
Introduction

Design Manual
Chapter 200
Geotechnical Design

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The Soils Design Section provides geotechnical engineering services and expertise in the areas of planning, design, construction, and maintenance for Iowa DOT's bridges, roadways, and other transportation related structures and facilities. The focus of Chapter 200 is to provide information with respect to the geotechnical design, construction, and maintenance support within the context of the Iowa DOT.

Note: An undertaking to shorten the overall project development process at Iowa DOT is underway. When finished, it will result in more concurrent, rather than linear, work efforts by and between numerous sections and offices at the Iowa DOT. This will change the description of work flow between sections and offices at the Iowa DOT as included and discussed in this manual.

Geotechnical Activities

Typical major geotechnical activities include:

- Conducting boring programs to identify subsurface conditions and to obtain samples as needed for testing, analysis, and recommendations.
- Coordinating testing with the Materials Laboratory as needed for geotechnical analysis.
- Preparing plans and reports with geotechnical information (S1, S2, S3, and S4 events). The Iowa DOT currently intends to use contractor provided borrow for essentially all future projects instead of plan borrow as discussed in this and subsequent sections of this chapter. Contractor provided borrow means the contractor is responsible for finding, acquiring, and providing acceptable borrow material for each required soil type and amount as defined in the plans. Contractors will also be responsible for obtaining all state and federal permits and clearances. Discussion of plan borrow is included in this chapter for documentation of previous practice, for use by others (e.g., counties, etc.) as applicable, and for the few Iowa DOT projects where plan borrow may still be used.
 1. S1 Event (see Section [200B-1](#)) – Includes review of the proposed alignment and grade of a project for potential major soils-related (geotechnical) problems affecting design and constructability. Identifies locations of multiple potential plan borrow sites.
 2. S2 Event (see Section [200B-2](#)) – Includes review and analysis of the proposed project alignment and grade to identify and document all soils-related items affecting ROW. Includes final plan borrow site selection and conceptual borrow design, as well as preliminary design and definition of all stability berms, backslope benches, and other stability features that require additional ROW acquisition. The subsurface investigation program is usually established and performed during the S2 period for both the potential borrow sites and the alignment.
 3. S3 Event(see Section [200B-3](#)) – All soils work for grading, grading-related, paving, and similar projects, including:
 - Plan-ready Soils Plan and Profile sheets (Q sheets) and CS sheets (for applicable soils tabulations),

- Subgrade treatment tab,
 - Longitudinal subdrain tab,
 - Shrinkage tab,
 - Summary of Structure Settlement form,
 - Settlement plates,
 - Incorporation of all ground improvements, ground remediations, and stability items (core-outs, benches, berms, blankets, drains, etc.) onto Q sheets and cross-sections,
 - All soils usage (i.e., select) information on final cross-sections,
 - Any other required tabs, etc., and
 - Everything else pertaining to Soils Design Section involvement on a grading, grading-related, paving, and similar projects.
4. S4 Event (see Section [200B-4](#)) – All structure-related soils work for bridges and similar structures or projects, including:
- SPS sheets,
 - Report of Bridge Soundings,
 - The Supplemental Report of Structure Soundings (containing design-related information on Settlement Analysis, Stability Analysis, input/recommendations on type and design of foundation, and other items as may be necessary),
 - Necessary core outs or other types of necessary ground improvements or remediations, and
 - Any other soils related remedial actions necessary with a bridge or structure project.
- Performing specialized geotechnical analyses. The following specialized geotechnical analysis, design, and coordination will be performed as part of the S2, S3, and S4 events described above or as a combination of the events.
 - Slope Stability Analyses.
 - Embankment Design including core-outs, drainage systems, staged construction, delays for settlement dissipation, and any similar features.
 - MSE wall geotechnical evaluations, including bearing pressure.
 - Coordination with Bridges and Structures on drilled shaft design.
 - Coordination with Bridges and Structures on driven pile design.
 - Coordination with Bridges and Structures on spread footing design.
 - Intermediate Foundation Improvements (IFIs).
 - Prefabricated vertical drains (also referred to as “wick drains”) or vertical sand drains.
 - Soil/Rock slope design, including pre-splitting rock.
 - Geosynthetic design.
 - Landslide Analysis and Mitigation.
 - Soil Slope Design.
 - Any other geotechnical design that may be needed for a project.
 - Being involved with the construction phase. The following remedial alternative designs for soil-related issues and review services may be required during the construction phase of a project:

- Design of remedial alternative for unsuitable subgrades.
 - Design of remedial alternatives for unstable cut/fill slopes.
 - Review of Contractor temporary shoring plans.
 - Review of Contractor foundation installation plans.
 - Review of Contractor provided or alternate borrow.
 - Review of drilled shaft integrity test reports.
 - Review of pile driving logs.
 - Review of foundation load testing reports.
 - Review of specialty contractor submittals (i.e., MSE wall or IFIs).
- Developing emergency relief (ER) projects.

Emergency relief projects are projects required to protect the public safety on Iowa roadways as a result of unforeseen geotechnical condition(s). These conditions could include damage to roadways and bridges resulting from events such as heavy rains, flooding, snow fall, etc. Soils Design Section involvement generally includes the following: evaluation of conditions, determination of causes, and designing repair alternatives. The following lists some of the typical emergency relief projects.

 - Landslide analysis and mitigation.
 - Bridge scour.
 - Rock fall.
 - Stream bank erosion.

General Guidance (Geotechnical Consultant Work)

General guidance with reference to project coordination between the Soils Design Section and geotechnical consultants on consultant-design projects is provided in Section [200A-2](#). Section 200A-2 describes the Soils Design events and project coordination process within the Iowa DOT design process, and provides a discussion of the necessary interaction among the various sections and consultants in coordinating the geotechnical involvement in typical road and bridge projects.

In Section [200A-3](#), guidance is provided with respect to geotechnical consultant services and document review required by the Iowa DOT. All consultants must perform services according to Section [200I-1](#).

Chronology of Changes to Design Manual Section:

200A-001 Introduction

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| 6/28/2018 | Revised
Eliminated references to R Sheets (borrows) and Z Sheets (borrow cross sections) since those are no longer being produced. |
| 1/15/2014 | New |