

Specification for TerraSeeding™

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1.0 SCOPE

This specification covers the requirements for the application of Terraseeding™. Terraseeding™ is the calibrated incorporation of seed into BioEarth (a composted soil mixture) by a pneumatic Blower Truck provided by Hermanns Contracting Limited, Schomberg, Ontario 905 939-1230. Contractor must have minimum ten (10) years proven experience with a successful track record of over 1000 projects in the application of Terraseeding™ using a Blower Truck as described in **Section 3.01 Pneumatic Blower Truck** of this specification.

2.0 MATERIALS

2.01 Seed

2.01.01 Grade Standards

All seed, supplied either as single seed species, or as a seed mix shall comply with the provisions of the Canada Seeds Act and Regulations with the grade standards for that particular seed kind.

2.01.02 Seed Analysis Certificate

A legible, valid Seed Analysis Certificate from a Seed Testing Laboratory approved by the Canadian Food Inspection Agency (CFIA) for all single seed species and all seed mixtures shall be provided to the Contract Administrator 24 hours prior to any seeding operations. The Seed Analysis Report shall stipulate the seed supplier's lot designation numbers.

Test results from the Seed Analysis Certificate shall specify germination and purity for each seed species of the mix as well as the seed mix composition expressed as a percentage of each seed species by mass for each seed mix specified in the contract. Test results shall meet or exceed the value for the various seed mixes as specified by the consultant.

2.01.03 Seed Packaging, Labeling and Storage

All seed and seed mixes shall be in the original sealed package with the original legible label securely attached.

Labeling shall conform to the requirements of the Canada Seeds Act and Regulations. Each package shall be labeled to show:

- a) The name and address of the seed supplier.
- b) The seed species or the name of the seed mix and the various individual seed species that comprise the seed mix and the percentage by mass.
- c) The grade of the seed or seed mix.
- d) The supplier's lot designation number, corresponding to the Seed Analysis Certificate.
- e) Mass in kilograms.
- f) The inoculant type, strain and expiry date (only required for seed mixes containing Crown Vetch or Birdsfoot Trefoil).

All seed and inoculant shall be stored in cool, dry location until use.

2.02 Permanent Seed Mixes

Permanent seed mixes as per consultant.

2.03 Annual Nurse Crop Seed

Nurse crop seed shall be a cereal grain such as Annual Ryegrass, Fall Rye Grain or Winter Wheat Grain unless otherwise approved by the Contract Administrator.

2.04 BioEarth™

BioEarth™ shall consist of a blend of composted organics, leaf compost and pine bark fines and shall be pre-mixed and consist of a minimum 60% compost material. Leaf compost shall be added to improve physical, chemical, and biological properties of the soil. Pine bark fines shall be added to adjust the pH of the soil and make the product lighter and easier to blow. Amendments shall be added at the discretion of the Contractor to ensure that the BioEarth™ meets the material specification and is suited for distribution by a pneumatic blower.

Once mixed, the BioEarth™ material shall consist of particles where 100% of the material is able to pass through a 25 mm sieve.

2.05 Compost

Compost shall be derived from well-composted green organic waste matter. All compost material shall meet the Ontario Ministry of the Environment's Interim Guidelines for the Production and Use of Aerobic Compost in Ontario definition for Type A compost and shall be supplied from composting sites certified to meet the Ontario Ministry of the Environment's Compost Regulation 101.

2.06 Pine Bark Fines

Pine bark fines shall be 98 percent pine trees with less than 10 percent pine wood fiber and sawdust content. Shredded particles shall not exceed 20 mm in size.

2.07 Water

Water shall be free of any contaminants or impurities that would adversely affect the germination and growth of vegetation.

3.0 EQUIPMENT

3.01 Pneumatic Blower Truck

The pneumatic blower truck shall be a custom manufactured, fully integrated, truck-mounted unit. The blower truck shall be equipped with a computer-calibrated seed injection system and shall be capable of uniformly applying BioEarth™ and seed at a rate greater than 0.25 cubic meters of material per minute. The blower truck shall also be equipped with an application hose capable of extended 90 meters from the blower truck unit.

4.0 CONSTRUCTION

4.01 Operational Constraints.

The BioEarth™ and seeding operation shall not commence until a legible, valid Seed Analysis Certificate and a legible, valid signed declaration from the compost supplier have been provided to the Contract Administrator.

The BioEarth™ and seeding operation shall not commence until the Contract Administrator has approved the surface preparation and the layout of permanent seed mixes.

