

The Type Founders' Point In Too Many Decimals

Dr. David M. MacMillan

This is an exercise in useless precision. But I did very poorly in math in school, so I find that it helps me to work things out very slowly just so I can know what does and what does not matter. Here I'll work to 12 decimal places (regardless of unit system), which is an unreal precision.¹

Typefounders' Association Point of 1886 in Millimeters

In 1886, the Type Founders' Association defined the pica, the base unit of the American Printers' Point system, as 83 picas per 35 centimeters. (Rather miraculously, this standard was adopted in practice.) In actuality, this was simply a measurement of the house pica standard of the MacKellar, Smiths and Jordan Type Foundry (a standard with a long history, which is not relevant here). They had to express it in metric units as there was not then (and isn't now) any actual legal definition of the inch.

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35 cm / 83 picas =  
350 mm / 83 picas =  
350 mm / 996 points =  
0.351,405,622,489,... mm/point
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The Inch in Millimeters, 1866 - 1893 - 1959

In 1866 the US Congress adopted an Act which made the metric system legal for trade in the US (no such Act has ever been adopted for the inch). It happened to contain data which provided a conversion between yards and meters (but did not actually create a legal definition of the yard (or inch)). This conversion,

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1 yard = 3600/3937 meter,
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was used informally until 1893. In that year, the director of the U.S. Coast and Geodetic Survey, Thomas C. Mendenhall, issued an order² for his department to use this 1866 conversion value. This didn't establish a legal definition of the inch either (it remains undefined), but since everyone using inches needed it, it became a *de facto* standard, and remained so until 1959. Thus:

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1 yard = 3600/3937 meter  
1 yard = 36/39.37 meter  
1 inch = (36/39.37)/36 meter  
1 inch = 1/39.37 meter  
1 inch = 1/39.37 * 1000 mm  
1 inch = 25.400,050,800,101,... mm
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1 The atomic radius of lead (Pb) is about 180 picometers. Admittedly, lead is a relatively large atom, but it is of special interest to typefounders. 180 picometers is 0.000,000,000,180 meters, or 0.000,000,18 mm, which is about 0.000,000,007,086,... inches. Antimony (Sb) and Tin (Sn) aren't much smaller, both at 145 picometers. In other words, by computing things out to twelve decimal places we're trying to define a printers' point to an accuracy smaller than an atom of typemetal.

2 The "Mendenhall Order," or more formally The U.S. Coast and Geodetic Survey *Bulletin No. 26 - Fundamental Standards of Length and Mass*.

The Type Founders' Association Point of 1886 in pre-1959 Inches

Converting the 1886 Type Founders' Association point to pre-1959 inches:

$$1 \text{ point} = (350 \text{ mm} / 996 \text{ points}) / 25.400,050,800,101, \dots \text{ mm/inch} = \\ \mathbf{0.013,834,839,357, \dots \text{ inches}}$$

The Inch in Millimeters Since 1959

Since the inch has never had a legal definition in the US, it's difficult to report on the changes of its definition. It would appear that in 1933 the American Standards Association in the US followed overseas practice and adopted a conversion of 1 inch = 25.4 mm exactly, but that was just the action of a private trade group. In 1959, the standards organizations of six countries (including the US, Britain, and Canada) agreed to an "international yard" of 0.9144 meters (which works out to 25.4 mm/inch, exactly). This still isn't actually a legal definition of the inch in the US, but it has become the *de facto* standard (for everyone except the U.S. Geological Survey, which had measured an awful lot of land using the old value.)

The difference in the old and new definitions (the inch got shorter) is:

$$(1 \text{ pre-1959 inch, in mm}) - (1 \text{ post-1959 inch, in mm}) = \\ (25.400,050,800,101, \dots) - (25.4) = \\ 0.000,050,800,101, \dots$$

This is about 51 millionths of a millimeter (or about 0.000,002 (two millionths) of an inch).

The Type Founders' Association Point of 1886 in post-1959 Inches

So today the 1886 Type Founders' Association point would be:

$$(350/996) / 25.4 = \mathbf{0.013,834,867,027, \dots \text{ inches}}$$

The Difference

The centimeter hasn't changed since 1799, so the Type Founders' Association point of 1886 hasn't changed, either. But the inch has changed, so the conversion of the point into inches has changed. The question then arises: for those working exclusively in inches (as essentially all American type Founders are): how much is this change and does it matter?

The difference between pre-1959 and post-1959 values for the 1886 Type Founders' Association American printers' point converted into inches is:

$$0.013,834,867,027, \dots \quad [\text{post-1959 value, in inches}] \\ - 0.013,834,839,357, \dots \quad [\text{pre-1959 value, in inches}] \\ = 0.000,000,027,669, \dots$$

This is about 28 billionths of an inch, or twice the diameter of an atom of lead. It doesn't matter.