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The Fundamentals of Estimating for Bidding Purposes
Including
An Estimate of the Construction Cost of the City of
East Lansing Water Softener Building.

A Thesis Submitted to
The Faculty of
MICHIGAN STATE COLLEGE
of
AGRICULTURE AND APPLIED SCIENCE

by
John M. Patriarche

Candidate for the Degree of
Bachelor of Science

June 1938

THESIS

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--- DEDICATION ---

I dedicate this thesis to Harry W. Lott in
acknowledgement of the time and materials he
gave for the furtherance of this thesis.

PREFACE

The purpose of this thesis is to present to the reader a study of the fundamentals of estimating by the use of an actual estimate worked out by the author.

The subject of estimating has never been thought of as being one of great importance by colleges and universities, or they would have included it in their curriculum sometime ago. However, estimating is of great importance, not only to contractors, but also to those who deal with contractors. Good estimators are few and far between, but they are needed, not only when construction jobs are plentiful, but also when they are scarce, as a good estimator, who can save money, is invaluable to contractors during times of depression.

In the following pages, will be found a description of the procedure which one must go through in preparing an estimate to be used for bidding purposes; also, the necessary forms which must be filled out in turning in a bid will be found, bound in the back of the thesis with a description of the formalities which must be undergone in completing them.

Special acknowledgement is due Harry W. Lott, City Clerk of the City of East Lansing, for allowing the use of the blueprints, the specifications, and the cost sheet of the East Lansing Softener Plant; also to Professor Allen, Head of the Civil Engineering Department of Michigan State College, for acting as advisor; to Mr. Harry Conrad, President of the H.G. Christman-Lansing Company, for suggesting the thesis and for the information he gave. Acknowledgement is also due those persons, whose names are unknown, who gave their time in assisting the author in figuring out the costs of the various materials used.

The author hopes that he has fulfilled his purpose and that this thesis will be of value to someone else, as he realizes it has been invaluable to him.

John M. Patriarche

The main purpose of this thesis is to present the fundamentals of estimating in an interesting yet concise manner, and to prepare an estimate that has been worked out by the use of those fundamentals.

In preparing this estimate, several very necessary assumptions had to be made in the beginning. It was assumed that the author is a contractor, whose headquarters are in East Lansing, Michigan. He has an average amount of equipment and does all his purchasing through local merchants. It also was assumed that the necessary preliminary survey had been made; that is, a study of the building site had been made, borings had been taken, and that the locations of the sewers, water mains, and electric power lines had been determined. Having obtained this information, the contractor is ready to start his estimate.

First, an outline was made to show the contractor the various types of work which had to be done on this particular job, and to show the approximate order in which they would come. Then, beginning from the first, the various quantities were taken off the blueprints and set down in such an order that the unit prices could be readily attached and the total cost figured. In several places, due to the authors lack of knowledge in construction details, assumptions were used. Several methods the author assumed could be used in the construction of the building might not be satisfactory to someone who has had experience in construction work, but they will accomplish the necessary work.

Having completed the quantity estimate, the next step is to obtain the unit prices for the different materials. These prices may be easily obtained from the different companies and the total cost of the materials found.

The next step, that part of the estimate which affects the size of the bid more than any of the other parts, is that of finding the cost of labor. The quantities of material can be estimated close enough, so that any variations in construction later, would not affect the cost of materials very much, unless it was some unusual occurrence. The labor estimate, however, cannot be determined by any set standard. The cost of labor changes rapidly. Not only do the wage scales change, but also the speed with which labor works. The variations in time will vary the amount of the estimate considerably. No contractor can tell beforehand at what speed his laborers will work, and therefore he is handicapped in figuring the cost of his labor. The use of time studies is by far the best method found to-date. From the use of time studies, the average rate of work for the different classes of laborers can be found, and knowing the quantity of work to be done, the cost of the labor for each job can be found. This may sound easy, but it isn't. There have not been time studies made for every type of job, and where certain times may fit one job, they won't fit any where near the same for a similar job. Therefore in preparing an estimate on the cost of labor, the contractor can use the various time

studies but he should also use common sense, which can only be gotten by long experience.

The cost of the materials and labor are the two main items. Other items that should enter into the estimate are the cost of equipment and all overhead expenses.

The cost of equipment for small jobs is not very high, as the contractor usually owns all the necessary equipment, but it should not be neglected. Nor should the cost of the equipment be charged directly to one job, but spread out, and a small part of the cost of the equipment attached to each job.

The cost of overhead includes the contractor's bonds, property damage liability, public liability, workmen's compensation, office salaries such as: timekeeper, engineer, superintendent, surveyor, etc.; any temporary sheds that might be erected, and trucking expenses. This list just includes those items that were used in the following bid. There are several others which may have to be included in other estimates such as, insurances, traveling expenses, photographs, repairing of streets and pavements, etc.

The different costs of the estimate are then totaled, and ten(10) per cent of that total is added for profit. This total is taken as the amount of the bid.

Before bids are called for, pre-qualification statements must be filled out by each contractor, a copy of which will be found in this thesis next to the bid proposal. This statement gives the financial status of the bidder, and shows the owner whether or not the contractor is capable of undertaking the proposed job.

When bids are called for, they are turned in in the form shown in the back of the thesis. The proposal sheet is first, then the specifications, followed by the contract and bonds unsigned. Also included with the bid should be a certified or cashiers check equaling five(5) per cent of the total amount of the bid, payable to the owner as a guarantee of good faith, and which if the contract be awarded to him, he agrees to forfeit, as liquidated damages to the owner in event of his failure to enter into contract and furnish satisfactory bonds to the owner within fifteen(15) days after notice of award. When the contract is awarded, the contract is filled out and signed by both parties. As soon as the contractor furnishes the necessary bonds his check is returned to him.

In concluding, it is the author's humble opinion that in order for anyone to become a good estimator, he must have many years of actual contact with construction work and construction methods. No one can be an estimator of construction work unless he knows the various methods used in the many different types of construction work. An estimator should have the plans, specifications, and reports on the existing conditions surrounding the contemplated structure before beginning his estimate. The estimator must be a good analyzer, must not be afraid to take chances, and by all means believe in his estimates. He should also be able to back up any estimate he makes with proper information, although he has had to base his estimate on logical thinking or common sense. The introduction of

time studies has been one step towards helping the estimator, as the time element is the biggest factor in any estimate.

On the following pages, can be found an estimate figured out by the author, which he hopes follows the rules he has just set forth in the preceeding pages. Also, there will be found a comparison of the author's estimate with the actual cost sheet kept by the City Clerk of the City of East Lansing. There is no accurate way to compare the two costs, but a general comparison can be made. There is no way of checking this bid with other bidders, as this job was a W.P.A. project and no contractors were called upon to submit bids.

COST COMPARISON

TYPE OF WORK	E.L. COST	ESTIMATE
Excavation, grading, & bldg. removal-----	L- \$ 542.25	L- \$ 553.00
Cement and concrete in place & reinforcing steel-----	M- 1624.50 L- 1794.45	M- 1561.39 L- 1538.40
Brickwork & masonry-----	M- 1538.23 L- 1369.25	M- 1342.85 L- 1456.80
Plastering, furring, & lathing-----	M- 147.92 L- 231.43	M- 195.83 L- 97.50
Carpentry---- Rough carpentry Roof framing ----- Mill work	M- 674.51 L- 741.65	M- 1031.18 L- 644.60
Roofing shingles-----	156.20	213.00
Sheet metal work-----	M- 92.46 L- 146.55	M- 67.60 L- 59.50
Heating-----	M- 315.00 L- 7.25	700.00
Painting-----	M- 295.20 L- 44.82	M- 115.45 L- 160.00
Structural steel-----	M- 184.98	M- 206.96
Miscellaneous expense-----	137.24	180.67
Equipment-----	349.63	266.50
Overhead----- Superintendence-----	1000.00	1050.00
Timekeeping-----	380.00	240.00
Liability insurance---	20.00	22.00
	<u>\$11,793.52</u>	<u>\$11,701.23</u>
M- materials		
L- labor		

- EXPLANATION OF COMPARISON -

It is the author's wish that no one take this comparison too seriously, as an exact comparison of each item is not possible. The time necessary to complete the work was calculated as being about three months by the author, while in reality it took nearer five months to do about the same amount of work. Some of the materials and labor he has accounted for in one place have been accounted for in another place by the City of East Lansing, thus making a truly exact comparison impossible. However, everything he has accounted for is also entered on the East Lansing side of the comparison except for a few minor items. The difference in prices in 1934 to those of 1938 also make an exact check impossible.

Concerning the items Roofing shingles and Heating, the contractor was told to allow the higher values, therefore he would have to refund the difference in cost to the owner.

As for the great differences in labor and materials in several of the accounts, the author is at a loss to explain, unless it could be that some of the items for materials could have been entered in other accounts, and that the wage scale used in one side of the comparison does not agree with that used by the author. However, the totals of the two columns compare remarkably well. To the total in the author's estimate column, must be added several more items in the overhead section in order to complete his bid, raising his total about \$1600.00 more. (see bidding proposal)

One other check was available. In Underwood's "Estimating Construction Costs" it gave the following percentages:

Overhead-20%
Materials-43%
Labor-35%
Equipment-2%

This is a very general means of comparison but it gives an added check on the author's estimate whose percentages are as follows:

Overhead-16%
Materials-46%
Labor-37%
Equipment-1%

On the following sheets will be found the working sheets and the summary sheets of the estimate.

- OVERHEAD -

Superintendent's salary-3 months at \$200.00 -----	\$ 600.00
Engineer's salary-3 months at \$150.00-----	450.00
Timekeeper's salary-3 months at \$80.00-----	240.00
Surveyor's wages-----	20.00
Temporary office building-----	50.00
" water closet-----	16.00
Public liability-----	11.00
Property damage liability-----	11.00
Bonds (1% of total bid)-----	135.00
Building permit-----	10.00
Trucking expenses-----	125.00
Workmen's Compensation:	
Plastering-----	3.06
Carpentry-----	85.90
Brick & concrete work-----	155.59
Excavation-----	32.78
Sheet metal work-----	2.14
Painting-----	8.02
Total Overhead-\$	<u>1955.49</u>

- EXCAVATION, GRADING, & BUILDING REMOVAL -

Amount of excavation necessary:

Brine storage-----	2960	cu.ft.
Pump basement-----	1896	"
Brine recovery-----	647	"
Footings-----	424	"
Pipe trench-----	193	"
Building foundations----	1182	"
Porch " ----	150	"
Chimney " ----	20	"
Pit for cellar window---	42	"
Total <u>7514</u>		cu.ft. use 8000 cu.ft. or 300 cu.yd.

Assuming 300 hours per 100 cu.yds. of hand labor, then 900 hours will be needed to excavate.

Cost- 900hrs. at .50 per hr. - \$ 450.00

Amount of backfill necessary:

Sides of foundations-----	610	cu.ft.
Side of brine recovery-----	23	"
Sides of porch foundations----	24	"
Total <u>657</u>		cu.ft. or 25cu.yds.

