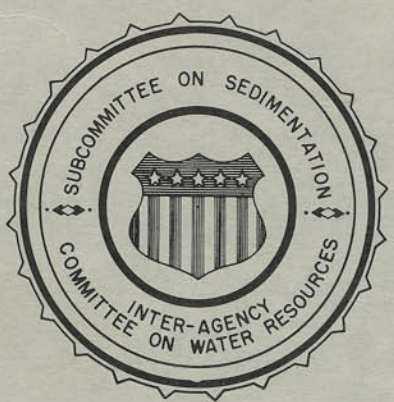
A STUDY OF METHODS USED IN

MEASUREMENT AND ANALYSIS OF SEDIMENT
LOADS IN STREAMS



REPORT M

OPERATION AND MAINTENANCE OF US BM-54 BED-MATERIAL SAMPLER

NOVEMBER 1958

A Study of Methods Used in

MEASUREMENT AND ANALYSIS OF SEDIMENT LOADS IN STREAMS

A Cooperative Project
Sponsored by the
Subcommittee on Sedimentation
Inter-Agency Committee on Water Resources
(Formerly Federal Inter-Agency River Basin Committee)

Participating Agencies

Corps of Engineers	**	Geological Survey
Soil Conservation Service	**	Bureau of Reclamation
Agricultural Research Service	**	Coast and Geodetic Survey
Tennessee Valley Authority	**	Federal Power Commission
Bureau of Public Roads	**	Public Health Service
Forest Service		

REPORT M
OPERATION AND MAINTENANCE OF
US BM-54 BED-MATERIAL SAMPLER

Published Through Arrangements Made by the
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at
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Minneapolis, Minnesota

1953

The cooperative study of methods used in
MEASUREMENT AND ANALYSIS OF SEDIMENT LOADS IN STREAMS
covers phases indicated by the following report titles.

Report No. 1
FIELD PRACTICE AND EQUIPMENT USED IN SAMPLING SUSPENDED SEDIMENT

Report No. 2
EQUIPMENT USED FOR SAMPLING BED LOAD AND BED MATERIAL

Report No. 3
ANALYTICAL STUDY OF METHODS OF SAMPLING SUSPENDED SEDIMENT

Report No. 4
METHODS OF ANALYZING SEDIMENT SAMPLES

Report No. 5
LABORATORY INVESTIGATIONS OF SUSPENDED-SEDIMENT SAMPLERS

Report No. 6
THE DESIGN OF IMPROVED TYPES OF SUSPENDED-SEDIMENT SAMPLERS

Report No. 7
A STUDY OF NEW METHODS FOR SIZE ANALYSIS OF SUSPENDED-SEDIMENT SAMPLES

Report No. 8
MEASUREMENT OF THE SEDIMENT DISCHARGE OF STREAMS

Report No. 9
DENSITY OF SEDIMENTS DEPOSITED IN RESERVOIRS

Report No. 10
ACCURACY OF SEDIMENT SIZE ANALYSES MADE BY THE BOTTOM-WITHDRAWAL-TUBE METHOD

Report No. 11
THE DEVELOPMENT AND CALIBRATION OF THE VISUAL-ACCUMULATION TUBE

Report No. 12
SOME FUNDAMENTALS OF PARTICLE-SIZE ANALYSIS

Report A -- PRELIMINARY FIELD TESTS OF THE U. S. SEDIMENT-SAMPLING
** EQUIPMENT IN THE COLORADO RIVER BASIN APRIL 1944
Report B -- FIELD CONFERENCES ON SUSPENDED-SEDIMENT SAMPLING
** SEPTEMBER 1944
Report C -- COMPARATIVE FIELD TESTS ON SUSPENDED-SEDIMENT SAMPLERS
** PROGRESS REPORT DECEMBER 1944
Report D -- COMPARATIVE FIELD TESTS ON SUSPENDED-SEDIMENT SAMPLERS
PROGRESS REPORT -- AS OF JANUARY 1946
Report E -- STUDY OF METHODS USED IN MEASUREMENT AND ANALYSIS OF
** SEDIMENT LOADS IN STREAMS JULY 1946
(Paper presented at ASCE convention, Spokane, Washington)
Report F -- FIELD TESTS ON SUSPENDED-SEDIMENT SAMPLERS, COLORADO
RIVER AT BRIGHT ANGEL CREEK NEAR GRAND CANYON, ARIZONA
AUGUST 1951
Report G -- PRELIMINARY REPORT ON U. S. DH-48 (HAND) SUSPENDED-
** SEDIMENT SAMPLER
(Superseded by material in Report No. 6)
Report H -- INVESTIGATION OF INTAKE CHARACTERISTICS OF DEPTH-
** INTEGRATING SUSPENDED-SEDIMENT SAMPLERS AT THE
DAVID TAYLOR MODEL BASIN NOVEMBER 1954
Report I -- OPERATION AND MAINTENANCE OF U. S. P-46 SUSPENDED-
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Report J -- OPERATING INSTRUCTIONS, SUSPENDED-SEDIMENT HAND
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Report K -- OPERATOR'S MANUAL, THE VISUAL-ACCUMULATION-TUBE METHOD FOR
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Report L -- VISUAL-ACCUMULATION TUBE FOR SIZE ANALYSIS OF SANDS
SEPTEMBER 1954
(Paper presented at ASCE convention, Austin, Texas)
Report M -- OPERATION AND MAINTENANCE OF U. S. BM-54 BED-MATERIAL
SAMPLER NOVEMBER 1958

** OUT OF PRINT

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INSTRUCTIONS FOR THE OPERATION AND MAINTENANCE OF US BM-54 BED-MATERIAL SAMPLER

I. INTRODUCTION

1. Scope of these instructions--These instructions are applicable to the US BM-54 bed-material sampler constructed from plans dated February 1954 and revised plans dated March 1956. The revisions include a safety bar and a catch spring. The first samplers were delivered to the field offices in 1954.

