SPECIFICATIONS
AND
DOCUMENTS

I hereby certify that this specification was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under laws of the State of Minnesota.

W W Kaufman

Date May 22, 1973 Reg. No. 9676

NORTHERN STATES POWER COMPANY
SHERBURNE COUNTY GENERATING PLANT
UNIT 1

COAL AND ASH STORAGE AREA CONSTRUCTION

SPECIFICATION 5377 – D-4C

DIN: S1PH12K700, S1PH12M100, S1PH12M300, S1PH14M000, S1PH11A200, S1PH11A400, S1PH11A600, S1PH11A810

Issued: MAY 22 1973

BLACK & VEATCH
Consulting Engineers
Kansas City, Missouri

1973

SPECIFICATIONS
AND
DOCUMENTS

NORTHERN STATES POWER COMPANY
SHERBURNE COUNTY GENERATING PLANT
UNIT NO. 1

COAL AND ASH STORAGE AREA
CONSTRUCTION

SPECIFICATION 5377 - D-4C

DIN:		
	S1PH12K700	S1PH11A200
	S1PH12M100	S1PH11A400
	S1PH12M300	S1PH11A600
	S1PH14M000	S1PH11A810

ADDENDUM 1
June 13, 1973

Each bidder shall note these revisions to the contract documents and incorporate these revisions in his proposal. Each bidder shall attach a signed acknowledged copy of this entire addendum in the front of the specifications submitted with his proposal. This addendum consists of three pages; revised drawings listed under Item 6; and revised PROPOSAL and GENERAL DESCRIPTION AND SCOPE OF THE WORK sections attached hereto; all made a part of this addendum.

1. Page SC-14, Article SC.37.4. Delete the second sentence and substitute the following:

"Such maintenance shall include dust control to the satisfaction of local authorities and the repair of the roadway to keep it in its original condition before hauling was started."

2. Page SC-14. After Article SC.37.5 add the following:

"SC.37.6 Haul Route Surfacing. The Contractor shall pave the road from the junction of County Road 4 and County Road 67 northward to the intersection with the east-west road at the center of Section 20 with a 24 foot wide asphalt surfacing. The surfacing shall conform to requirements of the Sherburne County authorities. The asphalt paving work shall be completed prior to the start of hauling material from the borrow area."

3. Page SC-14. Add the following article:

"SC.39 RIVER INTAKE ACCESS ROAD. The Company has provided under separate contract clearing, grubbing, and rough grading of the right-of-way for the river intake access road. The ditching, finish grading, subbase, and surfacing shall be provided under these specifications."

4. Delete the entire PROPOSAL Pages B-1 through and including B-7 and substitute the PROPOSAL Pages B-1 through B-6 attached to this addendum.

5. Delete Pages 1A-1 through and including 1A-3 and substitute new Pages 1A-1 through and including 1A-3 attached to this addendum.

6. The following list of revised drawings is submitted as part of this addendum:

Drawing No. - Rev.	Title	B&V Drawing No.
NF-49064-A	IMPERVIOUS EARTH BORROW AREA SHEET XII	SGC-0114
NF-49074-E	DETAIL GRADING PLAN SHEET 7	SGC-0129
NF-49089-A	ASH STORAGE AREA SECTIONS AND DETAILS	SYC-0609
NF-49090-B	ASH STORAGE AREA SECTIONS AND DETAILS	SYC-0610
NF-49091-B	COAL AND FUEL OIL STORAGE AREAS SECTIONS AND DETAILS	SYC-0611
NF-49093-A	FOUNDATIONS AND MISCELLANEOUS GRADING SECTIONS AND DETAILS	SYC-0613
NF-49101-A	SITE ARRANGEMENT PLAN SHEET I	CGC-0102
NF-49106-C	SITE ARRANGEMENT PLAN SHEET VI	CGC-0107
NF-49107-A	SITE ARRANGEMENT PLAN SHEET VII	CGC-0108

7. Delete from the drawings all reference to "limit of work included in lump sum price addition, under Spec. 5377 D-4C".

8. Page 2E-10, Article 2E.13.5. In the second paragraph first sentence delete the word "including" and substitute the word "excluding".

After the first sentence of the second paragraph add the following sentence:

"The clay core and impervious earth blanket shall be compacted to 93 per cent of maximum density at optimum moisture content."

9. Page 2E-10, Article 2E.14.1. In the second sentence delete the number "93" and substitute the number "95".

BLACK & VEATCH
Consulting Engineers

* * * * * * * * * * * * * * * *

ACKNOWLEDGMENT

The undersigned bidder hereby certifies that the revisions set forth in this addendum have been incorporated in his bid and are a part of the contract documents.

Signed _____

_____

Date _____

PROPOSAL

Northern States Power Company
414 Nicollet Mall
Minneapolis, Minnesota 55401

Attention: Mr. V. A. Frawley, Director of General Services

PROPOSAL FOR COAL AND ASH STORAGE AREA CONSTRUCTION
SHERBURNE COUNTY GENERATING PLANT - UNIT 1

Gentlemen:

The undersigned bidder having read and examined the specifications and associated contract documents for the coal and ash storage area construction which will be incorporated in the Sherburne County Generating Plant, does hereby propose to perform the construction and provide the services set forth in this Proposal.

The undersigned hereby declares that the following list states any and all variations from, and exceptions to, the requirements of the contract documents and that, otherwise, it is the intent of this Proposal that the work will be performed in strict accordance with the contract documents.

(Continued on Page B-6)

B.1 LUMP SUM PRICE. The undersigned bidder hereby proposes to furnish equipment and materials; labor, skilled, semiskilled, and unskilled; labor supervision; construction tools and equipment; construction services and utilities; as required to perform the coal and ash storage area construction in accordance with the specifications and associated contract documents as defined in GENERAL CONDITIONS, Article GC.1 for the following firm lump sum price:

_____

_____ ($)
(Price in Words)

B.1.1 Lump Sum Price Breakdown. The bidder shall, for the Company's accounting purposes, furnish a price breakdown of the LUMP SUM PRICE stated in Article B.1. The totals of the lump sum price breakdown shall equal the above LUMP SUM PRICE.

Description	DIN	Price
Coal yard storage area	S1PH12K700	$_____
Recycle and holding basins	S1PH14M000	$_____
Yard grading	S1PH11A200	$_____
Landscaping	S1PH11A400	$_____
Yard drainage	S1PH11A600	$_____
Roads	S1PH11A810	$_____
Ash handling systems foundations	S1PH12M100	$_____
Ash ponds	S1PH12M300	$_____

B.1.2 Performance Bond. Additional price for furnishing Performance Bond in the amount of 100 per cent of the lump sum price stated in Article B.1:

_____

_____ ($)
(Price in Words)

B.2 UNIT ADJUSTMENT PRICES. The following unit prices will be used to adjust the above LUMP SUM PRICE to compensate for differences between the quantities indicated on the drawings and those actually constructed under these specifications. It is further understood that these unit prices will be used for either additions to or deletions from the LUMP SUM PRICE. Each unit adjustment price shall include all costs for furnishing and installing the unit complete and shall apply only to the specific material designated:

"Excavated Materials" as defined in Article 1A.6.1, per cubic yard $_____

"Core Trench Excavation" as defined in Article 1A.6.2, per cubic yard $_____

"Impervious Clay Core Fill" as defined in Article 1A.6.3, per cubic yard $_____

"Impervious Earth Blanket" as defined in Article 1A.6.4, per cubic yard

Type 1 $_____

Type 2 $_____

Type 3 $_____

Type 4 $_____

B.3 PERFORMANCE BOND. The following unit price will be used to adjust the foregoing performance bond lump sum price (Article B.1.2) to compensate for the differences between the quantities indicated on the drawings and those actually erected in place under these specifications. It is further understood that this unit price will be used for either additions to or deletions from the performance bond lump sum price:

Unit price per $1000 of installation costs ($)

The undersigned proposes that he will perform the majority of the work with his own forces and that specific portions of the construction work not performed by the undersigned will be subcontracted by the following subcontractors:

Work Subcontracted	Name of Subcontractor

The undersigned hereby certifies that he has visited the sites of the proposed work and has familiarized himself with the conditions affecting the work.

The undersigned hereby declares that only the persons or firms interested in the Proposal as principal or principals are named herein, and that no other persons or firms than herein mentioned have any interest in this Proposal or in the contract to be entered into; that this Proposal is made without connection with any other person, company, or parties likewise submitting a bid or proposal; and that it is in all respects for and in good faith, without collusion or fraud.

The prices stated in this Proposal include all taxes of any nature which may become due or payable by the Contractor in connection with the proposed work, except Minnesota sales, use, and excise taxes applicable to the equipment and materials which are to be permanently incorporated into the work.

The undersigned hereby certifies that all conflicts and exceptions have been noted or listed.

If this Proposal is accepted, the undersigned hereby agrees to enter into contract and to furnish an acceptable Performance Bond if required by the Company.

The undersigned further agrees that the work will be prosecuted to completion in accordance with the specified schedule.

Dated at _____ this _____ day of _____, 19__.

Bidder _____

By _____

_____
(Typed)

Title _____

Attest:

_____

Business Address of Bidder _____

_____

State of Incorporation _____

Address of Principal Office _____

_____

Variations from, and exceptions to, the specifications and associated contract documents (continued from Page B-1).

Section 1A - GENERAL DESCRIPTION AND SCOPE OF THE WORK

1A.1 GENERAL. This section covers the general project description of the Company's new Sherburne County Generating Plant and the general requirements for the work under these specifications designated Coal and Ash Storage Area Construction.

1A.2 PROJECT DESCRIPTION. The Sherburne County Generating Plant is a new generating plant located near Becker, Minnesota. A railroad siding will be available for the delivery of equipment and materials.

Units 1 and 2 of the Sherburne County Plant will include complete coal fired steam electric generating units of 680 megawatts each. Unit 1 is scheduled for commercial operation on April 1, 1976; Unit 2 is scheduled for commercial operation on April 1, 1977.

In addition to major power plant structures, equipment, systems, and auxiliaries, the project will include site development, railroad construction, and construction of supporting facilities including coal handling structures, river intake structure, pump houses, cooling towers, fuel oil handling structures, coal and ash storage areas, and miscellaneous structures.

1A.3 WORK INCLUDED UNDER THESE SPECIFICATIONS. The work under these specifications shall include all equipment, materials and services to perform the coal and ash storage area construction for Units 1 and 2 complete in accordance with the specifications, drawings, and other contract documents, except as specifically excluded herein under WORK NOT INCLUDED UNDER THESE SPECIFICATIONS.

Work shall include submittal of drawings and data for all Contractor-furnished equipment and materials. Submittal shall be in accordance with the requirements of Section 1C.

Major components of work under these coal and ash storage area construction specifications are:

Clear and grub all areas as required.

Perform earthwork as required for the recycle and holding basins, bottom ash pond, fly ash pond, coal storage area, roads, and general site work.

Perform trenching required for the coal storage area sub-surface drainage system.

Perform ditching required for coal storage area surface drainage system.

Furnish materials and construct crushed rock or gravel surfaced roads and surfaced areas.

Furnish materials and construct asphalt paving.

Furnish materials and install culverts for roads and railroads.

Furnish and place impervious earth blanket for the coal storage area, recycle basin, holding basin, fuel oil storage tank area, bottom ash pond and fly ash pond.

Furnish and install riprap slope protection.

Construct coal retaining berms in coal storage area including furnishing and placing the soil cement.

Perform the finish grading.

Provide erosion slope protection including seeding, fertilizing, and mulching.

Provide road maintenance.

Clear, grub, and raze structures within the impervious earth borrow area.

Excavate, classify and haul all impervious materials to the designated locations within the plant site area.

Finish grade all borrow areas including permanent drainage.

Perform grading required for the ash sluice piping.

Furnish materials and construct ash sluice piping supports.

Furnish and install roadway guardrail.

The above explanations and listings are intended to give a general definition of the scope of the work under these specifications, and shall not be construed to be an itemized listing of each element of work required. The Contractor shall be responsible for construction of complete facilities, conforming in all respects to the details and requirements of the specifications, drawings and other contract documents.

1A.3.1 Contractor-furnished Materials, Manpower, and Services. The Contractor shall provide all materials and equipment which will be permanently incorporated in the work and which are not specifically designated to be furnished by the Company; all labor, supervision, technical direction, administration and management; and all construction plant and services.

The Contractor shall furnish all required cement for the soil-cement specified in Section 2F.

SPECIFICATIONS
AND
DOCUMENTS

NORTHERN STATES POWER COMPANY
SHERBURNE COUNTY GENERATING PLANT
UNIT NO. 1

COAL AND ASH STORAGE AREA
CONSTRUCTION

SPECIFICATION 5377 - D-4C

DIN:		
	S1PH12K700	S1PH11A200
	S1PH12M100	S1PH11A400
	S1PH12M300	S1PH11A600
	S1PH14M000	S1PH11A810

ADDENDUM 2
June 19, 1973

Each bidder shall note these revisions to the contract documents and incorporate these revisions in his proposal. Each bidder shall attach a signed acknowledged copy of this entire addendum in the front of the specifications submitted with his proposal. This addendum consists of two pages and revised drawings listed under Item 3; all made a part of this addendum.

1. Addendum 1, Page 1A-2. Delete the next to the last item on the page referring to furnishing and constructing ash sluice piping supports.

2. Page 2F-4, Article 2F.4.5. Add the following to the end of Article 2F.4.5:

"Construction shall not be halted during soil cement operations for periods in excess of 48 hours except for adverse weather conditions. Where construction is to be halted for a period of 48 hours or more or the time one lift is placed before receiving the next lift is to exceed 48 hours, the soil cement surfaces shall be fogged with water and covered with a membrane as specified in Article 2F.4.6. Upon recommencing soil cement construction the membrane material shall be removed from the soil cement surface and the top one inch of soil cement surface scarified and prepared for placing additional soil cement as specified. In any case, the lapsed time between lifts shall not allow the soil cement to gain such strength that succeeding work cannot be performed as specified."

3. The following list of revised drawings is submitted as part of this addendum:

Drawing No. - Rev.	Title	B&V Drawing No.
NF-49071-G	DETAIL GRADING PLAN SHEET 4	SGC-0126
NF-49072-I	DETAIL GRADING PLAN SHEET 5	SGC-0127
NF-49077-E	DETAIL GRADING PLAN SHEET 10	SGC-0132
NF-49078-E	DETAIL GRADING PLAN SHEET 11	SGC-0133
NF-49091-C	COAL AND FUEL OIL STORAGE AREAS SECTIONS AND DETAILS	SYC-0611
NF-49093-B	FOUNDATIONS AND MISCELLANEOUS GRADING SECTIONS AND DETAILS	SYC-0613
NF-49105-C	SITE ARRANGEMENT PLAN SHEET V	CGC-0106

BLACK & VEATCH
Consulting Engineers

* * * * * * * * * *

ACKNOWLEDGMENT

The undersigned bidder hereby certifies that the revisions set forth in this addendum have been incorporated in his bid and are a part of the contract documents.

Signed _____

_____

Date _____

TABLE OF CONTENTS

GENERAL CONDITIONS

GC.1 CONTRACT DOCUMENTS. It is understood and agreed that the Instructions to Bidders, Proposal, Proposal Data, Contract Agreement, Performance Bond (if required), General Conditions, Special Conditions, Specifications, Drawings, Addenda, and Change Orders issued by the Company and specifications and engineering data furnished by the Contractor and accepted by the Company, are each included in this Contract and the work shall be done in accordance therewith.

GC.2 DEFINITIONS. Words, phrases, or other expressions used in these contract documents shall have meanings as follows:

1. "Contract" or "contract documents" shall include the items enumerated above under CONTRACT DOCUMENTS.

2. "Company" shall mean the Northern States Power Company, named and designated in the Contract Agreement as "Party of the First Part", and its duly authorized agents. All notices, letters, and other communication directed to the Company shall be addressed and delivered to the Northern States Power Company, 414 Nicollet Mall, Minneapolis, Minnesota 55401.

3. "Contractor" shall mean the corporation, company, partnership, firm, or individual named and designated in the Contract Agreement as the "Party of the Second Part", who has entered into this Contract for the performance of the work covered thereby, and its, his, or their duly authorized representatives.

4. "Subcontractor" shall mean and refer only to a corporation, partnership, or individual having a direct contract with the Contractor for performing work at the job site.

5. "Engineer" shall mean the firm of Black & Veatch, Consulting Engineers, 1500 Meadow Lake Parkway, mailing address P.O. Box 8405, Kansas City, Missouri 64114, or its duly authorized agents, such agents acting within the scope of the particular duties entrusted to them in each case.

6. "Date of contract", or equivalent words, shall mean the date written in the first paragraph of the Contract Agreement.

7. "Day" or "days", unless herein otherwise expressly defined, shall mean a calendar day or days of 24 hours each.

8. "The work" shall mean the equipment, supplies, materials, labor, and services to be furnished under the contract and the carrying out of all obligations imposed by the contract documents.

9. "Drawings" or "plans" shall mean all (a) drawings furnished by the Company as a basis for proposals, (b) supplementary drawings furnished by the Company to clarify and to define in greater detail the intent of the contract drawings and specifications, (c) drawings submitted by the successful bidder with his proposal, provided such drawings are acceptable to the Company, (d) drawings furnished by the Company to the Contractor during the progress of the work, and (e) engineering data and drawings submitted by the Contractor during the progress of the work, provided such drawings are acceptable to the Engineer.

10. Whenever in these contract documents the words "as ordered", "as directed", "as required", "as permitted", "as allowed", or words or phrases of like import are used, it shall be understood that the order, direction, requirement, permission, or allowance of the Company is intended only to the extent of judging compliance with the terms of the contract; none of these terms shall imply the Company or the Engineer has any authority or responsibility for supervision of the Contractor's forces or construction operations, such supervision and the sole responsibility therefor being strictly reserved for the Contractor.

11. Similarly the words "approved", "reasonable", "suitable", "acceptable", "proper", "satisfactory", or words of like effect and import, unless otherwise particularly specified herein, shall mean approved, reasonable, suitable, acceptable, proper, or satisfactory in the judgment of the Company or Engineer, to the extent provided in 10 above.

12. Whenever in these contract documents the expression "it is understood and agreed" or an expression of like import is used, such expression means the mutual understanding and agreement of the parties executing the Contract Agreement.

13. "Official acceptance" shall mean the Company's written acceptance of all work performed under this Contract, based on the Company's final inspection and issuance of a final payment certificate.

14. "Startup" shall mean the time period required to bring the steam-electric generating unit from an inactive condition, when construction is essentially complete, to the state ready for commercial operation. The startup period shall include preliminary inspection and check-out of equipment and supporting subsystems; trial operation of supporting equipment and subsystems; initial operation of the complete steam-electric generating unit; operation of the complete unit to obtain data, perform calibration and corrective work; shutdown, inspection and adjustment prior to obtaining commercial operating status.

15. "Initial operation" shall mean the first integral operation of the complete steam-electric generating unit with subsystems and supporting equipment in service or available for service.

16. "Commercial operation" shall mean the condition of operation in which the complete steam-electric generating unit is officially declared by the Company to be available for continuous operation at variable loads up to and including rated capacity.

GC.3. EXECUTION OF CONTRACT. The contract agreement and required bonds and power of attorney shall be executed as directed by the Company.

GC.4. LEGAL ADDRESSES. All notices, letters, and other communication to the Contractor will be mailed or delivered to either the Contractor's business address listed in the Proposal or the Contractor's office in the vicinity of the work. Delivery to either of these addresses will be deemed as having been delivered to the Contractor. The address of the Company appearing on Page GC-1 is hereby designated as the place to which all notices, letters, and other communication to the Company shall be mailed or delivered. Either party may change his address at any time by an instrument in writing delivered to the other party.

GC.5. SCOPE AND INTENT OF CONTRACT DOCUMENTS. The specifications and drawings are intended to supplement but not necessarily duplicate each other. Any work exhibited in the one and not in the other shall be executed as if it had been set forth in both, so that the work will be constructed according to the complete design as determined by the Company and the Engineer.

Should anything necessary for a clear understanding of the work be omitted from the specifications and drawings, or should the requirements appear to be in conflict, the Contractor shall secure written instructions from the Company before proceeding with the work affected thereby. It is understood and agreed that the work shall be performed according to the true intent of the contract documents.

GC.6 INDEPENDENT CONTRACTOR. The relationship of the Contractor to the Company shall be that of an independent contractor.

GC.7 ASSIGNMENT AND SUBCONTRACTING. The Contractor shall not assign or subcontract the work, or any part thereof, without the previous written consent of the Company, nor shall he assign, by power of attorney or otherwise, any of the money payable under this Contract unless written consent of the Company has been obtained. No right under this Contract, nor claim for any money due or to become due hereunder shall be asserted against the Company, or persons acting for the Company, by reason of any so-called assignment of this Contract or any part thereof, unless such assignment has been authorized by the written consent of the Company. In case the Contractor is permitted to assign moneys due or to become due under this Contract, the instrument of assignment shall contain a clause subordinating the claim of the assignee to all prior liens for services rendered or materials supplied for the performance of the work.

Should any subcontractor fail to perform in a satisfactory manner the work undertaken by him, his subcontract shall be immediately terminated by the Contractor upon notice from the Company. The Contractor shall be as fully responsible and accountable to the Company for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him. Nothing contained in this Contract shall create any contractual relation between any subcontractor and the Company.

GC.8 ORAL STATEMENTS. It is understood and agreed that the written terms and provisions of this agreement shall supersede all oral statements of representatives of the Company, and oral statements shall not be effective or be construed as being a part of this Contract.

GC.9 REFERENCE STANDARDS. Reference to the standards of any technical society, organization, or association, or to codes of local or state authorities, shall mean the latest standard, code, specification, or tentative standard adopted and published at the date of taking bids, unless specifically stated otherwise.

GC.10 CONTRACTOR TO CHECK DRAWINGS AND SCHEDULES. The Contractor shall check all dimensions, elevations, and quantities shown on the drawings and schedules furnished to him by the Company, and shall notify the Company of any discrepancy between the drawings and the conditions on the ground, or any error or omission in drawings, or in the layout as given by stakes, points, or instructions, which he may discover in the course of the work. The Contractor will not be allowed to take advantage of any error or omission in the drawings or contract documents. Full instructions will be furnished by the Company should such error or omission be discovered, and the Contractor shall carry out such instructions as if originally specified.

GC.11 FIGURED DIMENSIONS TO GOVERN. Dimensions and elevations shown on the drawings shall be accurately followed even though different from scaled measurements. No work shown on the drawings, the dimensions of which are not indicated, shall be executed until necessary dimensions have been obtained from the Company.

GC.12 NO WAIVER OF RIGHTS. Neither the inspection by the Company or any of their officials, employees, or agents, nor any order by the Company for payment of money, or any payment for, or acceptance of, the whole or any part of the work by the Company nor any extension of time, nor any possession taken by the Company or its employees, shall operate as a waiver of any provision of this Contract, or of any power herein reserved to the Company, or any right to damages herein provided, nor shall any waiver of any breach in this Contract be held to be a waiver of any other or subsequent breach.

GC.13 AUTHORITY OF THE COMPANY. To prevent delays and disputes, and to discourage litigation, it is agreed by the parties to this Contract that the Company shall determine the quantities of work which are to be paid for under the contract and shall determine all questions in relation to the work.

It is the intent of this agreement that there shall be no delay in the execution of the work and the decision of the Company as rendered shall be promptly observed.

GC.14 ENGINEERING INSPECTION. The Company may appoint (either directly or through the Engineer) such inspectors as the Company deems proper to inspect the materials furnished and the work performed for compliance with the drawings and specifications. The Contractor shall furnish all reasonable assistance required by the inspectors, for the proper inspection of the work.

The Contractor shall obey the directions and instructions of the inspector when they are consistent with the obligations of this Contract. Should the Contractor object to any order given by any inspector, the Contractor may make written appeal to the Company for a decision.

Inspectors and other authorized representatives of the Company or Engineer shall be free at all times to perform their duties. Any attempted intimidation of one of them by the Contractor or his employees shall be sufficient reason, if the Company so decides, to terminate the contract.

Inspection shall not relieve the Contractor from any obligation to construct the work strictly in accordance with the drawings and specifications. Work not so constructed shall be removed and replaced by the Contractor at his own expense.

GC.15 RIGHT OF COMPANY TO TERMINATE CONTRACT. If the work to be done under this Contract is abandoned by the Contractor; or if this Contract is assigned by him without the written consent of the Company; or if the Contractor is adjudged bankrupt; or if a general assignment of his assets is made for the benefit of his creditors; or if a receiver is appointed for the Contractor or any of his property; or if at any time the performance of the work under this Contract is being unnecessarily delayed; or if the Contractor is violating any of the conditions of this Contract; or if he is executing the same in bad faith or otherwise not in accordance with the terms of said contract; or if the work is not substantially completed within the time named for its completion or within the time to which such completion date may be extended; then the Company may serve written notice upon the Contractor of the Company's intention to terminate this Contract. Unless within 5 days after the serving of such notice, a satisfactory arrangement is made for continuance, this Contract shall terminate. In the event of such termination, the Company may take over and prosecute the work to completion, by contract or otherwise. The Contractor shall be liable to the Company for all excess cost sustained by the Company by reason of such prosecution and completion. The Company may take possession of, and utilize in completing the work, all materials, equipment, tools, and plant on the site of the work.

If a performance bond has been executed, written notice of the Company's intent to terminate the contract will also be given to the Surety. In the event of such termination, the Surety shall have the right to take over and complete the work, provided that if the Surety does not commence performance within 30 days, the Company may take over and prosecute the work as provided hereinbefore, with the Contractor and his Surety liable for all excess costs as provided hereinbefore.

GC.16 BEGINNING, PROGRESS, AND TIME OF COMPLETION OF WORK. Unless otherwise specified the Contractor shall begin work under this Contract within 10 days after the date designated in a written order from the Company to begin work. The rate of progress shall be such that the work will be completed in accordance with the schedule named in the Contract Agreement. The Contractor shall furnish the Company a detailed schedule setting forth the procedure he proposes to follow and giving the dates he expects to start and to complete separate portions of the work. If in the opinion of the Company proper progress is not being maintained, changes shall be made in the Contractor's operations to assure proper progress.

GC.17 HINDRANCES AND DELAYS. The Contractor expressly agrees that the construction period named in the Contract Agreement includes allowance for all hindrances and delays incident to the work. No claim shall be made by the Contractor for hindrances or delays from any cause during the progress of the work, except as provided under SUSPENSION OF WORK and EXTENSIONS OF TIME.

GC.18 SUSPENSION OF WORK. The Company reserves the right to suspend and reinstate execution of the whole or any part of the work without invalidating the provisions of the contract. Orders for suspension or reinstatement of work will be issued by the Company to the Contractor in writing. The time for completion of the work will be extended for a period equal to the time lost by reason of the suspension.

Extra costs and expenses which are caused by work suspensions ordered by the Company and mutually agreed upon will be paid by the Company to the Contractor.

GC.19 EXTENSIONS OF TIME. Should the Contractor be delayed in the final completion of the work by any act or neglect of the Company, or of any employee of the Company, or by any other contractor employed by the Company, or by strike, fire, or other cause outside of the control of the Contractor and which could have been neither anticipated nor avoided, then an extension of time sufficient to compensate for the delay will be granted by the Company; provided that the Contractor gives the Company prompt notice in writing of the cause of delay in each case and demonstrates that he has used all reasonable means to minimize the delay.

Extensions of time will not be granted for delays caused by unfavorable weather, unsuitable ground conditions, inadequate construction force, or the failure of the Contractor to place orders for equipment or materials sufficiently in advance to insure delivery when needed.

Failure of Company-furnished equipment and materials to arrive as scheduled, or failure of other construction contractors to meet their schedule, shall not be justification for an extension of time, except where such failure causes an actual delay in the Contractor's work.

GC.20 MODIFICATIONS. The Contractor shall modify the work whenever so ordered by the Company, and such modifications shall not affect the validity of the contract. Modifications may involve increases or decreases in the amount of the work for which an appropriate contract price adjustment will be made.

All modifications shall be made under the authority of duly executed change orders issued and signed by the Company and accepted and signed by the Contractor.

GC.20.1 Extra Work. Claims for extra work will not be paid unless the work covered by such claims was authorized in writing by the Company. The Contractor shall not have the right to prosecute or maintain either an arbitration proceeding or an action in court to recover for extra work unless his claim is based upon a written order from the Company.

Extra work shall be performed either on a unit price, lump sum, or cost-plus-fee basis as applicable to the nature of the work.

If the extra work is of a type and character which can properly and fairly be classified under one or more unit price items stated in the contract documents or subsequently agreed upon, then the extra work shall be paid for at the applicable unit price or prices.

If the extra work is to be performed on a lump sum basis, the Contractor shall submit a written estimate of the work with documentation to justify the amount requested, to the Company or the Engineer as directed before the work is started. The amount agreed upon by the Company and the Contractor shall be paid for the work.

If extra work is ordered to be done on a cost-plus-fee basis, the cost shall be defined as the actual cost to the Contractor of material including freight and transportation charges, and the actual labor cost including the cost of field supervision but excluding the salary of the Contractor's superintendent and general office expenses. The labor cost shall include workmen's compensation insurance, social security, and other taxes applicable to labor costs. Time sheets for labor shall be submitted in duplicate each day to the Company's representative and shall be signed by him and the Contractor's superintendent. One copy shall be retained by the Contractor and one by the Company. Invoices for material shall be submitted weekly and shall be acknowledged and retained on the same basis. When extra work is authorized on a cost-plus-fee basis, the Contractor shall provide sufficient labor to complete the work in the most expeditious and economical manner consistent with the interests of the Company. The fee to be paid the Contractor in addition to the actual cost of the work shall be 15 per cent of the actual direct cost.

GC.20.2 Decreased Work. If a modification decreases the amount of work to be done, such decrease shall not consititute the basis for a claim for damages or anticipated profits on work affected by such decrease. Where the value of omitted work is not covered by applicable unit prices, the Engineer shall determine on an equitable basis the amount of (a) credit due the Company for contract work not done as a result of an authorized change, (b) allowance to the Contractor for any actual loss incurred in connection with the purchase, delivery and subsequent disposal of materials or equipment required for use on the work as planned and which could not be used in any part of the work as actually built, and (c) any other adjustment of the contract amount where the method to be used in making such adjustment is not clearly defined in the contract documents. The Contractor shall submit to the Engineer a written estimate of the value of the decreased work, with documentation as required.

GC.21 ARBITRATION. Before bringing any action in court pertaining to a decision of the Engineer or the Company, the objector (hereinafter referred to as Party A) to the decision shall first offer to arbitrate the question with the other party to the contract (hereinafter referred to as Party B) by notifying him in writing and setting forth in such notice the question to be arbitrated.

Party B can elect to arbitrate or not. If Party B agrees to arbitrate he shall so advise Party A in writing within 10 days after receipt of Party A's notice. Notice by Party B that he does not wish to arbitrate or failure of Party B to notify Party A within the 10 day period will give Party A the right to start action in court.

