

THE INDUSTRIAL LANDSCAPE -

FORGOTTEN BY THE LANDSCAPE ARCHITECT?

SUMMARY OF SEMINAR APRIL 1978

Robin Gardner

Plant Science 516

Professor: Dr. John Neill.

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PROBLEM DEFINED

Quotation from *New Lives - New Landscapes*, Fairbrother, 1970.

"In the last two centuries, we have produced a large variety of new land uses which have one thing in common; they seldom create valid new landscape - in time industry may achieve its own landscape identity, but at present, it is little more than descriptive of the old patterns".

Brief History - Pre Mid-18th Century

Growth from rural economy to industrial economy.

Early growth related to supply of raw materials, power and appropriate climate for textiles.

Gradual change from water to fossil fuel.

Advent of company towns.

Canals - a principal mode of transportation.

Post-Mid-18th Century

The advent of rail transportation.

Coal mining and emphasis on steam power.

Change from rural to urban living.

Industrial slums.

Rapid population growth.

Turn of the century and advent of heavy industry.

1914 and industrial production for the war machine.

Increasing population and recession of the late 20's.

Recovery and World War II

Heavy industry and advanced technologies.

The growth of light industry, plastics and manufacturing.

Mid-50's industrial sprawl - demand for industrial land.

The advent of industrial parks.

Environmental concerns.

Planning legislation and restrictive zoning.

Land use contracts and specific landscape requirements.

CLASSIFICATION OF INDUSTRY

- I. Office and Commercial
- II. Factory in Urban Setting
- III. Factory in Rural Setting
- IV. Ancillary Uses, e.g. cooling ponds, storage, etc.
- V. Special Types, e.g. power stations, reservoirs
- VI. Extractive Industries
- VII. Other Classifications - often along the lines of the following:
 - i) Primary - tends to be rural and extractive.
 - ii) Heavy Secondary - for example steel, aluminum and concrete production.
 - iii) Secondary manufacturing.
 - iv) Light industry as in light assembly, construction, distribution, service, utilities and transportation.

INDUSTRY BY IMPACT

The following is a sample list of different industries, illustrating progressively social and environmental impact on the landscape:

- i) Commercial and office
- ii) Research and development facilities
- iii) Warehouse, transport and distribution

- iv) Building and construction - secondary manufacturing in urban areas
 - secondary manufacturing in rural areas
 - secondary manufacturing with specific effects (as with toxic effluents)
- v) Heavy Secondary industry
- vi) Utilities and power production
- vii) Extractive industries

This seminar is primarily concerned with Industrial Impacts up to the level of secondary manufacturing. It would therefore seem useful to look briefly at both problems and solutions at each level of industry.

A. Commercial

Problems:

- (i) Separate areas cause bedroom-cities and aging downtown areas
- (ii) Impose intensive but short use green space needs in the central core
- (iii) Creates density dependent-problems
- (iv) Entrenches rigid boundaries in the central core
- (v) Produces high land values
- (vi) Produces car parking problems
- (vii) Creates overloaded streets and transport problems.

Solutions:

- (i) Decentralization
- (ii) Set-backs for light
- (iii) Height restrictions
- (iv) Underground parking
- (v) Pedestrian Precincts
- (vi) Court yards

Solutions (cont'd)

- (vii) Vest-Pocket parks
- (viii) Open arcades on ground floors
- (ix) Roof gardens

It is possibly best to avoid naked open spaces and conversely over-planted areas.

B. Research and Development:

Problems:

- (i) Safety
- (ii) Need for facilities to be grouped
- (iii) Climatic and noise requirements
- (iv) Security
- (v) Family requirements in rural areas

Solutions:

- (i) Shelter belts
- (ii) Mix of commercial/residential closeby and purpose built
- (iii) Research parks integrated with light industry
- (iv) High level of design and maintenance

C. Warehousing:

Problems:

- (i) Delivery, storage and distribution
- (ii) Building design - scale and bulk
- (iii) Transient staff
- (iv) Large vehicle roads
- (v) Parking
- (vi) Litter

C. Solutions:

- (i) Sensitive design
- (ii) Professional expertise in designing landscaping as an integral part of the facility.
- (iii) Municipal regulations
- (iv) High level of maintenance

D. Transport and Distribution:

Problems:

- (i) Heavy dependence on road haulage
- (ii) Conflicts with commuters
- (iii) Inadequate provision at rail terminals, docks and airports
- (iv) Structural damage to roads, buildings and memorials
- (v) Air pollution

Solutions:

- (i) Truck routes
- (ii) Strict zoning
- (iii) Sensitive site design
- (iv) Sensitive highway location

E. Construction Industry :

(a) Production Sites:

Problems:

- (i) Gravel Pits
- (ii) Concrete Mixing
- (iii) Tar Making
- (iv) Storage
- (v) Industry nomadic
- (vi) Transient effects of noise, dust, inconvenience, untidy appearance of facilities and visual impact.

