

Common Problems and Claim Threats Checklist

Below is a list of common problems and claim threats that you might encounter on an excavation project.

Note that some specifications described in the following content may not be the same as the specifications followed by your agency. Always check with your State agency's standards and specifications when using these guidelines.

Sections

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- Seepage/Shallow Water
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- Quantities Dispute
- Unstable Foundations
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- Unexpected Changes in Soil Types
- Shrink/Swell

Interpretation of Plans, Specifications, and Provisions

- Plans or special provisions may be misinterpreted
- Review the project documents thoroughly before the project starts
 - Bring up any questions during the preconstruction conference

Improper Equipment

- The contractor may select improper equipment for the type of work, such as selecting equipment too big or small, track type instead of tire (or vice versa), or equipment not suited for the material type or haul distance
- If this occurs, you must remember it is not the inspector's role to direct the contractor's work
- The right tool is required for the contractor to efficiently complete the job

Moisture Content of Soils

- You may encounter moisture content variance depending on location, topography, soil type, climate, and depth of excavation
- Proper moisture content and uniformity of moisture is essential to fill placement
- If material is too wet or too dry, it will require moisture conditioning
 - Too dry: Watering via trucks and mixing into soil – disking
 - Too wet: Disking, ripping, blading, blending, sun, and wind

Difficult Excavation

- ❑ **The contractor may have difficulty excavating certain types of material**
- ❑ **The following are a few problems that could be encountered:**
 - Saturated soils or high water table
 - May require the use of pumps, dewatering wells, and specialized equipment to excavate
 - Excavation and hauling equipment may get stuck
 - Materials may be too wet to be economical to use as fill
 - Sloughing materials
 - May cause the side slopes of an excavation to ravel or be unstable
 - Soft, wet soils
 - May cause equipment to get stuck
 - Presence of rock
 - May require special equipment and techniques, especially when not anticipated

Unsuitable Materials

- ❑ **Soils not suitable for embankment construction may be discovered during the excavation process**
- ❑ **Organic soils and peat are weak, absorb large amounts of water, and are highly compressible**
- ❑ **High plastic soils are often not allowed for embankment or subgrade construction because they are highly expansive and prone to slope failures**

- Rubble fill consisting of bricks, glass, concrete, and other materials from old waste sites is not allowed for fill placement and must be disposed of at an approved location, depending on local and State regulations
- Even if these unsuitable materials are shown in the plans, they are often difficult to quantify
- The areal extent and depth may be different than that was assumed in the plans
- Resultant change order will be required depending on actual site quantities and if the unsuitable materials were actually shown in the plans

Seepage/Shallow Water

- The contractor may have difficulty excavating certain types of material with seepage and/or shallow water
 - Saturated soils or high water table
 - May require the use of pumps, dewatering wells, and/or specialized equipment to excavate
 - Excavation and hauling equipment may get stuck
 - Materials may be too wet to be economical to use as fill
 - Soft, wet soils
 - May cause equipment to get stuck

Frozen Soil

- Frozen soils are more difficult to excavate and render proofrolling operations ineffective for identifying subgrades that may be otherwise soft
- Fill placement operations are also problematic

- In a frozen state, the water that naturally exists within soils solidifies and bonds soil particles together
- This prevents the soil from breaking down and acting as individual soil particles as they would under more temperate conditions
- When water is in a fluid state, it acts as a lubricant between soil particles and assists in the compaction process
- In addition, ice occupies more space or volume than fluid water, which means that compacted frozen soil would unavoidably become less dense (softer or looser) after thawing, defeating the purpose of compaction
- Therefore, proofrolling and compaction operations should not be attempted when soils are frozen

Improper Site Drainage

- Improper site drainage:**
 - Can lead to ponding
 - Can cause erosion of site, siltation
 - Results in unnecessary clean up
 - Increases moisture content of excavated soils
- Ditches are designed to collect surface runoff that would otherwise flow down the slope and into the excavation**
- This water could cause serious erosion as well as problems with slope stability**
- It will also saturate material to be excavated causing future compaction problems when material is placed in a fill**
- Delaying ditch work could create drainage problems**
- The working surface should be crowned and shaped to ensure proper drainage should it rain overnight**

