

**SECTION 02200
GENERAL EARTHWORK FOR ATHLETIC AND BASEBALL FIELDS**

PART 1 GENERAL

1.1 REQUIREMENTS, CODES

- A. All applicable portions of Division 1 - General Requirements shall be considered as included with this section.
- B. The following are minimum requirements and shall govern except that all Federal, Local and/or State Codes and Ordinances shall govern when their requirements are in excess hereof.

1.2 REFERENCES

- A. The Contract Drawings indicate and show limits of construction for this project. These Specifications specify material and work requirements for this project. Both are complementary to each other, and both shall be followed to properly complete the work. Plans govern over technical specifications.

1.3 GENERAL DESCRIPTION

- A. Provide all labor, materials, and equipment to perform the following work of the Contract, including incidentals related to that work and coordination and support of other work specified elsewhere in the Contract Documents:
 - 1. Excavation and backfilling to provide access to all work areas.
 - 2. Protection of Existing Features.
 - 3. Survey for horizontal and vertical control of all work of the Contract.
 - 4. Grading and compaction as required achieving lines and grades on Drawings.
 - 5. Dust, erosion, siltation and environmental controls.
 - 6. Soil and rock excavation, fill, backfill, refill and subgrade preparation as indicated or required, using specified materials.
 - 7. Installation of Sub-grade Geotextile if necessary over blasted rock areas.
 - 8. Excavation and legal off-site disposal of unsuitable or excess materials, including existing fill materials, boulders, excess topsoil, boulders, and overburden soils.
 - 9. Excavation and backfill of excavations for Storm Drainage System to lines and grades on Drawings.
 - 10. Excavation and backfill of excavations for detention basins as shown on Drawings.
 - 11. Grading & Compaction of sub-grade and base aggregates for Honeycombed grass pavers.
 - 12. Import and Placement of Infield Soils.
 - 13. Import and placement of Playfield Soils for Hydroseeded Lawn Areas.
 - 14. Furnishing and placing rip rap, various gradations of crushed stone and related materials in areas designated on the plan.
 - 15. Dewatering, pumping, bailing and control of all groundwater and surface water for all work under this Contract.
 - 16. Excavating and backfilling for free standing stone walls
 - 17. Removing materials from the site which are in excess of that required.

B. Law and Regulations

1. All work shall be accomplished in accordance with regulations of local, county and state agencies and national or utility company standards as they apply.
2. Secure all necessary permits from municipal, county and state departments having jurisdiction prior to the start of construction and furnish proof of acceptance upon completion of the work.

1.4 QUALITY ASSURANCE

- A. Comply with all the requirements of this section and with all applicable local, state and federal regulations having jurisdiction.
- B. The Engineer may require that an independent testing laboratory test imported materials at any time. This independent testing laboratory will be selected and paid for by the Owner. If the material is found to be non-compliant with the Contract, the Contractor shall bear the cost of testing, removal of all non-compliant materials from the Project Site, and replacement of the materials with materials meeting the requirements of the Contract.
- C. It is the responsibility of the Contractor to verify the accuracy of all survey information provided by the Owner prior to commencing excavations or filling operations. Commencement of these operations constitutes acceptance of the survey information as appropriate to meet the intent of the Contract.

1.5 USE OF EXPLOSIVES

- A. Do not bring explosives onto site or use in work without prior permission from the Owner and regulatory agencies, which have jurisdiction. Contractor is solely responsible for handling, storage, and use of explosive materials if their use is permitted. For such use, obtain necessary permits and transmit copies to the Owner. Contractor shall present certificates of insurance, in a form acceptable to the Owner, showing evidence that Contractor's insurance includes coverage for blasting operations, in the amounts required by the Contract for construction before bringing explosives on site.

1.6 SUBMITTALS

- A. Test Reports: Submit in accordance with Division 1.
 1. At least one (1) gradation test and one plasticity test per ASTM D 4318 report for the playing field soil. Report shall include name and location of sample tested.

The Owner may retain a Geotechnical Engineering consultant who may perform various tests and observations to determine if the suitability of the playing field preparation areas and parking area subgrade. The Geotechnical Engineer shall also verify that proper materials and construction methods are used, and that the Contractor is achieving the minimum amount of compaction as required by these specifications.

Filter Fabric samples shall be submitted for approval by the Engineer.

1.7 SITE INVESTIGATION

- A. The Contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, groundwater table or similar physical conditions at the site, the conformation of subsurface materials to be encountered, the character of equipment and facilities needed prior to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under this contract. Any failure by the Contractor to acquaint himself with all information concerning these conditions will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work.
- B. Soils Information - The Owner has provided on the drawings logs for test pits taken within the vicinity of the proposed improvements. These logs are included in their entirety, for informational purposes only. Such data is offered in good faith solely for the purpose of placing the Contractor in receipt of all information available. The Contractor must interpret such data according to his own judgment and acknowledges that he is responsible for his own determinations regarding the subsurface conditions which may be found to exist.

