

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 35 43 - Environmental Procedures.
- .2 Section 31 23 33.01 - Excavation, Trenching and Backfilling.

1.2 DEFINITIONS

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than a specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of all fallen timber and surface debris.
- .5 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than a specified depth below existing ground surface.

1.3 QUALITY ASSURANCE

- .1 Safety Requirements: worker protection.
 - .1 Workers must wear gloves, dust masks, eye protection, protective clothing, when applying herbicide materials.
 - .2 Workers must not eat, drink or smoke while applying herbicide material.
 - .3 Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.

1.4 STORAGE AND PROTECTION

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are to remain.
- .2 Repair any damaged items to approval of Departmental Representative. Replace any trees designated to remain, if damaged, as directed by Departmental Representative.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.
- .2 Trim limbs and tops, and saw into saleable lengths. Stockpile adjacent to site.

PART 2 PRODUCTS

Not applicable.

PART 3 EXECUTION

3.1 GENERAL

- .1 Obtain all necessary permitting as required by the authorities having jurisdiction.
- .2 Comply with conditions of all permits.
- .3 Inspect site and verify with Departmental Representative, items designated to remain.
- .4 Locate and protect utility lines. Preserve in operating condition active utilities traversing site:
 - .1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.
 - .2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.
- .5 Notify utility authorities before starting clearing and grubbing.
- .6 Keep roads and walks free of dirt and debris.

3.2 CLEARING

- .1 Do not remove trees or brush from outside limits indicated except for any tree or branch considered unsafe.
- .2 Cut trees and brush close to ground leaving no stump higher than 300mm.
- .3 Grub out stumps and roots to not less than 200mm below ground surface.
- .4 Grub out visible rock fragments and boulders, greater than 300mm in greater dimension, but less than 0.25 m³.

3.3 UNDERBRUSH CLEARING

- .1 Under clearing includes felling, trimming and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags brush and rubbish occurring within cleared areas.
- .2 Clear as directed by Departmental Representative, by cutting at a height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
- .3 Do not cut down any trees larger than 75mm in diameter without approval of Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Owner's Representative.

3.4 CLOSE CUT CLEARING

- .1 Close cut clearing to ground level.
- .2 Cut off branches down trees overhanging area cleared as directed by Departmental Representative.
- .3 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.5 GRUBBING

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots and designated stumps from indicated grubbing area.
- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m³.
- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.
- .5 Remove top layer of organic material in all camp site areas where gravel will be placed.

3.6 REMOVAL AND DISPOSAL

- .1 Remove cleared and grubbed materials off site.
- .2 Cut timber greater than 125 mm diameter to 3000mm lengths and stockpile. Unless otherwise notified, stockpiled timber becomes property of the Owner.
- .3 Dispose of cleared and grubbed materials off site.

- .4 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative.

3.7 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for immediate grading operations stripping of topsoil and organic layer.

3.8 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- .1 This Section specifies requirements for performing all operations necessary to complete site cutting and filling, to bring the site to sub-grade elevations.
- .2 The Work generally includes, but is not necessarily limited to, the following items:
 - .1 Excavation for new structures, parking area, campsites and roadways including common and rock excavation and placing to grades indicated.
 - .2 Excavation of fill material unsuitable for engineered structural fill and disposal of unsuitable material offsite in areas approved by Departmental Representative at no additional cost to the Contract.
 - .3 Supply, placing, and compaction of engineered structural fill.
 - .4 Control of water by dewatering.
 - .5 Environmental protection.
 - .6 Sheeting, shoring, tracing.
 - .7 Protection of stock-piled materials and excavation surfaces from disturbance by water and freezing.

1.2 REFERENCES

- .1 ASTM D698-07a¹, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft - 1 lb f/ft³ (600 KN- m/m³)).
- .2 New Brunswick Department of Transportation and Infrastructure (NB DTI formally NBDOT) Standard Specifications, latest edition.

1.3 DEFINITIONS

- .1 Unsuitable material: all organic, peat, silt, or other material, which is not suitable for use in the Work.
- .2 Subgrade: is the surface of mass excavation and embankment finished to lines and elevations indicated on Drawings.

