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REFERENTIAL DESIGN SUBMISSION

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TL	of Canada	du Canada	MEMORANDUM	NOTE DE SERVICE	(1,1)
- -	Mr. W. R. Director	BINKS Transportation Pr	Ogram	SECURITY - CLASSIFICATION - DE SÉ	CURITÉ
TO à ∳	Design an Public Wo	d Construction rks Canada	ogram	OUR FILE - N/RÉFÉRENCE	
	OTTAWA, O	ntario		6220-АЗ-В	
FROM	Mr. F. E. Manager Highways 1	KIMBALL Program	1	YOUR FILE - V/REFERENCE	

SUBJECT OBJET FINAL DESIGN SUBMISSION - MACKENZIE HIGHWAY MILE 490.0 TO 495.0, MARCH , 1977

Public Works Canada

EDMONTON, Alberta

Gouvernement

In accordance with the direction by the Director of Engineering and Architecture Branch, D.I.N.A., one set of design plans for contract purposes are enclosed. Thirteen copies of the narrative portion will be forwarded under separate cover.

One set of sepia mylar copies of the design plans for the above mentioned submission will be forwarded to G. D. Reid for printing and distribution.

DATE

1977-03-11

Copies of the plans and narrative will be sent to F. Janz, D.I.N.A., D.O.E. in Edmonton and Winnipeg and E.M.R. in Calgary.

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F. E. KIMBALL Manager Highways Program

Encl.

Government

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FINAL DESIGN SUBMISSION MACKENZIE HIGHWAY

MILE 490.0 TO 495.0

MARCH 1977

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INTRODUCTION

CHAPTER 1

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APPENDIX "A"

Special Ditch Treatment Amended June, 1974

APPENDIX "C"

Draft Specifications

INTRODUCTION

This Final Design, covering Mile 490.0 to 495.0 is the first design submission for this section of the proposed Mackenzie Highway.

The alignment for this section is the alignment recommended by Department of Public Works in the Final Alignment Recommendation, Mackenzie Highway, Mile 490 to 495, submitted in September, 1974.

The reader should note that this report forms only part of the total design submission. The major portion is contained in a separate plan form.

CHAPTER I - DESIGN COMMENTS

1. Alignment

Horizontal

The horizontal alignment is presented in the "Final Alignment Recommendation Mackenzie Highway Mile 490 to 495" submitted in September 1974.

The rationale for the route selections are outlined in that report.

Further minor alignment revisions will be investigated prior to construction. Their purpose will be to flatten the 5[°] curve north of the crossing and to eliminate or minimize the cut at Mile 491.5 by shifting the alignment slightly to the east. These changes would not result in a major change in bridge location.

The other possible revision to the alignment to be investigated prior to construction is in the vicinity of Mile 493. An improvement to the vertical alignment may be obtained by shifting the horizontal alignment 200 to 300 feet to the east of this location.

We may also wish to investigate again the possibility of crossing further downstream in the vicinity of the originally proposed bridge site which we believe is a better site from an engineering viewpoint. That would however, encroach more on the flood plains which may be environmentally undesirable.

Vertical

The Blackwater River bridge elevation is in accordance with the Hydrology Consultant's recommendations and provides three feet clearance above estimated high water due to Mackenzie River ice jams.

The approach fill to the north of the proposed bridge is approximately 10 feet below estimated high water. This will result in occasional road closures during spring breakup but the closure would approximately coincide with the spring breakup closing of the Camsell Bend crossing.

The vertical alignment from Mile 493 to 494 is subject to revision pending further geotechnical investigations prior to construction.

The design meets 60 m.p.h. design speed except for the 85% grade between Mile 493 and 494 and the crest vertical curve at Mile 493.7. This curve is designed for 50 m.p.h. to reduce excavation in potentially poor soil.

2. Drainage

The Blackwater River is the only major crossing in this section.

The largest culverts required are 60 inch diameter corrugated structural plate pipe.

3. Soils

Additional geotechnical information will be obtained for Mile 490.6 to 491.6 and for Mile 493.0 to 493.8

- 3 -

prior to construction. Further geotechnical information at the bridge site will also be obtained.

The requirement for ditch protection based on Appendix "A" Special Ditch Treatment Amended June 1974 is indicated on the plan profile sheets.

4. Borrow

Material for the embankment south of the Blackwater River will come from right-of-way cuts widened as required. Actual widening will be determined when field cross-sections are available.

To the north of the river the embankment material will be obtained from one large right-of-way cut at Mile 493.5 and from a borrow pit at Mile 495.0.

The right-of-way cut will yield approximately 369,000 cubic yards. The geotechnical logs show the material to be low to medium plastic silty clay with low ice content and moisture content roughly at the plastic limit of the clay. The design width of the ditches in this cut is 12 feet. Depending on the quality of the material actually uncovered during construction, these ditches may be widened to obtain more material and hence reduce borrow quantity requirements.

The borrow pit, which also will be used for the construction of the section north of Mile 495, will be enlarged to provide the approximately 120,000 cubic yards required.

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The pit will be deepened and expanded away from the highway.

Usable volume	220,000 cubic yards
Stripping	16,000 cubic yards
Cleared area	9.6 acres

This pit was drilled during the winter of 1975. The material consists of medium to highly plastic silty clay. The ice content is low and the moisture content is at or below the plastic limit.

APPENDIX "A"

SPECIAL DITCH TREATMENT

AMENDED: June, 1974

SPECIAL TREATMENT FOR DITCHES

Roadway and offtake ditches are often necessary elements in highway design and construction. These ditches require the removal of the vegetative cover from their respective areas, thus increasing the potential for scour erosion. This scour erosion in highway ditches is dependent upon numerous factors including discharge, channel gradient, sediment in water, soil characteristics such as grain size, density, organic binder, cementation and ice content. Some methods used in highway construction to control or prevent scour erosion are: blanketing the ditch floors with stable, free-draining granular materials, reducing the effective ditch gradient by constructing a series properly spaced ditch checks on the ditch floor and by diverting run-off water out of the ditch onto natural vegetation by using ditch blocks.

Design equations exist for open channel flow, which relate flow velocity to the gradient and cross-sectional configuration of the channel. The Manning formula, is such an equation and is commonly employed for open channel flow calculations. The formula is as follows:

 $V = (1.486/n) R^2/3 S^1/2 (1)$

where

V=velocity of water, in feet per second
R=hydraulic radius (water area divided by
wetted perimeter)

2

S=slope of channel gradient, in feet per foot. n=Coefficient of Roughness (Manning's "n")

One of the principles followed in designing the Mackenzie Highway was to avoid excavation in permafrost wherever and whenever possible. Therefore, the use of standard engineering texts for use in non-permafrost areas was considered applicable for deriving ditch lining and ditch check spacing charts for the Mackenzie Highway.

When cuts through ice-rich permafrost areas are unavoidable it is intended to sub cut and back fill with a sufficient depth of ice-free material, which would provide soil conditions similar to non permafrost areas.

The Handbook of Steel Drainage and Highway Construction Products, second Edition, 1971, lists limiting velocities for non erosion of channels. The following tabulated Manning's "n" and limiting velocities for the general soil types found on the Mackenzie Highway right-of-way are excerpts from this Handbook. TABLE 1

Material	Manning n	Velocity ft./sec. For Clear Water
Fine sand	.020	1.50
Silty sand	.020	1,75
Fine gravel	.020	2,50
Stiff clay	.025	3.75
Coarse gravel Well graded gravel	~ 025	4.00
Cobbles	.035	5.00
Shale, hard pan	. 025	6.00

Using the limiting velocities as tabulated above and Manning's formula, discharge versus gradient curves were calculated for a twelve foot wide "B" type road ditch. (See figure 1).

Ditch Lining

For a given soil type a curve in Figure 1 indicates the limiting discharge for a given gradient above which scour erosion may occur. Therefore, theoretically, by lining the ditch with an adequate depth of material selected higher in the graph scour erosion should be arrested or minimized.

Ditch Checks

As an alternate to ditch lining ditch checks, within their limits, would be adequate and possibly more economical in some areas for scour prevention. See Figure 6 of this report for a schematic explanation of ditch check theory.

Figures 2 to 5 inclusive of this report are recommended ditch check spacing charts calculated for discharges up to 20 c.f.s. over various soil types. The derivation of these ditch check spacing charts was based on the effective gradient required for non-erosion of a soil type at a given discharge.

Due to the physical limitations of the highway ditch depth the ditch check crest is one foot above the ditch floor. A forty-foot minimum spacing of ditch checks was considered to be reasonable for construction, maintenance and effectiveness.

Discharge Determination

The Rational formula developed in 1889 by sewage engineers is probably the most widely used formula for estimating discharges. The formula is:

Q = discharge in c.f.s.

Q = CiA. (2)

where

C = the run-off coefficient
i = the intensity of rainfall in
inches per hour.

A = the drainage area in acres.

This approach with the following modifications was considered to be an acceptable one for small drainage areas up to about one square mile.

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Bolter, Parish, Trimble, consulting engineers, have in their publication, Hydrology Study and Design of Culverts, Mile 297 to Mile 345, Mackenzie Highway, November, 1972, developed a modified Rational formula for large drainage areas in the following form: $Q_i = 26.7 \text{ ARr} (100 - \text{L}) \text{ M}$ (3) where $Q_i = \text{maximum instantaneous discharge}$

- c.f.s.

A = drainage area - square mile

R = rainfall in 24 hours

r = rainfall reduction factor

L = percent water loss

M = conversion factor mean daily discharge to maximum instantaneous.

maximum instantaneous discharge in c.f.s.

Rationalizing the variables in the above formula as they are effected in the Mackenzie Valley small drainage areas the following empirical formula was developed for estimating small drainage area discharges:

Q = .584 CA (4)

where

0

С

=

= run-off coefficient

A = drainage area in acres.

- (a) ".584" is the resultant of 26.7, R, r, M and the conversion of square miles to acres $(\frac{1}{640})$
 - "R" 4 inches per 24 hours was considered a conservative estimate.
 - "r" 1.0 was used since no appreciable reduction can be expected in small drainage areas.
 - "M" a value of 3.5 was considered conservative for small drainage areas.
- (b) "C" run-off coefficient is similar to (100-L). Bolter, Parish, Trimble arrived at an "L" value of 75% for large drainage areas (550 acres and greater). The accepted run-off coefficient for concrete and pavement is 0.8 suggesting a water loss of 20%. It was considered conservative to use this 20% water loss for drainage areas of 45 acres and less. Joining these limits with a porabolic curve, expected water losses for intermediate drainage areas were interpolated and converted to the following run-off coefficients:

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TABLE 2

Expected run-off coefficients for small drainage areas in the Mackenzie Highway

	A	cres		<u>"C"</u>
Up	to	45	-	0.80
Up	to	9 8	-	0.65
Up	to	222	-	0.50
Up	to	550	-	0.25

The selection of a particular type of ditch treatment or whether it is required will ultimately rest on the experience of the resident engineer.





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Figure 2

DITCH CHECK SPACING

(DESIGN DISCHARGE - 3 CFS)



DITCH CHECK SPACING - FT.

- 9 -

Figure 3 DITCH CHECK SPACING

(DESIGN DISCHARGE - 5 CFS)



DITCH CHECK SPACING - FT.

- 10 -

Figure 4

DITCH CHECK SPACING

(DESIGN DISCHARGE - 10 CFS)



DITCH CHECK SPACING - FT.

- 11 -

Figure 5

DITCH CHECK SPACING

(DESIGN DISCHARGE - 20 CFS)



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The ditch checks will be constructed with non-erodible materials.

N.W.T. Roads May, 1976		General Requirements	Division 1 Section 2 Page 1 of 9		
1.2.1 Land Use Regulations	.1	The Land Use Permit included is was issued to this Department, authority to carry out the wor Specifications and Plans subjections of the Ter Act. The Land Use Permit and Conditions shall be considered Specifications.	and Use Permit included in the Specifications ssued to this Department, granting it the rity to carry out the work described in the fications and Plans subject to the Territorial Use Regulations of the Territorial Land Use The Land Use Permit and the attached Operatin tions shall be considered part of the Contrac- fications.		
	.2	The Contractor's attention is of the General Conditions "C" he is hereby advised he will be sible for all fines and penals the Department of Public Works the Land Use Permit, and which or indirectly from the Contract the Project.	directed to Section of the Contract and be held fully respon- ties issued against s as Permittee under h resulted directly ctor's activities on		
1.2.2 Control of Materials		Royalties payable to the Crown the Territorial Quarrying Regu gravel, sand and/or loam are h the purpose of carrying out we	n under the terms of ulations for rock, hereby cancelled for ork under this Contra		
1.2.3 Measurement of	.1	Linear			
Quantities		All linear measurements shall distances, except for the meas installations as noted elsewhe cations.	be based on horizont surement of culvert ere in these Specifi-		
	.2	Volume			
		.1 In computing volume of exact the average end area method cept as otherwise agreed and the Engineer.	cavation and embankme od will be used, ex- to by the Contractor		
		.2 When materials are to be vehicle, the vehicle shall acceptable to the Enginee vehicles are of uniform c a plainly legible identif its specific approved cap measured at the point of	measured in the haula l be of a size and ty r. Unless approved apacity, each must be ication mark indicat: acity. Loads shall b delivery.		
		.3 Material specified for me yard may be weighed and so to cubic yards for paymen of conversion will be det and must be agreed to by such method of measuremen will be approved by the F	asurement by the cub uch weights converted t purposes. Factors ermined by the Engine the Contractor before t of pay quantities		

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.4 When gallons are specified as a measurement, they shall mean imperial gallons.

