

## **The Dipstick®: Its Invention and How It Got Its Name**

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In the 1970s, The Face® Companies recognized the problems with the old “straightedge specs” and invented the Face Floor Profileograph. It was a lift truck simulator that measured the “defined traffic” floors of narrow aisle warehouses. This measurement system is now known in the concrete industry as F<sub>MIN</sub>.

In the 1980s, the focus was how to measure the flatness and levelness of “random traffic” floors using what would be called the Face Floor Profile Numbering System... or “F-Numbers” (F<sub>F</sub>/F<sub>L</sub>). F-Numbers were adopted as an American Concrete Institute Standard in 1990. The instrument developed to measure F-Numbers was quickly given the working name “Dipstick.” Company lore has it that Sam Face was checking the oil in a company car when his son Allen approached him with the idea of a handheld device that could measure floor flatness. They both looked at the oil dipstick still in Sam’s hand and exclaimed – Dipstick!

After the instrument’s invention, Sam’s younger son, Brad, suggested that the DIP in Dipstick should stand for **D**igital **I**ncremental **P**rofiler.

But members of the 1980s development team at Face say the name “Dipstick” grew out of the first design for the instrument. Two key members of that team were George Garber and Robert Costa, now partners with Face Consultants based in Lexington, KY. Both are recognized experts in concrete construction. George is the author of several books including “Design and Construction of Concrete Floors.” His articles appear regularly in industry journals.

The development of the Dipstick, they recall, resembled the development of the Profileograph. The first model of the Profileograph didn’t directly measure the floor profile. It measured the distance between a taut, level wire and the floor surface. That didn’t work very well and the design was replaced by the differential floor Profileograph that has now been used for almost 40 years. The differential Profileograph has transverse and longitudinal sensors to record the movement of each of its measurement wheels.

When Sam and Allen began thinking about the random traffic measurement device, they again planned to use a taut wire. The original design (which was never built) was to have three features:

1. a taut wire, held by weights;
2. a tape measure with holes drilled in it on 12-inch centers; and
3. a stick that measured the distance from the wire to the floor surface.

The operator was to set the stick in the drilled holes and push down on it. The pushing action would bring a sensor into contact with the wire, thereby measuring the distance between wire and floor.

The device was given the working name “Dipstick” because the stick actually dipped at each reading. The Dipstick name was originally a joke used by members of the development team. It was assumed that a better name would come along, but it never did.

Clearly, the focus of the team at that time was not finding a better name. Their efforts were invested in coming up with a design for an instrument that could work on a real-world jobsite and still produce reliable data. As Robert recalls, “I distinctly remember some big battles with Allen about why the taut wire system wasn't workable in the construction environment and finally got him to back off after I suggested he look into getting an accelerometer and use it as the sensor.”

George recalls that, after Robert suggested using an accelerometer to measure the tilt of the device, the next “idea was that the Dipstick would always point in the same direction. The operator would lift the Dipstick and advance it 12 inches after each reading.” To ensure reasonable continuity of readings, a tape measure was used to position the instrument for each reading.

“One day I suggested to Allen that we could eliminate the tape measure, if we rotated the Dipstick 180 degrees after each reading,” George remembers. “I thought the pivoting would help reduce a source of error in case the accelerometer was not zeroed. But my main goal was to get rid of the tape measure.”

The entire team was involved in the final details. Sam and Allen disagreed over the Dipstick’s mechanical design – but since Sam personally machined the first Dipstick – he got his way. That first model looks much like the Dipstick does today. The electronics package was designed and manufactured by one of Sam’s best friends – Gray Miller – who owned MMC Instrument Labs down the street from the Face offices in Norfolk. The paint was literally still wet when Dipstick #1 arrived for its debut at the 1982 World of Concrete. And that unit still works today!

The Dipstick has been redesigned by Face Director of Engineering Jeff Rogers since the 1990s. It shares not one part in common with the original Dipstick. The Dipstick 2272 has the most sophisticated software in the industry. Under Jeff’s technical leadership and his work with clients on six continents, the Dipstick is now used in 63 countries and is so accurate and precise that governments and world standards groups choose Dipstick to calibrate other measuring devices.

But, the Dipstick still works today because of the two key design concepts proposed by Robert and George – who were the youngest members of the Face team at the time:

- the accelerometer, suggested by Robert; and
- the 180 degree pivot, conceived by George.

The idea of a profiler that uses an accelerometer and pivots down a measurement line was the basis of the first Dipstick patent.