- E. Solutions:
- (i) Tight regulations
 - (ii) Tight zoning
 - (iii) Relocation of undesirable industry
 - (iv) Tax penalties

(b) Construction Sites:

Problems:

- (i) Road widening
- (ii) Soil compaction
- (iii) Damage to plant material
- (iv) Littering
- (v) Spills of waste oil

Solutions:

- (i) Regulations
- (ii) Sensitive job schedules
- (iii) Impact reports
- (iv) Job site protection
- (v) Regulatory body supervision
- (vi) Worker information and education

F. Secondary Industry: Manufacturing in Urban Areas

Problems:

- (i) Factory sprawl
- (ii) Single storey buildings
- (iii) Yards, circulation areas and stocking space
- (iv) Chainlink fencing
- (v) Noise, dust and smoke
- (vi) Traffic congestion

F. Solutions:

- (i) Zoning
- (ii) Siting
- (iii) Sensitive design
- (iv) Pollution abatement

THE GROWTH OF INDUSTRIES AND THE INDUSTRIAL PARK SOLUTION

There has been a continuous growth of industry with market impact on the environment.

The rate of these impacts is characterized by:

- (i) Increase in scale and size
- (ii) Spread
- (iii) Attract second-rate dependent industries
- (iv) A widening search for raw materials, particularly coal, iron and steel, copper ore, aluminum, sand and gravel, clay, and refining facilities associated with the petroleum industry.
- (v) Construction of transportation corridors
- (vi) Increase in energy needs.

A number of solutions have been offered to this problem. Designated industrial zones is the commonest approach. In particular the industrial park, at least for all but heavy industry, has been proposed as a suitable solution. It can be developed with economical servicing and prevent conflict with residential areas. The following are important considerations:

- (i) Avoid flat sites, monotony, single architect concepts
- (ii) Start at least with 100 acres with sufficient growth for three to five times that
- (iii) Avoid unbroken and extensive developments with no fabric, amenities, recreation facilities.
- (iv) Communications must be good, particularly for road and rail transport.
- (v) Their must be adequate energy, work force, and training facilities.

- (vi) There are advantages to Municipal or Municipal/Developer plans with all roads, services, in the initial subdivision.
- (vii) The design should incorporate the existing land forms, the corporate plant material and provide adequate green space to fulfill the concept of "an industrial park".
- (viii) Every effort should be made to incorporate multiple use for example: play spaces, parks, sitting and resting areas and adequate provision for recreation including Par Course, exercise circuits.
- (ix) Wherever possible, adequate provision should be made for worker transportation other than by private car.

THE PARKING LOT LANDSCAPE

Industrial facilities feature a parking lot as a principal component of the facility.

Four major concerns should be borne in mind:

1. Screening
From Off-site within site, both horizontal and vertical; from outside parking area; from area to area within parking lot.
2. Shading
Of parked cars; of pedestrian circulation system.
3. Separation
Between parking areas, between parking areas and circulation systems, between vehicles and pedestrians, between parking and buildings.
4. Seepage
Adequate design of surface drainage; adequate design of sub-surface drainage; adequate provision for snow removal.
5. Maintenance
Techniques, programs, experience, guidelines, snow removal, irrigation, fertilization and replacement of trees, protection of plant material, climatic factors on microscale, visual control, theft protection, safety for vehicles

safety for pedestrians, management standards and guidelines, proper choice of plant material.

MAINTENANCE OF INDUSTRIAL FACILITIES

In order to provide the industrial worker with a receptive work environment, it is essential that industrial facilities have some aesthetic appeal. Where adequate provision has been made in the initial design, this approach should not be lost by negating the design through inadequate maintenance. The following are important considerations:

Incentives:

- land use contract can be used to enforce long-term maintenance
- development permit outside Vancouver, or municipal amendment act, 1977, 702AA (2)C.
- development permit within Vancouver, Vancouver Charter 565 A (d) and bylaw No. 3575.
- clear identity of premises, shaming owners to improve, plus pride and reputation correctives
- awards in local district and regional competition
- tax incentives for appearance
- provision of adequate training for landscape gardeners
- employment requirements for workers compensation board injured work people or elderly in order to provide the very basic maintenance
- tax incentives to employ handicapped
- government example e.g. Federal level post office, Provincial level ICBC centres, Municipal level Town Halls, Fire Halls, etc.

2. Standards:

Individual owner specifications provided with the design by landscape architects:

- consultant prepares detailed specifications for individual site owners
- landscape firms provide written specifications and service outline for maintenance contracts
- large facilities consider a mix of in-house employee maintenance and contract maintenance of all landscaping
- examine European experience with caretakers, either doing work or supervising landscape maintenance
- developer responsibility in industrial parks
- general standards prepared by professional societies.

