at such times the compacting work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compacting, or such other precautions shall be taken as may be necessary to obtain proper compacting. The moisture content of the embankment prior to, and during, compaction shall be distributed uniformly throughout each layer of material. The moisture content will be maintained within ± two percent (2%) of optimum moisture for A-1 through A-5 materials and optimum to three percent (3%) for A-6 and A-7-6 materials during compaction

In the event that sufficient satisfactory backfill material is not available on the site, the Director of Public Works shall direct the Contractor to import Class 1 structure materials as defined in Section 340.01 of these STANDARDS AND SPECIFICATIONS. The Contractor shall not be required to excavate below the depths of excavation indicated on the accepted plans to provide structural backfill material. However, to the extent that acceptable material is available within the excavation limits, the Contractor will be required to excavate, transport, and compact the material without compensation beyond that which may be included for "Unclassified Excavation used as Structural Backfill" or as may be allowed for in the bid documents.

Where pipe is connected to a structure being backfilled, the bedding and backfilling procedure shall conform to the requirements of Section 352.00 and 353.00 of these STANDARDS AND SPECIFICATIONS.

The Contractor shall apply the proper compactive effort and moisture control throughout the backfilling process. The Contractor shall be responsible for insuring that compaction tests are made of the fill when the Contractor has determined that he has properly compacted the structural backfill. Testing shall be completed in accordance with Section 354.00 of these STANDARDS AND SPECIFICATIONS.

Structure backfill shall be compacted in conformance with Table 345.00-1.

If at any time the Director of Public Works determines that the degree of compaction being obtained is insufficient, he may halt operations and order that compaction tests be taken at his direction. Areas found deficient in degree of compaction shall be recompacted and regraded, if necessary. Failed compaction tests, when ordered by the Director of Public Works, shall be paid for by the Contractor. The Town will pay for additional tests ordered by the Director of Public Works that meet the requirements of these STANDARDS AND SPECIFICATIONS.

345.02 Roadway Excavations, Backfill and Compaction

Roadway excavation shall be in accordance with unclassified excavation as defined in Section 340.01 of these STANDARDS AND SPECIFICATIONS, except for areas of rock excavation as defined in the same Section. The material and execution for the roadway backfill shall conform to Section 345.00 of these STANDARDS AND SPECIFICATIONS.

All roadway backfill shall be compacted to at least ninety-five percent (95%) of maximum density at optimum moisture content in accordance with ASTM Specification Designation D-698-70 (Standard Proctor). Water shall be applied uniformly during compaction to control moisture content. The moisture content will be maintained within $\pm$ three percent (3%) of optimum moisture for A-1 through A-5 materials and optimum to three percent (3%) above for A-6 and A-7-6 materials during compaction.

Prior to placement and compaction of roadway fill, all existing rubble and organic material shall be removed down to suitable existing material. The existing material shall then be scarified and roadway fill placed in accordance with Section 345.00 of these STANDARDS AND SPECIFICATIONS.

346.00 Grading

Grading shall be completed in accordance with Sections 332.00 and 340.02 of these STANDARDS AND SPECIFICATIONS.

347.00 Moisture Control

Moisture in fill materials shall be equal to that found in the natural unexcavated condition insofar as is practicable. If the Director of Public Works determines that the fill material to be used is extremely wet, the Contractor shall spread the material on the areas to be filled and the fill shall be permitted to dry to allowable moisture content. Harrowing where necessary shall assist the drying process.

If, in the opinion of the Director of Public Works, additional moisture is required, water shall be applied by some sprinkling device in such a way as to provide uniform distribution over the area to be treated with accurate control of the rate and quantity of water applied. If excessive amounts of water are added or if rain should cause excessive wetness, the area shall be allowed to dry as described above.

The moisture content of the fill shall be as near to optimum moisture content as possible, to create the least compactive effort to obtain maximum density.

