

# BOOLEAN OPERATIONS

## Objective:

To illustrate the use of boolean operations in the representation of a designed landscape condition. The example will use both the subtraction and intersection functions to model the pool structures as seen in the project example by Peter Walker and Partners. Keep in mind, layer and object management is integral to success.

## Inputs:

Parametric Solid Objects – on unique layers according to type or function.  
1 Solid Plinth – extruded rectangle (ground plane).  
3 Solid Cylinders – geometric primitive (pool volume).  
3 Smaller Cylinders – geometric primitives (water volume).

## Overview:

This process has three parts.

Part 1: Subtract the pool volume from the ground plane

**[designed ground plane = ground plane – pool volume]**

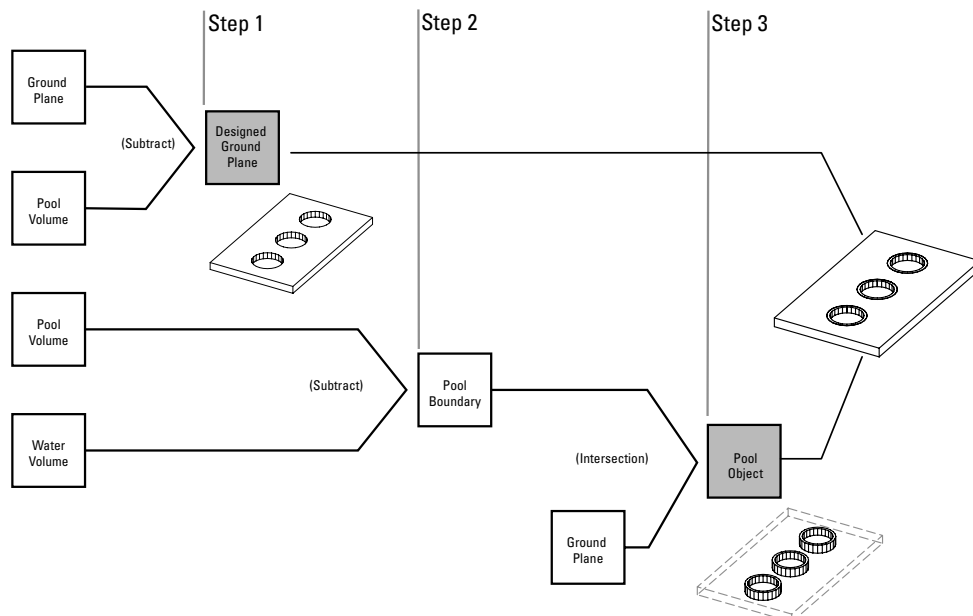
Part 2: Subtract the water volume from the pool volume in order to determine the edge and boundary material of the pool. **[pool boundary = pool volume – water volume]**

Part 3: Find the intersection between the ground plane and the pool objects so that the pool objects will be flush with the ground plane. **[Pool Object = Intersection (ground plane, pool boundary)]**

## Results:

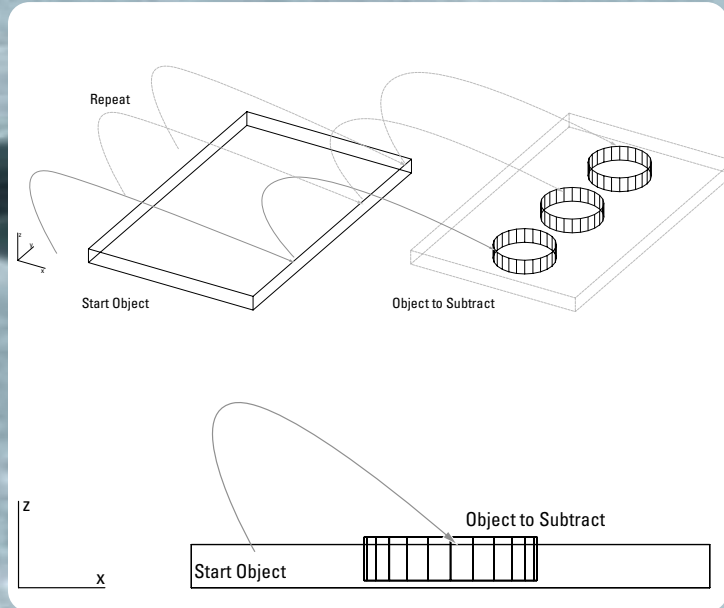
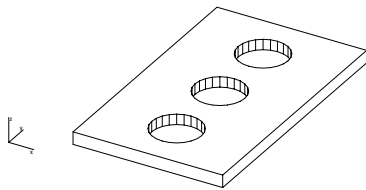
1 Solid rectilinear object with pool volume as void (designed ground plane)

