
Professional Degree Theses

Student Theses and Dissertations

1916

Method and cost of rock excavation, Inlet Swamp Drainage District, Lee County, Illinois

Arch W. Naylor

Follow this and additional works at: https://scholarsmine.mst.edu/professional_theses



Part of the [Civil Engineering Commons](#)

Department:

Recommended Citation

Naylor, Arch W., "Method and cost of rock excavation, Inlet Swamp Drainage District, Lee County, Illinois" (1916). *Professional Degree Theses*. 252.

https://scholarsmine.mst.edu/professional_theses/252

This Thesis - Open Access is brought to you for free and open access by Scholars' Mine. It has been accepted for inclusion in Professional Degree Theses by an authorized administrator of Scholars' Mine. This work is protected by U. S. Copyright Law. Unauthorized use including reproduction for redistribution requires the permission of the copyright holder. For more information, please contact scholarsmine@mst.edu.

7394

METHOD AND COSTS OF ROCK EXCAVATION
INLET SWAMP DRAINAGE DISTRICT
LEE COUNTY, ILLINOIS.

BY

ARCH W. NAYLOR

—

A

THESIS

submitted to the faculty of the
SCHOOL OF MINES AND METALLURGY OF THE UNIVERSITY OF MISSOURI
in partial fulfillment of the work required for the
Degree of
CIVIL ENGINEER
Rolla, Mo.
1916

—

Approved by

Elwood Harris

Professor of Civil Engineering.

19962

1.

--TABLE OF CONTENTS--

- (1) Description and History of District.
- (2) Advertising of Sale of Contract.
- (3) Specifications.
- (4) Contract.
- (5) Equipment.
- (6) Method and Costs.
- (7) Map and Profile.

Description and History
of the District.

The Inlet Swamp Drainage District, comprising 32000 acres of rich muck land, lies in Lee County Illinois, between the Chicago and Northwestern Railway, the Illinois Central Railway and the Chicago, Milwaukee and St. Paul Railway. The District is fifteen miles long and from one to five miles wide.

The watershed has approximately five times the area of the swamp, and in early days, as much as one-half the thirty two thousand acres was under water for practically the entire year. It was not unusual in the Spring, for the swamp to be under from two to five feet of water.

The point, where Inlet Swamp ends and Green River begins, is known as the Inlet. This is a limestone ledge four miles wide and of unknown depth, which acts as a dam at the lower end of the swamp. The river had, in years past, cut a narrow channel through this ledge; but its capacity was very small.

In 1888 some of the land owners in this section saw the possibilities of reclaiming this swamp, by dredging, and turning it into valuable farm lands.

3.

A District was organized under the Farm Drainage Act of the State of Illinois, a system of ditches laid out, and a contract let. This was the first dredge work done in Lee County, Illinois, and was only partially successful. The ditches were too small, and the capacity of Green River, which is the only out-let for the swamp, was not taken into account.

Ten years later an attempt was made to increase the size of the ditches and the out let, but the funds available were exhausted before the work was completed. Under the two early contracts this Inlet was dredged to a bottom width of thirty feet and a depth of six feet.

In 1907 the present district was organized, and five years later, in 1912, the Commissioners were authorized to issue bonds, advertised for, and received bids, for redredging the Inlet, constructing new ditches, cleaning out and enlarging the old **ditches**.

Notice to Contractors.

Notice is hereby given that sealed bids will be received by the Commissioners of Inlet Swamp Drainage District of Lee County, Illinois, at the office of the County Clerk of Lee County Illinois, at Dixon, Illinois until the hour of ten o'clock a.m. on Thursday, the 27th. day of June, A. D. 1912, at which time and place said bids will be publicly opened.

The work for which bids are desired consists of the enlargement of present existing open ditches, construction of new open ditches, cleaning out of existing ditches, filling in of present ditch, and the construction of new tile ditches, as follows:

Enlargement of 24.68 miles of openditches, containing 172,000 cubic yards of rock excavation and 863,000 cubic yards of earth excavation with the side slopes $\frac{1}{4}$ to 1 in the rock excavation and $\frac{1}{4}$ to 1 in the earth excavation, and base widths varying in side from 8 to 40 feet;

Construction of 10.63 miles of open ditches containing 209,000 cubic yards of earth excavation, with side slopes of $\frac{1}{4}$ to 1 and 1 to 1, and base widths varying in size from 3 feet to 12 feet;

Cleaning out of 8.49 miles of openditches, containing 42,000 cubic yards of earth excavation with side slopes of $\frac{1}{4}$ to 1 and 1 to 1, and base widths varying in size from 4 feet to 12 feet;

Filling in of present open ditch containing 3,400 cubic yards to fill;

No bids will be considered unless accompanied by cash or a certified or a certified check on some National Bank for a sum not less than ten per cent of the bid. Bidders to whom awards are made will be required to enter into a written contract with Inlet Swamp Drainage District of Lee County, Illinois, with good and approved security, in an amount of fifty per cent of the amount of the contract within twenty days from the date of mailing written notice of the acceptance of their bid. The form of contract which the bidders and guarantors are to enter into will be supplied by the engineer upon request.

5.

Parties making bids are to be understood as accepting the terms and conditions contained in such form of contract.

Payments will be made in cash, monthly, upon the estimate of the Engineer.

Bids will be received for the work in sections, as prescribed, or for the work as a whole.

Plans and specifications together with the Court's Order for said work may be seen at the office of the County Clerk, Dixon, Illinois.

Specifications may be had upon request of J.M. Eagan, Jr., Civil Engineer, Amboy, Illinois.

This right is reserved to reject any or all bids.

Dated this 6th. day of June A. D. 1912.

Commissioners

B. F. Lane, President, Lee Center, Illinois.
B. F. Johnson, Compton, Illinois,
X. F. Gehent, Secretary, Dixon, Illinois.

22-3

GENERAL INFORMATION.