Assuming 50 hours per 100cu.yds. hand labor, assume about 16 hours will be needed to shovel and tamp in backfilling.

Cost- 16hrs. at .50 per hr. - \$ 8.00

Amount of grading necessary: (rough grading 10' out around building required)

Cost- 16hrs. at .50 per hr. - \$ 8.00

Removal of building: (12' x 24' cement block building)

Time required - 24 man hours

Cost - 24hrs. at .50 per hr. - \$ 12.00

Time required for total operation about three (3) weeks.

Foreman's wage - 120hrs. at .625 per hr. - \$ 75.00

Total cost of labor--	\$ 553.00
Cost of equipment----	5.00
Total	<u>\$ 558.00</u>

- ROUGH FORM WORK -
(for concrete and brickwork)

Materials:

Lumber-	1" x 8" #1 Y.P. -3800B.M. at \$75M -	\$ 285.00
	2" x 4" #1 Y.P. -1740B.M. at \$38M -	66.12
Nails	- 3 kegs 8d common at \$ 4.00 per keg-	12.00
Wire	- 150# at \$ 5.00 per 100# -----	7.50
		<u>\$ 370.62</u>

Labor:

For walls and foundations--

Carpenter-	240hrs. at \$ 1.20 per hr. ----	\$ 268.00
Carpenter's helper-	240hrs. at .90 per hr.	216.00
Common laborer-	120hrs. at .50 per hr. --	60.00

For brick masons--

Carpenter-	24hrs. at \$ 1.20 per hr. -----	26.80
Carpenters helper-	24hrs. at .90 per hr.	21.60
Common laborer-	12hrs. at .50 per hr. ---	6.00

For removal of forms, cleaning, etc.--

Common laborer-	108hrs. at .50 per hr. --	54.00
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For cleaning up, removal of rubbish--

Common laborer-	80hrs. at .50 per hr. ---	40.00
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Time required for all operations about three (3) weeks

Carpenter foreman-	120hrs. at \$ 1.20 per hr.--	144.00
		<u>\$ 836.40</u>

Cost of materials--	\$ 370.62
Cost of labor-----	836.40
Cost of equipment--	15.00
Total	<u>\$ 1222.02</u>

- REINFORCED CONCRETE WORK -

Materials:

Gravel -- 200 cu.yds. at \$ 1.75 yd.-----	\$ 350.00
Sand ---- 100 cu.yds. at \$ 1.65 yd.-----	165.00
Cement -- 264 bbls. at \$ 2.00 bbl.-----	528.00
Lime ---- 50 lbs. at \$20.00 ton-----	.50
Reinforcing steel rods- 2626 lbs. at \$60 ton -	86.35
" " " - 967 lbs. at \$60 ton -	29.00
" " " - 967 lbs. at .40 100#-	3.87
Reinforcing steel mesh - 6 x 6 #10 mesh--	
1200 sq.ft. at \$1.30 per 100 sq.ft.-----	15.60
Reinforcing steel mesh - 6 x 6 #6 mesh--	
115 sq.ft. at \$2.13 per 100 sq.ft.-----	2.45
Tie wire- 200lbs. at \$ 5.00 per 100#-----	\$ 10.00
Total	<u>\$ 1190.77</u>

Labor:

Reinforcement placer- 40hrs. at .80 per hr.---	\$ 32.00
" placer's helper - 40hrs. at .55 hr.	22.00
Operator of concrete mixer- 90hrs. at .80 hr.	72.00
Workers charging mixer - 195hrs. at .60 per hr.	117.00
Finishers - 40hrs. at \$ 1.20 per hr. -----	48.00
Finishers helper - 40hrs. at .65 per hr. -----	26.00
Wheelbarrow labor - 270hrs. at .50 per hr. ---	135.00
Gravel fill labor - 48hrs. at .50 per hr. ----	24.00

Time required for all operations about three (3) weeks

Foreman at mixer - 90hrs. at \$ 1.00 per hr. --	90.00
" at placing - 80hrs. at \$1.20 per hr.	96.00
" for reinforcement gang- 40hrs. at \$1.00	40.00
	<u>\$ 702.00</u>

Equipment:

Mixer-----	\$ 10.00
Barrows---	2.00
Runways---	4.00
	<u>\$ 16.00</u>

Cost of materials--	\$ 1190.77
Cost of labor-----	702.00
Cost of equipment--	16.00
Total	<u>\$ 1908.77</u>

- STRUCTURAL STEEL WORK -

Materials:

1-8" 11.5# channel	8'-6" long,	weight	98#
1-12" 31.8# I.beam	16'-0" "	, "	509#
1-6" 12.5# I.beam	8'-0" "	, "	100#
1-3" x 2 1/2" x 1/4" angle	30' long,	"	135#
1-3" x 3" x 5/16" angle	8'-0" "	, "	49#
1-3 1/2" x 3 1/2" x 5/16" "	9'-0" "	, "	65#
1-5" x 3 1/2" x 3/8" "	103'-6" "	, "	1076#
1-4" x 4" x 5/16" "	16'-6" "	, "	135#
1-6" x 4" x 3/8" "	75'-0" "	, "	923#
1-3" x 1/4" plate	6" long	, "	1#
2-42" x 1/4" "	4'-0" "	, "	286#
1-9" x 1/4" "	8'-6" "	, "	65#
1-11" x 1/4" "	8'-0" "	, "	75#
2-11" x 3/8" "	1'-4" "	, "	37#
Total			3554#

3554# steel at \$ 3.94 per 100# ----- \$ 140.03

1-24" x 1/4" checkered plate 7'-0" long, 158#
 158# plate at \$ 5.84 per 100# ----- 9.23

1-3'-9" x 3'-9" steel grating (1" bars)
 14 sq.ft. at \$ 1.50 sq.ft. ----- 21.00

Cutting 3712# at .10 per lb. ----- 3.71
 Paint and painting 3712# at .15 per lb. 5.57
 Welding and fabrication 3712# at .20 lb. 7.42

\$ 186.96

12' steel ladder at \$ 1.50 per lin.ft. ----- \$ 18.00

Cost of material--	\$ 204.96
Cost of labor----	(included elsewhere)
Cost of equipment--	2.00
Total	\$ 206.96

- BRICKWORK -

Materials:

Standard face brick - 28,000brick at \$28M-----	\$ 784.00
Duo brick (3-5/4"x 5"x 8")- 5,300brick at \$75M-	397.50
Terra cotta flue lining (8"x 12"x 2')	
30ft. at .35 per ft.-----	10.50
Buff limestone (cut to order)-----	40.35
Sand -- 20 cu.yds. at \$ 1.65 yd.-----	33.00
Cement -- 36 bbls. at \$ 2.00 bbl. -----	72.00
Lime -- 550 lbs. at \$ 20.00 ton -----	5.50
	<u>\$1342.85</u>

Labor:

Bricklayers- 600hrs. at \$ 1.20 per hr.-----	\$ 720.00
Bricklayers- 170hrs. at \$ 1.20 per hr.-----	204.00
Bricklayers helper- 300hrs. at .70 per hr.-----	210.00
Moving scaffolding--	
cCommon laborer- 60hrs. at .50 per hr.-----	30.00
Cleaning and pointing outside--	
Bricklayers- 50hrs. at \$ 1.20 per hour----	60.00
Common laborer- 12hrs. at .50 per hour----	7.20
Washing inside--	
Bricklayers- 16hrs. at \$ 1.20 per hr.-----	19.20
Common laborer- 4hrs. at .50 per hr.-----	2.40
Culling brick- 140hrs. at .60 per hr.-----	84.00
Time required for all operations about three (3) weeks	
Bricklayers foreman- 120hrs. at \$ 1.00 per hr.-	<u>120.00</u>
	<u>\$1456.80</u>

Equipment:

Mixing boxes-- \$	4.00
Wheelbarrows--	2.00
Sand screen---	10.00
Shovels & hoes	2.00
Brick hods----	1.00
Mortar hods---	1.00
Cartage-----	2.50
	<u>\$ 22.50</u>

Cost of materials-- \$	1342.85
Cost of labor-----	1456.80
Cost of equipment--	22.50
Total \$	<u>2822.15</u>

- PLASTERING -

Material:

Metal lath- 188 sq.yds. at .30 sq. yd.-----	\$ 56.40
Plaster- 4 $\frac{1}{2}$ tons at \$ 17.50 ton-----	78.75
Channels-- 7-1 $\frac{1}{2}$ " 40'long at \$30 per 1000ft.--	8.40
" --31-3/4" 62'long at \$22 per 1000ft.--	42.28
Fastenings,wire,nails,etc.-----	10.00
	<u>\$ 195.83</u>

Labor:

Furring and lathing -- 50hrs.	
Plastering ----- 50hrs.	
Plasterers- 50hrs. at \$ 1.20 per hr.-----	\$ 60.00
Plaster's helper- 50hrs. at .75 per hr.--	37.50
	<u>\$ 97.50</u>

Cost of materials--	\$ 195.83
Cost of labor-----	97.50
Cost of equipment--	4.00
Total	<u>\$ 297.33</u>

- ROOFING SHINGLES -

Roofing-1775 sq.ft. at \$ 12.00 per sq. in place-- \$ 213.00

- CARPENTRY -

Materials:

2"x 12" #2 Y.P.- 170B.M. at \$46M-----	\$ 7.83
2"x 6" #2 Y.P.- 1100B.M. at \$38M-----	41.80
2"x 8" #2 Y.P.* 1520B.M. at \$38M-----	57.76
1"x 8" #2 Y.P.- 2630B.M. at \$38M-----	99.94
#1 fir cornice- 200ft. at .05ft.-----	10.00
4-Triple casements- \$23.37 ea. sash-----	93.48
21.75 ea. frame-----	87.00
3-Quadruple casements- * 31.16 ea. sash-----	93.48
\$ 29.00 ea. frame-----	87.00
1-Triple casement- sash-----	14.49
frame-----	20.25
2-Back doors- \$ 16.50 ea.-----	33.00
frame-----	10.50
2-Garage doors- \$ 27.20 ea.-----	54.40
frame-----	10.25
Complete front door setting-----	175.00
6-Colonial columns at \$16.50 ea.-----	97.50
4-Split columns at \$ 8.40 ea.-----	33.60
1-Keg of 10d common nails at \$ 3.90 keg-----	3.90
	<u>\$ 1031.18</u>

Labor:

Carpentry--

Roof sheathing-----	50hrs.
Rafter placement-----	35 "
Roof trusses-----	70 "
Installing cornice-----	20 "
Erecting columns-----	25 "
Installing windows-----	50 "
Front door installation----	20 "
Garage and back door inst.-	20 "
Erect wooden stairs-----	10 "
	<u>300 hrs.</u>
Cutting for other trades---	30
	<u>330 hrs.</u>

