

The separate system, under certain conditions, offers greater flexibility in the disposal of trade wastes than does the combined system, unless the first wash of the streets is to be intercepted and treated. Some trade wastes are offensive and if discharged into the sewers in such a condition must be treated. On the other hand, some trade wastes are inoffensive and can be discharged direct into the streams without causing any nuisance or trouble.

With the separate system the offensive trade wastes can be discharged into the sanitary sewers and the inoffensive wastes into the storm water drains. The offensive trade wastes only would then be carried to the treatment works. With the combined system all of the trade wastes, the inoffensive as well as the offensive ones, would have to be intercepted and carried to the treatment works, with the result that the treatment works would have to be somewhat larger in size, and hence would cost more than would be the case if the separate system had been adopted.

With a community which is largely residential in character, the volume of trade wastes would affect but very little the total sewage flow. With a manufacturing community, however, the trade waste might amount to quite a large percentage of the total flow and in extreme cases might equal in volume the house sewage. Under such conditions it is evident that, if any considerable percentage of the trade wastes is inoffensive, separate sewers would be of decided advantage, as they would permit of the inoffensive wastes being discharged direct into the storm water drains, the offensive wastes only being discharged into the sanitary sewers and by them carried to the treatment works.

With a combined system automatic regulators are generally used on the connections between the combined sewers and the intercepting sewer to limit the amount of flow from the combined sewers to the intercepting sewer. With a separate system automatic regulators are not required unless the first wash from the streets is intercepted in the storm water drains. Automatic devices in sewers, as a general proposition, no matter how well designed, are to be avoided wherever possible.

The Removal of Grit.—The presence of grit at a sewage disposal works is generally more or less of an annoyance, especially when the sewage has to be pumped and passed through settling tanks. With combined sewers, receiving as they do storm water from the streets, a considerable amount of grit must be expected to reach the disposal works, not only during wet weather but during dry weather also. With separate sewers the amount of grit received at the disposal works is relatively small unless the first wash from the streets is intercepted in the storm water drains and carried to the disposal works.

It has been suggested that a considerable amount of grit could be prevented from reaching the disposal works from combined sewers by inserting a catch basin or sand catcher on each connection between the combined sewers and the intercepting sewer. It is probably true that such would be the case, but it is a question whether this would be a good method of removing grit. In the first place these sand catchers would sooner or later fill up, and unless cleaned at proper intervals would fail to serve the purpose for which they were built. Again, it is very probable that more or less organic matter would be deposited in them, especially when only the dry weather flow, consisting as it would mainly of sewage, was passing through them. The retention of organic matter would lead to offensive conditions as soon as putrefaction began.

The inserting of sand catchers between storm water drains and an intercepting sewer would seem to be a more practicable proposition as the possibility of retaining offensive matter from sewage would then be eliminated. The sand catchers would still, however, have to be cleaned in order to make them effective.

With combined sewers or with separate sewers in which the first wash from the streets is intercepted in the storm water drains grit must be expected. Such being the case, it is a question if the simplest way of handling the grit is not to admit it into the intercepting sewer from the combined sewers or storm water drains, without attempting to intercept any portion of it, and then to transport it with a good velocity in the intercepting sewer direct to the sewage disposal works. Even with sand catchers on the connections between the combined sewers or storm water drains and the intercepting sewer enough grit is sure to reach the sewage disposal works to require its removal before the sewage is pumped or passed through settling tanks. The removal of grit at one point instead of at numerous points has many advantages.

The common practice of removing grit at a sewage disposal works is to pass the sewage at a slow velocity, roughly about one foot per second, through a grit chamber, the grit settling out and being retained on the bottom of the chamber. In large works mechanical means are provided for removing the grit from the grit chamber, but in smaller works it is common practice to drain out the liquid from the grit chamber and to then shovel the grit out by hand.

With a separate system, in which the first wash from the streets is not intercepted from the storm water drains, a question arises as to the necessity of providing a grit chamber at the sewage disposal works. Practice varies. At some disposal works grit chambers have been provided and at others not. If the sanitary sewers are properly designed and built and are provided with tight covers but very little grit should get into the systems, but with macadam or dirt streets and perforated covers some grit must be expected. The safest plan, under ordinary conditions, seems to be to provide a grit chamber, even if it be a small one. The grit would require removal only at more or less infrequent intervals.

Perhaps the question may arise as to the necessity of removing the grit. It would, of course, be perfectly possible to pump the grit along with the sewage, but this would cause unnecessary wear and tear on the pumps. Again, if the grit is not removed before reaching the suction well, it may easily settle in and clog up the suction well causing thereby a shut-down until the well is cleaned out.

If the grit is admitted to the settling tanks it may cause trouble there. It depends, of course, on what type of tank is used and on the method of operation. If the tank is an Imhoff tank the grit, by settling down into the sludge digestion chamber, may check or prevent the proper digestion of the sludge and consequently affect the satisfactory operation of the tank. The admission of grit to a septic tank may also interfere with its satisfactory operation. If admitted to a plain settling tank, which is cleaned out at frequent intervals, the main trouble to be expected would be in the cleaning out of the tank.

With sewage from a combined system the volume of sludge accumulating in settling tanks is greater than with sewage from the separate system. It may even be nearly

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