3. Maintenance Requirements:

- balance between wild areas and formal areas
- adequate size of green space areas
- original design plant material suitability, size of plants, vandalism, levels of previous maintenance
- grassed areas:
 - simple design
 - minimize size and traffic
 - trees planted widely
 - margins to solid objects should be avoided
 - proper alignment of manholes, sprinklers, etc.
 - not too many shaded areas
 - appropriate fertilization, aeration, etc.
- planted areas:
 - self-supporting plants , pest-free
 - adequate weed suppression
 - simple shapes
 - appropriate ground covers
- hard areas:
 - weed control in gravel
 - repair of broken and cracked surfaces

3. Maintenance Requirements (cont'd)

- water - avoid overhanging plants material, keep water very clean
- edging - allow for snow removal
- drainage - keep up original design objectives
- plant open drains with K31 Fescue
- hanging baskets - very high maintenance - daily watering
- containers - high maintenance but can vary landscape effect
- trees - have qualified staff maintain
- hedge - shaping, shearing vs clipping
- litter problems - properly designed containers - good condition - regular servicing
-steam clean large types to avoid smells
- insect control
- adequate water
- withhold fertilizer
- avoid invasion of creeping plant material
- lighting - maintenance of fixtures
- pruning obstructing plants
- check for plant damage
- tree roots and underground wiring conflicts
- glare control
- miscellaneous
 - dust control
 - gravel and stone chip control
 - dumping control

4. Administration:

- provision of adequate work force , training, administration and equipment
- preparation of maintenance plans and targets
- preparation of standard times
- clear rotation plans with adequate lead time
- cull, where appropriate
- remove damage or pest-prone stock
- provide adequate budget, adequately thought out and justify specific objectives
- prepare adequate work load analysis
- examine advantages and disadvantages of contract vs in-house-maintenance.

The Problem defined

Tandy, C. (edit) 1971. Handbook of Urban Landscape
Whitney Library of Design - Watson-Guptill

A brief account of industrial expansion and implication
for landscape impact.

Tandy, C. 1975. Landscape of Industry
Leonard Hill Books

A detailed examination in text book form of the landscape
problems arising from industrial land use, the advantages
of Industrial Estates and Parks, as examination of "Industry"
by clarification and its impact on the environment.

Whyte, W. H. 1968. The Lost Landscape
Doubleday

A brief review of industrial expansion and discussion on
the need for vertical stacking of manufacturing facilities.

Sparling, T. W. and Hough, M. 1971. In the Urban
Landscape. A study of Open Space in Urban Metro Areas
Conservation Council of Ontario.

A plea for more sensitive design of Industrial Parks which
would reinforce the "Park" concept and serve the public
when these areas are vacant at night and weekends.

Schwilgin, F.A. 1973. Town Planning Guidelines
Public Works Canada - Queen's Printer.

An outline of the environmental problems associated with
industry and a description of heavy industrial, light
industrial, secondary and service industry.

Design and Site Development

Bernotzky, A. 1974. Trees on Building Sites
Landscape Planning 1 (1974) 255-288.

A detailed account from Germany of the preservation on construction sites and tree surgery for repair and maintenance.

Public Works Canada - 1972. Landscape and Site Development
Queen's Printer.

A general guide to site development.

Tandy, C.R. - 1971. Handbook of Urban Landscape (of it)
Detailed Landscape specifications by subject.

Tandy, C. R. - 1974. Industrial Land Use and Derilection
In Landscape Use and Landscape Planning.

By Derek Lovejoy - Leonard Hill

An introduction to industrial siting and the location of ancillary services. A more detailed account of extractive industry and reclamation.

Tandy, C. R. - 1975. Landscape of Industry
Leonard Hill

A chapter in this longer text devoted to landscape design for industry with particular reference to industry in urban and rural areas.

Robinette, G. O. - 1976. Parking Lot Landscape Development.
Environmental Design Press

A description of screening, shading, separation and seepage requirements in large parking lots.

Kemmerer, H. - 1976. - Managing Outdoor Lighting Grounds.
Maintenance - Sept. 14-20

An outline of lighting considerations in the industrial landscape.

Nordstrom, P.E. - 1974. Combining Physical Fitness with
Nature Enjoyment.

A description of par cours in South Dakota modeled on the swim jogging trail with exercise stations.

U.S. Department of Transportation 1974.
The Audible Landscape!
A manual - Highway noise and Lande Use
Supt. of Documents.

Despite the title, an important introduction to noise in the landscape and provides extensive outline to administrative remedies to noise pollution. Some highway examples are given.

Maintenance

Anon. - 1974. Time Saver in the Landscape Grounds
Maintenance - Sept 10-12 and 38-39.

Outlines design standards for subsequent maintenance of fixtures, walkways, lawns, tree plantings, mulches and irrigation systems.