This discussion was prepared to aid the field men, who use the US BM-54 sampler, to better understand its operation and maintenance. Some general procedures and techniques for taking samples are presented. Precautions to observe when handling the samplers are discussed.

These instructions were prepared by Fred S. Witzigman.

II. DESCRIPTION OF THE SAMPLER

2. General description--The US BM-54 sampler was designed to collect a bed-material sample from the top 2 inches of a stream bed. The material to be sampled may be firm, soft, plastic or granular. Particles in size up to one inch or larger may be picked up in the sampler bucket. The sampler, which weighs 100 pounds, can be used in a stream of any depth unless the velocity is very high. The streamlined body is made of cast steel and it is equipped with tail fins.

The sample is collected in a single scoop-type bucket which swings out of the bottom of the sampler body. The bucket surrounds and encloses the sample. When the bucket is closed, its edges point upward and seal against a gasket so that none of the sample can be washed out.

When the sampler is supported by a steel cable the bucket may be cocked, that is set in the open position, for taking a bed sample. When tension on the cable is released by resting the sampler on the stream bed or other support, the bucket snaps shut.

3. Safety precaution--The US BM-54 sampler has a powerful bite. Keep hands away from bucket opening when sampler is cocked. It is well to study the plans and understand the operation of the sampler before attempting to use it. There is a safety bar under the sampler which is held in place with the back leg screw. When the sampler is cocked and the entire mechanism is in the operating position this safety bar can be set to hold the bucket in the open position for changing gaskets, removing a sample, or for doing other work on the sampler. It is advisable

to release the tension on the main coil spring before starting any repair work on the sampler mechanism. To remove a sample from the bucket, a small scraper or brush should be used, and care taken to keep fingers out of the way. Normally, when removing a sample, the bucket will be cocked, but this may be avoided by not drawing the bucket back sufficiently for the catch to become engaged. The bucket should be cocked only when a sample is to be taken. Special care should be taken at all times when removing the sampler from the cable suspension line to avoid picking up a cocked sampler.

4. Operation of the sampler--The sampler is suspended by the hanger (PT-21) projecting from its top, to which is attached a steel cable. Reference is made to Figures 1 and 2 for location and description of parts by part number (PT). With the weight of the sampler supported by the hanger, the recoil spring (PT-20) is compressed, taking pressure off the catch bar (PT-24). The catch spring (PT-26) then presses the end of the catch into position to engage the lip on the edge of the bucket (PT-9) to hold it open. The bucket is opened manually by inserting a 7/32-inch socket screw key into the hex recess in the end of the main shaft (PT-6) and rotating the shaft until the bucket is recessed into the body of the sampler and held there by the catch. The socket screw key is then removed. The sampler must be suspended by the hanger in order to operate.

The bucket will snap shut automatically when tension on the supporting cable attached to the hanger is relieved. This occurs when the sampler is set on the stream bed, the floor, or any other support. The bucket is powered by a very strong coil spring (PT-15). It is easily tripped and may injure fingers seriously.

III. AUXILIARY EQUIPMENT

5. General comments--The auxiliary equipment discussed in this chapter is used to facilitate handling of the heavy US BM-54 bed-material sampler.

6. Mounting--The sampler requires about the same mechanical support that is necessary to successfully handle a 100 lb. stream-gaging weight. The sampler is usually suspended on a cable wound on a sounding reel. Reel mountings similar to those used for stream gaging are generally employed. The samplers may be operated from a cable-car suspended on a cable across the stream at the section to be sampled. The samplers are frequently used from a bridge with some type of portable crane. Satisfactory light-weight collapsible cranes mounted on four-wheel bases, such as the U.S. Geological Survey crane, Type A, are available. This type of crane and base requires counter weighting for stability. There are also cranes which are mounted on cars or trucks for operation directly from the roadway of a bridge.

7. Reel--The reel must have a drum of sufficient capacity to handle the maximum length of cable required. The drum should be no less than 12 in. in circumference and a larger size is desirable. The reel may be equipped with a depth indicator. The "A" or "B" type reels of the U. S. Geological Survey are satisfactory for most of the work to be done with the US BM-54 sampler.

8. Cable--A 1/8-in. steel cable is recommended. The cable must be of sufficient length to accommodate varying field conditions and to reach the bottom of any streams encountered. The 1/8-in. Ellsworth reverse lay cable used by the U. S. Geological Survey may be used. The steel cable should be securely fastened to the reel.

9. Connector--A mechanically strong support for the sampler may be made with a connector commonly used to support the suspended-sediment sampler or the current meter and weight. The U. S. Geological Survey AU connector or spiral connector may be used. Either of these connectors can be attached to the hanger which is built into the top of the US BM-54 sampler.

10. Auxiliary support for sampler--Because the sampler bucket can cause injury to the fingers and also because the sampler is so heavy, a convenient level surface is needed on which to set the sampler while the sample is being removed. Space underneath is necessary for opening the bucket, for removal of material and for a pan to catch the sample. A sampler support which is easily attached to the Type A stream-gaging crane is shown in Figure 3. Holes need not be drilled in the members of the crane, and the support does not interfere with operation of the reel. The support is made of 1-3/4" x 1-3/4" x 1/8" structural steel angles and two 1-5/8" x 3-5/8" x 3" wooden blocks. Two angles 11" long are welded to two angles 24" long and wood blocks attached by four 3/8" x 2-1/2" bolts. A 1/2" x 9" bolt is used for holding the support in place on the crane. The support is installed on the crane with the end directly under the reel-support plate. The support was designed by W. L. Haushild and B. H. Ringen of the U. S. Geological Survey.