(Labor rate includes carpenter and carpenters helper)

330 hrs. at \$ 1.40 per hour-----	\$ 462.00
Common labor for carrying lumber & frames,& also for cleaning up--- 250 hrs. at .50 per hr. -----	125.00
Carpenter foreman- 48hrs. at \$ 1.20 per hr. -----	57.60
	<u>\$ 644.60</u>

Cost of materials--	\$ 1031.18
Cost of labor-----	644.60
Cost of equipment--	5.00
Total \$	<u>1680.78</u>

- SHEET METAL WORK -

Materials:

5" Gal.I.ridge roll-- 65' at .10ft.-----	\$ 6.50
4" Semi-circular hanging gutter--60' at.15ft.	9.00
5-3"Gal.I.wire baskets-- at ,25 ea.-----	1.25
4" Box gutter-- 55' at.12ft.-----	6.60
4" Gal.I.leader-- 75' at.15 ft.-----	11.25
150sq.ft. of tin at .35 sheet(20"x 28")-----	12.00
20 oz.copper valley flashings--	
35sq.ft. at.50 lb.-----	19.00
Nails,hoks,and straps-----	2.00
	<u>\$ 67.60</u>

Labor:

Tin roofing-----	3hrs.
Gutters and leaders--	24hrs.
Flashings-----	8hrs.
	<u>35hrs.</u>
Sheetmetal worker--	35hrs. at \$ 1.00 per hr.--
Sheetmetal worker's helper--	
	35hrs. at .70 per hr.---
	<u>24.50</u>
	<u>\$ 59.50</u>

	\$
Cost of material--	67.60
Cost of labor-----	59.50
Cost of equipment--	2.00
Total	<u>\$129.10</u>

- PAINTING -

Materials:

12½ lbs. of putty at .75-----	\$.75
5 Gals. varnish sizing at .40 gal.-----	2.00
36 Gals. lead & oil paint at \$ 2.75gal.---	81.00
3 Gals. shellac at \$ 2.10 gal.-----	6.30
5 Gals. #38 varnish at \$ 3.40 gal.6-----	17.00
4 Gals. flat at \$ 2.10 gal.-----	8.40
	<u>\$ 115.45</u>

Labor:

Painters- 100hrs. at \$ 1.00 per hr.-----	\$ 100.00
Painter's helper- 100hrs. at .60per hr.-----	60.00
	<u>\$ 160.00</u>

Cost of materials--	\$ 115.45
Cost of labor-----	160.00
Cost of equipment--	4.00
Total	<u>\$ 279.45</u>

- MISCELLANEOUS -

Steel casement- completely installed-	\$ 3.15
Hardware- 375 bolts-½" 18" long-----	39.00
14 bolts-¾" 24" long---	2.87
4 Hinged hasps-----	.70
Finished hardware (allowed)-----	50.00
Waterproofing-----	50.00
Manhole covers-----	30.00
C.I. clean out door-----	3.00
Metal rungs for ladder into storage	
bins- 15# at .03 lb.-----	.45
cutting- 15# at .10 lb.-----	1.50
Total	<u>\$ 180.67</u>

- COMBINED FORM OF BID -

Overhead-----		\$	1967.49
Excavation, grading, & building removal---			
	Labor--\$	553.00	
	Equipment	<u>5.00</u>	
			558.00
Formwork-----			
	Materials--\$	370.62	
	Labor-----	836.40	
	Equipment--	<u>15.00</u>	
			1222.02
Reinforced concrete work-----			
	Materials--\$	1190.77	
	Labor-----	702.00	
	Equipment--	<u>16.00</u>	
			1908.77
Structural Steel-----			
	Materials--\$	204.96	
	Equipment--	<u>2.00</u>	
			206.96
Brickwork-----			
	Materials--\$	1342.85	
	Labor-----	1456.80	
	Equipment--	<u>22.50</u>	
			2822.15
Plastering-----			
	Materials--\$	195.83	
	Labor-----	97.50	
	Equipment--	<u>4.00</u>	
			297.33
Roofing shingles-----			213.00
Carpentry-----			
	Materials--\$	1031.18	
	Labor-----	644.60	
	Equipment--	<u>5.00</u>	
			1680.78
Sheet metal work-----			
	Materials--\$	67.60	
	Labor-----	59.50	
	Equipment--	<u>2.00</u>	
			129.10

Plumbing----- (separate bid)-----

Painting-----

Materials--\$ 115.45

Labor----- 160.00

Equipment-- 4.00

----- \$ 279.45

Heating----- 700.00

Wiring----- (separate bid)-----

Miscellaneous----- 180.67

Total \$12,153.72

10% Profit 1,215.37

Bid-- \$13,369.09*

- BIBLIOGRAPHY -

Books:

Barnes- Estimating Building Costs.

Dingman- Building Estimator's Data Book.

" - Estimating Building Costs.

" - Plan Reading and Quantity Surveying.

Hoole and Kinne- Reinforced Concrete and Masonry Structures.

Underwood- Estimating Construction Costs.

" - Standard Construction Methods.

Miscellaneous:

Blueprints of the East Lansing Water Softener Building.

Specifications for the Water Softener Building, East Lansing,
Michigan by H.A. Childs, Architect.

Distribution of Accounts for the East Lansing Water Softener
Plant.

-*-

Standard Pre-Qualification Questionnaires and Financial Statement for Bidders

FOR BUILDING CONSTRUCTION

**In Ordering Specify
Form P.Q.B.C.**

Developed by

THE JOINT CONFERENCE ON CONSTRUCTION PRACTICES

**For use in investigating qualifications of appli-
cants to bid on public and private construction.**

**(Not intended for use in the purchase of
merchandise.)**

Approved and Recommended by:

AMERICAN INSTITUTE OF ARCHITECTS

AMERICAN SOCIETY OF MUNICIPAL ENGINEERS

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

First Edition, 1933

**Issued by the Joint Conference on Construction Practices,
222 Munsey Building, Washington, D. C.**

PRE-QUALIFICATION QUESTIONNAIRE FORMS

Sequence of Use

BUILDING CONSTRUCTION

Form No. 40—to be submitted with application to bid.

Forms No. 42 and No. 43—to be submitted with bid.

Folder P.Q.B.C. should contain 40, 42, 43.

No. 40—General Questionnaire submitted with application to bid and designed so as to describe generally the applicant that the qualifying agency may intelligently determine if applicant should or should not bid.

No. 42 and No. 43 are supplemental and are to be submitted with the bid.

No. 43 is designed to bring out in detail and to within a few days of the letting the amount of work on hand and other salient information in connection with the work bid upon.

This type of information cannot be ascertained previously as the time factor is important, i. e., it is possible for an organization to materially change its status with respect to its ability to perform through recent new obligations, etc. The manner and method of handling the work cannot be ascertained until the time of placing the bid as new quotations arrive until the last minute.

No. 42 is a detailed financial statement supplementing the balance sheet in form No. 40. The financial standing of a firm may be altered materially in a very short time—therefore, the date of the information should be as close to the letting date as practicable; otherwise, it may be of little value.

No. 42 is separate from No. 43 for the reason that the information should be confidential and may either be returned to the bidder or preserved separately while No. 43 would remain with the contract file.

Pre-Qualification Statement

(Required in advance of consideration of application to bid)

Form

Approved and Recommended by

AMERICAN INSTITUTE OF ARCHITECTS
AMERICAN SOCIETY OF MUNICIPAL ENGINEERS
ASSOCIATED GENERAL CONTRACTORS OF AMERICA

1933

Submitted by

Address

Date

Note: If you have filed a Pre-qualification Statement within the past.....
days, questions numbers 1, 14, and 15 only of this document need be
answered.

Published by Joint Conference on Construction Practices
222 Munsey Bldg., Washington, D. C.

Pre-Qualification Statement

Submitted to.....

By { ☐ A Corporation
☐ A Co-partnership
☐ An individual

Principal Office

The signatory of this questionnaire guarantees the truth and accuracy of all statements and of all answers to interrogatories hereinafter made

1. Have you filed a Pre-Qualification Statement within the past..... days?
2. How many years has your organization been in business as a general contractor under your present business name?
3. How many years' experience in construction work has your organization had: (a) As a general Contractor (b) as a Sub-Contractor.....
4. Corporation or Co-partnership Information:

<p>If a corporation, answer this:</p> <p>Capital paid in cash, \$.....</p> <p>When incorporated.....</p> <p>In what State.....</p> <p>President's name.....</p> <p>Vice-President's name.....</p> <p>Secretary's name.....</p> <p>Treasurer's name.....</p>	<p>If a co-partnership, answer this:</p> <p>Date of organization.....</p> <p>State whether partnership is general, limited or association.....</p> <table border="1"> <tr> <th>Name and address of partners:</th> <th>Age</th> </tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table>	Name and address of partners:	Age										
Name and address of partners:	Age												

5. List the construction projects your organization has under way on this date:

Contract Amt.	Class of work	Per cent Completed	Name and address of Owner or Contracting Officer

6. List projects your organization has completed in past three years:

Contract Amt.	Class of work	When Completed	Name and address of Owner

Use blank sheet if additional space is needed.

7. Have you ever failed to complete any work awarded to you?..... If so, where and why?

.....

.....

.....

8. Has any officer or partner of your organization ever been an officer or partner of some other organization that failed to complete a construction contract?..... If so, state name of individual, other organization and reason therefor.....

.....

.....

9. Has any officer or partner of your organization ever failed to complete a construction contract handled in his own name?..... If so, state name of individual, name of Owner and reason therefor.

.....

.....

.....

10. In what other lines of business are you financially interested?

.....

.....

.....

11. What is the construction experience of the principal individuals of your organization?.....

Individual's Name	Present Position or Office	Years of Construction Experience	Magnitude and Type of Work	In What Capacity

13. Give condensed current financial statement:

Condition at close of business _____ 19____

ASSETS

1. **Cash:** (a) On hand \$_____, (b) In bank \$_____, (c) Elsewhere \$_____
2. **Notes receivable** (a) Due within 90 days _____
(b) Due after 90 days _____
(c) Past due _____
3. **Accounts receivable from completed contracts, exclusive of claims not approved for payment** _____
4. **Sums earned on uncompleted contracts as shown by Engineer's or Architect's estimate**
(a) Amount receivable after deducting retainage _____
(b) Retainage to date, due upon completion of contracts _____
5. **Accounts receivable from sources other than construction contracts** _____
6. **Deposits for bids or other guarantees:** (a) Recoverable within 90 days _____
(b) Recoverable after 90 days _____
7. **Interest accrued on loans, securities, etc.** _____
8. **Real estate:** (a) Used for business purposes _____
(b) Not used for business purposes _____
9. **Stocks and bonds:** (a) Listed—present market value _____
(b) Unlisted—present value _____
10. **Materials in stock not included in Item 4** (a) For uncompleted contracts (present value) _____
(b) Other materials (present value) _____
11. **Equipment, book value** _____
12. **Furniture and fixtures, book value** _____
13. **Other assets** _____

Total assets _____

LIABILITIES

1. **Notes payable:** (a) To banks regular _____
(b) To banks for certified checks _____
(c) To others for equipment obligations _____
(d) To others exclusive of equipment obligations _____
- 2.* **Accounts payable:** (a) Not past due _____
(b) Past due _____
3. **Real estate encumbrances** _____
4. **Other liabilities** _____
5. **Reserves** _____
6. **Capital stock paid up:** (a) Common _____
(b) Common _____
(c) Preferred _____
(d) Preferred _____
7. **Surplus (net worth)** Earned \$_____ Unearned \$_____

Total liabilities _____

CONTINGENT LIABILITIES

1. **Liability on notes receivable, discounted or sold** _____
2. **Liability on accounts receivable, pledged, assigned or sold** _____
3. **Liability as bondsman** _____
4. **Liability as guarantor on contracts or on accounts of others** _____
5. **Other contingent liabilities** _____

Total contingent liabilities _____

* Include all amounts owing subcontractors for all work in place and accepted on completed and uncompleted contracts, including retainage.