LOCATION. Map of the locality, plans, profiles, and specifications, together with the Court's Order for said work, may be seen at the office of County Clerk, at Dixon, Illinois, or at the office of J.M. Eagan, Jr., Civil Engineer, Amboy, Illinois, at which latter office, bidding blanks may be also obtained.

The Inlet Swamp Drainage District lies entirely within Lee County, Illinois, lying almost wholly within a boundary line made by the following railroads: The Chicago and North Western Railway on the North, the Illinois Central Railway on the West, the Chicago, Burlington and Quincy Railway on the South, and the Chicago, Milwaukee & St. Paul Railway on the East.

The city of Amboy, near the southwest corner of the District, at the junction of the Illinois Central and Chicago, Burlington and Quincy Railways, is the most accessible point from which to view the work.

EXAMINATION. Bidders, or their authorized agents are expected to examine maps, plans and profiles, to visit the locality of the work and to make their own estimates of the facilities and difficulties attending the execution of the proposed work. The Commissioners or Engineer will be glad to furnish any other desired information, within their power, not contained herein. It is understood that the quantities given are approximate and that no claim shall be made against the Drainage District on account of excess or deficiency in the same.

BIDS AND CONTRACT. Bids shall be made out in accordance with the form of bid furnished by the Engineer and the prices stated in writing and figures. Said bids shall be placed in an envelope, sealed and addressed, "X. F. Gehant, Secretary for the Commissioners of Inlet Swamp Drainage District, Dixon, Illinois," and endorsed "Bid (or bids) for work in Inlet Swamp Drainage District.

Each bid must be accompanied by cash or a certified check, for a sum not less than ten per cent of the amount of the bid, and if a certified check, the same must be certified without qualification or reservation, and drawn

on some National Bank, said check to be made payable to the "Commissioners of Inlet Swamp Drainage District."

The party to whom any contract may be awarded will be required to execute the contract with approved sureties within twenty days from the date of mailing written notice of the acceptance of the bid. In case of failure or neglect to do so, the party will, if the Commissioners so elect, be considered as having abandoned said bid and the deposit in cash or check will then, in that event, be forfeited to the said Drainage District as liquidated and confessed damages, and thereupon the work may be let to the next lowest bidder or readvertised and relet as the Commissioners may determine. The cash or certified checks of unsuccessful bidders will be returned upon the awarding of the contract on which they have bid and the filing of acceptable bond.

The bond to be furnished by the successful bidder shall be personal or surety company bond in an amount of fifty percent of the amount of the contract which bond or bonds shall be conditioned upon the faithful performance of the things specified to be done in these specifications and contract shall be subject to the approval of the Commissioners.

Bids will not be considered except from parties furnishing evidence, satisfactory to the Commissioners, of necessary facilities, ability and pecuniary resources to fulfill and carry out the conditions of the specifications and contract.

DESCRIPTION OF WORK. The work consists of the enlargement of present existing open ditches, cleaning out of present existing ditches, construction of new open ditches, filling in of a present ditch and the construction of new tile ditches, with headwalls and manholes. The work is hereinafter divided into sections for the convenience of bidders and to conform to the bidding blanks, but the following list of ditches is given for reference to the accompanying map and profiles and for use in examining ground.

OPHN DITCHES

Name of Ditch	Length in Miles	Bottom Width in feet	Side Slopes	Cubic Yards	Remarks
Main Ditch..... Extension and	6.40.....	40.....	$\frac{1}{4}$ to 1.....	172,000.....	Rock- Enlargement. New Work.
Main Ditch.....			$\frac{1}{4}$ to 1.....	224,000.....	Earth.
North Ditch.....	1.70.....	36.....	$\frac{1}{4}$ to 1.....	105,000.....	Earth- Enlargement.
North Ditch.....	3.80.....	22.....	$\frac{1}{4}$ to 1.....	146,000.....	Earth- Enlargement.
North Ditch.....	1.70.....	18.....	$\frac{1}{4}$ to 1.....	38,000.....	Earth- Enlargement. New Ditch.
North Ditch.....				3,400.....	Filling present ditch.
North Ditch.....	2.31.....	12.....	$\frac{1}{4}$ to 1.....	16,000.....	Earth- Cleaning, Out work.
South Ditch.....	2.75.....	16.....	$\frac{1}{4}$ to 1.....	61,000.....	Earth- Enlargement.
South Ditch.....	1.42.....	8.....	$\frac{1}{4}$ to 1.....	14,000.....	Earth- Enlargement.
South Ditch.....	3.22.....	12.....	$\frac{1}{4}$ to 1.....	94,000.....	Earth- New Work.
o Cut-off					
South Ditch.....	0.91.....	4.....	$\frac{1}{2}$ to 1.....	9,000.....	Earth- New Work.
Cut-off					
Middle Ditch.....	6.00.....	30.....	$\frac{1}{4}$ to 1.....	265,000.....	Earth- Enlargement.
Town Line	4.00.....	4.....	1 to 1.....	64,000.....	Earth- Enlargement.
Lateral					
Town Line.....	1.51.....	3.....	1 to 1.....	12,000.....	Earth- New Work.
Lateral					
Sand Creek.....	1.90.....	4.....	$\frac{1}{4}$ to 1.....	39,000.....	Earth- New Work.
Lateral					
Cooper.....	0.94.....	4.....	1 to 1.....	4,000.....	Earth- New Work.
Lateral					Cleaning Out.
Weiner Lateral....	0.30.....	10.....	1 to 1.....	2,000.....	Earth- New Work.
					Cleaning Out.
McCausland.....	0.60.....	8.....	1 to 1.....	3,000.....	Earth- New Work.

Lateral
Richardson.....1.23..... 6.....1 to 1..... 6,000,.....Earth- Cleaning
Out.

Lateral

Frost Lateral.....1.90..... 4.....1 to 1..... 7,000.....Earth Cleaning
Out.

Hicks Lateral.....1.20..... 4.....1 to 1..... 4,000.....Earth Cleaning
Out.

DITCHES, SECTIONS AND QUANTITIES.