1.4 EXISTING CONDITIONS

- .1 Geotechnical Investigation has been carried out at the Site.
- .2 Information from Geotechnical Report No. 6596.01-R01 dated November 19 2012, prepared by GEMTEC is available for viewing upon request to the Departmental Representative.
- .3 Any interpretations shall be at the Tenderer's own risk and the Departmental Representative shall not be held responsible for the content or interpretation of this document.
- .4 Known underground and surface utility lines and buried objects are indicated on the Drawings. Locations are approximate from record

drawings.

1.5 PROTECTION

- .1 Prevent damage to structures, fencing, natural features, bench marks, or surface or underground utility lines which are to remain. If damaged, restore to original or better condition.
- .2 Protect stock-piles of excavated materials, excavation faces and the surface of mass excavations from disturbance by water and freezing.
- .3 Protect completed gravels and granular fill in all areas from contamination by traffic and construction operations on site. Make good any areas contaminated by use as haul roads or other activities at no additional cost to the Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Common Borrow: Departmental Representative approved, off-site borrow that meet the requirements of NBDTI Standard Specification for Borrow A1, Item 121.2.2.2.
- .2 Structural fill: Departmental Representative approved, off-site borrow that meet the requirements of NBDTI Standard Specifications for pit run gravel subbase or crushed sandstone subbase per Item No. 201.2.4.3 and 201.2.4.4, respectively.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Work from area of lowest elevation to area of highest elevation.
- .2 Once subgrade elevations are attained, do not let construction equipment or vehicles cross finished areas.
- .3 Before starting site grading operations, agree with Departmental Representative as to ground surface elevations to be cut and filled.
- .4 No standing water is to be left on site except for structures designed to retain or infiltrate water.
- .5 Compact subgrade to 98% maximum dry density and proof roll to satisfaction of departmental representative to show there are no soft areas.

3.2 TOPSOIL EXCAVATING

- .1 Strip topsoil to limits and depth indicated.
- .2 Stockpile in designated areas. Minimize loss and wastage. Work from area of lowest elevation to area of highest elevation.

- .3 Once subgrade elevations are attained, do not let construction equipment or vehicles cross finished areas.

3.2 EXCAVATING

- .1 Prior to commencing cut and fill operations, agree with Departmental Representative as to ground surface elevations to be cut and filled.
- .2 Notify Departmental Representative whenever unsuitable materials are encountered and remove unsuitable materials to depth and extent directed.
- .3 Excavate in all kinds of material including rock encountered on the site and make own computations of amount and nature of excavation required.
- .4 Perform all excavation within plus or minus 75mm of the lines, grades and dimensions shown on the Drawings, or as established by the Departmental Representative. During the progress of the Work, the Departmental Representative may vary the lines, grades and dimensions of the excavations from those specified in this Section.
- .5 Take necessary precautions to preserve the material below and beyond the lines of all excavation in the soundest possible condition.
- .6 Do not stockpile excavation spoils within 2m or 1.5 times trench depth, whichever is greater, of edge trench.
- .7 Do not obstruct existing drainage ditches and natural watercourses unless indicated on the drawings.
- .8 Reduce steepness of slopes wherever possible, and expose smallest practical area of land for shortest possible time.
- .9 During construction direct surface runoff to sediment control facilities installed and maintained to the requirements of the drawings.

3.4 EMBANKMENTS

- .1 Do not place frozen material or place material on frozen surfaces.
- .2 Maintain a sloped surface during construction to ensure ready run-off of surface water.
- .3 Place and compact embankment material to full width in uniform layers not exceeding 150 mm compacted thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved.
- .4 Compact material to a density of not less than 95% maximum dry density in accordance to ASTM D698.

3.5 STRUCTURAL FILL

- .1 Compact engineered structural fill material to 98% maximum dry density.

3.6 FINISHING

- .1 Remove soft or other unstable material that will not compact properly and fill resulting depressions with approved material. Grade to eliminate rough spots and low areas to ensure positive drainage.
- .2 Shape and compact entire subgrade to within 25mm of design elevations but not uniformly high or low.
- .3 Do scarifying, blading, compacting or other methods of work as necessary to provide a thoroughly compacted site shaped to grades indicated or directed.
- .4 Finish side slopes to a neat condition, true to lines and grades indicated.
 - .1 Remove boulders encountered and fill resulting cavities.
 - .2 Hand finish slopes that cannot be finished satisfactorily by use of machine.

3.7 SURPLUS MATERIAL

- .1 Dispose of surplus approved embankment material not required for placement in fills off site in areas approved by Departmental Representative at no additional cost to the Contract. Surplus selected backfill and Engineered Structural fill is to be disposed of offsite in areas approved by Departmental Representative at no additional cost to the Contract.