14. Will you, upon request, fill out an approved form of detailed financial statement and an additional form of Job Plan and Equipment Questionnaire? _____

15. Have you filed Performance Record reports with the Bureau of Contract Information, Inc., Washington, D. C.?.....

Dated at..... this
day of..... 19.....

.....
Name of Organization

By

.....
Title of Person Signing

STATE OF..... }
COUNTY OF..... } ss.:

..... being duly sworn deposes and says that he
is..... of.....
Name of Organization

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Sworn to before me this

..... day of..... 19.....

.....
Notary Public

My commission expires.....

STANDARD FORM OF

Contractor's Financial Statement

Approved and recommended by the Joint Conference
on Construction Practices for use in investigating the
qualifications of bidders on public and private construction.

*Not intended for use in the
purchase of merchandise.*

Submitted by _____

Address _____

Date _____

FIRST EDITION, 1933
ISSUED BY THE JOINT CONFERENCE ON CONSTRUCTION PRACTICES
222 MUNSEY BUILDING, WASHINGTON, D. C.

Contractor's Financial Statement

APPROVED AND RECOMMENDED FOR USE BY THE
JOINT CONFERENCE ON CONSTRUCTION PRACTICES

Submitted by _____
With principal office at _____
To _____

☐ An Individual
☐ A Co-partnership
☐ A Corporation

Condition at close of business _____ 19____

ASSETS

1. Cash: (a) On hand \$ _____, (b) In bank \$ _____, (c) Elsewhere \$ _____
2. Notes receivable (a) Due within 90 days _____
(b) Due after 90 days _____
(c) Past due _____
3. Accounts receivable from completed contracts, exclusive of claims not approved for payment _____
4. Sums earned on uncompleted contracts as shown by Engineer's or Architect's estimate.
(a) Amount receivable after deducting retainage _____
(b) Retainage to date, due upon completion of contracts _____
5. Accounts receivable from sources other than construction contracts _____
6. Deposits for bids or other guarantees: (a) Recoverable within 90 days _____
(b) Recoverable after 90 days _____
7. Interest accrued on loans, securities, etc. _____
8. Real estate: (a) Used for business purposes _____
(b) Not used for business purposes _____
9. Stocks and bonds: (a) Listed—present market value _____
(b) Unlisted—present value _____
10. Materials in stock not included in Item 4 (a) For uncompleted contracts (present value) _____
(b) Other materials (present value) _____
11. Equipment, book value _____
12. Furniture and fixtures, book value _____
13. Other assets _____

Total assets _____

LIABILITIES

1. Notes payable: (a) To banks regular _____
(b) To banks for certified checks _____
(c) To others for equipment obligations _____
(d) To others exclusive of equipment obligations _____
- 2.* Accounts payable: (a) Not past due _____
(b) Past due _____
3. Real estate encumbrances _____
4. Other liabilities _____
5. Reserves _____
6. Capital stock paid up: (a) Common _____
(b) Common _____
(c) Preferred _____
(d) Preferred _____
7. Surplus (net worth) Earned \$ _____ Unearned \$ _____

Total liabilities _____

CONTINGENT LIABILITIES

1. Liability on notes receivable, discounted or sold _____
2. Liability on accounts receivable, pledged, assigned or sold _____
3. Liability as bondsman _____
4. Liability as guarantor on contracts or on accounts of others _____
5. Other contingent liabilities _____

Total contingent liabilities _____

*Include all amounts owing subcontractors for all work in place and accepted on completed and uncompleted contracts, including retainage.

DETAILS RELATIVE TO ASSETS

1	(a) on hand _____ \$ _____ Cash (b) deposited in banks named below _____ (c) elsewhere—(state where) _____		\$ _____
NAME OF BANK	LOCATION	DEPOSIT IN NAME OF	AMOUNT

2*	(a) due within 90 days _____ \$ _____ Notes receivable (b) due after 90 days _____ (c) past due _____		\$ _____	
RECEIVABLE FROM: NAME AND ADDRESS	FOR WHAT	DATE OF MATURITY	HOW SECURED	AMOUNT

Have any of the above been discounted or sold? _____ If so, state amount, to whom, and reason _____

3*	Accounts receivable from completed contracts exclusive of claims not approved for payment _____ \$ _____		\$ _____
NAME AND ADDRESS OF OWNER	NATURE OF CONTRACT	AMOUNT OF CONTRACT	AMOUNT RECEIVABLE

Have any of the above been assigned, sold, or pledged? _____ If so, state amount, to whom, and reason _____

4*	Sums earned on uncompleted contracts, as shown by engineer's or architect's estimate: (a) Amount receivable after deducting retainage _____ \$ _____ (b) Retainage to date due upon completion of contract _____						
DESIGNATION OF CONTRACT AND NAME AND ADDRESS OF OWNER	AMOUNT OF CONTRACT	AMOUNT EARNED	AMOUNT RECEIVED	RETAINAGE		AMOUNT EX-CLUSIVE OF RETAINAGE	
				WHEN DUE	AMOUNT		

Have any of the above been sold, assigned, or pledged? _____ If so, state amount, to whom, and reason _____

*List separately each item amounting to 10 per cent or more of the total and combine the remainder.

DETAILS RELATIVE TO ASSETS (Continued)

Accounts receivable not from construction contracts _____ \$ _____

[illegible]

What amount, if any, is past due \$_____ \$_____

Deposits with bids or otherwise as guarantees_____ \$_____

[illegible]

Interest accrued on loans, securities, etc._____ \$_____

[illegible]

Real Estate/ Book value	(a) Used for business purposes	\$	
	(b) Not used for business purposes	\$	

DESCRIPTION OF PROPERTY		IMPROVEMENTS		TOTAL BOOK VALUE
		NATURE OF IMPROVEMENTS	BOOK VALUE	
1				
2				
3				
4				
5				
6				
7				
LOCATION		HELD IN WHOSE NAME	ASSESSED VALUE	AMOUNT OF ENCUMBRANCES
1				
2				
3				
4				
5				
6				
7				

*List separately each item amounting to 10 per cent or more of the total and combine the remainder.

DESCRIPTION		ISSUING COMPANY	LAST INT. OR DIV. PAID		PAR VALUE	PRESENT MARKET VALUE	QUAN- TITY	AMOUNT
			DATE	%				
1								
2								
3								
4								
5								
6								
7								

WHO HAS POSSESSION		IF ANY ARE PLEDGED OR IN ESCROW, STATE FOR WHOM AND REASON	AMOUNT PLEDGED OR IN ESCROW
1			
2			
3			
4			
5			
6			
7			

10 **Materials in stock and not included in Item 4, Assets:**
 (a) For use on uncompleted contracts (present value) _____ \$ _____
 (b) Other materials (present value) _____

[illegible]

11*	Equipment at book value _____ \$ _____
------------	--

[illegible]

Are there any liens against the above?_____ If so, state total amount_____ \$_____

DETAILS RELATIVE TO ASSETS (Continued)

12	Furniture and fixtures at book value _____	\$ _____
-----------	--	----------

13	Other assets _____	\$ _____
-----------	--------------------	----------

DESCRIPTION	AMOUNT

TOTAL ASSETS \$ _____

DETAILS RELATIVE TO LIABILITIES

1	Notes payable {	(a) To banks, regular _____ \$ _____ (b) To banks for certified checks _____ (c) To others for equipment obligations _____ (d) To others exclusive of equipment obligations _____	
----------	-----------------	--	--

TO WHOM: NAME AND ADDRESS	WHAT SECURITY	WHEN DUE	AMOUNT

2*	Accounts payable {	(a) Not past due _____ \$ _____ (b) Past due _____	
-----------	--------------------	---	--

TO WHOM: NAME AND ADDRESS	FOR WHAT	DATE PAYABLE	AMOUNT

3	Real estate encumbrances (See Item 8, Assets) _____	\$ _____
----------	---	----------

4	Other liabilities _____	\$ _____
----------	-------------------------	----------

DESCRIPTION	AMOUNT

5	Reserves _____	\$ _____
----------	----------------	----------

INTEREST	INSURANCE	BLDGS. & FIXT.	PLANT DEPR.	TAXES	BAD DEBTS		
	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____

6	Capital stock paid up {	(a) Common _____ \$ _____ (b) Preferred _____	
----------	-------------------------	--	--

7	Surplus: \$ _____	\$ _____
----------	-------------------	----------

Include all amounts owing subcontractors for all work in place and accepted on completed and pleted contracts, including retainage.

TOTAL LIABILITIES \$ _____

If a corporation, answer this:

Capital paid in cash, \$ _____

When incorporated _____

In what State _____

President's name _____

Vice-President's name _____

Secretary's name _____

Treasurer's name _____

If a co-partnership, answer this:

Date of organization _____

State whether partnership is general, limited or association _____

Name and address of partners:	Age
_____	_____
_____	_____
_____	_____
_____	_____

The undersigned hereby declares: that the foregoing is a true statement of the financial condition of the individual, co-partnership or corporation herein first named, as of the date herein first given; that this statement is for the express purpose of inducing the party to whom it is submitted to award the submitter a contract; and that any depository, vendor or other agency herein named is hereby authorized to supply such party with any information necessary to verify this statement.

NOTE: A co-partnership must give firm name and signatures of all partners. A corporation must give full corporate name, signature of official and affix corporate seal.

What date did you file your Financial Statement with Bureau of Contract Information, Inc., Washington, D. C.? _____

Affidavit for Individual

STATE OF _____ }
COUNTY OF _____ } ss.:

_____ being duly sworn, deposes and say that the foregoing financial statement, taken from his books, is a true and accurate statement of his financial condition as of the date thereof and that the answers to the foregoing interrogatories are true.