Anon. - 1970. - Design Changes to Cut Costs Grounds
Maintenance - Feb. 18-22.

A description of upgrading initial design to improve maintenance of grass and tree beds.

Anon. - 1970. - Landscape Work - A complete listing of maintenance tasks and approximate times for completion.
(Attached)

Baumgardt, J.P. - 1976. - Natural Low Maintenance Areas
Grounds Maintenance - May 40-48.

An advocate for the wider use in industrial and park settings of natural plant material left to develop without maintenance.

Harris, R. W. - 1974. - Pruning Landscape Trees
Arborists News 39(8) 133-140

A concise detailed account of pruning objectives, types of pruning, subsequent protection, the problems of mature trees and general considerations.

Kemmerer, H. - 1977. - Managing paved surfaces grounds.
Maintenance - Feb. 34-42.

A brief outline of the maintenance requirements for pavement.

Kemmerer, H. - 1976. - Managing litter in the Landscape
Grounds Maintenance - Oct. 14-18.

Though written for park areas also applicable to industrial litter problems.

Some Real World Examples

Seleger, J.A. - 1971. - Park Extension of the Swiss Re-insurance Co. - Zurich - Anthos 10(4) 1-5.

Concept and actual design including roof top garden, tennis courts, car parking and new main entry way.

Schmid, F. - 1968. - Research Centre of Messen Metther Ltd in Greifensee, Zurich - Anthos 7 (2) 13-15

A detailed design for entry way reception and exhibit hall, sales area, research and development group, service, parking, loading ramps, and park area with stream foot paths, seats and caretaker house.

Seifert, A. - 1968. - Industrial Greenery - Anthos. 7 (2) 3-5

A short article on the need to incorporate low cost material in the work environment.

Sutter, I.F. - 1968. - Ciba Photochemier's Morly Research Centre - Fribourg
Anthos F (2) 17.

A description of how the design was constrained by a need to exclude pollen from anywhere near their photo processing plant.

Schweyer, J. - 1968. - Front Garden of an Administration Building in Basle - Anthos. 7 (2) 23-26.

A description of the use of concrete and stones in the landscape.

Werkmeister, H. F. - 1968. - Proper Location of Industrial Plant enables them to be adjusted to the landscape
Anthos. 7 (2) 6-11

A planning approach but with detailed planting plan given.

Grounds Maintenance

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mance data. In its simplest form this represents the average time the person has taken to do the work. The primary statistical techniques are work sampling and historical standards. Although requiring more time and effort than the estimate, this standard proves to be more reliable.

An engineered standard is the time it should take to perform a work unit when working at a normal pace, according to a specified method determined by a detailed study of the job. This, in essence, represents the time the average skilled or trained worker should take to do the work. Engineered standards are usually determined by a direct time study, predetermined time study, standard data, or work sampling.

Most grounds maintenance supervisors use a technical estimate or a statistical standard to estimate how long it

will take to perform a maintenance task. Establishing an engineered standard would require too much time and effort for the benefit derived.

WORK PERFORMANCE STANDARDS

Even though circumstances vary in different localities because of climate, training, conditions of facilities, and other factors, the standard work time variations required to perform an operation are comparatively small. Also, work performance standards change with the adoption of simpler methods, and new or more efficient equipment. A grounds maintenance administrator must constantly revise his work performance standards to reflect his own crew's ratings. (See accompanying table for grounds maintenance performance standards.) ▲

Task	Unit	Standard (Man Hours)	Local Estimate
Roadside and drainage:			
Mow both roadsides w/hand tools	mile	0.75	
Apply herbicides on roadside	mile	1.30	
Special surface maintenance and repair:			
Seal bituminous and concrete pavement	1000 sq. yd.	8.00	
Resurface w/bituminous mix	1000 sq. yd.	22.00	
Roll or plane bituminous pavements	1000 sq. yd.	12.00	
Rebuild aggregate base course	1000 sq. yd.	88.00	
Snow and ice control:			
Remove snow from roadway and shoulders	mile	2.25	
Remove snow from bridges	mile	0.06	
Erect snow fences	100 lin. ft.	1.50	
Remove snow fences	100 lin. ft.	1.00	
Sand and/or salt roadway	mile	0.14	
Remove ice from roadway	mile	0.40	
Remove snow from ditches and culverts	mile	3.00	
Place or remove sand or cinder barrels	mile	0.20	
Traffic services:			
Paint center, lane, or edge lines	mile	6.40	
Paint hazard and/or guide markings	mile	0.75	
ENTOMOLOGY SERVICES			
Inspection:			
Inspection of buildings for wood destroying pests:			
Slab-on-grade	1,000 sq. ft.	0.50	
Crawl space	1,000 sq. ft.	0.80	
Full basement	1,000 sq. ft.	0.70	
Inspection of buildings for household pests	1,000 sq. ft.	0.30	
Inspection of stored products in warehouses	1,000 sq. ft.	0.50	
Inspection for pests of ornamentals and trees	acre	0.50	
Inspection for pests of greased areas	acre	0.25	
Inspection for rats and mice	1,000 sq. ft.	0.20	
Inspection for field rodents control	acre	0.33	
Control procedures:			
Treatment of buildings for control of wood destroying pests:			
Slab-on-grade	1,000 sq. ft.	18.00	
Crawl space	1,000 sq. ft.	16.00	
Full basement	1,000 sq. ft.	20.00	
Treatment of buildings for household pests:			
Dry storage buildings	1,000 sq. ft.	0.50	
Residential buildings	1,000 sq. ft.	0.80	
Treatment of warehouses for stored products pests:			
Aerosol	1,000 sq. ft.	0.10	
Residual	1,000 sq. ft.	0.33	
Treatment of ornamentals and trees for insect pests	acre	0.80	
Treatment of greased areas for insect pests	acre	1.50	
Larviciding for mosquito control	acre	0.50	
Area adulticiding	acre	0.10	
Fumigation of supplies and equipment	1,000 cu. ft.	0.75	
Rodent control in buildings	1,000 sq. ft.	0.33	
Control of field rodents	acre	0.80	