If Party B agrees to arbitrate, Party A shall choose an arbitrator and shall notify Party B of the name of the arbitrator within 10 days after receipt of Party B's notice. Party B shall notify Party A in writing within 10 days after receipt of the said notice that the arbitrator named by Party A shall act as sole arbitrator or shall name an additional arbitrator. If Party B names an additional arbitrator, then the arbitrator named by Party A and the arbitrator named by Party B shall choose a third arbitrator.

The arbitrator or arbitrators shall act with promptness. In the case of three arbitrators, the decision of any two shall be binding on both parties to the contract, as shall that of a single arbitrator if the dispute is submitted thereto as heretofore provided. The decision of the arbitrator or arbitrators may be filed in court to carry it into effect, if necessary.

If they consider that the case so demands, the arbitrator or arbitrators are authorized to award the party whose contention is sustained such sum or sums as they may deem proper for the time, expense, and trouble incident to the appeal, and if the appeal was taken without reasonable cause they may award damages for any delay occasioned thereby. The arbitrators shall receive reasonable compensation for their services. The arbitrators shall assess the costs and charges of the arbitration upon either or both parties. The decision of the arbitrators must be made in writing and shall not be open to objection on account of the form of proceedings or award.

If for any reason, after the said notices have been duly given by Party A and Party B, the arbitrators appointed shall be unable or shall fail to act with reasonable promptness in appointing a third arbitrator, Party A (or, if he does not do so within a reasonable time, Party B) may request a judge of the United States District Court who regularly

holds court in the district in which the site of the work, or any part thereof, is located, to appoint the third arbitrator. If it appears to the judge that the two arbitrators originally appointed were unable or failed to act with reasonable promptness in appointing a third arbitrator, he may appoint the said third arbitrator and such an appointment shall constitute a conclusive determination that the arbitrators originally appointed were so unable or failed to act with reasonable promptness and, if the said judge acted at the request of Party B, that Party A did not make such request within a reasonable time.

If for any reason after the arbitrator or arbitrators have been duly appointed, the arbitrator or arbitrators shall be unable or shall fail to act with reasonable promptness in reaching a decision regarding the question submitted to arbitration, Party A (or, if he does not do so within a reasonable time, Party B) may request a judge of the United States District Court who regularly holds court in the district in which the site of the work, or any part thereof, is located, to appoint three new arbitrators to act hereunder. If it appears to such judge that the arbitrator or arbitrators originally appointed were unable or failed to act with reasonable promptness in reaching a decision regarding the question submitted to arbitration, he may appoint three new arbitrators to act hereunder and such an appointment shall constitute a conclusive determination that the arbitrator or arbitrators originally appointed were so unable or failed to act with reasonable promptness, and, if the said judge acted at the request of Party B, that Party A did not make such request within a reasonable time.

If for any reason a third arbitrator, or three new arbitrators shall not be appointed by a judge of the United States District Court under the circumstances hereinabove described, or if three new arbitrators are so appointed and are unable or fail to act with reasonable promptness in reaching a decision regarding the question submitted to arbitration, then the arbitration procedure shall be deemed to have failed, and the parties shall be free to assert their rights in the same manner as if they had not agreed to submit the question to arbitration.

If the above agreement to submit questions of dispute to arbitration is not enforceable under the law of applicable jurisdiction, each such question after it has arisen may, by agreement of both parties, be submitted to arbitration in the manner set forth above.

The Contractor shall not cause a delay of the work during any arbitration proceedings, except by agreement with the Company. It is understood and agreed by the parties to the contract that no requirement or statement herein shall be interpreted as curtailing the power of the Engineer or the Company to determine the amount, quality, and acceptability of work and materials.

GC.22 LAWS AND REGULATIONS. The Contractor shall observe and comply with all ordinances, laws, and regulations, and shall protect and indemnify the Company and the Company's officers and agents against any claim or liability arising from or based on any violation of the same.

The Contractor shall comply with all regulations of agencies having jurisdiction with respect to sanitation.

GC.23 TAXES, PERMITS, AND LICENSES. Unless otherwise specified in these contract documents, the Contractor shall pay all sales, use, and other taxes that are lawfully assessed against the Company or Contractor in connection with the work included in this Contract and shall obtain and pay for all licenses, permits, and inspections required for the work.

Minnesota sales, use, and excise taxes applicable to the equipment and materials permanently incorporated into the work shall not be included in the proposal or contract price. The Contractor shall pay these taxes and will be reimbursed by the Company. Freight charges are not subject to sales tax. Freight charges and taxes paid to the State of Minnesota shall be shown as separate items on all invoices to the Company.

The Contractor will be compensated for any increase in tax rates, license fees, and permit fees or any new taxes, licenses, or permits imposed after the date of the Proposal; provided however, that this provision shall be limited to sales, use, and excise taxes assessed against the completed work and to licenses and permits required specifically for the proposed work.

GC.24 PATENTS. Royalties and fees for patents covering materials, articles, apparatus, devices, equipment, or processes used in the work, shall be included in the contract amount. The Contractor shall satisfy all demands that may be made at any time for such royalties or fees and he shall be liable for any damages or claims for patent infringements. The Contractor shall, at his own cost and expense, defend all suits or proceedings that may be instituted against the Company for alleged infringment of any patents involved in the work and, in case of an award of damages, the Contractor shall pay such award. Final payment to the Contractor by the Company will not be made while any such suit or claim remains unsettled.

GC.25 MATERIALS AND EQUIPMENT. Unless specifically provided otherwise in each case, all materials and equipment furnished for permanent installation in the work shall conform to applicable standard specifications and shall be new, unused, and undamaged when installed or otherwise incorporated in the work. No such material or equipment shall be used by the Contractor for any purpose other than that intended or specified, unless such use is specifically authorized by the Company in each case.

GC.26 WARRANTY. The Contractor warrants that the equipment, materials, and workmanship furnished under this Contract to be as specified and to be free from defects for a period of one year after the date of final payment. In addition, the equipment furnished by the Contractor shall be guaranteed to be free from defects in design.

Upon notification, the Contractor shall promptly make all adjustments, repairs, or replacements which, in the opinion of the Company arose out of defects and became necessary during the warranty period.

The cost of all materials, parts, labor, transportation, supervision, special tools, and supplies required for replacement or repair of parts and for correction of defects shall be paid by the Contractor or by the surety, (if a Performance Bond has been executed).

This warranty shall be extended to cover all repairs and replacements furnished under the warranty and the period of the warranty for each such repair or replacement shall be one year after installation or completion.

If within 10 days after the Company has notified the Contractor of a defect, failure, or abnormality in the work, the Contractor has not started to make the necessary repairs or adjustments, the Company is hereby authorized to make the repairs or adjustments or to order the work to be done by a third party, the cost of the work to be paid by the Contractor.

In the event of an emergency where, in the judgement of the Company, delay would cause serious loss or damage, repairs or adjustments may be made by the Company or a third party chosen by the Company without advance notice to the Contractor and the cost of the work shall be paid by the Contractor, or by the surety (if a Performance Bond has been executed).

GC.27 INSURANCE. The Contractor shall secure and maintain throughout the duration of this Contract insurance of such types and in such amounts as may be necessary to protect himself and the interests of the Company against all hazards or risks of loss not insured against under the coverage hereinafter specified to be furnished by the Company. The form and limits of such insurance, together with the underwriter thereof in each case, shall be acceptable to the Company but regardless of such acceptance it shall be the responsibility of the Contractor to maintain adequate insurance coverage at all times. Failure of the Contractor to maintain adequate coverage shall not relieve him of any contractual responsibility or obligation.

Satisfactory certificates of insurance shall be filed with the Company not less than 10 days prior to starting any construction work on this Contract. The certificates shall state that 10 days written notice will be given to the Company before any policy covered thereby is changed or canceled.

GC.27.1 Workmen's Compensation and Employer's Liability. This insurance shall protect the Contractor against all claims under applicable state workmen's compensation laws. The Contractor shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workmen's compensation law. This policy shall include an "all states" endorsement.

The liability limits shall not be less than:

Workmen's compensation	Statutory
Employer's liability	$100,000 each person

GC.27.2 Comprehensive Automobile Liability. This insurance shall be written in comprehensive form and shall protect the Contractor against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operation on or off the site of all motor vehicles licensed for highway use, whether they are owned, nonowned, or hired.

The liability limits shall not be less than:

Bodily injury	$250,000 each person $500,000 each occurrence
Property damage	$100,000 each occurrence

GC.27.3 Comprehensive General Liability. This insurance shall be written in comprehensive form and shall protect the Contractor against all claims arising from injuries to members of the public or damage to property of others arising out of any act or omission of the Contractor or his agents, employees, or subcontractors. In addition, this policy shall specifically insure the contractual liability assumed by the Contractor under the paragraph entitled DEFENSE OF SUITS.

To the extent that the Contractor's work, or work under his direction, may require blasting, explosive conditions, or underground operations, the comprehensive general liability coverage shall contain no exclusion relative to blasting, explosion, collapse of buildings, or damage to underground property.

The liability limits shall not be less than:

Bodily injury	$250,000 each person $500,000 each occurrence
Property damage	$500,000 each occurrence $500,000 aggregate

GC.27.4 Company-furnished Insurance. The Company will effect and maintain builders' risk insurance upon the entire project in an amount deemed adequate by the Company providing at least fire and extended coverage, transit and installation coverage upon materials, supplies, machinery, equipment, fixtures, and temporary structures to be used in, or incidental to, the fabrication, installation, erection or completion of the project.

The above insurance will not provide coverage for machinery, tools, equipment, and property of a similar nature not destined to become a permanent part of the installation or structure, or for any tools owned by mechanics or any tools or equipment owned or rented by the Contractor, and the Company shall not be responsible for any loss to said property.

All contractors will be included as additional insureds. The insurance policy or policies will insure all the insurable interests of the parties to this Contract including the insurable interests, if any, of the Engineer against direct loss by the perils defined in the policy or policies. The policy or policies will contain a waiver of subrogation rights against the insured parties. The Company will be responsible for any deductibles provided by the above coverage.

A copy of the policy or policies will be available upon request for review by any party having an insurable interest on the property insured therein.

GC.28 DEFENSE OF SUITS. In case any action in court is brought against the Company or Engineer, or any officer or agent of either of them, for the failure, omission, or neglect of the Contractor to perform any of the covenants, acts, matters, or things by this Contract undertaken; or for injury or damage caused by the alleged negligence of the Contractor or his subcontractors or his or their agents, or in connection with any claim based on lawful demands of subcontractors, workmen, material men, or suppliers; the Contractor shall indemnify and save harmless the Company and the Engineer and their officers and agents, from all losses, damages, costs, expenses, judgments, or decrees arising out of such action.

GC.29 RELEASE OF LIABILITY. Acceptance by the Contractor of the last payment shall be a release to the Company and every officer and agent thereof, from all claims and liability hereunder for anything done or furnished for, or relating to the work, or for any act or neglect of the Company or of any person relating to or affecting the work.

GC.30 CLAIMS FOR LABOR AND MATERIALS. The Contractor shall indemnify and save harmless the Company from all claims for labor and materials furnished under this Contract. When requested by the Company, the Contractor shall submit satisfactory evidence that all persons, firms, or corporations who have done work or furnished materials under this Contract, for which the Company may become legally liable, have been fully paid or satisfactorily secured. In case such evidence is not furnished or is not satisfactory, an amount will be retained from money due the Contractor which in addition to any other sums that may be retained will be sufficient, in the opinion of the Company to liquidate all such claims. Such sum will be retained until the claims as aforesaid are fully settled or satisfactorily secured.

Before final acceptance of the work by the Company the Contractor shall submit in duplicate a notarized affidavit stating that all subcontractors, vendors, persons, or firms who have furnished labor or materials for the work have been fully paid and that all taxes have been paid. A statement from the surety shall also be submitted consenting to the making of the final payment (if a Performance Bond has been executed).

GC.31 FINAL INSPECTION. When the work has been substantially completed and at a time mutually agreeable to the Company, Engineer, and Contractor, the Company and the Engineer will make a final inspection of the work as to the acceptability and completeness of the work.

GC.32 COST BREAKDOWN. The Contractor shall furnish to the Company a cost breakdown of the contract price in accordance with the Company's classification of accounts.

The Company will develop an Official Project Schedule by the CPM method as outlined in Section 1E. The Contractor will be given a list of activities from this schedule. Within one week of receipt of this list, the Contractor shall assign dollar values to each activity so that the value of all activities equals the totals of each account in the Company's classification of accounts. The dollar values given shall be balanced to equal the value stated in the appropriate divisions of the classification of accounts. The amounts given shall accurately reflect fair and reasonable amounts for the completion of each activity. Upon approval by the Company, the information submitted will be incorporated in the Official Project Schedule. This information, and the percentages of completion for each activity determined each month will be the basis for monthly field work progress payments. Payment of progress payments after the first payment will not be made until the detailed activity cost breakdowns are accepted.

GC.33 ESTIMATES AND PAYMENTS. On or about the first day of each month, the Company will make an estimate of the value of the work done and of unused materials stored on the site. The estimated cost of repairing, replacing, or rebuilding any part of the work or replacing materials which do not conform to the drawings and specifications will be deducted from the estimated value.

The Contractor shall furnish to the Company such detailed information as they may request to aid in the preparation of monthly estimates. The Company will pay to the Contractor by the 25th day of the month 90 per cent of the estimated value less any previous payments.

Payments for materials stored on the site shall be based only upon the actual cost of such materials to the Contractor and shall not include any overhead or profit to the Contractor.

After official acceptance of the work by the Company, the Company will prepare a final estimate of the work done under this Contract. The final estimate will not be prepared until the affidavit and statement required in the paragraph entitled CLAIMS FOR LABOR AND MATERIALS have been received. The Company will, within 30 days thereafter, pay the entire balance due after deducting all amounts to be retained under any provision of this Contract.

SPECIAL CONDITIONS

SC.1 GENERAL. The provisions of these Special Conditions apply to work on the site of the Sherburne County Generating Plant. These Special Conditions are nontechnical in nature and shall supplement the General Conditions in the administration and regulation of field construction work performed under these specifications.

SC.2 LOCAL CONDITIONS. It is the intent of this Contract that, before submitting his proposal, the Contractor shall have investigated local conditions which might affect the work. No adjustment or waiver of any provision of this Contract will be granted for cause based on unawareness or misunderstanding of local conditions.

SC.3 ENGINEER'S DRAWINGS AND SPECIFICATIONS. The Contractor will be furnished ten sets of all drawings including revisions thereto and ten copies of the specifications without charge. Additional sets of drawings and revisions thereto and additional copies of specifications may be obtained upon written request to the Company at no charge to the Contractor. All drawings and specifications shall be returned to the Engineer upon completion of the work.

SC.4 PROJECT MANAGEMENT. The coordination of all field construction will be under the direction of the Company, who will be responsible for coordinating work between various contractors and for resolving any conflicts between contractors regarding scheduling or coordination.

Meetings of the Company and all contractors at the site will be held at the times and places designated by the Company for the purpose of scheduling and coordination of each contractor's work within the requirements of the overall project. In the event conflicts arise between contractors concerning scheduling or coordination, the Company will make the final decision resolving the conflict. The Company's decision shall not be cause for extra compensation or for extension of time. The Contractor's superintendent shall attend each scheduled meeting.

The time of completion is of the essence of this Contract and the Contractor shall be responsible for performing his work in accordance with the Official Project Schedule. If at any time the Contractor's work is behind schedule, the Contractor shall increase his forces, work overtime, or otherwise accelerate his operations to comply with the Official Project Schedule, and shall put into effect definite procedures for getting the work back on schedule. The proposed procedures shall be subject to the Company's acceptance or modification. The procedures adopted shall be put into effect immediately. Upon continued failure to meet the established schedule such that completion of the project as a whole may be delayed, the Company may elect to perform such portions of the work as required, and deduct the cost of performing the same from the contract price.

The Company will not be responsible for the assignment of personnel, for obtaining materials or supplies, or for any other services to the Contractor except the coordination of work between contractors and as specifically set forth in the contract documents.

SC.5 CONTRACTOR'S OFFICE AT SITE OF WORK. During the performance of this Contract, the Contractor shall maintain a suitable office at the site of the work which shall be the headquarters of a representative authorized to receive drawings, instructions, or other communication or articles. Any communication given to the said representative, or delivered at the Contractor's office at the site of the work in his absence, shall be deemed to have been delivered to the Contractor.

Copies of items listed under FIELD RECORDS shall be kept at the Contractor's office at the site of the work, available for use at all times.

SC.6 FIELD RECORDS. The Contractor shall maintain at his office at the site up-to-date copies of all drawings, specifications, and other contract documents and supplementary data, complete with latest revisions thereto. In addition, the Contractor shall maintain a continuous record of all field changes and, at the conclusion of the work, shall incorporate all such changes on the drawings and other engineering data and shall submit the required number of copies thereof to the Company.

SC.7 CONTRACTOR'S SUPERVISION AT THE SITE. The Contractor shall furnish adequate management, supervisory, and technical personnel on the site to insure expeditious and competent handling of all matters related to the work.

A superintendent experienced in major construction of the type specified, and who is a permanent member of the Contractor's organization, shall be a resident at the project throughout the construction. The superintendent shall be fully authorized to act for the Contractor and to receive whatever orders may be given for the proper prosecution of the work, or notices in connection therewith.

The Contractor's field organization shall include an experienced staff of qualified technical personnel to handle on-site engineering, planning, and direction of all field work. The field organization shall also include a staff to handle timekeeping, employment, accounting, purchasing and expediting, stores and warehouses, stock and tool rooms, and security.

The Contractor shall be responsible for complete supervision and control of his subcontractors as though they were his own forces. Notice to the Contractor shall be considered notice to any affected subcontractor.

SC.8 SUBCONTRACTS. It is the intent of these specifications that the Contractor shall perform the majority of the work with his own forces and under the management of his own organization. Specific portions of the work may be subcontracted only by subcontractors who have been listed in the Proposal and who are accepted by the Company as provided in the General Conditions. All subcontractors shall be directly responsible to the Contractor and shall be under his general supervision. All work performed under subcontracts shall be subject to the same contract provisions as the work performed by the Contractor's own forces.

SC.9 RELATIONS WITH OTHER CONTRACTORS. The Contractor shall cooperate with all other contractors who may be performing work in behalf of the Company, and workmen who may be employed by the Company in the vicinity of the work under this Contract, and he shall conduct his operations to minimize interference with the work of such contractors or workmen. The Contractor shall promptly make good, at his own expense, any injury or damage that may be sustained by other contractors or employees of the Company at his hands. Any difference or conflict which may arise between the Contractor and other contractors, or between the Contractor and workmen of the Company, in regard to their work shall be resolved as determined by the Company. If the work of the Contractor is delayed because of any acts or omissions of any other contractor, the Contractor shall have no claim against the Company on that account other than an extension of time.

If any part of the Contractor's work is dependent upon the quality and completeness of work performed under another contract, the Contractor shall inspect the other contractor's work and promptly report defects therein which render such work unsuitable for the proper execution of the work under this Contract. Failure to report such defects to the Company shall constitute the Contractor's acceptance of such work as suitable to receive the Contractor's work; provided however, that the Contractor shall not be responsible for defects which develop after his inspection and which could not have been reasonably detected or foreseen.

SC.10 METHODS OF FIELD OPERATION. The Contractor shall inform the Company in advance concerning his plans for carrying out each part of the field work. Review by the Company of any plan or method of work proposed by the Contractor shall not relieve the Contractor of any responsibility therefor, and such review shall not be considered as an assumption of any risk or liability by the Company or any officer, agent or employee thereof. The Contractor shall have no claim because of the failure or inefficiency of any plan or method so reviewed.

Any method of work suggested by the Company, but not specified, shall be used at the risk and responsibility of the Contractor, and the Company will assume no responsibility therefor. The Contractor alone shall be responsible for the safety, adequacy, and efficiency of his plant, equipment, and methods.

The Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. Neither the Engineer's nor the Company's construction review of the Contractor's performance is intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site. The Contractor shall comply with all applicable requirements of Federal, State, and local codes, including the requirements of the Federal "Safety and Health Regulations For Construction" and the regulations of the Industrial Commission of Minnesota.

SC.11 LINES AND GRADES. All work shall be done to the lines, grades, and elevations indicated on the drawings. The Contractor shall provide suitable equipment and competent workmen who shall locate and lay out the work.

Basic horizontal and vertical control points will be established or designated by the Company. These points shall be used as datum for work under this Contract.

In addition, measurements shall be made from permanent base lines and elevation reference datum previously established on the site and shall be coordinated with existing building column lines and floor elevations where applicable.

The Contractor shall provide experienced instrument men, competent assistants, and such instruments, tools, stakes, and other materials as are required to complete survey, layout, and measurement work. In addition, the Contractor shall furnish, without charge, competent men from his force, and such tools, stakes, and other materials as the Company may require in establishing or designating control points, in establishing construction easement boundaries, or in checking survey, layout, and measurement work performed by the Contractor.

The Contractor shall keep the Company informed, a reasonable time in advance, of the times and places at which he wishes to do work, so that horizontal and vertical control points may be established and any checking deemed necessary by the Company may be done with minimum inconvenience to the Company and minimum delay to the Contractor.

Any work done without being properly located may be ordered removed and replaced at the Contractor's expense.

SC.12 PRESERVATION OF MONUMENTS AND STAKES. The Contractor shall carefully preserve all monuments, bench marks, reference points, and stakes. The Contractor will be charged with the expense of replacement of any such items destroyed, and shall be responsible for any mistake or loss of time that may be caused. Permanent monuments or bench marks which must be

removed or disturbed shall be protected until they can be properly referenced for relocation. The Contractor shall furnish materials and assistance for the proper replacement of such monuments or bench marks.

SC.13 PROTECTION OF PROPERTY AND PUBLIC LIABILITY. The Contractor shall be accountable for any damages resulting from his operations. He shall be fully responsible for the protection of all persons including members of the public, employees of the Company, and employees of other contractors or subcontractors, and all public and private property including structures, sewers and utilities, above and below ground.

The Contractor shall furnish and maintain all necessary safety equipment, such as barriers, signs, warning lights and guards, to provide adequate protection of persons and property.

The Contractor shall give reasonable notice to the owners of public or private property and utilities when such property and utilities are liable to injury or damage through the performance of the work, and shall make all necessary arrangements with such owners relative to the removal and replacement or protection of such property or utilities.

SC.14 EMERGENCY PROTECTION. Whenever, in the opinion of the Company, the Contractor has not taken sufficient precaution for the safety of the public or the protection of the work to be constructed under this Contract or of adjacent structures or property, and whenever, in the opinion of the Company, an emergency has arisen and immediate action is considered necessary, then the Company, with or without notice to the Contractor, may provide suitable protection by causing work to be done and material to be furnished and placed. The cost of such work and material shall be borne by the Contractor, and, if the same is not paid on presentation of the bills therefor, such costs may be deducted from any amounts due or to become due the Contractor. The performance of such emergency work shall not relieve the Contractor of responsibility for any damage which may occur.

SC.15 LOSSES FROM NATURAL CAUSES. All loss or damage arising out of the nature of the work, or from the action of the elements, or from floods or overflows, or from ground water, or from any unusual obstruction or difficulty, or any other natural or existing circumstance either known or unforeseen which may be encountered in the prosecution of the work, shall be sustained and borne by the Contractor at his own cost and expense.

SC.16 CHARACTER OF WORKMEN. The Contractor shall employ only workmen who are competent to perform the work assigned to them and, in the case of skilled labor, who are adequately trained and experienced in their respective trades and who do satisfactory work.

Whenever the Company shall notify the Contractor that any man on the work is, in the opinion of the Company, incompetent, unfaithful, or disorderly, or uses threatening or abusive language to any person representing the Company when on the work, such man shall be immediately discharged from the work and shall not be re-employed thereon except with the consent of the Company.

SC.17 SUNDAY, HOLIDAY, AND NIGHT WORK. No work shall be done between 6:00 p.m. and 7:00 a.m. or on Sundays or legal holidays without the written consent of the Company. However, emergency work may be done without prior consent.

Night work may be established by the Contractor as a regular procedure with the written permission of the Company. Such permission, however, may be revoked at any time if the Contractor fails to maintain adequate equipment and supervision for the proper prosecution and control of the work at night.

SC.18 UNFAVORABLE CONSTRUCTION CONDITIONS. During periods of unfavorable weather, wet ground or other unsuitable construction conditions, the Contractor shall confine his operations to work which will not be affected adversely thereby. No portion of the work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by the Contractor to perform the work in a proper and satisfactory manner.

SC.19 REJECTED WORK AND MATERIALS. The Contractor, upon written notice from the Company, shall remove from the premises all work and materials rejected as defective, unsound, improper, or in any way failing to conform to the requirements of the contract documents. The Contractor shall at his sole expense make good all work damaged by such removal and shall promptly replace materials damaged or improperly worked by him and re-execute his own work in accordance with the contract. This includes re-executing or replacing the work of any other contractor that is in any way affected by the removal of the defective work. The obligations of the Contractor under this article shall not extend to defective materials or equipment supplied by the Company.

If the Contractor does not remove his rejected work and materials within 10 days after written notice, the Company may remove and replace such work and materials at the expense of the Contractor.

SC.20 PLACING WORK IN SERVICE. If desired by the Company, portions of the work may be placed in service when completed and the Contractor shall provide proper access for this purpose. Such use and operation shall not constitute an acceptance of the work, and the Contractor shall be liable for defects due to faulty construction throughout the duration of this Contract and thereafter as provided under the "Warranty".

SC.21 CLEANLINESS. Special attention shall be given to keeping the inside of the structures and surrounding grounds clean and free from trash and debris. The General Construction-Superstructures Contractor (Spec. 5377/5619-D-4A) will employ sufficient and special personnel to thoroughly clean all work areas continuously each working day. This cleaning will include sweeping the floors, collecting and depositing of trash, and all other functions required to keep the work areas clean.

Materials and supplies shall be stored in locations which will not block accessways, and arranged to permit easy cleaning of the area. In areas where equipment might drip oil or cause other damage to the floor surface, a protective cover of heavy gage, flame resistant, oilproof sheeting shall be provided between the equipment and the floor surface so that no oil or grease contacts the concrete. This requirement is applicable to both finished and unfinished floors.

All hoses, cables, extension cords, and similar materials shall be located, arranged, and grouped so that they will not block any accessway and will permit easy cleaning and maintenance. At the close of each workweek and at the close of each day preceding a holiday, all such items shall be removed from the construction area and stored in the Contractor's warehouses or other storage areas.

The Contractor shall conduct his operations in conformance with the requirements of the Minnesota Pollution Control Authority. A copy of these regulations will be available in the Company's office at the site for examination.

Promptly upon the completion of the construction work, all scrap, trash, waste materials, and debris resulting from work under this Contract shall be deposited in the designated collection areas. All Contractor-owned facilities, materials, and construction plant shall be removed from the site. The Contractor shall thoroughly clean the work, removing all accumulations of dust, scraps, waste, oil, grease, weld spatter, insulation, paint, and other foreign substances. Surfaces damaged by deposits of insulation, concrete, paint, weld metal, or other adhering materials shall be restored by the Contractor.

Remaining Company-furnished materials shall be stored on the site or removed from the site as directed by the Company.

SC.22 PURCHASE ORDERS. The Contractor shall submit to the Company two copies of each purchase order for all materials and equipment furnished under these specifications for incorporation in the permanent construction. Each purchase order shall show the vendor's name, manufacturer's name, materials, type, model number, size, quantity, accessory list, and requested delivery date of the material and equipment ordered. The purchase order copies shall be submitted to the Company before or at the time when they are issued to the vendor.

SC.23 SOURCE OF MATERIALS AND REPAIR PARTS. Equipment, materials, and accessories shall be produced, manufactured, and fabricated by suppliers qualified as acceptable suppliers to the Company. The procedure established by the Company for qualifying suppliers considers the following:

a. Evaluation of the product by the Company's Research Department, Testing Laboratory, and Standardization Committee

b. Analysis of past performance including price, delivery, and service

c. Evaluation of the responsibility, capability, and integrity of the supplier

Foreign suppliers may qualify as acceptable suppliers provided they meet all of the Company's requirements including those listed above, and that a reasonable opportunity exists for United States suppliers to sell like products in the country in which the foreign supplier is located.

SC.24 FIRE PROTECTION. Only work procedures which minimize fire hazards to the extent practicable shall be used.

Combustible debris and waste will be collected and disposed of as provided under CLEANLINESS.

Fuels, solvents, and other volatile or flammable materials shall be stored away from the construction and storage areas in well marked, safe containers. Good housekeeping is essential to fire prevention and shall be practiced by the Contractor throughout the construction period. The Contractor shall follow the recommendations of the AGC "Manual of Accident Prevention in Construction" regarding fire hazards and prevention.

Unless specified herein for a particular application, untreated canvas, paper, plastic, and other flammable flexible materials shall not be used on the site for any purpose. If such materials are on equipment or materials which arrive at the site, they shall be removed and replaced with an acceptable covering before storing or moving into the construction area.

Likewise, corrugated paper and fiberboard cartons shall not be permitted in the construction area for the storage or handling of materials. If such cartons do arrive in the construction area, they shall be immediately unpacked and removed from the site. Acceptable flexible materials shall be waterproof and flame resistant, and shall be equal to or better than the glass reinforced laminated paper and aluminum foil sheeting, PYRO-KURE 613, manufactured by Sisalkraft Division, St. Regis Paper Co.

Formwork, scaffolding, planking, and similar materials which are combustible but which are essential to execution of the work shall be treated for fire resistance or otherwise protected against combustion resulting from welding sparks, cutting flames, and similar fire sources.

Temporary heating facilities, if required for proper performance of the work, shall be provided with adequate safeguards to assure safe operation.

The General Construction-Superstructures Contractor's supervisory personnel and a sufficient number of his workmen will be instructed in proper methods for extinguishing fires and will be assigned specific fire protection duties. When trained personnel leave the job, new personnel will be trained in their duties. These assigned workmen will be instructed in the selection and the operation of each type of fire extinguisher for each type of fire which might be encountered.

The Contractor shall provide adequate fire protection equipment in each warehouse and office, and in other temporary structures, and in each work area he is occupying as specified herein. Access to sources of firewater shall be identified and kept open at all times. The Company has installed a firewater system including fire hydrants. This system will be available for fire fighting in areas near hydrants. Suitable fire extinguishers shall be provided in enclosed areas, in areas which are not accessible to firewater, or in areas which may be exposed to fire that cannot be safely extinguished with water. Each fire extinguisher shall be of a type suitable for extinguishing fires which might occur in the area in which it is located. In areas where more than one type of fire might occur, the type of fire extinguisher required in each case shall be provided. Each extinguisher shall be placed in a convenient, clearly identified location which will be readily accessible in the event of fire.

Failure of the Contractor to comply with, or the Company to enforce, the above requirements shall not relieve the Contractor from any other responsibility or obligation under this Contract.