Sworn to before me this _____
_____ day of _____ 19

(Applicant must also sign here)

Notary Public

Affidavit for Co-partnership

STATE OF _____ }
COUNTY OF _____ } ss.:

_____ being duly sworn, deposes and say that he is a member of the firm of _____; that he is familiar with the books of the said firm showing its financial condition; that the foregoing financial statement, taken from the books of the said firm, is a true and accurate statement of the financial condition of the said firm as of the date thereof and that the answers to the foregoing interrogatories are true.

Sworn to before me this _____
_____ day of _____ 19

(Members of firm must also sign here)

Notary Public

Affidavit for Corporation

STATE OF _____ }
COUNTY OF _____ } ss.:

_____ being duly sworn, deposes and says that he _____ of the _____ the corporation described in and which executed the foregoing statement; that he is familiar with the books of the said corporation showing its financial condition; that the foregoing financial statement, taken from the books of the said corporation, is a true and accurate statement of the financial condition of said corporation as of the date thereof and that the answers to the foregoing interrogatories are true.

Sworn to before me this _____
_____ day of _____ 19

(Officer must also sign here)

Notary Public

SUPPLEMENTARY
Qualification Statement
For Building Construction

(Required in advance of Consideration of Award of Contract)

Form

Approved and Recommended by

AMERICAN INSTITUTE OF ARCHITECTS
AMERICAN SOCIETY OF MUNICIPAL ENGINEERS
ASSOCIATED GENERAL CONTRACTORS OF AMERICA

1933

Submitted by

Address

Project

Location

Date of Opening Bids

Note: This form of Statement is supplemental to the Pre-Qualification Statement (Standard Form No. 40) and will not be considered unless Standard Form No. 40 has previously been filed and approved.

Qualification Statement

Submitted to

By { ☐ A Corporation
☐ A Co-partnership
☐ An individual

Principal Office

The signatory of this questionnaire guarantees the truth and accuracy of all statements and of all answers to interrogatories hereinafter made

1. In what manner have you inspected this proposed work? Explain in detail

.....
.....
.....
.....
.....

2. The work, if awarded to you, will have the personal supervision of whom?

.....
.....
.....
.....

3.* What would be the total amount of your sub-contracts in connection with the work? \$

.....

4* Give the names of the principal sub-contractors:

.....
.....
.....
.....
.....
.....
.....
.....

5.* From which sub-contractors do you expect to require a bond?

.....
.....
.....
.....
.....
.....
.....

6. Have you made contracts or received firm offers for material within prices used in preparing your proposal?

If so, state which

.....
.....
.....
.....

*This information to be furnished in this statement when not required in proposal form.

7. List the construction projects your organization has under way on this date:

Contract Amt.	Class of work	Per cent Completed	Name and address of Owner or Contracting Officer

8. It is required that the Standard Form of Contractor's Financial Statement (Standard Form No. 42) be filed with this Statement. Have you done so?.....

Dated at..... this
day of..... 19.....

.....
Name of Organization

By

.....
Title of Person Signing

STATE OF..... }
COUNTY OF..... } ss.:

..... being duly sworn deposes and says that he

is..... of.....
Name of Organization

and that the answers to the foregoing questions and all statements therein contained are true and correct.

Sworn to before me this

..... day of..... 19.....

.....
Notary Public

My commission expires

City of East Lansing, Michigan

PROPOSAL FOR CONSTRUCTION OF

The City of East Lansing Water Softener Building

CITY OF EAST LANSING

Proposals for Construction of The City of East Lansing Water Softener Building

To the Mayor and Common Council,
East Lansing, Michigan

Date June 1 1928

Gentlemen:

The undersigned has examined the plans, specifications and the location of the above described work and is fully informed as to the nature of the work and the conditions relating to its performance, and understands the quantities shown in the estimate are only approximate and are subject to either increase or decrease.

The undersigned hereby proposes to furnish all necessary machinery, tools, apparatus and other means of construction, do all of the work and improve, in strict accordance with the plans and specifications therefore, the above described work, at the following unit prices:

Approximate Quantities	Items	Unit Bid	Totals
	<i>Total Amount of Bid</i>		<i>\$13,369 0</i>

The undersigned further proposes to furnish all necessary machinery and equipment, to supervise the work in such a manner as to insure its being economically done, and to do such extra work as may be ordered by the Engineer, prices for which are not included in the above items, for the actual cost to him, of the labor and materials plus ten (10) per cent of the cost of the same.

The undersigned further agrees to execute the contract and bonds within fifteen (15) days after the work is awarded to him, to begin the work within ten (10) days after the signing of the contract and to complete the same on or before September 30 1938

The undersigned encloses herewith a certified or cashier's check in the amount of \$ 668.45 which is approximately five (5) per cent of the total amount of the bid, payable to the order of the City Clerk, East Lansing, Mich., as guarantee of good faith, and which if the contract be awarded to him, the undersigned agrees to forfeit, as liquidated damages, to the City of East Lansing, in event of his failure to enter into contract and furnish satisfactory bonds to the City Clerk, East Lansing, Mich. within fifteen (15) days after notice of award.

If the contractor is a co-partnership, each member must sign this proposal.

Corporations must execute this proposal by its duly authorized officers in accordance with its articles of incorporation.

Signed John M. Patriarche

By _____

Full address of bidder

John M. Patriarche
525 M.A.C. Avenue, East Lansing, Michigan

SPECIFICATIONS FOR WATER SOFTENER BUILDING, EAST LANSING

GENERAL CONDITIONS

When the word Contractor or Sub-contractor is used hereinafter it shall be understood that the City of East Lansing may be substituted therefor, as the City of East Lansing, being the Owner, elects to do all the work required by these specifications on a "time and material" or force account basis.

All work is to be done in strict accordance with the provisions of the Federal Public Works Administrations regulations pertaining to work of this character.

The word Architect as used hereinafter refers to Harold A. Childs who is employed by the Owner in an advisory capacity.

SUPPLEMENTARY GENERAL CONDITIONS

PART 1: The following specifications are intended to embrace all labor and materials necessary to the erection and completion of the building herein described. The contractor is to give his personal attention, superintendence, and direction to the work; keeping also a competent Superintendent constantly on the work from the time that the excavation is started until the completion of the contract.

Contractor's superintendent must check up on materials and workmanship of all the different sub-contractors and be able to give the necessary reports on demand.

PART 2: The contractor is to provide all labor and materials, cartage, transportation, apparatus, machinery, tackle, centering, and scaffolding necessary for the completion and substantial erection of everything described, shown or reasonably implied on the drawings or in the specifications.

PART 3: The drawings and specifications are intended to coordinate and agree and anything mentioned in these specifications though not shown on the plans in particular or shown on the plans and not mentioned in the specifications is to be considered as though mentioned on both and must be executed in a thoroughly workmanlike manner satisfactory to both Architect and Owner.

PART 4: The Contractor is to take no advantage of any manifest omissions or discrepancies that may be found to exist between the plans and specifications and all differences and disagreements as to size, materials and workmanship the decision of the Architect upon his own plans and specifications is to be final and binding on the contractor.

The Contractor must count all work as per the plans and specifications as the Architect will insist with his complying to them.

PART 5: Discrepancies, if any, must be reported at once to the Architect for his revision or correction.

The Architect will supply full size and scale details for work as hereinafter specified and as occasion necessitates.

All details must be carried out in a careful manner, as the Contractor will be held responsible for them and will have to make corrections at his own expense.

Figured measurements on plans to be taken in preference to scale measurements and when no figures and details are given use scale, calculating from figures given.

1. The first part of the paper is devoted to a discussion of the general principles of the theory of the structure of the human brain. It is shown that the brain is a complex system of interconnected parts, each of which has its own function. The author emphasizes the importance of the study of the structure of the brain for the understanding of the human mind.

2. The second part of the paper is devoted to a discussion of the methods of the study of the structure of the human brain. It is shown that there are several methods of study, each of which has its own advantages and disadvantages. The author emphasizes the importance of the use of all methods in the study of the structure of the brain.

3. The third part of the paper is devoted to a discussion of the results of the study of the structure of the human brain. It is shown that the brain is a complex system of interconnected parts, each of which has its own function. The author emphasizes the importance of the study of the structure of the brain for the understanding of the human mind.

4. The fourth part of the paper is devoted to a discussion of the conclusions of the study of the structure of the human brain. It is shown that the brain is a complex system of interconnected parts, each of which has its own function. The author emphasizes the importance of the study of the structure of the brain for the understanding of the human mind.

5. The fifth part of the paper is devoted to a discussion of the future of the study of the structure of the human brain. It is shown that there are many problems which still need to be solved. The author emphasizes the importance of the study of the structure of the brain for the understanding of the human mind.

PART 6: Particular care must be taken by the Contractor of materials and finished work as the building progresses, which must be protected from injuries or defacement during the execution and until the completion of the work of the contract he must make good any defects, settlement or shrinkage in the workmanship, which may arise before the completion of the building.

PART 7: All work and materials shall be subject to the approval of the Architect who shall have the right to approve, condemn and inspect all work and materials at any and all times, and all condemned and rejected materials, or work not in accordance with plans and specifications, shall immediately be torn down and removed from the building and the grounds within twenty four hours after condemnation and replaced with the kind that does conform with the plans and specifications. The Architects decision regarding the above is final and binding on all parties and cannot be appealed.

PART 8: All payments made on the work during the progress of the building on account of this contract, or any extra work shall in no case be considered as acceptance of the work executed but the Contractor shall be liable to all conditions of the contract until his work is finally completed and accepted.

PART 9: The Contractor shall provide proper and sufficient safeguards and protection against the occurrence of any damage or injury to any persons or property during the progress of the work and up to the final acceptance of the work by the Architect and shall alone be responsible.

The contractor shall see that lights are put upon materials that extend beyond the property line and be liable to keep the highway clear according to State law.

Each Contractor upon this work shall be required to use the mechanical judgment in its execution whether it is or not particularly mentioned in the specifications or carried out in the details, certain things follow naturally in a well constructed building that must be considered.

The General and Sub-contractors will make thorough inspection of the property before submitting estimate and before actual work is started as they will be held responsible for any damage to property or highway during the construction of the building.

PART 10: The Owner and the Architect have the right to enter the building at all times, and the privilege to make changes they advisable. The Contractor must demand written orders for such changes or same will not be considered on the final payment of the building.

Such changes as are made shall in no way invalidate the contract but will be deducted or added to the balance of the contract as the case may be.

PART 11: The Architect has the right to request the discharge of any workman on the building without question.

PART 12: The building is to insured by the Owner.

PART 13 : When the building is finished it is to be broomed clean and all rubbish to be removed by the contractors.

Each Contractor is to make good any work damaged by him to the work of others during the progress of the work and they are to leave the work in a finished and clean condition.

PART 14: All drawings, blue-prints and specifications are the property of the Architect, and shall be kept constantly at the building during the progress of

the work and at the completion of the building to be returned to the Architect before the final payment is made.

All mill details, plans, etc., are included in the above.

