



Odontology Section – 2008

F17 The ABFO No. 2 Scale — A 20 Year Retrospective Study: The History and Accuracy of the ABFO No. 2 Scale

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After attending this presentation, attendees will better understand the history, accuracy, and markings on the ABFO No. 2 scale.

This presentation will impact the forensic community by providing an increased understanding of the history, use and accuracy of the ABFO No. 2 scale.

Since 1987, the American Board of Forensic Odontology Number 2 scale (ABFO No. 2) has been the accepted standard for use in the field of forensic odontology as well as many other forensic disciplines. William G. Hyzer and Thomas C. Krauss, DDS developed the ABFO No. 2 scale in February 1987. The American Board of Forensic Odontology encouraged the development of a “standard photogrammetric reference scale” and officially accepted the scale February 18, 1987. In 1987, Lightning Powder Company agreed to manufacture the scale, and that same year the scale was commercially available.

The designation ABFO No. 2 stems from the fact that there was an ABFO Scale No. 1 scale that was developed by Dr. Ray Rawson, who was then President of the American Board of Forensic Odontology in the mid 1980's and presented the ABFO No. 1 scale to the board. After discussion of the board, several revisions were suggested and Dr. Tom Krauss was assigned the task to develop a revised scale.

The ABFO No. 2 scale is unique in its design. The incorporation of three circles is useful in recognizing and compensating for distortion resulting from oblique camera angles. Graduations are metric, the width of the legs are one inch wide for English reference. The centimeter division lines are longer for tracing over and extending across the photographic print for gridding purposes. Measurements within the image are then made relative to the inscribed 1cm grid lines to compensate for distortion resulting from non-parallelism between the film and object planes. The gray areas of the scale have a reflectance value of approximately eighteen percent. The inclusion of alternate bars of black and white makes it possible to salvage useful metric reference information from poorly exposed photographs in which the finer graduations cannot be resolved. The scale is constructed from three layers of 0.343mm laminated plastic with an overall thickness of 1.016 millimeters. The millimeter markings are accurate to 0.1mm on inner edges. The overall size of the scale is 105mm x 105mm.

Twelve ABFO No. 2 scales were obtained from Lightning Powder Company, a subsidiary of Armor Holdings. Additionally, twelve scales that are similar to the ABFO No. 2 scales were obtained from Evident Crime Scene Products. These scales were sent to the National Institute for Standards and Technology (NIST). NIST is a non-regulatory federal agency within the U.S. Commerce Department's technology Administration. Each scale was compared to the purported error rates that Hyzer and Krauss published in the *Journal of Forensic Sciences*, Vol. 33, No. 2, March 1988, pp. 498-506. The reported error rates were as follows: “overall accuracy of ± 0.1 mm or $\pm 1\%$ for the major centimeter graduations. The widths of the two legs are 1.000 ± 0.002 in., which translates into a percentage error of $\pm 0.2\%$. The legs are mutually perpendicular to ± 2 rain of arc. The internal and external diameters of the three circles are 19.75 and 23.0 mm, respectively. The error in placement of the three circles is within 0.25% of the nominal 80-mm separation between their centers.”

The results of these analyzes will be reported at the American Academy of Forensic Sciences 2008 annual meeting in Washington D.C. in the Odontology Section.

William G. Hyzer and Thomas C. Krauss, D.D.S. were men of remarkable foresight. Twenty years ago, they set out to create a “modestly priced standard reference scale providing the information needed to recover maximum information available from high-quality bite mark photographs.” The scale is now used by the FBI and police departments across the world in addition to forensic scientists from many disciplines. The scale has been seen in television shows such as CSI. However, a study of the accuracy as well as the production of the scale is important information for all who use it.

Forensic Odontology, ABFO No. 2, Accuracy