Use of the support is an additional safety factor. It simplifies removal of the sample; it reduces the danger of injuring fingers if the bucket closes accidently; and it eliminates physical strain of raising and lowering the sampler by hand. The sampler may be set on the support when moving from one station to another, thus preventing it from swinging freely while the crane is being moved. A crane with the support may require a little more clearance between the crane and the guard rail on the bridge than one without the support. The support is removed when the crane is folded for transport in a truck.

IV. CARE OF THE SAMPLER

11. Cleaning--The catch mechanism should be kept clean of sand, otherwise it may fail to operate properly. After each sample is taken the sampler should be washed thoroughly in water to remove sand from the mechanism and from the bucket. Sand in the bucket, if not removed, will contaminate the next sample taken.

12. Oiling--The sampler mechanism should be oiled with a light protective oil when stored for any length of time. The mechanism should not be oiled just prior to use because the oil tends to cause sand particles to stick in the mechanism and cause it to bind.

13. Storage--When not in use for an appreciable length of time, the bucket should be closed and the spring tension should be further relieved by loosening the nut on the eye bolt (PT-18) on the nose of the sampler so that the main spring is not fully stressed. With the bucket closed, the sampler should be set on blocks when in storage so that its weight is not on the bucket.

14. Care in dismantling and assembling--Work on the sampler should be carefully done. Care is required to avoid damage to threads, to screw heads, and to finished surfaces. The proper tools for the job should always be used. Gaskets must be replaced as required.

15. Replacement of parts--If parts are to be replaced, the new parts should be carefully made and properly fitted. The action of the sampler should always be tested after repairs have been completed. Detail drawings of parts are shown in Figure 2.

V. DISMANTLING AND ASSEMBLING

16. To remove the bucket--The bucket mechanism can be removed from the sampler as follows:

(1) Refer to Figure 1 for identification and location of parts.
(2) The bucket (PT-9) should be in the closed position before attempting to work on the mechanism.
(3) Relieve tension on the main spring (PT-15) by removing the nut from the eyebolt (PT-18). Then remove the disc (PT-17) and eyebolt.
(4) Rotate the bucket (PT-9) half way into the body of the sampler and remove the two screws in the strap (PT-14) and remove the strap.

(5) Rotate the assembly of plates (PT-11 and 13) and gasket (PT-12) into the body of the sampler. Due to the tight fit of the gasket in the bucket (PT-9), the bucket probably will rotate further into the sampler.
(6) The assembly of plates (PT-11 and 13), gasket (PT-12) and yoke (PT-10) may then be drawn out of the bucket.
(7) The main spring (PT-15) now may be unhooked from the cable (PT-16) and the spring removed.
(8) The 3/16" roll pin should be driven out of the shafts (PT-6 and 8) with a drift punch.
(9) Press the main shaft (PT-6) out of the sampler.
(10) Then remove the bucket (PT-9) from the sampler.
(11) Study the plans and see how the cable (PT-16) is threaded through the two holes in the bucket shaft. The cable is held in place by two 8-32 NC socket head set screws, which may be loosened with a 5/64-in. socket screw key. If a cable end is to be moved, loosen the set screw on that end of the shaft, adjust or remove the cable and tighten the set screw again when the cable is replaced. These set screws are in a blind position but are not difficult to handle if one knows where they are and what kind of wrench to use.

17. To remove the catch and hanger--After the bucket (PT-9) has been removed, the catch (PT-24) and hanger (PT-21) may be removed as follows:

(1) Remove the two screws (PT-22) using a 5/16-in. socket scre screw key. These screws are accessible from the top of the sampler.
(2) After the screws are removed, the catch assembly (PT-23, 24 and 26) can be taken out through the bottom of the sampler body.
(3) After the catch assembly has been removed, the hanger (PT-21) and recoil spring (PT-20) may be removed through the cavity in the bottom of the sampler.
(4) The shoulder on the hanger (PT-21) may be adjusted after loosening the set screw in the edge of the shoulder using a 5/64-in. socket screw key.

18. To replace the hanger and catch--The hanger and catch may be replaced in the sampler as follows:

(1) If the shoulder has been removed screw the shoulder onto the hanger (PT-21) as shown in the assembly drawing on Figure 1, and lock with the set screw.

(2) Place the recoil spring (PT-20) on the hanger.
(3) Insert the hanger and spring through the bottom of the sampler and into the main bushing (PT-19) as shown in Figure 1 .
(4) Before replacing the catch assembly, make certain that the bar, catch and catch spring (PT-23, 24 and 26) are assembled correctly as shown on Figure 1 .
(5) Insert the catch assembly through the bottom of the sampler with the catch spring (PT-26) toward the front of the sampler.
(6) The catch assembly will hold the hanger assembly in place.
(7) While holding the catch assembly in place, insert screws (PT-22) through the top of the sampler and screw them securely into the bar (PT-23).

19. To replace the bucket--After the hanger and catch are installed as discussed above, the bucket may be replaced as follows:

(1) Insert the bucket (PT-9) into the cavity in the bottom of the sampler as shown in Figure 1 , being certain that the cable (PT-16) is correctly in place, as shown in the assembly drawing, and that it has been securely fastened with the two set screws.
(2) While holding the bucket (PT-9) in place, insert the main shaft (PT-6) through the side of the sampler into the bearing (PT-7) and into the bucket shaft (PT-8).
(3) Align the roll pin hole in the main shaft (PT-6) with that in the bucket shaft (PT-8) and insert the roll pin.
(4) Replace the disc (PT-17) on the eye bolt (PT-18) and hold it there loosely by screwing the nut onto the eyebolt only 3 or 4 threads.
(5) Hook the eyebolt (PT-18) to one end of the main spring (PT-15).
(6) Insert the main spring (PT-15) into the body of the sampler through the hole in the nose and hook the end of the spring over the cable (PT-16).
(7) Replace the base plate assembly, including base plate (PT-11), gasket (PT-12), cover plate (PT-13) and yoke (PT-10) by thrusting it at an angle into the partly open bucket, in such a way that the two yokes fit the bucket shaft. Then rotate the plate assembly so that it comes to rest flush with the bottom of the sampler.
(8) Replace the strap (PT-14) and secure the strap and base plate assembly to the bottom of the sampler with the two screws.
(9) Adjust the spring tension on the bucket (PT-9) by tightening the nut on the eyebolt (PT-18).

