



Modeling CULTEC Chambers in HydroCAD - Using the Chamber Wizard

The chamber wizard (added in HydroCAD-9) is a revolutionary tool for doing underground storage layout and modeling. In just a few steps you can layout a complete drainage field *and* create the storage elements used by HydroCAD to perform the actual hydrograph routing calculations.

Step 1: Select a chamber from the library

Step 2: Set the chamber spacing, bedding and cover. Or just check a box to automatically use the manufacturer's recommended parameters.

Step 3: Adjust the number of chambers until you achieve the desired layout and overall storage.

As you adjust any of the parameters, the storage analysis and layout sketch are instantly updated:

Model: Chamber Cost: (\$/ea) 200.00 Excavation: (\$/cy) 5.00 Stone: (\$/cy) 15.00

Sample 102A

Sample chamber: Width values at arbitrary depths
 Effective Size= 48.0"W x 30.0"H => 7.38 sf x 7.00'L = 51.6 cf
 Overall Size= 52.0"W x 30.0"H x 8.50'L with 1.50' Overlap

Use typical spacing Number of Rows: 10 Chambers per Row: 10

Row Spacing: (inches) 6.0

Side Stone: (inches) 12.0

End Stone: (inches) 12.0

Stone Cover: (inches) 6.0

Stone Base: (inches) 6.0

Side-Z: (run/rise) 0.0

Stone Voids: (%) 40.0

Stone Invert: (feet) 100.00

#	Qty	Description	\$ Price
1	1.00	Header assembly	900.00
2	3,700.00	sf Filter fabric	0.75
3			

Additional Materials: Show Costs

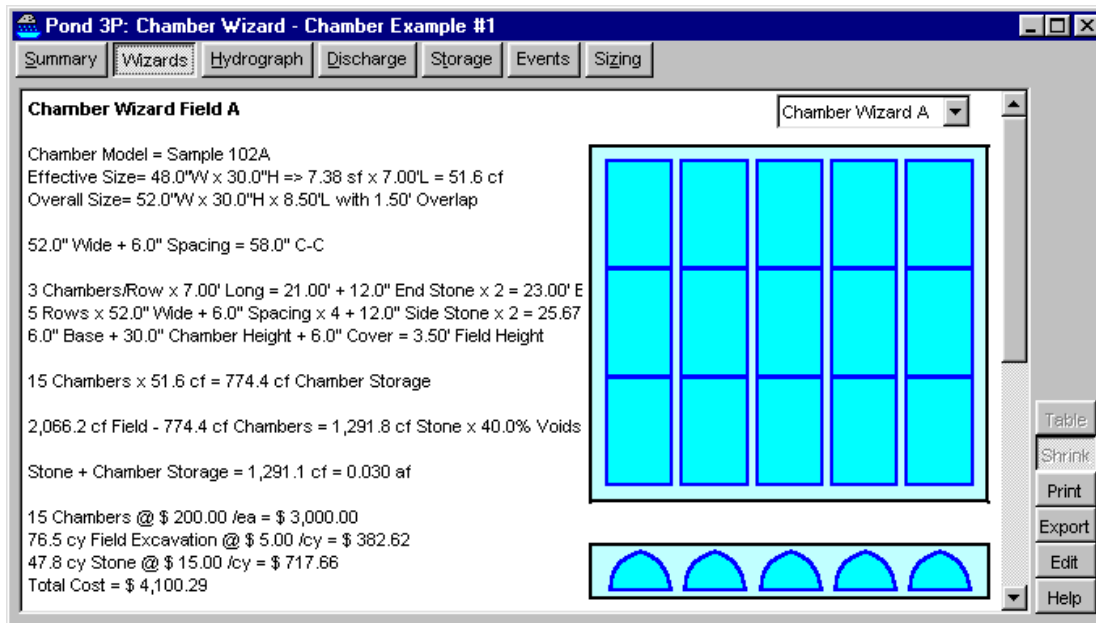
52.0" Wide + 6.0" Spacing = 58.0" C-C
 10 Chambers/Row x 7.00' Long = 70.00' + 12.0" End Stone x 2 = 72.00' Base Length
 10 Rows x 52.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 49.83' Base Width
 6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height
 100 Chambers x 51.6 cf = 5,162.5 cf Chamber Storage
 12,558.0 cf Field - 5,162.5 cf Chambers = 7,395.5 cf Stone x 40.0% Voids = 2,958.2 cf Stone Storage
 Stone + Chamber Storage = 8,120.7 cf = 0.186 af
 100 Chambers @ \$ 200.00 /ea = \$ 20,000.00
 465.1 cy Field Excavation @ \$ 5.00 /cy = \$ 2,325.56
 273.9 cy Stone @ \$ 15.00 /cy = \$ 4,108.61
 1 Header assembly @ \$ 900.00 = \$ 900.00
 3700 sf Filter fabric @ \$ 0.75 = \$ 2,775.00
 Total Cost = \$ 30,109.17

OK Cancel Help Print Export

The wizard can even be used to calculate the total system cost. Just enter your costs for the chamber, excavation, and stone, and everything instantly appears in the report. You can also include additional materials or comments, so that the final report contains all the relevant information.

When you save the wizard, HydroCAD automatically creates the appropriate storage definitions for the stone and embedded chambers. To perform a complete hydrograph routing, just add your outlet devices and inflow hydrograph!

For further details please read about [pond calculations](#), [pond storage](#), and [underground storage chambers](#).



Embedded Storage Tutorial

This document provides step-by-step instructions for setting up a pond with embedded storage, such as a prefab storage chamber set in a bed of crushed stone.

Although HydroCAD is typically used to route a hydrograph through such a pond, you can create a pond with no inflow or outlet devices, solely for the purpose of calculating the available storage.

