Final Report: Sedimentation Tank Updates

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Part 1: Problem Definition

Introduction

This semester, the Sedimentation Tank design script will be updated to include the most recent changes in the design of the Sedimentation Tank. This will provide the most accurate representation of the plant to anyone building the plants as well as those requesting designs of plants. First, the function for the floor and pipes in the Inlet Channel will be changed that so the pipes appear in the right position and the floor is angled correctly. Second, the Outlet Channel will be updated that so the width of the Exit Channel will be wide enough to fit the Outlet Pipe that leads to the Stacked Rapid Sand Filter. Finally, there will be a drain pipe added to the Exit Channel of the Sedimentation Tank.

Design Details

Each new Sedimentation Tank Design update mentioned above will be incorporated into the Sedimentation Tank MathCAD file. This summer, Serena and Meghan worked on angling the floor of the Sedimentation Tank Inlet Channel. The AutoCAD drawings were looking fine for a while until the fall semester began, when the AutoCAD drawings were no longer the correct design. This problem was a result of the unclear specifications of origins. In order to fix this issue,the original logic that was used to determine the origin was reviewed. Then, the Exit Channel was changed to be wider in order to accommodate for the larger Outlet Pipes. Finally, a drain system was added to the Exit Channel by examining the MathCAD code that created the Inlet Channel Drain Pipe system.

Part 2: Documented Progress

Achievements

10/6/14

The plumbing and the angling of the Inlet Channel floor was corrected. After reevaluating the distance between all of the pipes in the Inlet Channel, it was determined that the width of one Sedimentation Tank was incorrect. It was made clear that the width of the Sedimentation Tank was actually W.SedBay, so this was corrected in the origin specification of the concrete wedge that is removed from the Inlet Channel Floor. Please see Figure 1 below. This also changed the location of pipes in the Inlet Channel, automatically correcting the location of the Floc Hopper Viewer and Inlet Manifold plumbing. Now all of the pipes are placed on a flat surface that connects to the angled floor. Please see Figure 2 below. There was originally another issue with the Inlet Manifold plumbing but after referencing only the specific files needed rather than EtFlocSedFi in the MathCAD Sedimentation Tank design file, these errors were corrected automatically.

Figure 1: Inlet Channel AngleInletFloor Function

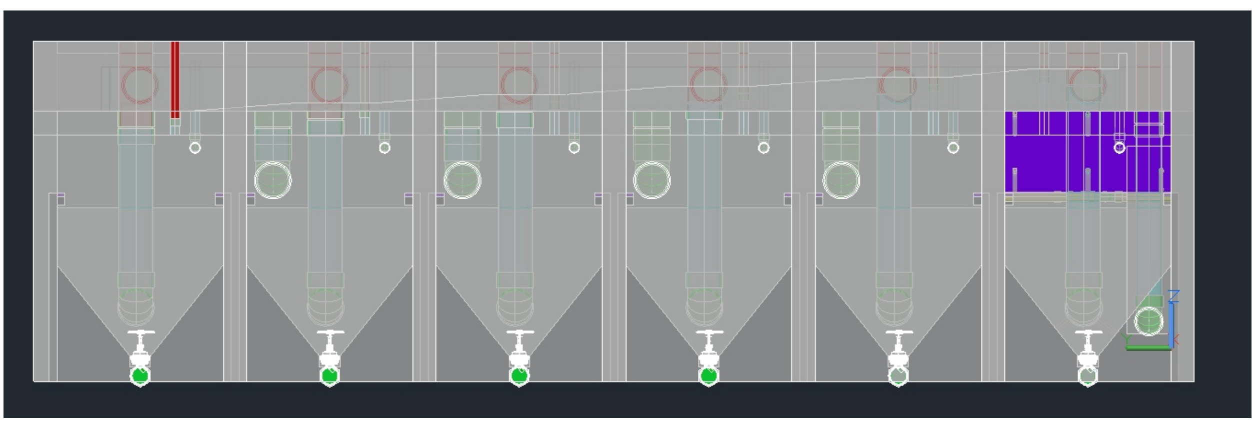


Figure 2: Inlet Channel With Angled Floor and Correct Pipe Placement

10/22/14

In order to add an image of the Sedimentation Tank with the important origins labeled, the team learned how to label origin points. Please see Figure 3 below. An AutoCAD drawing of the Sedimentation Tank was edited in AutoCAD using the “Multileader” function. This function allows the user to draw an arrow and caption the arrow. In this process, it was important to change the view of the AutoCAD drawing that so it was along the X, Y, and Z axis in order to accurately point to the correct origin point.

