Communities participating in the Community Rating System of the National Flood Insurance Program must maintain elevation certificates on their floodprone properties, and the ground, flood, and building elevations noted on those certificates must be based on the same datum. This handout explains the differences between some of the most common datums in use. Additional copies of this handout are available from your ISO/CRS Specialist or by e-mailing NFIPCRS@ISO.com.

NGVD to 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 It has been the basis for relating ground and flood elevations, but it has been replaced by the more-accurate North American Vertical Datum of 1988 (NAVD 88).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

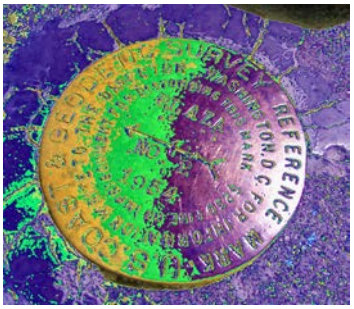
First, what is a "datum?" If we say that a flood will rise to 100 feet, one must ask "100 feet above what?" The starting point for measuring elevations is our datum. We need a consistent starting point so we can compare flood and ground elevations. In most cases, we mean "above sea level." But, some 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 (NGS), 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 1970s, 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. The 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 on which 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 (zero feet above Lake Michigan) equates to 579.48 feet above zero ("mean sea level") in NGVD 29. If one tries to compare a ground elevation in Chicago City Datum 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.

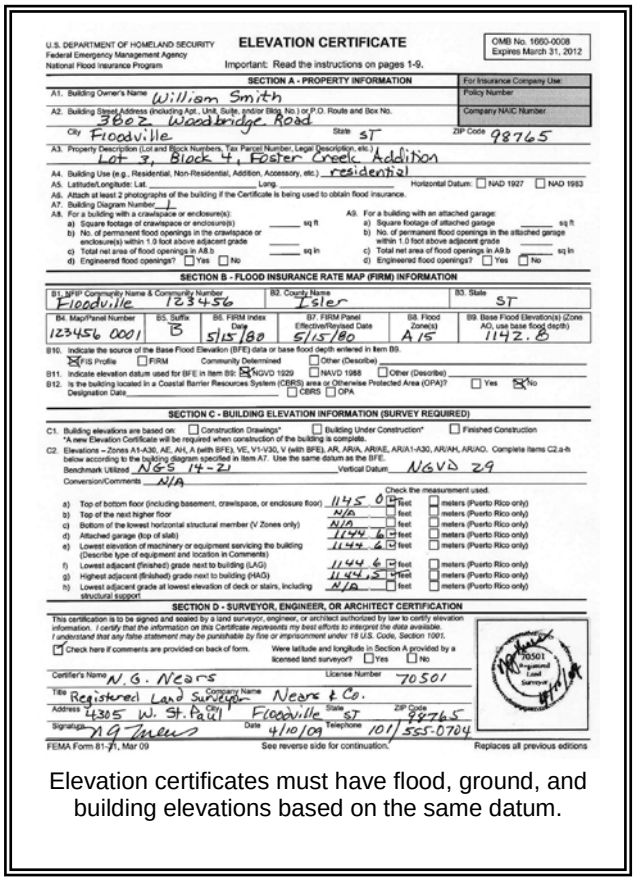


Accurate elevation surveying starts from a dependable elevation reference mark.

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.

Up until recently, most FEMA Flood Insurance Rate Maps used NGVD 29. However, FEMA's new maps are now using NAVD 88 as the basis for published flood elevations. If local surveyors or your community have not made the switch, errors will arise unless elevations in NGVD 29 or a local datum are converted to NAVD 88.

What is most important is that the same datum be used consistently. Since the base flood elevations used by the NFIP are on the FIRM, the FIRM datum must be used for the FEMA elevation certificate, LOMAs, LOMRs and other insurance-related purposes.



U.S. DEPARTMENT OF HOMELAND SECURITY
Federal Emergency Management Agency
National Flood Insurance Program

ELEVATION CERTIFICATE

OMB No. 1660-0008
Expires March 31, 2012

Important: Read the instructions on pages 1-9.