1.8 PROTECTION OF EXISTING STRUCTURES

- A. The Contractor shall protect existing underground utilities to remain, the location of which is shown approximately on the drawings or which are located in the field. Utilities whose location is not known shall be protected insofar as possible. All costs for repair of broken or damaged utilities will be the responsibility of the Contractor.
- B. Visit the site to review all details of the work and working conditions and to verify dimensions in the field including headroom and interference's from adjacent structures. Notify the Owner in writing of any discrepancy before performing any work.
- C. Protect existing above ground structures, landscaping, and appurtenances from movement or settlement. Provide bracing and shoring as needed.
- D. Consult official records of existing utilities, both surface and subsurface, and their connections to be fully informed on all existing conditions and limitations as they apply to this work and its relation to other construction work. The Contractor shall contact Call before you Dig" at 1-800-922-4455 to assist in locating utilities at least 4 working days prior to performing any earthwork operations on the site.
- E. Make a personal inspection of the site to evaluate the conditions affecting the work. No claim for additional costs will be allowed because of lack of knowledge of any existing conditions discernible from observation of the site, adjoining properties, or other available sources of information.

1.9 APPLICABLE STANDARDS

- A. ASTM D-422 - Method for sieve analysis of fine and coarse aggregates.
- B. ASTM D-1140 - Method for determination of fine soil fraction.

- C. ASTM D-1556 - Test method for density of soil and soil aggregate in place by the sand cone method.
- D. ASTM D-1557 - Test method for moisture - density relationships of soils and soil aggregate mixtures.
- F. ASTM D 4318 Test method for determination of Plasticity Index of soils.
- G. ASTM D-5195 - Test method for density of soil and rock at depths below the surface by nuclear methods.

1.10 SITE PREPARATION

- A. The Contractor shall verify existing grades prior to beginning general earthwork. If existing grades are at variance with the Drawings, notify the Owner and receive instructions prior to proceeding.
- B. All bench marks and monuments shall be protected during construction. If disturbed or destroyed, replace in original position.
- C. Construction stakeout shall be by a licensed surveying firm provided by the contractor. Exact locations and grade points are to be staked or fixed by the surveying firm prior to construction.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Onsite Fill - This material shall consist of on-site excavated soil from the Fill stratum and is for use as an alternative to Structural Fill and Subbase. It shall consist of sand, gravel, rock fragments, or a mixture thereof. On-Site materials may be reused provided that rocks larger than 6 inches are removed and it is placed and compacted to create a stable subgrade. On-site Fill will need to be well-graded for compaction and structural support, and to maximize on-site reuse.

On-site excavated fill may not be used in areas sensitive to drainage and may need to be screened to segregate unsuitable materials.

- B. Infield Soil – This material shall consist of imported soil as manufactured by Tilcon Connecticut, Inc. ¼” washed sand “Grits” Ball Field Infield Mix (850-224-6010). During the course of importation of materials, the Contractor shall be responsible for continually checking the materials to insure that they continue to meet the specification.
- C. Free Draining Sand and Gravel shall be free from ice and snow, roots, stumps, rubbish and other deleterious materials and should consist of hard durable sand and gravel conforming to the following gradation requirements:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
Pass 1-1/2 inch	100
Pass 1 inch	45-80
1/4-inch	25 to 60
No. 10	15 - 45
No. 40	5 - 25

No. 100	0 - 10
No. 200	0 - 4

- D. Suitable Native Material shall be obtained from on or off-site and shall be free of ice, snow, roots, vegetation and other deleterious materials. When used under pavement areas this material shall have a plasticity index not exceeding 15 (20 when used below 2 foot of subgrade) and a liquid limit not exceeding 40. Clay soils shall not be placed under structures or in the pad preparation area.
- E. Pavement Section Base Course (Processed Aggregate Base) shall consist of hard, durable processed gravel, free from ice snow, sand, clay, loam or other deleterious material, should be uniformly blended, conforming to the requirements of the Connecticut Department of Transportation Form 814, Section M.05.01 and the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
2-1/4-inch	100
2-inch	90 - 100
3/4-inch	50 - 75
1/4-inch	25 - 45
No. 40	5 - 20
No. 100	2 - 12

At least 70 percent of the materials retained on the 1-inch sieve should have a fractured face.

- F. Foundation Stone shall be free of ice, snow, roots, vegetation and other deleterious materials and conform to the requirements of Foundation Stone shall be graded, crushed, broken or processed stone, conforming to the grading requirements for 3/8 inch or 3/4 inch stone of Article M.01.01 of the Standard Specifications as ordered by the Engineer unless the Engineer orders processed aggregate in accordance with Article M.05.01 of the Standard Specifications.
- G. Riprap shall consist of sound, tough, durable and angular rock, free from decomposed stones or other defects impairing its durability. The size of a stone as hereinafter specified shall be its least dimension. Broken concrete or rounded stones are not acceptable. The type of material to be used shall be as noted on the plans, in the special provisions or as may be ordered by the Engineer.

1. Standard Riprap: This material shall conform to the following requirements:

- (a) Not more than 15 percent of the riprap shall be scattered spalls and stones less than 6 inches in size.
- (b) No stone shall be larger than 30 inches in size, and at least 75 percent of the mass shall be stones at least 15 inches in size.