1.2.3 Measurement of Quantities (cont'd)

.3 Weight

.1 The term ton shall mean two thousand (2,000) pounds avoirdupois.

- .2 All materials which are specified for measurement by weight shall be weighed on scales of a type and at a location approved by the Engineer. Trucks used shall be weighed empty at such times as the Engineer directs, and each truck shall bear a clearly legible identification mark.
- .3 Weight measurements will be made by a weighmaster provided by the Department using scales and a scale house to be provided by the Contractor. The scales shall be of suitable design and of sufficient capacity to accommodate any vehicle used on the work in a single weighing operation and shall be inspected and tested for accuracy by the Federal Department of Consumer and Corporate Affairs, Weights and Measures Inspection Branch, as often as may be required by the Engineer. The scale house shall be weatherproof and constructed to afford protection for the recording device of the scales. It shall have one sliding window facing the scale platform, one end window, and a shelf desk at least two (2) feet wide and six (6) feet long. Doors shall not open onto the scale platform. The Contractor shall provide adequate lighting and heating.

The furnishing of scales and scalehouse and the inspection and testing of the scales shall be considered incidental to the work under the Contract and will not be measured separately for payment.

- .1 The Contractor will be required to temporarily cease operations on certain sections of the Project for reasons of protecting the environment as outlined in Division 1, Section 1, or in the Operating Conditions of the Land Use Permit. The Contractor shall schedule and organize his works so that the maximum of productive work can continue on other sections of the project during the period(s) of constraint.
- .2 When an unscheduled shutdown of the Contractor's operation has been ordered for reasons of protecting the environment, other than those reasons specified in Division 1, Section 1, or for those reasons in the Operating Conditions of the Land Use Permit, and when, in the opinion of the Engineer, productive work cannot be performed on other sections of the project by the equipment affected by the shutdown,

1.2.4 Construction Interruptions for Environmental Protection 1.2.4 Construction Interruptions for Environmental Protection (cont'd) payment will be made to the Contractor for equipment and labour standby costs as follows:

.1 Production Equipment Standby

Production Equipment shall include only those units listed in the following group:

motor-scrapers, crawler tractors, front end loaders, motor graders, trucks larger than eight (8) cubic yards, rock drills, compressors and backhoes, draglines and shovels over one-half (1/2) cubic yard. The formula to be applied in determining standby costs for a piece of equipment shall be fifty (50) percent of the current "Alberta Road-Builders Association Rental Rate less the applicable operator wage rate quoted in the Association rate schedule." Such costs will be applicable up to a maximum of 10 hours per day, 5 days per week.

.2 Labour Standby

Labour standby costs will be paid for only those operators assigned to production equipment mentioned above and which have been affected by the shutdown. Measurement for payment will be made in accordance with Section 45 of the General Conditions "C" and shall be based on actual standby wage costs and costs of board and camp operation incurred by the Contractor. The Contractor may be required to present copies of his payroll records to support any labour costs claimed under this section. Payment for board and camp operation may be calculated on the basis of the Unit Price Table Item "Board for Engineer's Staff."

.3 The proposed payments outlined above for Production Equipment Standby and Labour Standby shall be considered full and final compensation for all costs directly or indirectly incurred by the Contractor because of unscheduled shutdown of his operations for protection of the environment.

The Contractor shall, at his own cost, provide, erect and maintain all necessary barricades, suitable and sufficient lights, danger signals and other signs and take all necessary precautions for the protection of the work and the safety of the public.

The Contractor may be required to erect and maintain a standard Department of Public Works project sign(s) supplied by the Department. Measurement for payment

1.2.5 Barricades and Warning Signs

1.2.6 Project Signs

1.2.6 Project Signs (cont'd)

1.2.7 Layout of Work

for the erection and maintenance of the sign(s) will be made in accordance with Section 45 of the General Conditions "C".

The Engineer will set stakes and bench marks establishing the location, alignment and reference elevations for the work. This will generally include the setting out of one set of clearing markers, offset baseline, bench marks, slope stakes and culvert stakes, together with two sets of second grade stakes.

Any restaking resulting from the careless operations of the Contractor will be at the Contrac**tor's** own cost

1.2.8 Maintenance of Work During Construction

The Contractor shall at his own cost maintain all work during construction. The maintenance shall constitute continuous and effective work, prosecuted day by day, with adequate equipment and forces so that the roadway and/or structures are, at all times, kept in a condition satisfactory to the Engineer.

.2 Roadway

.1 General

- (a) Ruts and ridges caused by machinery or vehicles shall be removed from the completed or partially completed roadway.
- (b) Any portion of the road used for travel shall be kept free of snow.
- (c) Prior to spring thaw, snow shall be removed from the top of the road, including shoulders, for the full length of completed or partially completed construction as directed by the Engineer.

.3 Icing of Culverts

The Contractor shall, at his own cost, thaw out iced culverts to ensure that culverts are functioning during the period of spring break-up. The Department will provide a mobile steamer for this purpose. The Contractor shall **be** responsible for operating and maintaining this unit and shall return it to the Engineer in good condition upon completing this work.

Vehicles of the Government of Canada and the Northwest Territories, or of the Agents or Contractors thereof, will be allowed access within the limits of the project at all times. Unless otherwise

1.2.9 Use of Roadway During Construction

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- 1.2.9 Use of Roadway During Construction (cont'd)
- 1.2.10 Construction Camp

provided in Division 1, Section 1, the Contractor may close the road to the general public during construction. The Engineer may, however, grant the use of the road to other operators.

The Contractor's camp and service area locations are subject to the approval of the Engineer and shall be set up and operated in accordance with the Government of the Northwest Territories Regulations governing operation of temporary field camps.

The development, maintenance and restoration of the Construction Camp and Service Area shall be considered incidental to the work under the Contract and will not be measured separately for payment.

The Contractor shall make application to the Controller of Water Rights, Department of Indian Affairs and Northern Development, Yellowknife, N.W.T., for authorization for the use of water and disposal of domestic sewage wastes at the camp in accordance with the Northern Inland Waters Act. The Contractor shall obtain this authorization prior to camp startup.

Untreated sewage shall not be discharged directly or indirectly into natural waters. Depending on camp population, soil conditions, climatic conditions and the duration of the camp at one site, the following generally are acceptable methods of sewage disposal.

- .1 Total underground containment or lagooning by means of:
 - (a) Discharge directly to a suitably cribbed and covered cesspool.
 - (b) Discharge to a suitably cribbed leach pit through a septic tank or through a leach cesspool compartment. The septic tank or leach cesspool compartment is for settlement and digestion and for sludge removal as necessary.
 - (c) Discharge to an underground holding pit (which could be a cesspool, leach pit or tank) of at least one week retention capacity and discharged weekly from there to a lagoon by a portable pump and flex-hose or other suitable arrangement. The lagoon shall be suitably located at least three hundred (300) feet away from the camp being served.

General Requirements

1.2.10 Construction Camp (cont'd) The lagoon shall have a minimum retention period of one (1) year, a liquid depth of six (6) feet to eight (8) feet, a free board minimum of eighteen (18) inches and impervious berms having a ten (10) foot top width and minimum slopes of three to one (3:1). Suitable precautions shall be taken for erosion control.

2. Package treatment plants such as rotating Bio Disc, Physical Chemical Plant, etc.:

The plants are to be sized and operated to produce an effluent of secondary treatment quality. The Contractor shall make every effort to use water-saving fixtures in the camps such as low water-use toilets, urinals, wash basin taps, shower heads, and washing machines.

- 3. Prior to the installation of the camp and related services, a plan of the layout shall be submitted to the Engineer for approval. Upon being vacated the construction camp and service areas shall be left in a condition acceptable to the Engineer.
- .1 The Contractor shall comply with the requirements for forest protection and fire fighting equipment regulations as outlined in the Land Use Permit and the Forest Protection Ordinance, Chapter 38 of the Revised Ordinances of the Northwest Territories.
- .2 The following fire fighting equipment is required for the construction camp(s):

Equipment	Size	e of Ca	mp (Me	<u>n)</u>
	25	<u>50</u>	75	<u>100</u>
Fire Shovels Axes, boys, 2½ 1b.	5 2	10 4	15 6	20 8
Pulaski Tools	5	10	15	20
Chain Saws	1	1	2	2
Backpack Pumps	5	15	20	20
Power Pumps, 1 ¹ ₂ "				
discharge	1	2	2	3
Fire Hose, $1\frac{1}{2}$ standard				
coupling	1500'	3000'	3000'	4500'
Hose Carrying Bags	3	3	6	9
Water Tank, slip on, 500 gal. capacity movable by truck				
or crawler tractor	1	1	1	2

The chain saw(s) shall weigh approximately twelve (12 lbs. and be equipped with a sixteen (16) inch bar, tools, fuel, oil, spare spark plugs and carburator

1.2.11	Forest Protection
	and Fire Fighting
	Equipment

Division 1 Section 2 Page 7 of 9

1.2.11 Forest Protection and Fire Fighting Equipment (cont'd) kit.

The power pumps shall be nine (9) horsepower pumps or larger fully equipped with suction hose, couplings auxiliary tanks, nozzles, funnels, spare spark plugs, fuel, hose wrenches and other tools.

- .3 Fire fighting equipment shall be stored in a conspicious place in the camp and used exclusively for fire control. Caches should be appropriately signed.
- .4 The Contractor shall designate three (3) persons who will be contacts for the Northwest Lands and Forest Service Field Officer. Prior to commencement of work, the Contractor shall contact the Northwest Lands and Forest Service Field Officer who will instruct the Contractor's "designated persons" so that they will become familiar with the fire regulations, safety precautions and general operating procedures in case of fire.
- .5 The supply of fire fighting equipment shall be considered incidental to the work under the contract and will not be measured separately for payment.
- .1 Notwithstanding all the terms of Section 27(2) of the General Conditions "C", special arrangements are required for the employment of local residents on this project. The Contractor, prior to recruiting his work force, shall meet with the Manager, Canada Manpower Centre, covering the area of the project and advise him of his labour requirements for the project.

The Canada Manpower Centre will identify for the Contractor, local residents in the area of the project who appear to be qualified to perform the duties as outlined by the Contractor and the Contractor must show just cause in event these qualified local people are not offered employment. The Canada Manpower Centre will act as the employment referral agency.

During the progress of the work, the Economic Development Section, Department of Local Government, Government of the Northwest Territories, will make a Liaison Officer available on site to assist the Contractor with any employment arrangements with the local people. The Contractor will maintain contact with Liaison Officers who will provide counselling services as required for employees and their families.

.2 The Contractor will provide for training on the job

1.2.12 Employment of Native People 1.2.12 Employment of Native People (cont'd)

1.2.13 Climatic Conditions

1.2.14 Environmental Briefings contracts, to be arranged by the Territorial Government, for those indigenous Territorial residents who require special assistance in order to fill available jobs.

The Contractor's attention is drawn to the severe climatic conditions at the location of the project. Information regarding the climatic conditions can be obtained from the Department of the Environment.

When he has commenced operation of all equipment necessary to perform the work identified as clearing and excavation, and thereafter approximately every three (3) months, the Contractor shall arrange to have all his field staff available for a period of about one hour for environmental briefings. The Contractor shall provide space for the briefings at his camp. The Department will arrange for and bear the cost of having environmental experts available for the briefings. The briefings will be scheduled to fit in with the Contractor's operation (double shift), so as not to require any shutdown of the construction work.

The Department may also have available in the camp, a short photographic slide presentation or movie outlining environmental concerns and precautions to be taken. If such is available, the Contractor shall ensure that all new employees on the work view this presentation as soon after arrival as possible.

The Contractor's Superintendent shall meet with the Engineer and the Land Use Officer prior to commencement of any work under this Contract to review the requirements of the Land Use Permit Operating Conditions, to identify areas of environmental concern, and to establish special procedures and precautions because of such concern.

