

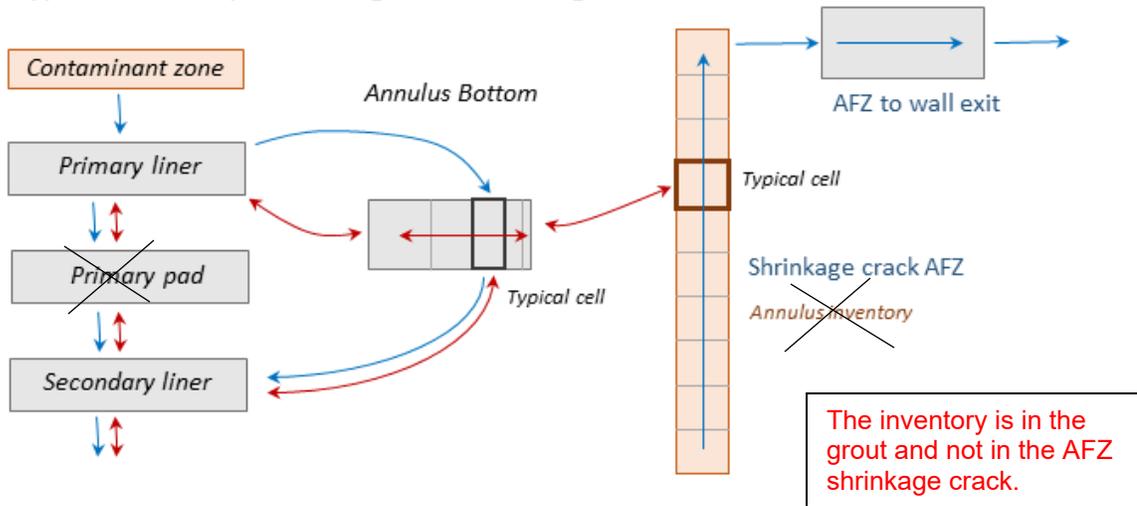
Questions regarding the GoldSim HTF Alternative Fast Zone (AFZ) Simulations
(Responses are provided in red text)

- For Type I tanks with a shrinkage crack AFZ.
 - The GoldSim model appears to load all annulus inventory into the AFZ cells. Please confirm that this understanding is correct or describe the correct model.
 - The annulus model appears to represent radial diffusion from the primary liner to the AFZ cells using AnnulusBottom_AFZ (which appears to also initially have all of the annulus inventory). Please confirm that this understanding is correct or describe the correct model.
 - Each cell in the annulus model appears to receive flow from the primary liner cell and lose the same flow to the secondary liner cell. Please confirm that this understanding is correct or describe the correct model. If this is the correct understanding, please explain the rationale for applying flow passing from the tank to annulus cells.
 - The “AnnulusBottom” represents the base of the annulus grout. The inventory is loaded in the grout and not in the AFZ crack.
 - There are 5 radial cells, which allow primary inventory to diffuse outwards.
 - The AFZ is between the outer radial shell of the annulus bottom and the inner perimeter of the vertical wall of the secondary liner. The AFZ allows clean water to flow from a joint at the upgradient cell and contaminated water to flow out from a joint at the downgradient cell.
 - There are different options for running the AFZ case. For example, AFZ option 2 zeros out the inventory. AFZ option 4 allows radial diffusion between the annulus bottom and the AFZ.
 - The sand pads are turned off for Type I tanks (no grout pad between the primary and secondary liners is simulated) and so the vertical flow downwards is through the primary liner and then to the secondary liner.
- For Type II tanks
 - The GoldSim model appears to load all primary sand layer inventory into the AFZ cells. Please confirm that this understanding is correct or describe the correct model.
 - The GoldSim model appears to load all secondary sand layer inventory into the secondary sand layer cell. Please confirm that this understanding is correct or describe the correct model.

- The annulus representation appears to consist of the AnnulusModel and AnnulusBottom_ctn (which initially has none of the annulus inventory set because of the switch noAFZ). Also, what does ctn stand for?
 - The annulus is not activated in the AFZ case (the set of cells to the left in the lower portion of the figure below for Type II tanks is not activated).
 - The primary sand pad is not activated in Type II tanks for the AFZ case.
 - The part of the AFZ representing the primary sand pad consists of 10 cells under the primary liner.
 - The part of the AFZ representing the annulus is represented by two cells, one upstream of the first primary sand pad AFZ cell and one downstream of the last primary sand pad AFZ cell.
 - The annulus inventory is located in the two AFZ cells representing the annulus, and the sand pad inventory is loaded in the inner sand layer AFZ cells (10 inner cells).
 - There is no diffusive path from the primary waste to the sand layer AFZ cells (there is only advection). This is different from the Type I tanks which allow diffusion of waste from the primary to the sand layer AFZ cells. Department of Energy (DOE) contractors indicate that numerical dispersion accounts for any diffusion from the primary liner to the sand layer AFZ.
 - The initials “ctn” stand for container.
- For all AFZ tank types
 - Please explain why diffusion from the primary tank Contaminated Zone (CZ) to other domains (e.g., the primary liner cell) is not included in the GoldSim model (e.g., diffusion could be an important transport mechanism early on in the simulation period).
 - Please clarify which of the AnnulusModel, AnnulusBottom_AFZ, and AnnulusBottom_ctn domains in the TypeI_II_AdditionalStructures structure are used for each of the AFZ simulations reported in the 2016 HTF special analysis, and what the conceptual model is for each domain.
 - Please summarize how the initial annulus inventory is represented for each of the AFZ simulations reported in the 2016 HTF special analysis.
 - Please explain the switches that must be set for running each of the AFZ simulations reported in the 2016 HTF special analysis.