The BioEarth™ and seeding application and/or re-application shall not be carried out under adverse field conditions such as high wind, frozen soil or soil covered with snow, ice or in areas of standing water or a concentrated flow of water.

The Contractor shall maintain the site and control erosion until conditions permit application or re-application of seed and BioEarth™.

The surface to be seeded shall be prepared not more than 7 calendar days before the seeding operation. No seeding or BioEarth™ application shall come in contact with the foliage of any trees, shrubs, or other vegetation. No seed or BioEarth™ application shall come in contact with waterbodies.

4.02 Surface Preparation for BioEarth™ and Seeding

At the time of seeding, all surface areas designated for seeding shall be free of erosion and shall have a fine graded uniform surface. The surface shall be uniformly cultivated with agricultural implements to a minimum depth of 50 mm and shall not have surface stones greater than 50 mm in diameter, weeds or other unwanted vegetation. Soil to be loose, friable and suitable as a seed bed to germinate seed.

4.03 Layout

The locations of the different, permanent seed mixes and BioEarth™ shall be staked out on the ground surface in accordance with the contract drawings. Stakes shall be used to indicate the limits of each type of seed mix.

4.04 BioEarth™ and Seeding

4.04.01 Application Rates for BioEarth™

Depending on slope gradation, depth of BioEarth™ with seed shall be as follows:

- 0-5% slope: 25 mm. depth
- 5-10% slope: 25 mm. depth
- 10-25% slope: (4:1 slope) 25 mm. depth
- 25-35% slope: (3:1 slope) 25 mm. depth
- 35-45% slope: (2:1 slope) 50 mm. depth

On areas with a slope of 1:2 or less, the EcoBlanket® shall be uniformly applied directly at the soil surface with a pneumatic blower as specified by Hermanns Contracting Limited. EcoBlanket® shall be applied at a depth of 50 mm and approximately 1 m over the top of the slope, or overlap it into existing vegetation.

In extreme conditions and where specified by the Engineer, an EcoBerm® as specified by Hermanns Contracting Ltd. shall be added to the top of the slope parallel to the top of the slope and/or around the perimeter of affected areas with slopes of 1H:3V or less.

4.04.02 BioEarth™ and Seed Application

Prior to the application of the BioEarth™ and seeding, the Contractor shall ensure that the pneumatic blower has been properly calibrated to provide the specified amounts of seed and that the blower can adequately uniformly apply composted topsoil and seed at a rate greater than 0.25 cubic meters of material per minute.

Once the blower has been calibrated, the Contractor shall apply BioEarth™ and seeding uniformly at specified depths to all areas identified for cover in the contract drawings or as directed by the Contract Administrator.

BioEarth™ and seed shall overlap the adjoining ground cover by 300 mm.

4.04.03 Clean-up

At the completion of the seeding and cover operation, materials applied to areas or objects other than those designated to grow grass shall be removed. Clean water shall be used to immediately wash seed or cover materials that have been applied to the foliage of trees, shrubs or other susceptible plant growth.

5.0 QUALITY ASSURANCE

5.01 Performance Measure

All BioEarth™ and seeded areas will be inspected by the Contract Administrator to ensure compliance with this specification at thirty, sixty and ninety day periods following the BioEarth™ and seeding operation.

At the thirty day inspection within the seeded earth area;

- the BioEarth™ shall be visually intact and shall form a uniform cohesive mat;

- germination of the nurse crop shall be visually evident.

At the sixty day inspection within the seeded earth area;

- the nurse crop shall be evident at mature height in an evenly dispersed, uniform cover;
- germination of the specified, permanent seed species shall be visually evident in an evenly dispersed uniform cover;
- there shall not be any significant bare areas, both in terms of quantity and size;
- non-seeded, non-specified vegetation shall not exceed 20% of the seeded earth area.

At the ninety day inspection within the seeded earth area;

- the permanent seed species shall be at an average height of 50mm in an evenly dispersed, uniform cover; representative of the specified, permanent seed mixes;
- there shall not be any significant bare areas, both in terms of quantity and size;
- non-seeded, non-specified vegetation shall not exceed 20% of the seeded earth area.

No inspections will be held during the winter dormant period or when site conditions prohibit a visual field inspection. The timing intervals between inspections will be suspended during the winter dormant period.