- Drainage will then be directed to the edges of the fill and into the ditches

Unstable Slopes

- It is often left up to the contractor to determine the appropriate slope geometry of an excavation based on soil type and depth of excavation
- Too steep of a slope can lead to raveling of material and even wall excavation failure
- For excavation on the right-of-way, it is important for the engineer to determine and provide the material type information ahead of time, however, this does not always happen
- Collapse can be a dangerous to personnel involved in the excavation
- It also means that the slope will require reconstruction
- Sloughing and failure may affect property outside of the excavation limits

Dispute Over Quantities

- It is common for the contractor and engineer to disagree on excavation quantities
- Disagreements usually depend on the quantity item
- Is the quantity measured by surveying (preliminary and final) or by in-place materials?
- If measured by survey:
 - May be mistakes on initial or final survey
 - Initial or final cross-sections of excavation may involve difficult terrain

- If measured by in-place quantity:**
 - The correct shrink/swell factors may not have been used (more on this later)

Unstable Foundations

- The planned depth of an excavation may bottom out in material that is soft, wet, or unstable**
- This can be expected at culvert locations, bottom land, and waterway areas that have saturated or weak soils present**
- Some sort of stabilization, such as the following, may be required in instances of unstable foundations:**
 - Over-excavation of soft materials and replacement with controlled/structural fill
 - Mechanical stabilization – use of crushed rock, geogrids, fabric, or a combination of these
 - Chemical stabilization – such as a chemical agent (fly ash, lime)
 - Installation of drainage – ditches, drain tile

Contaminated Soils/Hazardous Materials

- During the development of the project plans, it may be determined that these contaminated soils or hazardous materials are expected to be encountered**
- If so, quantities of excavation of material and disposal are often estimated, but may be incorrect due to the difficulty in defining a contaminated area**
- Costs associated with abiding by State and Federal regulations involved can be quite high**

- Costs can add up quickly and include hauling and disposal site, special materials testing, and disposal fees**
- During excavation, you may encounter unexpected waste materials that could vary from garbage dumps to chemically contaminated material**
- If hazardous material is uncovered, the contractor should not transport material until a complete environmental assessment can be made**
- There are severe criminal and civil penalties if hazardous or contaminated materials are knowingly transported without proper permits, notifications, and safeguards**

Unexpected Changes in Soil Types

- A geotechnical investigation tries to identify material types present for proposed excavations for the contractor's information**
- A contractor may bid excavation and placement based on the equipment and man-hours he or she estimates will be needed based on the material types presented in the plans**
- If material types differ, the contractor may have to change methods and equipment, which can result in claims**

Shrink/Swell

- To better understand the concept of shrink/swell of soil for the process of excavation to placement of fill, we need some definitions. Such as:**
 - **Bank Measure (or Bank Volume) – The volume of earth material in its in-ground natural state**
 - **Loose Measure (or Loose Volume) – The volume of earth material that is excavated and transported (via dump truck, scraper, or other)**

— Compacted Measure (or Compacted Volume) – The volume of earth material after it is compacted

- ❑ **Swell is when excavated earth materials increase in volume from its natural state to its loose state**

— $\text{Swell} = V_l = \left(\frac{100\% + \% \text{ Swell}}{100\%} \right) \times V_b$

— Where V_l = Volume Loose; and V_b = Volume Bank

- ❑ **Shrinkage is decrease in volume of earth materials from its natural state to its compacted state**

— $\text{Shrinkage} = V_c = \left(\frac{100\% - \% \text{ Shrinkage}}{100\%} \right) \times V_b$

— Where V_c = Volume Compacted; and V_b = Volume Bank

- ❑ **Disagreement on the amount of swell or shrinkage can result in claims**