SC.25 SECURITY. The Contractor shall be responsible for all materials and equipment in his custody or placed in construction by him. Security methods shall be employed as required to insure the protection of all materials, equipment, and construction work from theft, vandalism, fire, and all other damage and loss.

The Company will provide guard service during the normal construction period. The guard service will consist of uniformed guards on duty during each of three 8 hour shifts, 7 days a week. During regular working hours, including periods when workmen are arriving at and leaving the site, the guard will be on duty at the security guardhouse. During off hours and weekends and holidays, a guard will rove the site.

Each person employed on the construction site shall be issued an identification badge and registered with the guard. The Contractor will be responsible for furnishing badges for all his personnel; however, the badges shall be coordinated with the identification system adopted for the project and shall be subject to the acceptance of the Company. In addition to personnel identification, all licensed construction vehicles shall be registered with the guard and shall be marked with a suitable identification sticker. Likewise, the licensed vehicles of construction personnel authorized to bring their vehicles on the site shall be registered with the guard and shall be marked with a suitable identification sticker.

All construction personnel and vehicular traffic shall enter and leave the construction site through the designated construction entrance gate. Unauthorized personnel will not be permitted on the site. Materials or equipment leaving the site shall be authorized by the Contractor and the Company. The guard on duty at the gatehouse will check the arrival and departure of all construction personnel and traffic. When the guard is not on duty at the gatehouse, the gate will be closed and locked.

SC.26 CONSTRUCTION AREA LIMITS. The Company will designate the boundary limits of access roads, parking areas, storage areas, and construction areas, and the Contractor shall not trespass in or on areas not so designated. The Contractor shall be responsible for keeping all of his personnel out of areas not designated for the Contractor's use; except, in the case of isolated work located within such areas, the Company will issue permits to specific Contractor personnel to enter and do the work.

The Contractor's employees shall park their automobiles, trucks, and other vehicles in the assigned construction personnel parking area.

SC.27 ACCESS ROADS, PARKING AND STORAGE AREAS. Construction access roads, parking lots, and storage areas will be assigned for the Contractor's use by the Company.

SC.28 FOOD SERVICES. No food services will be permitted on the construction site.

SC.29 PROTECTION OF WORK. The Contractor shall be solely responsible for the protection of his work until its final acceptance by the Company.

The Contractor shall have no claim against the Company because of any damage or loss to the Contractor's work and shall be responsible for the complete restoration of damaged work to its original condition complying with the specifications and drawings.

In the event the Contractor's work is damaged by another party not under his supervision or control, the Contractor shall make his claim directly with the party involved. If a conflict or disagreement develops between the Contractor and one of the other contractors concerning the responsibility for damage or loss to the Contractor's work, the conflict shall be resolved as provided under RELATIONS WITH OTHER CONTRACTORS. Such conflict shall not be cause for delay in the restoration of the damaged work. The Contractor shall restore the work immediately and the cost thereof will be assigned pending the resolution of the conflict.

SC.30 PERMITS AND INSPECTION. The Contractor shall make arrangements for inspection by insurance, city, and state representatives, when required, and shall render all necessary assistance to aid these representatives in making inspections.

SC.31 REPAIR OF DAMAGES. The Contractor shall immediately repair any damage which results from this construction or abnormal use, including damage done to the work of other contractors. All such repair work shall be acceptable to the Company.

SC.32 TESTING AND INSPECTION BY CONTRACTOR. The Contractor shall provide as a part of his forces adequate testing and inspection to insure complete compliance with the specifications. Such testing and inspection shall not imply acceptance of the work by the Company. The Contractor shall provide adequate and competent supervisory personnel to insure compliance with the specifications. All costs for such testing and inspection shall be paid for by the Contractor.

In addition to the above testing and inspection the Company will provide independent testing as specified in the technical sections of these specifications.

SC.33 COOPERATION WITH COMPANY. The performance of construction work which affects the operation of the Company's system facilities shall be scheduled to be performed only at times acceptable to the Company.

In the event that it is necessary to either interrupt the power supply or to impose abnormal operating conditions on the Company's utility system, such procedure must be acceptable to the Company and a complete understanding and agreement must be reached by all parties concerned well in advance of the time scheduled for such operation, and such understanding shall be definite as to date, time of day, and length of time required. All work shall be scheduled to suit the Company's convenience, taking into consideration the facilities and requirements at all times during construction.

The Contractor shall be responsible for paying all regular and premium time labor costs arising from the necessity to perform work which affects the Company's system facilities at times other than regular working hours.

SC.34 CONSTRUCTION PLANT AND TEMPORARY FACILITIES. Except as otherwise specified, the Contractor shall furnish all construction plant, utilities and temporary facilities and all materials, equipment and supplies which are required for prosecution of the work but which will not be incorporated in the completed work.

Detailed instructions covering construction services to be provided by the Contractor and/or the Company are included in Section 1F of these specifications.

SC.35 RECEIVING, HANDLING, AND STORAGE. The Contractor shall receive from carriers at the plant site, check, unload, handle and store all materials and equipment which are to be incorporated in the construction under these specifications.

The Contractor shall be responsible for the prompt unloading of materials and equipment and shall pay any demurrage.

The Contractor shall provide all storage facilities. Storage areas on the site shall be limited to those areas so designated by the Company.

Detailed instructions covering receiving, handling and storage of Company-furnished and Contractor-furnished equipment and materials are included in Section 1G of these specifications.

SC.36 UNDERGROUND INSTALLATIONS. Underground installations constructed under separate specifications, such as pipelines, electrical duct banks, and buried structures, are indicated on the drawings at their design locations. The locations of these underground items, as built, may vary from the locations indicated. There is no guarantee as to the accuracy or completeness of work constructed under separate specifications.

The Contractor shall be responsible for locating all existing underground installations by prospecting in advance of excavating or trenching. The Contractor shall correlate this information with the underground information indicated on the drawings and shall not rely only on the information indicated on the drawings.

Any delay, additional work, or extra cost to the Contractor caused by existing underground installations shall not constitute a claim for extra work, additional payment, or damages.

SC.37 HAUL OF IMPERVIOUS EARTH. The Company has purchased property located as indicated on the drawings which the Contractor shall utilize for the impervious earth fill material required for the clay core and impervious earth blanket construction.

The transportation of the required impervious earth material from the borrow to the place of disposition at the plant site will require travel over local roads, highway, and railroad crossing not owned by the Company.

All Contractor vehicular travel within the limits of local road, highway, and railroad rights-of-way shall be in conformity with the requirements and under the control of the authority owning, or having jurisdiction over and control of, the right-of-way in each case.

SC.37.1 Route. The Contractor shall use the haul route designated on the drawings unless otherwise authorized by the Company. The Contractor may propose an alternate haul route; however, this must be stipulated in the Proposal.

SC.37.2 Permits. The Contractor shall obtain all permits required from the authorities having jurisdiction over local road, highway, and railroad rights-of-way to be used as part of the haul route. Copies of such permits including provisions and limitations imposed by the authorities shall be submitted to the Company prior to use of the haul route.

SC.37.3 Traffic Control. The Contractor shall conduct his vehicular operations along the haul route so as to interfere with other vehicular traffic as little as possible.

The Contractor shall provide flagmen, signs, warning lights, traffic signals or other similar traffic control devices and methods acceptable to the authorities having jurisdiction of the local road, highway, and railroad crossing rights-of-way. All haul route crossings at local roads, highway, and railroad shall be provided with one or more of the above traffic control devices as required by the authorities having jurisdiction thereover.

SC.37.4 Maintenance. The Contractor shall be responsible for maintenance of the haul route outside the Company's property limits. Such maintenance shall include dust control and the patching of the roadway to keep it in its original condition before hauling was started.

SC.37.5 Schedule. In addition to the requirements of Article SC.17, the Contractor shall not schedule any hauling operations crossing Highway 10 on Friday afternoons or evenings, or on days preceding holidays.

SC.38 BLASTING. No blasting or other use of explosives for excavation will be permitted.

DIVISION 1 - GENERAL REQUIREMENTS

CONTENTS

Section 1A - GENERAL DESCRIPTION AND SCOPE OF THE WORK

1A.1 GENERAL. This section covers the general project description of the Company's new Sherburne County Generating Plant and the general requirements for the work under these specifications designated Coal and Ash Storage Area Construction.

1A.2 PROJECT DESCRIPTION. The Sherburne County Generating Plant is a new generating plant located near Becker, Minnesota. A railroad siding will be available for the delivery of equipment and materials.

Units 1 and 2 of the Sherburne County Plant will include complete coal fired steam electric generating units of 680 megawatts each. Unit 1 is scheduled for commercial operation on April 1, 1976; Unit 2 is scheduled for commercial operation on April 1, 1977.

In addition to major power plant structures, equipment, systems, and auxiliaries, the project will include site development, railroad construction, and construction of supporting facilities including coal handling structures, river intake structure, pump houses, cooling towers, fuel oil handling structures, coal and ash storage areas, and miscellaneous structures.

1A.3 WORK INCLUDED UNDER THESE SPECIFICATIONS. The work under these specifications shall include all equipment, materials and services to perform the coal and ash storage area construction for Units 1 and 2 complete in accordance with the specifications, drawings, and other contract documents, except as specifically excluded herein under WORK NOT INCLUDED UNDER THESE SPECIFICATIONS.

Work shall include submittal of drawings and data for all Contractor-furnished equipment and materials. Submittal shall be in accordance with the requirements of Section 1C.

1A.3.1 Lump Sum Price. The lump sum Proposal Article B.1 shall include all work under these specifications and as indicated on the drawings except construction of the bottom ash pond, fly ash pond, ash pipe trenching, ash pipe supports, and access road.

Major components of this work are:

Clear and grub all areas as required.

Perform earthwork required for the recycle and holding basins, coal storage area, roads, and general site work.

Perform trenching required for the coal storage area sub-surface drainage system.

Perform ditching required for coal storage area surface drainage system.

Furnish materials and construct crushed rock or gravel surfaced roads and surfaced areas.

Furnish materials and construct asphalt paving.

Furnish materials and install culverts for roads and railroads.

Furnish and place impervious earth blanket for the coal storage area, recycle basin, holding basin, and fuel oil storage tank area.

Furnish and install riprap slope protection for the recycle basin and holding basin.

Construct coal retaining berms in coal storage area including furnishing and placing the soil cement.

Perform the finish grading.

Provide erosion slope protection including seeding, fertilizing, and mulching.

Provide road maintenance.

Clear, grub, and raze structures within the impervious earth borrow area.

Furnish material and construct the siltation pond including construction drainage.

Excavate, classify and haul all impervious materials to the designated locations within the plant site area including the stockpiling of impervious materials on the plant site.

Finish grade all borrow areas including permanent drainage.

Provide erosion protection for the impervious earth borrow area including seeding, fertilizing, and mulching.

1A.3.2 Lump Sum Price Addition. The lump sum addition Proposal Article B.2 shall include all work under these specifications and as indicated on the drawings for the construction of the bottom ash pond, fly ash pond, ash pipe trenching, ash pipe supports and access road.

Major components of this work are:

Clear and grub the bottom ash pond, fly ash pond, and ash pipe trenching and pipe access road areas.

Perform earthwork required for the bottom ash pond, fly ash pond and roads and site work.

Perform grading required for the ash sluice piping.

Furnish materials and construct ash sluice piping supports.

Remove from plant site stockpile and place impervious earth blanket and clay core for the fly ash and bottom ash ponds.

Furnish and install riprap slope protection for the fly ash and bottom ash ponds.

Furnish materials and construct crushed rock or gravel surfaced roads.

Furnish and install roadway guardrail.

Perform the finish grading.

Provide erosion slope protection including seeding, fertilizing, and mulching.

The above explanations and listings are intended to give a general definition of the scope of the work under these specifications, and shall not be construed to be an itemized listing of each element of work required. The Contractor shall be responsible for construction of complete facilities, conforming in all respects to the details and requirements of the specifications, drawings and other contract documents.

1A.3.3 Contractor-furnished Materials, Manpower, and Services. The Contractor shall provide all materials and equipment which will be permanently incorporated in the work and which are not specifically designated to be furnished by the Company; all labor, supervision, technical direction, administration and management; and all construction plant and services.

The Contractor shall furnish all required cement for the soil-cement specified in Section 2F.

1A.4 WORK NOT INCLUDED UNDER THESE SPECIFICATIONS. In addition to the work under these coal and ash storage area construction specifications, the Company has awarded or will award separate contracts for the following work which will be directly associated with the work under these specifications:

Landscaping	5377	D-4D
Yard Piping	5377	D-6A
Batch Plant and Concrete Supply	5377	S-6A
Crusher House Elevator	5377	S-18F
Painting	5377	S-22A
Coal Yard Railroad	5377	S-28B
Chimney Construction	5377	S-36A
Structural Steel - Yard Structures and Coal Handling	5377	S-40B
Car Dumper and Positioner Erection	5377	M-2A
Coal and Limestone Handling Equipment Erection	5377	M-2B
Stacker-Reclaimer Erection	5377	M-2E
Large Storage Tank Erection	5377	M-38A
General Construction - Substructures	5619	D-2A
General Construction - Superstructures	5377/5619	D-4A
Yard and Coal Handling Foundations	5377/5619	D-4B
Mechanical Construction	5377/5619	D-6B
Electrical Construction - Lighting	5377	D-8B
Electrical Construction - Power & Control	5377	D-8C
Control and Instrument Construction	5377/5619	D-10A
Demineralized Water Storage Tank Interior Coating	5377	W-12C
Electrical Construction Lighting	5619	D-8B
Electrical Construction - Power & Control	5619	D-8C
Metal Wall Panels	5377/5619	S-12A
Structural Steel - Generation Building	5377/5619	S-40A
Cooling Tower Erection	5377/5619	M-10A
Scrubber Erection	5377/5619	M-12A
Fabricated Pipe Erection	5377/5619	M-26D
Steam Generator Erection	5377/5619	M-34A

The Company and the Engineer have copies of the aforementioned specifications in their respective offices.

Part of the work listed hereinbefore will be in progress concurrently with the work under these specifications. The Contractor shall coordinate his activities and cooperate with the other contractors and the Company in the best interest of the project.

1A.4.1 Company-furnished Materials. The Company has stored topsoil on the site at the location indicated on the drawings. This topsoil as well as the topsoil stockpiled under these specifications shall be used by the Contractor as required to comply with the specifications.

1A.5 CONTOUR VERIFICATION. As specified hereinafter, the earthwork quantities for bidding and contract purposes shall be based on the contract issue of the drawings which indicate existing contours and elevations obtained by aerial surveys and other methods.

After the areas subject to the earthwork have been cleared and before the original ground or existing grades have been disturbed, the Contractor shall verify the contours indicated on the drawings by making field surveys. The Contractor shall then furnish the Company with a certified and signed document stating that the existing contours as indicated on the drawings are accepted by the Contractor as indicating the true existing site grades, or make a claim to the Company for adjustment on the basis of his field ground surveys. The Contractor's field ground surveys will be verified by the Company before commencing earthwork construction. Such claim shall include a copy of all relevant drawings clearly marked to indicate the Contractor's survey elevations of existing grades, in sufficient detail on all appropriate drawings, profile, or section to accurately establish the quantities of each category of earthwork for which there is a specified unit adjustment price.

1A.6 UNIT ADJUSTMENT PRICES. The unit adjustment prices stated in the Proposal shall be used to adjust the contract sum for additions to or deductions from the items of work specified hereinafter. The unit adjustment price in each case shall include all costs for furnishing and installing complete units of work. Adjustments shall take into consideration the contours existing at the time the Contractor was notified of the revisions to the work.

1A.6.1 Excavated Materials. As used hereinafter, the term "excavated materials" shall mean either material removed by cutting or material deposited as fill.

The unit adjustment price for "excavated materials" shall apply only to each cubic yard of the finish cut or final in-place fill, whichever quantity is larger, determined as follows:

(a) The net difference in cubic yards of "excavated material" subject to adjustment under CONTOUR VERIFICATION Article 1A.6. The net difference shall be the quantity in cubic yards, addition or deduction, between the volume calculated using the finish and existing contours indicated on the drawings and the volume calculated using the finish contours indicated on the drawings and the existing contours determined by the field surveys as specified under CONTOUR VERIFICATION Article 1A.6.

(b) The net difference in cubic yards of "excavated materials" added to or deducted from the work by revision of the contract drawings

The quantities in (a) or (b) above shall be calculated by the average end area method.

"Excavated materials" are unclassified material and shall include all materials encountered.

1A.6.2 Core Trench Excavation. The unit adjustment price for core trench excavation shall apply to each cubic yard of material added to or deducted from the work by revision of the contract drawings as amended or confirmed through original contour verification. This unit adjustment price shall include dewatering, excavating, transportation, and storing of this material whether it is or is not stockpiled for reuse.

1A.6.3 Impervious Clay Core Fill. The unit adjustment price for impervious clay core fill designated "clay core" shall apply to each cubic yard of material added to or deducted from the work by revision of the contract drawings. This unit adjustment price shall include excavating and transporting from the impervious earth stockpile area indicated on the drawings to the place of use, placement, compaction, watering, rolling, and discing of the material in place complete as specified in Section 2E.

1A.6.4 Impervious Earth Blanket. The unit adjustment price for impervious earth blanket fill (Types 1 through Type 4) shall apply to each cubic yard of material added to or deducted from the work by revisions of the contract drawings. This unit adjustment price shall include excavating and transportation from the impervious earth stockpile area indicated on the drawings to the place of use, placement, compaction, watering, rolling, and discing of the material in place complete as specified in Section 2E.

1A.6.5 Embankment Fill. The unit adjustment price for embankment fill shall apply to each cubic yard of material added to or deducted from the work by revision of the contract drawings. This unit adjustment price shall include the transportation, compaction, watering, rolling, and discing of the material in place complete as specified in Section 2E.

Adjustment quantities will be determined by the Company using field measurements. The unit adjustment price in each case shall include all costs for complete units of work.

1A.7 SCHEDULE. The work to be performed under these specifications shall begin on or before July 15, 1973 and shall be completed by November 30, 1974. Detailed schedule requirements are specified in Section 1E. Major items of work shall be scheduled in more detail as indicated on Schedule Drawing NF-49240 bound herewith at the back of these specifications and as modified by the start date indicated above.

The Engineer's design drawings are scheduled to be issued for release of construction at the time of award of contract.

1A.8 CONCRETE. All concrete required for the work under these specifications shall be procured from the on-site batch plant. Costs of concrete shall be estimated and accounted for as specified hereinafter.

1A.8.1 Estimate. The lump sum proposal price shall include the costs of all concrete of the various classes installed under these specifications and shall be based on procurement from the on-site batch plant at the following unit prices:

Concrete Class	Price per Yard
A-1, B-1, B-2	$12.00
B-3, B-4, B-5, B-6, C-1	$12.00
B-7, C-2	$15.00

The above prices include delivery to the Contractor's point of usage, but are exclusive of required heating or cooling charges.

The lump sum proposal price shall also include the costs of heating or cooling concrete installed under these specifications and shall be based on procurement from the on-site batch plant at the following unit prices which are premium charges to be added to the above unit prices:

Item	Price
Heating concrete	$ 67.00 per day of batching
Cooling concrete	$ 0.90 per cubic yard

1A.8.2 Payment. The Contractor shall not pay the concrete supplier directly for the concrete used. Instead, the Company will pay the concrete supplier directly for all concrete used and in turn will deduct an amount from the Contractor's monthly progress payments equal to the quantity of concrete actually used multiplied by the applicable unit prices stated in Article 1A.6.1. The amount deducted shall also include the costs, if any, of heating and cooling concrete, all at the unit prices stated in Article 1A.6.1 multiplied by the number of units involved.

The actual number of units of concrete supplied and the applicable pricing data for heating and cooling will be determined from invoices prepared by the concrete supplier.

The Contractor will receive one copy of the delivery tickets at the time each load of concrete is delivered and one copy of all invoices.

Section 1B - DRAWING SCHEDULE

1B.1 GENERAL. This section lists the drawings and schedules which have been prepared for the work covered by these specifications.

1B.2 CONTRACT DRAWINGS. The contract drawings are marked CONTRACT ISSUE, SPEC 5377 D-4C and dated May 22, 1973. The following drawings shall be a part of the contract documents:

Drawing No. - Rev.	Title	B&W Drawing No.
NF-49025-H	GENERAL SITE ARRANGEMENT	CGC-0101
NF-49061-E	SITE GRADING PLAN SHEET IX	SGC-0111
NF-49062-D	SITE GRADING PLAN SHEET X	SGC-0112
NF-49063-D	SITE GRADING PLAN SHEET XI	SGC-0113
NF-49064-	IMPERVIOUS EARTH BORROW AREA SHEET XII	SGC-0114
NF-49066-D	DETAIL GRADING PLAN SHEET 1	SGC-0121
NF-49067-E	DETAIL GRADING PLAN SHEET 2	SGC-0122
NF-49068-B	DETAIL GRADING PLAN SHEET 3	SGC-0123
NF-49071-E	DETAIL GRADING PLAN SHEET 4	SGC-0126
NF-49072-G	DETAIL GRADING PLAN SHEET 5	SGC-0127
NF-49073-D	DETAIL GRADING PLAN SHEET 6	SGC-0128
NF-49074-D	DETAIL GRADING PLAN SHEET 7	SGC-0129
NF-49075-D	DETAIL GRADING PLAN SHEET 8	SGC-0130
NF-49076-D	DETAIL GRADING PLAN SHEET 9	SGC-0131

Drawing No. - Rev.	Title	B&V Drawing No.
NF-49077-D	DETAIL GRADING PLAN SHEET 10	SGC-0132
NF-49078-D	DETAIL GRADING PLAN SHEET 11	SGC-0133
NF-49081-E	MISCELLANEOUS GRADING DETAILS	SYC-0601
NF-49082-E	MISCELLANEOUS GRADING DETAILS	SYC-0602
NF-49089-	ASH STORAGE AREA SECTIONS AND DETAILS	SYC-0609
NF-49090-	ASH STORAGE AREA SECTIONS AND DETAILS	SYC-0610
NF-49091-	COAL AND FUEL OIL STORAGE AREAS SECTIONS AND DETAILS	SYC-0611
NF-49092-	WATER COLLECTION BASINS SECTIONS AND DETAILS	SYC-0612
NF-49093-	FOUNDATIONS AND MISCELLANEOUS GRADING SECTIONS AND DETAILS	SYC-0613
NF-49094-	MISCELLANEOUS GRADING DETAILS	SYC-0614
NF-49101-	SITE ARRANGEMENT PLAN SHEET I	CGC-0102
NF-49102-	SITE ARRANGEMENT PLAN SHEET II	CGC-0103
NF-49103-	SITE ARRANGEMENT PLAN SHEET III	CGC-0104
NF-49104-	SITE ARRANGEMENT PLAN SHEET IV	CGC-0105
NF-49105-B	SITE ARRANGEMENT PLAN SHEET V	CGC-0106
NF-49106-B	SITE ARRANGEMENT PLAN SHEET VI	CGC-0107
NF-49107-	SITE ARRANGEMENT PLAN SHEET VII	CGC-0108

Drawing No. - Rev.	Title	B&V Drawing No.
NF-49108-	SITE ARRANGEMENT PLAN SHEET VIII	CGC-0109
NF-49241-B	CONCRETE-MAINTENANCE GARAGE AND CAR DUMPER BUILDING - PLAN	SCC-0361
NF-49244-C	CONCRETE-MAINTENANCE GARAGE AND CAR DUMPER BUILDING - SECTIONS AND DETAILS	SCC-0364
NF-49284-C	CONCRETE-RECYCLE & HOLDING BASINS PUMPHOUSE PLANS SECTIONS AND DETAILS	SYC-0390
NF-49285-D	CONCRETE-RECYCLE & HOLDING BASINS PUMPHOUSE PLANS SECTIONS AND DETAILS	SYC-0391
NF-49286-B	CONCRETE-DISCHARGE WATER MONITORING BUILDING PLANS SECTIONS AND DETAILS	SYC-0392
NF-49287-B	CONCRETE-FLY ASH POND DISCHARGE STRUCTURE PLANS SECTIONS AND DETAILS	SYC-0393
NF-49288-D	CONCRETE-BOTTOM ASH POND DISCHARGE PLANS SECTIONS AND DETAILS	SYC-0394
NF-49289-D	CONCRETE-ASH POND DISCHARGE STRUCTURES PLANS SECTIONS AND DETAILS	SYC-0395
NF-50120-L	CONSTRUCTION POWER SYSTEM PLOT PLAN	EGC-0101
NF-50121-K	CONSTRUCTION POWER SYSTEM ONE-LINE DIAGRAM	EGC-0102
NF-50123-H	CONSTRUCTION POWER SYSTEM POWER CENTERS AND DETAILS	EGC-0104

Section 1C - ENGINEERING DATA

1C.1 GENERAL. This section covers the requirements and procedures for submittal of engineering data.

Engineering data covering all equipment and fabricated materials to be furnished under this Contract shall be submitted to the Engineer for review. These data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment. Data submitted shall include drawings showing essential details of any changes proposed by the Contractor and all required wiring and piping layouts.

No work shall be performed in connection with the fabrication or manufacture of materials and equipment, nor shall any accessory or appurtenance be purchased until the drawings and data therefor have been accepted, except at the Contractor's own risk and responsibility.

1C.2 PROCEDURES. Drawings shall be submitted for the Engineer's review in accordance with the following procedures.

Four copies of each drawing shall be submitted to the Engineer. Each drawing submitted, whether from the Contractor or a subcontractor, shall be clearly marked with the name of the project, the specification number, the Engineer's assigned number, the Contractor's name, and references to applicable specification articles. When catalog pages are submitted, the applicable items shall be indicated.

Drawings will be reviewed by the Engineer and returned to the Contractor marked RETURNED FOR CORRECTION, EXCEPTIONS NOTED, NO EXCEPTIONS NOTED, or RECEIVED FOR DISTRIBUTION.

When the drawings are returned marked NO EXCEPTIONS NOTED or RECEIVED FOR DISTRIBUTION, ten additional copies plus one reproducible print shall be submitted to the Engineer.

When the drawings and data are returned marked EXCEPTIONS NOTED the changes shall be made as noted thereon and ten corrected copies plus one reproducible print shall be submitted to the Engineer.

When the drawings and data are returned marked RETURNED FOR CORRECTION the corrections shall be made as noted thereon and as instructed by the Engineer and four corrected copies shall be submitted.

The reproducible print requested above shall be of sufficient quality to provide clear and legible reproductions by Diazo process printing. Poor quality reproducible prints will not be accepted.

The Engineer's review of drawings and data will cover only general conformity to the specifications and the external connections and dimensions which affect the plant arrangement. The Engineer's review of drawings returned marked NO EXCEPTIONS NOTED or EXCEPTIONS NOTED will not constitute an acceptance of all dimensions, quantities, and details of the material, equipment, device, or item shown and does not relieve the Contractor from any responsibility for errors or deviations from the contract requirements.

All drawings, after final processing by the Engineer, shall become a part of the contract documents and the work indicated or described thereby shall be performed in conformity therewith unless otherwise required by the Company or the Engineer.

In addition to the above specified drawings, the Contractor shall furnish two "Military Type D" aperture cards of each final drawing. The aperture card shall be clearly identified on the face of the card by drawing number, title, Company name, project name and specification number.

Section 1D - QUALITY ASSURANCE

1D.1 GENERAL. To assure that the equipment and materials furnished and the construction work performed under this Contract fulfill the requirements and intent of these specifications, the Contractor shall comply with the quality assurance requirements specified herein in addition to the quality assurance procedures established by the Contractor.

1D.2 INSPECTION. The Company will appoint a Quality Assurance Engineer to follow the progress of the work. The Company's designated agent shall have free access at all times while the construction work is being performed and shall have the right to inspect at applicable equipment and materials supplier and subcontractor facilities. The Contractor shall make necessary arrangements for supplier or subcontractor inspection when requested by the Company. The Contractor shall keep the Quality Assurance Engineer informed of the progress of the work and shall notify him reasonably in advance when the work will be ready for any required tests or inspections.

Inspection by the Quality Assurance Engineer of any phase of the work shall not relieve the Contractor of his responsibility for compliance with the contract documents, drawings, and applicable codes and standards for the work.

1D.3 INSPECTION SYSTEM REQUIREMENTS. Suppliers for the following designated Contractor-furnished materials shall comply with all applicable quality assurance requirements contained within the Company's INSPECTION SYSTEM REQUIREMENTS Number D-10.0 included in this section.

1. Cement for soil cement

2. Seed

1D.4 CERTIFICATE OF CONFORMANCE. The Certificate of Conformance bound in this section shall be completed by the Contractor and forwarded to the Engineer prior to scheduled shipment of the equipment or material designated in Article 1D.3. If the Certificate of Conformance includes statements of deviations from specified requirements, the Contractor's supplier shall not ship the equipment or material without the consent of the Company's Quality Assurance Engineer. Where required by the Company, deviations from specified requirements shall be corrected by the Contractor prior to shipment.

1D.5 SPECIFIC REQUIREMENTS. In addition to inspections, tests and certification provided and documented as part of the Contractor's inspection program, the following specific quality assurance clauses shall apply.

1D.5.1 Information Requirements. The Contractor shall provide the Company's representatives with inspection reports, written procedures, and other information required by the Company to assure that the work will be done in accordance with the specifications. The Contractor shall maintain adequate records of testing, and other quality control information generated by him, and these records shall be available for inspection by the Company.

1D.5.2 Material Certification. If the material for any item designated in Article 1D.3 is specified by code, standard, or other specification, the Contractor shall certify that the material meets the requirements of that code, standard, or specification. All welding filler metal shall be certified as conforming to the requirements of these specifications; or if not specified, to the requirements of the Contractor's procedures. It is not necessary that the material be traceable to a specific chemial and/or physical test report; however, the Contractor's Quality Control Program shall be sufficient to furnish evidence that the material is controlled.

NSP NORTHERN STATES POWER COMPANY MINNEAPOLIS MINNESOTA	QUALITY NUMBER: D-10.0 EFFECTIVE DATE: April 1, 1970
TITLE: INSPECTION SYSTEM REQUIREMENTS	SUPERSEDES NUMBER: DATE: APPROVED BY:

1.0 Scope

This document establishes the minimum inspection system requirements for contractors/suppliers to Northern States Power Company. When referenced in the item specification, contract or purchase order, it shall apply to all supplies and services furnished under that document.

2.0 Applicability

This specification delineates minimum requirements and is not intended to establish the method by which requirements will be met.

The requirements of this document are in addition to and not in derogation of other contract requirements. Any inconsistency between this document and the general provisions of the contract shall be immediately brought to the attention of Northern States Power Company, or the Architect Engineer issuing the purchase order or contract. During the period in which the inconsistency is being resolved, the general provisions shall control.

3.0 Contractors/Suppliers Responsibilities

3.1 Inspection System

The contractor/supplier shall provide and maintain an inspection system which will assure that all supplies and services provided to Northern States Power Company conform to contract requirements and to applicable design drawings, specifications, codes and standards, whether the items have been manufactured or processed within

the contractor's/supplier's facilities or procured from subcontractors or subvendors.