3.8 UNSUITABLE MATERIAL

- .1 Dispose of unsuitable material offsite in areas approved by Departmental Representative at no additional cost to the Contract.

3.9 TESTING

- .1 Inspection and testing of soil compaction will be carried out by testing laboratory designated by Departmental Representative.

3.10 MAINTENANCE

- .1 Maintain finished surfaces in a condition conforming to this section until acceptance.
- .2 Contractor shall notify Departmental Representative 24 hrs prior to being ready for testing.
- .3 Contractor shall facilitate and allow access to work to be inspected or tested.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- .1 This Section specifies requirements for furnishing all materials, labour, tools and equipment and performing all operations necessary to excavate all types of material encountered, placing of suitable excavated material as backfill, disposal of unsuitable and surplus material on-site at designated disposal area, and furnishing and placing structural fill, and imported backfill material as specified below, all as shown on the Drawings and as specified herein.
- .2 The Work generally includes, but is not necessarily limited to, the following items:
 - .1 Trench excavation and backfilling for pipelines and appurtenances.
 - .2 Structure excavation and backfilling for manholes, catch basins and structures.
 - .3 Supply and placing pipe bedding material where required.
 - .4 Compaction of bedding and backfill.
 - .5 Control of water by dewatering.
 - .6 Removal and disposal of surplus and/or unsuitable material.
 - .7 Sheet piling, shoring and bracing to support trench walls, sides of excavations or utilities.
 - .8 Reinstatement of existing asphalt surfaces.

1.2 REFERENCE STANDARDS

- .1 CAN/ULC S701-2011, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .2 ASTM D698-07a, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- .3 New Brunswick Department of Transportation and Infrastructure (NB DOT formerly NBDOT) Standard Specifications, latest edition.

1.3 DEFINITIONS

- .1 Unsuitable Material: all organic or other excavated material, which is not suitable for use in Work.
- .2 Subgrade: the surface of mass excavation and embankment finished to lines and elevations indicated.

1.4 PROTECTION OF EXISTING FEATURES

- .1 Existing buried utilities:
 - .1 Size, and location of existing utilities as indicated are for guidance only. Depth to be confirmed by contractor prior to starting excavation. Completeness and accuracy are not guaranteed.

.2 Prior to commencing excavation Work, notify Departmental Representative and establish location and state of use of buried utilities. Clearly mark such locations to prevent disturbance during work.

.3 Confirm locations of buried utilities by careful test excavations.

.4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities encountered. It is the Contractor's responsibility to have these utilities field located.

.5 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Advise Departmental Representative of existing lines in area of excavation that require removal or relocation and cost for such work.

.6 Record location of maintained, re-routed and abandoned underground lines.

.2 Existing surface features:

.1 Conduct, with Departmental Representative condition survey of trees and other plants, lawns, service poles, wires, pavement, survey bench marks and monuments which may be affected by work.

1.5 SHORING, BRACING AND UNDERPINNING

.1 Protect existing features in accordance with applicable local regulations.

.2 Engage services of qualified professional engineer who is registered or licensed in province of New Brunswick, in which work is to be carried out to design and inspect shoring, bracing and underpinning required for work.

.3 Submit design and supporting data at least two (2) weeks prior to commencing Work.

1.6 SUPPORT OF EXCAVATION

.1 Suitably slope or properly shore sides of excavations according to site conditions, all in accordance with the New Brunswick Occupational Health and Safety Act.

.2 The choice of any method of support shall be the responsibility of the Contractor. However, drawings and calculations for the method of support selected, designed by a qualified professional engineer licensed to practice in New Brunswick in accordance with the Provincial safety requirements, are to be submitted to the Departmental Representative for review before its use.

.3 If it is desirable that any support, other than that which may be shown on the Drawings, be left in the excavations, then the Departmental Representative will issue instructions accordingly.