PART 15: The Owner reserves the right to reject any and all bids. The names of the Sub-contractors are subject to the approval of the Architect and Owner and a complete list must be submitted to the Architect before the signing of the contract will be permitted.

PERMITS: The General Contractor shall obtain and pay for all permits required, give all legal notices and pay all fees required for the work.

DRAWINGS: Drawings shall consist of ten sheets of drawings. The drawings together with all figures and writings thereon shall constitute these drawings.

PROMPTNESS: Contractor to push the work with due diligence and follow all the instructions given him in the construction thereof, but in no case be relieved of responsibility thereby.

EXAMINATION OF PREMISES: Before submitting proposals for his work each bidder will be held to have examined the premises and satisfied himself as to the existing conditions under which he will be obliged to operate or that will in any way affect the work under this contract.

No allowances shall be made subsequently in this connection, in behalf of the Contractor for any error or negligence on his part.

MEASUREMENTS: Before ordering any materials or doing any work each contractor shall verify all measurements at the building and shall be responsible for same.

No extra charge or compensation will be allowed on account of difference between actual dimensions and the measurements indicated on the drawings; any difference which may be found shall be submitted to the Architect for consideration before proceeding with the work.

SURVEY: The Owner to furnish all lot lines.

All other lines and levels and to be established by a competent surveyor by the General Contractor.

USE OF WATER: The General Contractor will not be required to pay for water used in construction with the erection of the building.

TEMPORARY CONVENIENCES: The Contractor shall set up and maintain a suitable water closet for the use of all mechanics, and shall remove same from premises at completion of building.

TEMPORARY BUILDING: At a convenient distance on premises build a temporary storage shed, at one end of which build a small office, well lighted, with a counter for laying out blue-prints during construction.

PROTECTING TREES: All trees on building site to be protected.

WRECKING: This Contractor shall accept the premises as he finds them and he shall completely wreck and remove the present building. Which is a one story, cement block building 12'-0" x 24'-0".

All old material to become the property of the General Contractor.

No old material will be permitted used in the new building.

TEST BORING: After the excavations are completed, this Contractor shall make test borings for determining the bearing capacity of the soil, as directed.

GENERAL EXCAVATION: Excavating for basement, steps, walls, retaining walls, footings, etc., of the dimensions and to the depth shown on the drawings and required by grade, and do all excavation required to fully carry out the work as herein specified.

BACKFILL: Fill in trenches and excavations in a proper manner and thoroughly tamp.

ROUGH GRADING: General Contractor to do all rough grading, ten feet out all around building.

FINISHED GRADING: Not in this contract.

CEMENT: Portland cement shall conform to all requirements of the Standard Specifications and Tests for Portland cement of the American Society for Testing Materials, serial designation C9-26, together with all subsequent official revisions thereof.

SAND AND GRAVEL: Sand and gravel to be used in concrete to be clean and coarse, with fine sand screened out, and to be free from boulders and cobble stones.

SAND: All sand shall be clean, sharp, free from pebbles and not to fine.

CONCRETE WALLS: Contractor to provide curbing for forming concrete foundations and footings. Proportions, one cement to six sand and gravel, to be thoroughly mixed with batch mixer, Concrete to be deposited immediately and the whole then to be rammed with approved metal rammers. Concrete that has stood more than three hours shall not be used.

CONCRETE FOOTINGS: Footings of cement concrete, same as specified for foundations, walls below grade, to be placed under foundations not otherwise provided for, all as shown on plans. Footings for outside walls to be carried down below grade as shown on drawings.

REINFORCED CONCRETE

SUPERVISION: Contractor must have in charge of the reinforced concrete work, at all times, during the work of construction, a thoroughly competent superintendent, one with experience in this form of construction.

FORMS AND CENTERING: All necessary wood centering, cores, etc., required for the proper execution of the work, to be supplied in sufficient quantities to further the work with proper dispatch.

Sufficient lumber must be provided for centering the entire work under the contract.

the centering must be true and rigid, thoroughly braced, both horizontally and diagonally and sufficiently strong to carry the dead weight of the construction as a liquid without appreciable deflection.

Norway or yellow pine to be used for the purpose.

MATERIALS: Samples of all materials must be submitted to and approved by the Architect, before being used.

All materials rejected for this work must immediately be removed from the vicinity.

CEMENT: As before specified.

The cement will be accepted at the work in stout, cloth, paper, or canvas sacks. Each package shall be plainly marked with the name of the brand and the manufacturer. Any package broken or container damaged cement may be rejected or accepted as a fraction package at the option of the engineer in charge of the work.

COARSE AGGREGATE: The coarse aggregate shall be composed of clean sharp gravel. The gravel shall be hard, close grained quality, free from dust and so that the largest dimension shall pass through a ring 1" in diameter.

PROPORTIONS: All concrete floor and beams shall be 1-2-4 concrete.

REINFORCED STEEL: Steel used shall be medium open hearth steel, to be rolled from new stock and to meet with the manufactures specifications.

MIXING CONCRETE: All concrete must be machine mixed, using a batch mixer of approved design, Fresh clean water, free from acids or strong alkalis shall be used in sufficient quantities so that the resulting mixture will flow readily around the reinforcing bars.

All materials shall be thoroughly dry after which the proper amount of water shall be added and the mixing continued until the concrete is uniform. A competent foreman shall be in constant attendance at the mixer to give his approval of every inch that leaves the machine.

FACE BRICK: All exposed brick surfaces are to have face brick of color selected by the Architect and Owner, and of forms and shapes as shown and detailed, all to be laid in regular bond, with 1/2" joints, rough out flush, bonded, etc., in the best manner as directed. Allow the sum of \$28.00 f.o.b. Lansing.

BRICK MORTAR: Mortar for entire brick work, except where otherwise specified, shall be composed of one part first Portland cement to four parts of coarse, sharp, clean sand, mixed in a dry box afterwards wet, tempered with lime paste to make it work smoothly and to be immediately used. Mortar that has set or hard or frozen in the box shall be thrown out and not used on the job.

COMMON BRICK: To be good, sound, sand lime brick or hard kiln-run brick.

CINDER BLOCK: Standard cinder block may be used for blocking up in gables ends and for filling in for chimneys.

BRICK WORK: All brick work shall be laid square and true to a line with full beds of mortar and joints slushed full. And to have face brick well tied to backing with gal. iron ties. Joints of thickness required to lay with face brick shown and detailed and inside joints of walls that are to be plastered are to be left rough for a good clinch. All brick to be wetted. Chimneys to be laid in cement mortar. All flues to be straight, square and of a size as shown and to be smooth inside.

CLEANING BRICK DOWN DURING PROGRESS OF WORK: All loose mortar to be removed from brick work during progress of work at proper time.

CLEANING AND POINTING: At the completion of all exterior work this contractor shall carefully point up all brick work and clean down all brick work throughout.

CINDER OR GRAVEL FILL: After all underground work is completed and inspected, the work within the building foundations will be leveled and uniformly graded, thoroughly wet down and tamped in preparation for a cinder or gravel or sand fill. After, place a clean 6" layer of boiler cinders or gravel or sand, properly graded and tamped up to the bottom of the concrete floor foundations, which will be laid over the entire surface at the levels indicated on the plans.

STONE: All stone as shown to be Buff Limestone.

BLOCK GLAZED TILE: Where so indicated on the plans or called for in the specifications, the entire main floor rooms shall have walls and partitions faced with "Vitrolite" as manfg. by the National Fireproofing Corp., or its equal, or "Duo" or its equal. No. 330.

Tile shall be of color selected by the Architect and be free from spills and other imperfections which would mar its appearance or affect its durability.

When requested to do so the Contractor shall submit to the Architect, for his approval, large scale or full size drawings showing the shape of the tile or the method to be used in its erection.

Shapes listed in National Fireproofing Corp. literature will be required to make an all tile finish, although not specifically called for in that name.

All tile for load bearing walls or furring shall be laid with 1/4" bed and head joints (unless a slight humoring is necessary to come up to sill or story heights) in mortar composed of one part Portland cement and one sixth part Hydrated lime or lime putty to three parts of sand.

The mortar shall be colored as approved by the Architect with mineral mortar or stain.

On completion the tile shall be washed down with clean water and a scrubbing brush. In order to prevent injurious effect on mortar use no acid unless necessary.

BASEMENT CEMENT FLOOR: Entire basement to have cement concrete floor, to be laid when directed with even pitch to drains as indicated. Bottom of basement excavation to be levelled off and well tamped. Lay down 3" cement concrete- One of cement to seven sand and gravel with 10% Hydrated lime by volume, and ram well. Lay over this 1" cement and sand, one to three and troweled to an even surface with neat cement dusted on. Work to be jointed where necessary. Properly protect all floors and do all patching that may be necessary to leave the work in good condition.

SOFTENER ROOM FLOOR: Lay over 4" concrete slab, 1" cement and sand, one to three, and troweled to an even surface with neat cement dusted on. Work to be jointed where necessary. Properly protect all floors and do all patching necessary to leave work in good condition, or make floor full 4" thick with topping run monolithic with bottom 3 1/2".

FLUE LINING: Boiler flues to be lined with terra cotta flue lining, as sizes shown on drawings.

THIMBLE: Boiler thimble to be furnished by Heating Contractor and set by General Contractor.

WATERPROOFING

SALT VATS: Waterproof the inside of all salt vats with two coats of "Barbers Genaco" Waterproofing Asphalt, or its equal, according to the manfg. specifications, or substitute such waterproofing as recommended by the Permutite Company.

STEEL WORK

STEEL WORK: Furnish and install all structural steel and iron work shown on drawings or described in specifications, except steel for reinforced concrete lintels. Furnish to Mason Contractor cast iron or steel bearing plates for beams having ends bearing on masonry. Do without extra charge all cutting, fitting and drilling that may be necessary for the proper setting and anchoring of masonry and attaching wood furrings. Furnish labor of every description connected with the work specified, including all cartage, hoisting apparatus, scaffolding, etc.

Before applying paint at shop or building, all metal work shall be thoroughly cleaned of all mud, grease or other foreign matter, using wire brushes when necessary.

All turned or planed surface shall be coated with a mixture of lead and tallow before being exposed to the light.

All steel to receive shop coat before erecting and one field coat on job.

BASEMENT WINDOW: Window in basement to be "Truscon" or its equal, of size as shown on plans.

CLEAN OUT DOOR: Furnish and install where noted on basement plan, cast iron cleanout door with frame at least 8"x8" door opening.

AREA GRATING: Furnish and install iron grating built according to standard practice for size of opening. Painted two coats.

SUMP GRATING: Same as area grating, or as detailed.

STEEL LADDER: Furnish and install ladder as shown made up of 1-1/2" pipe with 3/4" rounds welded into same 12" apart. All properly supported from wall.

MAN HOLES: Man holes to be East Lansing Standard.

ROOFING

SHINGLES: Furnish and install asphalt shingles allowing the sum of \$12.00 per sq. in place.