VI. ADJUSTMENT AND REPAIR

20. Adjustment of the main spring--The main spring (PT-15) drives the bucket to scoop a sample of material from the bed. Tension on this spring should be adjusted according to the type of bed material to be sampled. Less tension on the spring is required to sample a soft bed material than to sample a firm material. The nut on the eyebolt (PT-18) is tightened to increase the tension on the spring and increases the force with which the bucket (PT-9) closes. Unnecessarily great tension is undesirable and hard on gaskets; too little tension may permit failure of the sampler to close. The long threads on the eyebolt are simply to aid in mounting the main spring.

21. Adjustment of the tripping mechanism--The catch (PT-24) is a trigger type arrangement used to hold the bucket (PT-9) in the open position. The sample is taken when the catch is tripped. The end of the catch must make good contact with the notch on the bucket to hold the bucket open and prevent it from closing accidentally. The catch spring (PT-26) forces the catch into the notch on the bucket.

The bucket will not stay in the open position unless the sampler is suspended by the hanger (PT-21). When so suspended, the recoil spring (PT-20) is compressed so that the bottom of the hanger (PT-21) does not press against the catch (PT-24) sufficiently to trip the bucket. When the sampler is not supported by the hanger (PT-21) the recoil spring expands to press the bottom of the hanger against the catch, thus tripping the bucket.

Adjustment of the tripping mechanism is accomplished by turning the threaded collar either nearer to or farther from the bottom end of the hanger (PT-21). A set screw is provided to hold the collar in position once the adjustment is made. If the bottom end of the hanger projects too far beyond the collar, it will continue to press against the catch bar (PT-24) even when the sampler is supported by the suspension cable and the sampler cannot be cocked. If the distance between the bottom of the hanger and collar is too small the recoil spring will not press the end of the hanger against the catch bar, to trip the mechanism when the sampler is not supported by the suspension cable. The proper adjustment lies between the two extremes. The sampler trips with a tension of about 45# on the hanger. Adjustment of the tripping mechanism is controlled by many factors of fit of the catch, clearance, etc. This adjustment requires almost complete disassembly of the sampler, but it is not anticipated that the adjustment will need to be changed once it is established.

22. Testing operation of sampler--The sampler may be studied by suspending it from a boom or crane. It should be lifted by the suspension cable, cocked, and then lowered onto a bed of loose sand. When no bed of sand is available, care should be used to confine dry run tripping of the sampler to the minimum necessary for testing and study. Such operation is very hard on gaskets. Extra padding should be inserted over the impact point when testing. For dry run testing the sampler may be lowered so that the ends of the sampler come to rest on wooden 4"x 4", blocks, or other supports in such manner that the bucket is free to close. The bucket will trip if lowered to a flat floor, but will not close. The tripping alone may be tested on a flat floor if a mat is used to protect both floor and sampler.

VII. PROCEDURE FOR TAKING A SAMPLE

23. General comments on sampling--A single bed-material sample may be taken at a point selected as representative of the stream bed. More information on bed material at a section may be obtained by taking three or more samples across the channel. Samples may be taken at several cross sections depending upon the scope of the investigation. The samples may be analyzed individually for particle size distribution or may be combined before analysis depending on the type of information desired.

24. To take a bed-material sample--It is best to study the plans for the US D-54 sampler and understand its operating principles before attempting to take a sample. The sampler should be suspended on a crane by means of a cable attached to the hanger. When suspended, the sampler can be cocked by inserting a 7/32-in. socket screw key into the end of the main shaft and rotating the bucket back into the body of the sampler until the catch is engaged to hold the bucket in the sampling position.

The sampler is cocked just prior to taking a sample, or will have been cocked from dumping out the previous sample. The sampler is lowered to the stream bed to take a sample. When the cocked sampler comes to rest on the stream bed (or other support) tension on the cable is relieved, tripping the catch so that the main spring closes the bucket to take a sample. When lowering the sampler, be sure that its weight is allowed to rest on the bed for a moment, because simply feeling the bottom with most of the sampler weight on the suspension line will not release the bucket. After the sampler has come to rest on the stream bed, it is brought up and the sample is transferred from the bucket into a container held under the instrument.

25. To transfer a sample to a container--When a sample has been obtained it may be removed from the bucket as follows:

(1) Set the sampler on the support described in Section 10, on two 4" x 4" blocks of wood, or on some similar convenient support.

(2) Place a shallow pan or tray under the sampler to receive the sample as it falls from the bucket.
(3) Open the bucket by inserting the 7/32-in. socket screw key into the end of the main shaft and draw the bucket back so that the sample falls out or may be scraped out. A rubber kitchen scraper is useful in removing the sample.
(4) The sample then is transferred from the pan to a carton for shipment to the laboratory for particle size analysis.