The inspection system shall be documented and available for audit throughout the life of the contract or purchase order and must be acceptable to Northern States Power Company or its agents.

No change to the inspection system shall be made that could result in a nonconforming product being supplied to Northern States Power Company except under the conditions of paragraph 3.8 of this specification.

3.2 Inspection and Test Instructions

The contractor/supplier shall prescribe all inspection and testing to be performed by the use of clear, complete, and current instructions. Where changes in applicable codes, standards, specifications, design parameters occur, or product or process improvements are required, they shall be incorporated into processes in a timely and organized manner. The originator of the purchase order or contract, which may be either Northern States Power Company or its Architect Engineer shall be notified of all changes or revisions made and shall have the right of disapproval of such changes.

The instructions shall assure inspection and test of materials, work in process and completed articles as required by design drawings and specifications, applicable codes and standards and the contract and shall provide accept/reject criteria for the product.

3.3 Documentation and Records

Records shall be maintained of all inspections and tests made.

The records shall indicate the nature and number of observations made, the number and type of deficiencies found, the disposition of all nonconforming items, the corrective action taken, and the point in production where the corrective action was effected.

3.4 Document Control

The inspection system shall provide a means for assuring that the latest applicable drawings, specifications and instructions required by contract or purchase order and authorized changes thereto are used for fabrication, erection, inspection and testing.

3.5 Calibration of Measuring and Test Equipment

The contractor/supplier shall provide and maintain instruments, gages and other testing and measuring devices to assure that supplies conform to technical requirements. In order to assure continued accuracy these devices shall be calibrated at established intervals against certified standards with known valid relationships to national standards. Where tools, jigs, fixtures or other devices are used as media of inspection, they likewise shall be a part of the calibration program and be proved for accuracy at established intervals.

3.6 Control of Special Processes

Where the quality of the product is best controlled by certification and control of the process and of personnel performing the process, the process control procedures and certification of personnel shall be an integral part of the inspection system.

3.7 Indication of Inspection Status

The inspection status of supplies shall be positively identified by the contractor/supplier through the use of tags, stamps, labels,

routing cards or other devices.

3.8 Nonconforming Material

The contractor/supplier shall provide a positive means of identifying and controlling items which do not meet the technical requirements of the contract or purchase order.

Items which are nonconforming to criteria specified in the contract shall not be used or delivered except upon authorization of Northern States Power Company or its agent.

3.9 Qualified Products

The use of a product from any qualified products list in no way relieves the contractor/supplier of his responsibility to meet all specification requirements or to perform all specified inspections and tests for such material or product.

3.10 Sampling Inspection

Sampling inspection used by a contractor/supplier shall be as specified in the contract or purchase order or require prior approval by the originator of the purchase order or contract, which may be either Northern States Power Company or its Architect Engineer.

3.11 Source Inspection

Northern States Power Company reserves the right to inspect at the source all supplies, products or services intended for its ultimate acceptance and use. Where such supplies, products or services are not performed within the contractor's/supplier's own facility, he shall make the necessary arrangements for such inspections as Northern States Power Company or its agent desires to make at the

source. Such inspections shall not constitute acceptance of the item by Northern States Power Company.

3.12 Receiving Inspection

Subcontracted or purchased supplies shall be subjected by the contractor/supplier to necessary receiving inspections to assure conformance to contract or purchase order requirements.

3.13 Preservation, Packaging, and Shipping

Items procured under contracts or purchase orders invoking this specification shall be preserved, packaged and protected as directed by the contract or purchase order so as to preclude damage due to moisture or other environments and normal hazards of commercial handling and shipping.

NORTHERN STATES POWER COMPANY
SUPPLIER CERTIFICATE OF CONFORMANCE

SHERBURNE COUNTY GENERATING PLANT

SPECIFICATION NAME _____

D.I.N. No. _____ P.O. No. SHERCO-_____ Spec No. _____

This document provides evidence to Northern States Power Company that the tests and inspections specified in the purchase order have been completed and meet the specification requirements.

(1.0) Supplier: _____

(2.0) P.O. No.: _____ (3.0) COC No.: _____

(4.0) Contract Change Order: _____

(5.0) Manufacturer's Order No.: _____

(6.0) Drawing: _____

(7.0) Equipment in Shipment: _____

(8.0) Quantity: _____

(9.0) Tests and Inspections: The material shipped has received the following tests and inspections. The records of objective evidence are on file.

(10.0) Deviations to Specifications and Remarks:

We certify that parts and assemblies noted herein meet all requirements of your purchase order, drawings and specifications. We further certify that detailed fabrication, inspections and test records quoted in the order and specifications are traceable and are on file.

Signature _____ Title _____ Date _____

(instructions on last page)

(NSP - 5377/5619)
(COC)
022472

INSTRUCTIONS TO SUPPLIERS

1.0 Supplier: Name of manufacturing organization responsible for compiling and maintaining the required Quality Assurance records.

2.0 Purchase Order No.: SHERCO number shown on purchase order.

3.0 COC No.: The COC number is the SHERCO purchase order number followed by the shipment number from the vendor's plant. For example: First shipment SHERCO xxxx-1; second shipment SHERCO xxxx-2.

4.0 Contract Change Order: List all documents that change design and/or quality requirements for the product.

5.0 Manufacturer's Order No.: Number identifying order on manufacturer's records.

6.0 Drawing: Assembly drawings of items to be used in receiving inspection.

7.0 Equipment in Shipment: List equipment included in shipment to which the COC applies. Items requiring the same tests and inspections, and therefore the same documentation, may be included on one COC. However, those items having different documentation requirements shall be listed on separate Certificates of Conformance. Use serial numbers where possible.

8.0 Quantity: Number of items to which COC applies.

9.0 Tests and Inspections: List tests and inspections performed on items covered by the COC. Each supplier must compile a list of documents required by the specifications and review these documents for compliance. The COC shall then certify that these documents have been reviewed and comply with the specifications. A list of typical documentation is shown below. Select applicable items listed below and/or add items as required:

- 9.1 Material certification
- 9.2 Mill test reports
- 9.3 Nondestructive testing records
  - a. Ultrasonic
  - b. Radiographic
  - c. Eddy current
  - d. Magnetic particle
  - e. Liquid penetrant
  - f. Personnel qualifications
  - g. Other
- 9.4 Hydrostatic certification
- 9.5 Leakage test record
- 9.6 Performance test records
  - a. Conductivity
  - b. Electrical
  - c. Other
- 9.7 Welding procedure qualification
- 9.8 Welder qualification
- 9.9 Weld rod certification
- 9.10 Heat treatment records
- 9.11 Dimensional inspection records
- 9.12 Cleanliness
- 9.13 Packaging
- 9.14 Code forms
- 9.15 Material traceability

(NSP - 5377/5619)
(COC)
022472

10.0 Deviations to Specifications: List all deviations from drawings and specifications (which have been approved by the Company or the Engineer only).

11.0 Signature: The Certificate of Conformance shall be signed by a responsible person in the supplier's organization. For example: The Quality Assurance Manager.

12.0 Addressee: All Quality Assurance documents except radiographs (certificates of conformance, material certification, etc.) shall be transmitted by the Contractor to the Engineer. Radiographs shall be submitted to:

Northern States Power Company
Sherburne County Generating Plant
Becker, Minnesota 55308

Attention: Field Quality Assurance Engineer

Section 1E - CONSTRUCTION SCHEDULING

1E.1 GENERAL. This section covers the requirements for scheduling the various elements of work covered by these specifications.

The time of completion is of the ence of the contract. The Contractor shall start work in accordance with the instructions of the Company's notice to proceed and shall comply with the requirements of the CPM Project Schedule specified herein.

1E.2 CPM PROJECT SCHEDULE. To enable the work on the project to be laid out and prosecuted in an orderly and expeditious manner, to assist the contractors in coordinating work, and to evaluate progress and status at various stages of the project, Northern States Power Company will utilize the Critical Path Method (CPM) of planning and scheduling.

The following schedule diagrams show the key dates for the work under these specifications, as well as other field construction contract schedules:

NF-E-6881-P2-3	UNIT I CPM TIME SCALE NETWORK	SHT 2 (bound herein)
NF-E-7108-P2	UNIT II CPM TIME SCALE NETWORK	SHT 2 (bound herein)
NF-49240	PRELIMINARY CONSTRUCTION SCHEDULE	(in pocket at back of this volume)

These schedules are intended to show the relationship of the work under these specifications to the entire construction project and shall serve as a scheduling guide until preparation of the preliminary Official Project Schedule. In the event of conflict between the schedule diagrams and the dates specified in Article 1A.7, the latter shall govern.

A Company scheduling engineer will prepare the more detailed Official Project Schedule which will be in the form of an arrow diagram depicting the logical sequence, relationship, and interrelationship of the various activities which form the total construction phase of the project. The diagram will include the awarding of subcontracts, submission and review of shop drawings, procurement of material, equipment, plant etc., as well as actual on-site construction activities. The preliminary Official Project Schedule will be an unbiased practical evaluation of the sequence and times for the various activities, and with the exception of certain milestone dates and the completion date, is intended merely as a guide. The preliminary Official Project Schedule shall be used by the contractors as a guide until issuance of the Official Project Schedule.

Following the contract award, a Company scheduling engineer will meet with the project superintendent and project engineer of the Contractor to discuss the fundamentals of CPM, followed by the preparation of a schedule to portray the specific plan of operation envisioned by the Contractor. A logical sequence of work for all contractors would then be incorporated into a master network for the project. As new contractors are selected, it will be mandatory that they follow the same procedure for incorporating their schedule into the master network.

As networks are completed for the various phases of construction, they will be submitted to the Contractor for insertion of estimated times required for each individual activity. One calendar week from date of receipt of each network will be allotted to review sequence, insert estimated crew sizes and workdays, and return networks. When all networks have been returned, an initial schedule will be developed which will indicate the work sequence for all contractors.

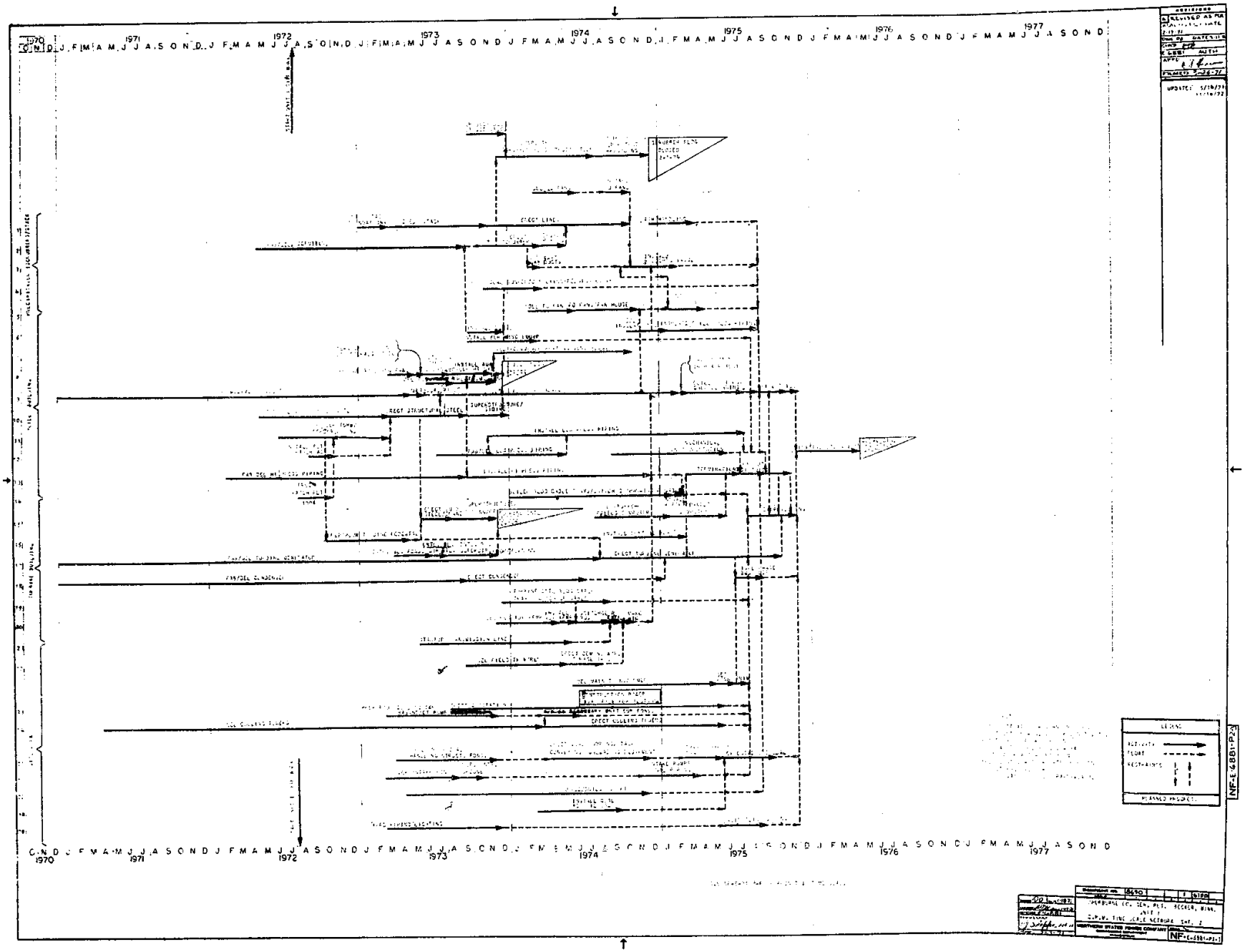
Upon submission of the initial schedules, the Company will hold a meeting with the various contractors to discuss the schedule and iron out conflicts. The network will be revised as required to indicate compliance with the contractual completion dates as specified. The revised CPM networks will then be issued as the Official Project Schedule and will be binding upon the contractors. It is intended that the CPM networks reflect the Contractor's actual plan of operation for his prosecution of the work.

Each contractor shall submit a Weekly Progress Report to NSP, using a form supplied by the Company. This report will consist of a simple checklist on which the Contractor will indicate start and finish dates for all activities, as well as indicate which activities are sufficiently completed for followers to start. In addition, the Contractor will indicate which activities he plans to start the following week. This report will be submitted to the Company field representative every Thursday morning.

Periodically, a schedule review meeting will be held for the purpose of reviewing the balance of the schedule to insure that the logical sequence of the work for the remainder of the project is correct. Any changes required will be incorporated in the network, and a revised schedule and diagram will be issued.

In the event a notice is received of any change in the contract or any extra work to be performed, or of any other conditions which are likely to cause or are actually causing delays, the Contractor shall notify the Company in writing of the effect, if any, of such change, or extra work, or suspension or other conditions upon the Official Project Schedule and shall state in what respects, if any, the Official Project Schedule should be revised with the reasons therefore.

The cost of the preparation and implementation of the Critical Path Schedule will be borne by the Company. However, the Contractor agrees to bear the cost of furnishing such of his regularly employed personnel as may be necessary for the purpose of working with the Company in preparing and maintaining the Critical Path Network.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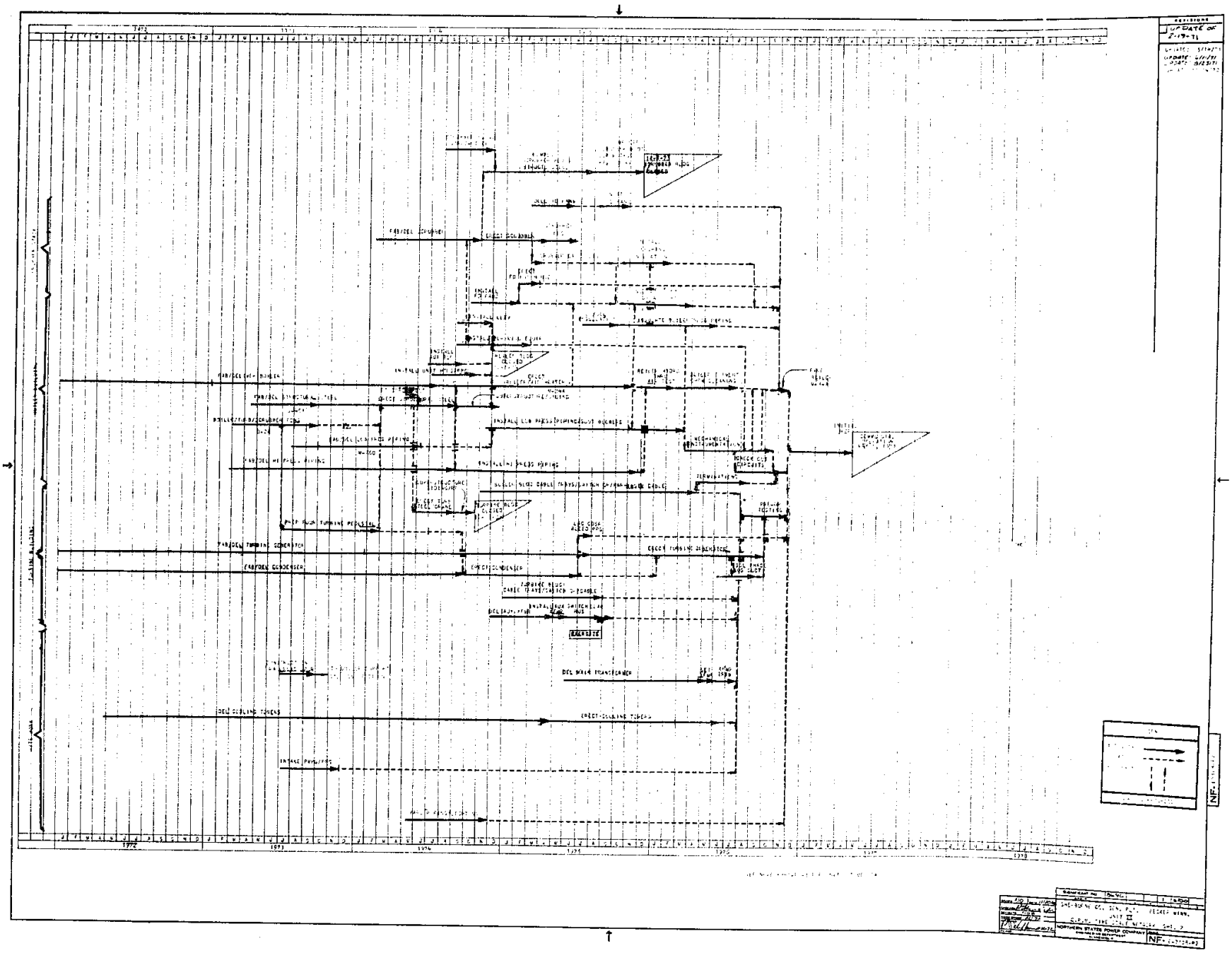
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Section 1F - CONSTRUCTION SERVICES

1F.1 GENERAL. This section covers the requirements for construction services which the Contractor shall provide and those services which will be furnished by the Company in the prosecution of the work under these specifications.

The construction services stipulated herein apply to the plant site only; the Contractor shall be responsible for furnishing the construction services required by him for the work on the impervious earth borrow site.

1F.2 CONSTRUCTION PLANT AND TEMPORARY FACILITIES. Unless otherwise specified, the Contractor shall furnish all construction plant and temporary facilities and all equipment, materials, and supplies which are required for prosecution of the work but which will not be incorporated in the completed work.

All temporary structures and facilities furnished by the Contractor for his own use, but not indicated on the drawings or specified, shall remain the property of the Contractor. When the work is completed, all such temporary structures and facilities shall be removed from the site and the area shall be restored to its original condition.

All construction plant and facilities shall be in sound condition and shall be of the proper type and size to adequately perform the work. The plant and facilities shall be regularly and systematically maintained throughout the work to insure proper, efficient operation. Plant and facilities which are inadequate or improperly maintained shall be promptly modified, repaired, or removed from the site and replaced.

1F.2.1 Temporary Structures. All temporary structures for offices, change houses, warehouses, and other uses for the Contractor or his subcontractors shall be of fireproof design using materials and construction acceptable to the Company. Temporary structures shall be placed in locations as directed by the Company. Suitable construction trailers may be used in lieu of temporary structures when acceptable to the Company.

1F.3 CONSTRUCTION UTILITIES. Construction utilities shall be provided by the Contractor or will be furnished by the Company as specified herein.

1F.3.1 Telephone. The Contractor shall provide his own telephone service.

1F.3.2 Compressed Air. The Contractor shall provide all air compressors, fuels, lubricants, hoses, piping, and other apparatus required for supplying compressed air required for prosecution of his work.

1F.3.3 Construction Power. The Company will furnish all energy for construction electric power and temporary lighting at no charge.

The power will be supplied at 480 volts, 3 phase and 120 volt, single phase, at the locations indicated on the drawings by late fall 1973.

The Contractor shall provide all disconnect switches, breakers, additional transformers, wiring, and other devices and facilities required to distribute power for his use and for the use of his subcontractors.

Temporary power facilities shall conform with applicable safety and code requirements, shall be constructed to provide proper clearances and minimum interference with construction, and shall be acceptable to the Company. All 480 volt circuits shall be multiconductor with neoprene or metal sheaths or be run in metallic conduit. All temporary wiring in the yard area shall be underground.

1F.3.4 Temporary Lighting. The Contractor shall furnish and install all temporary lighting required in the prosecution of his work. Conductors shall be not less than 12 AWG copper and insulated for 600 volts. A fuse or breaker shall be provided for the protection of each circuit.

1F.3.5 Welding Facilities. The Contractor shall furnish all welding machines and welding equipment required for his use. Electric power may be obtained from the construction power source. Gasoline powered welding machines will be permitted. The Contractor shall furnish all fuel requirements.

1F.3.6 Water. The Company will furnish construction water to the Contractor from a central well supply on the site. The Contractor shall provide his own facilities for distribution of construction water.

The General Construction - Superstructures contractor will provide drinking water service for all construction employees.

1F.3.7 Heat. The Contractor shall provide all heating facilities required for the efficient prosecution of his work, and as required to prevent freeze damage to equipment under his custody. The method of heating shall be acceptable to the Company.

Salamanders, open fires, or other methods which constitute a hazard to personnel or property shall not be used. All heating equipment shall be provided with adequate safeguards.

1F.3.8 Sanitary Facilities. The Company will furnish and maintain a system of chemical toilets for the use of all construction employees.

Construction personnel will not be permitted to use the permanent plant toilet and washroom facilities.

1F.4 CREW BUILDING. The Company will furnish a Crew Building for the use of Contractor personnel. The building will be insulated, heated, and provided with toilet facilities.

1F.5 FIRST AID STATION. The Company will furnish a fully equipped First Aid Station staffed with a full-time attendant for the benefit of all Contractor personnel at the site.

1F.6 CONSTRUCTION MANAGEMENT OFFICE. The Company will provide office space for the Contractor's supervisory personnel in the Construction Management Office. Office space so assigned by the Company shall be occupied by the Contractors' ranking supervisory personnel assigned to the project.

The Contractor may furnish supplementary office space as required to suit the scope of his construction activities.

1F.7 CONSTRUCTION MATERIALS WAREHOUSE. The Company will furnish one warehouse, approximately 60 feet wide by 200 feet long for the storage of equipment and materials to be used in the construction of Units 1 and 2. The use of the warehouse will be limited to storage of Company-furnished equipment and materials with the provision that any remaining space may be utilized by various construction contractors as allocated by the Company, taking into consideration the degree of protection required, the best utilization of space, and scheduling requirements.

1F.8 JANITORIAL SERVICE. The Company will provide janitorial service for the Crew Building, Construction Management Office and First Aid Station.

1F.9 TRASH DISPOSAL. The Company will furnish and operate a trash burner for disposal of all burnable refuse. The contractor for General Construction - Superstructures will collect all refuse except that from clearing and grubbing and haul it to the site of the trash burner. Trash shall be collected and deposited as specified under CLEANLINESS in the SPECIAL CONDITIONS.

1F.10 ACCESS ROADS, PARKING AREAS, AND STORAGE AREAS. The Company will maintain completed roads, parking areas, and storage areas and will provide snow removal.

Additional access roads are required for the work under these specifications.

The Contractor shall construct and maintain such additional access roads as are required to effectively prosecute his work. The location and type of construction of all such additional access roads shall be acceptable to the Company. Any temporary access roads constructed under these specifications shall be removed by the Contractor when he no longer has need for them. Surfacing shall be removed from these temporary roads and the area shall be restored to its natural condition. Restoration shall include clearing of all trash and construction debris, and grading to blend with the adjacent contours to provide effective natural drainage. Any surfacing materials such as gravel or bituminous materials shall be disposed of as directed by the Company.

Section 1G - RECEIVING, HANDLING, AND STORAGE

1G.1 GENERAL. This section covers the requirements for receiving, handling, and storage of all Contractor-furnished and Company-furnished materials and equipment.

Storage areas on the site will be allocated for the Contractor's use by the Company. When requested by the Company and before unloading any materials or equipment, the Contractor shall prepare and submit to the Company a drawing indicating proposed layout and utilization of his storage areas. Storage areas shall be utilized in accordance with the drawing as acceptable to the Company. This drawing shall be kept current and shall indicate the location and description of all stored items for which the Contractor is responsible. Revised copies of this drawing shall be submitted to the Company as they are made.

The Company-furnished Construction Materials Warehouse will be used basically for storage of Company-furnished equipment, spare parts, and tools, with limited storage of Contractor-furnished equipment and materials only as permitted by the Company.

1G.2 RECEIVING AND HANDLING. The Contractor shall be responsible for the prompt unloading of all equipment or material to be unloaded under these specifications and shall pay all demurrage incurred.

The Contractor shall handle all equipment and materials carefully to prevent damage or loss, shall store them in an orderly manner, shall keep adequate and convenient records of their location, and shall keep a continuously accurate inventory.

The use of bare wire rope slings for unloading and handling materials and equipment is prohibited except with the specific permission of the Company.

All receiving sheets and material handling forms shall be furnished by the Contractor and shall be acceptable to the Company.

1G.3 STORAGE. Stored equipment and materials shall be adequately supported and protected to prevent damage. Equipment shall be moved into the permanent building or onto its permanent foundation as soon as construction will permit.

Stored materials and equipment shall not be allowed to contact the ground. In warehouses that do not have dry concrete or suspended floors, materials and equipment shall be stored on platforms or shoring.

All platforms, enclosures, shoring, and weatherproof coverings for storage use shall remain the property of the Contractor and shall be removed upon completion of the work.

1G.3.1 Indoor Storage Facilities. Indoor storage furnished by the Contractor shall consist of buildings of fireproof construction which are weathertight, well ventilated, and secure against theft and vandalism. The buildings or enclosures shall be situated and constructed so that they will not be subject to flooding. Drainage shall be provided to intercept storm or surface water and divert it from the building. Equipment and materials shall be placed on pallets or shoring to permit air circulation under the stored item. Access doors shall be adequate to accommodate the movement and handling of materials and equipment to be stored and shall be equipped with secure locks.

Indoor storage facilities shall be acceptable to the Company.

Construction trailers or portable enclosures acceptable to the Company may be used in lieu of the indoor storage facilities described above.

1G.3.2 Open Platforms. Open platforms shall be constructed from sound lumber not less than 2 inches nominal thickness. Open platforms shall be adequately constructed to support the loads imposed by the stored materials and equipment. Platforms shall be level, shall be supported on concrete block piers and shall be not less than 18 inches above grade.

Shoring for storage of materials and equipment shall utilize sound timbers not less than 6 inches by 8 inches nominal size. Shoring shall be arranged to provide 8 inches of clearance above grade.

1G.3.3 Coverings. Weatherproof coverings for outdoor storage shall utilize a waterproof flame resistant type of paper base sheeting. This sheeting shall be of laminated paper and aluminum foil, glass reinforced, PYRO-KURE 613 as manufactured by Sisalkraft Division, St. Regis Paper Co. or acceptable equal. Sheeting widths shall be not less than 84 inches; if necessary, widths may be built up by using waterproof taped splices. The sheeting shall be carefully placed and tied down to prevent moisture from entering the laps and to prevent wind damage to the coverings.

1G.3.4 Storage Schedules. Except as otherwise specified hereinafter, the storage method to be used for various materials and equipment shall be determined as follows:

> Equipment and materials which incorporate electrical equipment or which have finish painted surfaces, and other items which would be damaged by outdoor exposure, shall be stored indoors.

When such storage would present an unreasonable building space or volume requirement, the equipment or materials may, when acceptable to the Company, be stored under weatherproof coverings on shoring or platforms.

All small loose items which could be easily lost, stolen, broken, or misused shall be stored indoors.

All other equipment and materials shall be stored on open platforms or shoring.

All storage methods and schedules shall be acceptable to the Company.

In addition to the general storage provisions listed hereinbefore, specific items of equipment and materials shall be stored as follows. This is not to be considered a complete listing and is offered as a convenience to the Contractor.

Storage Indoors.

Grass seed and fertilizer

Rubber or plastic jointing materials for drainage pipe if separate from piping

Miscellaneous metals and bolting materials

Outdoor Storage Under Weatherproof Covers on Platforms.

Cement

Outdoor Storage on Shoring Without Weatherproof Covers.

Drainage piping

Reinforcing steel

DIVISION 2 - SITE WORK

CONTENTS

Section 2A - CLEARING, GRUBBING, AND RAZING

2A.1 GENERAL. This section covers clearing and grubbing for the recycle basin, holding basin, bottom ash pond, fly ash pond, impervious earth borrow area, and roadways constructed under these specifications.

Razing of existing structures and facilities including septic tanks, wells, oil tanks, and foundations within the limits of construction as covered under these specifications and as indicated on the drawings except at the site of the impervious earth borrow area, has been performed by the Company.

Overhead utility facilities such as those for telegraph, telephone and power, will be removed, relocated, or abandoned by their owners. Abandoned overhead utilities shall become the property of the Contractor and shall be removed from the Company's property or disposed of in an acceptable manner.

Underground utilities will be removed, relocated, or abandoned in place by their owners. The Contractor will be required to remove only those abandoned underground utilities, or parts thereof, which interfere with the work under these specifications.

The Company has procured the land to be used for the impervious earth borrow. The Contractor shall be entitled to salvage any of the structures and facilities purchased, but not sold by the Company, however the Company is not responsible for their condition when the Contractor obtains access to them.

All excavations made by grubbing or removal of existing structures which are below indicated final grade, shall be backfilled and compacted in accordance with Section 2B.

Before clearing work is accepted, any regrowth of vegetation or tree shoots which have grown after initial cutting shall be cut and removed as specified hereinafter. Tree shoots shall be removed to the level specified for tree removal in that area. All regrowth of vegetation shall be mowed, raked and burned. The finished work at the time of final acceptance shall leave completely cleared and grubbed areas as specified.

2A.2 CLEARING AND GRUBBING. Clearing shall include cutting all trees and stumps flush with the original ground surface in each case; the cutting and removal of all brush, shrubs, debris and all vegetation flush with the ground surface; and the disposal of all cuttings and debris.