The following divisions or sections of the work have been made and bids will be received on each section, or on the work as a whole, in accordance with the bidding sheets:

SECTION No. 1. Main Ditch extensions and the Main Ditch, and extending from a point in the Green River in the North West quarter of Section 23, Amboy Township, to the head of the Main Ditch near the center of Section 3, in Lee Center Township, a distance of 6.40 miles. This section consists of the excavation of 172,000 cubic yards of solid rock and 224,000 cubic yards of earth, the rock being about 85 per cent "bottom work" and 15 per cent "side work," and the earth being about fifty per cent "bottom work" and fifty per cent "side work" the base width to be forty feet, with side slopes of $\frac{1}{4}$ to 1 in the rock and $\frac{1}{2}$ to 1 in the earth

Section No. 2. The North Ditch from its lower end or junction with the South Ditch to the junction of the Middle Ditch, a distance of 1.70 miles, and the Middle Ditch from its mouth to the terminus of the proposed improvement of the Middle Ditch in the West half of Section 14, in Viola Township, a distance of 6.00 miles. This Section consists of the excavation of 370,000 cubic yards of earth about 70 percent of which is "bottom work" and 30 per cent "side work" The base width of the North Ditch is to be 36 feet and the Middle Ditch is to be 30 feet, with side slopes of $\frac{1}{2}$ to 1.

Section No. 3. The North Ditch from its junction with the Middle Ditch to the terminus of the proposed improvement of the North Ditch near the Southeast corner of the southwest quarter of Section No. 26, in Reynolds Township, a distance of 7.81 miles. This section consists of the excavation of 200,000 cubic yards of earth, about 90 per cent being "bottom work" and 10 per cent being "side work" The base width from the junction of the Middle Ditch to the Junction with the Town Line Lateral, a distance of 3.80 miles, is to be 22 feet, and from the junction with the Town Line Lateral to the junction with the Ewald Lateral, a distance of

1.70 miles, is to be 18 feet, and from the junction with the Ewald Lateral to the terminus, a distance of 2.31 miles, is to be 12 feet, with side slopes of $\frac{1}{2}$ to 1. This section includes a short Cut-Off near the northwest corner of the northeast quarter of section 32, Reynolds Township. It also includes the filling of a portion of the present North Ditch near the same point. The fill is estimated at 3,400 cubic yards and will be measured and paid for in fill separate from the excavation in this section.

SECTION NO. 4. The South Ditch from its junction with the North Ditch to the terminus of the proposed improvement in the South Ditch near the southeast corner of the southwest quarter of Section 20, Viola Township, a distance of 4.17 miles, and the South Ditch Cut-Off, a new Ditch, 4.11 miles in length. This section consists of the excavation of 178,000 cubic yards of earth excavation, 75,000 cubic yards of which is in the South Ditch and is practically all "bottom Work" and 103,000 cubic yards of which is in the South Ditch Cut-Off. The base width of the South Ditch from its junction with the North Ditch to the mouth of the South Ditch Cut-Off, a distance of 2.75 miles is to be 16 feet, and from its junction with the South Ditch Cut-Off, to the upper terminus of the improvement in the South Ditch, a distance of 1.42 miles, is to be 8 feet, with side slopes of $\frac{1}{2}$ to 1.

The base width of the South Ditch Cut-Off from its mouth to a point about one-quarter of a mile west on the northeast corner of Section 21, Viola Township, a distance of 3.22 miles, is to be 12 feet and from the last named point to its upper terminus, a distance 0.91 miles, is to be 4 feet with side slopes of $\frac{1}{2}$ to 1.

SECTION NO. 5. The Town Line Lateral, a new ditch, 5.51 miles in length. This section consists of the excavation of 76,000 cubic yards of earth. The base width from its mouth to the north east corner of the northwest quarter of

Section 1, Viola Township, a distance of 4.00 miles, to be 4 feet with side slopes of 1 to 1, and from the last named point to its upper terminus, a distance of 1.51 miles, is to be 3 feet with side slopes of 1 to 1.

SECTION No. 6. The Sand Creek Lateral, a new ditch, 1.90 miles in length. This section consists of the excavation of 39,000 cubic yards of earth. The base width is to be 4 feet with side slopes of $\frac{1}{2}$ to 1.

SECTION No. 7. The following laterals: Cooper, Weiner, McCausland, Richardson, Frost and Hicks. This section consists of the cleaning out of these **Laterals**, with side slopes of 1 to 1, of 26,000 cubic yards of earth excavation as follows: The Cooper Lateral 0.94 miles in length, 0.25 miles of which is new work, base width of 4 feet, 4,000 cubic yards; the Weiner Lateral, 0.30 miles in length, a short piece of which is new work, base width of ten feet, 2,000 cubic yards; The McCausland Lateral, 0.60 miles in length, base width of 8 feet, 3,000 cubic yards; The Richardson Lateral, 1.23 miles in length, base width 6 feet, 6,000 cubic yards; The Frost Lateral, 1.90 miles in length, base width of 4 feet, 7,000 yds; and the Hicks Lateral, 1.20 miles in length, base width of 4 feet, 4,000 cubic yards.

GENERAL SPECIFICATIONS.

1. GENERAL. A copy of the "Notice to Contractors," "General Information," "Ditches, Sections, and Quantities," and "Specifications" will be attached to the contract or contracts and form a part thereof. The order of the County Court of Lee County directing said work to be done and the plans and profiles therein and in the petition for said work referred to will form an essential part of said specifications in all respects as if actually embodied therein.

2. DESIGNATION. Whenever the words "Commissioners," "Drainage District," or "District" are used in the "Notice to Contractors," "General Information," "Ditches, Sections, and Quantities," "General Specifications" or "Contract," they shall be understood to mean and refer to Inlet Swamp Drainage District and the duly authorized agents thereof; whenever the word "Contractor" occurs in the specifications and Contract, it shall be understood to mean the successful bidder. The word "Engineer" as used in the "Notice to Contractors," "General Information," "Ditches, Sections, and Quantities," "General Specifications" or "Contract," shall be understood to mean J.M. Eagan, Jr., Civil Engineer of Amboy, Illinois, or his duly authorized representative acting in his behalf, or his successor if any shall hereafter be appointed by the Commissioners.