- .4 Take every precaution against slips or falls, but if any should occur, at once make good the same. If any such slip or fall affects or may affect the stability of the permanent work, execute such remedial work as necessary, including filling up of any space left by the slip or fall with approved granular material. Submit proposed remedial work to Departmental Representative for review.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Selected Backfill material: material approved from site excavation or borrow pits. Such material shall be free from stumps, trees, roots, sod, muck or other deleterious material, and shall not contain rock or boulders larger than 150mm. The material shall be free from frost, and shall not be placed on frozen ground or in water. It must have a moisture content that will allow compaction to the specified densities.
- .2 Engineered Fill: as specified in Section 31 22 13.
- .3 Clear stone: crushed and screened, hard, durable stone, free from clay and organic matter, and graded as follows:
 - .1 Clear Stone, 25mm:

<u>Sieve Designation</u>	<u>% Passing</u>
25mm	100
19mm	15-85
12.5mm	0-53
9.5mm	0-30
4.75mm	0-4
1.18mm	0-2

- .2 100mm Clear Stone:

<u>Sieve Designation</u>	<u>% Passing</u>
100mm	100
50mm	25-60
25mm	0-5

- .4 Surge Rock: 150mm maximum crushed quarry-run material free from shale, clay, friable materials, roots and vegetable matter.
- .5 Gravels: as specified in Section 32 11 19.
- .6 Granular bedding material: Aggregate Base as specified in Section 32 11 19.
- .7 Rigid insulation: to CAN/ULC S701, Type 4, expanded polystyrene, minimum compressive strength 60 psi, thickness as indicated.

- .8 Underground warning tape:
 - .1 Detectable metallic tape, 50mm wide, clearly marked as follows:
 - .1 "CAUTION - BURIED WATER LINE", colour blue.
 - .2 "CAUTION - BURIED SANITARY SEWER", colour green.
 - .3 "CAUTION - BURIED STORM SEWER", colour green.
- .9 Erosion and sediment control measures in accordance with Section 31 15 53.

PART 3 - EXECUTION

3.1 SITE PREPARATION

- .1 Remove obstructions, ice, and snow from surfaces to be excavated within limits indicated.

3.2 SHORING AND BRACING

- .1 Construct temporary works to depths, heights and locations as approved by Departmental Representative
- .2 During backfill operation:
 - .1 Unless otherwise as indicated or as directed by Departmental Representative, remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Upon completion of substructure construction:
 - .1 Remove shoring and bracing.
 - .2 Remove excess materials from site as directed by Departmental Representative.

3.3 ASPHALT REMOVAL

- .1 Always cut asphalt with a cutting saw in order to facilitate removal and prevent lifting or damage to adjacent pavement, concrete or structures during excavation.
- .2 Under no circumstances will the cutting of pavement be allowed by the use of excavators or backhoe buckets, etc.
- .3 In full depth removal, care must be taken not to contaminate the reclaimed asphalt pavement with the underlying aggregate base material. All loose material remaining after cold milling shall be swept.
- .4 At all transverse vertical cuts milled in the existing pavement the Contractor shall immediately construct a temporary smooth taper with RAP (Recycled Asphalt Pavement) or hot-mix asphalt concrete to a minimum slope of 25:1.

- .5 Work, in such a manner that the structures are not damaged, and the area after removal matches the grade of the adjacent removal area. Any RAP that falls into structures shall be removed.

3.4 EXCAVATION - GENERAL

- .1 Excavate in all kinds of materials including rock encountered on Site and make own computations of amounts and nature of excavation required.
- .2 Select method of excavation, support and dewatering suitable for the works. Submit proposed method to Departmental Representative for review.
- .3 Protect property or structures above or below ground in accordance with the Contract.
- .4 Bear foundations or underside of all structures including pipe surrounds on the material as shown on the Drawings and neatly finish all bearing surfaces to the required levels and grades.
- .5 If the excavated surface is unsuitable, the Departmental Representative will determine what work is required. If such work is due solely to the nature of the ground, then Departmental Representative will measure the work, but if such work is due to any act or default of the Contractor in carrying out of the Works, resulting in disturbance of natural ground conditions, then the Contractor shall execute such work at no additional cost to the Contract.
- .6 Pile excavated material a safe distance away from sides of trench so it will not endanger personnel and the work, reduce sight distances, and obstruct roadways.
- .7 Leave existing utility controls unobstructed and accessible at all times.
- .8 Do not obstruct drainage ditches and natural watercourses.
- .9 Departmental Representative reserves the right to require surplus material to be placed for embanking, general grading or other improvement or use on site, for the general benefit of Departmental Representative.
- .10 Control grading so that the surface of the ground will be properly sloped to prevent water from running into excavated areas. Promptly remove any water, which accumulates in excavations.
- .11 Place excavated soil to be re- used as backfill in stockpiles properly graded and protected from all sources of moisture and freezing.

