

**Checking Elevations in the Field**

## APPENDIX C - CHECKING ELEVATIONS IN THE FIELD

Code enforcement officers may want to check lowest floor elevations in the field using the system described below. Three pieces of equipment are needed: a level, a rod, and a record book. The first two can usually be found in the local street or highway department. If not, the consulting engineer or a neighboring community may loan one. If one is needed all the time, new levels can be purchased for as little as \$200 (this can be recovered from permit fees). It is important to recognize that a local Code Enforcement Officer shall not do elevation certificates for permitting purposes within a Maine community that he or she is responsible for administering the floodplain management ordinance. The community floodplain management ordinances require the elevations for permitting new construction or substantial improvements or other development proposals that require elevations, be done by a Maine Professional Land Surveyor, Professional Engineer or Architect. However, it is important to understand the process that is involved in determining a site elevation.

### Starting Elevation

Typically the hardest part of field checking elevations is finding a point of known elevation from which to start. U.S. Geological Survey benchmarks are the best place to start but they can be several miles apart. Older Flood Insurance Studies (FIS) will provide some reference marks (RMs) however; the newer FIS do not provide RMs. Often the local engineer will keep elevation records from sewer or street projects. (Note: Make sure local records or bench marks are based on the same datum as the flood elevation). A community with no known elevations should contact the State Floodplain Management Program, the U.S. Geologic Survey, or the Army Corps of Engineers for Assistance.



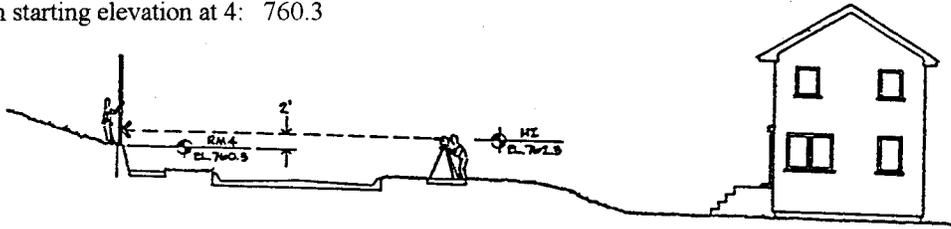
*(Photos) A FEMA hydrologist works with the Maine State Planning Office to locate an elevation reference mark (ERM). Photos by Lou Sidell, Maine Office of Floodplain Management*



A two person team is needed. One needs to run the level and the second serves as the rod man. This person places the rod on a point where the elevation is known, such as a reference mark from a Flood Insurance Study (starting elevation). It is important that the person holding the rod hold it straight to get accurate readings. The second levels the instrument and reads the height where the cross hairs show on the rod. This is called the "back sight." Add it to the starting elevation to produce HI (height of instrument).

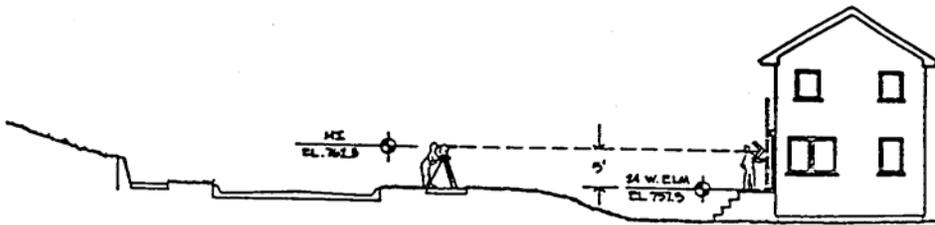
**Running the Level**

Known starting elevation at 4: 760.3



Starting elevation (760.3) + reading on rod (2') = Height of Instrument (HI)

Next the person with the rod places the rod on the lowest floor. Keeping the instrument level, the building official turns it to the rod and reads the height. This height is called the "fore sight." This number is subtracted from HI and gives the elevation of the lowest floor.