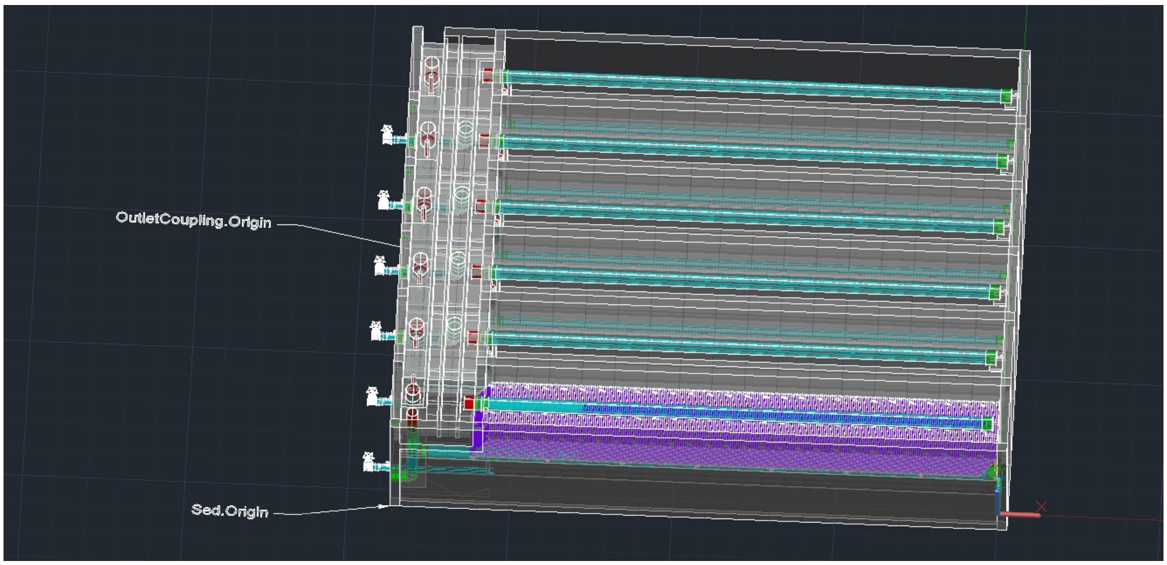


Figure 3: Two Origins in the Sedimentation Tank Labeled

11/2/14

The Exit Channel in The Sedimentation Tank was changed to be wide enough for the Outlet Pipes to fit comfortably. Please see Figures 4 and 5 below. This change was made by adding 2 S.Fittings to the width of the Exit Channel, which is defined as W.SedExitChannelPostWeir. For a 50L/s flow rate, this increases the width of the Exit Channel from 0.237m to 0.337m. Please see Figure 6 below**.** Then, to recenter the Vertical Outlet Pipes, Couplings, and Elbows, one S.Fitting was added to the origin in the X direction. Please see Figure 7 below. Finally, to compensate for the recentering of the vertical Outlet Pipes, the horizontal Outlet Pipes were lengthened by one S.Fitting. Please see Figure 8 below.

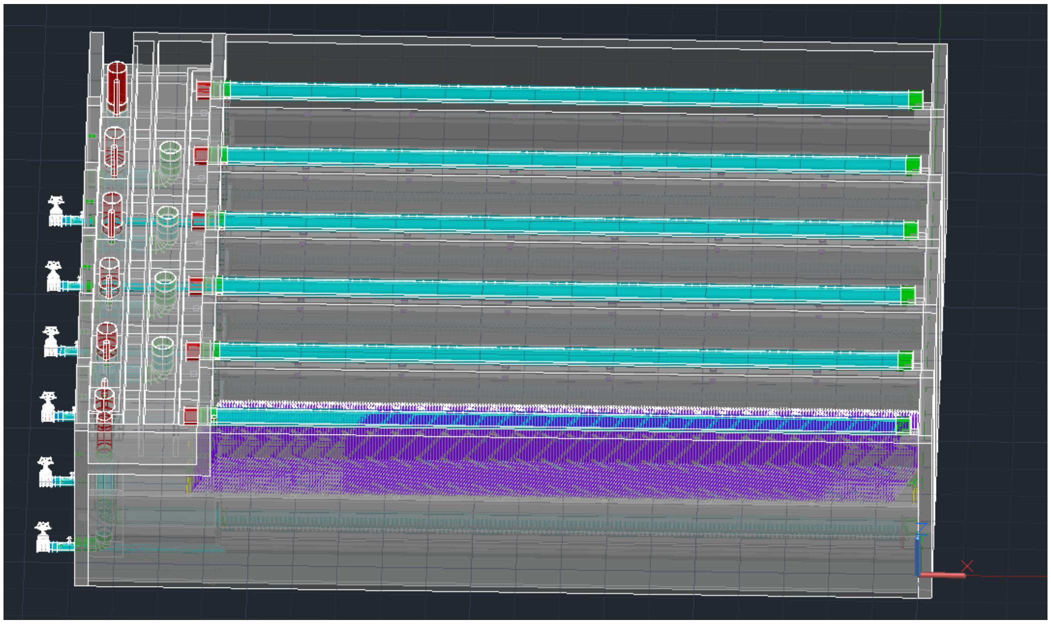


Figure 4: Sedimentation Tank Exit Channel AutoCAD Drawing with Outlet Pipes that Fit