1970 Landscape

work simplification

measurement

performance guide

■ Planning is the process of selecting the best line of action to get work done in the least time with the least expense. This line of action can result in improved efficiency of a grounds maintenance crew.

However, the use of unprofitable work methods, oversize crews and unsuitable equipment makes for an easily prepared plan with no improvement in efficiency or profit. Work simplification, measurement, and performance standards are three techniques that can be used to evaluate grounds maintenance activities.

WORK SIMPLIFICATION

There is always a better way of doing a job. Improved tools, better methods, better working conditions and shorter procedures can be discovered when the worker and supervisor pool their efforts to find them. The landscape contractor's natural reaction to work simplification would be a larger piece of equipment, but this might be simpler and yet not more profitable.

A contractor's main concern is to simplify the maintenance task. If it is profitable to use a larger machine, a larger machine is called for. If, however, only an extra effort or few man-hours are required, the more complicated approach might still be profitable.

The first step in work simplification is selecting the job to be improved. By carefully selecting the jobs which cause the most trouble, improvements can be made first where the returns will be the greatest. Performance data, as well as a backlog of work, excessive time and effort in gathering and organizing materials, simple jobs requiring too much time, and non-productive manpower and materials indicate the need for specific improvements.

There are three parts to every job—preparation, the actual accomplishment of the work, and the clean-up phase. The greatest amount of immediate improvement can be accomplished by reduction of preparation and clean-up time, since these efforts frequently do not contribute to the end result.

Recording the job details. After selecting the process to be improved, a record of each detail in the order in which it occurs should be made. This is done to permit closer analysis of each individual detail in proper sequence. Sufficient data should be recorded to question any detail which may affect the total process. Seemingly unimportant details should always be included, as they may have a bearing on the method used.

Analyzing the job details. The fact that work is being accomplished is not proof that the existing method is the best. The process should be analyzed to make certain that each detail is absolutely essential. Very often this analysis may result in elimination of details or major parts of the job.

Work simplification involves the efforts of individuals, and it is human nature to justify or offer excuses for existing conditions. Therefore, in questioning the details of a job, it is necessary to distinguish between reasons and excuses, between fact and opinion. Opinions may provoke arguments, but facts produce valid conclusions. It is also necessary to

SPECIFICATIONS FOR LANDSCAPE TREATMENT
OF INDUSTRIAL SITES AND PARK LAND.

1st February, 1973

Specifications for Landscape Treatment
Of Industrial Sites and Park Land.

1. GENERAL CONDITIONS

The instructions to Bidders, General Conditions of the Contract and General Conditions Supplementary form an integral part of this specification.

2. CONTRACTOR'S RESPONSIBILITY

(a) Mention herein or indication on the drawings of articles, materials, operations or methods requires that the contractor provide each item mentioned or indicated (of quality equal to or subject to qualifications noted), perform (according to conditions stated) each operation prescribed; and to provide therefore all necessary labour, equipment and incidentals.

(b) Should the drawings and specifications conflict on any point, the work shall be done according to the specification.

3. GUARANTEE

(a) Neither the final certificate nor payment there under, nor any provision in the contract documents shall relieve the Contractor from responsibility for faulty materials or workmanship which appears within a period of one year from the date of substantial completion of the work, and he shall remedy any defects due hereto and pay for any damage to other work resulting therefrom, which appears within such a period of one year. The owner shall give notice of observed defects.

(b) Plant material shall be guaranteed for a period of one year. All nursery stock which has failed to establish itself within twelve months of date of planting is to be replaced without charge.