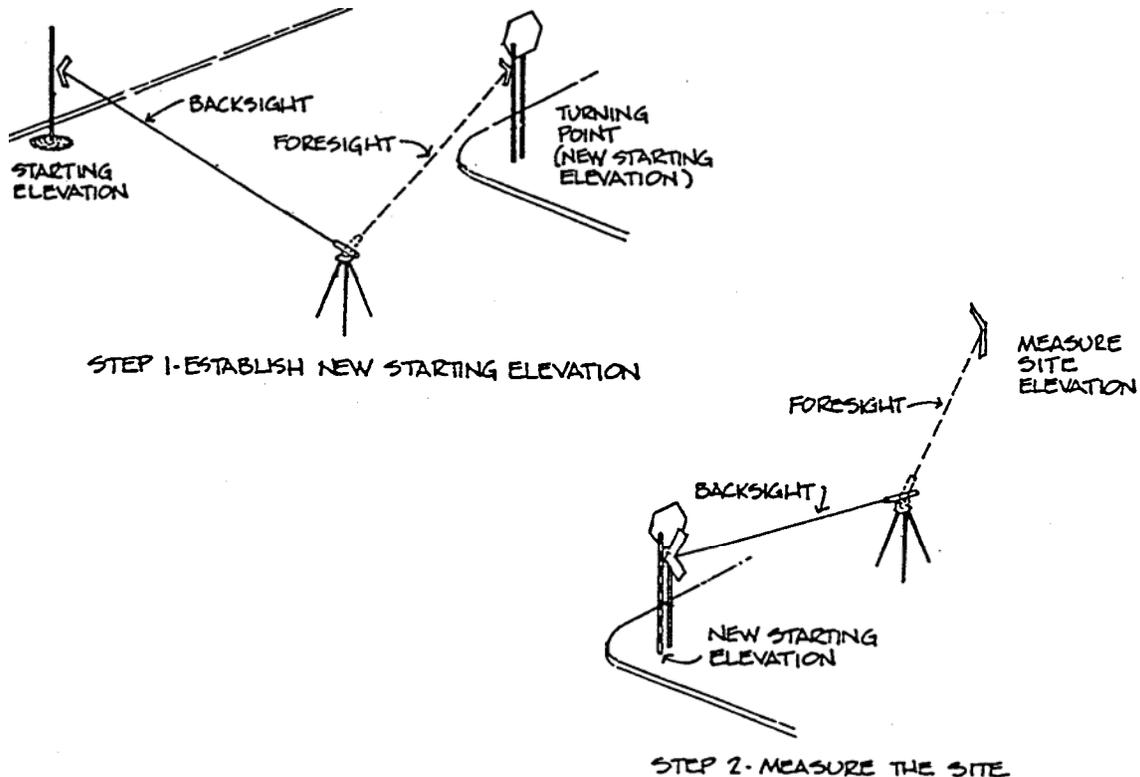
HI (762.3) minus foresite (5') = lowest floor elevation (757)

There is a standard way of recording the figures obtained. This method should be followed to assist engineers or other officials in understanding what was done. It is important that the records kept be as detailed as possible, especially the location of where the rod was placed as this will help later field checks to refer to the elevation records. This record should be kept with the permit records.

PERMIT NO. <u>85-12-03-11</u>		BUILDING OFFICIAL <u>Bill D. Best</u>			
SITE <u>24 West Elm</u>		FLOOD PROTECTION ELEVATION <u>756.0</u>			
Station	back-sight	HI	fore-sight	Elevation	Description
RM 4	2'	762.3		760.3	Flood Insurance Study Reference Mark
24 West Elm			5'	757.3	Top of Floor at Front Door

## Running a Turn

When the starting elevation is too far to see from the site you want to measure, a "turn" must be run. This is simply shooting the foresight to a selected "turning point." The level is then moved and a back sight is read with the turning point acting as the new starting elevation.



The CEO may want to help the applicant (and future enforcement work) by running the level before the permit is approved. The flood protection elevation could be marked at the building site. This shows the developer how high the structure must be built and can be helpful if plans must be modified. It will also make checking the "as built" elevation much quicker. A thorough record must be kept describing the mark to ensure that it won't be moved (e.g., "nail with red tape 4 feet from ground in largest oak tree in northeast corner of lot - FPE - 465.2 feet NGVD").

## Helpful Hints

From experienced personnel come the following hints on checking elevations in the field:

- A level mounted on a tripod, although more expensive, is more accurate and easier to use.
- Use an "automatic level." It levels itself, saving time, particularly when there are a lot of turning points.
- A light-weight fiberglass rod saves wear and tear on the person holding the rod. The ability to be extended to 25 feet is a feature that is very useful in steep terrain and for long shots.
- A level with high power magnification will help on long shots.
- Because there are never enough benchmarks, make an agreement with the Highway Department to be allowed to establish reference marks on pavement, bridges, etc.
- Maintain a reference file of area benchmarks with information from flood insurance studies, The United States Geological Survey, U.S. Army Corps of Engineers, the state highway department and utility companies.