.1 Tender Schedules

Each Bidder shall submit with his tender a schedule in bar chart form covering excavation, gravel, structural plate culverts, and temporary bridge structures and showing the calendar dates on which activities on each of those items will take place for each five-mile section of the Contract. This schedule must clearly demonstrate that the Bidder has examined all of the requirements of these Specifications, has examined the site conditions, has made himself aware of the access problems to the site and is aware of schedule limitations which may be brought about by **C**limatic conditions or environmental requirements.

1.2.15 Schedules

1.2.15 Schedules (cont'd)

.2 Construction Schedule

After notification of award of Contract, the Contractor must prepare a detailed Construction Schedule showing the calendar time planned for clearing, roadway and borrow excavation, temporary bridge construction, traffic gravel and installation of corrugated steel pipe and corrugated structural plate pipe on the basis of a mile by mile identification for the total length of the Contract. The schedule must meet the requirements of any milestone dates outlined in Division 1, Section 1.

There will be no payment of progress claims until the Construction Schedule is received in a form acceptable to the Engineer.

N.W.T. Roads Standard Specifications May, 1976		Clearing	Division 9 Section 1 Page 1 of ²
9.1.1 Description		This item consists of the removal accordance with these Specification stumps, logs and other surface del the highway right-of-way, haul roa disposal areas, gravel pits and of on the Plans or designated by the	and disposal, in ons, of trees, brus oris from within ads, borrow pits, cher areas shown Engineer.
9.1.2 Materials		Not applicable.	
9.1.3 Construction		Clearing shall consist of the remo of all items mentioned in Article trees and shrubs that are designant tion. These trees and shrubs shall from scarring, barking or other in construction operations. Dangerou overhanging the right-of-way and D edge of all cleared areas shall be and brush less than three (3) feet not require cutting.	oval and disposal 9.1.1, except for ted for preserva- 11 be protected ajury during the 15 trees and snags teaners along the removed. Shrubs t in height will
	.1	Machine Clearing	
		The Engineer will designate the an cleared by machine. Machine Clear be permitted for the clearing of h the clearing of the right-of-way a where roadway excavations are prop	ceas which may be ring will generall porrow pits and fo and haul roads posed.
	.2	Hand Clearing	
		Hand Clearing shall be performed of by the Engineer and shall consist within eight (8) inches of origina all trees and brush. Generally ha be confined to the right-of-way, of and haul roads.	on areas designate of cutting to al ground surface, and clearing vill offtake ditches
		Hand Clearing shall be carried out will not damage the existing insul material. The use of machinery to of the clearing debris will only b frozen ground conditions.	in a manner that ation of organic pile and dispose pe permitted over
	.3	Debris Piles	
		Debris piles consisting of trees, organic materials existing from pr operations shall be removed and di Contractor.	rubbish and/or revious clearing sposed of by the
	.4	Disposal	
		All clearing debris shall be dispo by the Engineer. Generally the di of-way debris will consist of burn	osed of as directe sposal of right- ing and placing

Standard Specifications May, 1976		Clearing	Section 1 Page 2 of 2
9.1.3 Construction (cont'd)		of any unburned debris in disp areas designated and/or approx For the clearing of borrow pit will generally be permitted to debris into a section of the p is completed or along the outs and to flatten, cover with was trim such debris to a condition Engineer.	oosal pits or disposa yed by the Engineer. as, the Contractor o place the clearing oit where excavation side edge of the pit ste excavation and on acceptable to the
		In specific areas, the Enginee that trees from the hand-cut o be laid into a uniform mat wit future embankment.	er may permit or dire clearing operation thin the limits of
	.5	Right-of-Way Clearing Limits	
		Generally the right-of-way will width of one hundred (100) fee quired, to provide a minimum of from the toe of embankment or excavation backslope to the ed	ll be cleared to a et or wider, if re- of fifteen (15) feet from the top of dge of the clearing.
	.6	Progress of Work	
		Except as may otherwise be app the Engineer, borrow pit areas in advance of excavation by mo The clearing within the right- pleted at least one-half (1/2) the grading operation.	proved or directed by s shall not be cleared ore than one (1) week -of-way shall be com-) mile in advance of
		Where portions of the right-of been cleared by others, the Co the Engineer no later than Oct of the section of anticipated tion to take place between Oct 15th.	f-way have previously ontractor shall advis tober 1st of each yea embankment construc- tober 1st and April
9.1.4 Measurement		The quantity of CLEARING to be shall be the number of acres accordance with these Specific	e measured for paymen acceptably cleared : cations.
		The removal of stumps and rema on areas cleared by others sha cidental to the clearing oper- measured separately for paymen	aining clearing debr 11 be considered in- ation and will not be nt.
		Earth material removed along debris during the clearing di- sidered incidental to the clear	with the clearing sposal shall be con- aring operation and

N.W.T. Roads Standard Specifications May, 1976		Road Exca	way and Borrow vation	Division 9 Section 2(a) Page 1 of 4
9.2(a).1 Description		This with and mate danc and the	item consists of excava in the freehaul distance trimming of all Roadway rials. The work is to b e with these Specificati grades shown on the Plan Engineer.	ating, loading, hauling e, placing or disposing and Borrow Excavation be carried out in accor- tions and to the lines as or as designated by
9.2(a).2 Materials	.1	<u>Exca</u>	vation Rock	
		Exca	vation Rock is defined a	as:
		(a)	Material excavated from sedimentary or metamorp its removal, was integr	n solid masses of igneous bhic rock which, prior to ral with its parent mass.
		(b)	Boulder or rock fragmer two (2) cubic yards or	nts measuring in volume more.
	.2	Exca	vation Common	
		Exca ials hard the	vation Common shall cons of whatever nature, inc pan and frozen materials classification of Excave	sist of all other mater- cluding dense tills, s that do not come under ation Rock.
9.2(a).3 Construction	.1	Road	way Excavation	
		(a)	Roadway Excavation will required for constructs ditches, embankments, s and the removal and dis materials.	l include all excavation ion of contiguous roadway installation of culverts, sposal of unsuitable
		(b)	All suitable materials in roadway embankments rected by the Engineer.	excavated shall be placed except as otherwise di-
		(c)	All materials which in Engineer are unsuitable disposed of at location directed by the Enginee	n the opinion of the e for embankments will be ns and in a manner as er.
		(d)	All roadway excavation a manner so as to minin natural ground cover on	shall be carried out in mize disturbance to the n adjacent areas.
		(e)	Trimming of all excavate done in a neat and work way excavations shall a shown on the Plans or a Engineer by more than a foot. In addition the constructed grade and a within any one hundred roadway, shall not vary tenth (1/10) of a foot	tion surfaces shall be kmanlike manner. Road- not vary from the grades as designated by the two-tenths (2/10) of a difference between the the designated grade, (100) foot length of y by more than one-

N.W.T. Roads Standard Specifications May, 1976		Road Exca	way and Borrow Section 2(a) vation Page 2 of 4
		2	
9.2(a).3 Construction (cont'd)		(f)	Where the subgrade is in transition from ex- cavation to embankment, sub-excavation will b carried out in the transition area in accorda with the Plans or as designated by the Engine
		(g)	Where unsuitable material is encountered at t grade level of a cut, the sub-grade shall be sub-excavated to the depth staked by the En- gineer.
		(h)	Where suitable material is encountered at the grade level of a cut, scarifying to a minimum depth of eight (8) inches below sub-grade wil be performed prior to shaping and compaction.
		(i)	If during excavation, material appearing to conform to the classification of Excavation Rock is encountered, the Contractor shall notify the Engineer and shall provide ample opportunity for the Engineer to investigate and to make such measurements as are necessar to determine the volume of material in questi
		(j)	Rock which cannot be ripped, shall be drilled and blasted in such a manner that all materia excavated will be usable for embankment con- struction.
		(k)	Where solid rock is encountered at the grade level of a cut, the subgrade shall be sub- excavated as shown on the Plans and back- filled with material designated by the Engineer.
		(1)	Rock slopes shall be scaled down removing bound ders and rock fragments to form stable slopes
	.2	Borr	row Excavation
		(a)	The Engineer will designate and approve all borrow sources and haul roads. Haul roads fr borrow pits will consist of one (1) two-way road having a maximum surface width of thirty two (32) feet or two (2) one-way haul roads each having a maximum surface width of twenty (20) feet. The haul roads will generally be doglegged so that only a short section of the haul road is visible from the highway.
		(ኴ)	Drill logs in the vicinity of potential borro sources have been indicated on the Plans. Th information has been provided to give the Contractor an appreciation of the general
		1	type of material to be encountered in borrow sources and the general spacing of such borro
N.W.T. Roads Standard Specifications May, 1976	Roa Exc	dway and Borrow avation	Division 9 Section 2(a) Page 3 of 4
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9.2(a).3 Construction (cont'd)		sources. The actual depths for excavation be designated in the s	location, dimensions and of borrow sources will field by the Engineer.
	(c)	Slopes of the excavate be steeper than two to Common and one-quarte cavation Rock, unless the Engineer.	ed borrow pits shall not o one (2:1) for Excavation r to one (1/4:1) for Ex- otherwise directed by
	(d)	Unsuitable materials will generally be dis designated by the Eng to the borrow pit in interfere with the na drainage from or into disposed of material by the Engineer. For the Engineer may dire unsuitable material be excavated area upon co excavation.	excavated from borrow pits posed of by placing it as ineer immediately adjacent such a location as not to tural ground drainage or the borrow pit. The will be trimmed as directed certain borrow excavation ct that all or part of the e placed back into the ompletion of the borrow
	(e)	If during excavation, conform to the classi Rock is encountered, the Engineer and shal for the Engineer to i such measurements as the volume of materia	material appearing to fication of Excavation the Contractor shall notif 1 provide ample opportunit nvestigate and to make are necessary to determine 1 in question.
	(f)	Rock which cannot be and blasted in such a excavated will be usa struction.	ripped shall be drilled manner that all materials ble for embankment con-
	.1 The pay mat cav ifi	e quantity of EXCAVATION ment shall be the numbe cerial in its original p vated and placed in acco cations.	COMMON to be measured for r of cubic yards of osition, acceptably ex- rdance with these Spec-
	Ori cle	ginal cross sections wi earing is completed.	11 be taken after the
	Sca sha bor ser	orifying as specified in all be considered incide row excavation operatio parately for payment.	Article 9.2(a).3.1(h) ntal to the roadway and n and will not be measure
	.2 The pay ter and	e quantity of EXCAVATION ment shall be the numbe ial in its original pos l placed in accordance w	ROCK to be measured for r of cubic yards of ma- ition acceptably excavate ith these Specifications.

N.W.T. Roads Standard Specifications May, 1976		Roadway and Borrow Excavation	Division 9 Section 2(a) Page 4 of 4
9.2(a).4 Measurement (cont'd)		Original cross sections will b exposed rock surface.	be taken on top of
	.3	There will be no measurement is ial excavated beyond the lines or as staked by the Engineer of excavations, where in the opin unavoidable over-break occurs payment will be made for the a volved provided the over-break ten (10) percent of the actual lines and grades as staked by the established one-hundred (1 intervals where the over-break in excess of the allowable over in the embankment, will be mea Excavation Common. Materials lowable over-break and not pla will not be measured for payme	for payment for mat s shown on the Plan except in roadway r nion of the Enginee . Measurement for actual quantity in- k does not exceed l quantity within t the Engineer betwe 100) foot station k occurs. Material er-break when place asured for payment in excess of the a aced in the embankm ent.
	.4	Where the Engineer directs the from a borrow pit be placed be area after completion of the this work will be measured for with Section 45 of the General	at unsuitable mater ack into the excava borrow excavation, r payment in accord l Conditions "C".
	.5	The removal and disposal of a face debris and other unsuita be considered incidental to t for Roadway and Borrow Excava	ll roots, stumps, s ble materials shall he measurement made tion.