(c) All large trees shall be guaranteed for a period of two years after planting. The Contractor shall feed and care for the trees for the guaranteed period but will be required to water only during period of contract operations.

4. CONTRACT (work included)

- (a) sodded and seeded areas noted on drawings
- (b) trimming to final finished grade
- (c) Supplying and planting all tree, plant or shrub material on drawing or in specifications
- (d) Cedar divider strips.
- (e) boulders
- (f) crushed stone and beach pebble
- (g) flagstone work
- (h) field stone wall
- (i) wooden bench
- (j) concrete bench

5. The following is excluded from the work of this contract:

- (a) surfaced drives and parking areas
- (b) finished grading
- (c) catch basins

6. GENERAL

(a) All landscaping shall be done by a subcontractor fully experienced in this type of work.

7. ERRORS AND OMISSIONS

(a) If any errors or omissions appear in the drawings, specifications, or other documents, the contractor shall within ten days after receiving such drawing, specification or documents, notify the Landscape Officer in writing of such omission or error.

In the event of the contractor failing to give such notice, he will be responsible for the results of any such errors or omissions and the cost rectifying same.

8. EXAMINATION OF THE SITE

(a) All contractors submitting proposals for this work shall first examine the site and all conditions thereon. All proposals shall take into consideration all such conditions, as may affect the work under this contract.

9. FINISHED GRADE

(a) The excavating and grading subcontractor will do all finished grading work and turn over to this subcontractor the areas ready for the work specified under this division. The landscape subcontractor shall do final trimming of grades.

(b) Any faults in levels or defects in finished grading, etc. discovered by this subcontractor that, in his opinion, will effect the quality of the landscaping shall be reported to the Landscape Officer in writing prior to commencing work. Commencing work will signify acceptance of the work of the other trades.

10. GRADING

(a) Grading shall consist of grading the lawn areas, walks and drives and all other parts of the topography in conformity with the plans and sections true to the lines and grades given. This grading shall include all clearing and grubbing, excavation, forming embankments, shaping and sloping, compacting and other work as may be necessary to bring the topography to the required grade, alignment and cross section. This work shall be done in accordance with these specifications.

11. SUB-GRADE

(a) The upper surface of the foundation of the driveway, walks and terraces shall be known as the sub-grade and shall be true to the lines, grades and cross sections given. All spongy material shall be removed to a depth to be determined by the Landscape Officer and filled with such material as the Landscape Officer may direct. All filled areas to be thoroughly rolled or tamped until surface is smooth and hard.

12. TOPSOIL

(a) Topsoil needed is to be furnished for this work and shall be fertile, friable, natural topsoil typical of the topsoil of the locality. It shall be free of subsoil and shall be free of stones, lumps, plants or their roots, sticks or other extraneous matter, and shall not be delivered while in a frozen or muddy condition.

13. MANURE

(a) Manure shall be well-rotted, unleached stable or cattle manure free from sawdust, shavings, refuse and harmful chemicals.

14. SCOPE

(a) Supplying and placing topsoil, supplying and planting lawn and plant materials all related items necessary to complete the work in accordance with the drawings and specifications excepted.

15. PLANTING BEDS

(a) All planting beds for nursery stock shall be excavated to a depth of 18" below finished grade. The grass area shall be excavated to a depth of 6" below finished grade.

(b) Tree pits for nursery size trees shall be excavated 1 cu.yd. in size.

(c) The planting beds for nursery stock shall be filled with 15" sandy loam, 3" well rotted manure and 3" sphagnum peat "Premier" or equal.

(d) Tree pits shall be filled with soil mix of:
2 parts sandy loam
1 part mushroom compost or well rotted manure
5 lbs. 10-6-4 chemical fertilizer shall be added for each tree pit.

(e) The same mixture as above shall be filled into excavation areas designated for grass, and be compacted to be firm against foot prints.

(f) The areas excavated for grassing shall be filled with sandy loam to which has been added a complete fertilizer whose percentages of nitrogen, phosphorous and potash are 5-20-10, at the rate of 50 lbs. per 100 sq. yards.

16. PLANT MATERIALS

(a) All nursery stock shall be British grown, true to name, correct size and of first grade, as specified by British Association of Nurserymen.

(b) Shrubs shall be pruned before planting. Dead twigs and branches caused through winter damage shall be cut. All plant material shall be well watered and planted immediately on arrival.

(c) Evergreen specimens shall be burlapped, transported and planted without breaking the ball of soil. Species of plants may be substituted only upon written approval of the Landscape Officer.

17. PLANTSMEN

(a) Only skilled and experienced plantsmen shall be employed in the handling and planting of all plant materials.

18. PLANT QUALITY

(a) All plants shall be first quality, well foliated with well developed root systems and a normal well-shaped trunk or stems and head. No plants will be accepted if in any other condition upon arrival. All plants shall be properly labeled as to genus, species and variety.