Grubbing shall include the removal and disposal of all stumps and roots larger than one inch in diameter, including matted roots regardless of size. Grubbing shall extend to a minimum depth of 12 inches below the natural surrounding ground surface or as otherwise required by the detailed specifications.

The Contractor shall not remove or damage trees outside of the areas specified to be cleared or grubbed. Also, the Company may wish to preserve certain trees or groups of trees within the limits of the work specified hereinafter. The Company will designate the trees which are to be preserved within the clearing limits and the Contractor shall mark them by clearly visible means which will not damage the tree.

In locations where fill is deposited around trees to be preserved, the fill shall be on a 1:2 slope with the toe of the slope starting at a point 3 feet from the base of the tree.

The clearing operations shall be conducted without damage to trees which are to be left standing, and without blocking existing roads. Equipment used in clearing and grubbing shall be kept within the specified limits of the work.

2A.2.1 Limits of Work. The limits of the clearing and grubbing under this section shall include all areas of cut or fill within the limits of construction as indicated on the drawings, including but not limited to the following:

Clearing and grubbing of all areas to be occupied by road construction

Clearing and grubbing of the impervious earth borrow area

Clearing and grubbing of the entire area lying within the recycle basin, holding basin, bottom ash pond, fly ash pond, and the plant site borrow areas

2A.2.2 Disposal of Waste. All logs, trees, stumps, roots, brush, tree trimmings and other materials resulting from clearing and grubbing operations shall become the property of the Contractor and shall be entirely removed from the property of the Company or shall be stacked and burned at locations approved by the Company. Disposal shall be such that upon completion the area shall be entirely void of all loose stumps, trimmings, brush, vegetation, and other debris.

All materials to be burned shall be piled and when in suitable condition shall be burned completely. All burning shall be so thorough that the materials are completely reduced to ashes. Piling for burning shall be done in such a manner and in such locations as to cause the least fire risk. Great care shall be taken to prevent the spread of fire. Fire guards of adequate width shall be provided wherever there is surface vegetation around any brush pile, by backfiring or other surface removal or by burying all surface vegetation within fire guard limits. No burning of trimmings or brush shall be done when the direction or velocity of the wind is such that there would be any danger of fire being carried to adjacent areas. Any and all governmental or statutory requirements or regulations relative to fire prevention in general and burning trimmings and brush in particular shall be complied with.

All burning of waste materials will be by controlled burning under favorable atmospheric conditions and at such a time and manner to minimize smoke and air pollution to meet the requirements of the Minnesota Pollution Control Authority.

The disposal of noncombustible materials shall be the responsibility of the Contractor. The Company will provide a landfill area on the plant site for noncombustibles. The Contractor shall haul plant site noncombustibles to the landfill area designated on the drawings. The Company will perform the disposition of these materials within the landfill area. The Contractor shall remove and dispose of all noncombustibles from the impervious earth borrow area.

2A.3 EXISTING STRUCTURES. The Contractor shall raze and dispose of all existing houses, barns, sheds, and other structures as designated by the Company which are within the limit of the impervious earth borrow area. Combustible and noncombustible materials shall be burned or disposed of as specified hereinbefore.

2A.4 EXISTING FENCES. All existing fences within the limit of the impervious earth borrow area shall be removed. Removal shall include the complete removal of posts and wire. Metal posts and wire shall be disposed of by and at the expense of the Contractor as specified for noncombustibles. Wooden fence posts shall be burned. Post holes shall be filled with tamped earth.

Existing construction fencing in the coal yard area shall be relocated as indicated on the drawings. Such relocation shall include the furnishing and installation of new fencing. New fencing shall as near as practicable match the existing construction fence. Other existing construction fence may be relocated as necessary to perform the work required under these specifications. Proposed relocation and alteration work with respect to the construction fencing shall be accepted by the Company prior to performance of the work.

2A.5 EXISTING ROADS. The Company will designate the roads within the Company's property which shall be used as construction roads.

Bituminous and concrete surfacing materials, culverts and similar existing structures shall be completely removed and disposed of as specified in Article 2A.3. Earth and aggregate surfaced roads may be worked into the subgrade and graded to match the surrounding contours. All subgrades shall be broken up to a depth of 12 inches, graded, and compacted.

The erection of barricades, warning lights, and other protective devices for road closures shall conform with Part V of the Manual on Uniform Traffic Control Devices for Streets and Highways of the State of Minnesota. The Contractor shall bear all costs and expenses incurred by him in complying with these provisions.

2A.6 EXISTING WELLS. All existing wells within the limit of the impervious earth borrow area shall be sealed. Well sealing shall be done by an acceptable well drilling subcontractor experienced in the sealing of water wells. Well sealing shall eliminate physical hazards, prevent the contamination of ground water, conserve the yield and hydrostatic head of aquifers, and prevent the intermingling of desirable and undesirable waters.

At least the upper 6 feet of all well casings shall be removed to prevent surface water from entering the water-bearing strata by following down the casing.

In all cases the upper 10 feet of the well shaft shall be filled with a concrete or cement grout plug.

Well abandonment shall satisfy all requirements of the Minnesota Department of Health and the Department of Natural Resources.

2A.7 MISCELLANEOUS UNDERGROUND FACILITIES. All septic tanks and cesspools shall be removed within the limits of the impervious earth borrow area in accordance with Minnesota Department of Health regulations.

Before removing underground fuel tanks, the Contractor shall make certain that all connections are properly closed off and that the tanks are completely purged of all fuel and fumes. It shall also be the Contractor's responsibility to take such other precautionary measures as may be necessary to comply with all governmental regulations regarding such work.

Section 2B - EARTHWORK AND TRENCHING

2B.1 GENERAL. This section covers general earthwork and shall include the necessary preparation of the construction areas; removal and disposal of all debris; excavation and trenching as required; the handling, storage, transportation, and disposal of all excavated material; all necessary sheeting, shoring, and protection work; preparation of subgrades; pumping and dewatering as necessary or required; protection of adjacent construction; backfilling; pipe embedment; construction of fills; surfacing and grading; and other appurtenant work.

General grading for a portion of the plant site has been performed under Specification 5377 D-2B. Other excavation and backfill work at the yard and coal handling structure locations will be performed under Specification 5377/5619 D-4B.

Dam embankment construction is covered under Section 2E.

2B.2 SHEETING AND SHORING. The stability of previously constructed structures and facilities shall not be impaired or endangered by excavation work. Previously constructed structures and facilities include both structures and facilities existing when this construction began and structures and facilities being constructed concurrently with work being performed under these specifications.

Hazardous and dangerous conditions shall be prevented and the safety of personnel shall be maintained. Adequate sheeting and shoring shall be provided as required to protect and maintain the stability of previously constructed structures and facilities and the sides of excavations and trenches until they are backfilled. Sheeting, bracing, and shoring shall be designed and built to withstand all loads that might be caused by earth movement or pressure, and shall be rigid, maintaining shape and position under all circumstances.

2B.3 REMOVAL OF WATER. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations and other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the work under these specifications is completed. Ground water level shall be maintained at least 12 inches below the bottom of each excavation.

Surface water shall be diverted or otherwise prevented from entering excavated areas to the greatest extent possible without causing damage to adjacent construction.

The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment. Any temporary drainage piping provided by the Contractor which is not a part of the permanent construction shall be removed at the completion of the work under these specifications.

2B.4 CLEARING, GRUBBING, AND RAZING. Clearing, grubbing, and razing shall comply with the requirements of Section 2A.

2B.5 CLASSIFICATION OF EXCAVATED EARTH MATERIALS. No classification of "excavated materials" will be made except for identification purposes. Excavation work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work, regardless of the type, character, composition, or condition thereof.

Soil identification shall be in accordance with Table 1 of the Unified Soil Classification System which is bound herewith at the end of this section. Identification and classification shall be based upon visual examination and simple manual tests performed by qualified personnel furnished by the Contractor.

2B.6 FREEZING WEATHER RESTRICTIONS. Backfilling and construction of fills during freezing weather shall not be done except by permission of the Company. No earth material shall be placed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any backfill or fill.

2B.7 MAINTENANCE OF TRAFFIC. The Contractor shall conduct his work so as to interfere as little as possible with the Company's operations and the work of other contractors. Whenever it is necessary to cross, obstruct, or close roads, driveways, parking areas, and walks, the Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients at his own expense. In making open cut road crossings, the Contractor shall not block more than one-half of the road at any time.

Where required by the drawings, the Contractor shall widen the shoulder on the opposite side of the road to facilitate traffic flow while blocking half of a road with an open cut. Temporary crushed rock surfacing shall be provided as necessary on the widened shoulders.

2B.8 PROTECTION OF UNDERGROUND CONSTRUCTION. The Contractor shall locate, protect, shore, brace, support, and maintain all existing underground pipes, conduits, drains, or other underground construction which may be uncovered or otherwise affected by the work.

2B.9 PRESERVATION OF TREES. Trees shall be preserved and protected as much as possible. Unless specifically authorized by the Company, trees shall be removed from only those areas which will be excavated, filled, or built upon. Consideration will be given to the removal of additional trees only where essential, in the opinion of the Company, for the safe, effective execution of the work.

Trees left standing shall be adequately protected from permanent damage caused by construction operations. Trimming of standing trees, where required, shall be as directed by the Company.

2B.10 UNAUTHORIZED EXCAVATION. Except where otherwise authorized, indicated, or specified, all material excavated below the bottom of concrete structures which will be supported by the subgrade shall be replaced with Type A-1 concrete, the costs of which shall be borne by the Contractor.

2B.11 STABILIZATION. Subgrades for structures and the bottom of trenches shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workmen.

Subgrades for structures and trench bottoms which are otherwise solid but which become mucky on top due to construction operations shall be reinforced with one or more layers of crushed rock or gravel.

The finished elevation of stabilized structure subgrades shall not be above the subgrade elevations indicated on the drawings.

Mud or muck shall not be allowed to remain on stabilized trench bottoms when the pipe embedment material is placed thereon.

All stabilization work shall be performed by and at the expense of the Contractor.

2B.12 TESTING. All field and laboratory testing required to assure the Company that the Contractor has complied with the compaction requirements of this section will be provided by the Company. The Contractor shall cooperate as necessary to assist the Company's field testing representatives to accomplish their work. The Contractor will be furnished one copy of the test results.

Maximum density for all compacted materials placed under this section will be determined in accordance with ASTM D1557, Method A or C. The terms "maximum density" and "optimum moisture content" shall be as defined in ASTM D1557, Method A or C.

2B.13 SITE PREPARATION. Clearing and grubbing for the entire site within the limits of construction under these specifications shall be performed except for the portions lying within the limit of construction designated on the drawings as Specification 5377 D-2B. In addition, all subgrades for construction, including subgrades for fills and embankments, shall be stripped of surface vegetation, sod, debris, and organic topsoil. Surface vegetation shall be removed complete with roots to a depth of not less than 4 inches below the ground surface.

All combustible and other waste materials shall be removed from the construction areas and disposed of as specified in Section 2A. Fire regulations and other safety precautions shall be observed when waste materials are burned.

Organic topsoil which is free of trash, vegetation, rocks, and roots shall be stockpiled as directed by the Company for later use as required under these specifications.

2B.14 ROADWAY AND RAILROAD ROADBEDS. Roadway and railroad roadbed construction shall include excavation and subgrade preparation and fills where required. Fills shall be constructed as specified hereinafter. In excavated roadbed areas, overburden shall be removed and the subgrade shall be shaped to line, grade, and cross section and compacted to a depth of at least 12 inches to 97 per cent of maximum density at optimum moisture content. This operation shall include any scarifying, reshaping, and wetting required to obtain proper compaction. Soft, organic, and otherwise unsuitable material shall be removed from the subgrade and replaced with suitable material.

All material in the upper 24 inches of the subgrade in both cut and fill section, shall be material with compaction characteristics equal to clean sand. This material shall be classified as Group SM or SP in accordance with the Unified Soil Classification chart bound at the end of this section.

In all cases roadway and railroad roadbeds shall have not less than the top 12 inches of subgrade compacted as specified hereinbefore.

The subgrade shall be compacted and finished to a true surface and no depression shall be left that will hold water or prevent proper drainage. The subgrade shall be finished to within 0.1 of a foot of the elevation indicated on the drawings. Any deviation of the subgrade surface in excess of one inch as indicated by a 16 foot straightedge, or template cut to typical section, shall be corrected by loosening, adding or removing material, reshaping, and recompacting.

Ditches and drains along the subgrade shall be maintained as required for effective drainage. Whenever ruts of 2 inches or more in depth are formed, the subgrade shall be brought to grade, reshaped, and recompacted. Storage or stockpiling of materials on the subgrade will not be permitted except as indicated on the drawings or specifically authorized by the Company.

Roadway subgrades for new roadways constructed under these specifications shall be maintained throughout the work under these specifications. Roadway surfacing is covered in Sections 2D and 2E.

Railroad subgrades and subballast constructed under these specifications shall be maintained throughout the work under these specifications. Track work will be performed under separate contract.

2B.15 TYPE I SUBBALLAST. Type I subballast shall consist of soil-aggregate materials conforming to ASTM D1241, Type I, Gradation C or D, with the additional requirement that the per cent by weight of aggregate passing the No. 200 sieve shall be limited to a maximum of 10 per cent and a minimum of 2 per cent.

Samples of the subballast material shall be submitted to the Company for testing and acceptance. Samples shall be submitted well in advance of the time the material will be needed for construction. Sampling shall be in accordance with ASTM D75.

The subballast shall have a total compacted thickness of not less than 12 inches and shall be constructed in layers not more than 3 inches in compacted thickness except if deemed by the Company that the Contractor's compaction equipment is adequate to compact at greater depths and passing test results are obtained in accordance with Article 2B.11.

The material for subballast shall be handled and spread in a manner that will prevent segregation of sizes. The subballast shall be carefully and uniformly spread, and when sufficiently deep to form a layer of the thickness specified, it shall be compacted to not less than 97 per cent of maximum density using a vibratory or pneumatic tired roller. Water shall be added as required for maximum compaction with the equipment used.

The completed subballast shall be free of ruts, depressions, and other surface disturbances and shall be finished to the lines and grades indicated on the drawings.

2B.16 FILLS. To the maximum extent available, suitable earth materials obtained from excavation classified "excavation materials" shall be used for the construction of fills. Additional material shall be obtained from

borrow pits as designated on the drawings. After preparation of the fill site in accordance with Article 2B.12, the subgrade shall be scarified, leveled, and rolled so that surface materials of the subgrade will be compact and well bonded with the first layer of the fill. All material deposited in fills shall be free from rocks or stones, brush, stumps, logs, roots, debris and organic or other objectionable materials. Fills shall be constructed in horizontal layers not exceeding 8 inches in uncompacted thickness. Material deposited in piles or windrows by excavating and hauling equipment shall be spread and leveled prior to compaction.

Each layer shall be uniformly compacted using equipment and methods which will achieve the densities specified hereinafter. The compacted density of each layer for roadbeds and other areas as designated on the drawings shall be at least 95 per cent of the maximum density at optimum moisture content. All other areas of fill shall be compacted to at least 90 per cent of maximum density at optimum moisture content. If the material fails to meet the density specified, compaction methods shall be modified as required to attain the specified density.

2B.16.1 Subgrade Preparation. After preparation of the fill site, the subgrade shall be leveled and rolled so surface materials of the subgrade will be as compact and well bonded with the first layer of the fill as specified for subsequent layers.

2B.16.2 Placement and Compaction. All fill materials shall be placed in approximately horizontal layers not to exceed 8 inches in uncompacted thickness, except if deemed by the Company that the Contractor's compaction equipment is adequate to compact at greater depths and passing test results are obtained in accordance with Article 2B.11. Material deposited in piles or windrows by excavating and hauling equipment shall be spread and leveled before compaction.

Each layer of material being compacted shall have the best practicable uniform moisture content to insure satisfactory compaction. The Contractor shall add water and harrow, disc, blade, or otherwise work the material in each layer as required to insure uniform moisture content and adequate compaction. Each layer shall be thoroughly compacted by rolling or other acceptable methods to 95 per cent of maximum density at optimum moisture content unless otherwise specified. If the material fails to meet the density specified, compaction methods shall be altered.

2B.16.3 Borrow Areas. Borrow areas indicated on the drawings shall not be utilized unless and until such time that the overall earthwork balance between cut and fill requires additional borrow to complete fills indicated on the drawings. Material necessary to complete fills shall be excavated from

borrow areas and hauled to the fill site. Borrow material will be available on the Company's property at locations indicated on the drawings. The borrow area designated on the drawings shall be for work to be performed under this Contract only.

The size, shape, depth, drainage, and surfacing of all borrow areas shall be acceptable to the Company. Borrow areas shall be regular in shape, with finish graded surfaces when completed. Side slopes shall not be steeper than two horizontal to one vertical, and shall be uniform for the entire length of any one side.

2B.17 STRUCTURE BACKFILL. Structure backfill pertains only to backfill which is to be deposited around and outside of structure foundations which are constructed under separate specifications. Backfill shall be deposited in layers not to exceed 6 inches in uncompacted thickness, except if deemed by the Company that the Contractor's compaction equipment is adequate to compact at greater depths and passing test results are obtained in accordance with Article 2B.12. Structure backfill shall be compacted to at least 95 per cent of maximum density at optimum moisture content. Compaction of structure backfill by rolling will be permitted provided the desired compaction is obtained.

Material for structure backfill shall be composed of earth only and shall be free of all debris of any kind.

No tamped, rolled, or otherwise mechanically compacted backfill shall be deposited or compacted in water.

All backfill material shall consist of loose earth having a moisture content such that the required density of the compacted soil will be obtained with the compaction method used. Moisture content shall be distributed uniformly and water for correction of moisture content shall be added sufficiently in advance so that proper moisture distribution and compaction will be obtained. Backfill material shall have a moisture content within 2 per cent of optimum as specified by ASTM D1557, Method A or C, when compacted.

2B.18 PIPE TRENCH EXCAVATION. The Contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work. Approximately 400 feet shall be the maximum length of open trench on any line under construction unless otherwise acceptable to the Company.

2B.18.1 Alignment and Grade. The alignment and grade or elevation of each pipeline shall be fixed and determined by means of batter boards and offset stakes unless otherwise accepted. Vertical and horizontal alignment of pipes, and the maximum joint deflection used in connection therewith, shall be in conformity with requirements of the specification section covering installation of pipe.

If piping elevations are not indicated on the drawings, underground piping shall be installed with a minimum of 7 feet of cover.

2B.18.2 Trench Widths. Trenches shall be excavated to a width which will provide adequate working space and pipe clearance for proper pipe installation, jointing, and embedment.

2B.18.3 Mechanical Excavation. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.

All mechanical trenching equipment, its operating condition, and the manner of its operation, shall be subject to the Company's acceptance at all times.

2B.18.4 Trench Depth. Except where otherwise required for concrete encasement, thrust blocking, or trench bottom stabilization, pipe trenches shall be excavated to the depth required for the installation of pipe foundation material below the underside of the pipe as indicated on the sketch bound at the end of this section.

If concrete encasement or thrust blocking is required, concrete base slabs or support pads shall be placed in the pipe trench and foundation material shall be omitted. Wedges and struts shall also be provided to bring the pipe to grade, hold alignment, and prevent flotation.

2B.18.5 Bell Holes. Bell holes shall provide adequate clearance for tools and methods used in installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or embedment material when the pipe is jointed.

2B.19 PIPE EMBEDMENT. Embedment materials both below and above the bottom of the pipe, classes of embedment to be used, and placement and compaction of embedment materials shall conform to the requirements indicated on the attached sketch, and to the following supplementary requirements.

2B.19.1 Embedment Classes. Pipe embedment classes shall be as indicated on the attached sketch and as sspecified herein:

First-class embedment shall be used for all gravity drain lines of the following piping materials:

Vitrified clay pipe, perforated and solid wall

Corrugated metal culvert pipe

Material for first-class embedment shall be crushed rock or gravel which shall have a gradation such that 95 per cent of the material shall pass a 1/2 inch sieve and not more than 5 per cent shall pass a No. 4 sieve. Culvert pipe foundation material shall have a gradation such that not less than 95 per cent of the material will pass a No. 4 sieve and not more than 10 per cent will pass a No. 100 sieve. On-site material may be used provided the gradation meets these gradations.

2B.19.2 Placement and Compaction. Embedment material shall be spread on the trench bottom and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. The material shall be compacted with vibrating platform type compactors. Compactive effort and moisture content shall be adjusted to provide a firm but slightly yielding support for the pipe. It will be permissible to slightly disturb the finished subgrade surface by withdrawal of pipe slings or other lifting tackle.

After each pipe has been graded, aligned, and placed in final position on the bedding material, and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations.

Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement. Embedment material shall be placed in layers of 8 inches or less and each layer shall be uniformly compacted. First-class embedment shall be compacted to 95 per cent of maximum density at optimum moisture content.

All tools used in the placement and compaction of the embedment of coated pipe shall be selected and used so that the pipe coating will not be damaged.

First-class embedment shall extend 12 inches above the pipe or 1/8 of the cover depth, whichever is greater.

2B.20 TRENCH BACKFILL. All trench backfill above pipe embedment shall conform to the following requirements.

2B.20.1 Compacted Backfill. Compacted backfill will be required for the full depth of the trench above the embedment.

Compacted backfill material shall meet the requirements specified hereinafter. Compacted backfill material shall be suitable material from trench excavation or suitable material from on-site borrow areas.

Compacted backfill material shall be finely divided and free from debris, organic material, and stones larger than 3 inches in greatest dimension. Compacted backfill material shall be placed in uniform layers not exceeding 8 inches in uncompacted thickness. Increased layer thickness may be permitted for noncohesive material if the Contractor demonstrates to the satisfaction of the Company that the specified compacted density will be obtained. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe. Trench backfill shall be compacted to not less than 95 per cent of maximum density at optimum moisture content. Moisture content of backfill material shall be adjusted as required to obtain the specified density with the compaction equipment used.

2B.21 MAINTENANCE AND RESTORATION OF FILLS AND BACKFILLS. Fills and backfills that settle or erode before final acceptance of the work under these specifications, and pavement and other facilities damaged by such settlement or erosion, shall be repaired. The settled or eroded areas shall be refilled, compacted, and graded to conform to the elevation indicated on the drawings or to the elevation of the adjacent ground surface. Damaged facilities shall be repaired in a manner acceptable to the Company.

Earth slopes of the roads constructed under these specifications shall be maintained to the lines and grades indicated on the drawings until the final acceptance of the road slopes by the Company.

2B.22 FINAL GRADING. After all construction work under these specifications has been completed, all ground surface areas disturbed by this construction or construction plant and operations shall be graded. The grading shall be finished to the contours and elevations indicated on the drawings or, if not indicated, to the matching contours and elevations of the original, undisturbed ground surface. In any event, the final grading shall provide smooth uniform surfacing and effective drainage of the ground areas.

2B.23 DISPOSITION OF MATERIALS. Excavated earth material shall be used to construct fills and backfills to the extent required. Surplus earth, if any, and materials which are not suitable for fills and backfills shall be spoiled on the site in a manner and location as directed by the Company and as indicated on the drawings.

Materials shall be deposited in the disposal areas and leveled and compacted in 12 inch maximum layers. Compaction shall be by not less than three passes of a bulldozer.

Table 1

UNIFIED SOIL CLASSIFICATION
(Including Identification and Description)

Major Divisions			Group Symbols	Typical Names	Field Identification Procedures (Excluding particles larger than 3 inches and basing fractions on estimated weights)			Information Required for Describing Soils	Laboratory Classification Criteria
1	2		3	4	5			6	7
Coarse-grained Soils: More than half of material is larger than No. 200 sieve size.	Gravels: More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size.)	Clean Gravels (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.			For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics.	
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.				
		Gravels with Fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).			Give typical name; indicate approximate percentages of sand and gravel, max. size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbol in parentheses.	
			GC	Clayey gravels, gravel-sand-clay mixtures.	Plastic fines (for identification procedures see CL below).				
	Sands: More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size.)	Clean Sands (little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.				
			SP	Poorly-graded sands, gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.			Example: Silty sand, gravelly; about 20% hard, angular gravel particles 1/2-in. maximum size; rounded and subangular sand grains coarse to fine; about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM).	
		Sands with Fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).				
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).				
Fine-grained Soils: More than half of material is smaller than No. 200 sieve size. The No. 200 sieve size is about the smallest particle visible to the naked eye.					Identification Procedures on Fraction Smaller than No. 40 Sieve Size				
					Dry Strength (Crushing characteristics)	Dilatancy (Reaction to shaking)	Toughness (Consistency near PL)		
	Silts and Clays: Liquid limit less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None	Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, color in wet condition, odor if any, local or geologic name, and other pertinent descriptive information; and symbol in parentheses.	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium		
			OL	Organic silts and organic silty clays of low plasticity.	Slight to medium	Slow	Slight		
	Silts and Clays: Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions.	
			CH	Inorganic clays of high plasticity, fat clays.	High to very high	None	High		
			OH	Organic clays of medium to high plasticity, organic silts.	Medium to high	None to very slow	Slight to medium	Example: Clayey silt, brown, slightly plastic, small percentage of fine sand, numerous vertical root holes, firm and dry in place, loess, (ML).	
Highly Organic Soils			Pt	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.				

Use grain-size curve in identifying the fractions as given under field identification.

Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows:

Less than 5% — GW, GP, SW, SP, GM, GC, SM, SC

More than 12% — Borderline cases requiring use of dual symbols.

5% to 12%

$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6

$C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between one and 3

Not meeting all gradation requirements for GW

Atterberg limits below "A" line or PI less than 4

Atterberg limits above "A" line with PI greater than 7

Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.

$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4

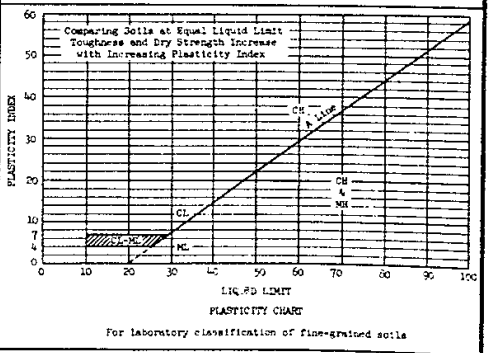
$C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between one and 3

Not meeting all gradation requirements for SW

Atterberg limits below "A" line or PI less than 4

Atterberg limits above "A" line with PI greater than 7

Limits plotting in hatched zone with PI between 4 and 7 are borderline cases requiring use of dual symbols.



PLASTICITY CHART

For laboratory classification of fine-grained soils

(1) Boundary classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder. (2) All sieve sizes on this chart are U. S. standard.

FIELD IDENTIFICATION PROCEDURES FOR FINE-GRAINED SOILS OR FRACTIONS

These procedures are to be performed on the minus No. 40 sieve size particles, approximately 1/64 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking)

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens, and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics)

After removing particles larger than No. 40 sieve size, mold a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun, or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit)

After removing particles larger than the No. 40 sieve size, a specimen of soil about one-half inch cube in size, is molded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eighth inch in diameter. The thread is then folded and rerolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

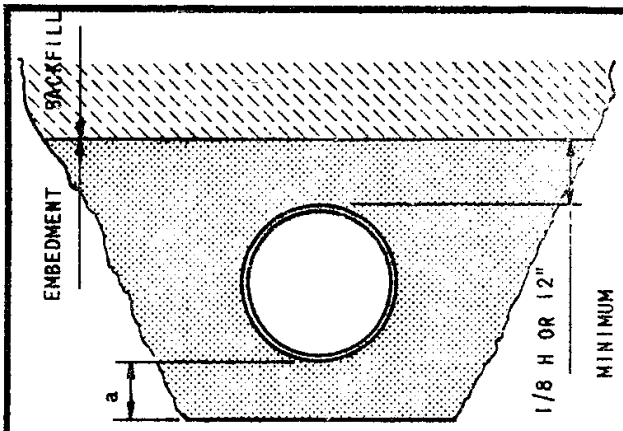
After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.

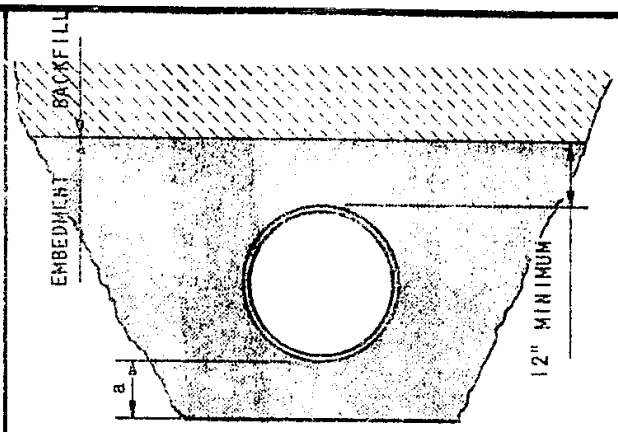
Highly organic clays have a very weak and spongy feel at the plastic limit.

Adopted by Corps of Engineers and Bureau of Reclamation, January 1952

R-0119538



FIRST-CLASS EMBEDMENT



SECOND-CLASS EMBEDMENT

PIPE FOUNDATION DEPTH		
D	a MIN. SOIL	a MIN. ROCK
60" & SMALLER	4"	9"
66" TO 90"	6"	12"
96" & LARGER	12"	12"

LEGEND

D	NOMINAL PIPE SIZE
Bc	OUTSIDE DIAMETER OF PIPE
H	COVER ABOVE TOP OF PIPE
a	FOUNDATION DEPTH BELOW PIPE SEE TABLE

GRAVEL OR CRUSHED ROCK

COMPACTED BACKFILL

SAND

NOTES

SEE SPECIFIED REQUIREMENTS FOR MATERIALS COMPACTION, AND TRENCH WIDTHS.

BLACK & VEATCH
CONSULTING ENGINEERS

PIPE EMBEDMENT

PE101571-1

P-GN-009-B

Section 2C - DRAINAGE PIPING

2C.1 GENERAL. This section covers materials, manufacture, and installation for drainage piping.

Earthwork and trenching shall be as specified in Section 2B.

2C.2 LAWS AND REGULATIONS. All drainage piping work shall be performed in accordance with all applicable local codes and ordinances, and state and federal laws and regulations which pertain to such work. In the case of conflict between these specifications and any law or ordinance, the latter shall govern. All piping work shall conform to all applicable provisions of the National Plumbing Code and the Minnesota Plumbing Code.

2C.3 DRAWINGS AND DATA. Drawings, specifications, and other data showing complete details of the design, fabrication, and construction of pipe and fittings, together with complete data covering all materials proposed for use in connection therewith, shall be submitted for review and acceptance as set forth in Section 1C.

