11.09

product manual

H-2795

Roll-a-Meter

Directions


ROLL-A-METER KIT
Kit Includes: Roll-A-Meter, Metal Straight Edge, Baffle Bottom Funnel, Syringe, Metal Agitator and Hard Wood Case.
1
Fill the base with a sample of fresh concrete, placing it in the base by vibrating or tamping or in much the same manner as the concrete is to be placed on the job. Strike off the base, level full with the straight edge furnished. Wipe top edge clean.
2
Clamp top on, slowly fill meter with water using baffle bottom funnel so sample will not be disturbed and air released.
3
When water is up into the glass on meter neck, remove funnel and add water up to top, zero mark. Put on top cap.
4
Invert meter and agitate until concrete settles free from the base.
5
With neck elevated, rock and roll meter until air rises to the top (up to five (5) minutes.)
6
Set meter upright and lightly jar until air has fully risen. Meter may be reagitated as a check on the result.
7
Read percent of air on glass. If necessary, foam may be precipitated by adding 23 mL of IsoPropyl alcohol with measuring cup provided.

The Solution
The accuracy of Roll-a-Meter results is not dependent on the correctness of all these factors, but gives directly the percent air in the sample. It is unnecessary to know anything about the weight or physical characteristics of the ingredients which are supposed to be in the mix.

In contrast to other methods commonly used to determine the percentage of entrained air, this method is unaffected by changes in water cement ratio, sand cement ratio, sand to gravel ratios, inaccuracies of specific gravity determinations, and uncertainties as to absorbed or free water content of the aggregates used in the mix.

The use of the Roll-a-Meter has eliminated practically all of the above listed work, together with the arduous computations and uncertainties Involved. Even the extremely accurate measurement of the sample to be tested is not as important with this new meter, as the resulting error would be only about 1/20 as great in using the meter as the same error would be when using other methods or meters. Only a small percentage of the original error is involved in the air-meter result.

Used as a pycnometer, the Roll-a-Meter has been found to be excellent for other tests, such as determination of specific gravities of cement, sand, gravel and admixtures, and for quickly obtaining the percentage of free water in damp sand and gravel.

Practical Control of Entrained Air
Held within well-established limits, air entrainment is highly beneficial In many ways. With ordinary highway or building construction using 1-1/2" to 2" maximum aggregate, a maximum of about 4% air is usually desirable. Consequently, it is fundamentally important that an accurate method of determining the percentage of air be available. Having this, the amount of air entraining agent to be used, under any of the infinitely variable mix combinations and placing conditions can be quickly determined and effectively controlled.

Why the unit weight or gravimetric method is unsatisfactory
The unit weight method of determining the volume of entrained air is tedious and often impractical and unreliable. It involves technical manipulations and computations, which can readily lead to serious errors.

General information
The accuracy of the unit weight method is dependent on extreme accuracy of several Coronary technical determinations. Among these are:

- specific gravity of cement.
- specific gravity of sand and graver.
- absorption of sand and gravel.
- average free moisture in sand and gravel.

- there must also be accurate batching and accurate recording of all ingredients (including water) in the batch.
- thorough mixing of all ingredients.
- accurate measurement of the sample taken for an entrained air test

How reliable is the unit weight method? It is possible for two well-qualified laboratory technicians to run parallel tests on all the above details and to come out with results differing materially in apparent entrained air. Here is some convenient information in regard to the extreme accuracy required in determination of percent of air by other methods. Slightly incorrect factors may make errors as great or greater than listed below:

An error of:	in	Material=	% Air Error
.03	Specific Gravity	Sand	.3%
.03	Specific Gravity	Gravel	.7%
.1	Specific Gravity	Cement	.6%
2%	Free Water	Sand	.5%
1%	Free Water	Gravel	.5%
1%	Absorption	Sand & Gravel	.7%

Cement brands may differ .10 to .15 in specific gravity, or using kerosene instead of water for obtaining specific gravity of cement may cause .6%. A sample taken from a poorly mixed batch may weigh as much as 3 lbs. per cubic foot more or less than average. This would lead to an error of 2% or so in apparent air entrainment. Thus, accuracy by other meters or methods are dependent on:

- highly refined accuracy in determining all of the factors listed above;
- on getting truly average representative samples of all materials used for making the above determinations;
- on getting all materials uniformly mixed;
- on getting a sample for air content test, which has all the ingredients contained in the main batch, in practically the same proportions as the main batch.

Satisfactory accuracy of all of these operations is very difficult to obtain in the field.

Specifications

Total weight. Including accessories and carton:	22lbs.
Height:	22 Inches
Outside diameter at center:	8 Inches
Volume of base:	130 Cu. In.