3. DIVISION OF CONTRACTS AND METHODS OF PROCEDURE. For convenience the work is divided into ten sections, each section of which shall be offered separately to bidders, or bids will be received on the work as a whole. Description of sections is given heretofore. Work in Sections, 1, 2, 3, 4 and 6 shall be started within twenty days after notice of the award of the contract thereon and on sections 5, and 7 at the reasonable discretion of the Commissioners or Engineer, depending to a large extent on the rate of progress in the first named sections. Bidders must state in writing to accompany their bids what the character and general description of their equipment is or will be with which they expect to do the work, if successful bidders, where such equipment as they may now have is located, what other works of

like character and size they have accomplished, the manner in which they would operate on this work, stating when they would start actual excavation, where they would start, the rate of progress they would make, at what date they would complete their contract, and a thorough description of their intended method of handling the work.

4. SUB-CONTRACTS. Should the Contractor sublet any part of the work he will not be released from any responsibility he may have assumed in executing the contract for this work.

5. INTERPRETATION. The Contractor will not be allowed to take advantage of any error or omission in the specifications, as full instructions will always be given by the Engineer, should any error or omission be discovered. The decision of the Engineer, as to the quality and quantity of material, work done and workmanship shall be final.

6. ESTIMATES ARE APPROXIMATE. The quantities of the work to be done are estimated and approximate. The Commissioners reserve the right to increase or diminish the depths and widths of the ditches and change their location while in progress of construction, if the right and necessity of making such changes should develop, providing such changes shall not reduce the total contract price more than twenty-five per cent or materially change the general character of the work, so as to make necessary the installation of different equipment. Should such action diminish the work that otherwise would be done, no claim shall be made for damages on the ground of loss of anticipated profits of work so dispensed with; and should such action result in a greater amount of work for said Contractor, it shall be performed by him as a part of his contract, and said Engineer shall certify to said Commissioners the amount to be allowed therefor, which he shall consider fair and equitable as between the parties, and his decision, when approved by said Commissioners, shall be final and conclusive. The price to be paid for each cubic yard, or other rate of pay shall cover the risk of any such change that may operate to the disadvantage of said Contractor, and he shall have the benefit of any alteration that may operate in his favor. No claims

shall be allowed for extra work unless the same shall be done in pursuance of a written order from the Engineer in charge or his authorized representative. In case of extra work for which no unit price has been set, the Contractor shall be paid the actual cost to him plus fifteen percent thereof.

7. EXTENSION OF TIME. Time shall be of the essence of the contract. But no charge against the District shall be made by said contractor for damages or loss of profits due to hindrances or delays on account of any legal difficulty or failure of any Contractor to do his work on the contract; but if unusual or extraordinary conditions prevent the work being completed within the time set for completion in the contracts, the Commissioners may, upon the recommendation of the Engineer, waive the time limit and extend the time for the completion of the work. Should the time limit be thus waived all loss and damage to the Drainage District due to delay beyond the time originally set for completion, shall be determined by the Engineer and deducted by the Commissioners from any payments due or to be come due to the Contractor; provided, that the Commissioners may remit such charges as for such time as, in their judgement may be equitable; and provided further, that nothing herein shall affect the power of the Commissioners to annul the contract as herein provided.

Such extension shall not be granted except upon request in writing by the Contractor to the Commissioners and good cause shown; and no such extension shall be valid unless the same is in writing.

8. DAMAGES. The Contractor shall not be entitled to any damages for any hindrance or delay from any cause whatever in the progress of the work or any portion thereof, as the Contractor, in submitting his bid, takes the chances of the occurrence of such delay; but such hindrance may, in the discretion of the Commissioners, entitle the Contractor to such extension of time for completing the work as may be determined by the Engineer.

Under the direction of the Engineer the Contractor may erect tents, shanties, and storage buildings along the lines of the ditches, and the Contractor may provide his own lodging camps properly equipped, at which laborers and teamsters employed by him on the work will be required to lodge unless otherwise directed by the Engineer. It is further understood that whenever dynamite, giant powder, or other explosives are to be employed on the work, it shall be handled by persons experienced in its use, and in such manner as to in no way hazard the safety of the men employed about the work, or the safety of the work itself. All explosives shall be stored by themselves at a distance of at least one hundred feet from the work or any structure. The Contractor assumes all liability for accidents due to explosives.

The Contractor assumes the responsibility for the safe keeping of all his materials and apparatus, and for all unfinished ditches, or other work, and if any of it be damaged, destroyed or lost from any cause, including among others floods, washouts, or fires, the Contractor shall replace the same at his own expense. The Contractor shall be responsible for any unnecessary injury to property of the District or the land owners.

The Contractor must indemnify and save harmless the District or its agents as provided in the state law relating to liens. The Contractor shall furnish the Commissioners such satisfactory evidence when called for by them, that all persons who have done work or who have furnished materials under this contract for which he is or may become liable, have been fully paid or satisfaction secured.

The Contractor shall also indemnify and save harmless the District, its Commissioners, agents, or employes, from all suits or actions or any name or description brought against any of said parties for or on account of any injuries received or sustained by any person or persons by or through the Contractor, his servants or agents, in the construction of

the work, or by or in consequence of any negligence in doing the work, or by or on the account of any act or omission of the Contractor or his agents.

The Contractor will be required to hold the Drainage District and its Commissioners harmless against all claims for the use of any patented article, process or appliance used in the connection with the contract herein contemplated.

9. STAKING OUT WORK. The Engineer will from time to time set stakes 100 feet apart, in advance of the work, for the center line and side lines of the ditches, and will furnish the Contractor with depths and widths of cut for the ditch. The Contractor will be held responsible for the preservation of these stakes and for the ditch being constructed in exact accordance therewith. The Contractor when required by the Engineer shall properly clear the right-of-way for the ditch for such distance in advance of the work as may be directed, for the purpose of staking out the work.