5.02 Failure to Meet Performance Measure

If the completed work does not meet the Performance Measure after the thirty-day inspection, the Contract Administrator shall document the failure areas, notify the Contractor of those areas, and re-inspect at the sixty day inspection.

If the completed work does not meet the Performance Measure after the sixty or ninety day inspection, the Contract Administrator shall notify the Contractor in writing and the Contractor shall re-apply the specified materials in accordance with this specification within 14 calendar days of receiving the notification.

The Contractor shall maintain the site and control erosion until conditions permit application or re-application of and BioEarth™ and seed.

All replaced BioEarth™ and seed shall be subject to the Quality Assurance section of this specification.

5.03 Dispute Resolution

Dispute resolution only applies to the germination and growth of the permanent seed mix species.

Disputes arising from the Performance Measure evaluation shall be settled through referee testing using an actual live seedling count of the specified permanent seed mix species within the seeded earth area.

An independent consultant with experience in herbaceous plant identification shall perform the referee testing. Both parties shall agree on the selection of the independent consultant and both parties shall be bound by the consultant's evaluation

The actual count shall be based on minimum germination requirements and minimum levels of acceptability to meet industry standards and federal legislation governing the testing, inspection, quality and sale of seed.

The various seed mixes specified by the Owner are comprised of different individual commercial seed species expressed as a percentage of the overall seed mix by weight. Industry standards list the number of seeds per unit of weight. For this specification, the mid-range number for each seed species shall be used based on these industry standards. Where there is a difference in estimated number of seeds by weight, the lower figure shall be used.

The Canada Seeds Act requires a minimum germination rate of 70% for each seed species to be registered and labeled. While several seed species require higher levels of germination, this specification has adopted 70% as the acceptable minimum and has allowed a further 25% reduction to account for variation in seeding application, seedbed quality, seedbed preparation and area cover.

The Contractor and the Owner may agree to use a simplified analysis, where instead of counting each seedling of each individual seeded perennial species of the mix, only the total number of seedlings of the mix is counted. If the parties cannot agree to the simplified analysis, the default method is a seedling count of each seeded perennial species.

The field inspection to determine the number of live plant seedlings should only be performed after the ninety-day inspection. Many of the perennial plants in the various seed mixes take several months to grow to an identifiable and measurable size.

The sampling procedure should be randomized over an area that both parties agree is representative of the seeded contract. The selection and evaluation process is as follows:

1. Select a representative area from the average seeded areas, eliminating the thinnest and thickest growth areas from the analysis.
2. Measure its length and depth. Use a random numbers table to generate five sets of X and Y axis coordinates from the area.
3. Each axis coordinate is a sampling point. A sampling plot, or quadrat, is set out in a 200 mm by 1000 mm plot with the axis coordinate becoming the lower right-hand corner of each quadrat.
4. Each quadrat is divided into 20 sub-sampling units, each being 100 mm by 100 mm.
5. The sub-sampling units are numbered from 1 to 20.
6. Using a random numbers table, two of the twenty sub-sampling units are randomly selected.
7. Live seedlings of each individual seeded perennial species of the mix are counted in the selected sub-sampling units to determine actual plant densities.
8. An average seedling density per seeded perennial species, expressed as the number of seedlings per square meter is generated for each sampling plot, or quadrat, based on the data from the two selected sub-sampling units.
9. The procedure is repeated for the four other sampling points.
10. The average number of seedlings per square meter for each of the seeded perennial species generated from the five sampling points is evaluated against the minimum industry standard benchmark for the seeded mix.

The results of the referee testing analysis will be binding on both parties, subject to further dispute mechanisms as described in the General Conditions of the contract.

If the results of the referee testing prove that the seed and cover is unacceptable in meeting the minimum industry standard for germination, then the Contractor shall pay all costs associated with dispute resolution process.

If the results of the referee testing prove that the seed and cover is acceptable in meeting the minimum industry standard for germination, then the Owner shall pay all costs associated with the dispute resolution process.

6.0 MEASUREMENT FOR PAYMENT

6.01 BioEarth™ and Seed

The work outlined in this Section for Terraseeding™ and EcoBlanket® will be measured and paid for at the unit price per square metre measured along the contours of the ground. Where EcoBerm® shall be applied, work shall be measured in place and paid for at the price per linear metre. Payment shall be in full compensation for all the labour, equipment and materials to complete the work.

7.0 BASIS OF PAYMENT

7.01 BioEarth™ and Seed

Payment at the contract price for the above tender items shall be full compensation for all the labour, equipment and material to do the work.