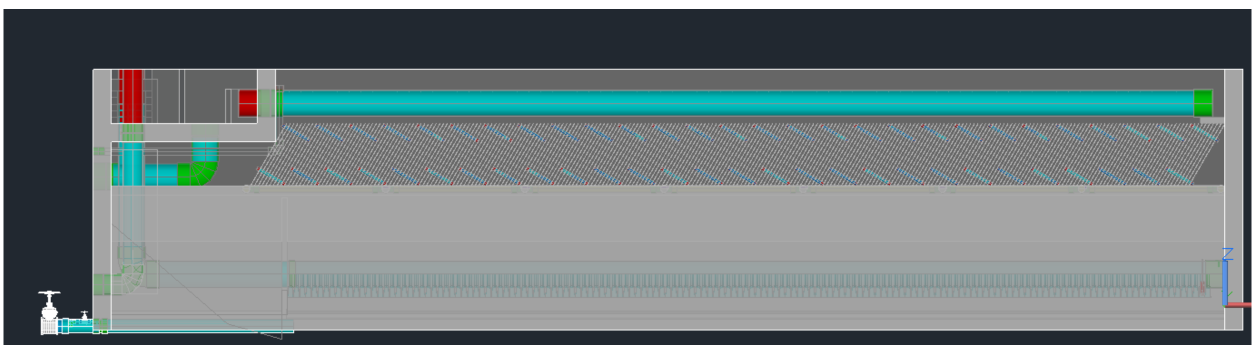


Figure 5: Sedimentation Tank Exit Channel AutoCAD Drawing Left View

Figure 6: Sedimentation Tank MathCAD Definition for W.SedExitChannelPostWeir

$$SedOutletCoupling1_{Origin}(N) := \begin{bmatrix} \left(Plant_{Origin_0} - L_{Sed} + W_{SedInletChannel} + T_{SedWeir} + ConRadius\left(ND_{FiEntrancePipe}\right)\right) + S_{Fitting} \\ Plant_{Origin_1} - T_{PlantWall} + \left(W_{SedBay} \cdot N_{SedBays} + T_{SedWallDivider}\right) \cdot N_{SedTanks} - ConRadius\left(ND_{FiEntrancePipe}\right) - S_{Fitting} - (N-1)W_{SedBay} - T_{PlantWall} \cdot \left(floor\left(\frac{N-1}{N_{SedBays}}\right)\right) \\ Z_{SedChannelBottom} - SocketDepth\left(ND_{FiEntrancePipe}\right) \end{bmatrix}$$

Figure 7: Sedimentation Tank MathCAD Definition for Outlet Plumbing Origins

```
SedOutletHorizPipeScript := | Local ← SelectSedPipes
                            | for i ∈ 1 + MoveOutletDown .. 2N_FiEntrancePipes + MoveOutletDown
                            |   | OutletPipe ← PipeSUBF[SedOutletHorizPipe_Origin(i), SedCutletElbow_Origin(i)_0 − ElbowRadius(ND_FiEntrancePipe) − (Plant_Origin_0 − T_PlantWall − L_Sed + CouplingLength(ND_FiEntrancePipe) − SocketDepth(ND_FiEntrancePipe) + S_Fitting), (0 0)deg, ND_FiEntrancePipe, PS_Default, ("SedTankCon")]
                            |   | Local ← stack(Local, OutletPipe)
                            | Local ← stack(Local, SedPipeFrz)
                            | return Local
```

Figure 8: Sedimentation Thank MathCAD function to draw Horizontal Outlet Pipes

11/20/14

There was a need for a drain pipe in the Exit Channel of the Sedimentation Tank so an extra pipe was added to the Exit Channel that connects to the Drain Pipe from the Inlet Channel. Please see Figure 9 below. The origins for the Exit Channel Drain Pipes were taken from the origins of the Inlet Channel Drain Pipe origins. At first, the length of the Exit Channel Vertical Drain Pipe was taken from the original Inlet Channel Vertical Drain Pipe. However, the Inlet Channel Drain Tee needed to connect the Inlet Channel Vertical Drain Pipe to the Exit Channel Horizontal Drain Pipe was larger than expected. Inconveniently, the short tee length of the Inlet Channel Drain Tee was larger than the elbow radius of elbow that was originally attached to the Inlet Channel Vertical Drain Pipe. Thus, the Inlet Channel Vertical Drain Pipe needed to be shortened to compensate for the long short tee length of the Inlet Channel Drain Tee. Please see Figure 10 below. Also, because the Inlet Channel Drain Tee was so large, it was actually sticking into the Sedimentation Tank Wall. So, the original Inlet Channel Drain Horizontal Coupling was removed and the Inlet Channel Horizontal Drain Pipe was instead, extended to reach the end of the Sedimentation Tank Wall. Please see Figure 11 below. The length of the Exit Channel Vertical Drain Pipe and the Exit Channel Horizontal Drain Pipe were determined by new origins of the Inlet Channel Drain Pipes. Please see Figure 12 below. The Exit Channel Drain Couplings were drawn using the origins determined by Exit Channel Vertical Drain Pipes and the Inlet Channel Drain Coupling origins. Please see Figure 13 below.