348.00 Borrow

It will be the Contractor's responsibility to stockpile suitable backfill material, both for embankment fill and structure backfill, in anticipation for use in other areas of the project. Only at the time that he estimates that he has sufficient suitable backfill material stockpiled to complete the project, should he proceed to haul excavated material from the site. If the Contractor should fail to preserve, on-site, sufficient suitable material, and should haul off and dispose of suitable material, he shall be responsible for recovering said suitable material to the site for use, at his sole cost.

Should there be an insufficient quantity of material available on site for completion of the necessary embankment and structure backfill operations, the Contractor shall furnish approved backfill material as defined in Section 340.01 of these STANDARDS AND SPECIFICATIONS.

350.00 TRENCHING, BACKFILLING AND COMPACTING

This work shall consist of furnishing all labor, materials, tools and equipment for trenching, bedding, backfill and compaction for all underground utilities as specified herein and shown on the accepted plans. The excavation shall be made to lines and grades shown on the accepted plans and as established by the Director of Public Works. Except where shown otherwise on the accepted plans and except where the Director of Public Works gives written permission to do otherwise, all trench excavation shall be made by open cut to the depth required to construct the pipelines as shown on the accepted plans. All excavation shall be unclassified.

When excavating in concrete or asphalt areas, the limits of the trench shall be string lined and the surface cut in a vertical plane by sawing, cutting wheel or jack hammering. Vertical edges shall be

cut to a vertical plane to a point one (1) foot outside the limits of excavation prior to placing the resurfacing material.

The maximum size of street cut in existing major arterial or collector streets will be eight (8) feet square; pushing or boring, unless otherwise approved in writing by the Director of Public Works, will install the remainder of the line under the finished street.

Surface materials such as concrete and asphalt shall be disposed of independently of the underlying soil; base course and gravels are to be salvaged to stockpile, protected from contamination and reused for suitable material for backfill. The Contractor, in accordance with Sections 324.00 and 333.00 of these STANDARDS AND SPECIFICATIONS must dispose of all unsuitable materials unacceptable for use as backfill.

All excavated material which meets the requirements for backfill materials shall be stockpiled in a manner which will not endanger the performance of the work, endanger the workmen, at a sufficient distance from the banks to avoid overloading, obstruct sidewalks, driveways, or streets, AND provide the least possible interference with traffic.

In existing developments excavation will not be permitted to advance more than one hundred fifty (150) feet ahead of pipe laying and two hundred (200) feet in advance of the backfill operations. No trench will be left open overnight without written permission of the Director of Public Works.

The contractor shall provide and maintain adequate equipment to properly remove and dispose of all surface or ground water entering the trench. A Construction Dewatering permit must be obtained from the Colorado Department of Public Health and Environment (CDPHE). Water shall be disposed of in a suitable manner without damage to adjacent property or without being a nuisance to public health and convenience. The use of any sanitary sewer to dispose of trench water will not be permitted. The trench shall be dry at all times during pipe installation and so maintained until the joining operation is complete.

350.01 Special Conditions

Subsurface investigation - Prior to the connection of any planned utility line to an existing line, the Contractor shall expose the existing utility at the points of connection in order to verify the elevations and materials of construction. The Director of Public Works shall be notified a minimum of two (2) working days before such an investigation is performed. The Contractor shall also expose utilities as they cross each other to allow for verification of elevation and materials of construction. The Director of Public Works will evaluate this information and provide revisions, if required, within three (3) working days of the completion of the investigation.

Telephone, Fiber Optic, Cable TV, and all other “Wire Utility” lines - Where underground “wire utility” lines are encountered which were not shown on the accepted plans, they shall be relocated as

directed by the Utility Company and in accordance with its specifications. The Contractor shall coordinate this work with all other phases of construction to avoid further conflicts.

Gas and electric lines - Where underground gas and electric lines are encountered which were not shown on the accepted plans, they shall be relocated as directed by the Utility Company, and in accordance with its specifications. The Contractor shall coordinate this work with all other phases of construction to avoid further conflicts.

