

6.30 EXCAVATION

The importance of being able to identify soil types cannot be overemphasized. Some soil types have to be placed in the proper location. For example, [Standard Road Plan RL-1B](#) illustrates where unsuitable soils are allowed to be placed in the roadway. The inspector must be sure that the work is performed according to the plans.

The inspector should be familiar with all the "Standard Road Plans" listed, in particular SW standards for sewer construction, RB or MI standards for incidental construction, EC standards for erosion control, SI or BA standards for guardrail, RF standards for drainage, and RL or EW standards for excavation and embankment.

Grading plans show cut equals fill plus/or minus shrink or swell respectively. Shrink is the change in quantity from cut to fill and includes subsidence, change from in situ density to compacted density, incidental loss, and all other factors changing density. Swell is the increase in class 12 excavation from ledge rock to broken rock in the fills. The swell factor will include other losses or increases.

SOILS CLASSIFICATION CRITERIA

Roadway and Borrow Excavation is divided into the following classifications:

Class 10

Includes all normal earth materials, such as loam, silt, gumbo, peat, clay, soft shale, sand, and gravel. Class 10 is subdivided into Unsuitable Soil and Suitable Soil.

UNSUITABLE SOIL - Use [Standard Road Plan RL-1B](#)

Slope Dressing Only

- Peat or muck
- Soils with Plasticity Index (P.I.) 35 or greater
- A-7-5 or A-5 having less than 1.35 Mg/m³ (85 pcf) AASHTO T-99 proctor density

Type C Disposal - Placed 1 m (3 feet) below top of subgrade in Fills

- All soils other than A-7-5 or A-5 having a AASHTO T-99 proctor density of 1.5 Mg/m³ (95 pcf) or less
- All soils other than A-7-5 or A-5 containing 3.0% or more carbon

Type B Disposal - 1.5 m (5 ft) below top of subgrade in fills

- A-7-6 (30 or greater)
- Residual clays (overlying bedrock) regardless of classification

Type A Disposal in Fills – 1.5 m (5 ft) below top of subgrade in fills but placed in alternate layers with Type C Unsuitable or Suitable Soil

- Shale
- A-7-5 or A-5 soils having a AASHTO T-99 proctor density greater than 1.35 Mg/m³ (86 pcf) but less than 1.5 Mg/m³ (95 pcf).

SUITABLE SOIL

- AASHTO T-99 Proctor Density of 1.5 Mg/m³ (95 pcf) or greater, and
- AASHTO M 145-91 Group index less than 30

Class 12

Includes granite, quartzite, chert, limestone, sandstone, hard shale and slate. Includes estimated or measured volumes of boulders.

Class 13

Commonly referred as "Unclassified Excavation." The contract documents will specify the limits for Class 13.

Select Soils

Must meet all criteria, except proctor, if proctor was not taken.

Cohesive Soil

- Must have 45% or less silt content
- Must have a proctor AASHTO (T-99) density of 1.75 Mg/m^3 (110 pcf) or greater
- A-6 or A-7-6 soils of glacial origin
- Must have a plasticity index (PI) of 10 or greater

Granular Soil

- Must have a proctor density of 1.75 Mg/m^3 (110 pcf) or greater
- Must have a combined silt and clay content of 15% or less (finer than 0.074 mm or #200 sieve)
- PI = 3 or less
- A-1, A-2, or A-3(0)

These are desired select soil criteria, but may be overridden by Office of Design (Soils Section) if soils meeting these requirements are not found within the project.

6.31 PEAT EXCAVATION

Office of Design uses two methods for peat removal. In both methods, it is required to de-water the excavated area during the placement of the granular blanket and the embankment.

Total Removal of Peat

In this method, the peat is removed entirely down to an identifiable soil layer. Soil sheets in the plans will identify the soil type found below the peat. If problems in identifying this soil class are encountered, the Office of Design (Soils Section) or the Office of Construction should be contacted for assistance.

Partial Removal of Peat

In areas where the peat is very deep, partial removal is designed with an overload specified to remove most of the settlement which will occur due to the remaining peat. The Office of Design (Soils Section) has calculated the stability of the area under the plan requirements; therefore, the plan should be explicitly followed to prevent possible failure.

To fill the excavated area below water, material with 85% or more sand may be placed without de-watering. Placement of material with less than 85% sand requires de-watering and Type A compaction.

6.32 ROCK EXCAVATION

Rock excavation is defined as excavation which cannot be made with equipment normally used for Class 10. Any excavation requiring ripping or blasting is considered rock excavation (Class 12). The soil sheets of the road plans are useful in determining the depth at which Class 12 excavation begins.

Because Class 12 excavation requires field judgment, overburden removal should begin near the centerline so the backslope can be adjusted to meet the design template in case the rock elevation is not uniform.

The backslope on rock excavation is usually 1/2:1 except where presplitting is indicated on the plans.

Presplitting is a multiphase blasting operation:

Phase 1: Drill holes into rock ledge

Phase 2: Detonate a "light" explosive charge to prefracture the ledge

Phase 3: Production blasting to remove material and develop a uniform rock face

Presplitting is a part of the Class 12 excavation quantity with the locations shown on the soil cross sections by the 1/4:1 slope. This work may also be tabulated on the "C" plan sheets.