$$W_{SedExitChannelPostWeir} := \max\left[2S_{Fitting} + 2\cdot ConRadius\left(ND_{FiEntrancePipe}\right)\cdot\left(N_{FiEntrancePipes} > 1\right), W_{ChannelMin}, W_{HorizChannel}\left(Q_{Train}, H_{SedWeirInlet}, HL_{ChannelMax}, L_{SedChannel} - \frac{W_{SedBay}}{2}, Nu_{Water}, E_{Concrete}, 1\right)\right] = 0.337\,m$$

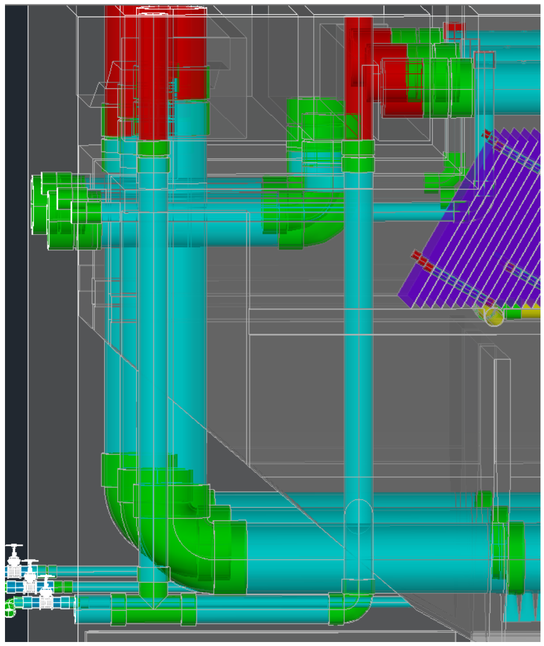


Figure 9: AutoCAD Drawing of the Sedimentation Tank Inlet and Exit Channel Drain System

Origins and Dimensions

$$SedIChannelDrainVertCoupling_{Origin} := \begin{pmatrix} Plant_{Origin_0} - L_{Sed} - T_{PlantWall} + \max(T_{PlantWall}, CouplingLength(ND_{SedInletChannelDrain})) + SocketDepth(ND_{SedInletChannelDrain}) + ElbowRadius(ND_{SedInletChannelDrain}) \\ Plant_{Origin_1} + S_{Fitting} + ConRadius(ND_{SedInletChannelDrain}) \\ Plant_{Origin_2} + Z_{SedChannelBottom} - CouplingLength(ND_{SedInletChannelDrain}) + SocketDepth(ND_{SedInletChannelDrain}) \end{pmatrix}$$

$$L_{SedIChannelVertPipe} := Z_{SedChannelBottom} - CouplingLength(ND_{SedInletChannelDrain}) - ShortTeeLength(ND_{SedInletChannelDrain}) - ConRadius(ND_{SedInletChannelDrain}) = 1.315\,m$$

$$L_{SedIChannelHorizPipe} := SedIChannelDrainVertCoupling_{Origin_0} - \left(Plant_{Origin_0} - L_{Sed} - T_{PlantWall}\right) - \frac{TeeLength(ND_{SedInletChannelDrain})}{2} = 0.157\,m$$

$$SedIChannelDrainHorizCoupling_{Origin} := \begin{pmatrix} Plant_{Origin_0} - T_{PlantWall} - SocketDepth(ND_{SedExitChannelDrain}) - L_{Sed} + CouplingLength(ND_{SedExitChannelDrain}) \\ SedIChannelDrainVertCoupling_{Origin_1} \\ SedIChannelDrainVertCoupling_{Origin_2} - L_{SedIChannelVertPipe} - ElbowRadius(ND_{SedExitChannelDrain}) \end{pmatrix}$$

Inlet Channel Drain Fittings

$$SedIChannelDrainVertCoupling := CouplingSUBF\left[SedIChannelDrainVertCoupling_{Origin}, \begin{pmatrix} 0 \\ 90 \\ 0 \end{pmatrix} deg, ND_{SedInletChannelDrain}, PS_{Default}, (\text{"SedTankCon"})\right]$$

$$SedIChannelDrainTee := TeeSUBF\left[SedIChannelDrainVertCoupling_{Origin} + \begin{pmatrix} 0m \\ 0m \\ -L_{SedIChannelVertPipe} \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 90 \end{pmatrix} deg, ND_{SedInletChannelDrain}, PS_{Default}, (\text{"SedTankCon"})\right]$$

$$-(ElbowRadius(ND_{SedInletChannelDrain}) + ShortTeeLength(ND_{SedInletChannelDrain})) = -0.133\,m$$