351.00 Trench Excavation for Pipelines and Service Lines

Trenches shall be adequately supported and the safety of workers provided for as required by the most recent Occupational Safety and Health Administration (OSHA) "Safety and Health Regulations for Construction". These regulations are described in Subpart P, Part 1926 of the Code of Federal Regulations. Sheeting and shoring shall be utilized where required to prevent any excessive widening or sloughing of the trench which may be detrimental to human safety, to the pipe being placed, to trees, or to any existing structure. Where excavations are made under severe conditions, it may be required that the contractor use an approved piling instead of sheeting and shoring.

Excavated material shall not be placed nearer than two (2) feet from the sides of the trench. Heavy equipment shall not be used or placed near the sides of the trench unless the trench is adequately braced.

The width of the trench must comply with the requirements set forth in these STANDARDS AND SPECIFICATIONS and will be ample to permit the pipe to be laid and joined properly and backfill to be placed and tamped. The allowable trench width, regardless of the type of soil encountered, the depth of excavation or method of bedding densification, shall not exceed the outside diameter of the pipe barrel plus twenty-four (24) inches, or be less than the outside diameter of the pipe barrel plus twelve (12) inches when measured at any point below the top of the pipe bell, flange or collar.

Where the width of the lower portion of the trench exceeds the maximum width herein stated, the Contractor, at his expense, shall furnish and install special pipe embedment or concrete encasement to protect the pipe from the additional loading. The pipe supplier shall determine the type and quantities of special pipe embedment, using trench-loading criteria based upon saturated backfill weighing 120 pounds per cubic foot and allowance for truck and other superimposed live loads.

351.01 Removal of Water

The Contractor shall provide and maintain at all times ample means and devices with which to remove promptly and properly dispose of all water entering the trench excavation. Water shall be disposed of in a suitable manner without damage to adjacent property or without being a nuisance to public health and convenience.

Dewatering shall be accomplished by well points, sumping or any other acceptable methods that will insure a dewatered trench. All dewatering methods will be subject to the approval of the Director of Public Works.

351.02 Preparation of Foundation for Pipe Laying

When the excavation is in firm earth, care shall be taken to avoid excavation below the established grade plus the required specified over depth to accommodate the pipe bedding material.

In case soft or otherwise unsuitable foundation material is encountered in the bottom of the trench, the Director of Public Works may order its removal and replacement with stabilization material to provide a suitable foundation for the pipe. The fact that the trench bottom is wet will not be considered as evidence that the trench bottom is unstable. The bottom of sumps utilized for dewatering shall be two (2) inches minimum below the bottom of the trench excavation to prevent the upward flow of water into the excavation resulting in unstable bottom conditions.

352.00 Bedding for Pipelines and Service Lines

All pipe shall be installed on sufficient bedding material (as defined in Section 340.01 of these STANDARDS AND SPECIFICATIONS or set forth below) so as to provide a minimum of six (6) inches separation between the subsoil and the pipe and shall extend up to the spring line of the pipe. The bedding material will be tamped around the full length of the pipe barrel to assure support for the total pipe length. The pipe barrel will be uniformly supported along the entire length of the pipe. Bedding material will be placed to a depth of twelve inches (12") above the top of all PVC pipe, HDPE pipe, and ductile iron pipe and to the spring line of all other pipe unless otherwise noted on the accepted plans. Suitable backfill material, as defined in Section 340.01 and modified in Section 353.00 of these STANDARDS AND SPECIFICATIONS, shall be placed from spring line to a minimum of twelve (12) inches over the top of the pipe and carefully tamped in place. Each type of pipe shall be installed as specified in the appropriate Section. Bedding material for sanitary sewer and water lines shall be a clean well-graded squeegee sand or ½" x No. 4 bedding material, and shall conform to the following limits when tested by means of laboratory sieve:

