

found by multiplying the net weight on the brake-arm in pounds by the circumference of the corresponding circle in feet and by the number of revolutions per minute, and dividing the final product by 33,000.

In the case of a wheel supplied through a penstock the head is found by adding together the pressure at the intake to the wheel case, the velocity head at this point, and the elevation of the point above the surface of the tail water, all expressed in feet.

In an impulse wheel, the head is the sum of the pressure at the nozzle, in feet and the velocity head at that point in feet.

**Data and Results.**—The data and results should be reported in accordance with the form given herewith (Table 21), adding lines for data not provided for or omitting those not required, as may conform with the object in view:—

**Table 21.—Data and Results of Waterwheel Test  
Adapted to Brake Measurement of Power.**

**Code of 1915.**

- (1) Test of.....water wheel located at.....  
To determine.....
- (2) Test conducted by.....
- (3) Type of wheel and class of service.....lb.
- (4) Type of generator, if any, kind of current, etc.....h.p.
- (5) Rated power of wheel.....
- (6) Cross-section of stream where velocity of water is measured.....sq. ft.

**GENERAL DATA.**

- (6) Date.....hr.
- (7) Duration of period covered by test.....lb.
- (8) Average net weight on brake arm.....r.p.m.
- (9) Average revolutions per minute.....ft.
- (10) Total average head of water on wheel.....
- (11) Average velocity of water per second in measuring canal.....cu. ft.
- (12) Volume of water flowing per second.....lb.
- (13) Weight of water flowing per second (Item 12 × 62.35).....lb.
- (14) Leakage per second.....
- (15) Net water discharged by wheel per second (Item 13 — Item 14).....lb.

**POWER.**

- (16) Total power of water available.....h.p.
- (17) Brake horsepower developed by wheel.....br. h.p.

**EFFICIENCY.**

- (18) Efficiency of wheel, (Item 17 ÷ Item 16) × 100...per cent.

**Rules for Conducting Tests of Steam Turbines and Turbo-Generators.**

**Introduction.**—The code for steam turbine tests applies to tests for determining the performance of the turbine alone, apart from that of steam-driven auxiliaries which are necessary to its operation. For tests of turbine and auxiliaries combined, and tests of turbines from which steam is withdrawn for heating feed water or other purposes, refer to the Code for Complete Steam Power Plants, Part IX. For methods of conducting tests of generators, motors, etc., and for general information bearing on the subject, reference may be made to the Standardization Rules of the A.I.E.E.

**Object and Preparations.**—Determine the object of the test, take the dimensions and note the physical conditions not only of the turbine, but of the entire plant concerned, examine for leakages, install the testing appliances, etc., as pointed out in the general instructions given in \* ¶ 1 to 33 and prepare for the best accordingly

(as given in the pamphlet report covering this subject).

**Apparatus and Instruments.**—The apparatus and instruments required for a performance test of a steam turbine or turbo-generator are:—

- (a) Tanks and platform scales for weighing water, (or water meters calibrated in place).
- (b) Graduated scales attached to the water glasses of the boilers.
- (c) Pressure gages, vacuum gages, and thermometers.
- (d) Steam calorimeter.
- (e) Barometer.
- (f) Tachometer, revolution-counter, or other speed-measuring apparatus.
- (g) Friction brake or dynamometer.
- (h) Volt meters, ammeters, wattmeters, and watt-hour meters for the electrical measurements in the case of a turbo-generator.

\*Directions regarding the use and calibration of these particular appliances are given in ¶ 7 to 9, and in ¶ 24 to 33.

The determination of the heat and steam consumption of a turbine or turbo-generator should conform to the same methods as those described in the Steam Engine Code, Part V.

If the steam consumption is determined from the water discharged by the wet vacuum or hot-well pump, correction should be made for water drawn in through the packing glands of the turbine shaft, for condenser leakage, and for any other foreign supply of water.

**Operating Conditions.**

**Duration.**

**Starting and Stopping.**

**Records.**

**Calculation of Results.**

The rules pertaining to the subjects, Operating Conditions, Duration, Starting and Stopping, Records, and Calculation of Results, are identically the same as those given under the respective headings in the Steam Engine Code, ¶ 71 to 77, with the single exception of the matter relating to indicator diagrams and results computed therefrom; and reference may be made to that code for the directions required in these particulars.

**Data and Results.**—The data and results should be reported in accordance with the form (Table 11) given herewith, adding lines for data not provided for, or omitting those not required, as may conform to the object in view. If a shorter form of report is desired, the items in fine print designated by letters of the alphabet, may be omitted; or if only the principal data and results are desired, the subjoined abbreviated table (Table 12) may be used. Unless otherwise indicated, the items should be the averages of the data.

**Table 11.—Data and Results of Steam Turbine or Turbo-Generator Test.**

**Code of 1915.**

- (1) Test of.....turbine located at.....  
To determine.....  
Test conducted by.....

**DIMENSIONS, ETC.**

- (2) Type of turbine (impulse, reaction, or combination)....
  - (a) Number of stages.....
  - (b) Condensing or non-condensing.....
  - (c) Diameter of rotors.....
  - (d) Number and type of nozzles.....
  - (e) Area of nozzles.....
  - (f) Type of governor.....
- (3) Class of service (electric, pumping, compressor, etc.)...