N.W.T. Roads Standard Specifications May, 1976		Roadway and Borrow Excavation	Division 9 Section 2(b) Page 1 of 4
9.2(b).1 Description		This item consists of excavat within the freehaul distance, and trimming of all materials vation Usable or Excavation W to be carried out in accordan fications and to the lines an the Plans or as designated by	ing, loading, hauling placing or disposing classified as Exca- laste. The work is the with these Speci- ad grades shown on the Engineer.
9.2(b).2 Materials	.1	Excavation Usable	
		All excavated material incorp Haul Road and Access Road emb ified as Excavation Usable.	oorated into the Roadway ankments will be class-
	.2	Excavation Waste	
		All excavated material which into the Roadway, Haul Road a bankments will be classified	is not incorporated and Access Road em- as Excavation Waste.
9.2(b).3 Construction	.1	Roadway Excavation	
		(a) Roadway Excavation will required for the constru- roadway ditches, embankm culverts and the removal unsuitable materials.	include all excavation action of contiguous ments, installation of and disposal of
		(b) The Engineer will design used in embankments and wasted.	nate the material to be the material to be
		(c) All roadway excavation s a manner as not to damage cover on adjacent areas.	shall be carried out in ge the natural ground
		(d) Trimming of all excavatidone in a neat and worknexcavations shall not vadimensions shown on the by the Engineer by more of a foot. In addition, the constructed grade an within any one hundred ()	ion surfaces shall be manlike manner. Roadway ary from the lines and Plans or as designated than two-tenths (2/10) , the difference between nd the designated grade (100) foot length of
		roadway, shall not vary $(1/10)$ of a foot.	by more than one-tenth
		(e) Where the subgrade is in vation to embankment, su carried out in the trans dance with the Plans or Engineer.	n transition from exca- ubexcavation will be sition area in accor- as designated by the
		(f) Where unsuitable materia the grade level of a cut be subexcavated to the c	al is encountered at t, the subgrade shall depth staked by the

N.W.T. Ro Standard May, 1976	ads Specifications	Roa Exe	dway and Borrow avation	Division 9 Section 2(b) Page 2 of 4
9.2(b).3	Construction		Engineer.	
		(g)	Waste disposal areas an disposal will be design	d the manner of waste ated by the Engineer.
		(h)	Where suitable material grade level of a cut, s depth of eight (8) inch be performed prior to s	is encountered at th carifying to a minimu nes below subgrade wi shaping and recompact:
		(i)	Where solid rock is enc level of a cut, the sub excavated as shown on t with materials designat	ountered at the grade grade shall be sub- he Plans and backfill ed by the Engineer.
		(j)	Rock which cannot be ri and blasted in such a m excavated will be usabl struction.	pped, shall be drille anner that all materi e for embankment con-
		(k)	Rock slopes shall be sc boulders and rock fragm slopes.	aled down, removing ents to form stable
		.2 <u>Bor</u>	row Excavation	
		(a)	The Engineer will desig borrow sources and haul consist of one (1) two- imum surface width of t two (2) one-way haul ro imum surface width of t haul roads will general that only a short secti visible from the highwa	nate and approve all roads. Haul roads w way road having a man hirty-two (32) feet of ads each having a man wenty (20) feet. The ly be dog-legged so on of the haul road i y.
		(b)	Drill logs in the vicin sources have been indic information has been pr tractor an appreciation material to be encounte The actual location, di excavation of borrow so in the field by the Eng	ity of potential born ated on the Plans. To ovided to give the Co of the general type ared in borrow sources mensions and depths a purces will be designa- gineer.
		(c)	Slopes of the excavated be steeper than two to tion Waste and one-quan Excavation Usable unles by the Engineer.	d borrow pits shall n one (2:1) for Excava rter to one (1/4:1) f ss otherwise directed
		(d)	Waste materials excava will generally be dispo designated by the Engin jacent to the borrow p	ted from borrow pits osed of by placing as neer immediately ad- it in such a locatior

N.W.T. Roads Standard Specifications May. 1976		Roadway and Borrow Excavation	Division 9 Section 2(b) Page 3 of 4
9.2(b).3 Construction (cont'd)		as not to interfere with drainage or drainage from pit. The disposed of man as directed by the Engine borrow excavations, the H that all or part of the w placed back into the exca completion of the borrow	the natural ground n or into the borrow terial will be trimmed eer. For certain Engineer may direct waste materials be avated area upon excavation.
		(e) Rock which cannot be ripp and blasted in such a man excavated will be usable struction.	ped, shall be drilled nner that all materials for embankment con-
9.2(b).4 Measurements	.1	The quantity of EXCAVATION WAS payment shall be the number of material, in its original post excavated and disposed of in a these Specifications.	STE to be measured for f cubic yards of ition, acceptably accordance with
		Original cross sections will clearing is completed.	be taken after
	.2	The quantity of EXCAVATION US for payment shall be the numbe material, in its original post excavated and placed in accord Specifications.	ABLE to be measured er of cubic yards of ition, acceptably dance with these
	.3	There will be no measurement material excavated beyond the Plans or as staked by the Eng able roadway excavations, when the Engineer, unavoidable over surement for payment will be quantity involved provided the not exceed ten (10) percent or within the lines and grades as Engineer between the establish foot station intervals where Materials in excess of the all will only be measured for pay acceptably utilized in the com bankment.	for payment for lines shown on the ineer except in us- re in the opinion of r-break occurs, mea- made for the actual e over-break does f the actual quantity s staked by the hed one hundred (100) the over-break occurs. lowable over-break ment if they are nstruction of em-
	.4	Scarifying and relaying as sp 9.2(b)3.1(h) shall be conside the roadway and borrow excavat will not be measured separate	ecified in Article red incidental to tion operation and ly for payment.
	.5	Where the Engineer directs the from a borrow pit be placed be area after completion of the work will be measured for pays with Section 45 of the Genera	at unsuitable material ack into the excavated borrow excavation, this ment in accordance l Conditions "C".

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	N.W.T. Roads Standard Specifications		Roadway and Borrow	Division 9 Section2(b)
	May, 1976		Excavation	Page 4 of 4
-	9.2(b).4 Measurements (cont'd)	.6	The removal and disposal of surface debris and other un	all roots, stumps, suitable materials
			shall be considered inciden made for Roadway and Borrow	tal to the measurement Excavation.
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This item consists of the excavation required for 9.3.1 Description permanently deepening, widening and relocating water channels, the construction of ditches other than contiguous roadway ditches, loading, hauling within the free haul distance, placing or disposing and trimming of materials in accordance with these Specifications and to the lines and grades shown on the Plans or as designated by the Engineer. Except for intercepter ditches running generally parallel to the roadway embankment but not contiguous with it, channel excavation will be designated beyond a distance of fifteen (15) feet from the staked toe of the embankment. 9.3.2 Materials .1 Channel Excavation Rock Channel Excavation Rock is defined as: (a)Channel material excavated from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass. (b) Boulder or rock fragments measuring in volume two (2) cubic yards or more. .2 Channel Excavation Common Channel Excavation Common shall consist of the excavation of all other materials of whatever nature including dense tills, hardpan and frozen materials that do not come under the classification of Channel Excavation Rock. All materials excavated shall be disposed of as 9.3.3 Construction shown on the Plans or as directed by the Engineer. Suitable material shall be used in the roadway embankment, where considered practical by the Engineer. When excavated material is placed near the banks of a channel or ditch, provision shall be made to ensure proper flow of water from adjacent land to this waterway. The excavation shall be neatly finished and the disposed of material shall be shaped and trimmed to a condition satisfactory to the Engineer. The excavation equipment is subject to the approval of the Engineer. All Channel Excavation shall be carried out in a manner as not to damage the natural ground cover on adjacent areas. 9.3.4 Measurement .1 The quantity of CHANNEL EXCAVATION COMMON to be measured for payment, shall be the number of cubic yards of material, in its original position, acceptably excavated and placed in accordance with these Specifications.

Mackenzie Highway N.W.T. Standard Specifications May, 1976		Channel Excavation	Division 9 Section 3 Page 2 of 2
9.3.4 Measurement (cont'd)	.2	The quantity of CHANNEL EXCAVAT measured for payment, shall be yards of material, in its origin ably excavated and placed in ac Specifications.	ION ROCK to be the number of cubic nal position, accept cordance with these
	.3	Measurement for payment of mate the lines shown on the Plans or gineer will not be made except Excavation Rock where, in the or unavoidable overbreak occurs. I payment will be made of the act volved, provided the overbreak exceed ten (10) percent of the rock within the lines and grade Engineer between the establishe foot station intervals where th Channel Excavation Rock beyond break will not be measured for	rial excavated beyor staked by the En- that for Channel pinion of the Engine Measurement for ual quantities in- quantity does not actual quantity of s as staked by the d one-hundred (100) e overbreak occurs. the allowable over- payment.
	.4	Original cross sections will be is completed.	taken after clearin

N.W.T. Roads Standard Specifications May, 1976		Embankment Construction	Division 9 Section 4 Page 1 of 7
9.4.1 Description		This item consists of the constr ments for the highway, haul road ditch blocks and ditch checks an of culverts, structures and sub- accordance with these Specificat lines and grades shown on the Ph by the Engineer.	fuction of embank- ls, access roads, ad the backfilling excavated areas in tions and to the ans or as designate
9.4.2 Materials		The materials shall consist of a or rock free from wood, brush, r organic matter. All materials s the approval of the Engineer pri bankment construction.	acceptable earth an roots and other shall be subject to for to use in em-
9.4.3 Construction	.1	Placing Embankments	
		(a) The embankment shall be con- lines and grades shown on t staked by the Engineer. If constructed beyond the desi grades, the excess material by the Contractor and place	structed to the the Plans and/or an embankment is gnated lines and shall be removed ad where the embank

The initial lift of embankment material on (b) unstable foundations shall have a minimum thickness of three (3) feet for support of construction equipment. The Engineer may permit the initial lift to be placed in a narrow fill along the uphill side of the embankment area to provide access to various works along the right-of-way. Successive lifts on an unstable foundation and all lifts on stable foundations shall be constructed in uniform layers of eighteen (18) inches maximum thickness across the entire width of the embankment with the final lift of eight (8) inches maximum compacted thickness. In embankments composed primarily of material obtained from rock cuts, the larger stones shall be carefully distributed and the voids filled with smaller stones and other available material to form a compact mass.

ment is below grade level. If the excess material cannot be acceptably used in embankment construction, it shall be disposed of at a location designated by the Engineer in a man-

ner approved by the Engineer.

(c) The Contractor shall maintain sufficient crown and/or superelevation during the embankment construction to ensure ready transverse runoff of surface water.

N.W.T. Roads Standard Specifications May, 1976	Emba	unkment Construction	Division 9 Section 4 Page 2 of 7
9.4.3 Construction (cont'd)	(d)	Preliminary shaping of si done as close behind emba possible.	de slopes shall be nkment placement as
	(e)	Trimming of the top surfa toe of the embankments sh and workmanlike manner. shall not vary from the g Plans or as designated by than two-tenths (2/10) of the difference between th and the designated grade, dred (100) foot length of vary by more than one-ten	ce, side slopes and all be done in a neat Final embankments rades as shown on the the Engineer by more a foot. In addition, e constructed grade within any one hun- roadway, shall not th (1/10) of a foot.
	(f)	Final trimming shall be u of a competent foreman an by September 15th of each tions of the road which h to final grade.	nder the supervision d shall be complete year for all sec- ave been constructed
	(g)	The Contractor shall be r mining the type of equipm trimming the materials en ject, and shall provide s work as required, to acce trimming and clean up.	esponsible for deter- ent most suitable for accountered on the pro- such equipment on the eptably complete the
	(h)	Material used in the fina of embankment, shall be s tractor to ensure a minim fragments having dimensio (6) inches. After placim inch lift, all stones, bo ments having a major dime six (6) inches shall be r terial and disposed of at by the Engineer.	al eight (8) inch lift selected by the Con- num of boulders or stor ons larger than six ag the final eight (8) bulders or rock frag- ension greater than removed from the ma- i locations approved
	(i)	As this project lies with frost, it will be permiss embankment using soils in	ain the zone of perma- sible to construct a a frozen state.
	.2 <u>Com</u>	paction of Embankments	
	(a)	Each layer of embankment spread evenly to the sati Engineer. The hauling eq directed uniformly over t each layer of material pl	material shall be sfaction of the uipment shall be the full width of aced.
	(Ъ)	The Engineer will determin paction is required in a vided by the hauling unit the type and number of co	ine if and when com- ddition to that pro- cs and will designate ompaction units to be

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Embankment Construction

9.4.3 Construction (cont'd) (c) The addition of water to the embankment material may be required during the compaction operation. The Engineer will designate when this is required and the quantities to be applied. The water shall be distributed in accordance with Division 9, Section 10.

.3 Drying of Embankments

During embankment construction, if in the opinion of the Engineer, the material is too wet for compacting, he may direct that drying of the embankment material be carried out. The type and number of drying equipment units and the drying procedure used will be as directed by the Engineer. If in the opinion of the Engineer the weather is not suitable for drying, the drying work will cease and not resume until the Engineer has so directed.

- .4 Embankment Adjacent to Structures
 - (a) Embankment at Bridge Approaches

The permission of the Engineer must be obtained before any fill is placed against concrete arches, abutments or wing walls.

Approach fills to structures, within the lines shown on the Plans or as directed by the Engineer, shall be constructed of approved material placed in layers of maximum compacted thickness of six (6) inches. The amount of compaction and the type of equipment to be used will be determined by the Engineer. For structures requiring embankments on both sides, the embankment shall be placed simultaneously at the same elevations on both sides of the structure.