2. Intermediate Riprap: This material shall conform to the following gradation:

<u>Stone Size</u>	<u>% of the mass</u>
18" or over	0
10" to 18"	30-50
6" to 10"	30-50
4" to 6"	20-30

2" to 4"	10-20
less than 2"	0-10

3. Modified Riprap: This material shall conform to the following gradation:

<u>Stone Size</u>	<u>% of the mass</u>
10" or over	0
6" to 10"	20-50
4" to 6"	30-60
2" to 4"	30-40
1" to 2"	10-20
less than 1"	0-10

H. Geotextile Filter Fabric shall be a non-woven needle punched geotextile and meet the following requirements:

<u>Property</u>	<u>Test Method</u>	<u>Average Minimum Value</u>
Grab Strength	ASTM D 4632-91	110 pounds
Grab Elongation	ASTM D 4632-91	40-60%
Trap. Tear Strn.	ASTM D 4533-91	45 pounds
Puncture Resist.	ASTM D 4833-88	60 pounds
Permittivity	ASTM D 4491-92	120 gal.min/sf
Appar. Open Size	ASTM D 4752-93	60-120
U.V. Resistance	ASTM D 4351-84	70 (%Str. >500 Hrs)

I. Topsoil shall consist of suitable organic soil, free from ice and snow, clay, large stones, or debris conforming to the requirements of Division 2 of these specifications.

2.2 USE OF MATERIALS

A. On-site Fill shall consist of on-site, excavated fill and sand and is for use as backfill for the building and pavements, and where specified. These materials may be reused provided the soil is free of organic and other deleterious matter, materials and rocks larger than 6 inches are to be removed within 5 feet of subgrade and limited to less than 12" in size more than 5 feet below the subgrade or two-thirds the lift thickness, whichever is smaller.

On-site, excavated fill may not be used in areas sensitive to drainage and may need to be screened to segregate unsuitable materials.

B. Infield Soil—shall consist of imported soil and is for use for the filling of infield areas where specified.

C. Sand and Gravel

Use this material under the building concrete slab-on grade as a capillary moisture break. This material is also used for above and around subdrainage systems as outlined herein and for backfill against frost walls, retaining walls and foundation walls as outlined herein.

The Contractor may also choose to use this material as a working mat in wet areas and to expedite dewatering and pumping and as a bedding for utility pipes.

This material may also be used under footings or building concrete slab-on grade and slabs on grade. This material is also used for above and around subdrainage systems as outlined herein and for backfill against frost walls, cast-in-place concrete retaining walls and foundation wall as outlined herein. The Contractor may also choose to use this material as a working mat in wet areas and to expedite dewatering and pumping and as a bedding for water mains and services.

D. Suitable Native Material

Use this material for fill slopes, outside the building footprint and under pavements subgrades. Place fine sand and silty sand in the upper 2 to 4 feet or greater below pavement grade in 12 inch minimum lifts at moisture contents within 2 percent of optimum. Place clay and silt in 8-inch minimum lifts 6 feet or more below pavement grade at moisture contents within 6 percent of optimum.

E. Pavement Section Base Course (Processed Aggregate Base)

Use this material as a base course below parking lot of sidewalk areas.

F. Foundation Stone

Use this material for pipe bedding or as indicated on the Contract Drawings or ordered by Engineer.

G. Riprap

Use this material at culvert ends, within temporary sediment basins, at detention pipe spillways, inside ditches or channels, or along sloped embankments where indicated on the Contract Drawings.

H. Geotextile Filter Fabrics

Use these materials where indicated on the Contract Drawings.

I. Topsoil

Use topsoil for final grading of proposed playing field, areas where honeycombed grass paveres are to be placed, detention basins, and general grass areas.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- B. Identify required lines, levels, contours, and datum.
- C. Notify Owner in writing of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- D. Identify and flag known utility locations. Maintain and protect existing utilities to remain and which pass through the work areas.

- E. Verify fill material to be reused are acceptable.

3.2 PROTECTION OF WORK IN PROGRESS:

- A. It is the responsibility of the Contractor to protect all work in progress from damage due to extremes of cold, moisture, or drying, or mechanical damage from equipment traffic or foot traffic. Alert the Engineer to the presence or likelihood of conditions that may adversely affect the quality of the work, the physical structure of soils, or transport of site soils off-site.
- B. Do not work frozen soils.
- C. Protect soils from excessive moisture. During periods of prolonged precipitation, take aggressive steps to avoid over-saturation, erosion, or homogenization of soils by covering with protective plastic sheeting, collection and controlled dewatering, detention for sediment removal, and allowing excessively wetted soils to remain fallow until approved by the Engineer as appropriate for continued work.
- D. Apply supplemental moisture to overly dry soils.
- E. Do not operate heavy equipment near excavations where trench wall or cut-slope failure may result.

3.3 PROTECTION OF ADJACENT WORK

- A. Protect all adjacent structures which may be damaged by dewatering and excavation work, including service utilities and pipe chases. All damage caused by construction activities shall be repaired by the Contractor at no additional expense to the Owner.
- B. Grade excavations and fills to prevent surface water runoff into the work area or to adjacent properties.
- C. Protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, by the same.