Figure 10: MathCAD Definition of Inlet Channel Drain Plumbing Lengths and Origins

Inlet Channel Drain Pipes

$$\text{SedIChannelDrainHorizPipe} := \text{PipeSUBF}\left[\text{SedIChannelDrainVertCoupling}_{\text{Origin}} + \begin{bmatrix} -\left(\frac{\text{TeeLength}(\text{ND}_{\text{SedInletChannelDrain}})}{2}\right) \\ 0 \\ -\text{L}_{\text{SedIChannelVertPipe}} - \text{ShortTeeLength}(\text{ND}_{\text{SedInletChannelDrain}}) \end{bmatrix}, \text{L}_{\text{SedIChannelHorizPipe}}, \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}\text{deg}, \text{ND}_{\text{SedInletChannelDrain}}, \text{PS}_{\text{Default}}, (\text{"SedTankCon"})\right]$$

$$\begin{bmatrix} \text{SedIChannelDrainVertCoupling}_{\text{Origin}_0} - \left(\frac{\text{TeeLength}(\text{ND}_{\text{SedInletChannelDrain}})}{2}\right) \\ \text{SedIChannelDrainVertCoupling}_{\text{Origin}_1} \\ \text{SedIChannelDrainHorizCoupling}_{\text{Origin}_2} - \text{ND}_{\text{SedInletChannelDrain}} \end{bmatrix} \qquad \text{SedEChannelDrainVertCoupling}_{\text{Origin}} + \begin{pmatrix} -\text{ElbowRadius}(\text{ND}_{\text{SedInletChannelDrain}}) \\ 0 \\ \text{L}_{\text{SedEChannelVertPipe}} - \text{ElbowRadius}(\text{ND}_{\text{SedInletChannelDrain}}) \end{pmatrix}$$

$$\text{SedIChannelDrainVertPipe} := \text{PipeSUBF}\left[\text{SedIChannelDrainVertCoupling}_{\text{Origin}}, \text{L}_{\text{SedIChannelVertPipe}}, \begin{pmatrix} 0 \\ 270 \\ 0 \end{pmatrix}\text{deg}, \text{ND}_{\text{SedInletChannelDrain}}, \text{PS}_{\text{Default}}, (\text{"SedTankCon"})\right]$$

$$\text{SedIChannelDrainStub} := \text{PipeF}\left[\text{SedIChannelDrainVertCoupling}_{\text{Origin}} + \begin{pmatrix} 0\text{m} \\ 0\text{m} \\ \text{CouplingLength}(\text{ND}_{\text{SedInletChannelDrain}}) - 2 \cdot \text{SocketDepth}(\text{ND}_{\text{SedInletChannelDrain}}) \end{pmatrix}, \text{H}_{\text{SedInletChannel}} + \text{SocketDepth}(\text{ND}_{\text{SedInletChannelDrain}}), \begin{pmatrix} 0 \\ 90 \\ 0 \end{pmatrix}\text{deg}, \text{ND}_{\text{SedInletChannelDrain}}, \text{PS}_{\text{Default}}\right]$$

$$\text{SedInletDrainRemovables} := \text{layer}_{\text{new}}(\text{"SedInletDrainRemovables"}, \text{red})$$

$$\text{SedInletDrainRemovablesSelect} := \text{SelectLayer}(\text{"SedInletDrainRemovables"})$$

$$\text{SedInletDrainRemovablesFrz} := \text{FreezeLayer}(\text{"SedInletDrainRemovables"})$$

$$\text{SedInletChannelDrainPipeScript} := \text{stack}(\text{SelectSedPipes}, \text{SedIChannelDrainHorizPipe}, \text{SedIChannelDrainVertPipe}, \text{SedPipeFrz}, \text{SedInletDrainRemovables}, \text{SedIChannelDrainStub}, \text{SedInletDrainRemovablesFrz})$$

$$\text{SedInletDrainScript} := \text{stack}(\text{SedInletChannelDrainFittingScript}, \text{SedInletChannelDrainPipeScript})$$

Figure 11: MathCAD Definition of Inlet Channel Drain Pipes

Origins and Dimensions

$$\text{SedEChannelDrainVertCoupling}_{\text{Origin}} := \begin{bmatrix} \left(\text{Plant}_{\text{Origin}_0} - \text{L}_{\text{Sed}} + \text{W}_{\text{SedInletChannel}} + \text{T}_{\text{SedWeir}} + \text{ConRadius}(\text{ND}_{\text{FiEntrancePipe}})\right) + \text{S}_{\text{Fitting}} \\ \text{Plant}_{\text{Origin}_1} + \text{S}_{\text{Fitting}} + \text{ConRadius}(\text{ND}_{\text{SedInletChannelDrain}}) \\ \text{Plant}_{\text{Origin}_2} + \text{Z}_{\text{SedChannelBottom}} - \text{CouplingLength}(\text{ND}_{\text{SedInletChannelDrain}}) + \text{SocketDepth}(\text{ND}_{\text{SedInletChannelDrain}}) \end{bmatrix}$$