CARPENTER WORK

FURRING, ETC.: The Carpenter shall furnish all wood bracks, bond timbers, furring, lintels, rough brackets, etc., required for proper finish.

PROTECTION: The Carpenter shall properly protect all wood previous to plastering and after plastering is completed he shall protect all wood from damage of any character up to the time that the building is turned over to the painter for finish.

CUTTING AND FITTING: The Carpenter shall do all such work in his line as is usually required by the other mechanics about the building such as, cutting away and rebuilding, fitting to other work, cutting for registers and casing in pipes where necessary.

CLEANING: The Carpenter shall thoroughly clean out each room and the entire building so far as is practicable before the painters finish is commenced. He shall keep the same in a clean condition until the completion of the work and shall leave the entire building broom clean.

FRAMING: All framing to be #1 Y.P. and shall be as well seasoned as the market affords free from large or loose knots, shakes, or other damaging imperfections, and shall be sawed square and true.

FINISHING: All wood for finish shall be thoroughly seasoned and the lumber for doors, sash, floors, and inside finish shall be thoroughly kiln-dried, and all finish shall be left smoothly dressed.

RAFTERS: Provide 2"x 6" rafters as required by plans. Rafters between trusses to be supported at center by a continuous 2"x 6" ribbon securely fastened to trusses, as shown.

ROOF BOARDING: Cover the rafters with 1"x 6" D & M, Y.P. #2 boards for rear wing, laid horizontally and well nailed at every bearing and #2 Y.P., 1"x 6" D. & M. for roof over Softener Room.

CORNICE: All cornice shall be as shown and detailed. All wood to be #1 Fir. All cornice to be finished with mouldings shaped and put to-gether as detailed.

DOOR FRAMES: Outside door frames to be 1-3/4" thick with stop nailed on for door rabbet and with outside 1-3/4" brick mould, both sides.

WOOD WINDOW FRAMES: To have 1-3/4" rabbetted wood frames with 1-3/4" moulded brick mould, detailed to permit screens to be inserted.

SASH (WOOD SASH): Wood sash to be 1-3/4" thick of white pine with 1/4" muntins.

DOORS (INTERIOR): All doors unless otherwise marked, to be of sizes as shown, 1-3/4" thick and as detailed.

DOORS (EXTERIOR): To be of solid pine for paint finish, 1-3/4" thick. Garage doors to be 2-3/4" thick.

INTERIOR WOOD FINISH: All places marked "Gum" to be Figured Red Gum. All to be properly jointed and to be thoroughly secured in place, and to be moulded, shaped and put together as shown and detailed, and all to be smoothed before being put up, sanded and left ready for painters finish. Other interior wood finish to be clear Y.P.

FORMS: See forms under heading "Reinforced concrete".

BUILDING HARDWARE: This contractor shall furnish all the rough hardware such as, nails, screws, weights, cord pullies, also any hardware especially mentioned in this specification.

FINISHED HARDWARE: For all finished hardware allow the sum of \$50.00 if more expensive hardware is desired the difference in price shall be paid by the Owner. If hardware should fall below \$50.00, the Owner shall receive credit for same. Hardware shall be selected by the Architect and Owner. This hardware to include door chack and kick plates for front door.

PAINTING

GENERAL REQUIREMENTS: Whenever so directed this Contractor shall clear out his rubbish or materials which may be in the way of other mechanics, and at completion shall clear off all paint and varnish spots from floors, walls and glass and shall clear out all rubbish and materials left over by him. This contractor shall assume responsibility for his work and shall repair all damages to same by whomsoever made, and shall leave his work clean and in good repair. The Contractor is referred to the plans and to the Carpenters specifications for the amount of work to be done.

PREPAIRING WORK: All work shall be properly prepared before finishing is begun. The Painter shall smoothly sand paper any roughness that may appear before priming has been done. All knots and pitch shall be stopped with shellac.

PRIMING: All outside work shall be primed before or as soon as being put up, and sash be primed before being sent to the building. All inside work put up before plastering work shall be primed before plastering is begun. Priming coat on all painted wood work shall be of white lead and oil.

PUTTY.

WOOD SASH: The painter shall thoroughly putty stop all wood both exterior and interior, after the first coat and before the last coat with putty colored to match the woodwork after darkening with age.

PAINTS: Strictly pure white lead and linseed oil shall form the basis of all paints, unless otherwise specified. All paints shall be of such color as the Architect and Owner shall direct.

VARNISHES: All varnishes and finishes shall be brought to the building in the original packages and shall not be thinned down or otherwise adulterated. Pratt and Lambert's or other approved varnishes shall be used.

EXTERIOR WORK: All exterior work shall be given three coats of lead and oil. Color to be selected by the Architect.

FINISH OF WOODWORK: All Red Gum to receive one coat of shellac, two coats of #38 varnish and one coat of flat, sanded between coats.

DOORS (EXTERIOR): To receive three coats of lead and oil inside and outside. Color to be selected by the Architect.

DOORS (INTERIOR): To be finished as specified under, "Finish for Woodwork."

STEEL WINDOWS: To be painted two coats inside and outside. Inside finish to conform with Gum finish.

METAL WORK: All exposed outside metal work to be given two coats of approved metallic.

DECORATION: Ceiling of main floor room and ceiling of entrance to be given sizing and three coats of lead and oil and left in a flat finish. Color to be selected by Architect.

SHEET METAL WORK

WORK REQUIRED: The work contemplated under this contract includes all labor, materials, equipment, and services necessary for and reasonably incidental to the providing and installing of all sheet and metal work as follows, flashing, counter flashing, flashing down spouts, gutters, saddles and ridge roll.

GUTTERS: Hanging gutters shall be semi-circular in cross sections. THEY SHALL be beaded and provided with mitered corners, outlets, etc., as required. Hanging gutters shall be supported on adjustable hangers spaced not over 2'-0" apart, and secured with heavy screws. Where box gutters are used the pitch of the gutters shall be formed in the gutter construction. The back edge of gutter lining connecting with sheet metal roof shall be locked to the roof covering.

At every outlet of the downspout furnish gal. wire basket pattern extending same down into the downspout without soldering. All downspouts shall be round gal. iron as shown, and will be secured to the building with gal. iron hooks and straps.

GAUGES: The gauge for tin and sheet iron work shall be U.S. Standard gauge.

The gauge for all copper work shall be specified in oz. per sq. ft.

Tin shall not be less than I.X.

Gal. iron shall not be lighter than #26 gauge.

Copper shall be 20 oz., or heavier.

FLASHING: All chimney and vertical masonry walls, extending above roof, shall have step flashings not less than 8" high, and counter flashing extending 4" into walls. The lower edge of the counter flashing shall be kept 3" above roof.

GLAZING

GENERAL: All glass in woodwork shall be firmly bedded in the best lead and oil putty, and after the stops are in place, shall be neatly puttied.

No glass shall be put in place until after the woodwork is primed.

All glass shall be free from waves and other imperfections.

At completion of the building all glass shall be cleaned and polished and all broken glass shall be replaced.

PLAIN SHEET GLASS: All glass throughout the building, unless otherwise specified, shall be double thick American Sheet Glass.

METAL CASEMENTS: (SETTING GLASS) To metal casements.

PLASTERING

REQUIREMENTS: This Contractor shall furnish all the labor and materials necessary to complete the labor of plastering as herein specified, including all metal lathing and supports for same, for beams, etc., and the plastering of all walls and ceilings as shown on the drawings.

This Contractor shall provide all scaffolding, hoists, implements and cartage necessary for this work.

EXAMINING WALLS, ETC.: This Contractor shall examine all walls, ceilings and furrings; he shall notify the Architect of any that are not true and accurately fixed and shall see that all faults are corrected before lathing, and failing to do this he shall, at his own expense, replace in a proper manner all plaster that may have to be removed to correct the fault.

PROTECTION OF WORK: This Contractor shall at all times take proper precautions to provide against injury to the plastering by the weather or by any other causes.

PATCHING: This Contractor shall repair all damaged plastering at such times as the Architect may direct.

PORTION TO BE PLASTERED: The main floor and pump room ceilings to be plastered.

SAND FINISH: All plaster finish to be as specified, to be light sand finish using "Lake Sand".

CHARACTER OF WORK: Work to be as specified, best two coat work on brick walls and three coat on lath. Base coat to be carried down to the floor in all places. All angles and corners to be plumb and true. All plastered surfaces to be free from laps and clouds and must be left in perfect condition.

Use approved brand of patent plaster, in strict accordance with manufacturer's specifications.

SUSPENDED CEILINGS: All suspended ceilings shall be lathed with ribbed "steeltex" lath Manfg. by the Pittsburgh Steel Co., or its equal, as shown and detailed on sheets #4 and #9. Ceilings over Softener Room to be metal furrings.

PLASTERED CORNICE: See detail sheet #9.

REMOVAL OF RUBBISH: This Contractor shall remove all plaster rubbish and shall leave the entire building in a clean condition ready for other work. All plaster shall be removed from floors, glass, etc., and the entire work shall be left in first class condition.

PLUMBING

SANITARY SYSTEM: The Plumbing Contractor shall provide all plumbing items of labor and materials for the installation of a system of drainage for the rain water, sanitary soil and waste from all water closets, sinks, etc.

WATER PIPING: Water piping for sanitary fixtures shall be standard gal. iron pipe run with malleable galvanized fittings. Size of pipe shall be governed by the character of fixtures it is to supply.

SOIL PIPES: Soil pipes shall be new cast iron pipes and when the vertical height of a soil stack exceeds 12 ft. and also under basement floors and outside of building the pipe shall be extra heavy. Fittings to be of the same character as the adjacent straight pipe. Sizes to be as required by fixtures served.

VITRIFIED TILE DRAIN: All rain water drained shall be vitrified sewer tile, laid in a solid bed and by levels established on the premises. Joints in the tile must be completely filled with cement mortar composed of one part cement to one part sand and all joints must be well swabbed out on the inside.

SILL COCKS: All sill cocks must be freezeless type, with stop on the inside, Crane or its equal. For 3/4" hose connections.

FLOOR DRAINS AND TRAPS: Furnish and set in floor and connect with sewer extra heavy floor drains with hinged covers, and deep seal running traps. Traps shall have strainers set flush with floor.

RAIN WATER CONDUCTORS SHOES: Furnish and install one length of heavy cast iron pipe for each down spout, 4" in diameter. All pipe connected to sewer tile.

AREA DRAIN: Provide and set in areas, 2" cast iron traps with screens and properly connect with rain water system.

CLEANOUTS: All cleanouts shall be cast iron with brass screw plugs. Cleanouts shall be placed on all horizontal lines and at the base of all risers.

JOINTS: All joints of cast iron pipes to be made with packed oakum and pure, soft, moulten pig lead, beaded with hammer and caulking iron.

FLASHING: Furnish and install copper or lead flashing for all vents through roof. To be carried up through vent pipe 1'-0" and cap flashed. Copper to be 16 oz.