3.4 EXCAVATION AND REMOVAL OF TOPSOIL AND MISCELLANEOUS FILL AND MISCELLANEOUS MATERIAL

- A. All topsoil, subsoil, unsuitable fill and miscellaneous materials (i.e. structures, foundations, pavements) shall be stripped to their entire depths within the footing bearing zones and below bottom of floor slab base course within building areas if applicable to this contract. All such unsuitable materials will be excavated below finish pavement grades within pavement areas until suitable natural soils are encountered. Materials suitable for reuse as determined by the Geotechnical Engineer shall be stored in designated locations that will not interfere with building operations. As previously specified, topsoil to be reused shall be free from clay, large stones and debris. All materials not suitable for reuse shall be legally disposed of off-site as specified elsewhere in the Contract Documents. Topsoil and Subsoil proposed in fills greater than 6 feet in height may remain in place, with the approval of the Geotechnical Engineer.

- B. The Contractor shall excavate all topsoil, unsuitable fill and any other unsuitable materials to firm natural ground below all spread footings and within the area as sloping downward and outward on a one horizontal to one vertical (1H:1V) line to firm natural ground or to five (5) feet beyond structure or building lines if applicable to this Contract, whichever is greater, or as required by the Geotechnical Engineer. Unsuitable material is herein classified as existing fill, topsoil, organic silt, peat, branches, logs, stumps, boulders, cobbles, existing structures (i.e. footings, foundations, floor slabs, pavements, abandoned utilities, etc.) and any trash, (i.e., snow, roots, sod, rubbish or other deleterious or organic matter).
- C. The Contractor shall excavate and remove topsoil, subsoil, miscellaneous unsuitable fill and any other unsuitable materials to 5-feet below specified finish pavement grades as indicated on the Contract Drawings then proof roll the subgrades in the manner specified below.
- D. Excavated topsoil, unusable boulders, unusable excavated rock and unsuitable materials shall be removed and stockpiled at a designated location or otherwise removed from the project at the Contractor's expense.
- E. Excavated rock consisting of on-site boulders and mechanically broken ledge shall be stockpiled on site for preparation of primary and secondary crushing, as necessary, for reuse at locations on site provided material gradations after any processing, screening and mixing operations meet those outlined in Section 2.01 herein. Alternatively, all excavated rock should be legally disposed of off-site.

3.4 SITE EXCAVATION

- A. All areas within the limits of work shall be excavated or filled with suitable material to the subgrade lines and elevations as shown on the plans and cross sections in accordance with these specifications

The Contractor shall not excavate below top of suitable in-place natural soil subgrades except for utility installation without the authorization of the Geotechnical Engineer. The Contractor shall follow a construction procedure which permits visual identification of firm natural ground.

Surplus material, if any, shall be disposed of off-site in a legal manner at the Contractor's expense.
- B. The Contractor shall follow a construction procedure which permits visual identification of natural subgrade soils.

In the event that groundwater is encountered, the Owner may require that the size of the open excavation be limited to that which can be handled by the Contractor's chosen method of dewatering and allow visual observation of the bottom and placement of all fill in the dry.
- C. If subgrade soils become loose and saturated, the Contractor shall be required to excavate such loose and saturated soils and replace them, at no additional cost to the Owner, with compacted sand-gravel fill in order to stabilize areas which may become disturbed due to surface runoff, construction disturbances by the Contractor, and subsurface seepage pressure and also to expedite pumping. Particular areas of concern are within new building areas and under all pavement areas.

- D. The Contractor may be required, if necessary to place 4" underdrains 50 feet on center, two or more feet below grade, in 3/4 inch crushed stone and filter fabric on top of the silt and clay natural ground, or, to place a twelve inch (12") to eighteen inch (18") layer of free-draining sand-gravel material over the natural underlying soil to stabilize areas which may become disturbed due to water seepage and to expedite drainage if requested by the Geotechnical Engineer or as indicated on the Contract Drawings.
- E. Prior to placement of the initial layer of fill over the natural ground, proofrolling of the exposed subgrades, if above the groundwater table, shall be performed as specified herein. This requirement may be waived by the Geotechnical Engineer based on actual conditions encountered.
- F. Protect all subgrade soils. Excavate subgrade soils which become disturbed, and backfill in accordance with specifications at Contractor's expense.
- G. Do not excavate to full depth when freezing temperatures may be expected unless subgrade is protected from freezing, or footings or slabs can be placed immediately after excavation is completed and are protected from freezing.
- H. Maintain safe and stable excavation walls in accordance with OSHA requirements.
- I. Excavate in a manner that will not disturb existing foundations to remain. Plans for excavating near existing remaining foundations shall be submitted to the Geotechnical Engineer for approval prior to beginning such excavation.
- J. Correct unauthorized excavation at no additional cost to the Owner.

3.5 TRENCH EXCAVATION

- A. Excavate for sewer, water, and drainage piping and other utilities at locations indicated on the Drawings. Dewater trenches to permit work to be performed in dry conditions. Over excavate and remove unsuitable material and replace and compact with foundation stone or material approved by the Geotechnical Engineer.
- B. Cut trenches sufficiently wide to enable installation and inspection of utilities. Cut trenches sufficiently wide to allow compaction of fills with a double-drum, walk-behind vibratory roller. Slope or shore trenches in accordance with OSHA standards.
- C. Support pipe and conduit during placement and compaction of bedding fill.
- D. Backfill trenches with specified material according to the specifications contained herein and the Contract Drawings to required contours and elevations.
- E. Place and compact fill materials in accordance with specifications contained hereinafter.
- F. Dispose of unsuitable materials, rock not to be used, etc. in a legal manner offsite.