½" x #4 BEDDING MAT		SQUEEGEE SAND	
Sieve size	Percent Passing	Sieve size	Percent Passing
3/4 inch	100%	3/4 inch	
1/2 inch	98%	1/2 inch	
3/8 inch	70%	3/8 inch	100%
No. 4	14%	No. 4	95% - 100%
No. 8	7%	No. 8	80% - 100%
No. 16	5%	No. 16	50% - 85%
No. 30	4%	No. 30	25% - 60%
No. 50	4%	No. 50	10% - 30%
No. 100	3%	No. 100	2% - 10%
No. 200	2.1%	No. 200	.5%

Bedding material for all other pipe (except as noted below) will be as defined in Section 340.01 of these STANDARDS AND SPECIFICATIONS.

Bedding for underdrain pipe or for gravel underdrain without pipe, if required by the approved construction plans, shall be composed of washed gravel or crushed rock well graded in the size range from one-half (1/2) inch minimum to one (1) inch maximum.

352.01 Bedding Compaction

All bedding material and suitable material placed to twelve (12) inches above the top of the pipe shall be carefully compacted to at least 70% of maximum relative density in accordance with ASTM D 4253 and 4254.

353.00 Backfill for Pipelines and Service Lines

Suitable backfill shall be as defined in Section 340.01 of these STANDARDS AND SPECIFICATIONS. In addition, all wood or other organic material and deleterious substances must be removed. Clay and similar material with a liquid index in excess of 35 and a plasticity index in excess of 6 (determined in conformity with AASHTO T 89 and T 90) for import material will not be considered suitable for backfilling in trenches located in improved streets, roads, highways and thoroughfares.

When the excavated material is unsuitable for compaction, other material must be provided which will meet the requirements of the following table:

SUITABLE BACKFILL MATERIAL	
Sieve size	Total Percent Passing by Weight
2 inch	100
No. 4	30 - 100
No. 50	10 - 60
No. 200	5 - 20

Additionally, structure backfill (flow-fill) meeting the following requirements may be used to backfill pipelines and service lines when specified in the Contract.

Mix

Minimum 24-hour strength - 10 PSI

Maximum 28-day strength - 60 PSI
Maximum aggregate size - 1”
Cement - Type I-II (Ideal ASTM C 150)
Slump - 6” minimum
8” maximum

MIX PROPORTIONS (per cubic yard of concrete)	
Cement	50 Lbs.
Water	325 Lbs. (39 gallons)
1” Aggregate (ASTM C33, Size No. 57)	1700 Lbs.
Sand - ASTM C33	1845 Lbs.
Air (Entrapped)	5.0 ounces

Theoretical Unit Weight - 143.7 lbs/yd3 @ 1.5% air
Theoretical Yield - 27.23 ft3 @ 1.5% air
% Sand of Total Aggregate - 52%

Note: Aggregate weights are based upon the materials being in a saturated surface-dried condition.

Materials used above the subgrade level must conform to the requirements for sub base and base course materials as defined in Section 500, Street Construction, of these STANDARDS AND SPECIFICATIONS.

Any bracing installed to prevent cave-ins will be withdrawn in a manner that will maintain the desired support during the backfill operations. Driven sheet pilings shall be cut off at or above the top of pipe, and the portion below the cut-off line will be left in the ground.
During construction the trench backfill shall be topped out with not less than nine (9) inches of CDOT Class 5 or 6 aggregate base course and maintained free of chuckholes, ruts and loose rock, until permanent asphalt surfacing is in place.

353.01 Backfill Compaction

Bedding material shall be hand placed in loose six (6) inch lifts, hand tamped, and each lift thoroughly consolidated to the level(s) described in Section 352.00 of these STANDARDS AND SPECIFICATIONS. The remainder of the trench backfill will be placed in loose six (6) inch lifts and each lift thoroughly consolidated by tamping, vibrating, or a combination thereof, until the relative compaction density is equal to or greater than the minimum value shown in Table 345.00-1 of these STANDARDS AND SPECIFICATIONS for the various classes of soil and type of compaction. The moisture content will be maintained within ± two percent (2%) of optimum moisture during compaction.