(b) Embankment at Culverts

Embankment materials around culverts shall be selected by the Engineer and placed to the limits shown on the Plans or as designated by the Engineer. The material shall be placed and compacted in six (6) inch layers alternately on each side of the culvert so as not to displace the culvert during installation. The amount of compaction and the type of equipment to be used will be determined by the Engineer. To obtain the required compaction under the haunches, the material in this area shall be placed and tamped by hand to the satisfaction of the Enginer.

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9.4.3 Construction (cont'd) (c) Fill - Retaining Walls

The fill behind the walls shall consist of approved material placed in layers not exceeding six (6) inches in thickness and compacted as directed by the Engineer. In the case of cell type retaining walls, the fill behind the wall shall be tamped and kept near but not above the level of the compacted material within the cells. Where fill is to be placed on a sloping surface, the surface must be benched to reduce the load on the retaining structure.

.5 Compaction Equipment

All compactors specified herein for compaction of material shall comply with the following minimum requirements:

- (a) Sheepsfoot compactors shall consist of one or more drum units, having a total minimum width of eight (8) feet. The length of the tamping feet shall not be less than seven (7) inches. Under working conditions, the compactor shall be of such weight that the minimum load upon each tamper foot will not be less than fourhundred (400) pounds per square inch of crosssectional area of the tamping feet. The sheepsfoot compactor shall be of the selfcleaning type and the ends of the tamping feet shall at all times be kept in a flat condition acceptable to the Engineer.
- (b) Pneumatic-tired rollers shall have a width of not less than six (6) feet. They shall be equipped with pneumatic tires of equal size and diameter. The space between the side walls of adjacent tires shall be not greater than the tire width, and the rear tires shall be staggered in relation to the front tires. The roller shall be equipped with mechanical means of distributing the contact pressure uniformly among all the tires and the tires shall be uniformly inflated so that the air pressure in all tires does not vary more than five (5) pounds per square inch. Pneumatic tired rollers shall be so constructed that the total weight of the roller shall be not less than seventeen (17) tons and that the roller shall develop a minimum of four-hundred (400) pounds pressure per inch width of tire. During rolling, the operating weight of the roller and the tire pressure shall be varied as directed by the Engineer to fit the soil conditions.

N.W.T. Roads Standard Specifications May, 1976	Emba	nkment Construction	Division 9 Section 4 Page 5 of 7
9.4.3 Construction (cont'd)	(c)	Grid Rollers shall weigh no (15) tons. The roller shal width of eighty (80) inches inches nominal distance bet the bars forming the grid.	t less than fifteen l have a nominal ; with five (5) ween the centre of
	(d)	Type (A) steel drum vibrato be of the articulated frame width of not less than six weight on the drum end shal five (5) tons with minimum of five-hundred (500) pound components of dynamic and s linear inch of drum.	ry compactors shall type having a drum (6) feet. The he not less than total applied force (combined vertica tatic forces) per
	(e)	Type (B) steel drum vibrato consist of a double drum (v drums), self-propelled comp the following minimum requi	ry compactors shall ibration on both action unit meeting rements:
		Total weight Width of drums Total applied force (combined vertical components of dynamic and static forces)	1200 lbs. 24 inches 200 lbs. per linear inch of drum
	(f)	Vibratory padfoot drum comp the articulated frame type h of not less than six (6) fe the drum end shall be not 1 tons with a minimum total a pressure (combined dynamic of five hundred (500) pound	eactors shall be of aving a drum width eet. The weight on less than five (5) applied contact and static pressur as per square inch.
	(g)	Self-powered, hand-operated units for compaction of bac bankment immediately adjace and culverts shall be of a the Engineer and weighing r hundred (200) pounds.	l vibratory plate ckfill and/or em- ent to structures design approved by not less than two
	(h)	Pneumatic, hand operated ta compaction of backfill and forty-eight (48) inch and 1 culverts shall be the rammi design and weighing not les pounds.	amping units for the haunches of larger diameter ing type of approve as than thirty (30)
	(i)	Each compaction unit shall operated compactor. Compact in Articles 9.4.3.5(a), (b) (f) shall be self-propelled be capable of moving at a s	consist of a fully ion units describe , (c), (d), (e) an d or power-drawn, a speed up to four (4

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Embankment Construction

9.4.3 Construction (cont'd)

miles per hour, with the exception of the compaction units described in Article 9.4.3.5(e which shall be capable of moving at speeds up to seventy (70) feet per minute.

.6 Drying Equipment

(a) Drying Equipment shall consist of a heavy duty hinge offset type disc plow meeting the following minimum requirements:

Weight	8000 lbs. with pro- visions for additional weight as required
Width	8 feet
No. of discs	12
Disc diameter	36 inches

(b) Each drying unit shall consist of fully operated self-propelled or power-drawn drying equipment. Drying units shall be capable of moving at speeds up to four (4) m.p.h.

.7 Time Recording

- (a) All compaction and drying units with the exception of the self-powered and hand operated vibrating plate and tamping units as described in Articles 9.4.3.5(g) and (h) shall be equipped with an approved time recording device which accurately records the number of hours each machine is in operation.
- (b) It will be the Contractor's responsibility to ensure that the time recording devices are properly mounted and maintained, that the cards are accurately identified as to the machine, date and shift and to daily deliver said cards to the Engineer.
- (c) The Engineer will record the number of operating hours for each machine and both the Engineer and the Contractor will certify daily that such records are correct.
- .1 The construction of embankments shall be considered incidental to the work under the Unit Price Table Items, and will not be measured separately for payment.
- .2 The quantity of Compaction to be measured for payment, shall be the actual number of approved hours

9.4.4 Measurement

N.W.T. Roads Standard Specifications <u>Mav. 1976</u>	Embankment Construction	Division 9 Section 4 Page 7 of 7
9.4.4 Measurement (cont'd)	each compaction unit is ope Engineer in accordance with	erated as directed by the these Specifications.
	.3 The quantity of Drying to b shall be the actual number drying unit is operated as in accordance with these Sp	e measured for payment, of approved hours the directed by the Engineer pecifications.
	.4 The Unit Price Table prices drying units shall be const operated rates including op	s for compaction and/or dered all-found fully perators as required.
	.5 Other equipment used in the operations, which is not sh Table, shall be considered and compaction operation an separately for payment.	e drying and/or compaction nown in the Unit Price incidental to the drying nd will not be measured
	.6 Work described in Article 9 sidered incidental to the e operation and will not be r payment. Excess material r ment but disposed of as dir will be excluded from the e at its source.	4.4.3.1(a) shall be con- embankment construction measured separately for not used in the embank- rected by the Engineer, excavation measurement
	.7 The removal and disposal of rock fragments as described shall be considered incider construction operation and	f stones, boulders and/or 1 in Article 9.4.3.1(h) 1 tal to the embankment will not be measured

N.W.T. Roads Standard Specifications May, 1976		Overhaul	Division 9 Section 5 Page 1 of 1
9.5.1 Description		This item consists of the authori excavated material, classified un excavation items, in accordance w fications for a distance beyond a tance of one-half (1/2) mile, (2,	zed hauling of der the various with these Speci- free haul dis- 640 feet).
9.5.2 Materials		Not applicable.	
9.5.3 Construction		Not applicable.	
9.5.4 Measurement .1	.1	The quantity of Overhault to be me shall be the number of cubic yard authorized material beyond the tw hundred and forty (2,640) foot fo in accordance with these Specific will be calculated by the Mass Di	easured for payment d miles of haul of wo thousand six see haul distance cations. The Haul lagram Method.
		The overhaul distance shall be the the centres of volume of the over its original position and its position less the free haul distance. The be measured along the shortest re the Engineer as feasible and sate	ne distance between chauled material in sition after placing e haul distance will oute determined by isfactory.
		When material is obtained by extright-of-way cut, any area of the than one hundred and fifty (150) centreline of the roadway shall, centre of mass and overhaul calcus sidered as a separate area off the its distance from the roadway with the centreline of the roadway.	ra widening of a e excavation more feet from the for the purpose of ulations, be con- he right-of-way and ll be measured to

N.W.T. Roads Standard Specifications May, 1976		Corr Culv	ugated Steel Pipe erts	Division 9 Section 6 Page 1 of 3	
9.6.1 Description		This desi Corr danc and the	item consists of the trans gnated supply site(s) and t ugated Steel Pipe (C.S.P.) e with these Specifications grades shown on the Plans o Engineer.	portation from the he installation of Culverts in accor- and to the lines r as designated by	
9.6.2 Materials	.1	Culv the list be p	Culverts, couplers and hardware will be supply the Department at the designated supply site(s) listed in Division 1, Section 1. The material be palletized.		
	.2	Mate vert list	rials used for bedding and s will be selected by the E ed in the Unit Price Table.	the fill around cu ngineer from items	
	.3	Mate be s	rials for water tight joint upplied by the Department t	s and insulation w o the project.	
9.6.3 Construction	.1	Hand	ling of Culvert Material		
		(a)	The Contractor shall trans material in the existing p signated supply site(s) to stockpile site(s). The pa tained during shipment.	port the culvert allets from the de the Contractors llets shall be mai	
		(b)	Prior to removing the culv designated supply site(s), supply the Engineer with a ledging receipt of the mat to completion of the proje shall assume full responsi terials and shall replace items.	ert material from the Contractor sh certificate ackno erial and from the ct, the Contractor bility for the ma- any lost or damage	
			The culverts have been nes a manner most economical f pallets are of such size t exceed the width, height a ments for highway transpor	ted and palletized or shipment. The hat they will not nd length require- t.	
		(c)	The culvert material shall to bruise or damage the sp shall not be dragged on th lated with heavy equipment caution to protect the sur the spelter coating shall application of two (2) coa tant high zinc dust oxide requirements of the C.G.S. No. 1-GP181. The areas da thoroughly cleaned and rou smooth prior to the paint	be handled so as elter coating. It e ground or maniput without proper pr face. Any damage be protected by th ats of weather resi paint meeting the B. Specification amaged shall be ugh edges ground application.	

.2 Excavation

- (a) The location and elevation of excavations for culverts will be staked by the Engineer.
- (b) During construction the Contractor may be required to provide a temporary channel diversion outside the limits of the culvert. The location of the channel diversion and the method of construction is subject to the Engineer's approval.
- (c) Excavation shall be carried out in accordance with Division 9, Section 2(a) or Section 2(b).

.3 Bedding

The culvert bed shall be constructed to provide a uniform and firm foundation throughout its entire area. When a firm foundation is not encountered at the grade established for the culvert, the bottom of the bed shall be sub-excavated to the dimensions staked by the Engineer. The sub-excavated area shall be back-filled with material approved by the Engineer, and compacted as directed by the Engineer.

.4 Installation

- (a) Corrugated Steel Pipe Culverts shall be placed with the inside circumferential laps pointing downstream. The longitudinal laps for annular corrugated culverts shall be located at the side or quarter points.
- (b) The sections of the culverts shall be firmly jointed with coupling bands.
- (c) If watertight joints are specified, the method used shall be as directed by the Engineer.
- (d) If insulation is specified, installation of insulation materials shall be as shown on the Plans or as directed by the Engineer.
- (e) The backfilling around the culvert will be in accordance with the Plans and shall conform with Division 9, Section 4. The material used will be subject to the approval of the Engineer who will also determine the amount of compactive effort required.
- (f) Vehicular traffic and construction equipment will not be allowed to cross over a culvert until the backfill has been constructed and compacted to a minimum depth two (2) feet

9.6.3 Construction (cont'd)

Standard Specifications May, 1976	Corrugated Steel Pipe Culyerts	Division 9 Section 6 Page 3 of 3
9.6.3 Construction	over the highest point	of the culvert.
(cont'd)	(g) Strutting of culverts w out written approval fr	ill not be allowed wi om the Engineer.
9.6.4 Measurement	.1 The quantity of CORRUGATED S for payment, shall be the nu the various sizes of pipe sp Price Table acceptably deliv accordance with these Specif	TEEL PIPE to be measu mber of lineal feet o ecified in the Unit ered and installed in ications.
	The measurement will be base of pipe sections.	d on the nominal leng
	.2 Installation of watertight j for payment in accordance wi General Conditions "C".	oints will be measure th Section 45 of the
	.3 Installation of insulation w payment in accordance with S Conditions "C".	vill be measured for ection 45 of the Gene
	.4 Quantities of culvert excav and compaction will be measu accordance with the appropri Items.	ation, backfill mater ured for payment in ate Unit Price Table
	.5 The replacement of any lost described in Article 9.6.3.1 incidental to the culvert in and will not be measured sep	or damaged items as (b) shall be consident stallation operation parately for payment.
	.6 The provision for a temporan described in Article 9.6.3.2 incidental to the culvert in	y channel diversion (b) shall be conside stallation operation

