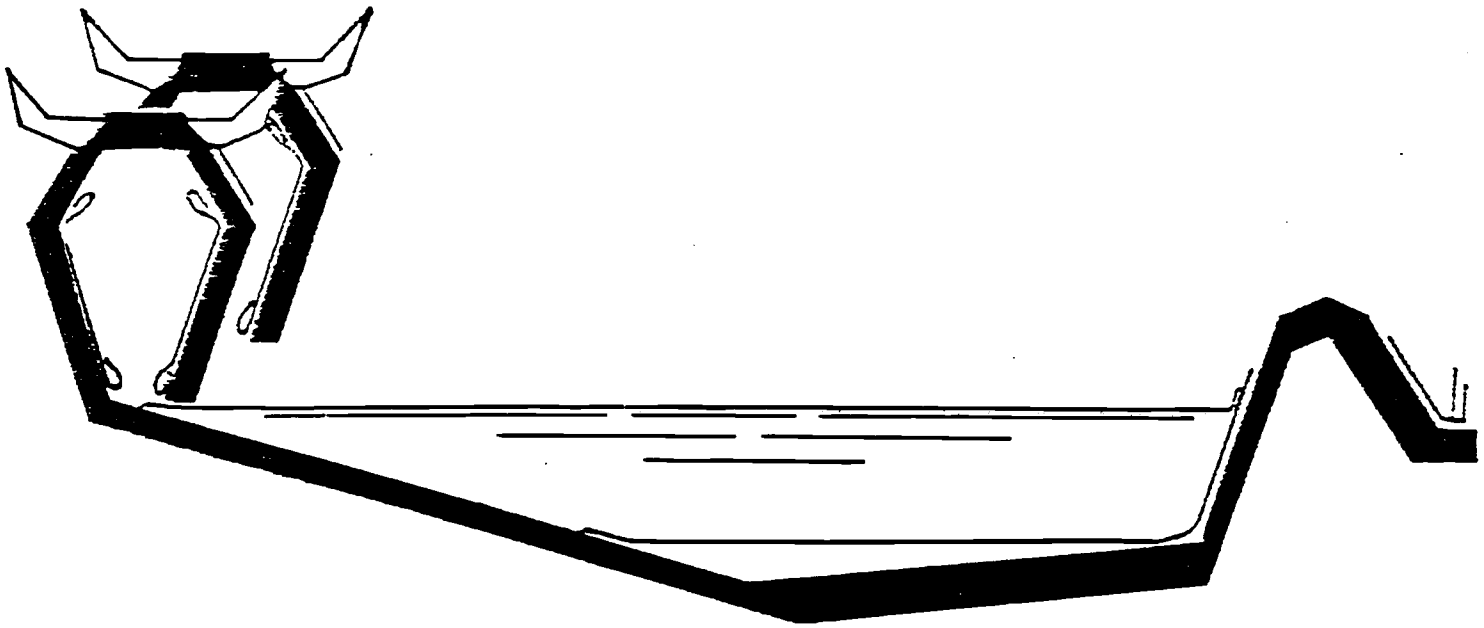
GUIDELINES FOR COMPUTING CAPACITIES OF

STOCKWATERING PONDS

AND SMALL IMPOUNDMENTS AND LAKES



ARIZONA WATER COMMISSION
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Appendix 1

ARIZONA DEPARTMENT OF WATER RESOURCES
GUIDE FOR DETERMINING STOCKPOND CAPACITY

INTRODUCTION

This pamphlet is designed to help answer some of the items in question 7 on the Stockpond Use Statement of Claimant Form, particularly the maximum storage volume.

