IOWA DOT

Office of Design

200C-1

Subsurface Investigation Methods

Design Manual
Chapter 200
Geotechnical Design
Originally Issued: 01-15-14

This section addresses subsurface investigations, which include drilling of soil borings and possibly excavation of test pits as part of a geotechnical field exploration. It is organized by activities and policies involved prior to, during, and after exploration.

In addition, other types of subsurface investigative techniques such as cone penetrometer, dilatometer, pressuremeter, geophysical (seismic, resistivity, etc.) are evaluated and used on a case-by-case basis when considered necessary or beneficial for full and optimal geotechnical analysis and design of the project.

Section 200I-1 explains the purpose of the subsurface information.

Quick Tips:

- Subsurface investigations should maximize the amount of information obtained during each phase of the investigation process and minimize the number of site visits required to obtain information.
- Geotechnical consultant work should be performed according to Section 200I-1.

Consultant geotechnical work requires that the consultant be pre-qualified in Category 321 during the duration of their geotechnical work.

Consultant geotechnical (soils design) work may include any combination of soils events including S1, S2, S3, or S4 work, and possibly other types of geotechnical work. Sections 200B-1 to 200 B-4 include definitions of S1, S2, S3, and S4 work, along with detailed discussion of numerous items associated with each S-event and its submittal requirements. Document work performed as part of the S1, S2, S3, and S4 effort, including submittal items, according to Chapter 200. Prepare plan sheets according to Sections 1F-1 to 1F-24. Prior to performing any subsurface investigation in the field, the proposed subsurface investigation plan will be reviewed by the Iowa DOT Soils Design Section, and approved before field operations are initiated.

Office Review/Preliminary Planning

The goal in the office review/preliminary planning phase is to develop an efficient investigation plan, maximize the amount of information obtained during each phase of the investigation process, and minimize the number of site visits required to obtain information. Geotechnical designers should become completely familiar with the proposed project elements by reviewing:

- Proposed corridor/project limits.
- Plan/profile sheets.
- Project cross sections.
- Estimated borrow need and distribution.
- Location of all structures (bridges, culverts, etc.).
- Anticipated project breaks (termini).
- S1 Event Report.

In addition, the geotechnical designer should become familiar with the site and geologic conditions. Soils deposited by a particular geologic process assume characteristic topographic features or landforms that can frequently be readily identified by the geotechnical designer. A landform commonly contains soils with generally similar engineering properties and may extend regularly or irregularly over wide areas of a project alignment. Identification of geologic landforms can be used to optimize the subsurface investigation program. The following can be used to identify landforms:

- GIS information:
    - Topographic maps,
    - Aerial photographs,
    - Soil survey maps,
    - Wetland maps, and
    - Geologic maps.
- Other information that could or should be reviewed includes:
    - As-built plans, construction records.
    - Previous DOT borings.
    - LiDAR (if available).

Site Reconnaissance

Refer to Section 200I-1 for information regarding site reconnaissance.

Development of a Field Exploration Plan

Refer to Section 200I-1 for a list of items to include and address in the field exploration program.

Locations of Exploration Points

Refer to Section 200I-1 for information regarding locating exploration points.

Equipment and Methods

Specific requirements of equipment and methods (i.e., sampling, drilling, etc.) are found in Section 200I-1.

Field Records

Soil Borings and Rock Coring

Specific requirements for recording findings of soil borings and rock coring are found in Section 200I-1.

Elevations

If the elevation of the ground surface at each exploration point location cannot be determined or documented from project information or other acceptable existing information, the elevation of the ground at each exploration location (referred to plan datum) must be accurately determined and recorded by acceptable means.

Water Level Readings

Obtain “time-of-drilling” and “delayed” water level readings in all borings and exploratory holes where safe, practical, and feasible. Properly cover the holes during the delay. The depth or elevation of the top of free water is to be logged on the boring log, and should include at what hour after completion of the boring/exploration the water level is determined (such as 24 hours after drilling), including if water is not present.

Obtain water level readings within exploration points at stream-crossing bridges and include in bridge plan sheets for the contractor's information. If drilling fluid is used to advance the exploration, drill a secondary open-hole boring/exploration adjacent to initial exploration point to obtain delayed water level readings. After delayed water level readings have been obtained from the adjacent boring/exploration, place backfill in all exploratory holes.

Sampling and Laboratory Testing

Sampling and laboratory testing requirements are outlined in Section 200I-1.

Final Records

Final record requirements are outlined in Section 200I-1.

Storage of Samples

Storage of Sample requirements are outlined in Section 200I-1.

Reports and Submittals

Report and geotechnical submittal requirements are outlined in Section 200I-1.

References

American Association of State Highway and Transportation Officials (AASHTO), 1991. Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Designation: M-145-91, Washington, DC.

Chronology of Changes to Design Manual Section:

200C-001 Subsurface Investigation Methods

1/15/2014	NEW New