26. Information to be recorded--All pertinent information must be recorded for every sample. The carton containing the sample may be numbered or otherwise identified and the information recorded in a notebook. A duplicating field book may be used to record pertinent information, including the sample identification number. The original copy of the field book record is sent to the laboratory with the sample while the duplicate is retained in the field book. Complete records must be made in such a way that there will be the least possible chance of the information being lost or of the samples being mixed up. The following information should be recorded:

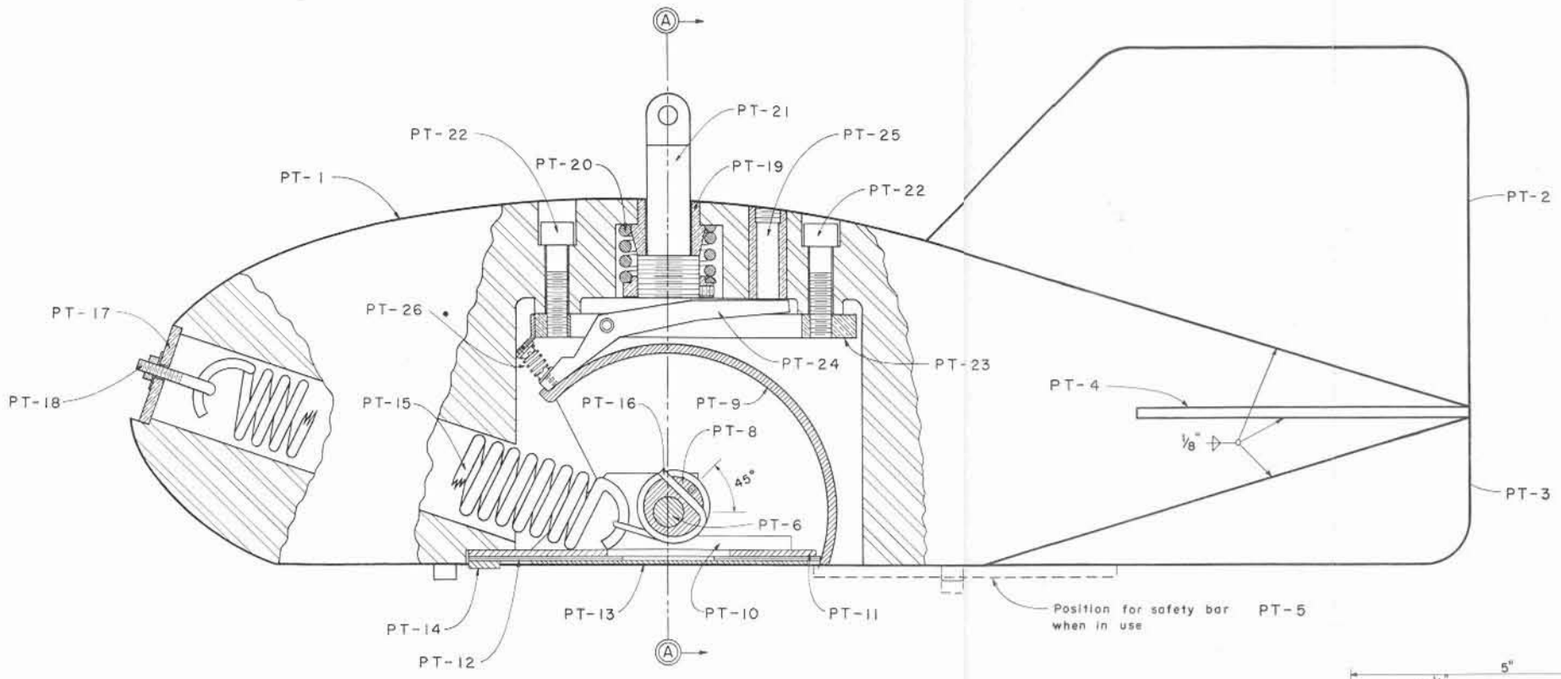
Name of the stream.
Location on the stream (precise).
Location across the width of the stream.
Depth at which the sample was taken.
Stage of the stream (gage height on a permanent gage if available).
Water temperature.
Remarks pertinent to river conditions observed.
Date.
Party taking the sample.
Number of the individual sample.

27. Tools and extra parts--The following tools are furnished with the sampler:

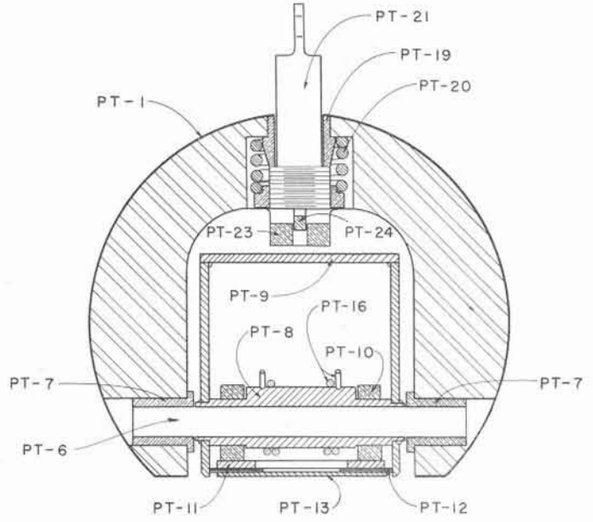
One 5/16-inch socket screw key.
Two 7/32-inch socket screw keys.
One 3/16-inch socket screw key.
One 5/64-inch socket screw key.

The following extra parts are furnished:

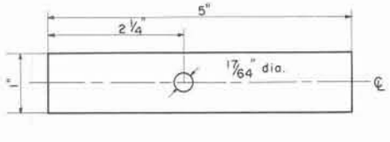
One eyebolt (PT-18).
Two 3/16-inch roll pins 1 inch long.
One set of plans.
One safety bar (PT-5).