$$\text{Z}_{\text{SedChannelBottom}} - \text{CouplingLength}(\text{ND}_{\text{SedInletChannelDrain}}) = 1.452\,\text{m}$$

$$\text{L}_{\text{SedEChannelVertPipe}} := \text{Z}_{\text{SedChannelBottom}} - \text{CouplingLength}(\text{ND}_{\text{SedInletChannelDrain}}) - \text{ElbowRadius}(\text{ND}_{\text{SedInletChannelDrain}}) - \text{ConRadius}(\text{ND}_{\text{SedInletChannelDrain}}) = 1.354\,\text{m}$$

$$\text{L}_{\text{SedEChannelHorizPipe}} := \text{SedEChannelDrainVertCoupling}_{\text{Origin}_0} - \text{SedIChannelDrainVertCoupling}_{\text{Origin}_0} - \left(\frac{\text{TeeLength}(\text{ND}_{\text{SedInletChannelDrain}})}{2}\right) - \text{ElbowRadius}(\text{ND}_{\text{SedInletChannelDrain}}) = 0.503\,\text{m}$$

Exit Channel Drain Pipes

$$\text{SedIChannelDrainVertCoupling}_{\text{Origin}} + \begin{bmatrix} \left(\frac{\text{TeeLength}(\text{ND}_{\text{SedInletChannelDrain}})}{2}\right) \\ 0 \\ -\text{L}_{\text{SedIChannelVertPipe}} - \text{ShortTeeLength}(\text{ND}_{\text{SedInletChannelDrain}}) \end{bmatrix}$$

$$\text{SedEChannelDrainHorizPipe} := \text{PipeSUBF}\left[\text{SedEChannelDrainVertCoupling}_{\text{Origin}} + \begin{pmatrix} -\text{ElbowRadius}(\text{ND}_{\text{SedInletChannelDrain}}) \\ 0 \\ -\text{L}_{\text{SedEChannelVertPipe}} - \text{ElbowRadius}(\text{ND}_{\text{SedInletChannelDrain}}) \end{pmatrix}, \text{L}_{\text{SedEChannelHorizPipe}}, \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}\text{deg}, \text{ND}_{\text{SedInletChannelDrain}}, \text{PS}_{\text{Default}}, (\text{"SedTankCon"})\right]$$

$$\text{SedEChannelDrainVertPipe} := \text{PipeSUBF}\left[\text{SedEChannelDrainVertCoupling}_{\text{Origin}}, \text{L}_{\text{SedEChannelVertPipe}}, \begin{pmatrix} 0 \\ 270 \\ 0 \end{pmatrix}\text{deg}, \text{ND}_{\text{SedInletChannelDrain}}, \text{PS}_{\text{Default}}, (\text{"SedTankCon"})\right]$$

$$\text{SedEChannelDrainStub} := \text{PipeF}\left[\text{SedEChannelDrainVertCoupling}_{\text{Origin}}, \text{H}_{\text{SedInletChannel}} + \text{SocketDepth}(\text{ND}_{\text{SedInletChannelDrain}}), \begin{pmatrix} 0 \\ 90 \\ 0 \end{pmatrix}\text{deg}, \text{ND}_{\text{SedInletChannelDrain}}, \text{PS}_{\text{Default}}\right]$$

$$\text{SedExitDrainRemovables} := \text{layer}_{\text{new}}(\text{"SedExitDrainRemovables"}, \text{red})$$

$$\text{SedExitDrainRemovablesSelect} := \text{SelectLayer}(\text{"SedExitDrainRemovables"})$$

$$\text{SedExitDrainRemovablesFrz} := \text{FreezeLayer}(\text{"SedExitDrainRemovables"})$$

$$\text{SedExitChannelDrainPipeScript} := \text{stack}(\text{SelectSedPipes}, \text{SedEChannelDrainHorizPipe}, \text{SedEChannelDrainVertPipe}, \text{SedPipeFrz}, \text{SedExitDrainRemovables}, \text{SedEChannelDrainStub}, \text{SedExitDrainRemovablesFrz})$$

$$\text{SedExitDrainScript} := \text{stack}(\text{SedExitChannelDrainFittingScript}, \text{SedExitChannelDrainPipeScript})$$