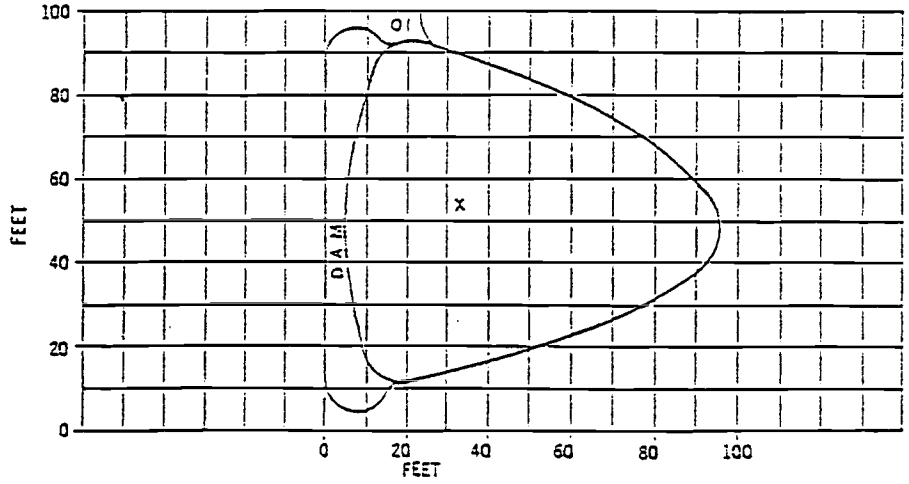
The method to compute the Maximum Storage Volume (MSV) of a stockpond consists of the following steps:

1. Sketch a top view of the stockpond—see Section I.
2. Guided by the sketch, select one of the nine basic surface shapes from Section II.
3. Select a corresponding stockpond bottom shape from the three-dimensional diagrams in Section III.
4. Compute the Maximum Storage Volume (MSV) according to the directions in Section IV.

SECTION I

On the worksheet at the end of this pamphlet, fill in the name of the stockpond in Question 1 (if not named, so indicate).

From personal observation of your stockpond, draw a sketch (using the grid in worksheet Question 2) of the top surface of the pond. The sketch should be drawn so as to depict the edge of the stockpond when *entirely full* (even if the pond is presently dry). It is helpful here if you write in foot scales along the left-hand side and bottom of the grid (see example below).



Label the dam, if one exists, by writing "DAM" at the appropriate location. The spillway should be located by placing an "O" on the sketch. If instead of a spillway the dam is equipped with a grated or ungrated overflow pipe (sometimes called "siphon" or "glory hole"), indicate this with an "X" on the drawing. If the depth of the pond is uniform throughout, place the "X" in the center of the pond and write "UNIFORM" next to it.

Now proceed to Section II.

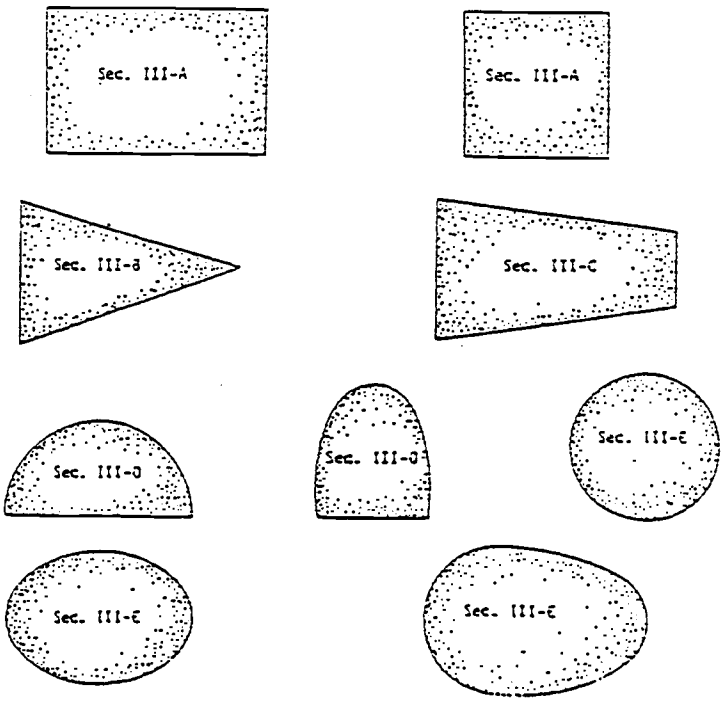
SECTION II

The following diagrams are representative of the basic surface shapes of stockponds commonly found in this region. Using the sketch you just completed, compare it with the nine (9) basic surface shapes shown below and choose the one shape which it *most closely resembles.*

Remember that you are looking at the outline of your pond, as seen from above, as it would appear if entirely filled with water. Do not worry if the surface shape of your pond does not exactly match the examples below; few will. Normally, however, after the small shoreline variations are averaged out, your pond will resemble one of the basic shapes shown. For example, the pond shown in the sketch in Section I best resembles Shape 3 – the triangle.