ASSEMBLY



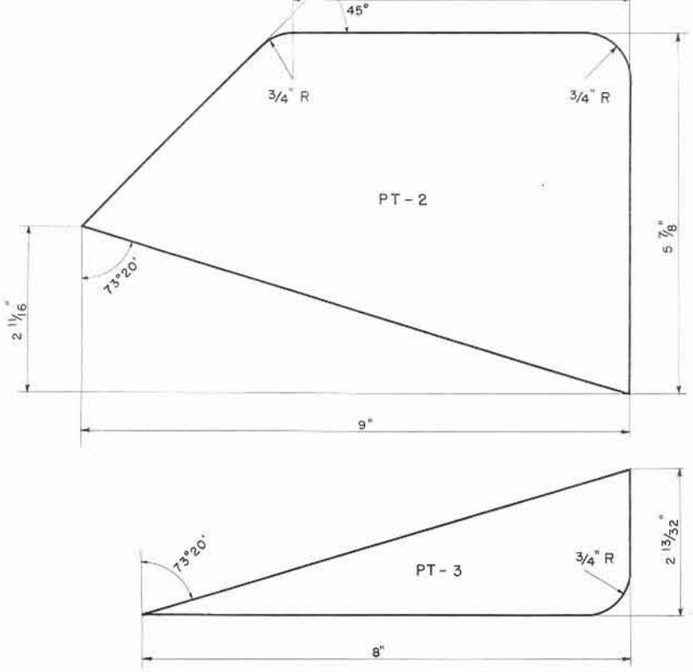
SECTION A-A



SAFETY BAR

PT-5

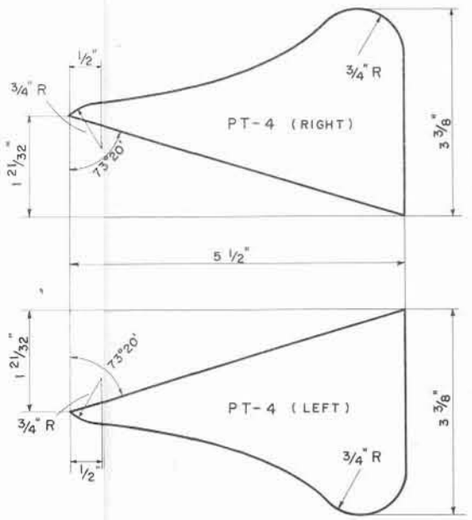
MAKE 2 3/16" BRASS



VERTICAL TAIL FINS

PTS. 2-3

MAKE 1 EACH 3/16" STEEL



HORIZONTAL TAIL FINS

PT-4

MAKE 2 3/16" STEEL

BILL OF MATERIAL FOR ONE SAMPLER

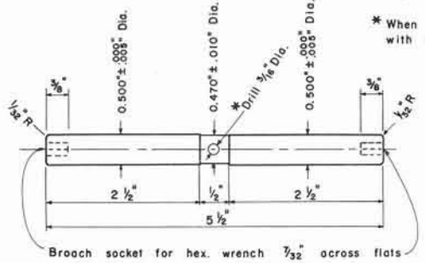
Part No.	Name	Material	Quantity	Remarks
1	Body	Cast steel	1	Finish by grinding
2	Vert. tail fin	3/16" Structural steel	1	Top fin
3	Vert. tail fin	3/16" Structural steel	1	Bottom fin
4	Horiz. tail fin	3/16" Structural steel	2	Horizontal fins
5	Safety bar	Brass	2	
6	Main shaft	Stainless steel	1	With hex. wrench sockets
7	Bearing	Bronze	2	
8	Bucket shaft	Stainless steel	1	W/2 s. steel set screws
9	Bucket	Stainless steel	1	1/8" s. steel plate
10	Yoke	Bronze	2	
11	Base plate	Stainless steel	1	1/8" s. steel plate
12	Gasket	Rubber	1	1/16"
13	Cover plate	Stainless steel	1	1/16" s. steel plate
14	Strap	Stainless steel	1	1/8" s. steel plate
15	Main spring	Spring grade steel	1	Plated tension spring
16	Cable	Stainless steel	1	1/10" dia. 15" long
17	Disc	Brass	1	
18	Eyebolt	Stainless steel	1	Or chrome plated steel
19	Main bushing	Bronze	1	
20	Recoil spring	Spring grade steel	1	Plated spring
21	Hanger	Stainless steel	1	With collar & set screw
22	Screw	Stainless steel	2	Socket head screw
23	Bar	Brass	1	3/8" X 1" X 5 1/4"
24	Catch	Stainless steel	1	W/3/16" dia. s.s. roll pin
25	Small bushing	Bronze	1	Threaded
26	Catch spring	Stainless steel	1	