Important
Care should be taken to have approximately the same proportions of mortar and course aggregate as are used in the mix. Larger than 2-inch aggregate should be discarded and air determinations made on the balance. After proper agitation, the air, accompanied by some foam, rises to the top. This should be allowed to stand, with occasional light agitation until the bubbles practically cease rising. This may take 3 to 5 minutes, although an immediate reading will tell whether there is any material excess or deficiency of air. Following this, far closer results if desired, two general steps are possible:

Method A
The foam may be dispelled by adding 23ml. of IsoPropyl alcohol (rubbing alcohol) in a special brass cup provided with each meter. This 23ml. is sufficient to reduce the air reading 1% (decreased air due to the added alcohol) will be the correct percentage of the air in the test batch.

Method B
Numerous tests made by Method A indicate that usually the true reading should be 85 to 90 percent of the primary reading before defoaming. This is often sufficiently accurate for routine control purposes, but may be confirmed or modified by a few (A) tests. The water, the kind of air entraining agent used, as well as the brand of cement and the type of sand, gravel or admixture, may alter the above factor.

Value of Entrainment
This is probably the greatest new development in concrete in this generation. Tests indicate that correctly controlled air entrainment will increase the durability of concrete under severe exposure several hundred percent. The careful control of the air to about 4% of the volume is considered ideal for average 1-1/2" to 2" maximum concrete. Beyond this point the concrete strength is rapidly reduced. Air entrainment increases the placability of concrete, and aids in preventing segregation. When air is entrained, the water may be reduced, which aids in keeping the strength high.

With air entrainment, coarser sand my be used or less of the regular sand, which again helps to lower the water and maintain high strengths. Sand may be increased in coarseness from .3 to .5 above normal fineness. Modulus when proper air entrainment is used. Tests indicate that the troubles caused by premature stiffening of cement may be materially decreased by the use of the ideal amount of air. Resistance to the deleterious action of sulphate waters may be increased with air entrainment. Many contractors are voluntarily using air entraining agent because of the great improvement in placability, prevention of bleeding, and reduction in segregation accompanying its use, even where the extra durability is not required.

Where is air entrainment desirable?
Any job where the concrete is to be exposed to weathering will benefit by the use of an air entraining agent. To avoid loss in strength due to too much air, which may be serious if over 5 or 6 percent, frequent routine tests of entrained air will

be invaluable. No change of mix can be made without a resulting change in the percentage of air entrained with the same amount of air entraining agent being used.
A prompt air meter measurement whenever a change occurs in temperature, slump, time of mixing, richness of mix, or proportion of sand to gravel, will usually reveal a corresponding change in

Use of roll-a-meter for specific gravity tests
To correctly Design mixes on technically controlled concrete work, accurate specific gravity determinations are required. Using the Roll-a-Meter as a pycnometer is one of the most convenient, accurate, and rapid methods of testing for specific gravity (hereinafter referred to as S.G.).

Its use is based on the principle that any material immersed in a vessel full of water will displace exactly its absolute volume of water (solid volume). S.G. is the ratio of the weight of a unit volume of water to the same volume weight of the material being tested. Displacing the water by a known weight of any material and finding the loss in weight of the water displaced, compared to the weight of the material immersed, gives the S.G.