19. TRUE TO NAME

(a) The contractor shall be responsible for the replacing and reinstallation of any plant that proves not to be true to name on label within a period of one (1) year from the date of the final certificate.

20. SUPPLYING AND PLANTING OF LARGE TREES

(a) The large trees shall be available for inspection before moving into place.

(b) The trees shall be well-shaped, symmetrical and typical of its species. It shall be upright, straight and have a reasonable spread of branch structure. Trees shall be in good growing condition and shall be free from insects, disease and abrasions to the bark.

(c) The trees shall be moved while dormant.

(d) Balled and burlapped stock shall be complete and perfect. All roots shall be cleanly cut at the ends. Split roots will not be accepted. The ends of all roots of one inch in diameter and over shall be painted with asphalt emulsion or equivalent. The depth of the ball shall be great enough to contain seventy-five percent of the roots.

(e) The tree shall be planted vertically and shall stand on the same level in relation to finished grade as it grew in former location.

(f) Holes or pits for trees shall be large and deep enough to allow a twelve (12) inch layer of topsoil to surround the roots at all points. Tree pit bottoms shall be mounded shaped, on which the roots shall be laid in their normal growing position. Soil around the roots shall be packed by hand, keeping roots from drying in the process. After planting, topsoil shall be filled in the hole to final grade, leaving a slight depression around trunk. Water until depression remains filled for some minutes.

21. STAKING

(a) Stake all trees immediately after planting in the approved manner.

(b) Stake trees up to 3-inch caliber with two stakes on opposite sides of the tree about 18 inches from the trunk and parallel to walks, roads etc.

(c) 2" x 2" spruce stakes acceptable material.

(d) Stakes to be treated with one coat of pentox preservative.

(e) $\frac{1}{2}$ " to $\frac{3}{4}$ " rubber hose to be used around tree trunk.

(f) No. 9 wire galv. to be used for tying.

22. PLANTS WITH BALLED AND BURLAPPED (B. & B.) ROOTS

(a) Plants specified in the plant list as B & B shall be set in their planting pits or beds incased in the burlap. After placing is properly done, loosen fastenings of burlap around trunk or stems and fold down so as to bury it in the soil surface. Fill in topsoil to grade leaving the proper depression.

23. RESPONSIBILITY

(a) The contractor shall be responsible for the protection of plants before planting and during the first month thereafter.

24. PLANT LIST

(a) The plant list which is hereby made a part of these specifications, indicates characteristics required for individual plants.

(b) Quantities indicated on the plant list will be considered exact. The contractor, however, is expected to complete the plantings to the satisfaction of the Landscape Officer. Any plants required in excess of the quantity indicated on the plant list will be paid for at the unit contract price.

25. PLANT MATERIAL

(A lengthy plant list is usually found in the specifications, however, it has been omitted here to save space).

26. PRE-INSPECTION

(a) All plants may be inspected and approved by the Landscape Officer at the nursery or wherever they are located before being moved to the property. Said plants may be rejected by the Landscape Officer if, in his opinion, they are not suitable for the intended location or in any way fail to meet the specifications.

27. HEELING IN

(a) As soon as stock arrives from nursery, packing shall be removed from all but balled and burlapped stock, and if beds are not ready or if the requisite number of skilled workmen are not on hand so that the plants may be permanently set, they shall be "heeled" in in trenches sufficiently wide and deep to take the roots comfortably without bending. All plants to be laid in separately and not in bundles. The trench shall be immediately filled with good loam, covering all the roots and the top of fill banked to throw off rain. If plants seem unduly dry, moisten the roots before filling trench.

28. PLANTING GENERAL

(a) Holes for shrubs shall be dug at least six (6) inches larger in all directions than is required to accommodate roots of plant. Roots shall be spread to natural position: Soil well compacted about roots by hand. Plants shall be set not more than two (2) inches deeper than the soil mark of its former position in the nursery. After planting, soil about plants shall be tamped slightly.

(b) After planting, entire areas shall be covered with top mulch of peat moss and well watered.

(c) This contractor shall be responsible for keeping plants well watered for first month after planting. Water to be supplied by owner.

29. LAWN

Preparation of Seed Bed

Clear soil of stones and debris for a depth of at least six (6) inches and bring grades to a level four (4) inches below final grade. Place four (4) inches of topsoil over lawn areas and work into lower layer of existing earth to establish a good bond. Roll in both directions bringing grades to absolute final contour in all directions.

30. FINAL SEED BED PREPARATION

(a) The final state of seed bed shall be firm, even, and true to grade. Hand rakes shall be used for finishing and smoothing the seed bed. Rake well into top two (2) inches a complete fertilizer whose percentages of nitrogen phosphorous and potash are 5-20-10 at the rate of 25 lbs. per 1000 square feet. Fertilizer shall be evenly applied, using a regular fertilizer of lime spreader. At least one week should elapse between the fertilizer application and seeding. If seeding must be postponed, soil must be regularly cultivated until seeded, to destroy weed crops and fined and checked for levels again before seeding.