- .12 Reduce steepness of slopes wherever possible, and expose smallest practical area of land for shortest possible time.
- .13 Dispose of surplus materials off site at approved disposal site.

3.5 DRAINING, PUMPING AND THAWING

- .1 Keep excavations and trenches free of water. Control excavations to prevent surface water running into excavated areas.
- .2 Do work in connection with dewatering and supply and maintain on the worksite pumps in a number and capacity sufficient to keep bottom of excavations dry and free from water so placing of pipe, manholes, and concrete will be done in the dry. Operate equipment for as long as necessary.
- .3 Dispose of water removed from excavations in a manner that will prevent injuries to public health or private property or to any operation of the work completed or under construction. Do not pump water containing silt or other material in suspension into streams or drainage courses or water bodies.
- .4 Ensure that sub-drains, sump holes, wells or the like required for dewatering shall not endanger the stability of the Works. On completion of the work completely backfill and consolidate excavations.
- .5 Excavate, remove or thaw out frozen ground as necessary.

3.6 TRENCH EXCAVATION

- .1 Trenches for piping and related excavations shall be of sufficient width and depth at all points to allow pipes to be laid, joints to be formed, and appurtenant structures to be built in a workmanlike manner, and when needed, to allow for sheeting and shoring, pumping, draining, and for removing and replacing all materials unsuitable for foundations.
- .2 Excavate trenches so pipe can be laid to the alignment and depth required. Excavation length to be not more than pipe length that can be laid and backfilled in one day. Brace and drain trench so workers may work safely and efficiently.
- .3 Remove organic material and soft deposits to a depth where medium dense to dense materials are encountered as designated by the Departmental Representative.
- .4 Do not stockpile excavated materials alongside trench if the bearing soil will cause trench side failure or bottom uplift and affect pipe alignment.

3.7 UNSUITABLE MATERIAL EXCAVATION

- .1 Notify Departmental Representative when materials unsuitable for use in the work are encountered and remove to depth and extent as directed by Departmental Representative.
- .2 Dispose of unsuitable material off site at an approved disposal site.

3.8 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150mm compacted thickness to depth as indicated.
- .2 Shape bed true to grade to provide continuous uniform bearing surface for pipe. Do not use blocks when bedding pipe.
- .3 Shape transverse depressions in bedding as required to suit joints.
- .4 Carry bedding material across actual trench width. Mounding bedding shall not be permitted.
- .5 Compact each layer full width of bed to at least 95% of corrected maximum dry density.
- .6 After pipe installation, place and compact bedding to haunch line of pipe. Place and compact bedding material from haunch line of pipe to top of pipe in maximum 150mm layers. Place remaining bedding material to 300mm above top of pipe before further compaction.
- .7 Compact granular bedding to ASTM D4254, 98% relative density for Aggregate Base Gravel.

3.9 BACKFILLING - GENERAL

- .1 Do not proceed with backfilling operations until Departmental Representative has inspected and approved installations.
- .2 After pipelines, and structures have been built, backfill trenches and other excavated areas with materials shown on Drawings or as specified. Remove timber and debris from excavation before backfilling is commenced. Do not cover up or put out of view any work until it has been examined and approved by the Departmental Representative. If any work is covered without approval of the Departmental Representative it must, if requested, be uncovered for examination.
- .3 Do not backfill around or over cast-in-place concrete within 24 hours after placing.

- .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures, permit concrete to cure minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure.

3.10 BACKFILLING TRENCHES

- .1 Backfill trench from top of pipe bedding elevations indicated using materials shown on Drawings.
- .2 Place backfill in 300mm layers and compact to 98% maximum dry density.
- .3 During backfilling, keep trenches free of water at all times and controlled so as to prevent surface water running into excavated areas. Remove silty materials, which become wetted and subsequently liquid or extremely plastic.
- .4 Leave surface of backfill initially high and repair settlement of trench backfilling.

3.11 INSULATION

- .1 Place rigid insulation in trench where indicated on drawings. Do not disturb or break boards during backfilling.

3.12 MARKER TAPE

- .1 Place marker tape in trenches where indicated.

3.13 REINSTATEMENT

- .1 Upon completion of work, remove surplus materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Reinstate disturbed areas to conditions, elevation and thickness equal to or better than that which existed before excavation.
- .3 Clean and reinstate areas affected by work as directed by Departmental Representative.

END OF SECTION