3 Solid cylinders with water volume as void (pool object)



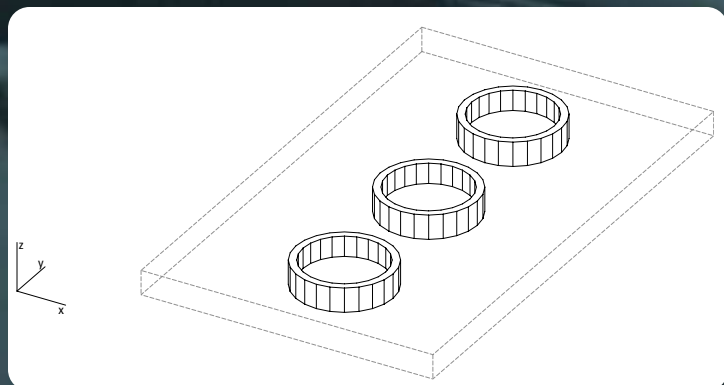
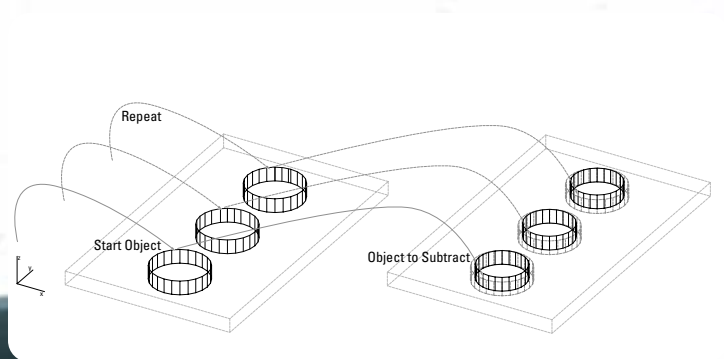
## Part 1: [Designed Object = Ground Plane – Pool Volume]

1. Invoke the "subtraction" command.
  2. Select the object that you want to subtract from – the ground plane.
  3. Select the object that you want to subtract – the pool volume.
  4. Repeat for the remaining pool volumes.
- Result = Designed ground plane.

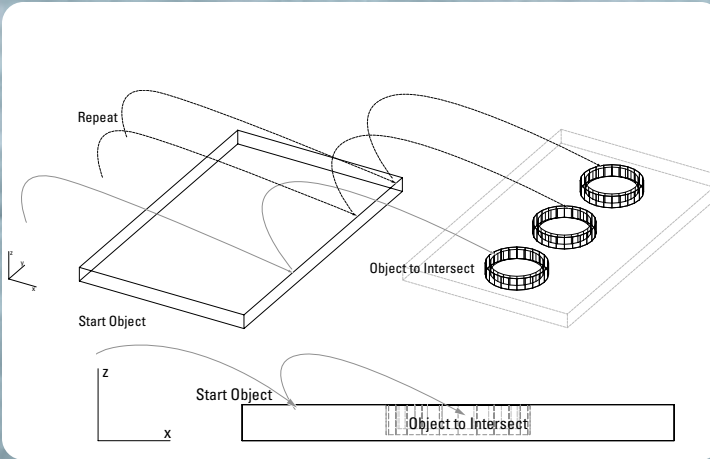


## Part 2: [Pool Boundary = Pool volume – Water Volume]

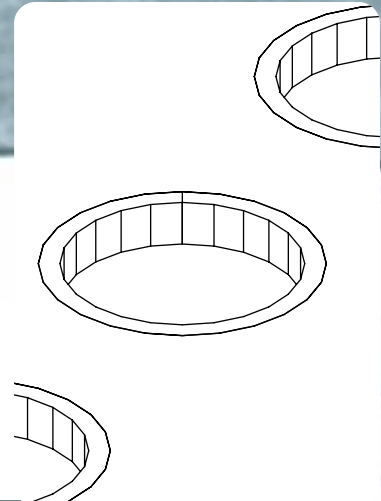
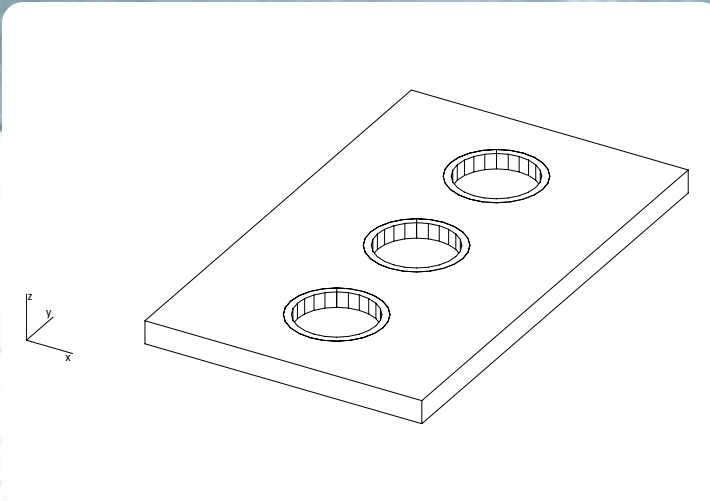
1. Turn off the "Designed object layer."
  2. Define a new layer called "pool boundary" and make it the current or active layer.
  3. Invoke the "subtraction" command.
  4. Select the object that you want to subtract from – the pool volume object.
  5. Select the object that you want to subtract – the water volume object.
  6. Repeat for the remaining pools.
- Result = Pool boundaries.



### Part 3: [Pool Object = Intersection (Ground Plane, Pool Boundary)]



1. Define a new layer called "pool object" and make it the current or active layer.
2. Invoke the Intersection command.
3. Select the "start" object – the ground plane.
4. Select the object that you want to intersect with the ground plane – the pool boundary.
5. Repeat for remaining pools. Result = Pool objects.



#### TECHNICAL NOTE: BOOLEAN OPERATIONS

The solid resulting from some boolean operations (especially subtraction and intersection) sometimes can no longer be represented by simple contours or surface model, and may be represented internally in a unique format, so it may not be transportable between one software package and another. Also, some boolean operations may generate "ill-formed" solids in which all surface normal vectors have not been computed, or may be incorrect, etc. Often some cleanup operation must be applied to solids generated from boolean or other combinatorial operations to correct these defects before they can be reliably rendered.