Since Class 12 excavation is a measured item, elevations are required before and after rock excavation.

The "Blasters' Handbook", a good source of information about explosives, is available from:

International Society of Explosive Engineers
29100 Aurora Road
Cleveland, OH 44139
(Telephone 440-349-4004)

During design, shale is classified as Class 12 excavation. However, in many cases it can be moved in a manner normal to Class 10. Where shale can be handled in a manner normal to Class 10, the shale should be measured and paid for as Class 10. Shale cuts are usually benched and covered with topsoil in accordance with the plans. If unexpected shale is found, the shale should be covered with topsoil if possible.

Payment for "rock pick-up" during stabilizing crop seeding and fertilizing should be measured and paid for as Class 12. If Class 12 is not included as an item in the contract documents, the quantity should be paid for at 10 times the contract price of Class 10 excavation or embankment-in-place item.

6.33 USE OF AND PAYMENT FOR WATER USED FOR EXCAVATION AND EMBANKMENT

The placement of select backfill and special backfill both have moisture limit requirements. When either type of backfill is moisture deficient, water should be added and mixed into the backfill material prior to compaction. If water is added, and there is no contract item for water, then it should be paid for as extra work if in accordance with [Specification 2102.14E](#).

Furnishing and applying water will not be paid for separately when compaction with moisture or moisture and density control is specified.

For fugitive dust control, see [Construction Manual 2.12](#).

6.34 ALTERNATE BORROW AREAS AND CONTRACTOR FURNISHED BORROW

The contractor may submit to use an alternate borrow area in lieu of the designated borrow area(s). Also on some projects, the contract documents will require contractor furnished borrow. In both cases, the contractor is responsible for:

- Providing approved fill material by selecting a site (or sites) for each plan required soil type
- Obtaining all necessary environmental clearances and permits.
- Reviewing for impacts to, but not limited to the following:
 - A) Culturally sensitive sites or graves. (Refer to [Construction Manual 6.35](#). Contact information: Office of the State Archaeologist, 319-384-0735, to request an *Iowa Site File Search*)
 - B) Wetlands or “Waters of the U.S.”, including streams or stream banks below the “ordinary high water mark”, without an approved U.S. Army Corps of Engineers Section 404 Permit. (Refer to [Construction Manual Chapter 10](#). Contact information: US Army Corps of Engineers, 309-794-5057)
 - C) Threatened or endangered species. (Contact information: US Fish and Wildlife Service, 309-757-5800, or Iowa DNR, 515-281-8967)
 - D) Floodplains. (Contact information: Iowa DNR, 866-849-0321)
 - E) Sovereign lands. (Contact information: Iowa DNR, 515-281-8967)
 - F) Storm water discharge. (Refer to [Construction Manual Chapter 10](#). Contact information: Iowa DNR, 515-281-7017)

[Specification Section 2102.03, F. 2](#). requires the contractor to submit a plan to the Engineer for use of all alternate borrow areas or designated borrow areas intended to be used in a manner different from that shown in the contract documents. The plan should include subsurface and testing information plotted similarly to borrow “R” plan sheets used for design borrows and include surface elevation, thickness of layers, soil sample locations and soil classifications. The contractor shall also obtain and provide soil samples to the project engineer for verification testing by the Contracting Authority (verification testing to be completed at the discretion of the project engineer).

Assuming that the proposed alternate borrow site meets the design criteria for the intended soil type, that all archaeological/historical clearances have been obtained and that the plan site is not a mandatory borrow, an alternate borrow site may be approved as follows:

- If use of the alternate borrow site results in no change in quantities, the change may be executed as a mutual benefit change and plan quantity agreement.
- If the alternate borrow site results in significant savings, such as decreased amount of overhaul, this is to be executed as a Value Engineering Incentive Proposal.

Soil samples should also be provided by the Contractor for contractor furnished borrow material. This material shall be verified by the Contracting Authority for compliance with the soil type requirements. However, if the material is not placed under the proposed road, the project engineer may waive testing.

6.35 PRESERVATION OF CULTURAL RESOURCES

Cultural resources are the composite of archaeological and historical/architectural resources in an area. Examples of culture resources include burial grounds, bones (human or animal), Indian relics, etc.

The *Code of Iowa, Chapter 263B*, requires action be taken to insure that cultural resources are not damaged nor destroyed.

If a cultural site is discovered during construction, the contractor is required to temporarily discontinue work at the site. This is according to the Code of Iowa and to [Specification 2102.03, J](#). Upon discovering such a site, the project engineer shall notify the Office of Location and Environment (515-239-1225) and the Office of Construction (515-239-1352) of the finding. *Iowa Department of Transportation Policy and Procedure 500.17* outlines the procedures to follow.

Alternate Borrow Areas and Contractor Furnished Borrow

The contractor is required to comply with [Specification 1106.07](#), which includes reviewing for impacts to culturally sensitive sites or graves. For most contractors to comply with this, they will need to contact the Office of the State Archaeologist (OSA), who will review the database of cultural resources. There is a nominal fee for OSA's review. This expense is the contractor's responsibility.