Instructions for Sampling with Depth-Integrating Suspended-Sediment Samplers US D-59 and DH-76

The US DH59 and DH76 suspended-sediment samplers are depth-integrating instruments designed for use in streams not more than about 15 feet in depth. The samplers have streamlined bodies weighing about 24 and 25 pounds respectively, which are recessed to accommodate the round 1 pint milk bottle, and the 1 quart mayonnaise sample containers. Tail vanes to orient the instruments into the direction of flow and air escape passages are cast integrally. The heads of the samplers are drilled and tapped to receive the intake nozzles. Five nylon nozzles (color coded red), two of the 1/4 inch, two of the 3/16 inch, and one 1/8 inch diameter bore, threaded for hand assembly to the head, are supplied with each instrument. In the sampling operation, the head is oriented upstream with the nozzle pointing directly into the current, and the sampler is lowered from the water surface to the stream bed and then raised to a position above the water surface. During the period of submergence a continuous filament of tream flow is collected in the sample bottle. Air displaced from the bottle while the sample accumulates is discharged through the air escape passage which points downstream. A fixed static head differential of 1/2 inch between the intake and exhaust facilitates sampling in low stream velocities and slack waters.

Selection of sampling locations requires evaluation of local conditions, a procedure which will not be discussed here. After the sediment sampling station or cross section has been selected, sediment samples are usually taken at verticals that represent equal fractions of stream discharge. One or more samples may be taken at each sampling vertical. For further guidance in this respect see Reports No. 8 or 14 in the series, "A study of Methods Used in Measurement and Analysis of Sediment Loads in Streams."

Depth-integrating suspended-sediment samplers accumulate a sample of the water-sediment mixture throughout the period of submergence. However, if the container becomes completely filled during a sampling operation, the sample will not be representative and must be discarded. Clean bottles must be used and after sampling they should be covered with suitable caps to prevent contamination or loss of the sample. The capacity of the sample bottle is about 470 cc. in the case of the DH59 and 950 cc. in the case of the DH76. However, because the axis of the bottle is inclined to the vertical, any sample containing more than 440 cc. or 730 cc. respectively, may be in error due to circulation of the water-sediment mixture. The period of submergence should be sufficient to produce a sample volume less than 440 cc. and 730 cc. but greater than 375 cc, 665 cc. in order to obtain a sample large

enough for a laboratory analysis. It is generally preferable to retain an initial sample of less than 375 cc., 665 cc. but greater than 300 cc, 650 cc. rather than to discard the sample and resample into the same bottle. If the initial sample volume is considerable less than 300 cc. 600 cc., the stream vertical may be integrated a second time, or even a third time, each be additive to the same sample bottle. A minimum sample of 350 cc, 650 cc is suggested, but sufficient latitude in minimum sample volume should be permitted to avoid retaking a large number of samples.

The volume of sample collected at a vertical is dependent primarily upon the local stream velocity and the duration of submergence of the instrument. Because the operator has no control over the stream velocity and depth encountered, he must regulate the volume of the sample by selecting a nozzle of appropriate size or by varying the sampling time (total time of submergence of the instrument).

A chart showing the relation between stream velocity and corresponding filling time (time of submergence of the sampler) to produce samples 395 cc. (for pints) and 690 cc. (for quarts) in volume for the three standard nozzle diameters is attached. The filling time in seconds represents the total time of submergence of the instrument, that is, the time involved in traversing the stream vertical in both tge downward and upward directions. Use of these filling time curves will provide acceptable sample volumes and will permit minor variations in the total time of submergence without invalidating the sample. Enter the sampling time curve with the stream velocity and determine the sampling time to secure a sample volume of 395 cc., 690 cc. for the respective nozzle sizes. Then select the largest diameter nozzle that can be traversed conveniently throughout the depth of the stream in the time indicated, at a uniform rate throughout each direction of travel.

If the estimated mean velocity of flow in a stream vertical is 4 feet per second, a sediment sampler equipped with a 1/4 inch diameter intake nozzle will accumulate a sample of 395 cc. in 10 seconds of submergence. The sampler must be lowered from the water surface to the stream bed at a unifrom rate in 5 seconds and raised from the bed of the stream at a uniform rate to break the water surface at the expiration of the remaining 5 seconds. The time used in traversing the stream vertical need not be the same in both directions of travel. However, the rate at which the sampler moves vertically in any one direction must remain uniform. Thus, in the above example, the stream vertical could be traversed at a uniform downward rate in 6 seconds and at a uniform rate upward to clear the water surface in 4 seconds, a total submergence period of 10 seconds. If the 1/4 inch diameter nozzle requires a vertical transit rate greater than allowable for the stream depth than a smaller diameter nozzle should be used.