3.6 PROOFROLLING

- A. Proofroll existing natural soil subgrade and fill subgrades within grass pavement areas prior to placement of fill in all grass pavement areas or installation of utilities, in two perpendicular directions. Proofrolling shall be accomplished with a minimum of 8 passes of a vibratory steel drum roller with a minimum static weight of 10,000 pounds. Any soft, weaving or deleterious areas shall be locally excavated and replaced with compacted

structural fill. This work shall be performed under the direct observation of the Geotechnical Engineer. The Geotechnical Engineer may elect to waive this work within wet areas, if excessive disturbance is being created.

- B. Existing fill materials which may potentially remain in place below grass pavement areas shall be proof rolled with minimum of 8 passes of a vibratory steel drum roller with a minimum static weight of 10,000 pounds. Loose soils identified during proofrolling shall be excavated and replaced with compacted structural fill in loose lifts not to exceed 9 inches thick.
- C. If the exposed subgrade is wet or otherwise susceptible to disturbance, the Geotechnical Engineer may waive proofrolling requirements.

3.7 SHORING, SHEETING AND BRACING

- A. Provide shoring, sheeting and/or bracing of excavations as required to assure complete safety against collapse of earth at side of excavations. Alternatively, lay back excavations to a stable slope.
- B. Excavations shall be adequately sheeted, shored and brace as necessary to permit proper execution of the work and to protect all slopes and earth banks until new building walls are cured and acceptable for backfill. Sheet piling shall be installed if required to prevent cave-ins or settlement and to protect workmen and utilities. Shoring and bracing may be removed as the backfilling progresses, but only when banks are safe against caving, taking all necessary precautions to prevent collapse of excavation sides. Bracing of all foundation walls during backfilling and compaction is the responsibility of the Contractor.
- C. Comply with OSHA and local safety regulations.
- D. Remove sheeting or shoring, etc. as backfilling operations progress, taking all necessary precautions to prevent collapse of excavation sides. Where sheeting is required to be left in place, as determined by the Geotechnical Engineer, in areas not indicated on Contract Drawings, additional payment will be made as provided under Unit Prices.
- E. Temporary bracing of all below-grade walls to eliminate movement during backfilling will be required except in cases where the walls have been integrated into the permanent superstructure and derive support there from. The design and proposed construction procedure for bracing systems shall be submitted to the Geotechnical Engineer for approval at least one week prior to commencing backfill operations.

3.8 PLACEMENT AND COMPACTION OF FILL

- A. All areas within the limits of work shall be filled or excavated and filled with suitable materials to the subgrade lines and elevations as shown on the plans as herein specified. The use of on-site materials shall be permitted only if such materials meet the respective requirements of the Section 2.01, MATERIALS section of these Specifications and only when authorized by the Geotechnical Engineer.

Off-site borrow material necessary to achieve design subgrades shall be provided at the Contractor's expense and shall also meet the requirements of the sub-part 2.01 section of these specifications. All fill materials, including existing suitable on-site materials and off-site borrow materials, shall be in conformance with the sub-part 2.01 section of these specifications.

- B. The Geotechnical Engineer must be allowed sufficient time to make necessary observations and tests. A minimum of four working days shall be required by the Geotechnical Engineer for performing laboratory compaction and sieve tests.

Forty-eight hours notice shall be given by the Contractor to the Geotechnical Engineer when field observations and tests are required.
- C. Grade and compact fill surface to readily shed water. Slope fill surfaces away from buildings a minimum of two inches in 10 feet, unless otherwise noted. Make grade changes gradual. Blend slope into level areas.
- D. Where horizontal layers meet a naturally rising slope exceeding 1 vertical to 5 horizontal, key layer into slope by benching into the slope with minimum 4 foot high vertical steps.
- E. At completion of work, leave site completely free of excess fill materials.
- F. The degree of compaction shall be based on a maximum dry density as determined by ASTM D-1557. Compaction of silt and clays and of fine sand and silty sand shall be per materials at moisture contents within the percentages of acceptable optimum moisture contents. The degree of compaction for fill placed in various areas shall be as follows:

<u>Areas</u>	<u>Maximum Degree of Compaction</u>
1. Controlled On-Site Fill	92%
2. Subgrade Soils on Playing Field	92%
3. Grass Pavement base courses	92%
4. Trench backfill outside of building and pavement areas	92%
5. Trench backfill inside of building and beneath pavement	95%
6. All fill outside and pavement bearing zones	92%
7. All fill in slope areas at or steeper than 10 Horiz. to 1 Vert.	92%
8. Free Draining Sand and Gravel fill around subdrains	Tamp into place with fill around subdrains with hand operated flat plate vibratory compactor to 95%
9. General Landscaping Areas	90%

- H. After all excavation has been completed, unless indicating otherwise herein, all new fill materials shall be deposited in loose lift thickness not exceeding twelve (12) inches in

depth over the areas to be filled. In exceptional cases, the Geotechnical Engineer may permit the first layer to be thicker than twelve (12) inches.

The entire area of each layer shall be compacted with the specified equipment to the specified degree as outlined herein. No subsequent layer shall be deposited until the specified compaction is achieved for the previous layer. If necessary to obtain the required compaction due to fill becoming too dry, water shall be added if authorized by the Geotechnical Engineer.