N.W.T. Roads Standard Specifications May, 1976		Corr Pipe	ugated Structural Plate Culverts	Division 9 Section 7 Page 1 of 5
9.7.1 Description		This desi Corr in a line by t	item consists of the trans gnated supply site(s) and t ugated Structural Plate Pip ccordance with these Specif s and grades shown on the P he Engineer.	portation from the he installation of e (C.S.P.P.) Culve ications and to th lans or as designa
9.7.2 Materials	.1	The atta be s supp 1.	culvert plates, cut-off wal achments, steam lines and al supplied by the Department a bly site(s) listed in Divisi	l s, hold down l hardware will t the designated on l, Section
	2.	Mate culv of t	rials used for bedding and erts will be selected by th he Unit Price Table Items.	the fill around th e Engineer from on
	3.	Mate be s	erials for water tight joint supplied by the Department t	s and insulation w o the project.
9.7.3 Construction	.1	Hand	ling of Culvert Material	
		(a)	The Contractor shall trans terial in the existing bun from the designated supply tractors stockpile site(s) pallets shall be maintaine	port the culvert r dles and/or pallet site(s) to the Co . The bundles and d during shipment
		(b)	Prior to removing the culv the designated supply site shall supply the Engineer acknowledging receipt of t then to completion of the tractor shall assume full the materials and shall re damaged items.	ert material from (s), the Contracto with a certificate he material and for project, the Con- responsibility for place any lost or
			The culvert material has b manner most economical for pallets are of such size t exceed the width, height, quirements for highway tra	een palletized in shipment. The hat they will not and length re- nsport.
		(c)	The culvert material shall not to bruise or damage th It shall not be dragged on ipulated with heavy equipm precautions to protect the to the spelter coating sha application of two (2) coa tant, high zinc dust oxide requirements of the C.G.S. 1-GP181. The areas damage cleaned and rough edges gr	be handled so as e spelter coating, the ground or man ent without proper surface. Any dan all be restored by the of weather-ress paint meeting the B. Specification ed shall be thorous round smooth prior

N.W.T. Roads 9 Standard Specifications May, 1976		Corr Pipe	ugated Structural Plate Culverts	Division 9 Section 7 Page 2 of 5
9.7.3 Construction	.2	Exca	vation	
(cont·d)		(a)	The location, lines and gra required for the culvert in as shown on the Plans or as Engineer.	ades of the excavations the excavation stallations will be be designated by the
		(b)	During the construction, the required to provide a tempor nel outside the limits of a location of the channel dive thod of construction is sub- approval.	ne Contractor may be orary diversion chan- the culvert. The version and the me- oject to the Enginee:
		(c)	Excavation shall be carried with Division 9, Section 2	d out in accordance (a) or Section 2(b).
	.3	Foun	dation	
		The thro exca and be c	culvert bed shall provide a ughout its entire area. The vated to the dimensions stal backfilled with approved man ompacted as directed by the	firm foundation e bed shall be sub- ked by the Engineer terial which shall Engineer.
	.4	Asse	mbly	
		(a)	Placing and assembly of the ceed after the excavation, bedding for the pipe have a Engineer. The assembly show with the Shop Drawings. A filled with bolts and shall torque of not less than one (150) foot pounds and not	e pipe may only pro- foundation and been approved by the all be in accordance 11 holes shall be 1 be tightened to a e hundred and fifty more than two hundre
			(200) foot pounds.	more than two hunare
		(b)	The Contractor shall, when sion 1, Section 1, arrange field a fully qualified re- culvert supplier during the lation to ensure that the erection and general const accordance with the Supplie	specified in Divi- to have in the presentative of the e period of instal- culvert assembly, ruction are in er's recommendations
	.5	Back	filling	
		(a)	Assembly and tightening of completed and approved by backfilling may commence. will be designated by the	all bolts shall be the Engineer before Backfill material Engineer.
		(b)	Backfill material shall be layers and compacted in ac Plans or as directed by th ment used for the backfill	placed in successiv cordance with the e Engineer. Equip- ing operation up to

Corrugated Structural Plate Pipe Culverts

9.7.3 Construction (cont'd) three (3) feet above the top of the pipe shall run parallel and as close to the pipe as possible with simultaneous hand spreading and compaction by vibrators and/or mechanical tampers adjacent to the face of the pipe. The material under the haunches shall be hand placed and tamped as directed by the Engineer.

(c) During the course of backfilling around and above the pipe, the deflections within the pipe will be measured by the Engineer and the results will be made available to the Contractor on a routine basis.

If required, the Contractor shall assist the Engineer in placing the measuring devices. Lateral movement of the pipe shall be prevented by controlling the rate of filling on each side. The Contractor will be responsible for the proper placing of the bedding and backfill as evidenced by the deformation of the pipe from its original shape. No strutting of the pipe will be allowed without written approval from the Engineer.

Unless otherwise directed, the following criteria on deflection will be followed. Only vertical deflections that tend to increase the original vertical dimension will be allowed. Increase in vertical dimension will not be permitted to exceed three (3) percent of the original vertical diameter. Horizontal deflections will not be permitted to exceed a five (5) percent decrease of the original horizontal diameter.

- (d) If during the placement of backfill or embankment around and above the pipe the deformations should exceed the above limits, the work shall cease. The Engineer may then order the removal and replacement of the backfill in its entirety or in part and may require that the pipe be strutted either horizontally or vertically. The Contractor shall undertake the corrective work as designated by the Engineer.
- (e) Vehicular traffic and construction equipment will not be allowed to cross over the structure until the backfill has been constructed and compacted to a minimum depth of three (3) feet over the highest point on the pipe, or to a height specified by the culvert supplier for the loadings anticipated.

N.W.T. Roads Standard Specificati May, 1976	ons	Corrugated Structural Plate	Division 9 Section 7 Page 4 of 5
9.7.3 Construction (cont'd)	.6	Cut-Off Walls, Hold Down Attach Steam Lines	ments, Stiffeners,
		Where specified, cut-off walls, ments and steam lines shall be culvert installations in accord Except where otherwise specifie materials will be provided to t with the culvert materials.	hold down attach- installed with the lance with the Plans d, all required the Contractor along
	.7	Dewatering	
		The foundation shall be kept fr the excavation and backfilling and the assembly of the culvert	ee of water during of the culvert bed
		During the backfilling of the o and above the culvert, water le backfill shall be kept at least the level of backfilling.	culvert bed and aro evels abutting the two (2) feet belo
	.8	If watertight joints are specif shall be as directed by the Eng	ied, the method us gineer.
	.9	If insulation is specified, ins ation materials shall be as sho as directed by the Engineer.	stallation of insul own on the Plans or
9.7.4 Measurement	.1	The quantity of CORRUGATED STRU be measured for payment shall be acceptable delivery and install Structural Plate Pipe culvert(se with these Specifications at each shown on the Plans and reference Table.	JCTURAL PLATE PIPE be as a unit for th lation of Corrugate s) in accordance ach individual site ced in the Unit Pri
	.2	The delivery and installation of down attachments and steam line in the Plans shall be considered culvert installation operation measured separately for payment	of cut-off walls, h es where specified ed incidental to th and will not be
	.3	Quantities for culvert excavati ials and compaction will be mea in accordance with the appropri Items.	ion, backfill mater asured for payment late Unit Price Tab
	.4	Installation of watertight joir for payment in accordance with General Conditions"C".	nts will be measure Section 45 of the
	.5	Installation of insulation wil payment in accordance with Sect General Conditions "C".	ll be measured for tion 45 of the

 9.7.4 Measurement (cont'd) .6 The replacement of any lost or damaged items as described in Article 9.7.3.1(b) shall be considered incidental to the culvert installation operation and will not be measured separately for payment. .7 The provision for a temporary channel diversion a described in Article 9.7.3.2(b) shall be consider incidental to the culvert installation operation and will not be measured separately for payment. .8 The provision to have in the field a representation of the culvert supplier as described in Article 9.7.3.4(b) shall be considered incidental to the culvert installation operation and will not be measured separately for payment. .9 Corrective work as described in Article 9.7.3.5(d) shall be considered incidental to the culvert installation operation and will not be measured separately for payment. .10 Dewatering as described in Article 9.7.3.7 shall considered incidental to the culvert installation operation and will not be measured separately for payment. 	N.W.T. Roads Standard Specifications May. 1976		Corrugated Structural Plate Pipe Culverts	Division 9 Section 7 Page 5 of 5
 .7 The provision for a temporary channel diversion a described in Article 9.7.3.2(b) shall be consider incidental to the culvert installation operation and will not be measured separately for payment. .8 The provision to have in the field a representation of the culvert supplier as described in Article 9.7.3.4(b) shall be considered incidental to the culvert installation operation and will not be measured separately for payment. .9 Corrective work as described in Article 9.7.3.5(d) shall be considered incidental to the culvert installation operation and will not be measured separately for payment. .10 Dewatering as described in Article 9.7.3.7 shall considered incidental to the culvert installation operation and will not be measured separately for payment. 	9.7.4 Measurement (cont'd)	.6	The replacement of any lost or da described in Article 9.7.3.1(b) s sidered incidental to the culver operation and will not be measure for payment.	amaged items as shall be con- t installation ed separately
 .8 The provision to have in the field a representation of the culvert supplier as described in Article 9.7.3.4(b) shall be considered incidental to the culvert installation operation and will not be measured separately for payment. .9 Corrective work as described in Article 9.7.3.5(d) shall be considered incidental to the culvert installation operation and will not be measured separately for payment. .10 Dewatering as described in Article 9.7.3.7 shall considered incidental to the culvert installation operation and will not be measured separately for payment. 		.7	The provision for a temporary cha described in Article 9.7.3.2(b) s incidental to the culvert install and will not be measured separate	nnel diversion as hall be considere ation operation ly for payment.
 .9 Corrective work as described in Article 9.7.3.5(d shall be considered incidental to the culvert installation operation and will not be measured separately for payment. .10 Dewatering as described in Article 9.7.3.7 shall considered incidental to the culvert installation operation and will not be measured separately for payment. 		.8	The provision to have in the fiel of the culvert supplier as descri 9.7.3.4(b) shall be considered in culvert installation operation an measured separately for payment.	d a representativ bed in Article cidental to the d will not be
.10 Dewatering as described in Article 9.7.3.7 shall considered incidental to the culvert installation operation and will not be measured separately for payment.		.9	Corrective work as described in A shall be considered incidental to stallation operation and will not separately for payment.	rticle 9.7.3.5(d) the culvert in- be measured
		.10	Dewatering as described in Articl considered incidental to the culv operation and will not be measure payment.	e 9.7.3.7 shall t ert installation d separately for

N.W.T. Roads Standard Specifications May, 1976		Traffic Gravel	Division 9 Section 8 Page 1 of 3
9.8.1 Description		This item consists of exc otherwise removing oversi and loading, hauling and the road or in stockpile(these Specifications or a gineer.	eavating, screening or ze material from gravel placing the material or s) in accordance with as directed by the En-
9.8.2 Materials		Traffic Gravel will consi gravel or pit run gravel.	st of either screened
	.1	Screened Gravel - 3" Minu	IS
		The material shall consist clean, hard particles, fr tation and organic or oth and shall meet the follow	st of screened gravel of see from clay lumps, cen her deleterious material ying gradation requireme
		Sieve No.	Percent Passing (By Weight)
		3''	100%
		No. 4	30-70
	.2	No. 200 Pit Run Gravel	3-10
		The material shall consist clean, hard particles from tation and organic or oth All oversize material shat source or at the road. M (3) inches in dimension is material.	st of pit run gravel of ee from clay lumps, ceme her deleterious material all be removed at the Material exceeding three is classified as oversia
9.8.3 Construction	.1	Clearing of material sour and stockpile site(s) sha Division 9, Section 1.	cce a rea(s), haul road(s all be in accordance wit
	.2	Excavation and disposal of gravel source and the con and/or stockpile site(s) with Division 9, Section 4.	of material overlaying istruction of haul road shall be in accordance 2(a) or 2(b) and Sectio
	.3	To minimize the amount of to the road, the Contract out the pit run gravel ma	f oversize material hau tor shall select and so aterial at the source.
	.4	Before gravel can be plac in stockpile(s), approval the Engineer.	ced either on the road 1 must be received from
		 (a) For placement of gra roadbed surface shall free from potholes a 	avel on the road, the 11 be smooth riding and and ruts. Scarifying a