FEDERAL INTER-AGENCY SEDIMENTATION PROJECT

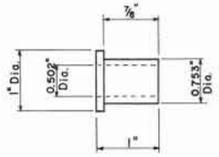
US BM-54
BED MATERIAL SAMPLER
ASSEMBLY & PARTS LIST

MARCH 1956 FIG. 1

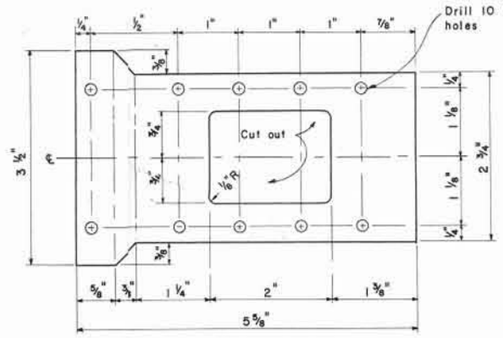
Z 6-6-21



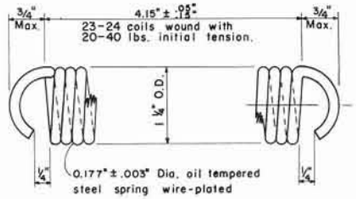
MAIN SHAFT
PT-6
MAKE 1 S. STEEL



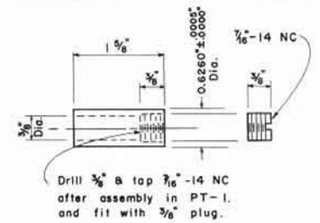
BEARING
PT-7
2 REQUIRED BOST-BRONZE* OR EQUAL
*BOSTON GEAR WORKS



BASE PLATE
PT-11
MAKE 1 1/8" S. STEEL

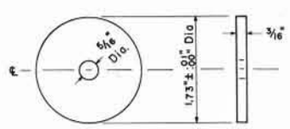


MAIN SPRING
PT-15
MAKE 1 SPRING STEEL

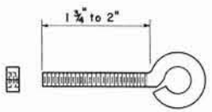


SMALL BUSHING
PT-25
MAKE 1 BRONZE

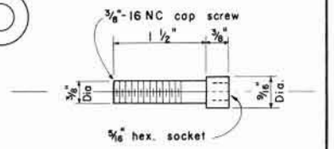
CABLE
PT-16
NOT SHOWN-S.STEEL
1 REQUIRED 1/10" DIA. 15" LONG



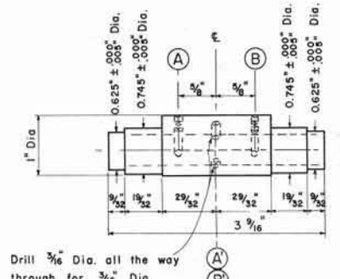
DISC
PT-17
MAKE 1 BRASS

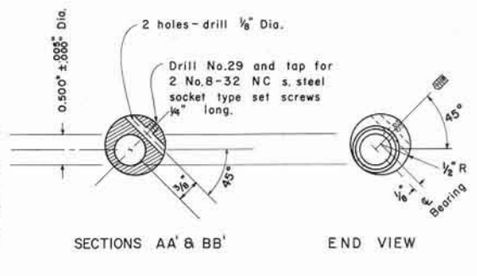


EYE BOLT
PT-18
MAKE 1 STEEL

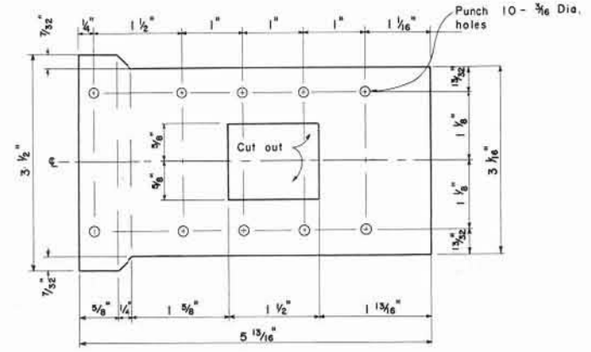


SCREW
PT-22
2 REQUIRED S.STEEL

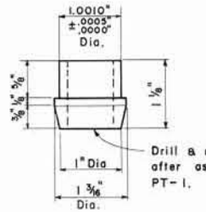




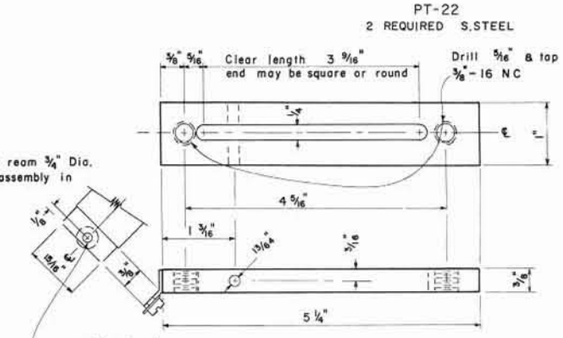
BUCKET SHAFT
PT-8
MAKE 1 S.STEEL



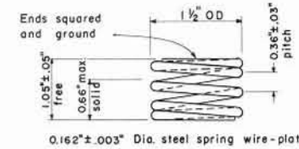
GASKET
PT-12
MAKE 1 1/16" RUBBER



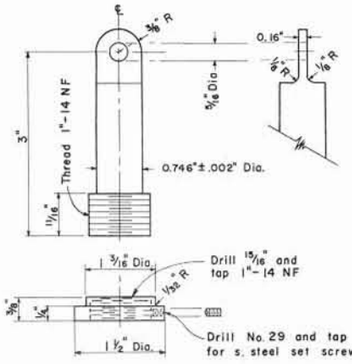
MAIN BUSHING
PT-19
MAKE 1 BRONZE



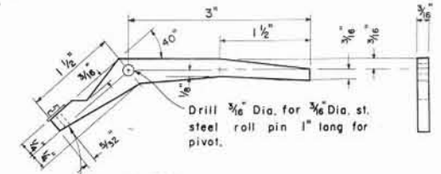
BAR
PT-23
MAKE 1 BRASS



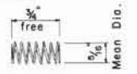
RECOIL SPRING
PT-20
MAKE 1 SPRING STEEL



HANGER
PT-21
MAKE 1 S. STEEL

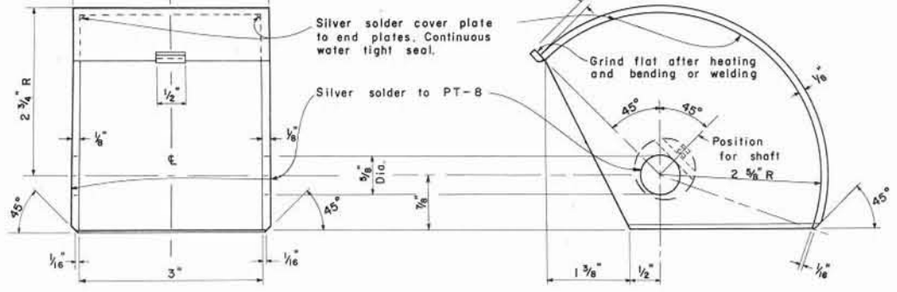


CATCH
PT-24
MAKE 1 3/16" S. STEEL

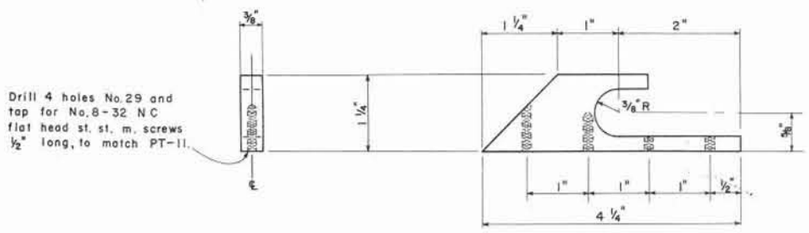


0.028" Dia. s. steel 18-8 wire
0.085" pitch, ends squared & ground
6 active coils.