10. PAYMENTS. On or about the first day of each month, the Engineer will make estimates of the amount of work done during the preceeding calendar month (which estimates will be conclusive as a basis to compute the amount the Contractor shall receive for such work,) and on or about the fifteenth of each month the Commissioners will pay in cash, eighty-five percent of the value of the work as shown by said estimates. Upon the completion of the entire work, the Engineer will, upon finding the work to be in accordance with the plans, profiles, and specifications thereof, prepare a final estimate of the amount and value of such work, deducting therefrom all previous payments to and charges against the Contractor, and upon the acceptance of the work by the Engineer and Commissioners, the balance of the final estimate thereof will be paid.

11. RIGHT-OF-WAY. The Commissioners will furnish land for the construction of the ditches, and right-of-way along the entire route of the ditch, and across farms for passing in and out with supplies, fuel, and machinery to prosecute the work.

12. PROGRESS OF THE WORK. The Contractor shall prosecute the work with such equipment and shall employ such help as shall, in the opinion of the Engineer, be neces-

sary to complete the work within the contract time. In case the Contractor does not comply with these provisions, the Commissioners shall have the power to employ labor and additional outfit, as, in their judgement may seem necessary to complete the work within the contract time, deducting the total cost of same from moneys due or to become due the Contractor, and in case the cost of completion of the work shall be greater than the contract price thereof, then the Contractor shall be liable to the Commissioners in action on his bond or such other remedy as may be available, for such balance.

The work shall at all times be conducted by the Contractor in such a manner and with such machinery or other equipments and apparatus as will produce work in conformity with the plans and specifications and to the satisfaction of the Engineer and the Commissioners, and whenever the work produced is not acceptable and satisfactory to the Engineer, the Engineer may require the Contractor to follow such methods in handling the work as shall produce satisfactory results, or the Engineer may require the Contractor to furnish such machinery or other equipment as will produce work in accordance with the plans and specifications.

In lieu of the exercise of the power herein before given, in case of said Contractor's default, to employ labor and additional outfit and complete the work, the Commissioners reserve the right and option, instead thereof, to annul and cancel the contract and relet the work, or any part thereof, and the Contractor shall not be entitled to any claim for damages on account of such annulment, or shall such annulment affect the right of the Drainage District to receive damages which may arise from such failure on the part of said Contractor, to fulfill the terms of the contract. And in case of such annulment, all moneys due the Contractor, or retained under the terms of the contract shall be forfeited to the Drainage District; but such forfeiture shall, however, not release the Contractor or his sureties for the fulfillment of his contract, and the Contractor and his sureties shall be credited with the amount of

of the money so forfeited toward any greater sum that they may become liable for to said Drainage District on account of the default of the Contractor.

13. WORKMEN. The Contractor shall either personally superintend his work on the ground, or cause it to be done by some capable representative who shall be satisfactory to the Engineer.

Incompetent or incorrigible persons shall be dismissed by the Contractor or his representative when requested by the Engineer, and such persons shall not again be permitted to return to work without the written consent of the Engineer.

14. BRIDGES. The Commissioners will take the responsibility of causing bridges to be removed, when required, in the progress of the work, upon being notified by the Contractor in writing, ten days in advance, of the time, as nearly as practicable, when such removal will be needed.

15. SIDE SLOPES. The sides of all solid rock excavations are to be sloped at the rate of three inches horizontal distance to each one foot of vertical rise. The sides of excavations of all other material than solid rock on the **Main Ditch**, The South Ditch Cut-Off, the Middle Ditch and the Sand Creek Lateral, are to be sloped at the rate of six inches horizontal distance to each foot of vertical rise. The sides of all other excavations on all other open ditches or laterals in all materials other than solid rock, are to be sloped at the rate of one foot horizontal distance to each one foot of vertical rise.

16. BERMS. A clean berm or ledge of four feet in width is to be left on the top of all solid rock excavations. The side slopes of the over-lying earth are to begin not less than four feet back from the top edge of said excavations. All excavated material is to be so placed as to

leave a clean berm of not less than six feet between the newly made waste banks and the nearest edge of the ditch or lateral from which the material is excavated. The tops and sides of the present waste banks lying on such berms shall be considered as "clean" in their present condition.

17. EXCAVATED MATERIAL. The material excavated from the open ditches shall be uniformly placed on the banks as far as practicable, within the right-of-way, except where otherwise directed by the Engineer, and the following exceptions; On the main Ditch from its lower terminus to the entrance of the Hicks Lateral where about two thirds of the excavated material shall be placed on the left bank; on the new work on the Cooper Lateral, where all of the material shall be placed on the East side of the ditch; and the Town Line Lateral from the north and south center line of section one; in Viola Township, to its upper terminus, where the material shall all be placed in the public highway, adjacent to said lateral. The Commissioners reserve the right to have the excavated material other wise than ~~above stated and~~ should the same prove to be a burden on the Contractor, the burden shall be termed "Extra Work" and as such shall be paid for accordingly.

On all open ditches the excavated material shall be deposited as near as practicable so as to form continuous banks. Openings, shall however, be left in the waste banks, for the admission of water from all minor streams, ditches, or present channels, and at such other places as the Engineer may direct.

18. LEVEES. Levees are to be constructed on either side of the Middle Ditch from the center line of Section 15, Viola Township, to the upper terminus of the proposed improvement in the Middle Ditch. Said levees are to be at least three feet in height with a crown at least three feet wide on top, and sides sloped at the rate of one and one-half feet horizontal distance to each one foot of vertical rise. Where the excavated material proves insufficient for the construction of said levees, the ditch shall be excavated deeper to secure the required amount of material for the construction of such levees. The price per cubic yard bid on the excavation in "Section Two"

21.

shall include the cost of the construction of these levees.