Figure 12: MathCad Definition of the Exit Channel Drain Origins and Pipe

Exit Channel Drain Fitting

$$\text{SedEChannelDrainVertCoupling} := \text{CouplingSUBF}\left[\text{SedEChannelDrainVertCoupling}_{\text{Origin}}, \begin{pmatrix} 0 \\ 90 \\ 0 \end{pmatrix}\text{deg}, \text{ND}_{\text{SedInletChannelDrain}}, \text{PS}_{\text{Default}}, (\text{"SedTankCon"})\right]$$

$$\text{SedEChannelDrainElbow} := \text{ElbowSUBF}\left[\text{SedEChannelDrainVertCoupling}_{\text{Origin}} + \begin{pmatrix} 0\text{m} \\ 0\text{m} \\ -L_{\text{SedEChannelVertPipe}} \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 270 \end{pmatrix}\text{deg}, \text{ND}_{\text{SedInletChannelDrain}}, \text{PS}_{\text{Default}}, (\text{"SedTankCon"})\right]$$

$$\text{SedIChannelHorizCoupling} := \text{CouplingSUBF}\left[\text{SedIChannelDrainHorizCoupling}_{\text{Origin}}, \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}\text{deg}, \text{ND}_{\text{SedExitChannelDrain}}, \text{PS}_{\text{Default}}, (\text{"SedTankCon"})\right]$$

$$\text{SedExitChannelDrainFittingScript} := \text{stack}(\text{SelectSedFittings}, \text{SedEChannelDrainVertCoupling}, \text{SedEChannelDrainElbow}, \text{SedFittingFrz})$$

Figure 13: MathCad Definition of the Exit Channel Drain Fittings

Challenges Encountered

9/17/14

Based on the AutoCAD Sedimentation Tank drawing, it was clear that the origin of the pipes and wedges that were removed from the concrete to create the incline in the Inlet Channel floor were incorrect. The origin specification of the different elements in the Inlet Channel will need to be reviewed.

9/22/15

There are missing Inlet Manifold Vertical Pipes and Couplings in the Sedimentation Tank. Also, the angling of the Inlet Channel Floor is not happening at the correct location. The origin specifications of the concrete wedges being removed from the Inlet Channel Floor need to be corrected. Also, there are two bays pwe tank being drawn in the AutoCAD drawing of the Sedimentation Tank. This needs to be corrected that so there are no longer double bays.

10/8/14

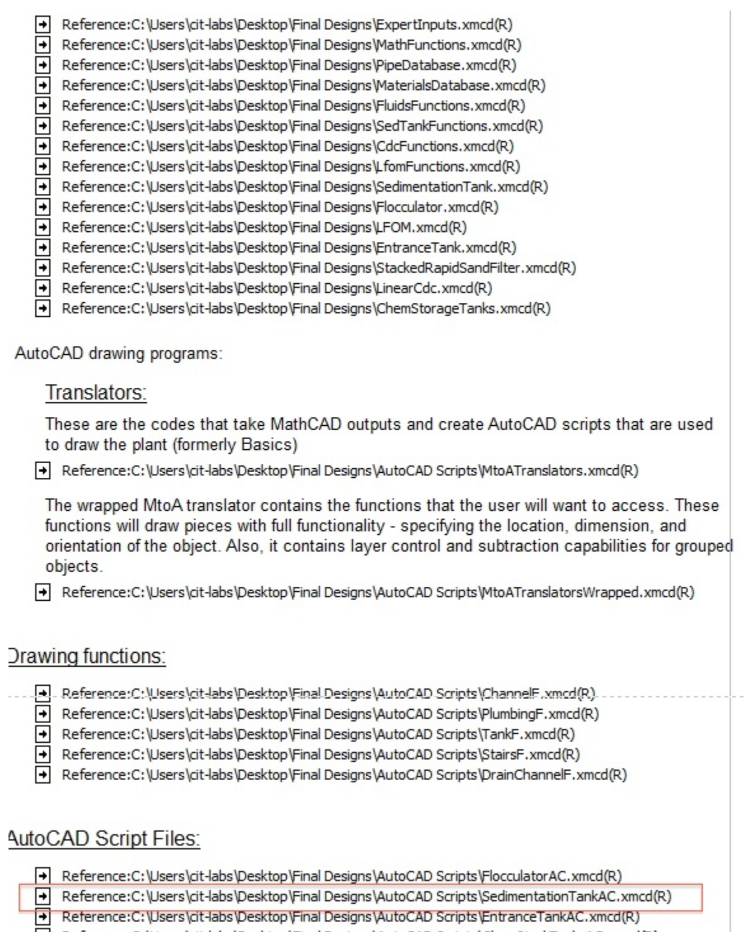
Based on the updates made in the Sedimentation Tank Inlet Channel that will be sent to Honduras, it was clear that the way we define distances should be changed. Having origins with really long definitions can be extremely confusing. For instance, the Block Origin of the Inlet Channel in the Sedimentation tank was defined using many other variables that made it hard to determine if the correct origin was being selected. Please see Figure 14 below. This was the cause of the errors with the Inlet Channel floor angling. One solution to this problem may be to add a picture at the top of the MathCAD file that identifies certain origins.