Pipes, culverts, sewer and other miscellaneous structures outside the roadway prism or sidewalk and not subject to traffic loads or heavy loads for a period of two (2) years shall be backfilled in layers as described above but shall be compacted to approximately the density of the surrounding earth.

Consolidation shall be obtained by the use of hand tampers having a minimum weight of twenty (20) pounds and a facial area in excess of twenty-four (24) square inches. Hydro hammers shall not be used. Large roller, tractor drawn equipment shall not be used within eighteen (18) inches of rigid pipe or thirty-six (36) inches of flexible pipe. Flooding or jetting of trenches will not be permitted.

353.02 Maintenance of Backfill

All backfill shall at all times during construction be maintained to the satisfaction of the Director of Public Works. Access across trenches for driveways and streets shall be maintained free of hazards to traffic or pedestrians.

354.00 Compaction Testing

The compaction of the bedding and all types of backfill shall be tested at a rate of at least one (1) test per 200 cubic yards of fill material or portions thereof and at least one (1) test per 200 lineal feet per lift starting at two (2) feet above the pipe, whichever controls. The testing shall be at various depths and locations. The Director of Public Works may require additional testing around structures, manholes, valve boxes, etc. The Contractor shall also have tests provided to the Town for water and/or sewer service lines as directed by the Town Inspector.

Initial test results shall be submitted to the Director of Public Works within twenty-four (24) hours of the test or on the next working day.

Private engineering or geotechnical firms shall perform compaction testing at the Contractor's expense. A qualified technician who works under the direct supervision of a Registered Professional Engineer shall perform this testing. Final soils compaction reports shall be prepared and signed by a Registered Professional Engineer who is registered in the State of Colorado, and who is qualified to prepare such reports. Reports shall be submitted to the Director of Public Works within one (1) week of the test.

355.00 Cable Installation

355.01 General

Unless otherwise approved in writing by the Director of Public Works, all cable installation must be within public right-of-way or within a dedicated utility easement. All cable must be installed at a minimum depth of twenty-four (24) inches in accordance with the requirements of Article 300-5 of the National Electric Code (NEC).

355.02 Underground Installation

All underground installation shall be in accordance with Article 300-5 of the NEC.

355.03 Overhead Installation

All overhead installation shall be in accordance with Article 230-24-(b) of the NEC.

360.00 RESTORATION AND CLEANUP

At all times during construction, the Contractor shall maintain the site, partially finished structures, material stockpiles and other like areas in a reasonable state of order and cleanliness.

The surface grade and condition of all un-surfaced areas shall be restored to the grade and condition immediately prior to construction. The Contractor shall restore or replace all sod, trees, shrubbery, sprinkler systems, fences, and any other items, to a condition equal to that before the work began and to the satisfaction of the Director of Public Works. See Section 1030.00 Seeding Specifications regarding appropriate mix for specific areas.

All roadway surfacing, curbing, sidewalks, and gutters shall be restored or replaced to a condition equal to that before the work began and to the satisfaction of the Director of Public Works. All roadway surfacing between the vertical surface cuts on each side of the excavation shall be removed and replaced with base course material and/or hot mix bituminous or concrete surfacing.

Pavement repair shall be completed as described in Section 143.00, Pavement Cuts, of these STANDARDS AND SPECIFICATIONS.

Before final acceptance, the project area, material pits, and ground occupied by the Contractor in connection with the work shall be cleaned of all rubbish, excess materials, temporary structures, and equipment, and all parts of the work shall be left in acceptable conditions to the satisfaction of the Director of Public Works.

In the event of the Contractor's failure to perform the above work, the Town at the expense of the Contractor may perform the work.