Levees are to be constructed on either side of the McCausland Lateral throughout its entire length at least three feet in height, and side sloped at the rate of one and one-half feet horizontal distance to each one foot of vertical rise. The price per cubic yard bid on the excavation in "Section Seven" shall include the cost of the construction of these levees.

19. CLEARING RIGHT-OF-WAY. The Contractor will be required without extra charge or compensation to remove all fences, buildings, trees, and other obstacles, encountered upon the line of work. The materials so removed shall be disposed of under the direction of the Engineer.

20. SEQUENCE OF WORK. The Contractor is required, as far as possible, so as to arrange his work and so dispose of his materials as not to interfere with the work or storage of the materials of the other Contractors engaged upon the work. He is also required to join his work to that of others in a proper manner, and in accordance with the spirit of the plans and specifications, and to perform his work in the proper sequence in relation to that of other Contractors, and as he may be directed by the Engineer. Failure to do this shall be sufficient grounds for annulling the part of his contract which may be affected. The Engineer shall have the right to decide upon the sequence of the work when necessary to prevent delay of one Contractor by another.

21. PLANS AND PROFILES. The plans, profiles, and descriptions of the various ditches are parts of an order made and entered by the County Court of Lee County, Illinois, under date of June 23rd, 1911, and form a part of the specifications and contract. Copies of the plans and profiles, are hereto attached and make a part of these specifications.

CONTRACT

ARTICLES OF AGREEMENT, made and entered into this 11th day of July, 1912, by and between the Northern Construction Company of Elkhart, Indiana, party of the first part, and Inlet Swamp Drainage District, of Lee County, Illinois, party of the second part, WITNESSETH, that

WHEREAS, on the 6th day of June, 1912, said party of the second part advertised for bids for the doing of certain work as directed by order of the County Court of said County, made and entered on the 23rd. day of June, 1911, to be filed in the office of the County Clerk of said county on the 27th day of June, 1912, and on said later date said party of the first part presented and filed it's bid to do a portion of said work basing the same on the printed pamphlet of terms, information and specifications prepared and furnished by the party of the second part, which work it proposed doing at the following prices:

Section No.1. 172,000 cubic yards of rock excavation at ninety-eight and 84/100 cents per cubic yard,.....\$170,004.80

Section No. 1.	224,000 cubic yards of earth excavation at seven and 7/10 cents per cubic yard.....	<u>\$7,248.00</u>
		<u>\$187,252.80</u>
Section No. 2.	370,000 cubic yards of earth excavation at seven and 7/10 cents per cubic yard.....	28,490.00
Section No. 3.	200,000 cubic yards of earth excavation at seven and 7/10 cents per cubic yard.....	15,400.00
" " "	3,400 cubic yards of earth filling at at twenty-five cents per cubic yard.....	850.00
Section No. 4.	178,000 cubic yards of earth excavation at nine cents per cubic yard.....	16,020.00
" " 5	70,000 cubic yards of earth excavation at fourteen and 5/10 cents per cubic yd.....	11,020.00
" " 6	39,000 cubic yards of earth excavation at fourteen and 5/10 cents per cubic yd.....	5,655.00
Section " 7	26,000 cubic yards of earth excavation at thirty cents per cubic yard,.....	<u>7,800.00</u>
		Total <u>\$272,487.80</u>

(said section references being to sections as numbered on page of said pamphlet headed "Ditches, Sections and Quantities.")

And the party of the second part having determined that the party of the first part is the lowest bidder for the work embraced in said sections, has awarded the contract for said work to it.

NOW THEREFORE, in consideration of the premises and the covenants of the party of the second part hereinafter expressed, the party of the first part does hereby covenant and agree to and with the party of the second part that it will in all things carry out in good faith all of the terms of the order of the County Court aforesaid, of June 23rd, 1911, in doing the work so awarded to it, and will in good faith conform to the terms and specifications prescribed in said pamphlet, all of which as well as said order are made a part of said contract in like manner and to the same effect as if they were word for word embodied herein: that it will do and complete said work for the rate and prices, or price rate, named, not later than January 1st, 1915, subject only to one modification hereinafter noted.

And the party of the second part, in consideration of the covenants of the party of the first part, covenants with the party of the first part that it will in the manner and at the times and on the conditions mentioned in said pamphlet pay said party of the first part for said work at the price and rate named in said bid. Provided, however, that the excavation of Town Line Lateral and the cleaning out of the Hicks and Frost Laterals shall be last done, and if the commissioners of said district shall conclude that the financial condition of the district will not admit of this work being done under this contract, the party of the first part will, at the option of the Commissioners, release the district from the obligation of the contract so far as it relates to said laterals.

And it is further mutually agreed that Section 10 or pamphlet, entitled "payments" is construed to require payment on engineer's estimate for the drilling and blasting of rock before its removal but the rate of payment on such estimate shall be fifty percent of the eighty-five per cent payable

for other work, the balance of the eighty-five per cent to be payable when the work so drilled and blasted shall be removed in accordance with specifications.

IN WITNESS WHEREOF, said party of the first part has caused this instrument to be executed in duplicate by it's President and attested by it's Manager under it's corporate seal, the day and year first above written, and said party of the second part, by its commissioners has also on said date executed said instrument in duplicate.

THE NORTHERN CONSTRUCTION COMPANY.

Attest G. C. Berkey
Manager.

By W. H. Hoover
President.

L. W. Berkey,
Secretary.

INLET SWAMP DRAINAGE DISTRICT.

By B. F. Lane

X. F. Gehant

B. F. Johnson

Commissioners.

27.

STATE OF INDIANA,

ELKHART COUNTY, ^{ss}

Before me, a Notary Public, in and for said County, personally appeared Northern Construction Company, by W. H. Hoover, it's president and C.C. Berkey, it's Manager, and acknowledged the execution of the foregoing instrument for the uses and purposes therein mentioned.

Witness my hand and Notarial Seal, this 16th day of July, A. D. 1912.