2C.4 MATERIALS. Culvert pipe shall conform to the following requirements:

Corrugated metal pipe	
Round pipe	Fed Spec WW-P-405A, Class I, Shape 1, type and end conditions as specified or noted on the drawings
Pipe arch	Fed Spec WW-P-405A, Class I, Shape 3, type and end conditions as specified or noted on the drawings
Vitrified clay pipe and fittings	Extra strength, ASTM C700
Ordinary joints	Factory molded plastic, ASTM C425
Field cut joints	Can-Tex "C-T Adapters", Dickey "Field Unions", or Fernco "Flexible Couplings"

2C.5 CORRUGATED METAL PIPE MANUFACTURE. Corrugated metal pipe, pipe arches, and end sections shall be fabricated from corrugated galvanized steel sheets unless otherwise noted on the drawings.

Pipe and pipe arches shall be of the sizes, gages, and lengths indicated on the drawings. Pipe arches may be substituted for round pipes provided they are of a design size having an equivalent diameter to the round pipe size indicated.

2C.5.1 End Conditions. Round corrugated metal pipe and pipe arches shall have either square cut ends, bevel cut ends, or have flared end sections where indicated on the drawings.

Flared end sections shall be the manufacturer's standard for the size and shape of pipe provided.

2C.5.2 Coatings. Unless otherwise noted on the drawings, pipe and pipe arches, end sections and accessories shall be coated inside and out with an acceptable bituminous coating to a minimum dry film thickness of 0.05 inch, measured on the crests of the corrugations. The coating shall adhere tenaciously, shall not chip off during handling and installation, and shall protect the metal against damage during installation and deterioration after installation.

2C.5.3 Joints. Coupling bands shall be provided for jointing of sections of corrugated metal pipe. Bands shall have corrugations that match the pipe and shall lap equal portions of pipe being joined. Connection bolts for coupling bands shall be zinc coated, conforming to ASTM A307, Grade A, electroplated in accordance with ASTM A164, Type RS. The Contractor shall touch up damaged bituminous coatings on bolts and bands.

2C.5.4 Asbestos Bonded Pipe. Material used in the fabrication of asbestos bonded pipe shall conform to the requirements of ASTM A569 with minimum 0.2 per cent copper added. The base metal sheets shall be coated on both sides with a layer of asbestos fibers, applied to the sheet by pressing it into the molten metallic bonding medium. Immediately after the metallic bond has solidified, the asbestos fibers shall be thoroughly saturated with a bituminous material that is compatible with the asphalt coatings added after the sheets are corrugated and formed into pipe. Type H asbestos bonded pipe shall have paved inverts.

2C.6 VITRIFIED CLAY PIPE. Vitrified clay pipe shall be tested in accordance with ASTM C301. Crushing strength tests shall be conducted by an independent testing laboratory. Test reports shall be submitted to the Engineer for review. It is not required that tests be made on pipe manufactured specifically for this Contract. Reports covering tests made on other pipe of the same size, strength, and manufactured at the same plant will be acceptable.

2C.6.1 Joints. Factory-molded plastic joints for vitrified clay pipe shall be installed in accordance with the instructions and recommendations of the pipe manufacturer. All joint surfaces shall be lubricated with a lubricant furnished by the pipe manufacturer immediately before the joint is completed.

2C.7 HANDLING. Pipe, fittings, and accessories shall be handled in a manner that will insure installation in sound, undamaged condition. Equipment, tools, and methods used in loading, unloading, reloading, and hauling pipe and fittings shall be such that the pipe and fittings are not damaged. Hooks inserted in the ends of pipe shall have broad, well padded contact surfaces and shall not come in contact with joint surfaces.

All pipe coating which has been damaged shall be repaired by the Contractor before installing the pipe.

2C.8 CLEANING. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter before being installed and shall be kept clean until the work has been accepted. Such surfaces shall be wire brushed, if necessary, and wiped clean and dry and free from oil and grease before the joints are assembled. All joint contact surfaces shall be kept clean until jointing is completed.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being installed. No debris, tools, clothing, or other materials shall be placed in the pipe.

2C.9 LAYING PIPE. Foundations and embedments for pipe shall be installed in accordance with Section 2B.

Under no circumstances shall pipe be laid in water and no pipe shall be laid under unsuitable weather or trench conditions.

Pipe shall be laid with the bell ends facing upstream except when making closures.

Culvert pipes shall be laid on the prepared bed starting at the outlet end with sections firmly joined.

Outside laps of circumferential joints of corrugated metal culverts shall point upstream. All joints of bituminous coated pipe shall be coated with bituminous paint after installation.

Section 2D - IMPERVIOUS EARTH BORROW WORK

2D.1 GENERAL. This section covers clearing and grubbing; stockpiling; excavating as required; the classification, handling, blending, transportation and storage of all material; dewatering as required; site restoration; landscaping; and other related work for the impervious earth borrow work. The impervious earth borrow shall be utilized in the construction of the clay core for the dam embankment of the fly ash and bottom ash ponds and the impervious earth blankets for the fly ash and bottom ash ponds, recycle and holding basins, the coal storage area, and the fuel oil storage area. All work performed under Section 2D of this specification, including delivery of all impervious earth material to the plant site shall be performed under the LUMP SUM.

2D.2 IMPERVIOUS EARTH BORROW SITE. The borrow site is located northeast of the Sherburne County Generating Plant site as indicated on the drawings.

2D.3 CLEARING, GRUBBING, AND RAZING. Clearing, grubbing and razing shall comply with the requirements of Section 2A and the additional requirements stated herein.

Organic topsoil which is free of trash, vegetation, rocks, and roots shall be stockpiled as directed by the Company for later use in the site restoration.

2D.3.1 Disposal of Waste. All logs, trees, stumps, roots, brush, tree trimmings and other combustible materials resulting from clearing, grubbing, and razing operations shall be stacked and burned at the locations designated by the Company. Disposal shall be such that upon completion the area shall be entirely void of all loose stumps, trimmings, brush, vegetation, and other debris.

2D.4 CLASSIFICATION OF EARTH MATERIALS. The classification of excavated impervious earth materials shall be in accordance with Table 1 of the Unified Soil Classification System bound at the end of Section 2B. Only the classification and types of soils listed herein shall be hauled to the plant site.

Material Classified as Specified	Unified Soil Classification	Designated Use at Plant Site
Clay core	CL	Embankment at ash ponds
Impervious earth blanket		
Type 1	CL	Within embankment at ash ponds; bottom and slopes; ditches within coal storage area and recycle and holding basins and fuel oil storage area

Material Classified as Specified	Unified Soil Classification	Designated Use at Plant Site
Type 2	CL, SC	Bottom of ash ponds, remaining CL material not required as Type 1 supplemented with SC material
Type 3	SC	Erosion resistant cover for ditches in coal storage area
Type 4	SC, SC-SM, CL-SC	Remainder of coal storage area

2D.5 PRESERVATION OF TREES. Trees outside the boundaries of excavations shall be preserved and protected as much as possible. Consideration will be given to the removal of additional trees only where essential, in the opinion of the Company, for the safe, effective execution of the work.

Trees left standing shall be adequately protected from permanent damage caused by construction operations. Trimming of standing trees, where required, shall be as directed by the Company.

2D.6 UNAUTHORIZED EXCAVATION. Any materials excavated below the elevations indicated on the drawings shall be replaced and compacted to the density of adjacent undisturbed materials. The excavation of unauthorized material and subsequent replacement and compaction shall be by and at the expense of the Contractor.

2D.7 REMOVAL OF WATER. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations. Excavations shall be developed in a manner that will assure positive drainage of the complete excavation area at all times without impounding water.

2D.8 TESTING. All field and laboratory testing required to assure the Company that the Contractor has complied with excavation and compaction requirements of this section will be provided by the Company. The Contractor shall cooperate as necessary to assist the Company's field testing representatives to accomplish their work. The Contractor will be furnished one copy of the test results.

The Company will designate where the types of impervious earth materials are located within the borrow site.

2D.9 EXCAVATION. Clay core and impervious earth blanket materials will be required for the fly ash pond, bottom ash pond, recycle and holding basins, and the coal storage area construction. All clay core and impervious earth blanket material contained within the limit of borrow for the

impervious earth borrow area shall be excavated, regardless of depth involved, and transported to the plant site under the LUMP SUM. The Contractor shall propose a method and sequence of excavation that is satisfactory to the Company.

The size, shape, depth, and drainage of the borrow area shall be acceptable to the Company. Borrow areas shall be regular in shape, with finish graded surfaces when completed. Side slopes shall not be steeper than three horizontal to one vertical for the entire length of any one side unless indicated otherwise on the drawings.

2D.10 HAULING REPORTS. The Contractor shall submit hauling reports to the Company at the end of each day's work. These reports shall indicate the number of trucks and size of load; the number of round trips each made; and the location at which the impervious earth material was deposited.

2D.11 MAINTENANCE OF HAUL ROADS. The haul route maintenance shall be as specified in the SPECIAL CONDITIONS.

2D.12 SEDIMENTATION POND. A temporary sedimentation pond shall be constructed at the northwestern corner of the borrow area as indicated on the drawings. Any dikes required shall be constructed of on-site material and shall be compacted as specified in Article 2B.15. A corrugated metal culvert pipe shall be placed in the dike in accordance with the requirements of Section 2C.

2D.13 SITE RESTORATION. The borrow site shall be restored to a condition acceptable to the Company after the Company has verified that all impervious earth material has been excavated from the impervious earth borrow area and hauled to the plant site. The borrow area shall be regarded to meet the drainage requirements and finish grades generally as indicated on the drawings and acceptable to the Company. Seeding, fertilizing, and mulching shall be as specified in Section 2J.

Section 2E - DAM EMBANKMENT AND IMPERVIOUS EARTH BLANKET CONSTRUCTION

2E.1 GENERAL. This section covers stripping, excavating, hauling, stockpiling, spoiling, mixing, blending, placing, wetting, compacting and other earthwork required for the construction of the earth dam embankments and impervious earth blanket construction.

Dam embankment is defined as the containment facilities for the bottom ash and fly ash ponds.

Impervious earth blanket construction is required for the fly ash and bottom ash ponds, recycle and holding basins, coal storage area, and the fuel oil storage area.

This section also covers toe drains and spillway drains.

Construction of the dam embankment and impervious earth blanket shall not be performed during freezing weather except by permission of the Company. No embankment materials or impervious earth blanket shall be placed on frozen surfaces. Frozen materials, snow, or ice shall not be placed in the dam embankment.

The Contractor is advised that water requirements may vary depending on soil conditions, weather, and the time required for soil manipulation prior to compaction.

Compaction of the embankment material within the specified range of moisture content is an essential requirement for the stability of the dam embankment. Improper moisture content at the time of compaction will be sufficient cause for rejection of a lift.

Compaction of the impervious earth blanket within the specified range of moisture content is an essential requirement for the adequacy of the blanket for seepage control.

2E.2 TESTING. All field and laboratory testing required to determine compliance with the requirements of this section will be provided by the Company. The Contractor shall cooperate with the Company in this respect. The Contractor will be furnished one copy of test reports.

Maximum density for the compacted materials placed under this section will be determined in accordance with ASTM D1557, Method A or C. The terms "maximum density" and "optimum moisture content" shall be as defined in ASTM D1557, Method A or C.

At least one field density test will be made for each 2000 cubic yards of compacted material. Sampling and testing will be more frequent at the start of embankment construction and when soil type is changing.

2E.3 CLASSIFICATION OF EXCAVATED EARTH MATERIALS. No classification of earth dam materials will be made for payment purposes except as provided for in the Proposal and Section 1A. However, earth materials will be classified as specified in Article 2E.13 for construction purposes.

Dam embankment construction shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work, regardless of type, character, composition, or condition thereof.

2E.4 CLEARING AND STRIPPING. Major clearing and grubbing work on the dam site shall be performed as described in Section 2A. Clearing and grubbing under this section shall include all other clearing and grubbing required to perform the work covered by this section.

All stripping of top soil and surface vegetation for construction of the dam embankment and impervious earth blankets shall be performed under this section.

Topsoil which is free of trash, vegetation, rocks, and roots shall be stockpiled for later use as specified hereinafter.

The areas to be occupied by the dam embankment and impervious earth blanket construction shall be cleared of all objectionable materials and debris. In addition, subgrades shall be cleared and stripped of all surface vegetation, sod, topsoil, and other organic material. All deposits of material such as roadway embankments shall be completely removed. All combustible and other waste materials shall be removed from the dam embankment and impervious earth blanket sites and disposed of by and at the expense of the Contractor as specified in Section 2A. Fire regulations and other safety precautions shall be observed when waste materials are burned.

All stripping work at the dam embankment site shall be completed prior to the excavation of the core trench and prior to the placement of any embankment material.

2E.5 TEMPORARY TOPSOIL STOCKPILE. The Contractor shall store topsoil removed under these specifications adjacent to the Company stockpile designated on the drawings. The Contractor shall use the stockpiled topsoil as required to comply with the requirements of these specifications.

2E.6 PRESERVATION OF TREES. Trees shall be preserved and protected as much as possible. Unless specifically authorized by the Company, trees shall be removed from only those areas which will be excavated, filled, or built upon. Consideration will be given to the removal of additional trees only where essential, in the opinion of the Company, for the safe, effective execution of the work.

Trees left standing shall be adequately protected from permanent damage by construction operations. Trimming of standing trees, where required, shall be as directed by the Company.

2E.7 UNAUTHORIZED EXCAVATION. Except where otherwise authorized, indicated, or specified, all material excavated below the bottom of concrete walls, footings, or slabs on grade, and foundations shall be replaced with Type A-1 concrete, by and at the expense of the Contractor, with concrete placed at the same time and monolithic with the concrete above.

2E.8 SHEETING AND SHORING. Except where banks are cut back on a stable slope, excavations shall be properly and substantially sheeted, braced, and shored, as necessary, to prevent caving or sliding and to provide protection for workmen and the work. Sheeting, bracing, and shoring shall be designed and built to withstand all loads that might be caused by earth movement or pressure, and shall be rigid, maintaining shape and position under all circumstances.

2E.9 BORROW AREAS. Materials necessary to complete the embankments except for clay core and impervious earth blankets, shall be obtained largely by other earthwork operations. Additional material necessary to complete the embankments except for clay core and impervious earth blankets shall be obtained from areas indicated on the drawings.

Material for construction of the embankment clay core and impervious earth blankets shall be obtained entirely from the impervious earth borrow site.

The size, shape, depth, drainage, and surfacing of all borrow areas shall be acceptable to the Company. Borrow areas shall be regular in shape, with finish grade surfaces when completed. Side slopes shall not be steeper than two horizontal to one vertical, and shall be uniform for the entire length of any one side.

2E.10 REMOVAL OF WATER. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built therein is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

All excavations which extend down to or below static ground water elevations shall be dewatered by lowering and maintaining the ground water surface beneath such excavations a distance of not less than 12 inches below the bottom of the excavation.

Surface water shall be diverted or otherwise prevented from entering excavated areas to the greatest extent practicable.

The Contractor shall dewater the core trench excavation as required. The method used shall be continued in effective operation, in all areas where dewatering is required until the placing and compacting of the dam embankment has been completed to the top of the side slopes of the excavation.

2E.11 STRUCTURE EXCAVATION AND PACKFILL. Structure excavation shall be done to the lines and grades indicated on the drawings and to the limits required to perform the construction work. Machine excavation shall be controlled to prevent undercutting the proper subgrade elevation and shall not be used within 3 feet of previously constructed structures and facilities. Only hand tools shall be used for excavation around previously constructed structures and facilities.

Work shall be done so that the construction areas will be as free as possible from obstructions and from interference with the transportation, storage, and hauling of materials. Excavated materials free of trash, rocks, roots, and other foreign materials, and which meet the specified requirements, may be used as required for fills and backfills constructed under these specifications.

Vertical faces of excavations shall not be undercut to provide for extended footings.

2E.11.1 Subgrade Preparation. After the structure excavation is completed and prior to placement of concrete or structure backfill, the subgrades shall be thoroughly compacted and proof rolled. The subgrade shall be shaped to the lines and grade and cross section indicated on the drawings to a depth of at least 12 inches to 95 per cent of maximum density at optimum moisture content. This operation shall include any scarifying, reshaping, and wetting required to obtain the specified compaction. After compaction, the areas shall be proof rolled by a single pass of a vibratory roller to test for uniformity and any loose soils detected shall be recompacted as specified.

No structure backfill or embankment fill shall be placed until the subgrade has been properly prepared and acceptable to the Company.

2E.11.2 Backfill for Structures. Backfill for structures shall be made with compacted earth which shall consist of excavated inorganic earth materials free of trash, rocks, roots, and other foreign materials. The earth shall be loose and finely divided and shall have the moisture content required to obtain maximum density with the compaction method used.

Backfill shall be deposited in layers not to exceed 6 inches in uncompacted thickness, except if deemed by the Company that the Contractor's compaction equipment is adequate to compact at greater depths and passing test results are obtained in accordance with Article 2E.2. Structure backfill shall be compacted to at least 95 per cent of maximum density at optimum moisture content. Compaction of structure backfill by rolling will be permitted provided the desired compaction is obtained.

No tamped, rolled, or otherwise mechanically compacted backfill shall be deposited or compacted in water.

All backfill material shall consist of loose earth having a moisture content such that the required density of the compacted soil will be obtained with the compaction method used. Moisture content shall be distributed uniformly and water for correction of moisture content shall be added sufficiently in advance so that proper moisture distribution and compaction will be obtained. Backfill material shall have a moisture content within 2 per cent of optimum as specified by ASTM D1557, Method A or C, when compacted.

2E.12 EMBANKMENT SITE AND FOUNDATION PREPARATION. The entire area to be covered by the dam embankment shall be cleared and stripped as specified in Article 2E.4.

The core trench shall be excavated to the lines and grades indicated on the drawings. Suitable material excavated from the core trench shall be stockpiled for later use as backfill and embankment material.

2E.12.1 Subgrade Preparation. Prior to placement of the clay core, impervious earth blanket, or embankment material, the subgrade shall be thoroughly compacted and proof rolled. The subgrade shall be shaped to the lines, grades, and cross sections indicated on the drawings, and compacted to a depth of at least 12 inches to 95 per cent of maximum density at optimum moisture content. This operation shall include any scarifying, reshaping, and wetting required to obtain proper compaction. After compaction the areas shall be proof rolled by a single pass of a vibratory roller to test for uniformity and any loose soils detected shall be recompacted as specified.

No material shall be placed in any portion of the dam embankment until the subgrade has been properly prepared and acceptable to the Company.

2E.13 EMBANKMENT CONSTRUCTION. The dam embankment which includes the horizontal embankment drains, clay core, and impervious earth blanket within the dam, shall be constructed to the lines and grades indicated on the drawings. General requirements, the order of the excavation, the sources of materials, and the deposit and compaction of all excavated materials shall be as specified herein.

At the beginning of the dam embankment construction, the Contractor shall set grade stakes to indicate the intersection of the embankment slopes with the ground surfaces, the plane of intersection between the core and other fill materials, and the depth of fill to be made at various points on the site. As the work proceeds, the Contractor shall set contour stakes in the slopes of the embankment. These stakes shall be set on 5 foot contours, or less if required, on both faces of the embankment, and will be located in cross planes as desired by the Contractor, at regular distances of 50 feet. The Contractor shall keep all slopes dressed as the embankment work proceeds, so that when the top is reached only fine grading will be necessary.

The finish grades indicated on the drawings shall be provided to allow for shrinkage or settlement after construction is complete. The grades indicated shall be rechecked at the time the road base material is placed on the embankment. Additional embankment material shall be placed and compacted as required to restore the grades indicated on the drawings before any road base material is placed thereon.

2E.13.1 Materials. All materials placed in the dam embankment shall be free from brush, stumps, logs, roots, and other deleterious material. Materials for the embankment proper designated embankment fill, shall be obtained from surplus excavated material as required under these specifications and from borrow pits as indicated on the drawings. Materials for clay core and impervious earth blanket shall be obtained from the impervious earth borrow area designated on the drawings.

The embankment materials will be classified by the Company by testing and visual inspection and in accordance with Table 1 of the Unified Soil Classification System bound at the end of Section 2B.

Classification of materials obtained from the impervious earth borrow area will be determined as follows.

Material Designation as Specified	Unified Soil Classification	Location Within Dam Embankment
Clay core	CL	Clay core
Impervious earth blanket, Type 1	CL	Impervious earth blanket within the dam embankment

Material Designation as Specified	Unified Soil Classification	Location Within Dam Embankment
Embankment fill	SM, SP, SW	Remainder of dam embankment, excluding filter material, riprap bedding, and riprap

The drawings indicate the detailed limitations for the placement of the clay core and impervious earth blanket, Type 1, and embankment fill material.

Filter materials for use in the horizontal embankment drains at locations indicated on the drawings shall be crushed rock, gravel, or natural sand meeting the following gradations:

Type	US Standard Sieve	Per Cent Passing
I	3 inch	100
	2 inch	85-100
	1-1/2 inch	72-90
	3/4 inch	50-70
	1/2 inch	35-50
	No. 3	22-32
	No. 6	12-20
	No. 10	0-12
II	6 inch	100
	4 inch	72-86
	2 inch	32-65
	1-1/2 inch	20-32
	1 inch	0-20

2E.13.2 General Requirements. The suitability of each part of the foundation for placing foundation materials thereon and of all materials for use in embankment construction shall be acceptable to the Company.

It may be feasible to transport a large portion of the materials which are excavated for various parts of the work and which are suitable for embankment construction directly to the embankment at the time of making the excavations. However, the Contractor shall not be entitled to additional compensation for excavation of the material involved by reason of it being necessary, or required by the Company, for any reason, that such excavated materials be deposited in temporary storage piles prior to being placed in the embankment.

Excavation of material accepted for use in the dam embankment shall be performed in a manner that will segregate materials of different character. Suitable precautions shall be taken to assure that the classified materials

are placed to avoid intermingling them. Materials of differing classification which are intermingled in the embankment shall be removed and replaced. The cost of all such corrective work shall be borne by the Contractor.

Dimensions indicated on the drawings for thickness of clay core, impervious earth blanket, and filter material are minimum dimensions. No intermingling of materials will be permitted within these dimensions.

2E.13.3 Equipment. Maximum compaction of the embankment subgrade as prepared, and of each layer or lift of the fill, shall be obtained through the use of equipment operated such that the finished embankment shall be uniformly stable and compacted as specified. Isolated operations shall be provided with sufficient equipment to permit the work to be carried to completion in a continuous and efficient manner.

2E.13.4 Placing and Compacting Embankment Material. Except as otherwise acceptable to the Company, the entire body of the fill, including upstream and downstream portions, shall be placed and carried up at the same rate, provision being made to bond the layers of adjoining sections together. Where it is impractical, in the opinion of the Company, to carry up each layer of fill over the entire area at the same time, the slope of any existing fill, or the slope of the natural ground, against which new fill material is placed, shall be cut or plowed into benches having level beds and vertical sides, and each layer of new fill shall terminate in such a bench. In no case shall the horizontal width of the bench be less than the depth of the layer of fill to be bedded therein nor shall the vertical side of the bench be greater in height than one foot.

All fill material shall be placed in the embankment parallel to the axis of the embankment in approximately horizontal layers not to exceed 9 inches in uncompacted thickness over the prepared foundation or fill. The embankment fill on-site material shall be constructed by placing the silty sand (SM) material adjacent to the clay core, the poorly-graded sand (SP) material in the intermediate portion of the embankment, and the well-graded sand (SW) material in the outer slopes of the embankment and around the horizontal filter drains. Proper equipment shall be used on each lift to remove mounds and ridges caused by dumping operations and to obtain uniform thickness prior to compacting, as well as to provide a reasonably smooth riding surface for equipment. After each layer has been properly spread, it shall be sprinkled or wetted if necessary to provide the required amount of water for proper compaction and working to insure uniform moisture content, after which the layer shall be compacted to the required density before the next layer is placed thereon. Combined excavation, hauling, and placing operations shall be such that the materials, when compacted in the embankment, will be blended sufficiently to secure the best practicable degree of compaction, impermeability, and stability.

The Contractor will be required to break up the earthfill materials, either at the place of excavation or on the embankment, to such maximum size as is determined necessary by the Company to secure specified density of the material in the embankment. Equipment on the embankment shall spread out and not track each other to such an extent as to make ruts. The top surface of the fill shall bbe kept crowned, with grades not to exceed 2 per cent, to insure free drainage toward the slopes. The rolled surface of each lift shall be roughened or loosened by scarifying to the satisfaction of the Company, before the succeeding layer is placed thereon, in order to provide the necessary bond between each lift.

Prior to and during the compacting operations the material in each layer of the embankment shall have the best practicable moisture content, and the moisture content shall be uniform throughout the layer. To obtain the best practicable moisture content the Contractor will be required to perform such operations as are necessary. Supplementary water, as required, shall be added to the material on the earthfill. If the fill material in borrow areas or other excavations contains an excess of moisture prior to excavation, the Contractor will be required to excavate drainage channels or perform such work as may be necessary to reduce the moisture content of the material. Working of the material on the embankment may be required to produce the required uniformity of water content.

Water required to bring the material to the moisture content necessary for maximum compaction shall be evenly applied and it shall be the Contractor's responsibility to secure a uniform moisture content throughout the layer by such methods as may be necessary. Compaction shall commence immediately after the layer has been brought to the uniform moisture content required, and shall continue, with or without additional watering, until each layer has been uniformly compacted to not less than the specified density. Density tests will be made as necessary. If the material fails to meet the density specified the compaction methods shall be altered, if necessary, to obtain the specified density.

In restricted areas successive passes of the compaction equipment need not overlap but uniform compaction is required. Where new material abuts old material, either original ground or embankment fill, the old material shall be cut or broken by machine or hand methods until it shows the characteristic color of undried materials. The compaction equipment shall then work on both materials, bonding them together.

Backfilling around and outside of structures shall be compacted as specified hereinbefore. All fills forming the approach to the 36 inch diameter concrete encased vitrified clay pipe shall be constructed in horizontal

layers not exceeding 9 inches in uncompacted thickness and spread and leveled before compacting. Each such layer shall be thoroughly compacted by acceptable methods.

Construction around and in the vicinity of the 36 inch diameter concrete encased vitrified clay pipe shall be undertaken with special precaution to insure the integrity of the embankment for stability and seepage purposes. Embankment fill and clay core fill shall be deposited and compacted as specified to insure a uniform homogeneous dense fill completely surrounding the discharge pipe placed longitudinal to the axis of the dam embankment. Special care shall be given not to disturb the discharge pipes. Damage to the discharge pipe shall be corrected by and at the expense of the Contractor.

2E.13.5 Compaction and Moisture Requirements. Compacted earth materials shall meet the following compaction and moisture requirements.

All parts of the dam embankment, including the clay core and impervious earth blanket, shall be compacted to 95 per cent of maximum density at optimum moisture content. During compaction for the embankment fill, the moisture content shall be within a range of 2 per cent plus or minus of optimum. During compaction for the clay core and impervious earth blanket, the moisture content shall be within a range of 0 to 3 per cent above optimum.

Filter material shall be placed in horizontal layers not more than 6 inches in thickness and shall be thoroughly compacted to 100 per cent of maximum density. Increased layer thickness may be permitted if the Contractor demonstrates to the satisfaction of the Company that the specified compacted density will be obtained. Water shall be applied to the filter material as necessary to obtain the required compaction.

2E.14 IMPERVIOUS EARTH BLANKET CONSTRUCTION. The entire area to be covered by an impervious earth blanket shall be cleared and stripped as specified in Article 2E.4.

2E.14.1 Subgrade Preparation. Prior to placement of the impervious earth blanket the subgrade shall be thoroughly compacted and proof rolled. The subgrade shall be shaped to the lines, grades, and cross sections indicated on the drawings and compacted to a depth of at least 12 inches to 93 per cent of maximum density at optimum moisture content. This operation shall include scarifying, reshaping, and wetting required to obtain proper compaction. After compaction the area shall be proof rolled to test for uniformity and any loose soils detected shall be recompacted as specified.

No impervious earth blanket material shall be placed until the subgrade for that portion has been properly prepared and accepted by the Company.

2E.14.2 Impervious Earth Blanket Construction. The impervious earth blankets shall be constructed to the lines and grades indicated on the drawings. General requirements, the order of excavation, and the sources of materials shall be as specified herein.

At the beginning of the impervious blanket construction at the bottom ash and fly ash ponds, holding and recycle basins, the fuel oil storage area, and the coal storage area, the Contractor shall set grade stakes to show the intersection of the slopes with the grade surfaces.

2E.14.3 Materials. All materials placed in the impervious earth blankets shall be free from brush, stumps, logs, roots, and other deleterious material. All material for the impervious earth blanket construction required under the LUMP SUM shall be obtained from the impervious site borrow area designated on the drawings. All material for the impervious earth blanket construction required under the LUMP SUM PRICE ADDITION shall be obtained from the impervious earth stockpile area indicated on the drawings.

The impervious earth blanket material will be classified by the Company by testing and visual inspection and in accordance with Table 1 of the Unified Soil Classification System bound at the end of Section 2B.

Classification of materials obtained from the impervious earth borrow area will be determined as follows:

Material Designation as Specified	Unified Soil Classification	In-Place Location
Impervious earth blanket		
Type 1	CL	Recycle and holding basins, and fuel oil storage area
Type 2	SC	Bottom of bottom ash and fly ash ponds with SC material and remaining CL material; ditches in coal storage area
Type 3	SC-SM	Top erosion resistant cover for ditches in coal storage area
Type 4	SC, SC-SM, CL-SC	Coal storage area excluding ditches

The drawings indicate the detailed limitations for the placement of impervious earth blanket Type 1-4 material.

2E.14.4 General Requirements. The suitability of each part of the foundation for placing foundation materials thereon and of all materials for use in impervious earth blanket construction shall be acceptable to the Company.

Dimensions indicated on the drawings for thickness of impervious earth blanket material are minimum dimensions. No intermingling of material will be permitted within these dimensions.

2E.14.5 Equipment. Maximum compaction of the natural ground as prepared, and of each layer or lift of the fill, shall be obtained through the use of equipment so operated that the finished embankment shall be uniformly stable and compacted. Isolated operations shall be provided with sufficient equipment to permit the work to be carried to completion in a continuous and efficient manner. Prime movers used for pulling equipment shall have sufficient power to pull the equipment satisfactorily when fully loaded. The loading and operation of equipment shall be subject to adjustment as required to produce the specified compaction.

The Company will determine the areas of the borrow pits from which the various classifications of material are to be obtained and also the depth of excavation in the borrow pits. The Manager will also determine the location in the dam where each type of material will be placed in accordance with the classification of materials specified hereinbefore under "Materials".

The Contractor will be required to break up the earthfill materials, either at the place of excavation or on the embankment, to such maximum size as is determined necessary by the Company to secure specified density of the material in the embankment. Equipment on the embankment shall spread out and not track each other to such an extent as to make ruts. The compacted surface of each lift shall be roughened or loosened by scarifying to the satisfaction of the Company, before the succeeding layer is placed thereon, in order to provide the necessary bond between each lift.