Compacted fills shall be prevented from freezing by use of approved admixtures or by use of approved protection on the surface, or both.

- I. Excavated material containing rock or stone greater than 6" in largest dimension is unacceptable as fill to within 24 inches of subgrade elevation in the proposed building and paving area.

Rock or stone less than 6" in largest dimension is acceptable as fill to within 24" of surface of proposed subgrade when mixed with suitable material.

Rock or stone less than 2" in largest dimension and mixed with suitable material is acceptable as fill within the upper 2' of proposed subgrade.

- J. Procedures

- 1. Protect both fill and cut areas by grading surface topography to promote drainage away from these areas and by providing smooth surfaces which readily shed water.

To the extent that it is practicable, each layer of fill shall be compacted to the specified density the same day it is placed.

- 2. Fill that is too wet for proper compaction shall be diced, harrowed, or otherwise dried to a proper moisture content for compaction to the required density. If the fill material cannot be dried within forty-eight (48) hours of placement, it shall be removed and replaced with drier fill.

New fill shall have a moisture content which is within 5% of the optimum moisture content per ASTM D-1557 for Clay and Silt placed greater than 6 feet below pavement or embankment grades. (Within 3% of the optimum moisture content within the top six feet below building and pavement subgrades).

3.9 PLACEMENT OF INFIELD SOIL MIX

- A. Place a minimum of 6" of infield soil mix evenly in established new infield area. Compact the entire infield area to 92% density by mechanically dragging and rolling, as required. The infield shall be graded slightly following the established grades of the entire ball field area, or as shown on the grading plan, to allow drainage off of the infield surface.
- B. Meet existing surfaces and grades of the surrounding areas. The finished infield surface shall be true to the existing grades or grades as shown on the plans with no bumps, ridges, potholes, or gullies. Match grades flush with the top of the concrete mow strips and slabs located under backstops, wing fences and dugouts if they exist.

3.10 FILL PLACEMENT IN TRENCHES

- A. As soon as practicable after the pipe has been placed and the pipe joints made in accordance with the appropriate Sections(s) of the Specification, and the pipe has been inspected and approved by the Geotechnical Engineer, backfilling shall be performed. The Contractor shall be held responsible for the satisfactory execution of pipe line construction. If subsequent testing shows defects in materials or workmanship, the necessary repairs and replacements shall be made by the Contractor at his own expense to the satisfaction of the Geotechnical Engineer
- B. Bedding shall be as specified for the particular type of pipe installation and as shown on the Drawings. Backfill shall be placed simultaneously on either side of the pipe alignment. In placing material, care shall be taken that stones do not strike the pipe.
- C. For applications requiring crushed stone bedding, the bedding shall be placed to the spring line of the pipe and so shaped that the pipe shall be firmly supported across its diameter for the full length of the barrel. Particular care shall be taken to provide recesses in the bedding or trench bottom, as required, to relieve each bell of any load.
- D. Placement of bedding shall be done manually by persons skilled in this operation and shall precede the laying of pipe by no more than a few feet.
- E. From the bottom of the pipe in the trench to a minimum of 12 inches above the pipe crown, the trench shall be backfilled by placing and packing the specified materials by hand shovel. The filling shall be carried up evenly on both sides of the pipe, care being taken not to raise or otherwise dislodge the pipe. Backfill to this depth shall be thoroughly compacted with approved hand-operated devices.
- F. No stone or rock fragment greater than 3 inches shall be placed into the trench. Large masses of backfilling materials shall not be dropped into the tamped layers of backfill until at least one foot of backfill has been placed over the top of the pipe. Backfilling shall be placed in 9-inch maximum loose lifts.

No compaction shall be done when the material is too wet to be compacted properly; at such times, the compaction work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions shall be taken as may be necessary to obtain proper compaction. Water jetting or flooding to attain compaction is not permitted.
- G. An independent testing laboratory shall perform compaction test at intervals not exceeding 200'-0" of trench for the first and every other nine-inch (9") lift of compacted trench backfill and furnish copies of test results as specified.

3.11 REUSE OF EXCAVATED MATERIALS

- A. Inorganic on-site soils (i.e. glacial till and portions of existing fill materials) and broken rock which are excavated during site grading and installation of utilities may be reused as fill materials providing that the excavated materials meet the requirements of sub-part 2.01 of these specifications. Rock which is excavated and/or mechanically broken during site grading and installation of utilities may be reused as fill materials providing that the excavated materials meet the requirements of these specifications. To the extent possible, mechanically broken rock may be used without crushing, provided that the

specifications included herein are met to the satisfaction of the Geotechnical Engineer. Mechanically broken rock which cannot substantially satisfy those gradation requirements specified herein will require crushing or screening.

3.12 DEWATERING

A. General

1. This section specifies the designing, furnishing, installing, maintaining, operating and removing of a complete temporary dewatering system as required to lower and control water levels, hydrostatic pressures during construction; disposing of pumped water; construction, maintaining, observing and, except where indicated or required to remain in place, removing or filling of dewatering tubing and observation well; and instrumentation for control of the system.
2. The Contractor shall provide, at his own expense, adequate pumping and drainage facilities to keep the excavate areas sufficiently dry from groundwater and/or surface runoff so as not to adversely affect construction procedures or cause excessive disturbance of underlying natural ground. The drainage of all water resulting from pumping shall be arranged so as not to cause damage to adjacent property. All requirements of local environmental or conservation authorities shall be satisfied with respect to discharge of pumped water.
3. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from the slopes or bottom of the excavation, thereby decreasing the stability of excavated slopes, causing loss of material from beneath the slopes or bottom of the excavation and hauling characteristics of soil, and/or causing rupture or heaving of the bottom of an excavation.