My commission expires
April 27, 1915.

Goldie M. Bowerman,
Notary Public.

EQUIPMENT.

Dredge. Marion Steam Shovel Company. Model
No. 695, Dipper Drèdge, 2 cu. yd. capacity.
Shop No. 2281.

70' boom, telescopic bank spuds. Double hitch
type swinging engines.

90' x 34' x 7' Wood hull.

Macinery only \$11,150.00

Hull Complete \$ 8,000.00

Drills.

Ingersol-Rand Company. E 44 Steam
Drills fitted with 44 head, 44 shell and 42 chuck.
\$208.00 each.

E 27 tripods complete \$45.50 each.

Cross bits 1-1/8" shank.

Methods and Costs.

In order to avoid drilling the rock, which was under water from one to five feet in depth, from barges, two crib dams were built, one at the upper end of the Inlet, and one two miles from the lower end. The water was held by these dams during the day and allowed to flow through the gates, with which the dams were equipped, during the night. This made it possible to drill the rock dry, and to carry on the work up into the winter months. This also necessitated the work being started at the lower end of the ditch.

The holes were drilled approximately five feet apart. The outside holes one and one-half to two feet outside of the slope line. The holes were all drilled approximately three feet below grade, after experimenting on the first five hundred feet. This broke the rock a little below grade, and with the exception of the first few hundred feet, it was never found necessary to drill and blast the second time.

The rock varied in depth from one to eight feet, and, in places, was covered with loose rock and sand from one to three feet in depth.

Forty and sixty per cent dynamite was used and the charges were fired by a battery, forty to sixty holes at one time, usually at noon and at night when all of the men were out of the ditch.

The dredge was built in Green River below the rock, began excavating as soon as the first rock was blasted, and followed as close as possible to the drillers at all times.

A brush dam was built in river below the dredge to control water for same, and to allow it to work under the most favorable conditions.

It was only found necessary to build two dams for this purpose. The second one was built two miles from the lower end after the dredge had passed this point.

31.

The dredge was only operated during the day. The ten hour shift was sufficient to take care of rock as rapidly as it was blasted.

This rock was wasted along the banks, leaving a berm of five feet.

The actual construction work was started May 3rd. 1913, and finished December, 15th. 1915.

32.

Costs.

Expenses, Dredge Contract No. 68 H.

August 1st, 1915 to February 1st, 1916.

Station 249 to the End.

Shut Down	\$	608.70
Stripping		371.21
Drilling		3,495.60
Blasting		2,021.07
Dredging Rock		2,551.75
Dredging Earth		1,014.70
Dismantling Dredge		1,190.79
Overhead Expense		780.00
Rental		<u>1,287.50</u>
	\$	13,321.32

Extra Work before August 1st, 1915.

Ditch at Station 186	149.68
Dam at Station 196	940.70
Digging Sand Creek Basin	292.50

After Aug. 1st, 1915.

Dam at Source of Sand Creek	224.11
Taking Jury over rock	7.50
Dam at mouth of Sand Creek	<u>1,802.21</u>
	\$ 3,416.70

Dredge Sundry Repairs.....	130.20			609.86	739.97	...444
Blasting repairs.....			76.54		76.54	...46
Dynamite 60%.....			12,818.62			
" 40%.....			6,107.13		18,925.75	11353
Fuzes.....			1,306.49		1,306.49	...784
Rental on Equipment.....	843.50	3,250.00	134.37	2,625.00	6,852.87	..4111
Bond or Premium.....	46.24	260.10	150.28	121.40	578.02	...347
Dams and Maintenance.....	491.30	2,063.67	255.11	1,238.68	4,048.76	..2428
Liability Insurance.....	54.13	344.89	327.99	128.28	855.29	...513
Overhead Expenses.....	408.00	2,295.00	1,326.00	1,071.00	5,100.00	..3059
Cost Each Division	<u>7,450.52</u>	<u>43,557.65</u>	<u>25,627.03</u>	<u>20,659.34</u>	<u>97,294.54</u>	<u>.58362</u>
Cost per yard ea.div.	<u>.0446</u>	<u>.2613</u>	<u>.1537</u>	<u>.1240</u>	<u>.5836</u>	

Total cost on 166,692.00 cubic yds. \$97,294.54
 Net Profit " " " 67,463.75
 Total Earnings " " " \$164,758.29

Distance: 14,700.00 Feet.
 Average Cut,
 Slope $\frac{1}{4}$ to 1.
 Bottom Width, 40 foot.

All Dirt Station 195 to 230 plus 50 ft.

Cost Excavating Rock per Yard 58.63 Cents.
 Net Profit " " " " 40.48 "
 Amount Received. 98.84 Cents.

COST RECORD - EXCAVATING ROCK.
INLET SWAMP DRAINAGE DISTRICT, AMBOY, ILLINOIS.

Contract No. 68 H. Dredge No. Eight Station 0 to 66 plus 50'