SECTION A - PROPERTY INFORMATION (For Insurance Company Use: Policy Number; Company NAIC Number)

A1. Building Owner's Name: William Smith
A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.: 3802 Woodbridge Road
City: Floodville State: ST ZIP Code: 98765
A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.): Lot 3, Block 4, Foster Creek Addition
A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.): residential
A5. Latitude/Longitude: Lat. ____ Long. ____ Horizontal Datum: ☐ NAD 1927 ☐ NAD 1983
A6. Attach at least 2 photographs of the building if the Certificate is being used to obtain flood insurance.
A7. Building Diagram Number: 1
A8. For a building with a crawlspace or enclosure(s):
a) Square footage of crawlspace or enclosure(s): ____ sq ft
b) No. of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade: ____
c) Total net area of flood openings in A8.b: ____ sq in
d) Engineered flood openings? ☐ Yes ☐ No
A9. For a building with an attached garage:
a) Square footage of attached garage: ____ sq ft
b) No. of permanent flood openings in the attached garage within 1.0 foot above adjacent grade: ____
c) Total net area of flood openings in A9.b: ____ sq in
d) Engineered flood openings? ☐ Yes ☐ No

SECTION B - FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1. NFIP Community Name & Community Number	B2. County Name	B3. State
Floodville 123456	Isler	ST

B4. Map/Panel Number	B5. Suffix	B6. FIRM Index Date	B7. FIRM Panel Effective/Revised Date	B8. Flood Zone(s)	B9. Base Flood Elevation(s) (Zone AO, use base flood depth)
123456 0001	B	5/15/80	5/15/80	A15	1142.8

B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in Item B9.
☒ FIS Profile ☐ FIRM ☐ Community Determined ☐ Other (Describe)
B11. Indicate elevation datum used for BFE in Item B9: ☒ NGVD 1929 ☐ NAVD 1988 ☐ Other (Describe)
B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? ☐ Yes ☒ No
Designation Date: ____ ☐ CBRS ☐ OPA

SECTION C - BUILDING ELEVATION INFORMATION (SURVEY REQUIRED)

C1. Building elevations are based on: ☐ Construction Drawings* ☐ Building Under Construction* ☐ Finished Construction
*A new Elevation Certificate will be required when construction of the building is complete.
C2. Elevations – Zones A1-A30, AE, AH, A (with BFE), VE, V1-V30, V (with BFE), AR, AR/A, AR/E, AR/A1-A30, AR/AH, AR/AO. Complete Items C2.a-h below according to the building diagram specified in Item A7. Use the same datum as the BFE.
Benchmark Utilized: NGS 14-21 Vertical Datum: NGVD 29
Conversion/Comments: N/A

		Check the measurement used.
a) Top of bottom floor (including basement, crawlspace, or enclosure floor)	1145.0	☒ feet ☐ meters (Puerto Rico only)
b) Top of the next higher floor	N/A	☐ feet ☐ meters (Puerto Rico only)
c) Bottom of the lowest horizontal structural member (V Zones only)	N/A	☐ feet ☐ meters (Puerto Rico only)
d) Attached garage (top of slab)	1144.6	☒ feet ☐ meters (Puerto Rico only)
e) Lowest elevation of machinery or equipment servicing the building (Describe type of equipment and location in Comments)	1144.6	☒ feet ☐ meters (Puerto Rico only)
f) Lowest adjacent (finished) grade next to building (LAG)	1144.6	☒ feet ☐ meters (Puerto Rico only)
g) Highest adjacent (finished) grade next to building (HAG)	1144.5	☒ feet ☐ meters (Puerto Rico only)
h) Lowest adjacent grade at lowest elevation of deck or stairs, including structural support	N/A	☐ feet ☐ meters (Puerto Rico only)

SECTION D - SURVEYOR, ENGINEER, OR ARCHITECT CERTIFICATION

This certification is to be signed and sealed by a land surveyor, engineer, or architect authorized by law to certify elevation information. *I certify that the information on this Certificate represents my best efforts to interpret the data available. I understand that any false statement may be punishable by fine or imprisonment under 18 U.S. Code, Section 1001.*
☒ Check here if comments are provided on back of form. Were latitude and longitude in Section A provided by a licensed land surveyor? ☐ Yes ☐ No
Certifier's Name: N. G. Nears License Number: 70501
Title: Registered Land Surveyor Company Name: Nears & Co.
Address: 4305 W. St. Paul City: Floodville State: ST ZIP Code: 98765
Signature: N G Nears Date: 4/10/09 Telephone: 101 555-0704

FEMA Form 81-31, Mar 09 — See reverse side for continuation. — Replaces all previous editions

Elevation certificates must have flood, ground, and building elevations based on the same datum.

A community and the surveyors in the community may normally use NAVD 88 for most purposes, but if the community's FIRM uses NGVD 29, then NGVD 29 must be used for all flood, ground, and building elevations on elevation certificates and other NFIP applications.

It is basically the responsibility of the professional surveyor, engineer, or architect to use the appropriate datum on FEMA documents. However, the community must be aware of the potential for errors if the datums are mixed. You don't need to know the conversion factor between two datums, but you do need to ensure that the same datum is used for all elevations on the same document. In time, that datum will be NAVD 88 for just about every community. Meanwhile, local officials should review their bench marks and other elevation reference marks to ensure that they state which datum they reference and that they are consistent with any code requirements.

For more information on datums and their use in FEMA mapping, see http://www.fema.gov/pdf/fhm/frm_gsab.pdf.