PAINTING: All exposed pipe to be painted two coats of paint.

PROTECTION OF FIXTURES: Immediately after the setting of fixtures, fitting or piping, this contractor is to protect it adequately against damage. He shall be held responsible for all fixtures until they are accepted by the Architect. Any fixtures or fixture that become damaged is to be replaced by this contractor without extra charge to the Owner. At all stages of the installation the piping openings must be protected against the entrance of foreign bodies.

FIXTURES: The Plumbing Contractor shall furnish and install all fixtures as indicated on the drawings and as herein specified. All plumbing fixtures shall be as manufactured by Kohler Co. or its equal, as noted in schedule and shall be the products of one manufacturer, except such items as are herein specified to the contrary.

CLOSETS: Rough in for one closet, only.

SINK: 1(one) K-1740-C, Alameda, 13"x 30" with, K-8784, K-9120, K-8355.

HEATING

HEATER: For heating unit in Softener Room, completely installed allow the sum of \$700.00.

WIRING

WORK REQUIRED: The work to be done under this contract includes all labor and materials, equipment and services necessary for and reasonable incidental to the proper completion of all the electrical work shown on the drawings or herein specified. The installation of a system of lighting, wiring and connections.

CODE: The National Electrical Code as revised in 1928 and subsequently, shall govern all work and materials under this specification and shall be strictly adhered to unless otherwise noted.

DRAWINGS: Before starting his work the Electric Wiring Contractor shall examine the architectural, mechanical and structural drawings and if any discrepancies occur between them and these specifications, he shall report same to the Architect in writing and obtain written instructions for changing the work. The Electric Wiring Contractor shall prepare all shop equipment and other drawings at his own expense, if required, and shall submit same to the Architect for approval before starting work. These drawings shall indicate thickness of material, feeder and conduit sizes, type of switches, etc.

PERMITS: The Electric Wiring Contractor shall give all requisite notices, obtain and pay for all permits and pay all deposits and fees necessary for the installation of the work under this contract, including all expenses, deposits, fees, etc.

SERVICE: The service to the building will be run from the pole at the south west corner of the lot and run ~~fo~~ the inside of the building and extended on ceiling to the switch board l location by the City of East Lansing.

CONDUIT: All underground work to be run in gal. iron conduit. All other work in building to be run in thin wall conduit of sufficient strength and size to allow the ready insertion of all conductors without abrasion. No more than three quarter bends will be allowed from outlet to outlet. All joints in conduits shall be properly made by fitting tight in the couplings so as to make watertight and each end to be reamed and butted. The entire system shall be installed complete before any conductors are drawn in, and the plaster shall be thoroughly dry. Bx may be used in places where same does not conflict with code.

LIGHTING SYSTEM: The system of wiring to be known as the 3-2 wire, 110-220 volt, three wire feeder and two wire branches, not more than 12 sockets or 1200 watts will be allowed on one circuit.

POWER SYSTEM: To be done under separate contract.

WIRE: Except where otherwise specified to be of rubber covered copper of size required by the circuit load, and all wires larger than #9 shall be stranded.

DISTRIBUTION PANEL: Lighting panel shall be surface mounted, code thickness, with hinged door frames and cover, as supplied by the Square D Co., or its equal. Cabinet shall have fuses for two extra circuits.

MAIN SWITCH: Lighting main switch shall be 60 amp. as Manufactured by the Square D Co., Square D Switch Co., Detroit, Mich., or its equal.

METERS: Furnished and installed on plane by Electric Light and Water Board, Lansing, Mich.

PANEL: Panel board for all lighting and power meters switches and cabinets to be built by the City of East Lansing.

MOTORS TO BE CONNECTED BY OTHERS: All connections to softeners and brine pump motors furnished by The Permutit Co., Run conduit to Permutit Co., control cabinet from service line entrance to building. Size of conduit to be as directed by Permutit Co.

OUTLETS: Wiring shall terminate at all outlets in stamped steel outlet boxes of approved make. Outlet boxes shall be located where directed, set so that the plates shall be flush with the finished wall, and to be protected from injury by the plasterers or other workmen, When two or more switches are located side by side they must be set in a gang box.

LOCATION OF OUTLETS: The location of outlets are shown on the Architects drawings, but must be verified by the Architect at the building before the outlets are placed, Slight changes in the position of the outlets, if decided upon before any work had been done by the Contractor, shall be made by him without extra charge. The height of the bracket lights shall be in general 6'-0" from the finished floor. The height of the switches shall be in general about 4'-0" from the finished floor.

SWITCHES: All switches to be flush and to be toggle type furnished complete as manfg. by the General Electric, or its equal.

RECEPTACLES: All receptacles to be flush duplex and to be standard flush type as manfg. by General Electric or its equal. Exterior receptacles to be of the waterproof type, Russell Stoll or its equal.

PLATES: Switch and receptacle plates shall be "Bakelite"

SEPARATE CIRCUITS: All motors to be separate circuits.

CUTTING AND PATCHING: The Electric Wiring Contractor shall work in advance of the work of others whenever possible, eliminating all cutting and patching. Where such procedure is not possible cutting shall be done in a neat manner by this Contractor and all such cutting shall be patched by the contractor whose work is cut and the cost of patching shall be paid by the Electric Wiring Contractor.

PLASTER PATCHING AND GLASS BREAKAGE: All plaster patching and glass breaking caused by the Electric Wiring Contractor in the installation of his work shall be made good and paid for by the Electric Wiring Contractor.

INSPECTION AND TESTS: The Electric Wiring Contractor shall obtain all inspections required by the law, ordinances, rules, regulations or public authority having jurisdiction, shall obtain certificates of having had such inspection and submit same to Owner, and shall pay all fees, charges and other expenses in connection with same.

PERFORMANCE TESTS: The Electric Wiring Contractor shall test all wiring and connections for continuity and grounds before fixtures are connected.

REMOVAL OF RUBBISH: At completion of the work under this contract, the Wiring Contractor shall remove from the building all rubbish and accumulated materials of whatever nature not caused by other trades and shall leave the work in a clean, orderly and acceptable condition.

TEMPORARY LIGHTING: The Electric Wiring Contractor shall furnish a price for connecting and installing such items of labor and materials as may be directed, for the purpose of temporary lighting during construction. Temporary lighting service charge and current used in temporary lighting as well as cost of temporary lighting wiring and connections, etc., shall not be a part of the Electric Wiring Contract.

TEMPORARY POWER: The Wiring Contractor shall furnish a price for connecting and installing such items of labor and material as may be directed for the purpose of temporary power for the building during construction. Temporary service charge and current used in temporary power as well as cost of temporary power wiring, connections, etc., shall not be a part of the Electric Wiring Contract.

FIXTURES: For all electric lighting fixtures allow the sum of \$50.00, installed and left in perfect condition. This not to include lamps.

GUARENTEE: Contractor shall guarantee all materials installed by him against all defects of workmanship or material for a period of one year after final completion of the work and he shall repair or replace any materials that develop such defects within the time, promptly upon due notice being given by the Owner.

CONTRACT

ARTICLES OF AGREEMENT, made and entered into this _____ day of _____, 19_____, by and between _____

_____ party of the first part, and _____

_____ of the City of _____ County of _____ and State of _____, party of the second part, to-wit:

(1). That all proposals, specifications, plans, bonds, etc., hereto attached or herein referred to, shall be and are hereby made a part of this agreement and contract.

(2). That the party of the second part, under penalty of bond attached, shall furnish all labor, materials and appliances necessary, and do all the work as set forth in proposal, _____

_____ according to the specifications, plans, etc., which have been made a part of this contract, in a manner, time and place, all and singular, as therein set forth.

IN CONSIDERATION WHEREOF, said party of the first part, for it and its successors, promises and agrees to pay to said party of the second part, the sum provided in the attached proposal, _____

_____ specifications, etc., all in the time and manner therein provided.

For the faithful performance of all and singular of the stipulations, terms and conditions of this agreement, said parties respectfully bind themselves, their successors, heirs, executors, administrators and assigns.

IN WITNESS WHEREOF, said parties have hereunto set their hands and seals, in duplicate, the day and year first above written.

Party of the first part

By _____

WITNESS:

Party of the second part

By _____

BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned.....

as principal, and.....

of..... as sureties are hereby held and firmly bound unto the

in the full and just sum of.....

Dollars (\$.....) for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed and sealed this..... day of..... 19.....

The condition of the above obligation is such that if said.....

shall well and faithfully do and perform the things agreed by..... to be done and performed by the annexed contract, according to the terms thereof, then this obligation shall be void, otherwise the same shall remain in full force and effect.

It is mutually understood and agreed that in cases where changes are required, either by order of the Engineer, or owner, or by mutual agreement, such change or changes shall not modify, discharge or release this bond.

..... (Seal)

..... (Seal)

Principal

..... (Seal)

..... (Seal)

Surety

Signed, Sealed and Delivered
in presence of

.....

.....

BOND

KNOW ALL MEN BY THESE PRESENTS, That we _____

of the _____, hereinafter called the Principal, and

_____ hereinafter called the
Surety, are held and firmly bound unto the People of the State of Michigan in the sum of

_____ Dollars (\$ _____),
to the payment whereof, well and truly to be made, we bind ourselves, our heirs, execu-
tors, administrators, successors and assigns, jointly and severally, firmly by these pres-
ents.

Sealed with our seals, and dated this _____ day of _____

A. D. 19_____.

WHEREAS, The above named Principal has entered into a contract with the _____

_____ dated the _____ day of _____

A. D., 19_____, wherein said Principal has covenanted and agreed as follows, to wit:

To furnish all the labor and material _____

AND WHEREAS, This bond is given in compliance with and subject to the provi-
sions of Act No. 187 of the Public Acts of Michigan, for the year 1905, same being sec-
tions 14,827 to 14,830 inclusive of the Compiled Laws of the State of Michigan of 1915,
as amended by Act No. 384 of the Public Acts of Michigan for 1925 and Act. No. 167 of
the Public Acts of Michigan for the year 1927.

NOW, THEREFORE, the condition of this obligation is such that if payment shall
be made by the Principal to any subcontractor or by him or any subcontractor as the
same may become due and payable of all indebtedness which may arise from him to a
subcontractor or party performing labor or furnishing materials or supplies or any sub-
contractor to any person, firm, or corporation on account of any labor performed or ma-
terials or supplies furnished in the performance of said contract then this obligation
shall be void, otherwise the same shall be in full force and effect.

AND PROVIDED, That any alterations which may be made in the terms of said
contract, or in the work to be done under it, or the giving by the party of the first part
to said contract of any extension of time for the performance of said contract, or any
other forbearance on the part of either party to the other shall not in any way release
the Principal and the Surety, or either of them, their heirs, executors, administrators,
successors or assigns from any liability hereunder notice to the Surety of any such alter-
ation, extension or forbearance being hereby waived.

Signed, Sealed and Delivered in Presence of _____

Principal

Surety

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