$$\text{BlockFarCorner} \leftarrow \begin{bmatrix} \text{BlockOrigin}_0 - W_{\text{SedInletChannelPreWeir}} \\ \text{Plant}_{\text{Origin}_1} + \frac{-W_{\text{SedDiffuserOutlet}}}{2} + \text{outerradius}\left(ND_{\text{SedJetReverser}}\right) + \frac{W_{\text{SedBay}}}{2} - T_{\text{SedDiffuserWall}} - S_{\text{FromSedWall}} + \text{ConRadius}\left(ND_{\text{SedManifold}}\right) + T_{\text{SedWallDivider}} + \text{SedManifoldSpace} + \text{SedHopperViewerSpace} + 3S_{\text{Fitting}} + 2\,\text{ConRadius}\left(ND_{\text{Se}}\right. \\ \left(\text{BlockOrigin}_2 + \text{HeightVector}_1\right) \end{bmatrix}$$

Figure 14: MathCAD Origin Specification of the BackFarCorner in the Inlet Channel

10/19/14

During the entire semester, there had been issues with AutoCAD drawings. Although the MathCAD code being inputted into AutoCAD was correct, the referenced file, EtFlocSedFi located in the Final Designs folder, was not outputting the correct reference information. This was a problem when the entire file was referenced. However, if one were to look at the list of files referenced in EtFLocSedFi and referenced only the files before the the file they were currently working on in their MathCAD file, AutoCAD will draw the corresponding design to the MathCAD code. Please see Figure15 below.



Reference:C:\Users\cit-labs\Desktop\Final Designs\ExpertInputs.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\MathFunctions.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\PipeDatabase.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\MaterialsDatabase.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\FluidsFunctions.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\SedTankFunctions.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\CdcFunctions.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\LfomFunctions.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\SedimentationTank.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\Flocculator.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\LFOM.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\EntranceTank.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\StackedRapidSandFilter.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\LinearCdc.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\ChemStorageTanks.xmcd(R)

AutoCAD drawing programs:

Translators:

These are the codes that take MathCAD outputs and create AutoCAD scripts that are used to draw the plant (formerly Basics)

Reference:C:\Users\cit-labs\Desktop\Final Designs\AutoCAD Scripts\MtoATranslators.xmcd(R)

The wrapped MtoA translator contains the functions that the user will want to access. These functions will draw pieces with full functionality - specifying the location, dimension, and orientation of the object. Also, it contains layer control and subtraction capabilities for grouped objects.

Reference:C:\Users\cit-labs\Desktop\Final Designs\AutoCAD Scripts\MtoATranslatorsWrapped.xmcd(R)

Drawing functions:

Reference:C:\Users\cit-labs\Desktop\Final Designs\AutoCAD Scripts\ChannelF.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\AutoCAD Scripts\PlumbingF.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\AutoCAD Scripts\TankF.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\AutoCAD Scripts\StairsF.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\AutoCAD Scripts\DrainChannelF.xmcd(R)

AutoCAD Script Files:

Reference:C:\Users\cit-labs\Desktop\Final Designs\AutoCAD Scripts\FlocculatorAC.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\AutoCAD Scripts\SedimentationTankAC.xmcd(R)
Reference:C:\Users\cit-labs\Desktop\Final Designs\AutoCAD Scripts\EntranceTankAC.xmcd(R)

Figure 15: MathCAD file for EtFlocSedFi

10/28/14

The Exit Channel in the Sedimentation Tank is not wide enough to fit the Outlet Pipes. Currently, at the AguaClara plant in Morocelí, the Exit Channel wall that is closest to the Outlet Pipes are curved out to fit the pipe within the Exit Channel. The width of the Exit Channel is extremely narrow because when the exit channel was first designed, it was made just wide enough to be constructible. Please see Figure 16 below. The original plan to solve this issue was to double the number of Outlet Pipes and connections to the Stacked Rapid Sand Filter. This method would have MathCAD recalculate the size and amount of the pipes that would be needed to maintain a certain flow rate while making sure all of the pipes are contained in the Exit Channel. However, this would make the design of the plant less elegant because there will be many pipes going across the plant. The new plan is to make the width of the Exit Channel dependent on the size of the Outlet Pipe necessary for the given flow rate.

Figure 16: Exit Channel in Morocelí

11/6/14

The Exit Channel in the Sedimentation Tank needs a Drain Pipe that connects with the Drain Pipe from the Inlet Channel. This will be accomplished by taking the X origin of the horizontal Drain Pipe in the Inlet Channel, as well as the Y and Z origins of the Outlet Pipes in order to determine the origins and lengths of the new Outlet Drain Pipes that need to be created.

Part 3: Future Work

Goals

Eventually, all of the AutoCad drawing files should be understood easily by anyone. There should be a more rigid structure for the style of code the Design team uses. This sort of continuity will help the team stay organized in the long run. For this semester, the Sedimentation Tank AutoCad Drawing code was be updated to include the newest changes in the plant's design. Future teams should continue to add design updates to the Sedimentation Tank Design code. Also, the logic of the Sedimentation Tank MathCAD code should be modified to be as simple and clear as possible for determining elevations, especially in the sludge drain and floc hopper. This will simplify the fabrication process.