A clean bottle must be used for each separate sediment sample; at least one suspended-sediment sample is taken at each sampling vertical in the cross section. When a filled sample bottle is removed from the sampler it is immediately capped to prevent contamination and appropriately marked. Pertinent information for every sample should be recorded to include the following:

Name of the stream
Precise location on the stream (vertical)
Location of the cross section
The stream depth covered by the sample
State of the stream (gage height)
Date
Time of day
Identification applied to sampling personnel

In addition to the above, the following information may be useful also:

Sampling time (sampler submergence time)
Water temperature
Coordination with sample groups
Individual identifying sample number

A portion of the exterior of the glass bottle may be etched or otherwise treated to provide a surface suitable for recording all the essential information for each sample.

Methods of analyzing sediment samples are discussed in Reports Nos. 4, 7 and 11 of the series of reports on "A study of Methods Used in Measurement and Analysis of Sediment Loads in Streams," sponsored by the Subcommittee on Sedimentation, Inter-Agency Committee on Water Resources.

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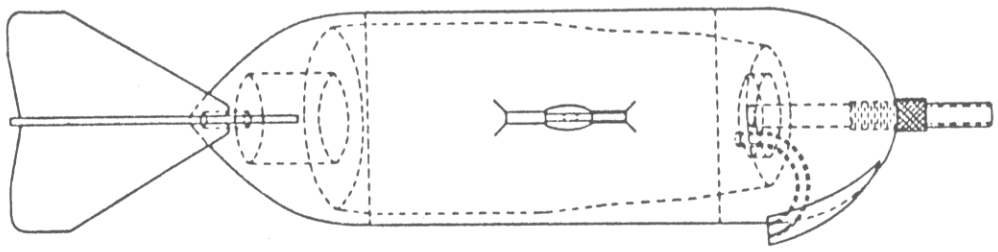
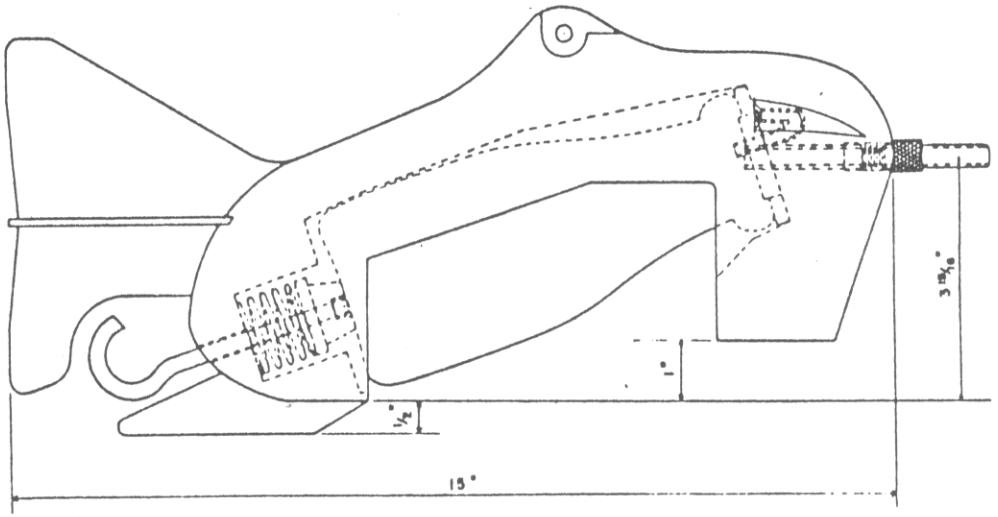
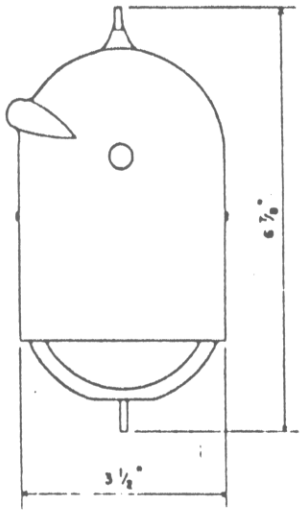