----- 0 -----

	DRILLING	BLASTING	DREDGING	TOTALS	Cost per. YARD.
Labor.....	\$ 5,649.60	...808.78	\$ 1,094.61	\$ 7,552.99	17,227
Supt. & Office.....	..559.82	93.30	279.91	933.03	2.129
Blacksmith Labor..	520.16	.....	39.55	559.71	1.276
Boarding Laborers.	2,250.64	149.06	352.88	2,752.58	6.278
" Blksmiths	24.25	.....	5.10	29.35	.067
Team work.....	583.59	74.94	166.72	825.28	1.882
Coal Inc.Frt.Haul'g.l,	258.46	.....	1, 110.82	2,369.28	5.404
Rubber Boots,Clothes	324.66	34.45	7.32	366.43	.836
Lubricating Oils....	101.49	.....	92.20	193.69	.442
Burlap	59.00	.....	.....	59.00	.135
Drill Reprs.....	734.66	.....	.....	734.66	1.663
Drill'g.Sun.Reprs...	393.65	.....	.....	393.65	.898
Drill Boiler Reprs..	691.61	.....	.....	691.61	1.577
Drill Sparp.Reprs...	44.39	.....	.....	44.39	.101
Drill Bits.....	135.00	.....	.....	135.00	.308
Flues for Castings..	174.68	.....	.....	174.68	.398
Planks & Timbers....	54.25	.....	.....	54.25	.124
Blacksmith Coal.....	15.10	.....	4495	20.05	.046
Boiler Chemicals....	18.26	.....	11.05	29.31	.067
Traction Engine.....	31.10	.....	.....	31.10	.071
Cables.....	.....	.....	98.42	98.42	.234
Sundries,Expenses...	192.47	...29.76	75.40	297.63	.679
Dredge Factory Reprs.	.....	.....	577.86	577.86	1.318
Dredge Sun. Reprs....	.....	.....	443.92	443.92	1.013
Blasting Repairs.....	.....	27.95	.....	27.95	.064
Dynamite 60%.....	.....	1,957.16	.....	.....	.....
Dynamite 40%.....	.....	2,933.14	.....	4,890.30	11.154
Fuzes.....	.....	708.60	.....	708.60	1.617
Rental on Equipment..	1,100.00	48.50	928.70	2,077.20	4.738

Dams & Maintenance.....	350.16	.....	178.16	528.32	1.205
Liability Insurance.....	103.13	168.90	25.45	297.48	.678
Overhead expenses.....	605.00	326.70	278.30	1,210.00	2.760
Cost of Each Division	<u>15,975.13</u>	<u>7,361.27</u>	<u>5,771.32</u>	<u>29,107.72</u>	<u>66.389</u>
Cost per yard ea. "	<u>.3643</u>	<u>.1679</u>	<u>.1317</u>	<u>.6639</u>	

Net Cost for above Section 29,107.72
Net Profit 14,227.69
Total Earnings \$ 43,335.41

Distance, 3,900 feet, Rock and Earth
Distance, 2,750 feet, All Earth.
Average Cut about 7 feet.
Slope $\frac{1}{4}$ to 1,
Bottom Width 40 feet.
Cubic yards 43,844

Cost in cents per yard 66.39
Profit " " " 32.45
Parice received" " 98.84¢

Note:- From Station 0 to 27 plus 50', All Earth/
" " 27 plus 50' to 66 plus 50', Nearly all Rock.

COST RECORD - EXCAVATING EARTH.
INLET SWAMP DRAINAGE DISTRICT, AMBOY, ILLINOIS.

Contract No. 68 H. Dredges No. Eight & No. Seven Two Sections.

Earth Section, Station 0 to 27 plus 50' and a portion to 66 plus 50'
Sand " , " 195 to 230 plus 50' ,

----- 0 -----

37.

	Earth SECTION	SAND Section	Totals	Cost per Yard	
Labor.....	\$ 477.65	\$ 1,507.02	\$ 1,984.67	2.450	Cents.
Supt. & Office.....	160.50	178.90	339.40	.419	
Blacksmith Labor.....	5.25	25.08	30.33	.037	
Boarding House:-.....	.....	.....	.....	.....
For Laborers and Blacksmiths...	140.74	526.60	667.34	.824	
Engine Hire.....	.....	36.70	36.70	.045	
Team Work.....	.18.84	115.17	134.01	.165	
Coal (Inc.Frt.& Hauling).....	317.59	724.48	1,042.07	1.286	
Rubber Boots and Rain Clothing.	3.20	6.31	9.51	.012	
Lubricating Oils.....	35.17	53.93	89.10	.110	
Boiler Chemicals.....	4.00	10.65	14.65	.018	
Removing and replacing bridges.	.....	84.00	84.00	.104	
Cables.....	12.17	231.59	243.76	.301	
Sundries Expenses.....	10.25	10.15	20.40	.025	
Factory Repairs.....	101.98	160.28	262.26	.324	
Sundries, Repairs.....	90.98	114.47	205.45	.254	
Rental on Equipment.....	179.50	280.00	459.50	.567	
Dams and Maintenance.....	24.79	67.97	92.76	.114	
Liability Insurance.....	11.58	30.80	42.38	.052	
Overhead expenses.....	130.58	260.00	390.00	.482	
Cost of Each Section.	<u>1,724.19.</u>	<u>4,424.10</u>	<u>6,148.29</u>	<u>7.589</u>	

Cost per yard on total yardage
of both sections, 81,002 cu.yds.

.0213 .0546 .0759

Sand Section had 37,768 cu. yds.
Actual cost per yard for going
over it three times.

.1171

Earth Section had 43,234 cu. yds.
Cost per yard to excavate once,

.0399

Cost for both sections
Profit on Earth Section
Total, less,
Loss on Sand Section
Total Earnings

6,148.29
1,640.03
8,788.32
1,515.96
7,272.36

Note:

Costs on Sand Section
includes dismantling and
hauling of Dredge No. seven
to Lee Center.

Cost per yard 7.59
Profit " " .11
Price Received 7.70¢

Dismantling \$411.80
Hauling 245.49
Total \$657.29

39.

February, 1st. 1916.

Summary:

Cost of Contract 68 H.

Dredging Earth	7,162.99
Stripping Rock	7,821.73
Drilling Rock	63,028.38
Blasting Rock	35,009.37
Dredging Rock	28,982.41

Dismantling Dredge	1,190.79
Overhead Expense 8/1/15 to 2/1/16	780.00
Rental on Eqpt. " " "	1,287.50
Shut Down	698.70
Liability Ins. " " "	.....

Total Cost Cont.68 H. 145,871.87

Cost of Extra Work 3,416.70

Total Cost Cont.68H & E.W. 149,288.57

I N D E X.

Page 1 - Table of Contents.
2 - Description and History of the District.
4 - Notice to Contractors.
6 - General Information.
10 - Ditches, Sections and Quantities.
13 - General Specifications.
22 - Contract.
28 - Equipment.
29 - Methods and Costs.
Map and Profile.