N.W.T. Roads Standard Specifications May, 1976		Trai	ffic Gravel	Division 9 Section 8 Page 2 of 3
9.8.3 Construction (cont'd)			blading shall be performed Engineer.	as directed by the
		(b)	Hauling equipment shall be full width of the traffic form compaction of the ro	directed over the lanes to ensure uni- adway surface.
		(c)	The gravel shall be dumped on the roadbed surface at by the Engineer.	and spread uniformly the rate specified
		(d)	When gravel is used to bac areas, or for backfill mat verts, the backfill operat accordance with Division 9	kfill sub-excavated erial around cul- ion sha ll be in , Section 4.
		(e)	Stockpile site(s) shall be clean of all deleterious m pile(s) shall be shaped as Engineer and constructed i three (3) feet in depth ov pile area. Stockpiles sha snow and ice during the st	firm and level and aterial. The stock- directed by the n layers not exceedin er the entire stock- 11 be kept free of ockpiling operation.
9.8.4 Measurement	.1	The payr acce stoo tion	quantity of SCREENED GRAVEL ment, shall be the number of eptably placed on the road o ckpile(s) in accordance with ns.	to be measured for tons of material r in the designated these Specifica-
	.2	The pays acce stoo tion	quantity of PIT RUN GRAVEL ment, shall be the number of eptably placed on the road o ckpile(s) in accordance with ns.	to be measured for tons of material r in the designated these Specifica-
	.3	The payr haul danc	quantity of GRAVEL HAUL to ment shall be the number of for traffic gravel accepta with these Specifications	be measured for ton miles of gravel ably placed in accor- 3.
		The weig of, frac betw del:	quantity will be computed b ght of the material in tons, by the haul distance measur ctions thereof, along the de ween the point of loading an ivery point.	y multiplying the or fractions there- ed in miles, or signated route d the designated
	.4	Remo size to f meas	oval from the road surface a e pit run material shall be the traffic gravel operation sured separately for payment	nd disposal of over- considered incidental and will not be
	.5	Clea of 1 sure	aring, excavation of overburd naul roads and/or stockpile ed for payment in accordance	den and construction sites will be mea- with the appropriate

N.W.T. Roads Standard Specifications May, 1976		Traffic Gravel	Division 9 Section 8 Page 3 of 3
9.8.4 Measurement		Unit Price Table Items.	
	.6	Preparation of the roadbed s haulroads, and removal of sn in Article 9.8.3.4(e) shall to the traffic gravel operat measured separately for paym	urface, maintenance of ow and ice as specifi be considered incider ion and will not be ent.
		ì	

N.W.T. Roads Standard Specifications May, 1976		Surfacing Gravel	Division 9 Section 9 Page 1 of 3		
9.9.1 Description		This item consists of excavating gravel or stone, loading, haulin material on the road or in stock cordance with these Specification by the Engineer.	g, crushing from ng and placing xpile(s) in ac- ons or as directed		
9.9.2 Materials	.1	.1 <u>Crushed Gravel</u> The material shall consist of crushed stone or crushed gravel of clean, hard, angular particl free from clay lumps, cementation and organic or other deleterious material, and shall meet following gradation requirements:			
		Sieve No.	Percent Passing (By Weight)		
		3/4" No. 4 No. 10 No. 40 No. 200	$100\% \\ 40 - 65 \\ 25 - 55 \\ 10 - 30 \\ 3 - 10$		
		A minimum of fifty (50) percent retained on the No. 4 Sieve shal one fractured face.	of the material 1 have at least		
9.9.3 Construction	.1	Clearing			
		Clearing of the material source road(s) and stockpile site(s), s dance with Division 9, Section 1	area(s), haul shall be in accor- l.		
	.2	Excavation of Overburden			
		Excavation and disposal of mater the material source and the cons roads and/or stockpile sites sha with Division 9, Section 2(a) of 4.	rial overlaying struction of haul all be in accordanc r 2(b) and Section		
	.3	Roadbed Surface Reconditioning			
		Before placement of gravel on the road, the roa surface shall be restored to a condition satisf tory to the Engineer. Scarifying and blading s be performed as directed by the Engineer.			

.4 Placement of Gravel on the Road

The gravel shall be dumped and spread uniformly on the road at the rate specified by the Engineer.

N.W.T. Roads Standard Specifications May, 1976	Surfacing Gra	Division 9 avel Section 9 Page 2 of 3
9.9.3 Construction	.5 <u>Compaction</u>	
(cont'd)	Compaction of surface recon course shall	E the roadbed surface during the ro aditioning and of the gravel surfac be as directed by the Engineer.
	.6 Water for Con	npaction
	Water for con Division 9,	npaction shall be in accordance wit Section 10.
	.7 Drying	
	If drying is directed by	required, this shall be performed the Engineer.
	.8 Stockpiling	
	Stockpile si clean of all shall be sha constructed feet in dept Stockpiles s during the s	te(s) shall be firm and level and b deleterious material. The stockpi ped as directed by the Engineer and in layers not exceeding three (3) h over the entire stockpile area. hall be kept free of snow and ice tockpiling operation.
9.9.4 Equipment	.1 Roadbed Surf	ace Reconditioning Equipment
	The roadbed consist of a flywheel hor The motor gr years old an mounted ripp	surface reconditioning equipment sh motor grader having a minimum net sepower of one hundred and fifty (1 ader shall be not more than three (d shall be equipped with a rear er.
	.2 Compaction E	quipment
	All compacti Price Table paction equi 4.	on equipment specified in the Unit shall meet the requirements for com pment specified in Division 9, Sect
	.3 Drying Equip	ment
	The drying e Table shall equipment sp	quipment specified in the Unit Pric meet the requirements for drying ecified in Division 9, Section 4.
	.4 <u>Time Recordi</u>	ng
	Roadbed reco	nditioning equipment, compaction un

Roadbed reconditioning equipment, compaction units and drying units shall be equipped with approved time recording devices which accurately record the number of hours each machine is in operation.

N.W.T. Roads Standard Specifications May, 1976		Surfacing Gravel	Division 9 Section 9 Page 3 of 3
9.9.4 Equipment (cont'd)		It will be the Contractor's reasons are that the time recording demounted and maintained, that the curately identified as to the maintain to daily deliver said Engineer.	sponsibility to en- evices are properly ne cards are ac- machine, date and l cards to the
		The Engineer will record the number hours for each machine and both the Contractor will certify data are correct.	umber of operating n the Engineer and ily that such record
9.9.5 Measurement	.1	The quantity of CRUSHED GRAVEL payment shall be the number of acceptably placed on the road of stockpile(s) in accordance with	to be measured for tons of material or in the designated these Specification
	.2	The quantity of GRAVEL HAUL to payment shall be the number of for surfacing gravel acceptably dance with these Specifications	be measured for tons of gravel haul y placed in accor- s.
		The quantity will be computed a weight of the material in tons by the haul distance measured thereof, along the designated point of loading and the design point.	by multiplying the or fractions thereo in miles or fraction route between the nated delivery
	.3	The quantity of Roadbed Surfactory to be measured for payment shall number of approved hours that reconditioning equipment is ac- as directed by the Engineer in these Specifications. Provision of ripper teeth shall be consi- to the roadbed surface recondi- and will not be measured separ-	e Reconditioning 11 be the actual the designated ceptably operated accordance with n and replacement dered incidental tioning operation ately for payment.

.4 Clearing, excavation of overburden, construction of haul roads and/or stockpile sites, compaction, drying and water for compaction will be measured for payment under the appropriate Unit Price Table Items.

.5 Removal of snow and ice as specified in Article 9.9.3.8 shall be considered incidental to the surfacing gravel operation and will not be measured separately for payment.

N.W.T. Roads Standard Specifications <u>May, 1976</u>		Water for Compaction	Division 9 Section 10 Page 1 of 1
9.10.1 Description		This item consists of loading distributing water required for highway embankment or the plac materials, all in accordance tions.	, transporting and or the construction of cing of road surfacing with these Specifica-
9.10.2 Materials		The water shall be free from of organic matter and mineral	undesirable quantities salts.
9.10.3 Construction	.1	Watering equipment shall constank(s) mounted on adequately water shall be applied through of such design as to provide a of water over a minimum width suitable device for positive bar shall be so located as to the cab of the truck.	ist of water-tight powered trucks. The h a spray bar or nozzle a uniform unbroken sprea of eight (8) feet. A shutoff of the spray permit control from
	.2	The Engineer will determine to be applied and the rate of	he quantity of water application.
	.3	Water used for dust control w payment.	ill not be measured for
9.10.4 Measurement	.1	The quantity of WATER to be m shall be the number of one th units of water acceptably dis	easured for payment, ousand (1,000) gallon tributed in accordance

with these Specifications.

N.W.T. Roads Standard Specifications May, 1976		Rip-	Rap	Division 9 Section 11 Page 1 of 5
9.11.1 Description	5	This stru or a eart fabr Rip- in c the	item consists of supplying cting a protective covering pproved stone, with or with h bed or granular filter bla ic in accordance with these Rap shall be constructed at onformity with the lines and Plans or as designated by th	materials and con- of sacked concrete out mortar, on an anket or filter Specifications. the locations and d grades shown on me Engineer.
9.11.2 Materials		The exce by t supp appr	Contractor will supply all a pt for filter fabrics, which he Department to the project lied by the Contractor will oval by the Engineer.	rip-rap materials h will be supplied t. The materials be subject to
	.1	Ston	e Rip-Rap:	
		Ston and boul of a othe	e rip-rap materials shall be shall consist of sound, har ders or quarry rocks resists ir and wat er and free from a r structural defects.	e of approved qual d and dense stones ant to the action seams, cracks or
		(<u>a</u>)	Stone #fp-rap materials get for corrugated steel pipe checks and ditch blocks sha quirements of "Normal Stone Stone Rip-Rap shall consis or quarry rocks having dim- than six (6) inches in any	nerally designated culverts, ditch all meet the re- e Rip-Rap". Norma t of stones, bould ensions of not les one direction.
		(b)	Stone rip-rap materials ge for corrugated structural bridges, and channel bank consist of stones, boulder meeting with the requireme Rip-Rap" or "Armour Stone	nerally designated plate pipe culvert protection shall s or quarry rocks nts for "Heavy Sto Rip-Rap."
			HEAVY STONE RI	P-RAP
			Weight of Stones (1bs)	Percenta
			800 - 1,200 400 - 800 50 - 400 Under 50	40 - 20 - 10 - 0
			ARMOUR STONE R	IP-RAP
			Weight of Stones (1bs)	Percenta
			1,200 - 2,000 400 - 1,200	60 - 20 -

N.W.T. Roads Standard Specifications May, 1976	Ri	p-Rap	Division 9 Section 11 Page 2 of 5
9.11.2 Materials (cont'd)		Weight of Stones (1bs)	Percentage
		200 - 400 Under 200	10 - 20 0
	(c) Sand for mortar grout shal latest C.S.A. Specificatio Masonry Mortar A 82.56 unl structed by the Engineer.	l conform to the ons for Aggregate fo ess otherwise in-
	(d) Cement for mortar grout sh Cement conforming to the 1 cation A5, Type 1.	aall be Portland Latest C.S.A. Specif
	.2 <u>Sa</u>	cked Concrete Rip-Rap	
	(a) The soil material shall co or gravel as designated or Engineer.	onsist of a sand and approved by the
	(Ъ) S acks shall be manufacture (10) ounce burlap and shal twenty (20) inches by thir measured inside the seams laid flat. The capacity of be approximately one and o cubic feet.	ed from minimum ten 1 be approximately ty-six (36) inches when the sack is of each sack shall one quarter (1.25)
	(c) The cement shall be Portla to the latest C.S.A. Speci	and Cement conformin lfication A5, Type 1
	.3 <u>Fi</u>	lter Blanket	
	Fi we qu de to	lter blanket material shall of 11 graded granular material f antities of soft particles, of 1eterious material. The sour of the approval of the Engineer	consist of approved free from undesirabl organic or other cce shall be subject
	.4 <u>Fi</u>	lter Fabrics	
	Fi Co po	lter fabric materials will be ntractor in rolls weighing ap ounds each.	e supplied to the oproximately 150
9.11.3 Construction	.1 Pr	eparation of Foundation	
	(a	Aprons and slopes to be re- excavated as shown on the by the Engineer to provide upon which the rip-rap sha tion bed shall be fine are	ip-rapped shall be Plans or as directe adequate foundatio all rest. The found

9.11.3 Construction (cont'd) and even surface. Depressions shall be filled and thoroughly compacted.

- (b) Filter blankets shall be constructed at locations shown on the Plans or where directed by the Engineer, and to the lines and grades as staked by the Engineer.
- (c) Filter fabrics shall be placed at locations designated and in a manner directed by the Engineer. A thin lift of fine grained material will generally be placed over the filter fabric when used on other than hand placed rip-rap installation.

.2 Placing of Rip-Rap

(a) Hand Placed Rip-Rap:

The stones, boulders or quarry rocks shall be placed by hand to conform with the lines and dimensions designated by the Engineer. The stones shall be firmly bedded into the slopes and against adjoining stones, with smaller stones used to fill in the voids.

