

8. Theme: Geodetic Control



In the U.S., the National Geodetic Survey (NGS) maintains a national geodetic control network called the **National Spatial Reference System (NSRS)**. The NSRS includes approximately 300,000 horizontal and 600,000 vertical control points (Doyle, 1994). High-accuracy control networks are needed for mapping projects that span large areas; to design and maintain interstate transportation corridors including highways, pipelines, and transmission lines; and to monitor tectonic movements of the Earth's crust and sea level changes, among other applications (FGDC, 1998a).

Some control points are more accurate than others, depending on the methods surveyors used to establish them. [The Chapter 5 page titled "Survey Control"](#) outlines the accuracy classification adopted in 1988 for control points in the NSRS. As geodetic-grade GPS technology has become affordable for surveyors, expectations for control network accuracy have increased. In 1998, the FGDC's Federal Geodetic Control Subcommittee published a set of [Geospatial Positioning Accuracy Standards](#). One of these is the Standards for Geodetic Networks (FGDC, 1998a). The table below presents the latest accuracy classification for horizontal coordinates and heights (ellipsoidal and orthometric). For example, the theoretically infinitesimal location of a horizontal control point classified as "1-Millimeter" must have a 95% likelihood of falling within a 1 mm "radius of uncertainty" (FGDC, 1998b, 1-5).

Accuracy classification for geodetic control networks (FGDC, 1998).

Accuracy Classification	Radius of Uncertainty (95% confidence)
1-Millimeter	0.001 meters
2-Millimeter	0.002 meters
5-Millimeter	0.005 meters
1-Centimeter	0.010 meters
2-Centimeter	0.020 meters
5-Centimeter	0.050 meters
1-Decimeter	0.100 meters
2-Decimeter	0.200 meters
5-Decimeter	0.500 meters
1-Meter	1.000 meters
2-Meter	2.000 meters
5-Meter	5.000 meters
10-Meter	10.000 meters

If in Chapter 2 you retrieved a NGS datasheet for a control point, you probably found that the accuracy of your point was reported in terms of the 1988 classification. If yours was a "first order" (C) control point, its accuracy classification is 1 centimeter. NGS does plan to upgrade the NSRS, however. Its 10-year strategic plan states that "the geodetic latitude, longitude and height of

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points used in defining NSRS should have an absolute accuracy of 1 millimeter at any time" (NGS, 2007, 8).

Think About It

Why does the 1998 standard refer to absolute accuracies while the 1988 standard (outlined in Chapter 5) is defined in terms of maximum error relative to distance between two survey points? What changed between 1988 and 1998 in regard to how control points are established?



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