(b) All finished lawn grades to be checked by Landscape Officer before seeding operations begin.

(c) When in a finished smooth shape, lawn areas shall be carefully seeded as specified. Seeding may be omitted if the season requires and an allowance made therefor, or it may be postponed to a favourable date as directed without prejudice to the acceptance of the balance of the work.

31. RATE OF SEEDING

(a) Seeding shall be done using approved grass seed from a responsible supplier. Seed for all areas as shown on drawings shall be a mixture as follows, spread at the rate of five pounds per 1000 sq. ft.

30% Kentucky Blue Grass (by weight)
10% Red Top
10% Colonial Bent
50% Creeping Red Fescue

(b) Seed for playing field turf shall be a mixture as follows, spread same rate as above.

50% Kentucky Blue
25% Red Top
25% Red Fescue

(c) Seeding shall be done in the spring as soon as possible after the soil is in working condition, or if in the Fall, early enough to give the grass a good start before freeze up.

32. METHOD OF SEEDING

(a) Seed shall be evenly distributed. Seeding shall be done in two operations, one half the seed to be sown across the lawn area in one direction and the other half in the opposite direction.

33. COVERING AND ROLLING

(a) After seed is sown, it shall be mixed immediately with top half inch of soil, but not deeper. This shall be done properly. The lawn area shall then be rolled with light to medium heavy rollers.

34. MOWING

(a) Lawn shall be under care of contractor until it has reached a height of three (3) inches and has received its first mowing.

35. WATERING

(a) Water seeded and sodded areas as required for at least thirty consecutive days after placing, leaving same in good growing condition to the satisfaction of the Landscape Officer. On sodded areas, use heavy rollers to compact and level sod until the surface is satisfactory to the Landscape Officer.

36. SODDING

(a) Sod, where required, shall be a good grade of nursery sod, 2" thick, containing the same specified grass as specified for seeding above. It shall be closely grown, free from weeds, and in a healthy condition. Sod shall be carefully laid and rolled over the top soil bed. Peg sod on steep slopes.

(b) Submit all seed and sod materials for approval by the Landscape Officer before commencing work.

(c) Sod shall be laid evenly and be closely knit together.

(d) After laying, sod shall be thoroughly watered before drying occurs.

37. COMMERCIAL FERTILIZER

Commercial fertilizer, if used, must be approved by the Landscape Officer before its application.

38. ACCEPTANCE

Finished lawn shall be even, true to grade and uniformly covered with strong stand of grass, free from weeds, quack grass or other blemishes.

39. PEBBLES

- (a) Pebbles shall be placed where shown on drawings.
- (b) Pebbles shall be 80% 3" to 4" ϕ 10% 2 ϕ and 10% 6" ϕ .
- (c) Membrane, polyethylene, heavy duty, to act as a weed barrier.
- (d) Granite acceptable material.
- (e) Pebble beds 3" deep.

40. WOOD DIVIDER STRIPS

- (a) Supply and install 3" x 4" cedar divider strips where shown on the drawings.
- (b) Anchors for divider strips shall be concealed. Strips shall be spiked together at each corner and intersection. Corner joints shall be mitred.
- (c) Before installing strips, tops and edges shall be given two (2) coats of cedar rez paint, bottoms two (2) coats of Pentox green wood preservative.

41. BOULDERS

- (a) Supply and install boulders in locations as shown on the drawings.
- (b) Granite boulders acceptable material.
- (c) Must have interesting texture.
- (d) To be approved by Landscape Officer before placing.

42. FLAGSTONE WORK

- (a) Construct flagstone paving where shown on the drawings.
- (b) Credit Valley Flagstone all in the same colour of grey to be used.
- (c) Minimum thickness of stone 1 $\frac{3}{4}$ ".
- (d) To be laid on a concrete bed 3" thick.
- (e) Concrete bed to be placed on 3" of $\frac{3}{4}$ " crushed stone.
- (f) Flagstones to be set in a mortar bed (1:3 mix cement and sand) with mortared joints.
- (g) Finished tooled joints.

43. FLAGSTONE CURBS

Supply and install flagstone curbs around planting beds as shown on the drawings. Stone shall be neatly cut. Lengths 4'0" approx. - joints not cemented.

44. FLAGSTONE COPING

- (a) Supply and install flagstone coping around field stone wall.
- (b) Stones shall be neatly cut lengths 4'0" approx. - joints cemented.

45. FIELD STONE WALL

- (a) Construct field stone wall where shown on the drawings.
- (b) Granite field stone acceptable material varying in size.
- (c) Finished tooled joints.