PLAN

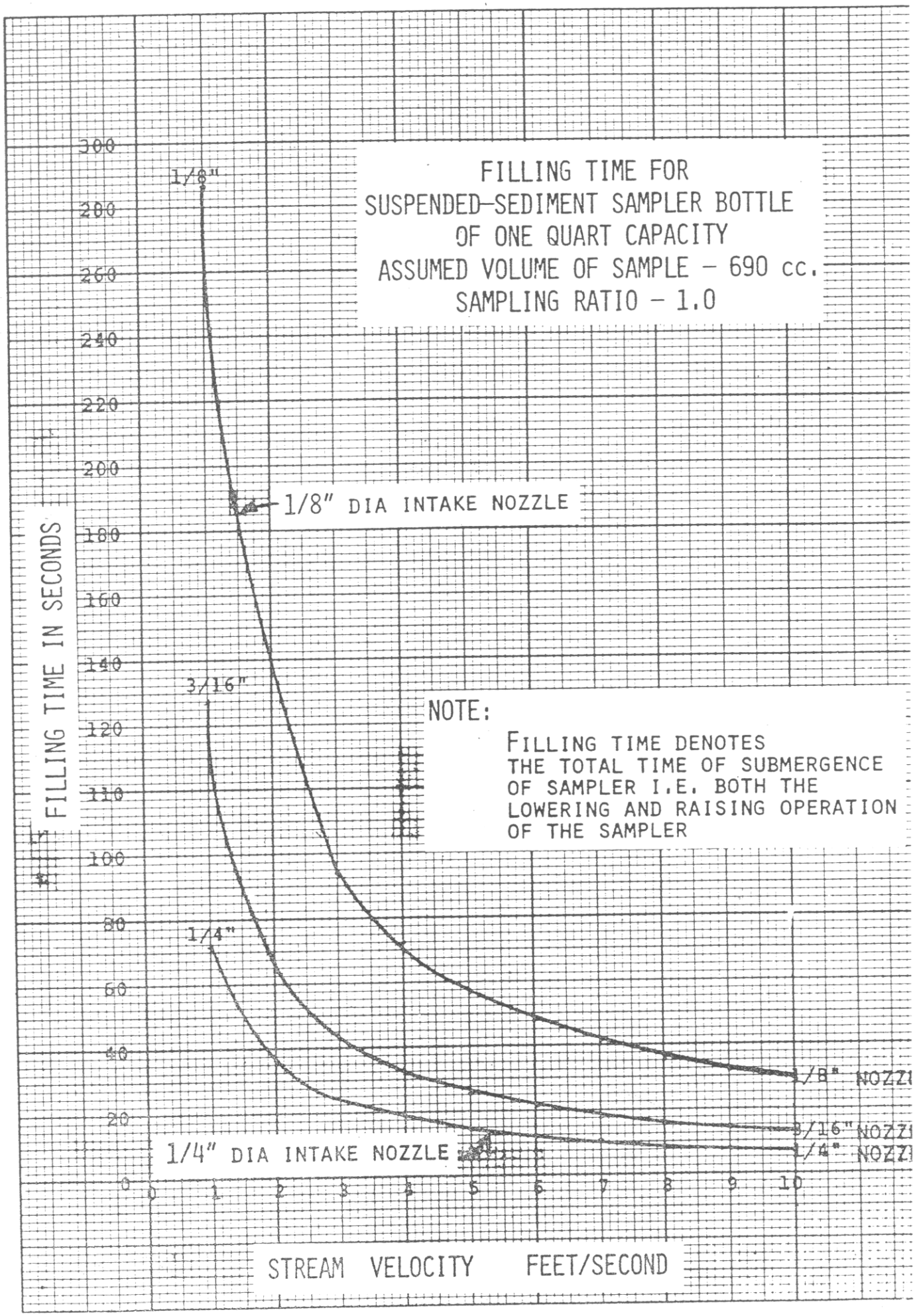


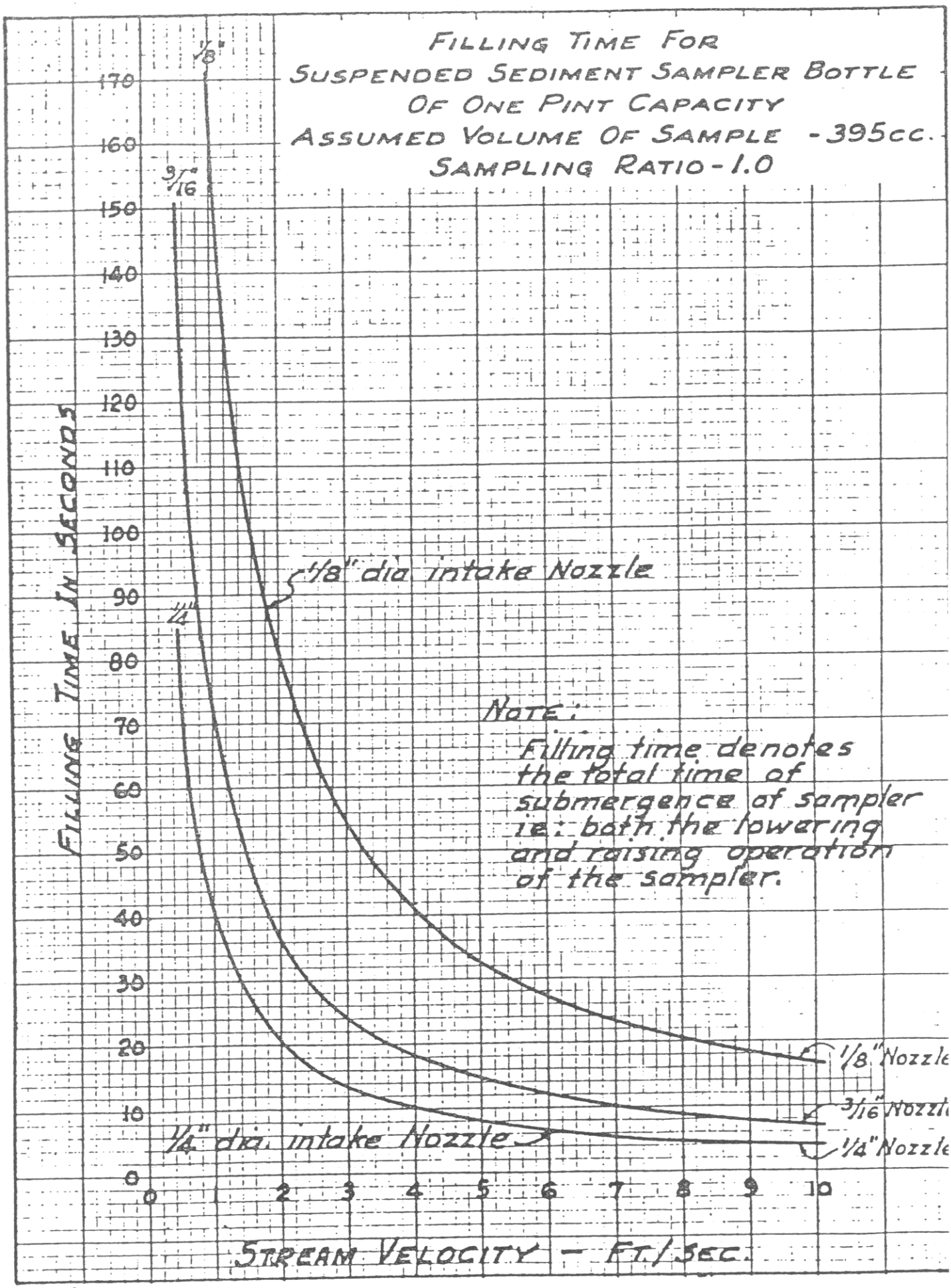
ELEVATION



FRONT

DEPTH-INTEGRATING HAND LINE SAMPLER, US DH-59




FILLING TIME FOR
SUSPENDED SEDIMENT SAMPLER BOTTLE
OF ONE PINT CAPACITY
ASSUMED VOLUME OF SAMPLE - 395cc.
SAMPLING RATIO - 1.0
FILLING TIME IN SECONDS
STREAM VELOCITY - FT./SEC.
1/8"
3/16"
1/4"
1/8" dia intake Nozzle
1/4" dia intake Nozzle
NOTE:
Filling time denotes the total time of submergence of sampler ie: both the lowering and raising operation of the sampler.
1/8" Nozzle
3/16" Nozzle
1/4" Nozzle
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
1
2
3
4
5
6
7
8
9
10