B. Design Criteria

1. Design of dewatering system which will:
 - a) Develop a substantially dry and workable subgrade for the execution of subsequent operations;
 - b) Cause no damage due to the loss of ground from incompletely drained soils or removal of soil particles in the discharge.
2. Relocate dewatering procedures which cause, or threaten to cause, damage to new or existing facilities. These modifications will be at no additional expense to the Owner.

Modify dewatering procedures which cause, or threaten to cause, damage to new or existing facilities. These modifications will be at no additional expense to the Owner.
3. Maintain the artificially lowered groundwater table at least 2 feet below the proposed excavation levels.

C. Job Conditions

1. The Contractor shall repair damage, disruption or interference to existing properties, buildings, structures, utilities and other work resulting directly or

indirectly from operations conducted under this contract, loss of ground due to incompletely drained soils, or removal of soil particles in discharge from the dewatering operations, to the Engineer's satisfaction at no cost to the Owner.

2. Provide means for sampling dewatering system discharge so that water quality can be determined on a routine basis.
3. All dewatering tubing to be left in-place below building areas shall be pressure grouted with neat cement to prevent long-term loss of soil fines into the tubing with subsequent potential for advanced structure settlements.

D. Execution

1. Surface Drainage

- a) Intercept and divert surface drainage away from the excavations and observation wells.
- b) Design surface drainage systems so that they do not cause erosion on or off the site or cause unwanted flow of water.
- c) Remove the surface drainage system when no longer required.
- d) Remove debris and restore the site or sites to original conditions.
- e) Surface drainage may be discharged into storm sewers provided that any necessary permits are obtained by the Contractor.

2. Drainage of Excavated Area

- a) Collect surface water and seepage which may enter the excavation, and divert the water into a sump so that it can be drained or pumped away from the work area.
- b) Install settling basins or other approved apparatus as required to reduce the amount of soil fine particles which may be carried by water diverted or pumped during construction.

Dispose of water in a manner approved by the Owner and Geotechnical Engineer.
- c) Backfill sumps and settling basins when no longer required with structural fill material, concrete or other material as approved by the Geotechnical Engineer.

3. Dewatering of Subsurface Water

- a) Dispose of subsurface water collected in a manner approved by the Owner and Geotechnical Engineer in work areas.
- b) Maintain continuous and complete effectiveness of the installation at all times.

- c) Maintain water levels at such elevations that no damage to the structure can occur because of excessive or deficient hydrostatic pressure.

3.13 RIPRAP PLACEMENT

Riprap placement area shall be accurately shaped prior to placing of any bedding material or riprap.

The riprap shall be machine placed to its full course thickness in one operation in such a manner as to produce a reasonably well-graded mass of rock without causing displacement of the underlying material. The finished surface shall be free from pockets of small stones and clusters of larger stones. Placing this material by methods likely to cause segregation of the various sizes of stone will not be permitted. Rearranging of individual stones by mechanical or hand methods will be required to the extent necessary to obtain a reasonably well-graded distribution of the specified stone sizes. The completed course shall be of the specified thickness and to the lines and grades as shown on the plans or as ordered by the Engineer.

Where machine placed riprap is called for, the riprap shall be installed and interlocked by machine, and by manual burring, wedging, etc. to produce a level plane exposed top. Dumping and spreading will not be permitted as a finished product. Install small pieces in voids to aid in interlocking of larger riprap stones.

3.14 GRASS PAVEMENT BASE

- A. Base preparation shall be carefully shaped to the required cross section and compacted as follows:

The entire area of each layer of the embankment and the subgrade in the excavated areas shall be uniformly compacted to at least the required minimum density by use of compaction equipment consisting of rollers, compactors or a combination thereof. Earth-moving and other equipment not specifically manufactured for compaction purposes shall not be considered as compaction equipment. Compact each lift by a minimum of six passes of a Bomag 210 vibratory roller or equivalent vibratory roller.

- B. The dry density after compaction shall not be less than 95 percent of the dry density for that soil when tested in accordance with ASTM D-1557 (Modified Proctor).
- C. Where underdrains and outlets are specified on the plans or ordered by the Engineer, they shall be in place and functioning before any subbase material is placed.
- D. Spread subbase material uniformly upon the required grade, in courses not to exceed 6 inches in thickness after final compaction. However, if the required thickness of subbase does not exceed 8 inches, it may be placed in one course.
- E. Compact after each course has been placed as specified above; its entire area shall be compacted with equipment specifically manufactured for that purpose. The sole use of hauling and spreading equipment shall not be considered as a substitute for compacting equipment.

Exception to the use of compacting equipment shall be allowed where subbase is made of gravel and used in conjunction with a traffic bound gravel surface in which case the work shall be as follows:

- F. Spreading shall begin at the end of the project nearest the source of supply of the material in such a way that, as the work progresses, the material is trucked over that already in place so as to obtain as much compaction as possible during construction. No other compaction of the material will be required.