Hand placing will generally be designated for Normal Stone Rip-Rap.

(b) Machine Placed Rip-Rap:

The stones, boulders or quarry rocks shall be sorted and placed so as to produce a uniform thickness of rip-rap conforming with the lines and grades shown on the Plans or designated by the Engineer. The equipment used for the machine placing operation shall have the capability of handling and positioning individual rip-rap particles.

Machine placing will generally be applicable to Heavy Stone Rip-Rap and Armour Stone Rip-Rap.

(c) Random Rip-Rap:

The stones, boulders and quarry rocks shall be dumped onto the surface to be rip-rapped. Sufficient hand and/or machine work shall be performed to produce a uniform thickness of rip-rap conforming with the lines and dimensions designated by the Engineer.

Random placing may be designated for all types of stone rip-rap.

N.W.T. Roads Standard Specifications May, 1976	Rip-	Rap	Division 9 Section 11 Page 4 of 5
9.11.3 Construction	(d)	Sacked Concrete Rip-Rap:	
		The Engineer will determine the concrete. Each burlap filled with approximately of of concrete and securely st wire ties. Within one half of the concrete the sacks so their final position on the kneaded, rammed and packed with the prepared base and already in place. Addition shall be placed to obtain to within the area as designat	the mix design of sack shall be one (1) cubic foot apled or tied with hour after mixing shall be placed in prepared base, into conformance adjacent sacks al courses of sacks the required depth and by the Engineer.
		The pattern to which the sa be approved by the Engineer other debris shall be remov of sacks in place before su are placed.	acks are laid shall . All earth and ved from the surface acceeding courses
		Following placing, the sach rap shall be kept moist for twenty-four (24) hours by a means approved by the Engin	xed concrete rip- c a period of sprinkling or other neer.
	(e)	Grouted Stone Rip-Rap	
		Grouted stone rip-rap may h or machine placed type. Th stones, boulders or quarry cleaned and thoroughly weth the mortar. The spaces bet boulders or quarry rocks sh with cement mortar grout we of the stones, boulders or exposed. The grout shall h (1) part cement to three (1) of such consistency that if a mason's trowel. The thick between the stones shall be (4) inches or one-third (1) diameter of the stones, bound rock thickness whichever is	be of the hand place the surface of the rocks shall be ted before applying tween the stones, hall be filled ith the outer faces quarry rocks left be composed of one 3) parts sand, and t can be placed with tekness of the grout e a minimum of four (3) of the average ulder or quarry s the greater.
		Grouted rip-rap shall be concompounds or wetted burlap earth kept wet for seventy- or by sprinkling with a fin (2) hours during the dayting three (3) days.	ured using curing or a blanket of -two (72) hours, ne spray every two me for a period of
		The grouting of the rip-rap place when the air tempera	p can only take ture is continuously

above freezing.

N.W.T. Roads Standard Specifications May, 1976		Rip-Rap	Division 9 Section 11 Page 5 of 5
9.11.4 Measurement	.1	The quantity of RIP-RAP to be mean shall be the number of cubic yard of rip-rap identified in the Unit which has been acceptably placed with these Specifications. Measurap will be made in its final pos	asured for payment ds of each type t Price Table in accordance urement of rip- sition.
	.2	The quantity of CEMENT to be mean shall be the number of eighty (80 cement acceptably incorporated in tion of sacked concrete and/or gro accordance with these Specificat	sured for payment D) pound bags of nto the construc- outed rip-rap in ion.
	.3	The supply and delivery of filter will be measured for payment unde Unit Price Table Items. Placemen will be measured for payment in a Section 45 of the General Condit	r blanket materials er the appropriate nt of the materials accordance with ions "C".
	.4	Installation of Filter Fabrics w payment in accordance with Section Conditions "C".	ill be measured for on 45 of the Genera
	.5	All other work and materials requested by the completion of the rip-rincluding the preparation of the be considered incidental to the and will not be measured separate	uired for the ac- ap installations foundation shall rip-rap operation ely for payment.

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N.W.T. Roads Standard Specifications May, 1976		Ditch Linings	Division 9 Section 12 Page 1 of
9.12.1 Description		This item consists of supplying structing a protective lining of or gravel along ditch bottoms or subject to surface scour. Ditch constructed in accordance with t and at locations and in conformi and grades shown on the Plans or the Engineer.	materials and approved stor on other area Linings shall hese Specifica ty with the li as designated
9.12.2 Materials		Ditch lining materials shall con granular material from sources d proved by the Engineer. The mat erally consist of stones smaller inches in diameter. Where desig gineer, the materials shall be s vated to obtain the desired grad	sist of sound esignated or a erials will ge than eight (8 nated by the B electively exc ation.
		Filter fabric materials will be Contractor in rolls weighing app pounds each.	supplied to th roximately 150
9.12.3 Construction	.1	Prior to placing, the ditch shall lines and grades staked by the E face shall be smooth and uniform	be trimmed to ngineer. The
	.2	The materials shall be placed an manner to ensure a uniform layer thickness. The Engineer may dir material be placed in more than different sources in order to ob blanket effect.	d handled in a of the specif ect that the one layer from tain a filter
		Hand trimming of the materials i required where the work cannot b completed by machine.	n place will b e acceptably
	.3	Oversize materials shall be remo at the ditch lining site.	wed at the pit
	.4	If the use of filter fabric has the Engineer, it shall be placed Plans or as directed by the Engi	been designate as shown on t neer.
9.12.4 Measurement	.1	The quantity of DITCH LINING to be payment shall be the number of commaterial acceptably supplied and pe dance with these Specifications. will be made in the haulage vehice	oe measured fo blic yards of blaced in acco The measurem cle(s).
	.2	Haul of ditch lining materials wi for payment in accordance with Di 5.	ll be measure vision 9, Sec

N.W.T. Roads Standard Specifications May, 1976		Ditch Linings	Division 9 Section 12 Page 2 of 2
9.12.4 Measurement (cont'd)	.3	Removal and disposal of overs be considered incidental to a operation and will not be mea payment.	size materials shall the ditch lining asured separately for
	.4	Installation of filter fabric payment in accordance with Se General Conditions "C".	cs will be measured for ection 45 of the

N.W.T. Roads Standard Specifications May, 1976		Snow and Ice Removal	Division 9 Section 13 Page 1 of 2
9.13.1 Description		This item consists of the rem snow and ice from the right-o with these Specifications and Engineer.	noval and disposal of of-way in accordance a as designated by the
9.13.2 Materials		Not applicable.	
9.13.3 Construction	.1	Removal of Snow and Ice	
		(a) Snow and ice shall be re- of-way prior to the comm excavations or embankment snow removal shall be kee mile $\binom{1}{2}$ mile in advance not more than three (3) struction.	emoved from the right- mencement of roadway at construction. The ept at least one-half e of construction but miles ahead of con-
		(b) The snow and/or ice remo along the edge of the ri manner as to avoid damag On areas not to be excay snow shall be carried ou minimum disturbance to to cover.	oved shall be windrowe ight-of-way in such a ge to adjoining trees vated the removal of it so as to cause the natural ground
	.2	Snow and Ice Removal Equipmen	<u>nt</u>
		(a) The snow and ice removal sist of a crawler tractor net flywheel horse power eighty (180) and equippe The blade shall be equip adjustable mushroom type approved by the Engineer	l equipment shall con- or(s) having a minimur r of one-hundred and ed with a dozer blade pped with two height e shoes of a design r.
		(b) The snow and ice removal equipped with an approve vice which accurately re hours the machine is in	l equipment shall be ed time recording de- ecords the number of operation.
		(c) It will be the Contractor to ensure that the devia and maintained, that the identified as to date and deliver said cards to the	or's responsibility ce is properly mounte e cards are accuratel nd shift, and to dail he Engineer.
		(d) The Engineer will record ating hours for the mach Engineer and the Contra- daily that such records	d the number of oper- hine and both the ctor will certify are correct.
9.13.4 Measurement	.1	The quantity of SNOW AND ICE for payment shall be the act hours that the designated eq directed by the Engineer in	REMOVAL to be measurual number of approve uipment is operated a accordance with these

N.W.T. Roads	Snow and Ice	Division 9
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9.13.4 Measurement (cont'd) Specifications.

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.2 The removal of snow and ice from borrow pits, haul roads and other related areas as well as removal of snow on the right-of-way after excavation and/or embankment work has commenced shall be considered incidental to the roadway construction operation and will not be measured separately for payment. 9.14.1 Description

9.14.2 Accommodation

This item consists of supplying and/or delivering, setting up, operating, maintaining and dismantling the Engineer's Camp and supplying of meals, linen and cleaning services in accordance with these Specifications.

The Engineer's Camp will be for the exlusive use of the Engineer and his staff for the duration of the work.

- .1 The Engineer's Camp will generally consist of the following trailer units: one office trailer, sleeper trailers, one ablution trailer and one recreation trailer.
 - (a) The trailers specified in Article 9.14.2.1 above shall be placed into a self-contained unit joined by a minimum four (4) feet wide walkway having the same floor elevation as the trailers. The walkway shall be weather-proof, insulated and adequately heated. The layout shall be subject to the Engineer's approval.
 - (b) All the trailers specified in Article 9.14.2.1 above shall be adequately blocked and weather skirted for winter operation.
- .2 In addition to the trailer units specified in Article 9.14.2.1, the Engineer's Camp will consist of:
 - (a) One (1), only, unheated but weathertight storage shed, a minimum of eight (8) feet by twelve (12) feet and equipped with one locking door and one interior light. The storage shed shall be placed near the Engineer's camp and will be for the Engineer's exclusive use.
 - (b) Five (5) parking places for vehicles complete with five (5) exterior electrical outlets shall be provided near the office trailer for the exclusive use of the Engineer and his staff.
- .3 The Engineer's Camp shall be set up and ready for occupancy at the same time as the Contractor's camp.
- .4 The Contractor shall be responsible for the operation, repair and maintenance of the trailers, buildings and facilities in the Engineer's Camp.
- .5 The Contractor shall dismantle, move and re-establish the Engineer's Camp whenever he moves his own camp.

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9.14.2 Accommodation (cont'd)	.6	The Contractor shall dismantle the Engineer's camp upon completion of the work and shall restore the camp area(s) to a condition satisfactory to the Engineer.	
	.1	The Contractor shall provide and labour required to prov meals and services of the sa as provided for the Contrac	e all equipment, suppl ide the Engineer's stat ame quantity and quali tor's staff.
	.2	The Contractor shall clean the linen weekly or whenever occurs. "Linen" shall cons kets, two (2) sheets, one (cover and two (2) towels for	trailers daily and char r a change in personne ist of three (3) blan- 1) pillow, one (1) pil r each occupant.
· .	.3	A water and sewer system sh Contractor for the Engineer shall connect the Engineer's his own system. The Contra Engineer's trailer units in the Northern Inland Waters	all be provided by the 's Camp or the Contrac s ablution trailer to ctor must include the his application under Act.
	.4	A steady and dependable sou shall be supplied by the Co shall connect all trailers, outlets to this source.	rce of electric power ntractor. The Contrac buildings and exteric
	.5	The Contractor shall supply ments for the camp and shal unit is kept supplied with operating condition.	all the fuel require- 1 see that each heatin fuel and is in good
9.14.3 Measurement	.1	The quantity of the ENGINEE for payment shall be as a U accommodation in accordance tions.	R'S CAMP to be measure nit for the acceptable with these Specifica-
	.2	The quantity of ENGINEER'S for payment shall be the nu fractions thereof that the acceptably provided with me services in accordance with	BOARD to be measured mber of mandays and Engineer's staff is als and other related these Specifications
		All part days shall be calc one-third (1/3) based on th	ulated to the nearest e number of meals tak

Mobilization

9.15.1 Description

This item consists of the provision to the Contractor of a fixed sum to cover costs of mobilization of plant, personnel and material, the establishment of temporary buildings, shops, offices and facilities and licenses, fees and premiums necessary to commence the work and which are not specifically measured under any other Item contained in the Unit Price Table.

9.15.2 Measurement

Measurement for payment for mobilization shall be on the basis of the amount pre-established by the Department and shown on the Unit Price Table. This amount is to be included in the total amount of the tender and will be measured for payment on the following schedule.

- .1 Fifty (50) percent of the fixed amount when the Contractor has established his camp, has placed his fuel storage and has delivered to the camp site all the equipment necessary to perform work identified as clearing and excavation.
- .2 Twenty-five (25) percent of the fixed amount when the Contractor has commenced operation of all the equipment indicated in Article 9.15.2.1 above in the performance of that work identified as clearing and excavation.
- .3 Twenty-five (25) percent of the fixed amount when the Contractor has completed construction of the equivalent of ten (10) percent of the total length of the Contract.