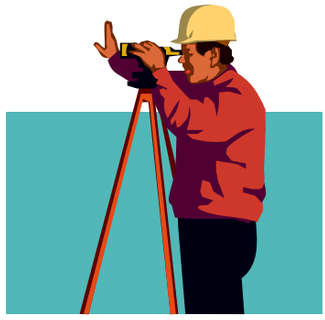
NGVD ⇗ NAVD?

Regulatory floodplains are defined by the elevation of the base flood in relation to the elevation of the ground. Base flood elevations are used to determine the required elevation of new buildings in the floodplain. Floodplain management will not succeed without accurate measurements of flood elevations, ground elevations and building elevations. Needless to say, if flood elevations are based on one system and ground or building elevations are based an another, things won't work.

NGVD 29 stands for National Geodetic Vertical Datum of 1929. It is a system that has been used by surveyors and engineers for most of the 20th Century. It has been the basis for relating ground and flood elevations, but it has been replaced by the more accurate North American Vertical Datum of 1988 (NAVD 88). Because it has such an impact on floodplain management, it is important for local officials to understand what's happening.



Effective floodplain management depends on accurate surveying

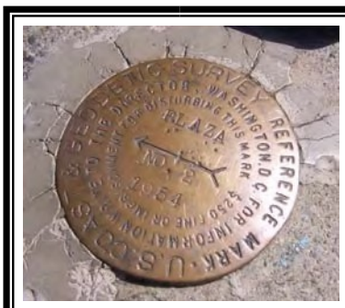
First, what is a "datum?" If we say that a flood will rise to 100 feet, one must ask "100 feet above what?" The starting point for measuring elevations is our datum. We need a consistent starting point so we can compare flood and ground elevations. In most cases, we mean "above sea level." But, some inland communities' elevation records were developed in relation to some other starting point. For example, Chicago City Datum started from the level of Lake Michigan.

The National Geodetic Survey, the government people responsible for mapping, needed a common, consistent national datum to map the whole country. During the 1920s, NGS established a network of 26 tidal gauges in the United States and Canada. Maps were prepared with elevations based on "mean Sea Level Datum of 1929." In the 1970's, the name was changed to the National Geodetic Vertical Datum (NGVD) of 1929.

One of the reasons for the name change was that it was found that the sea is actually not level. There are local variations caused by currents, wind, barometric pressures, temperature, topography of the sea bed, and salinity differences. NGS ran more surveys around the country and had trouble making the numbers fit because mean sea level at one location was higher or lower than mean sea level elsewhere. This leveling work also found that ground elevations had risen or fallen, due to earthquakes, subsidence, and rebounding of the earth that has continued since the glaciers left. New satellite technology has discovered distortions in surveyed elevations caused by gravity.

Because of these shortcomings, the NGS has established a new system to base elevation measurements. The North American Vertical Datum of 1988 corrects many of the problems with NGVD 29. It is also based on satellite systems that account for differences in gravitational forces in different areas.

One can readily convert elevations in one datum to those based on another. For example, zero in the Chicago City Datum is 579.48 feet above zero ("mean sea level") in NGVD 29. If one tries to compare a ground elevation in CCD to a flood elevation in NGVD 29, the 579 foot difference will make it readily apparent that something is off. A simple formula can convert elevations from one datum to the other.



Accurate elevation surveying starts from a dependable elevation reference mark.

It's not so easy converting to NAVD 88, though. The North American Vertical Datum is the product of thousands of corrections in elevation data. In the Rocky Mountains (where gravitational forces caused a lot of distortion to traditional surveys) the difference can be three feet or more. In other areas, the difference may be inches. It takes a computer program called VERTCON to relate the two systems at any one point. However, it must be noted that VERTCON 2.0 is not to be considered reliable beyond the boundaries of the lower 48 United States.

https://www.fema.gov/media-library-data/1406747117296-744b6bd203c18ada4806ad4e90c18b81/Vertical_Datum_Conversion_Guidance_May_2014.pdf

March 30, 2007