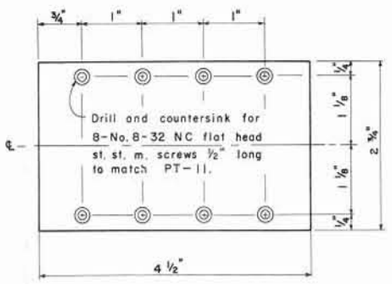
CATCH SPRING
PT-26
MAKE 1 STAINLESS STEEL



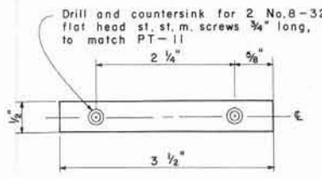
BUCKET
PT-9
MAKE 1 1/8" S. STEEL



YOKE
PT-10
MAKE 2 BRONZE



COVER
PT-13
MAKE 1 1/16" S. STEEL



STRAP
PT-14
MAKE 1 1/8" S. STEEL

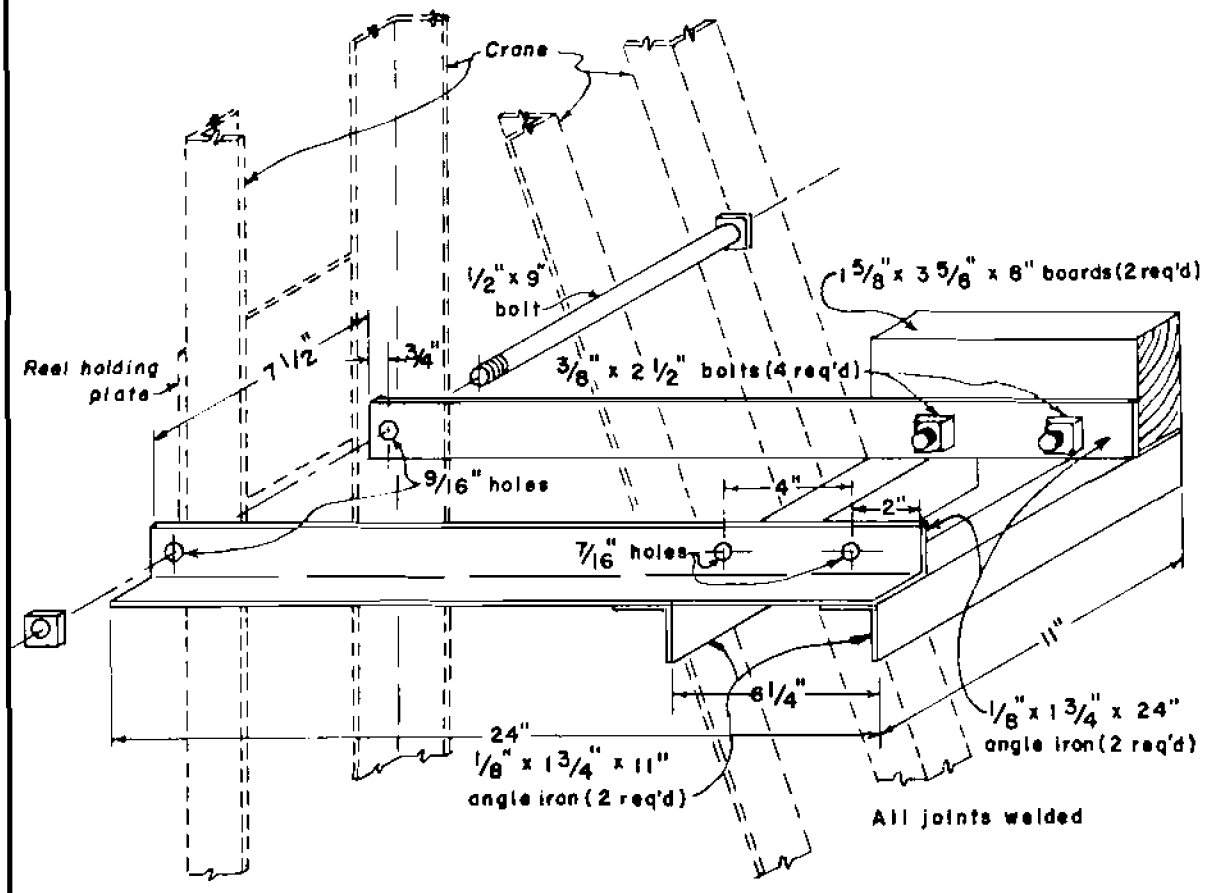
FEDERAL INTER-AGENCY SEDIMENTATION PROJECT

US BM-54 BED MATERIAL SAMPLER

DETAIL OF PARTS

MARCH 1956 FIG. 2

Z6-6-23



FEDERAL INTER-AGENCY SEDIMENTATION PROJECT

US BM-54

BED-MATERIAL SAMPLER

SUPPORT FOR SAMPLER

OCTOBER 1958 FIG. 3

Communications Regarding Reports

Should be Addressed to:

Federal Interagency Sedimentation Project
3909 Halls Ferry Road
Vicksburg, MS 39180