- Please clarify the roles of the transport model pathways with `_ff`, `_np`, and `_npw` subscripts, and identify which pathways are enabled in the AFZ simulations reported in the 2016 HTF special analysis.
 - There is no diffusion from the secondary sand pad back up to the AFZ cells.
 - The initials “ff” stands for fast flow, “np” stands for non-porous, and “npw” stands for non-porous wall. The non-porous cell volume is not used to count the number of pore volumes and time to chemical transition.
- Could DOE provide model file(s) with the AFZ simulated (one file each for Type I and II tanks)?
 - DOE will provide an example AFZ simulation for Type I tanks 9 and 12, and Type II tanks 16 and 13 (one each of Type I and II tanks with and without initially failed liners).

Type I tank transport routing with a shrinkage crack AFZ



Type II tank transport routing with a sand layer AFZ

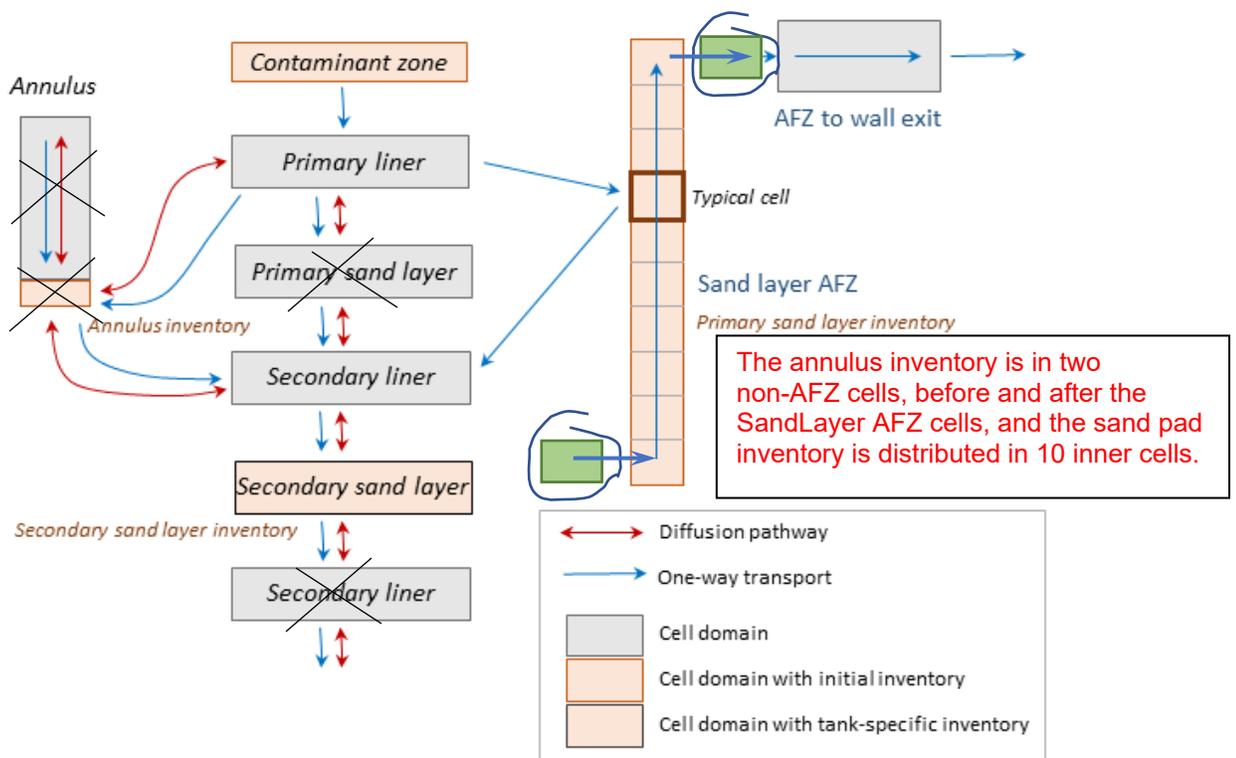


Figure. Simplified representation of the GoldSim transport model implementation exchanges between initial inventory and the AFZ for Type I and II tanks; for simplicity, alternative flow paths are merged, and bypass flow paths are omitted. The Type I tank model (top) augments the annulus domain into a sequence of cells to represent radial flow through the annulus. The Type II tank model (bottom) adds a separate AFZ domain consisting of a series of cells to represent lateral flow through the primary sand pad and across the annulus. Initial inventories are tank specific. Liner cells are used to organize flow paths. **Annotations are included in the figure (e.g., show cells that are turned off or mislabeled in the model (marked with an "X") and circles showing where the annulus inventory is loaded in the Type II annulus).**