1) Prepare a "pond" to hold the storage data:

1.1 Start HydroCAD and create a new project. Or you can add to any existing project.

1.2 Create a new pond by dragging the pond symbol from the palette into the middle of the routing diagram.

1.3 Double-click the pond to begin editing. (Or right-click and select Edit from the drop-down menu.)

1.4 Select the "Detention Pond" button and click on the "Storage" tab.

1.5 If you want your reports to use Cubic-Feet instead of Acre-Feet, uncheck the box labeled "Use Large Units." (For metric projects, this will select Cubic-Meters instead of Mega-Liters.)

2) If you're using an older version of HydroCAD (prior to 9.0) or want to define the storage elements manually, skip ahead to [section 3](#). Otherwise use the *underground storage wizard* for automatic layout of the chambers and stone backfill:

2.1 On the Storage tab, start a new storage definition by double-clicking line #1, or just click the "Edit Storage" button.

2.2 From the list of available storage types, select "Chamber Wizard" and click OK.

2.3 Select the desired chamber from the drop-down list.

2.4 Adjust the layout parameters as required. The sketch and storage report are updated automatically as you make changes.

2.5 If you want a cost estimate, enter the applicable pricing for each item.

For further details and examples please read about the [chamber wizard](http://www.hydrocad.net/chamberwizard.htm). at www.hydrocad.net/chamberwizard.htm

2.6 You have now created a complete drainage field, with the chambers embedded in stone! Click OK to save your data and [skip ahead to section 5](#).

3) Define the overall volume that will contain all the chambers and be backfilled with stone: (Manual procedure)

3.1 On the Storage tab, create the first storage definition by double-clicking line #1, or just click the "Edit Storage" button.

3.2 From the list of available storage types, select "Prismatoid" and click OK. This is generally the easiest procedure for defining the excavated volume, which will ultimately be back filled with stone.

3.3 On the Prismatoid screen, set the description to "Drainage Field" and enter the bottom elevation. Enter the length, width, and height of the entire field. Finally, set the Voids to 40% (or whatever value is appropriate.) Click the OK button to close the Prismatoid screen.

Note: It is important to enter the overall dimensions of the entire drainage field containing all the chambers. Do not use the dimensions for the stone around each chamber, since this is incompatible with some of the exfiltration options you may decide to use later.

4) Define the embedded storage chambers: (Manual procedure)

4.1 On the storage tab, create a new storage definition by double-clicking the next blank line.

4.2 From the list of available storage types, select "Prefab Chamber" and click OK. (You can also embed other storage shapes, as required.)

4.3 On the Prefab Chamber screen, click "Chamber Model" and select the desired chamber from the drop-down list. When the chamber is selected, additional summary information will appear at the bottom of the screen. You can use the up and down arrow keys to scroll through the available chambers and examine the parameters for each one.

4.4 Set the invert elevation for the bottom of the chamber. This must be at or above the bottom of the outer excavation.

4.5 For most chambers, the lay-up length is set automatically and should not be changed. However, you must set the Storage Multiplier to indicate the total number of chambers that are being embedded.

4.6 Since the interior of the chamber is open space, leave the voids at the default of 100%

4.7 Finally (and most importantly), click "Embed Inside" and select "Volume 1". This indicates that the chamber is being embedded inside the first storage definition.

4.8 Click the OK button to close the Prefab Chamber Screen.

5) Define any additional storage:

5.1 If you want to embed additional chambers in the same drainage field (such as a distribution header) repeat section 4 for each chamber, embedding all the chambers in "Volume 1."

5.2 If you want to define additional storage volumes, such as a catch basin that feeds the chambers, create an additional storage definition for each volume. If these are separate storage volumes that are not embedded inside the stone bed, be sure to leave "Embed Inside" set to "Nothing."

5.3 If you want to include above-ground storage, such as back-up into a parking lot, create an additional definition using the Prismatic or Custom storage type. As before, do not embed this storage.

6) View the results

6.1 Click the OK button to save the overall pond description. (For this simple pond, we don't need to enter anything on any of the other description tabs.)

6.2 To view the storage calculations, right-click the pond and select "Report" from the menu (or just double-click the pond.)

6.3 Click the "Storage" tab on the new report window. This will plot the total storage for all defined storage definitions vs. water surface elevation. The invert of each storage definition is also labeled.

6.4 Click the "Table" button to see the storage results in tabular form.

6.5 For an analysis of the storage calculations, click the "Summary" tab. (Enlarge the report window as needed so you can view the entire report.) This will show the overall volume of the excavation, the volume of embedded storage, the amount of stone backfill, and the final storage that results.

6.6 Click "Edit" if you need to make any changes, or use the "Print" button to print the current report.

7) Saving and managing your work

7.1 When you close HydroCAD, you will be prompted to save the current project. Once saved, you can return to the project at any future time.

7.2 You can create any number of projects you wish. Depending on the capacity of your HydroCAD program, each project can contain multiple ponds.

8) More advanced calculations:

8.1 If you wish to analyze the behavior of your "pond" under actual rainfall conditions, you can create one or more subcatchments and route them into the pond.

8.2 If the pond has an outlet device or overflow mechanism, you can define these on the Outlets tab of the pond description. Otherwise the pond will need to have sufficient capacity to retain the entire rainfall event.

8.3 If you want to evaluate how infiltration affects the storm routing, you can define an exfiltration outlet. However, since infiltration may require many hours or even days to empty the pond, it is often excluded from routing calculations. This produces a more conservative design that is not dependent on the exact exfiltration rates, which can be hard to predict, especially over time.

For further details, please read about [embedded storage chambers at www.hydrocad.net/chambers.htm](http://www.hydrocad.net/chambers.htm)

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