A. General Procedure

1. Read the soils report and become familiar with sight layout and soil conditions. If possible, take a copy of soil report with you to the site.

2. Obtain a copy of the project specifications concerning foundations (and concrete, if necessary) become familiar with the project.

3. Identify the particular footing to be inspected on the foundation plan. Log pertinent information concerning the footing in your foundation report. (bottom elevation, size, description of material)

4. Perform the footing inspection. Verify the following meet the requirements of the design documents.
   A) Dimensions at the footing sub grade
   B) Bearing surface Elevation
   C) Bearing capacity of the sub grade soil (see “Technical Considerations”)
   D) Cleanliness of the footing sub grade
   E) Reinforcing

B. Technical Considerations

Footings on natural sand, Non-plastic silt, and Fill

For footings on natural sands, non-plastic silts, engineered fill (sand, clay, or mixes of sand and clay) and non-engineered fill, the Dynamic Cone Penetrometer (DCP) can be used for bearing capacity verification. After DCP blow counts are obtained, these must be converted to Standard Penetration Test (SPT) values (N-values). The general relationship between DCP blow counts and N-values is 2.5 to 3.0 blows to one STP blow. For example, a DCP blow count of 30 blows per foot is about the same as a SPT blow count of 10 to 12 blows per foot.
In general, for soil deposit of uniform density (with depth), the DCP blow counts should increase with depth of penetration of the tip. This is probably due, in part, to increased side friction on the rod and increased embedment of the tip. Many time the blow counts drop off as the tip is near (above or below) the ground water level (liquefaction effect). This is particularly true for fine sands and silts. When reporting questionable DCP test results, make note of the groundwater level and its possible affects on the blow counts.

Always have at least one extension rod for the DCP in case a greater depth needs to be checked. In general, it is not good practice to end the DCP test with falling blow counts. This could be an indication of a stratum of loose soil or a thin seam of looser soil. The latter case may not have an effect on the foundation performance whereas the formed could seriously impact the performance of the footing.

**Footings on Clay and Plastic Silts**

For footings on clay or plastic silt the Hand Penetrometer should be used for an indication of bearing capacity. The Hand Penetrometer is used to obtain the unconfined compression strength of the soil.

**C. Use of the Pigtail Auger**

On projects with minimal or no soil boring information, the condition of the bearing soil should be checked using a pigtail auger. The pigtail auger is also an effective method for verifying the depth of fill.

**D. Special Problems**

**Water in Footing Excavations**

Depending on the soil conditions and the source of the water, this can range from an inconvenience to a major problem. In general, footing bearing surfaces should be free of standing water, mud, and loosened material. If the seepage is minor (such as that from sand seams within a clay strata), a laborer with a bucket and shovel can usually control it. However, if seepage is heavy, sump pits and pumps may be necessary. For heavy seepage the contractor should be informed.

**Footings at or Near the Groundwater Level**

Care must be taken with footings bearing on sand or non-plastic silts at or near the groundwater level. This type of bearing soil is highly susceptible to disturbance by normal construction activities in the presence of water. For sands, the disturbed soil should be removed and the resulting surface stabilized with a dense graded crushed aggregate, usually we recommend a crushed aggregate or concrete with a maximum 3 inch nominal particle size and a maximum of 7% passing the No. 200 sieve. Another possible solution may be to install local sumps to lower the water level and then compact the loosened soil at the footing bearing surface.
**Frozen Footing Bearing Surface**

Footing excavations should not be left open in winter months without protection from freezing. Any frozen soil in the footing area should be considered disturbed and should be removed and or replaced and compacted prior to placement of concrete.

In addition, during the winter, interior footings not constructed at typical frost depths (i.e. less than 3.5 foot embedment) should be protected against possible frost heave. This may consist of placing straw or a soil berm over and around the footing.

Possible frost heave situations could also develop for formed, narrow wall footings constructed at frost depths, where the sidewalls of the excavation are not in contact with the sides of the footings. Even though these footings are at the nominal frost depth, the necessary insulating soil would not be present until the footings are backfilled.

**Fill Versus Natural Soil**

Generally, foundations are designed to be constructed on the natural, undisturbed soil. When non-engineered fill materials are encountered, the footings are usually extended down to the natural soil. On sites with relatively clean materials, it is sometimes difficult to determine whether the soil at the design bearing level is fill or natural. The following are practical considerations which can be used to help make that consideration.

A) Check the boring logs to see the depth of fill indicated on the logs. This should provide the approximate depth of the fill. Look at the log for the boring performed closest to the footing to get the most reasonable estimate of the fill

B) Check the excavation sidewalls, and look for old topsoil layers, obvious indications of fill such as bricks, rubble, organics, etc. for any indications of stratigraphy in the sidewalls. If the excavation extends below the topsoil layer, it is likely the natural soil has been encountered. However, be cautious the site has not been filled more than once resulting in multiple layers of buried topsoil. If no buried topsoil layer is observed, it could be an indication either no fill is present or the topsoil layer was removed prior to placing the fill.

Pieces of bricks, concrete, wood, or man-made objects are always a very good indication of existing fill materials. Note that sometimes rubble from the sidewalls can fall to the bottom of the excavation and then be trod into the underlying soil giving the appearance of fill

If the sidewalls have a random structure with no layering present, this could indicate a clean fill. Natural soils usually display some stratification of natural structure, such as silt partings in clay, etc.
C) Use the pigtail auger to observe the soil types with depth below the bottom of the excavation. As mentioned above, look for topsoil, organics, or rubble which would indicate fill.

D) Random, highly variable, and/or inconsistent results can be an indication of an uncontrolled fill deposit. The DCP, when used with a pigtail auger, can be a very effective tool for determining if a soil is fill or natural. Natural soils usually exhibit consistent and somewhat reproducible DCP results.