Prior to and during the compacting operations the material in each layer of the impervious earth blanket shall have the best practicable moisture content, and the moisture content shall be uniform throughout the layer. To obtain the best practicable moisture content the Contractor will be required to perform such operations as are necessary. Supplementary water, as required, shall be added to the material on the earthfill. If the fill material in borrow areas or other excavations contains an excess of moisture prior to excavation, the Contractor will be required to excavate drainage channels or perform such work as may be necessary to reduce the moisture content of the material. Working of the material on the embankment may be required to produce the required uniformity of water content.

Water required to bring the material to the moisture content necessary for maximum compaction shall be evenly applied and it shall be the Contractor's responsibility to secure a uniform moisture content throughout the layer by such methods as may be necessary. Compaction shall commence immediately after the layer has been brought to the uniform moisture content required, and shall continue, with or without additional water, until each layer has been uniformly compacted to not less than the specified density. Density tests will be made as necessary. If the material fails to meet the density specified the compaction methods shall be altered, if necessary, to obtain the specified density.

In restricted areas successive passes of the compaction equipment need not overlap but uniform compaction is required. Where new material abuts old material, either original ground or embankment fill, the old material shall be cut or broken by machine or hand methods until it shows the characteristic color of undried materials. The compaction equipment shall then work on both materials, bonding them together.

Backfilling around and outside of structures shall be compacted as specified hereinbefore. All fills forming the approach to the spillway bridge shall be constructed in horizontal layers not exceeding 9 inches in uncompacted thickness and spread and leveled before compacting. Each such layer shall be thoroughly compacted by acceptable methods.

2E.14.6 Compaction and Moisture Requirements. Compacted earth materials shall meet the following compaction and moisture requirements.

All parts of the impervious earth blanket shall be compacted to 93 per cent of maximum density at optimum moisture content. During compaction, the moisture content of each of these materials shall be maintained within the range from optimum to 3 per cent greater than optimum.

Sand cover material shall be placed in horizontal layers not more than 6 inches in thickness and shall be thoroughly compacted to 95 per cent of maximum density. Water shall be applied to the sand cover material only as necessary to obtain the required compaction.

2E.14.7 Recompaction of Impervious Earth Blanket. All compacted impervious earth blanket within the bottom ash pond, fly ash pond, holding basin, and recycle basin shall be recompacted and sealed. Recompaction and sealing is required to reduce potential cracks caused by freezing, thawing, shrinkage, and swell due to temperature and moisture changes. The entire earth blanket within the fly ash and bottom ash ponds, and the holding and recycle basins shall be recompacted and sealed as directed by the Company just prior to filling the basins and ponds by the Company. Any areas needing repair shall be scarified, watered and compacted as specified.

2E.15 DISPOSAL OF WASTE AND EXCESS EXCAVATED MATERIALS. All unsuitable materials excavated in connection with stripping operations, all materials excavated and determined by the Company to be unsuitable for use, and excess excavated materials which are suitable for use but which are not needed shall be disposed of as indicated on the drawings.

Section 2F - SOIL CEMENT

2F.1 GENERAL. This section covers the materials and construction requirements for soil cement including placing, application of cement, mixing, compaction, construction joints, and protection and curing.

Road mix soil cement shall conform to the applicable requirements of Standard Specifications for Highway Construction, Minnesota Department of Highways, Section 2206 and to such additional requirements stated herein.

The soil cement shall be used in the construction of the stacker-reclaimer track base and the coal retaining dike to the limits indicated on the drawings.

2F.2 TESTING. All field and laboratory testing required to determine compliance with the requirements of this section will be provided by the Company. The Contractor shall cooperate with the Company in this respect. The Contractor will be furnished one copy of test reports.

Maximum density for the compacted materials placed under this section will be determined in accordance with ASTM D1557, Method A or C. The terms "maximum density" and "optimum moisture content" shall be as defined in ASTM D1557, Method A or C.

At least one field density test will be made for each 2000 cubic yards of compacted material. Sampling and testing will be more frequent at the start of soil cementing.

2F.3 MATERIALS. Materials used for the soil cement shall generally be on-site earth materials mixed with portland cement and water and shall conform to the following requirements:

Soil	On-site SP or SM material reasonably free of organic material, clay or other objectionable matter
Cement	ASTM C150, Type I
Water	Clean and free from mud, oil, organic matter, or other deleterious substances; potable
Bituminous material for curing	
Cut-back asphalt	RC-70, 250
Asphalt emulsion	RS-1, RS-2

Unless otherwise restricted, the type and grade of bituminous material used shall be optional with the Contractor.

On-site earth material shall not contain organic matter in detrimental quantity, and shall be screened as necessary to remove all stones or large aggregate that would be retained on a 3 inch sieve.

Cement for the production of soil cement will not be available from the existing on-site concrete batch plant.

2F.4 CONSTRUCTION. The soil cement shall be constructed by the method where the soil, cement and water are mixed in place on the stacker-reclaimer track base and the coal retaining berms.

Operations shall be so conducted that the mixing, compacting and application of the curing material will be completed, over the full width of the section under construction during daylight hours on the same day. The mixing may be done on portions of the width at a time, provided there is sufficient overlapping at the edges of the longitudinal strips to produce a mixture with a uniform cement content and thickness over the entire width.

Mixing, spreading, and compacting operations shall only be performed when the air temperature is 40 F or above.

2F.4.1 Placing. Selected soil or aggregate shall be placed in the stacker-reclaimer base and the coal retaining dikes as required, shaped approximately to the required grade and cross section indicated on the drawing, and compacted with a pneumatic tired roller. Two passes of the roller over each strip the width of the roller shall be required for each lift.

2F.4.2 Application of Cement. A record of the gross and tare weights of each truck load of cement will be required. The Contractor may provide a truck platform scale within the limits of the project or the trucks may be weighed on public scales outside the project. In either case the scales shall be large enough to weigh the loaded truck in one operation, and the scales shall be equipped with a digital recorder which will provide a record of the gross and tare weights. When trucks are weighed on the Contractor's scale, the cement record shall be submitted to the Company each day together with a certified statement of the total weight of cement used in the work that day. When trucks are weighed on public scales, a weigh ticket shall be furnished with each load, the cement compartments shall be sealed at the point of origin, and the seals shall be broken only at the destination in the presence of a representative of the Company.

When mixed, the soil cement shall have nominally 188 pounds of cement for each cubic yard of compacted soil cement.

The specified quantity of cement shall be deposited uniformly over the width of section being constructed. The quantity of cement placed shall not be less than 181 pounds for each cubic yard of compacted soil cement.

No equipment, except that used in spreading and mixing, will be allowed to pass over freshly spread cement until it is mixed with the earth materials.

Cement shall be applied only to a section of such length that all subsequent operations can be carried out in accordance with these specifications. No cement shall be applied when the subgrade will not support the equipment without rutting or other deformation or when the percentage of moisture in the soil exceeds the allowable maximum moisture content of the soil cement mixture.

2F.4.3 Mixing. The mixing machine may be of the type which picks up loose soil for the full depth of the base and mixes the soil, cement and water, all as a single operation or loosens and pulverizes the soil in the section for the full depth of the base and mixes the soil, cement, and water, all as a single operation. Mixing shall be done by a single continuous forward movement of the machine.

Mixing operations on each section shall be started within one hour after placement of cement thereon.

Either as a part of the mixing operations or prior thereto, the earth shall be pulverized to the extent that all of the material will pass the one inch sieve and not less than 80 per cent (by moist weight) will pass the No. 4 sieve, exclusive of stones retained. Pulverizing shall not be done on any section in which the base can not be completed within 48 hours.

The soil, cement and water shall be mixed for the full depth of the base at one time to provide a uniform mixture with uniform moisture content. Water required to be added shall be applied uniformly in the mixer. The mixing operation shall be such that, prior to the application of water, sufficient mixing of earth and cement shall be done to prevent the formation of cement balls. The moisture content of the mixture at the conclusion of the mixing operations shall be not less than 80 per cent nor more than 100 per cent of optimum moisture, except that it shall be less than that which will cause the base to become unstable during the compacting and finishing operations.

2F.4.4 Compaction. Compaction shall be obtained by the specified density method. The soil cement mixture shall be compacted uniformly in 6 inch lifts to 97 per cent of maximum density. The maximum density of the soil cement mixture will be determined by the Company by the method prescribed in the Minnesota Department of Highways Grading and Base Manual, using representative samples of the moist soil cement mixture. The samples will be obtained near the conclusion of moist mixing operations from the section being processed. The density of the completed base will be determined by the method described in the Minnesota Department of Highways Grading and Base Manual. During compaction of the soil cement, the moisture content shall be within the range of 2 per cent plus or minus of optimum.

Just prior to beginning the compacting operations, the mixture shall be shaped to the section indicated on the drawings.

At the time compacting is started, the mixture shall be in a loose condition for the depth of the lift. To ensure this condition, all mixtures in each section of the base shall be loosened to the full depth of that lift at least once every 30 minutes from the time the mixing is completed until compacting is started on that lift.

The compaction shall proceed continuously until about one inch of loose mixture remains on the surface, and shall be completed to that extent on each lift within 4 hours after the mixing operations on that area were started.

After a lift, except approximately the top one inch, has been compacted, the surface shall be shaped to the required line, grade and cross section. The surface shall then be lightly scarified to produce a uniformly loose mulch approximately one inch thick, and water added as may be necessary to produce the required moisture content in the loose material, which moisture content shall be maintained until compaction is completed. The water required for his operation shall be applied by a distributor capable of applying water uniformly over the entire section. The resulting surface shall be rolled in such a manner as to produce a smooth, closely knit surface, free of cracks, ridges, or loose material, conforming to the required lines, grade and cross section.

The compaction of the top one inch of a lift on the full width of the section under construction shall be completed within one hour after the completion of the compaction of the lower portion of that lift. On any area of the lift, the material in the top one inch shall be loosened at least every 30 minutes from the time the compaction of the lower portion of the lift on that area is completed until compaction of the top one inch on that area is started.

During final compaction operations, the Company will check the work for conformance with the specifications. Excess materials shall be disposed of immediately and the disturbed portions of the soil cement shall be recompacted. Any portion of the work which does not meet the specifications shall be removed and replaced by and at the expense of the Contractor.

The slopes of the cross section shall be constructed true to line and grade as indicated on the drawings and shall be graded within 3 hours after placement of each lift.

2F.4.5 Construction Joints. No construction joints will be permitted except where construction is halted for a period of 3 hours or more. Unless such joints are made by the use of headers, the end of the section placed shall be cut back to a square joint and a firm section before operations are resumed. The portions removed may be pulverized and reused as soil with cement added as directed by the Company.

2F.4.6 Protection and Curing. Within 4 hours after the surface has been finished and during daylight hours on the same day, the exposed finished surfaces of the stacker-reclaimer track base and the coal retaining dikes shall be fogged with water in an amount sufficient to fill the voids in the surface, immediately after which it shall be covered with a membrane of bituminous curing material applied at a rate designated by the Company, but not to exceed 0.2 gallon per square yard. The temperature of the bituminous material at the time of application shall be acceptable to the Company within the ranges of 90 F to 150 F for emulsion and 125 F to 175 F for cutback asphalt. The surface shall then be uniformly covered with sand applied at a rate designated by the Company, but not to exceed 15 pounds per squre yard.

The bituminous membrane shall be maintained intact, and the base shall be protected from freezing, for a period of not less than 7 days.

The finished top surface of the section shall show no variation greater than 1/2 inch from a 10 foot straight edge laid thereon parallel to the longitudinal center line. The finished slopes shall be within 3 inches of plan dimension at the top and bottom of the slopes and shall show no variation greater than 1/2 inch from a 10 foot straight edge laid parallel to the slope.

Elevation of the finished surface of the base, at any point thereon, shall not vary by more than one inch from the designated elevation for that point as indicated on the drawings.

The top lift of soil cement shall be completed in one operation and no construction equipment shall be allowed on the completed surface until it has cured at least 7 days.

Section 2G - RIPRAP

2G.1 GENERAL. This section covers materials and procedures for the installation of dumped riprap and riprap bedding.

Riprap and riprap material shall be obtained from sources other than the property of the Company. Quarries and gravel pits for the express purpose of producing riprap and riprap bedding are prohibited on the Company's property.

Riprap and riprap bedding will be required at locations indicated on the drawings. Riprap bedding will be required at all riprap locations. Thickness of riprap and bedding shall be as indicated on the drawings.

2G.2 MATERIALS. Stone used for dumped riprap shall be hard, durable, angular in shape; resistant to weathering and to water action; free from overburden, spoil, shale and organic material; and shall meet the gradation requirements for the class specified. Neither breadth nor thickness of a single stone should be less than one-third its length. Rounded stone or boulders will not be accepted. Shale and stone with shale seams are not acceptable. The minimum weight of the stone shall be 162 pounds per cubic foot as computed by multiplying the specific gravity (bulk-saturated-surface-dry basis, AASHO T85) times 62.3 pounds per cubic foot.

The riprap bedding blanket shall consist of one or more layers of gravel, crushed rock, sand, or a combination thereof of the thickness indicated on the drawings. The gradation of material in each layer of the blanket shall meet the requirements for the class specified. All material comprising the riprap bedding blanket shall be composed of tough, durable particles, reasonably free from thin, flat, and elongated pieces, and shall contain no organic matter nor soft, friable particles in quantities in excess of those specified.

Class B riprap has no bedding.

2G.2.1 Dumped Riprap. The riprap gradation requirements shall be as follows unless otherwise acceptable to the Company.

Class	Stone Size (in pounds)	Per Cent of Total Weight Smaller than the Given Size
A	200	100
	80	80
	50	50
	2 not to exceed	10
B	200	100
	80	0

Five per cent (by weight) of the stone may be 15 inches in greatest dimension.

Each load of riprap shall be reasonably well graded from the smallest to the maximum size specified. Stones smaller than the specified 10 per cent size and spalls will not be permitted in an amount exceeding 10 per cent by weight of each load. Sand and rock dust will not be permitted in an amount exceeding 5 per cent by weight of each load.

Control of gradation will be by visual inspection. The Contractor shall provide two samples of stone of at least 5 tons each, meeting the gradation specified. One sample shall be located at the construction site near the location where the riprap is to be placed. The other sample shall be provided at the quarry. These samples shall be used as a frequent reference for judging the gradation of the riprap supplied and shall be in place and accepted by the Company before riprap placing work begins. Any difference of opinion between the Company and the Contractor concerning gradation, shall be resolved by dumping and checking the gradation of two random truckloads of stone. Mechanical equipment, a sorting site, and labor needed to assist in checking gradation shall be provided by the Contractor at no additional cost to the Company.

2G.2.2 Riprap Bedding. The riprap bedding and gradation requirements shall be as follows unless otherwise accepted by the Engineer.

US Standard Sieve Size	Per cent Passing
3 inch	100
2 inch	85-100
1 1/2 inch	72-90
3/4 inch	50-70
1/2 inch	35-50
No. 3	22-32
No. 6	12-20
No. 10	0-12

2G.3 PRELIMINARY REVIEW. The Company's acceptance of the source and quality of riprap and riprap bedding blanket materials shall be obtained before the riprap work is started. For such review, certified reports prepared by an independent testing laboratory shall be submitted to the Company. Acceptance given on the basis of these reports will be a general review only and continued compliance with all contract provisions will be required.

2G.3.1 Dumped Riprap. The sources from which the stone will be obtained shall be selected well in advance of the time when the stone will be required in the work. The acceptability of the stone will be determined by tests. Suitable samples of stone shall be taken in the presence of the Company at least 25 days in advance of the time when the placing of riprap is expected to begin. The acceptance of some rock fragments from a particular quarry site shall not be construed as constituting the acceptance of all rock fragments taken from that quarry.

Riprap materials shall meet the following requirements when tested in accordance with the specified procedures:

Test	Designation	Requirements
Specific gravity (Bulk saturated surface dry)	AASHO T85	Greater than 2.60
Abrasion (Abrasive Grading A)	AASHO T96	Less than 40 per cent loss of weight after 500 revolutions
Freezing and thawing (Ledge rock type test and sample tested by Procedure A)	AASHO T103	Less than 10 per cent loss of weight after 12 cycles

In addition, documented service records of the proposed material will be considered by the Company in determining the acceptability of the stone.

2G.3.2 Riprap Bedding. Riprap bedding materials shall meet the following requirements when tested in accordance with the specified procedures:

Test	Designation	Requirements
Sampling	AASHO T2	No special requirements
Sieve analysis	AASHO T27	Percentages passing standard sieve sizes 3, 2, 1-1/2, 1, 3/4, and 3/8 inch and Nos. 4 and 16
Organic matter (Alternate Procedure A)	AASHO T21	Test solution lighter in color than standard
Clay lumps	AASHO T112	Not to exceed 1.5 per cent by weight
Lightweight pieces	AASHO T113	Not to exceed 2 per cent by weight

2G.4 PLACEMENT. Dumped riprap and riprap bedding materials shall be placed on slopes indicated on the drawings. Earth slopes shall be compacted as specified in the section covering construction of the slope.

Where required by the drawings, a riprap bedding blanket shall be placed on the prepared slope or area to the full specified thickness of each layer in one operation, using methods which will not cause segregation of particle sizes within the bedding. The surface of the finished layer should be reasonably even and free from mounds or windrows. Additional layers of bedding material, when required, shall be placed in the same manner, using methods which will not cause mixture of the material in the different layers.

Stone for riprap shall be placed on the prepared slope or area in a manner which will produce a reasonably well graded mass of stone with the minimum practicable percentage of voids. The entire mass of stone shall be placed in conformance with the lines, grades, and thicknesses indicated on the drawings. Riprap shall be placed to its full course thickness in one operation and in such a manner as to avoid displacing the underlying material. Placing of riprap in layers, or by dumping into chutes, or by similar methods likely to cause segregation will not be permitted.

The larger stones shall be well distributed and the entire mass of stone shall conform to the gradation specified. All material placed as riprap protection shall be so placed and distributed that there will be no large accumulations of either the larger or smaller sizes of stone.

It is the intent of these specifications to produce fairly compact riprap protection in which all sizes of material are placed in their proper proportions. Stone fragments in riprap need not be compacted by mechanical means, but shall be dumped and graded off in a manner which will insure that the larger rock fragments are uniformly distributed and that the smaller rock fragments fill the spaces between the large rock fragments. The result shall be a compact, uniform riprap layer of the specified thickness. Hand placing will be required only to the extent necessary to obtain the results specified above.

Section 2H - CRUSHED ROCK OR GRAVEL SURFACING

2H.1 GENERAL. This section covers furnishing of materials and the application of crushed rock or gravel surfacing for access roads and other areas designated on the drawings. Areas to receive crushed rock or gravel surfacing shall be designated as Class 1, 2, 5 or 6 on the drawings.

Materials, application of surfacing, and the sampling and testing of aggregates shall comply with Sections 2211 and 3138 of Minnesota Department of Highways "STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION", (hereinafter referred to as MDH) unless otherwise specified herein.

Surfaced areas shall be maintained by the Contractor until final acceptance by the Company of the work under these specifications.

2H.2 MATERIALS. Crushed rock or gravel surfacing materials shall conform to the requirements of MDH Section 3138 Table 3138-1 and the following requirements:

Location	Compacted Total Aggregate Depth	Aggregate Gradation
Roads or areas indicated on the drawings as Class 5 or 6	As indicated on the drawings	Class 5 or 6
Roads or areas indicated on the drawings as Class 1 or 2	As indicated on the drawings	Class 1 or 2

2H.3 SUBGRADES. Subgrades for roadways indicated to be surfaced shall be graded and compacted as specified in Article 2B.14.

2H.4 APPLICATION. Surfacing shall be applied in layers not exceeding 3 inches in thickness having a total compacted thickness as tabulated hereinbefore except that, if vibratory or other acceptable types of special compacting equipment are used, the thickness of each layer may be increased to a maximum of 6 inches.

The aggregate for each layer shall be handled and spread in a manner that will prevent segregation of sizes. Each layer shall be carefully and uniformly spread, and compacted to 97 per cent of maximum density at optimum moisture content as determined by ASTM D1557, Method A or C.

The completed road surfacing shall be free of ruts, depressions, and other surface irregularities and shall be finished to the lines, grades, and cross section indicated on the drawings.

2H.5 MAINTENANCE. Maintenance of crushed rock or gravel surfaced roads shall consist of daily inspection and periodic maintenance operations by the Contractor throughout the period utilized to complete the work under these specifications. Maintenance operations shall include loosening, adding, and removing material, grading, reshaping, recompacting, and dust control as required to keep the surfaced areas in first class condition. Dust control shall include watering roadway surfaces as required by the Company.

Section 2I - BITUMINOUS PAVING

2I.1 GENERAL. This section covers the materials and construction methods for bituminous paving for the areas designated on the drawings.

Bituminous paving shall consist of asphaltic concrete placed in maximum lifts of 1-1/2 inches each over compacted aggregate or earth base.

Materials and workmanship shall conform to Minnesota Department of Highways "STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION" (hereinafter referred to as MDH), Section 2331 covering Plant Mixed Bituminous Surface (Single Aggregate Type).

Paved areas shall be maintained by the Contractor until final acceptance by the Company of the work under these specifications.

2I.2 MATERIALS. Materials for bituminous paving shall conform to the following:

Aggregate for base course	MDH, Section 3138, Class 5 or 6
Asphalt primer	MDH, Section 2358, Grade MC-70
Asphaltic concrete	MDH, Section 2331, job mix formula acceptable to the Company, design density 95 per cent of voidless mixture determined by Hubbard-Field test or ASTM D1074
Asphalt cement	AC-1, penetration grade as determined by the Company
Mineral aggregates	MDH, Section 3138, Class 5 or 6
Mineral filler	ASTM D242 or as specified in Section 3145 of MDH, subject to acceptance by the Company
Liquid asphalt	AASHO M141, grade as determined by the Company
Tack coat	MDH, Section 2357, grade as determined by the Company

2I.3 SUBGRADES. The top 12 inches of subgrade for areas designated to have asphalt paving shall be prepared and compacted as specified in Article 2B.14.

2I.4 BASE COURSE. The base course shall be constructed in equal layers to provide a total compacted depth as indicated on the drawings. The aggregate shall be spread in a manner that will minimize segregation of particle sizes.

Each layer shall be compacted to 100 per cent of maximum density, as determined by the "Specific Density Method" in Section 2211 of MDH. The surface of each layer shall be hard and smooth and shall parallel the grade and section indicated for the finished paving surface.

2I.5 ASPHALTIC CONCRETE. Before the asphaltic concrete is placed, an asphalt primer shall be applied to the base course at a rate between 0.10 and 0.30 gallon per square yard as required to fill all voids and interstices and uniformly coat the base course surface.

The rate of application of the primer shall be adjusted to suit the gradation of the base course material. The prime coat shall cure for not less than 24 hours. If the asphalt primer is not entirely absorbed by the base within 24 hours, excess primer shall be blotted with sand. Blotter sand shall pass a No. 4 sieve and be retained on a No. 200 sieve.

The paving shall be laid in lifts not to exceed 1-1/2 inches each and shall be laid hot using a mechanical spreader having widths between 8 feet and 12 feet. Where practical, the work shall be laid out so that equal widths are used throughout the area being surfaced. The spreader shall be equipped with a screed or strike-off device which produces a smooth, uniform surface of proper shape and grade.

The asphalt paving shall be compacted continuously as closely behind the paver as necessary to obtain the specified density without causing undue displacement. The completed paving shall have a density equal to or greater than 95 per cent of the density of a laboratory specimen made in the proportions of the job mix formula.

A tack coat shall be applied between lifts of asphalt paving at the rate of not to exceed 0.05 gallon per square yard. The tack coat shall not be applied when the surface or weather conditions are unsuitable.

The surface at the time of applying the tack coat shall be clean and dry, and all foreign matter on the surface shall be removed and disposed of by the Contractor.

2I.6 TESTING. The job mix formula, aggregate requirements, and compaction density requirements for subgrade, base course, and asphaltic concrete paving shall be determined by an independent testing laboratory retained and paid by the Company. One compaction density test shall be made in the subgrade, in each layer of the base course, and in the asphaltic concrete paving. If the original density tests indicate the compaction to be inadequate, additional compaction and testing shall be performed until the density meets the requirements of these specifications.

Section 2J - SEEDING

2J.1 GENERAL. This section covers the furnishing of all materials and equipment, and the performance of all operations in connection with seeding in accordance with the drawings, these specifications, and referenced specifications.

Seeding work shall include preparation of soil surfaces, fertilizing, planting seed, and mulching.

Areas which shall be seeded include all areas within the limits of seeding indicated on the drawings and all areas disturbed under other specifications within the designated limits of construction.

All seeding work shall be performed by an experienced seeding contractor having acceptable equipment manufactured expressly for the purpose.

The Contractor shall not start seeding or preparatory work until notified by the Company and until excavation, trenching, backfill and embankment, rough grading, surfacing and paving have been completed under concurrent specifications in the vicinity of seeding.

2J.2 EQUIPMENT. The equipment used for the seeding, mulching, and fertilizing shall be manufactured expressly for the establishment of native grasses. A complete list of equipment proposed by the Contractor for all seeding work shall be included in the Proposal. To be considered adequate and appropriate the equipment proposed for use by the Contractor shall include but not be limited to equipment generally conforming to the following:

1. A grass seed drill, 10 to 12 feet wide with 6 inch spacing between seedcups. The disc openers should be equipped with depth bands for 3/4 inch soil penetration. It should also be equipped with a minimum of two seed boxes; one for coarse grass seeds and the other for small seeds. The seed boxes should have agitators and a force feed system. The drill should have a set of packer wheels to firm the seed into the ground.

2. A mulch tiller having flat serrated discs spaced 8 inches apart, mounted on rubber tired wheels for controlled mulch penetration and two boxes mounted front and back of discs for loading of weights for controlled penetration.

3. A blower mulcher capable of spreading mulching material evenly over the surface, either on slopes or flat areas, at the rates specified.

2J.3 MATERIALS. Materials and workmanship shall comply with Section 2575 of Minnesota Department of Highways "STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION" (hereinafter refered to as MDH) unless otherwise specified herein.

2J.3.1 Seed. All seed shall comply to the requirements of the latest seed laws of the State of Minnesota including those governing weed seed tolerances. All seed shall equal or exceed the percentage of sproutable seed as indicated in the tabulation which follows. The percentage of either germination or purity may vary slightly from those indicated, provided the product of per cent germination times per cent purity shall not fall below the specified minimum sproutable seed (hereinafter referred to as Pure Live Seed - PLS). The germination and purity of all seeds used shall be determined by acceptable laboratory test methods as employed by the State Seed Laboratory. All grass seed shall be of South Dakota, North Dakota, Nebraska or Montana origin.

	Minimum Per Cent		
Legumes	Purity	Germination	PLS
Bird's-foot Trefoil, var. Empire (Lotus corniculatus)	97	85	82.4
White Dutch Clover (Trifolium repens)	99	92	91.1
Grasses			
Side Oats Grama var. Pierre or Killdeer (Boutoloua carpentendula)	50	65	32.5
Creeping Red Fescue, var. Illake or Pennlawn (Festuca rubra)	97	80	77.6

The seed mixture furnished shall be mixed by the vendor and shall be delivered in standard size bags of the vendor, showing weight, analysis and vendor's name.

2J.3.2 Inoculating Bacteria. The inoculant for treating leguminous seed shall be pure culture of nitrogen-fixing bacteria selected for maximum vitality, not more than one year old. All cultures shall be subject to the acceptance of the Company.

2J.3.3 Commercial Fertilizer. Commercial fertilizer (10-20-20) shall contain not less than 10 per cent nitrogen, 20 per cent available phosphoric acid and 20 per cent water soluble potash. The fertilizer shall be inorganic or a combination of inorganic and organic substances. The methods used to determine the various elements shall be those adopted by the Association of Official Agricultural Chemists.

Commercial fertilizer shall be delivered in standard size bags of the manufacturer, showing weight, analysis, and name of manufacturer. If the commercial fertilizer is not used immediately after delivery, the Contractor shall store it in a manner that will not impair its effectiveness.

2J.3.4 Mulch. Straw or hay mulch shall consist of wheat straw, oat straw, Sudan grass hay or prairie hay. The prairie hay shall consist of bluegrass hay, switch grass, Indian grass or other desirable grasses that are adaptable for use in a blower mulcher. The material shall be relatively free of seed-bearing stalks of noxious grasses or weeds as defined by the rules and regulations of Minnesota Department of Agriculture.

2J.4 CONSTRUCTION METHODS. The preparation of seedbed for embankments and flat areas are described as follows.

Embankments include road, railroad, and dike slopes. Embankments shall be thoroughly tilled parallel to the contour to a depth of 2 inches until the soil is well pulverized.

Flat areas include all areas not included under embankments. Parcels of flat land which have been disturbed shall be thoroughly tilled perpendicular to prevailing winds and to a depth of at least 2 inches until the soil is well pulverized. After completion of the tilling operation, the surface shall be cleared of all stones, stumps, or other objects larger than 1-1/2 inches in thickness or diameter, and of roots, wire, grade stakes, and other objects that might be a hindrance to maintenance operations. Paved areas in the vicinity of this work shall be kept clean and dirt that may be brought upon the surface shall be removed promptly.

Any objectionable undulations or irregularities in the surface resulting from tillage or other operations shall be removed before seeding operations are begun. Seedbed preparation shall be performed only during periods when satisfactory results are likely to be obtained. When results are not satisfactory because of drought, excessive moisture or other causes, the seeding work shall be stopped. The seeding work shall recommence at the earliest possible date and be completed to the satisfaction of the Company.

2J.4.1 Mulching. Mulching shall be accomplished as soon after grading as possible in order to prevent erosion, regardless of the proper seeding time. Seed may be drilled in later on top of the mulch if the proper seeding dates do not correspond with the mulching. If it is the proper time for seeding as specified in Article 2J.4.3.1 then the mulching shall be performed immediately following and on the same day as the seeding.

The mulching material shall be placed uniformly at the rate of 2 tons per acre over the entire seedbed area, by means of a mulching blower or other acceptable means. The mulching material shall be disced or punched into the soil to a depth of 2 to 3 inches so that it is partially covered. Two or more passes of the mulch puncher or serrated disc may be required to thoroughly anchor the mulch into the soil. The operation of all mulch tilling equipment shall be performed parallel to the ground contours.

2J.4.2 Fertilizing. Commercial fertilizer of the type specified shall be distributed uniformly over the area only at time of seeding at the rate of 800 pounds per acre. The fertilizer shall be applied with a fertilizer drill before the beginning of the mulching operation as a part of the seedbed preparation or, if a seed drill with a fertilizer attachment is used, it may be applied with the seeding operation.

The second application of fertilizer shall be broadcast over the entire seeded area near the end of the first growing season either in the fall between September 1 and October 30 or in the spring between February 15 and April 15. Fertilizer shall be the same type as specified above and broadcast over the surface at the rate of 800 pounds per acre.

2J.4.3 Seeding. The seeds shall be mixed and applied uniformly at the following rates with the seed drill.

