Featured Technical Topic Summary
FGI Monthly Members Meeting
Friday, December 1, 2023

TOPIC: Discussion of Subtitle D

Each month Tim Stark introduces a new technical topic for discussion and possible action. This month's topic is: "**Discussion of Subtitle D**". This topic generated significant discussion with the main "take-aways" being listed below:

1. **Discussion Topics for Subtitle D**
   - Subtitle D became effective in the late 1990s and thus is over thirty years old
   - Subtitle D is followed in Canada but some of Europe has more stringent requirements than Subtitle D, e.g., Germany
   - A discussion of Subtitle D was convened to identify various requirements that might be clarified or updated
   - States can implement their own requirements if they are equally or more stringent than Subtitle D, i.e., Federal = minimum level – states can have different requirements, e.g., CA, PA, NY
   - As a result, clarifications and/or modifications can be initiated at the state level
   - Only major change in Subtitle D since its promulgation is inclusion of: Project XL Bioreactor Landfill Projects as a research and development initiative

   - First requirement discussed involved the Flexible Membrane Liner component of a composite liner system – under "Design Criteria", the requirement is: "the upper component must consist of a minimum 30-mil flexible membrane liner (FML)." FML components consisting of high density polyethylene (HDPE) shall be at least 60-mil thick. The FML component must be installed in direct and uniform contact with the compacted soil component."
     Some of the suggestions for clarification and/or updating of this requirement include:
     - Replace 60 mil HDPE with at least 40 mil thick unreinforced or reinforced LLDPE b/c better dimensional stability, i.e., "direct and uniform contact"
     - Change requirement to be engineering property based instead of polymer and thickness based, e.g., make FML requirement to be a performance specification like compacted soil component, i.e., saturated hydraulic conductivity "of no more than $1x10^{-7}$ cm/sec"
     - Main advantage of HDPE = chemical resistance so require FML performance based on 9090 US EPA testing - immersion test with SW846 - https://www.epa.gov/hw-sw846/sw-846-test-method-9090a-compatibility-test-wastes-and-membrane-liners - Use landfill gas condensate for 9090 testing because more aggressive than bottom leachate
     - Can use different types of FMLs for the primary and secondary composite liner systems, e.g., 60 mil HDPE or 40 mil LLDPE for primary liner system and 30 mil or 40 mil thick FML (PVC, EIA, PP, LLDPE, WCPE, etc.) for secondary liner system

   - Second requirement discussed involves Seismic impact zone
     - Seismic impact zone is area with peak horizontal ground acceleration of 0.1g or greater with a 2% probability of exceedance in 50 years ~ 10% in 250 years (OH and MI) –
     - Seismic impact zone designation is important because it increases cost by needing to increase stability to resist the seismic loading
     - All of Ohio $\geq$ 0.1g so seismic impact zone but in current map only some of Ohio is a seismic impact zone

- Subtitle D requires use of old map so could be changed to allow current USGS map, e.g., new CCR Disposal Rules allow use of new USGS map – Ohio handles this be allowing slope stability to use current map – currently State by State determination of which map should be used
- Could be updated to consider difference b/t east and west coast earthquakes –
- Earthquake magnitude and acceleration usually increases with time, so Ohio only requires seismic slope stability and design for new unit or expansion, i.e., do not have to re-evaluate prior cells and facilities even if earthquake magnitude increases after initial permit.

- Third requirement discussed involves Subtitle F – Closure and Caps
  - Cover requirement = ? Can you only use a GM or CSL?
  - Subtitle D = composite bottom liner means composite cap because cap must be equivalent or better than bottom liner system so can use only CSL if bottom liner system is only CSL
  - More facilities delaying cap and fill additional waste after settlement occurs
  - Consider impact of high landfill temperatures on GM longevity in cap and bottom liner systems – in Ohio most elevated temperature landfills (ETLFs) are operating so no cap experiencing heat now –
  - Consider new High Temperature GMs ~ 170F = max temperature for cover system because even six months of exposure can decrease GM durability significantly
  - Magnitude of elevated temperatures at bottom liner still not known so hard to determine GM durability

- Agreed to create a "Subtitle D and CCR Subcommittee" to identify various requirements that might be clarified or updated – initial committee members are: Duff Simbeck, Brian Fraser, Mark Sierake(Tim to invite), Annette DeHavilland, Margie Ring, and Ed Silva
  - Subcommittee to identify performance factors, FoS=surface impoundments, seismic impact zone acceleration, GM thickness = 30 mil and 60 mil, allowable permanent deformations, e.g., Ohio requires deep-seated seismic permanent deformation $\leq$ 6" (15 cm), shallow seated seismic permanent deformation $\leq$ 12" (30 cm)