Should the foundation material beneath any subbase become churned up and mixed with subbase at any time, the Contractor shall, without additional compensation, remove the mixture and replace it with new subbase material to the required thickness shown on the plans or as previously required by the Engineer. Such replaced subbase material shall be compacted to the required minimum density placed upon the prepared subbase to a depth which will not be less than the required depth after compaction. The subbase shall be true to line and grade a minimum of 200 feet in advance of the work.

Maximum thickness of the course shall not exceed four (4) inches prior to compaction unless permitted by the Engineer.

- G. Processed aggregate base preparation shall be uniformly placed upon the prepared subbase to a depth which will not be less than the required depth after compaction. The subbase shall be true to line and grade a minimum of 200 feet in advance of the work.

Maximum thickness of the course shall not exceed four (4) inches prior to compaction unless permitted by the Engineer.

- H. The bottom course shall be spread uniformly upon the prepared subbase. Only approved spreaders or stone boxes shall be used. Power graders shall not be used unless otherwise permitted by the Engineer.

After the aggregate is spread, it shall be thoroughly compacted and bound use of equipment specifically manufactured for that purpose. Rollers shall deliver a ground pressure of not less than 300 pounds per linear inch of contact width and shall weigh not less than 10 tons. Vibratory units shall have a static weight of not less than 4 tons. Water may be used during the compaction and binding operation. Water shall be applied from an approved watering device. The direction and intensity of the stream shall be as ordered by the Engineer. The compacting and binding operation shall begin at the outside edges, overlapping the shoulders for a distance of not less than 6 inches and progress towards the middle, parallel with the centerline of the pavement. The work shall cover the entire surface of the course with uniform overlapping of each preceding track or pass. Areas of super-elevation and special cross slope shall be compacted by beginning at the lowest edge and proceeding towards the higher edge, unless otherwise directed by the Engineer. The compacting and binding operation shall be continued until the voids in the aggregates have been reduced to provide a firm and uniform surface satisfactory to the Engineer. The amount of compactive effort shall be as directed by the Engineer, but in no case shall be less than four (4) complete passes of the compacting equipment being used. Any surface fines shall be distributed uniformly by use of brooms during the compacting and binding operations. All aggregate shall be completely compacted and bound at the end of each day's work or when traffic is to be permitted to operate on the road.

- I. Construction methods for the top course shall be the same as described for the bottom course. Construction of the top course shall not commence until the bottom course has been approved by the Engineer and accepted. Final total thickness of the two courses shall equal the thickness as specified on the plans.

Any soft yielding or irregular areas which develop during or after work on either course shall be removed and replaced with suitable aggregate as required. The area shall then be

rebound and recompact until it is brought to a uniform surface to match the adjacent base all as approved by the Engineer.

3.15 GRADING AND ELEVATIONS

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades. Finish surfaces shall be free from irregular surface changes.
 - 1. Grassed areas: Finished areas scheduled to receive topsoil to within not more than 1" above or below the required subgrade elevations.
 - 2. Grassed Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1" above or below the required subgrade elevation.
 - 3. Grass Pavements: Shape surface areas under pavement to line, grade and cross-section, with finish surface not more than 1" above or below the required subgrade elevation.
- B. The Drawings indicate, in general, the alignment and finished grade elevations of site structures, the Owner's representative, however, may make such adjustments in grades and alignment as are found necessary in order to avoid interference and other special conditions encountered. Grading between indicated final grades shall provide smooth, even surfaces, except as otherwise required. Minimum cover over pipes shall, in any case, conform to requirements of local and state agencies having jurisdiction.
- C. Modify dewatering procedures which cause, or threaten to cause, damage to new or existing facilities. These modifications will be at no additional expense to the Owner.
- D. Maintain the artificially lowered groundwater table at least 2 feet below the proposed excavation levels.

3.16 REMOVAL OF SURPLUS MATERIALS

- A. Remove all surplus earth, boulders, and rock materials including unsuitable miscellaneous fill materials and building debris, not needed to complete filling and grading to an approved area off-site and outside of the work limits. No on-site area shall be approved by the Owner. All surplus materials removed off-site and outside of the work limits shall become the property of the Contractor. Costs for transportation and disposal of surplus on-site and off-site materials shall be included in the Contractor's Lump Sum Bid Price.

3.17 FIELD QUALITY CONTROL

- A. Provide for observation by the Geotechnical Engineer of bottom excavation and of bearing surfaces.
- B. Testing and analysis of fill materials will be performed in accordance with ASTM D-422, D-1140 and D-1557.

- C. In-place compaction testing will be performed in accordance with ASTM D-1556, D-2167 or ASTM D-5195.
- D. If tests indicate work does not meet specified requirements, remove work or recompact where appropriate, replace and retest at no cost to Owner.

3.18 PROTECTION

- A. Protect excavations to prevent cave-in or loose soil or debris from falling into excavation. Observe OSHA standards for trenching and excavation.
- B. Protect bottom of excavation and soil adjacent to and beneath foundations from freezing. Do not place fill over frozen soil.
- C. Recompact fills subjected to vehicular traffic or other disturbances.

END OF SECTION 02200