PROCEDURE IN MAKING ELECTROLYSIS SURVEYS.*

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THIS paper deals with the methods of procedure to be followed in examining underground pipe and cable systems and the return system of electric railways for the purpose of determining the liability of the underground metallic structures to damage from stray electric currents from the electric railways. The paper describes the principal methods that have been successfully used by the engineers of the Bureau of Standards in work of this kind during the past five years.

The introduction sets forth the purpose of making electrolysis surveys, and outlines several classes of surveys that may be made according to the character of the information sought. The paper points out that by means of proper measurements it is possible to determine the extent and location of the areas in which the pipes and other structures are in danger, and the approximate degree of seriousness of the trouble. The cause of the damage in progress, whether due to stray currents or natural corrosion by soil, cinders, or organic matter, can generally be pointed out, and in case of electrolytic corrosion the source of the current can generally be definitely determined. The various factors tending to produce or aggravate electrolytic damage, such as local discontinuity or high resistance in the pipe systems, unusually low resistance soil; or, in the railway lines, poor rail-joints, infrequent cross-bonds, insufficient conductance in the negative return, improper use of such conductance, or too long feeding distances, may be determined, besides many questions of local importance. Attention is called to the fact that a large amount of preliminary data and information on the railway systems needs to be obtained prior to the making of electric measurements. These include:

1. The character of the service, whether city, suburban, or interurban. This will have a bearing on the schedule, momentary variation in load, and load factor.

2. Physical data on the railway systems, such as rail weights, types of bonds and joints used, and road-bed construction.

3. The practice of the railway company in regard to frequency of cross-bonding, bond maintenance, and bond testing.

4. Load curves are necessary for the interpretation of the data in order to reduce short-time readings to all-day or other average values. Where the load varies considerably in different sections of a power-house feeding area it may be necessary to get the load curves on different feeders as well as the total power-house load.

5. Where a survey is made with the ultimate purpose of correcting electrolysis conditions by applying some method of mitigation it will also be necessary to secure complete data on the magnitude and distribution of load, the generating and substation feeder systems, frequency of schedule, and probable future demands of traffic.

The electrical measurements required in electrolysis surveys are treated under three heads, namely: (1) Measurement of over-all potential drops between the points of lowest potential and outlying points on the railway system, potential gradient measurements in tracks and earth, and potential difference measurements between different systems of underground structures; (2) current measurements, including measurement of current in feeders and rails, measurement of current in pipes and lead cable sheaths, measurement of current leakage from buried metallic structures into the earth; (3) miscellaneous measurements, which include the location and testing of high-resistance joints in pipes, track testing, measurement of earth resistance, measurement of leakage resistance between railway tracks and earth, determination of the cause of corrosion, determination of the source of stray currents, location of concealed metallic connections, and examination of concrete structures.

There is also a section devoted to the discussion of the principles involved in the proper interpretation of the results of electrolysis test data, and the importance of having electrolysis surveys carried out under the supervision of an engineer thoroughly experienced in work of this nature is emphasized.

*Notes from the Bureau of Standards Journal of Franklin Institute for August, 1916.

QUEENSTON SEWAGE TREATMENT PLAN.*

Queenston, an undivided part of Niagara township of the province of Ontario, has a population of about 200, and is located on the Canadian side of the Niagara River immediately opposite to Lewiston, N.Y., U.S.A. It is the terminus of the passenger line of boats plying between the Niagara River and Toronto, but otherwise is a strictly rural residential community, with small chance for increase in population unless there should occur a serious development of power at the rapids in the lower Niagara River.

Water supply is derived entirely from local springs and wells. Drainage is non-existent, except perhaps in the case of two or three local residences which drain direct to the river. There appears no probability that this community will require the installation of sanitary drainage for some time to come, but should the need arise it would be quite simple to supplement any strictly drainage lines by the addition of some 1,000 feet of intercepting sewer which would serve to carry the dry-weather flow to any of several sites, the most convenient, perhaps, being in the vicinity of the lower reaches of the car loop of the electric line connecting to the Toronto boat landing, although this site has the disadvantage of being located somewhat upstream from the village itself, an objection which, considering the small amount of sewage which would have to be handled, and the large volume of the river, would not be of much force. The construction of interception of this character, together with supplementary tank treatment, would be covered by the following estimate of cost:

1,000 feet of interceptor, at $2.50	$2,500
Sewage treatment, 300 people, at $6	1,800
Total	$4,300

As in the case of Lewiston, to which the community is in many ways similar, the operation costs should not exceed $500 per annum, with annual charges at 6 per cent. of the construction cost.

*From report to the International Joint Commission made by Prof. Phelps, consulting sanitary engineer to the commission.

The building permit for the new Lake Erie and Northern station at Brantford, Ont., has been issued, subject to the carrying out of the award of the Dominion Railway Board in regard to the transfer of certain lands. Work on the foundation has started and the new station, which will be a handsome one, will cost $25,000. Schultz Bros., Limited, have the contract.