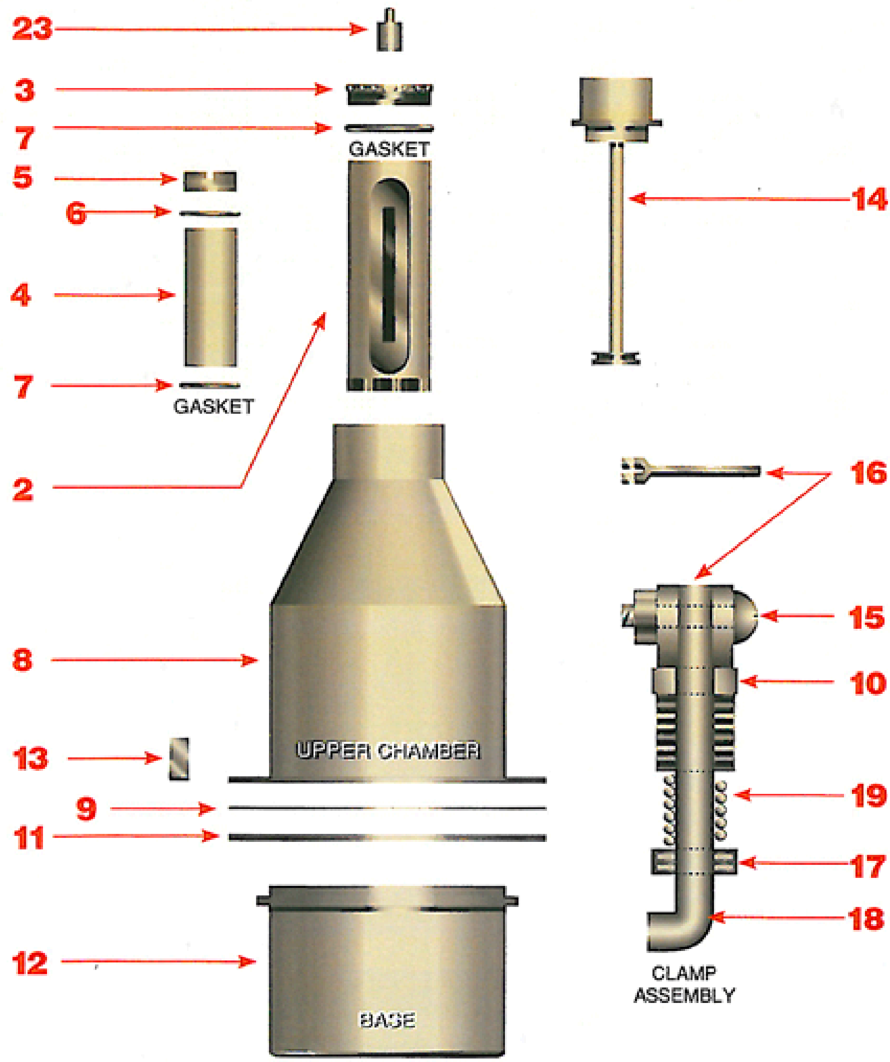
In practice, three accurate gross weights are needed: the weight of the Roll-a-Meter full of water (P), a known weight of gravel (B), and the weight of the Roll-a-Meter refilled with water after gravel is added (Ps). The water displaced is shown by the difference in the combined weight (Ps) from the sum of the weights (P) and (B). Thus, if tile weight of water displaced is one-half of the weight of gravel added, then the gravel must be twice as heavy for the same volume as water. As the S.G. of water is 1.00, then the S.G. of the gravel must be 2.00. As the weight (P) is constant, the only weights necessary to be obtained for the S.G. determination are weights (B) and (Ps). As the weight (P) is constant, the only weights necessary to be obtained for the S.G. determination are weights (B) and (Ps). The mathematics involved are very simple:

$$\frac{(B)}{(P) + (B) - (Ps)} = \text{Specific Gravity (S.G.)}$$

Use a scale or balance with sensitivity of 114 ounce or less for weighing sand or gravel. On fine materials such as cement, sensitivity should be .01 lb. or less. Use about 10 Ibs. of sand or gravel and about 5 Ibs. of cement for a test. The usual rolling of the Roll-a-Meter, to get all air released before final refilling and weighing, will give very reliable accuracy. (The use of water instead of kerosene for the determination of the S.G. of cement is more accurate for this purpose.)
The following example will illustrate the method:

(P)	Weight of meter full of water (only)	30 1bs.
(B)	Weight of sample of sand, gravel, or other material	10 Ibs .
(Ps)	Weight of meter refilled with water (all air out) with sample of gravel.	37 Ibs. (10 Ibs. immersed)

$$\frac{10}{30+ 10 - 37} = \text{Specific Gravity (S.G.)}$$



2.	Graduated Tube	16.	Toggle Lever
3.	Brass Cup	17.	Spring Retainer
4.	Gauge Tube	18.	Jay Bolt
5.	Glass Clamp Ring	19.	Jay Bolt Spring
6.	Top Glass Gaskets	23.	Brass Plug for Cap
7.	Bottom Glass Gaskets	28.	Clamp Assembly (15-19)
8.	Upper Chamber	**NOT Shown**	
9.	Chamber Gasket	**20.**	**Brass Measuring Cup**
10.	Adjusting Nuts	**21.**	**Strike-off Bar**
11.	Brass Gasket Ring, Chamber	**22.**	**Spanner Wrench**
12.	Base (Brass)	**24.**	**Tamping Rod**
13.	Guide Pin	**25.**	**Syringe**
14.	Baffle Funnel Assemby	**26.**	**Carrying Case**
15.	Toggle Pin	**27.**	**Gasket Kit Complete**

Warranty

Humboldt Mfg. Co. warrants its products to be free from defects in material or workmanship. The exclusive remedy for this warranty is Humboldt Mfg. Co., factory replacement of any part or parts of such product, for the warranty of this product please refer to Humboldt Mfg. Co. catalog on Terms and Conditions of Sale. The purchaser is responsible for the transportation charges. Humboldt Mfg. Co. shall not be responsible under this warranty if the goods have been improperly maintained, installed, operated or the goods have been altered or modified so as to adversely affect the operation, use performance or durability or so as to change their intended use. The Humboldt Mfg. Co. liability under the warranty contained in this clause is limited to the repair or replacement of defective goods and making good, defective workmanship.

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