Drills shall deliver seeds uniformly in each drill furrow so that seeds are covered by no more than 1/2 inch of earth. When drilling seed, provisions shall be made with markers or other acceptable means to assure that successive planted strips will either overlap or be separated by a space not greater than the space between rows planted by the equipment being used.

If inspection during planting operations, or after there is a show of green, indicates that strips wider than the space between planted rows have been left or other areas skipped, additional seed shall be planted in all such areas. Seeding shall not be done during periods of such severe drought, high winds or excessive moisture (as determined by the Company) that satisfactory results are not likely to be obtained.

2J.4.3.1 Seed Mixture. The following seed mixtures shall be drilled into the specified areas. Spring seeding shall be performed between April 1 and June 10 and fall seeding shall be performed between August 1 and August 15. Coordinate seeding and mulching as specified in Article 2J.4.1.

Spring Seeding Mixture

Approximate Per Cent of Mixture	Seed	Pounds PLS Per Acre
60	Creeping Red Fescue	19.5
10	Side Oats Grama	3.5
20	Bird's-foot Trefoil	6.5
10	White Dutch Clover	3.5
100		33.0 Total

Fall Seeding Mixture

Approximate Per Cent of Mixture	Seed	Pounds PLS Per Acre
65	Creeping Red Fescue	21.1
13	Side Oats Grama	4.6
22	Bird's-foot Trefoil	7.2
100		32.9 Total

2J.5 GUARANTEE. The Contractor shall be responsible for good stands of grass on all seeding areas for one full growing season. Any washes caused by erosion or areas disturbed by construction equipment shall be repaired and reseeded.

DIVISION 3 - CONCRETE

CONTENTS

Section 3A - CONCRETE

3A.1 GENERAL. This section covers the furnishing and placing of all cast-in-place concrete and includes furnishing and placing of reinforcing steel and forms, finishing, curing, and other appurtenant work.

Ready-mixed concrete and mortar puddle shall be obtained from an on-site batch plant having a capacity of 150 cubic yards per hour.

The Contractor shall inform the Company and batch plant contractor at least 24 hours in advance of the times and places at which he intends to place concrete.

The Company will also provide certain field testing of concrete and concrete materials as described hereinafter under TESTING.

3A.2 BATCH PLANT CONCRETE. The concrete from the batch plant will be delivered in truck mixers in the general vicinity of the concreting work. The Contractor shall handle the concrete from the discharge spout of the truck to final placement.

Field control of the concrete mix and consistency will be maintained by the Company.

The classes of concrete from the batch plant will conform to the requirements given in Table I attached at the end of this section. Type II cement will be used in all concrete classes. The Company may or may not elect to substitute fly ash for a part of the cement.

Classes of concrete will be provided as described hereinafter for the various items of work under these specifications:

Concrete Class	Structure or Use
A-1	Lean concrete fill

The use of plasticizing or retarding admixtures will be controlled by the Company.

Heated concrete will be available for placement during cold weather and cooled concrete will be available during hot weather as defined hereinafter.

All testing for control of the concrete will be provided by the Company. The Contractor shall cooperate with the Company in procuring samples for testing.

The Contractor shall cooperate with the concrete supplier to unload the trucks and place the concrete within 45 minutes after introduction of the cement to water or wet aggregates. The current concrete supply contract requires an initial set time of not less than 5 hours after the water and cement are added to the aggregates. Time of set will be determined by ASTM C403.

The Contractor will not be permitted to alter the concrete furnished. The Contractor may request a change in the mix by written request to the Company who will determine whether the change is justified. Mix changes which increase the cost of the concrete will be charged to the Contractor if the change was made at his request.

The Contractor shall keep accurate records on the amount, class, location, date, and time of each concrete delivery, and shall be solely responsible for ordering and placing the correct concrete class in each structure.

It is the intent of these specifications to achieve sound, durable, strong concrete. The concrete supplier will be responsible for providing concrete which meets the specified strength, slump and water cement ratio.

Concrete with defects caused by honeycomb, cold joints, or improper curing as the result of improper placement shall be repaired at the Contractor's expense.

3A.3 MATERIALS.

3A.3.1 Batch Plant-furnished Materials. The Company has specified that concrete from the batch plant be composed of the following:

Cement	ASTM C150, Type II
Fine aggregate	Clean natural sand, ASTM C33. Artificial or manufactured sand will not be acceptable. Iron oxide 0.5 per cent maximum
Coarse aggregate	Crushed stone, washed gravel, or other acceptable inert granular material conforming to ASTM C33, except that clay and shale particles shall not exceed one per cent; iron oxide 0.5 per cent maximum
Fly ash	ASTM C618, except weight loss on ignition shall not exceed 5 per cent
Water	Clean and free from mud, oil, organic matter, or other deleterious substances; potable

Admixtures

Retarder	ASTM C494, Type D; Grace "Daratard" Master Builders "Pozzolith Retarder", Protex "PDA Retarder", Sika Chemical "Plastiment", or acceptable equal
Plasticizer	ASTM C494, Type A; Grace "WRDA", Master Builders "Pozzolith", Protex "PDA Normal Set", Sika Chemical "Plastocrete", or acceptable equal
Air entraining agent	ASTM C260; Grace "Darex AEA", Master Builders "MBVR", Protex "Air Entraining Solution", Sika Chemical "AER", or acceptable equal

3A.3.2 Contractor-furnished Materials. Where the use of the following materials is specified herein, such materials shall be in accordance with these requirements:

Reinforcing steel	ASTM A615, Grade 40
Bar supports	Product Standard PS7, fabricated from galvanized wire. Plastic coated or tipped for use in contact with forms for exposed surfaces

Forms

Prefabricated	Low Cost Forms "One Lock Forms", Symons "Steel Ply", or Universal "Uni-form"
Plywood	Product Standard PS1, waterproof, resin-bonded, exterior type Douglas fir; face adjacent to concrete Grade B or better
Fiberboard	Fed Spec LLL-B-810, Type IX; tempered, waterproof, screenback, concrete form hardboard
Lumber	Straight, uniform width and thickness, and free from knots, offsets, holes, dents, and other surface defects
Chamfer strips	Clear white pine, surface against concrete planed

Form coating	Industrial Lubricants "Nox-Crete Form Coating", L&M "Debond", Protex "Pro-Cote", or Richmond "Rich Cote"
Polyethylene film	Fed Spec L-P-378, Type I; 6 mil
Curing compound	ASTM C309, Type 1, L&M "Clear Seal"

3A.4 TESTING BY THE COMPANY. Field control tests, consisting of aggregate gradation tests, slump tests, air content and yield tests, and the securing of compression test cylinders, will be made by the Company. A copy of all test reports will be furnished to the Contractor.

The frequency hereinafter specified for each field control test is a minimum. If additional field control testing is necessary, in the opinion of the Company, such tests will be made.

3A.4.1 Aggregate Gradation. Each 100 tons of fine aggregate and each 200 tons of coarse aggregate will be sampled and tested in accordance with ASTM D75 and C136.

3A.4.2 Fly Ash. If fly ash is used, fly ash will be sampled in accordance with ASTM C311 and tested in accordance with both ASTM C618 and C311.

3A.4.3 Slump. A slump test will be made from each of the first three batches mixed each day. An additional slump test will be made for each additional 50 cubic yards of each class of concrete placed in any one day. Slump will be determined in accordance with ASTM C143.

3A.4.4 Air Content. An air content test will be made from one of the first three batches mixed each day and from each batch of concrete from which concrete compression test cylinders are made. Air content will be determined in accordance with ASTM C231.

3A.4.5 Compression Tests. Two sets of two concrete compression test cylinders will be made each day from each concrete class when from 25 to 100 cubic yards of that class of concrete are placed. Two additional sets will be made for each additional 100 cubic yards of each class, or major fraction thereof, placed in any one day. One cylinder of each set will be tested at an age of 7 days and the other cylinder of each set will be tested at an age of 28 days. Concrete test cylinders will be made, cured, stored, and delivered to the testing laboratory in accordance with ASTM C31 and tested in accordance with ASTM C39.

3A.5 TESTING BY THE CONTRACTOR. The Contractor may make slump tests in accordance with ASTM C143 to satisfy himself that the concrete supplied is within the limits tabulated in Table I attached at the end of this section.

The Contractor may also make whatever additional tests he desires of concrete and concrete materials. All such tests shall be at the Contractor's expense and shall not interfere with the work of the concrete supplier or other contractors at the site.

3A.6 STORAGE OF MATERIALS. Reinforcing steel and miscellaneous embedments shall be carefully handled and shall be stored on supports which will keep them from contact with the ground.

3A.7 PLACEMENT. The handling, depositing, and compacting of concrete shall conform to these specifications subject to adjustment by the Company for weather or placement conditions.

Concrete shall not be pumped through aluminum pipe or aluminum alloy pipe.

Before concrete is placed, forms, reinforcements, anchor bolts, and embedments shall be rigidly secured in proper position; all dirt, mud, water, and debris shall be removed from the space to be occupied by the concrete; all surfaces which may have become incrusted with dried mortar or concrete from previous placement operations shall be cleaned; and the entire installation shall be acceptable to the Company.

3A.7.1 Conveyance and Distribution. Concrete shall be conveyed to the point of final deposit by methods which will prevent the separation or loss of the ingredients. Concrete shall be deposited in its final position without moving it laterally in the forms for a distance in excess of 5 feet.

3A.7.2 Depositing Concrete. Concrete shall be deposited in approximately horizontal layers of proper depth for effective compaction; however, the depth of a layer shall not exceed 20 inches nor be less than 10 inches except for slabs less than 10 inches in thickness. Each layer of concrete shall be plastic when covered with the following layer and the forms shall be filled at a rate of vertical rise of not less than one layer per hour. Vertical construction joints shall be provided as necessary to comply with these requirements.

Plastic concrete is defined as concrete which can be revibrated at least to the extent that an immersion type vibrator spud will penetrate the concrete at least one inch by vibration action and its own weight. Concrete shall remain plastic to this extent for at least 2-1/2 hours after initial contact of cement and water. Concrete which is no longer plastic but which must be covered by an additional lift shall be immediately chipped back to well consolidated concrete, slushed with mortar puddle as specified in Article 3A.7.1, and otherwise treated as acceptable to the Company to insure that a cold joint will not occur. If the pour requirements do not exceed the Contractor's placing ability, these measures should not be necessary.

Except where placed with a tremie, concrete shall be deposited and compacted in wall or column forms before any reinforcing steel is placed in the system to be supported by such walls or columns. Concrete in walls or columns shall settle at least 2 hours before concrete is placed in the structural systems to be supported by such walls or columns.

Concrete shall be thoroughly settled when top finished. All laitance, debris, and surplus water shall be removed from concrete surfaces at top of forms. Wherever the top of a wall will be exposed to weathering, the forms shall be overfilled and after the concrete has settled, the excess shall be screeded off.

3A.7.3 Compaction. During and immediately after depositing, all concrete shall be thoroughly compacted, worked around reinforcements and embedments, and worked into the corners of the forms.

All concrete shall be compacted by means of mechanical vibrating equipment and concrete slabs 6 inches or less in thickness may be either vibrated or tamped.

Unless otherwise accepted by the Company, mechanical vibrators shall be spud type immersion vibrators which will maintain at least 9000 cycles per minute when immersed in the concrete. The number and type of vibrators shall be subject to the acceptance of the Company.

3A.7.4 Hot Weather Concreting. Except as modified herein, hot weather concreting shall comply with ACI 305. Special procedures will be adopted to limit the maximum temperature of concrete. The temperature of all other classes of concrete when unloaded will not exceed 85 F. At air temperatures of 85 F or above, special procedures shall be adopted to keep the concrete as cool as possible during placement and curing.

3A.7.5 Cold Weather Concreting. Except as modified herein, cold weather concreting shall comply with ACI 306. The temperature of concrete at the time of mixing will be not less than that shown in the following table for corresponding outdoor temperature (in shade) existing at the time of placement:

Outdoor Temperature	Concrete Temperature
Below 30 F	65 F
Between 30 F and 45 F	60 F
Above 45 F	50 F

When deposited, the temperature of heated concrete will not exceed 80 F.

When freezing temperatures may be expected during the curing periods, suitable means shall be provided for maintaining the concrete at temperatures of not less than 50 F for 5 days or 65 F for 3 days after the concrete is placed. Concrete and adjacent form surfaces shall be kept moist at all times.

Sudden cooling of concrete shall not be permitted. During and at the conclusion of the curing period, means shall be provided to insure that the temperature of the air immediately adjacent to the concrete does not fall more than 3 degrees F in any one hour nor more than 30 degrees F in any 12 hours.

The use of calcium chloride will not be permitted.

3A.8 REINFORCEMENT. Reinforcements shall be accurately formed. Unless otherwise indicated on the drawings or specified herein, the details of fabrication and placement shall conform to ACI 315 and 318. In case of conflict, ACI 318 shall govern.

3A.8.1 Certification. The Contractor shall furnish the Company with a certification that the reinforcing steel furnished complies with the requirements specified hereinbefore under MATERIALS. The certification shall be signed by the Contractor and the reinforcing steel fabricator.

3A.8.2 Welding. Welding of reinforcement for any purpose, and tack welding in particular, is expressly prohibited. Reinforcements upon which unauthorized welding has been done shall be presumed to be damaged and such reinforcing shall be removed and replaced at the Contractor's expense. Replacement materials shall conform to all applicable requirements of these specifications.

Welded chairs and supports may be used provided they are clamped or wired to the reinforcement.

3A.8.3 Shop Drawings and Bar Lists. Bar lists and drawings for the fabrication and placing of reinforcements shall be prepared, checked, and submitted as specified in Section 1C. Each bar list and placement drawing shall have noted thereon the grade of reinforcing steel being furnished.

3A.8.4 Placement. Reinforcements shall be accurately positioned on supports, spacers, hangers, or other reinforcements and shall be secured in place with wire ties or suitable clips. Bare metal supports shall not be used in contact with forms for exposed surfaces.

With the exception of lapped portions of spliced bars which are wired or clamped together, the clear distance between parallel bars shall be not less than 1.5 times the maximum size of coarse aggregate in the concrete, or less than one inch in beams, 1-1/2 inches in columns, or 2 inches in other locations. Where reinforcements in beams are placed in two or more layers, the bars in the upper layer shall be placed directly above the bars in the lower layer.

3A.8.5 Splices. Splices shall be as indicated on the drawings and where not indicated on the drawings shall be tension lapped splices. Lapped splices shall conform to the requirements for tension lapped splices of Table 2-8 of the ACI Manual of Standard Practice for Detailing Reinforced Concrete Structures, ACI Standard 315-65, using a yield stress of 40,000 psi and an allowable design stress of 20,000 psi. The table for special tension lap splices shall not be used.

Splices shall not be used in regions of maximum bending stress.

3A.9 FORMS. Forms shall be designed to produce hardened concrete having the shape, lines, and dimensions indicated on the drawings. Forms shall be constructed and maintained in proper position and accurate alignment.

Concrete shall be placed against job-built plywood forms or forms that are lined with plywood or fiberboard, except as otherwise specified. Prefabricated forms or metal frames with plywood inserts will be permitted only for surfaces which are not normally exposed to view when construction has been completed. Plywood and fiberboard shall be new when they are brought to the construction site and shall be properly coated, protected, and maintained throughout their use. All plywood and fiberboard materials which are damaged, cracked, weathered, or otherwise unsuited, in the Company's opinion, for producing smooth, uniformly textured formed surfaces shall be rejected as form material.

Where concrete is placed against dry or porous surfaces, such surfaces shall be covered with polyethylene film to protect the concrete from loss of water. Joints in the film shall be sealed with waterproof sealing tape. Unless otherwise permitted by the Company, all concrete in contact with sand, gravel, crushed rock, or earth shall be placed against polyethylene film.

Vertical concrete surfaces above extended footings shall be formed.

3A.9.1 Design. Forms shall be substantial and sufficiently tight to prevent leakage of mortar. They shall be properly braced or tied so that they will maintain the desired position, shape, and alignment during and after placing concrete therein. Walers, studs, internal ties, and other form supports shall be of sufficient size and number and shall be located and spaced so that proper working stresses therein are not exceeded.

The top edges of forms for walls, equipment bases, and other concrete which are to be finished to a specified elevation, slope, or contour, shall be brought to a true line and grade so that the top concrete surface can be finished with a screed or template resting on the top edges of the forms. Wall forms, on one side at least, shall not extend above horizontal construction joints.

3A.9.2 Form Ties. Form ties shall be of the removable end, permanently embedded body type, and shall have sufficient strength, stiffness, and rigidity to support and maintain the form in proper position and alignment without the use of auxiliary spreaders. Outer ends of the permanently embedded portions of form ties shall be at least one inch back from adjacent outer concrete faces. Permanently embedded portions of form ties which are not provided with threaded ends shall be constructed so that the removable ends can be broken off by twisting, without chipping or spalling the concrete surface. The type of form ties used shall be acceptable to the Company.

3A.9.3 Edges and Corners. Chamfer strips shall be placed in forms to bevel all salient edges and corners except edges which are to be buried and edges which are indicated on the drawings with a special treatment. Equipment bases shall have formed beveled salient edges for all vertical and horizontal corners unless specifically indicated otherwise on the drawings. Bevel dimensions shall be 3/4 inch by 3/4 inch unless indicated otherwise on the drawings.

3A.9.4 Form Removal. Forms shall not be removed or disturbed until the concrete has attained sufficient strength to safely support all dead and live loads to be imposed thereon. Supports beneath beams or slabs shall be left in place and reinforced as necessary to carry any construction equipment or materials placed thereon. Care shall be taken in form removal to avoid surface gouging, corner or edge breakage, or other damage to the concrete.

3A.10 EMBEDMENTS. Anchor bolts, steel shapes, and other materials that are to be embedded in the concrete shall be accurately positioned and securely anchored.

Unless installed in pipe sleeves or "Ankor-Shields", anchor bolts shall be provided with sufficient threads to permit a nut to be installed on the concrete side of the form or template. A second nut shall be installed on the other side of the form or template and the two nuts shall be adjusted so that the bolt will be held rigidly in proper position.

Embedments shall not be welded to reinforcement.

Embedments shall be clean when they are installed. After concrete placement, surfaces not in contact with concrete shall be cleaned of all concrete spatter and other foreign substances.

3A.11 FINISHING FORMED SURFACES. All fins and other surface projections shall be removed from all formed surfaces from which the forms are stripped except exterior surfaces that will be in contact with earth backfill.

Projecting ends of all form ties shall be removed and the resulting recesses shall be filled with mortar. Surface gouges shall also be filled with mortar.

3A.12 FINISHING UNFORMED SURFACES. Surfaces shall be finished by screeding and floating.

Screeded surfaces shall be finished to provide a flat profile within 1/2 inch deviation as measured from a 10 foot straightedge. Float finished surfaces shall be finished to provide a flat profile within 1/4 inch deviation as measured from a 10 foot straightedge.

3A.12.1 Screeding. Screeding shall provide a concrete surface conforming to the proper elevation and contour with all aggregates completely embedded in adjacent mortar. Unless separate mortar topping is applied, all screeded surfaces shall be "jitterbug" tamped immediately prior to final screeding to force all coarse aggregate particles below the concrete surface and to provide sufficient excess mortar for proper finishing. Surface irregularities in screeded surfaces shall be limited as requried to produce finished surfaces within the tolerances specified. No other finishing will be required for surfaces designated on the drawings as screeded surfaces.

3A.12.2 Floating. After screeding, concrete surfaces shall be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which may be disturbed by the float or which causes a surface irregularity shall be removed and replaced with mortar.

Initial floating shall produce a surface of uniform texture and appearance with no unnecessary working of the surface with the float.

Initial floating shall be followed by a second floating at the time of initial set. The second floating shall produce a smooth, uniform, and workmanlike float finish of uniform texture and color. The completed finish for all unformed surfaces designated as float finished and surfaces not otherwise designated shall be a float finish as produced by the second floating.

Floating shall be performed with hand floats or mechanical compactor floats of an acceptable type.

3A.13 CURING. Concrete shall be protected from loss of moisture for not less than 7 days after the concrete is placed by application of curing compound.

3A.13.1 Curing Compound. "Clear Seal" curing compound shall be applied as soon as the concrete has been float finished and is hard enough to walk on without damaging the surface. "Clear Seal" shall be applied by spray at a rate not to exceed 250 square feet per gallon.

3A.14 REPAIRING DEFECTIVE CONCRETE. Defects in formed concrete surfaces shall be repaired to the satisfaction of the Company within 24 hours, and defective concrete shall be replaced within 48 hours after the adjacent forms have been removed. All concrete which is porous, honeycombed, or otherwise defective to a depth in excess of one inch shall be cut out and removed. Cut surfaces shall be coated with epoxy bonding compound before the repair concrete is placed.

Concrete repair work shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. Mortar and concrete used in repair work shall be adequately cured and shall be finished to match adjacent surfaces.

3A.15 PRECAST CONCRETE. Precast concrete elements may be cast on site utilizing the classes of concrete indicated on the drawings and as specified herein or the Contractor may at his option cast concrete off the site by a manufacturer regularly engaged in precast work. Should the Contractor elect the option of off-site casting, he shall be required to indicate in his proposal, the manufacturer, location of plant, details of manufacture, design details of precast member including reinforcing and concrete, concrete design mix including cylinder tests, types of materials to be utilized in the manufacture, methods of delivery to the site, and all other information which may be required by the Company or the Engineer.

TABLE I
CONCRETE CLASSES

Mix Class	28 Day Strength (psi)	Coarse Aggregate Size (inches)	Air Entraining Required	Slump (inches)	Maximum Water/Cement Ratio (by weight)
A-1	2,000	1-1/2 to No. 4	No	3 to 4	--
B-1	3,000	1-1/2 to No. 4	Yes	2 to 3	0.53
B-2	3,000	1-1/2 to No. 4	Yes	2 to 3	0.49
B-3	3,000	3/4 to No. 4	Yes	3 to 4	0.49
B-4	3,000	3/4 to No. 4	Yes	3 to 4	--
B-5	3,000	3/4 to No. 4	No	3 to 4	--
B-6	3,000	3/4 to No. 4	Yes	5 to 6	--
B-7	3,000	No. 4	Yes	As Required	As Required to Match Mix
C-1	4,000	3/4 to No. 4	Yes	3 to 4	0.49
C-2	4,000	No. 4	Yes	As Required	As Required to Match Mix

If fly ash is used, it will be substituted as 1.67 parts fly ash for 1.0 part cement and the maximum ratio of fly ash to cement in the mix will be limited to 0.294.

DIVISION 5 - METALS

CONTENTS

Section 5A - MISCELLANEOUS METALS

5A.1 GENERAL. This section covers the materials, fabrication, and erection requirements for miscellaneous metals.

Except as otherwise specifically noted on the drawings, or specified herein, all materials furnished and work performed in connection with miscellaneous metals work shall be in conformity with the AISC "Manual of Steel Construction, Seventh Edition".

5A.2 DRAWINGS. Detailed fabrication and erection drawings for all materials furnished under this section shall be prepared, checked, and submitted in accordance with the requirements of Section 1C.

5A.3 MATERIALS. All materials shall be new and undamaged and shall conform to pertinent AISC and ASTM standard specifications and the following requirements:

Shapes and plates noted "galv" or "galvanized" on the drawings	ASTM A36 steel, galvanized
Steel pipe	ASTM A53 Type E or S, Grade B steel pipe with yield strength of 35,000 psi.
Anchor bolts	ASTM A36 and ASTM A307, with nuts conforming to ASTM A307 Grade B heavy hexagon; all galvanized
Welding electrodes	AWS specifications
ASTM A36 steel	Class E70XX or Grade F7X-EXXX
Guardrails	
Posts	ASTM A36 steel, hot-dip galvanized after fabrication, size as indicated on the drawings
Rail	Armco 10 gage Flex-Beam, or acceptable equal, with curved end plates where indicated on the drawings; all galvanized
Bolts	Heat-treated high carbon steel, 5/8 inch diameter, galvanized. Armco standard for Flex-Beam, or acceptable equal to fit rail and post selected.

5A.4 FABRICATION. Miscellaneous metals shall be fabricated in conformity with the dimensions, arrangements, sizes, and weights or thicknesses indicated on the drawings or stipulated in the specifications. Framing and connections of all members shall be detailed and fabricated in accordance with AISC standards, specifications, and details unless otherwise indicated on the drawings or specified herein.

All fabricated materials shall conform to the tolerances specified in the AISC Manual and ASTM A6.

All members and other parts of fabricated material, as delivered, shall be free of winds, warps, local deformations, unauthorized splices, or unauthorized bends. Holes and other provisions for field connections shall be accurate and shop checked so that proper fit will be provided when the units are assembled in the field.

5A.4.1 Shapes and Plates. Shapes and plates shall be fabricated and assembled in the shop to the greatest extent practicable. Shearing, flame cutting, and chipping shall be done carefully, neatly, and accurately. Holes shall be cut, drilled, or punched at right angles to the surface and shall not be made or enlarged by burning. Holes shall be clean-cut without torn or ragged edges, and burrs resulting from drilling or reaming operations shall be removed with the proper tool.

Shapes and plates shall be fabricated to tolerances that will permit field erection within AISC tolerances except as otherwise specified.

Contact surfaces at all connections shall be free of loose scale, dirt, burrs, oil, and other foreign materials that would prevent solid seating of the parts.

Beam connections shall be as detailed on the drawings.

All bolts shall be 7/8 inch diameter unless otherwise indicated on the drawings.

High strength bolts shall conform to all requirements for A325 bolts of the "Specifications for Structural Joints Using ASTM A325 or A490 Bolts" including the commentary given therewith, as approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation, March 1970, and endorsed by AISC, except as otherwise modified and supplemented herein. Bolt length shall be determined in accordance with the Research Council specification and commentary.

High strength bolted connections shall be friction type connections except where other type connections are required by the drawings or specifications.

Tightening of high strength bolts shall be done using either the calibrated wrench method or the "turn-of-nut" method. If the bolts are tightened by the calibrated wrench method, each impact wrench shall be calibrated at the start of each day's work and at least once during the day. Wrench calibration shall be performed using the same length of hose and air pressure used during the tightening of the bolts.

Any ASTM A325 bolt which has been tightened more than one-half turn beyond snugtight shall not be loosened and retightened. All such bolts shall be discarded and new bolts used in their place.

5A.4.2 Anchor Bolts. Anchor bolts shall be as detailed on the drawings. Each bolt shall be furnished with two nuts and sufficient threads to permit a nut to be installed on each side of the concrete form or template.

All anchor bolts 3/4 inch and larger shall be fabricated from ASTM A36 steel rods and shall have heavy hexagon nuts conforming to ASTM A307, Grade B. Anchor bolts smaller than 3/4 inch shall conform to ASTM A307, Grade A and shall have hexagon heads and nuts.

All anchor bolts, nuts, and washers shall be hot-dip galvanized after fabrication, threads being undercut to provide a tolerance equal to ANSI Class 2A.

5A.4.3 Guardrails. Steel guardrail materials shall be fabricated in accordance with the manufacturer's standards for accurate fit and proper alignment. Terminal sections shall be accurately made to fit the guardrail sections without warp or twist. Guardrail sections shall be fabricated and drilled to fit the post spacing indicated on the drawings.

5A.5 WELDING. Except as otherwise specified, all welds, welding, and related operations for steel shall be in conformity with the applicable provisions of the AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings adopted February 12, 1969, including its supplements, and the Code for Welding in Building Construction, AWS D1.0-69 and its addenda, issued by the American Welding Society.

Permissible weld stress for all welding provided under these specifications shall be as tabulated in Table 1 of AWS D1.0-69 except the stresses opposite the fifth item listed under "kind of stress" shall not exceed 85 per cent of the tabulated values. For instance, the allowable shear stress on the effective throat of a fillet weld on ASTM A36 steel shall not exceed 18,000 psi. "Effective throat" shall be the shortest distance from the root to the face of the diagrammatic weld regardless of weld size.

Except as otherwise specified, welding shall be performed using only those joint details which have a prequalified status when performed in accordance with the AWS code and the AISC specification.

All welding procedures and operators shall be qualified by an independent testing laboratory in accordance with the latest AWS Standard Qualification Procedures. All procedure and operator qualifications shall be subject to the Company's review. Accurate records of operator and procedure qualifications shall be maintained by the Contractor and shall be made available to the Company and the Engineer upon request.

All welded joints exposed in exterior locations or subject to submergence in any location shall be provided with continuous welds along all contact edges.

Welds that are not dimensioned on the Engineer's drawings shall be sized to develop the full strength of the least strength component involved in the connection.

All welds shall be properly identified on the detailed shop drawings and shall be subject to acceptance by the Engineer.

Components to be welded shall be accurately positioned and shall be rigidly secured during welding.

5A.6 GALVANIZING. Metal materials which are specified herein or indicated on the drawings to be galvanized shall be hot-dip galvanized in accordance with ASTM A123, ASTM A153, and ASTM A385. Materials specified to be galvanized shall be prepared for galvanizing by being properly cleaned, pickled, rinsed, and dried. The cleaned materials shall be immediately galvanized before any rusting can occur.

During painting, the ambient temperature shall not be below 50 F. During damp or wet weather all painting shall be done in a dry shelter.

Materials shall not be handled in any manner until the shop paint is dry, hard, and able to resist abrasion.

Contact surfaces at friction type high strength bolted field connections shall not be painted.

5A.7 ERECTION. Metal materials shall be erected in accordance with AISC, the Engineer's drawings, the erection drawings and these specifications. Unless specified otherwise, erection tolerances shall be the same as those specified hereinbefore under FABRICATION.

Smooth beveled washers shall be used when the bearing faces of the bolted parts have a slope of 1:20 or greater with respect to a plane normal to the bolt axis.

Anchor bolts and other materials embedded in concrete shall be installed as specified in Section 3A.

Installation of high strength bolts, bolting tools and equipment, and tightening of high strength bolts shall be the same as specified hereinbefore under FABRICATION.

5A.7.1 Guardrails. Posts may be driven in a manner that does not damage the post or set in prebored holes and backfilled with material removed or other suitable soil. Backfill shall be placed in lifts not exceeding 4 inches, each lift thoroughly tamped.

Rail elements shall be erected to produce a smooth, continuous rail paralleling the line and grade of the roadway surface. Rail elements shall be joined by bolts, lapped in the direction of traffic in the lane adjoining the guardrail, and bolted to and through the posts. Where indicated on the drawings, rail elements shall be curved before erection. Holes for special details may be field drilled. Terminal sections shall be installed at each end of each run of guardrail.

5A.7.2 Field Welding. Field welding shall conform to the requirements specified under WELDING, and to these additional requirements. Each welding operator shall be qualified for all welding procedures and positions required in a joint that he welds. The entire weld of any structural joint shall be made by one operator.

It shall be the responsibility of the Contractor to have all welding procedures, welders, and welding operators qualified in accordance with applicable code requirements before work is begun. Qualification shall be made in accordance with AWS D1.0-69 "Code for Welding in Building Construction, Appendix A".