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Design of Sewer System
For College Grove
I.J. VANSKIVER
1903

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DESIGN OF SEWER SYSTEM FOR COLLEGE GROVE.

by

P. J. VanSkiver.

THESIS

The design of the sewer system for College Grove, began by a survey to obtain the topography of the plat. The levels were taken with reference to the bench mark on College Hall, because all the levels, in this vicinity have been taken with reference to this bench mark, and could easily be compared with those of the plat. The levels were taken at the lot corners, as this method would save the time of following out even contours, and then establishing lines on which to run the levels. As the ground is very even, and with a slight, but gradual slope, these levels also served to obtain the profiles of the streets and alleys.

A map of the plat was then made, and the levels were plotted directly on the map. No contour lines were drawn, as they were not needed. An inspection of the levels, as plotted, being all that was necessary to determine the natural water courses. ~~These~~ all slope toward the South East corner of the plat, and this was chosen as the outlet of all the sewage.

The next step, which also figures somewhat in

the selection of the sewer lines, is determining the method of disposal of the sewage. The usual method of disposing of sewage, is to turn it into neighboring streams, and, in this particular case, the best and most economical method would be to turn it into the Red Cedar river, if that were possible. But, the only natural water course, running from the plat to the river, ran directly across the College Campus, and according to the state law, no sewers can be put through public property without a special permit. As this permit could not be obtained, some other means had to be used of disposing of the sewage. Another means of disposal would be to purify the sewage by means of a septic tank, and let the purified sewage run off through the ditch, or small stream, which flows along the East side of the plat, and thence across the Campus to the river. This method was the one adopted, and a septic tank is to be installed on Charles st., opposite the alley between The Elms and Albert ave. This place was selected because it was the most convenient place for the collection of all the sewage.

The sewer lines were then selected. Many routes could be selected, but the most economical ones were found to be in the alleys. By placing them in the alleys, it will require fewer sewer lines, as is seen in the sewerage of the lots between Albert ave. and The Elms. By placing the sewer in the alley, the one line will serve all the lots, while if the sewer were placed in the street, two lines would be necessary, one on Albert ave. and one on The Elms. In the case of the alleys parallel to M. A. C. ave., it was thought more economical to place sewers in these alleys, as otherwise it would require sewers in Grove st., M. A. C. ave., and Charles st. Of course, if the plat were built up rapidly, and require an enlargement, so that lots would have to be laid out on the West side of Grove st., and the East side of Charles st., it would not make any very material difference, whether the sewers were placed in the streets or in the alleys. But from the present outlook, such additions to the plat would probably not be made during the life of this system, and therefore the plan adopted seems to be the most

economical one.

An estimate of the amount of sewage was made by assuming six persons to a lot, and that the amount of sewage per capita was 0.0162 cu. ft. per minute. These were considered as very good values for a residential district. Estimating the amount in this way, the sewer through the East alley does service for twenty four lots, or one hundred forty four persons, making the amount of sewage $144 \times .0162 = 2.332$ cu ft. per minute. The sewer through the West alley does service for the same amount or 2.332 cu. ft. per minute. Along Anna st., the increase of sewage is from five lots or thirty persons, making an increase of .486 cu. ft. per minute. In the Alley between Albert ave. and the Elms, the sewer serves twenty four lots or one hundred forty four persons, making 2.332 cu. ft. per minute. This makes the total amount for the whole plat $2.332 + 2.332 + .486 + 2.332 = 7.484$ cu. ft. per minute. According to the diagram which gives the capacity of sewers on different grades, this amount is considerably less than the capacity of a six inch sewer on a five tenths

percent grade. As no grades will be less than five tenths percent, a six inch pipe would allow a considerable factor of safety.

After the selection of the sewer lines, profiles were made of the streets and alleys through which they were to run for the purpose of determining the best grades for the sewers. The profiles were drawn to a horizontal scale of one inch equals fifty feet, and to a vertical scale of one inch equal to five feet. The distances were computed from the widths and lengths of the lots and streets. Before determining the grades and depths of the sewers, it was found necessary to take the levels at the bottoms of the cellars which the sewers would drain, and also the elevation of the ditch that flows across the Campus, and into which the tank would empty. The elevation of this ditch was a very important item in determining the depth of the sewer at the outlet, as ample fall had to be provided for between the sewer and the ditch to carry off the purified sewage. The mouth of the sewer was placed about a foot higher than the bottom of the

ditch. This brings it about three feet below the surface at this point which is considered shallow, but as it lies in the street, the street will probably be filled in and graded up higher, if it is ever improved. This was the first point determined, and was the one upon which all the grades were based as they had to be brought to this elevation at the outlet.

The depth of the sewer in the alley parallel to The Elms was determined principally by the elevation of the cellar of the store at the west end. To bring it below the cellar, the sewer had to be lowered to about nine feet below the surface. Examining the profile, the point was selected at which the grade would have to be changed, and an approximate depth of sewer determined at that point. Then beginning at the outlet and working backwards, an even grade was determined which would bring the sewer at about the depth required at that point, care being taken that the sewer did not run too deep or too shallow at the intermediate points. After having determined upon the best grade,

the depth of the sewer was computed accurately at the point where the grade was to be changed, and with this depth, the grade and depth of the sewer above was determined in the same way.

The grades of the sewers along Charles and Anna streets were next determined. The governing factors in this case, were the depth of the sewer at the outlet, and also, the fact that the sewer along Anna st. had to be deep enough to afford an outlet for the sewers in the East and West alleys. Inspecting the profiles of the two alleys, an approximate depth was made at the mouth of each, which would be sufficient for the mouths of the sewers in the alleys. Then beginning at the outlet, even grades were determined which would bring the sewer at the required elevation at the alleys. The elevation of the sewers at the mouths of the alleys were then computed accurately, and the grades in the alleys determined with reference to these points. In determining the grades, the method of beginning

at the outlet and working backwards, was used so as to avoid using fractional grades, and thus facilitate the work of setting grade stakes.

Manholes are to be placed at all intersections, and at all changes of grade. At the dead ends lamp holes are to be placed. It was thought that manholes at the dead ends would not be necessary, unless the sewers would sometime be extended. But in all probability, sewers will not be extended beyond the present design within the life of this system.

The cost of the system was estimated as follows:

3821 ft. 8" tile @ 12¢ per ft. -----	\$458.52
Excavating, laying, and backfilling,	
231.6 rds. @ \$4.00 per rd. -----	926.40
7 manholes at \$30.00 each -----	210.00
3 lampholes at \$5.00 each -----	15.00
Total - - - - -	\$1609.92

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47