When you have decided which surface shape most closely approximates your pond surface, make note of the SECTION number listed for that shape, then continue to Section III.

BASIC SURFACE SHAPES OF STOCKPONDS:



SECTION III

Immediately following these paragraphs, you will find several sets of drawings that represent three-dimensional views of stockponds. Only one set contains the surface shape you picked in Section II. From that set, you will select the drawing that best conforms to the three-dimensional shape of your stockpond. If your pond is presently not dry, you will have to visualize how the pond looked when it was constructed or last dry.

Turn now to the SECTION number you noted earlier and examine the drawings, selecting the one that best approximates the shape of your stockpond. For example, the hypothetical stockpond shown in the sketch in Section I looks most like code number 16 (CN 16).

SECTION III-A

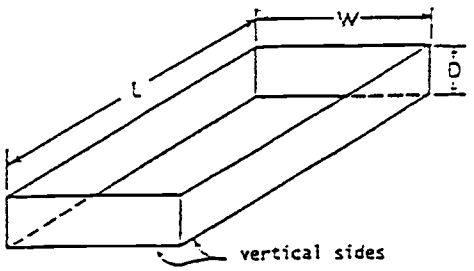
These five drawings show stockponds with a basic surface shape that is RECTANGULAR (or SQUARE). Write the code number for the drawing you select in the box at worksheet item 3, and then proceed to Section IV for further directions.

CN 1 0

Required Dimensions:

Length L
Width W
Depth D

MSV = L x W x D x 23

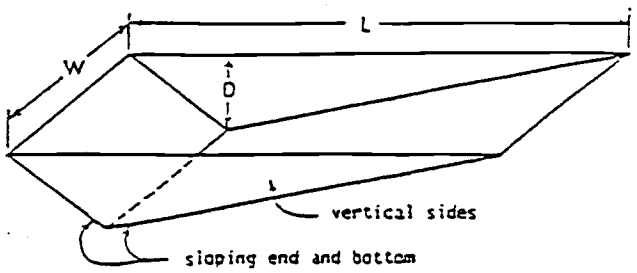


CN 1 1

Required Dimensions:

Length L
Width W
Depth D

MSV = L x W x D x 12



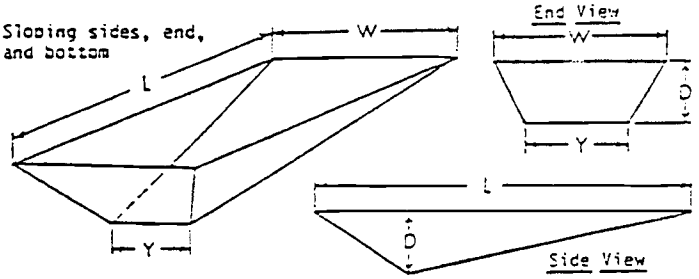
CN 1 2

Required Dimensions:

Length L
Width, top W
Width, bottom Y
Depth D

MSV = L x D x 4 x [(2xW) + Y]

Note: Sloping sides, end, and bottom

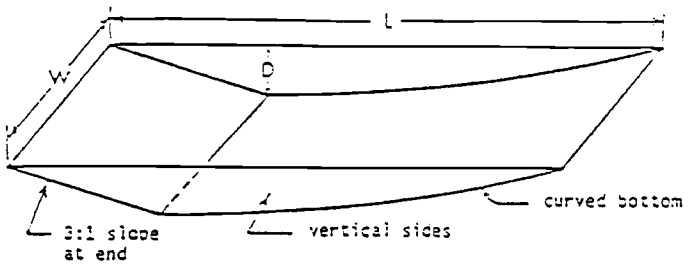


CN 1 3

Required Dimensions:

Length L
Width W
Depth D

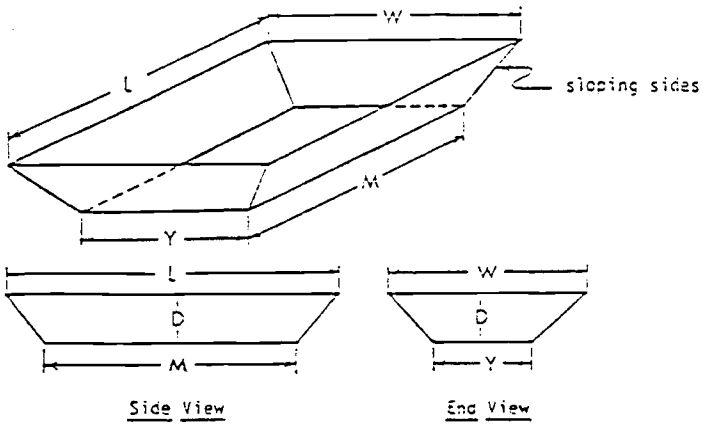
MSV = L x W x D x 15



CN| 1 | 4

Required Dimensions:

Length, top	L
Length, bottom	M
Width, top	W
Width, bottom	Y
Depth	D



MSV = 12 x D x [(LxW) + (MxY)]

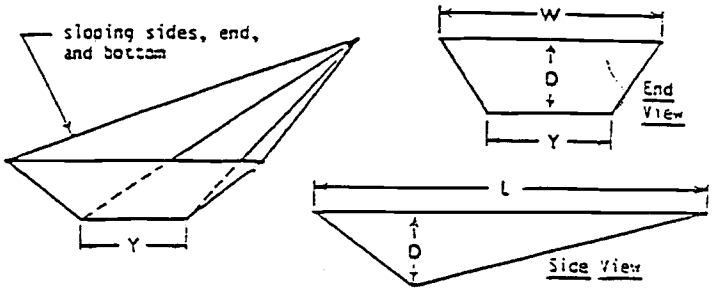
SECTION III-B

These two drawings show stockponds with a basic surface shape that is TRIANGULAR. Write the code number for the drawing you select in the box at worksheet item 3, and then proceed to Section IV for further directions.

CN| 1 | 5

Required Dimensions:

Length	L
Width, top	W
Width, bottom	Y
Depth	D

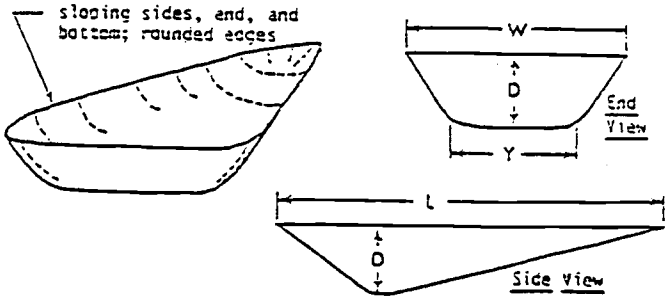


MSV = L x D x 4 x (W+Y)

CN| 1 | 6

Required Dimensions:

Length	L
Width, top	W
Width, bottom	Y
Depth	D



MSV = L x D x 4 x (W+Y)

SECTION III-C

These three drawings show stockponds with a basic surface shape that is TRAPEZOIDAL. Write the code number for the drawing you select in the box at worksheet item 3, and then proceed to Section IV for further directions.

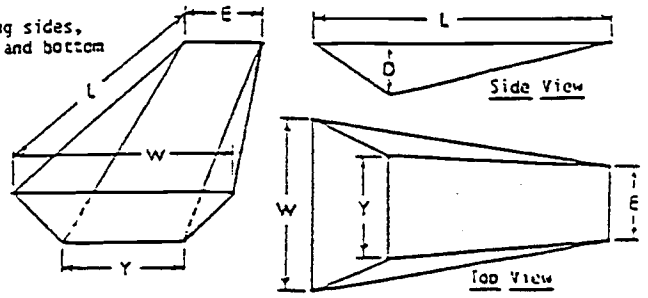
CN| 1 | 7

Note: Sloping sides, ends, and bottom

Required Dimensions:

Length	L
Width, top	W
Width, bottom	Y
Width, end	E
Depth	D

MSV| = L x D x 4 x (W+Y+E)

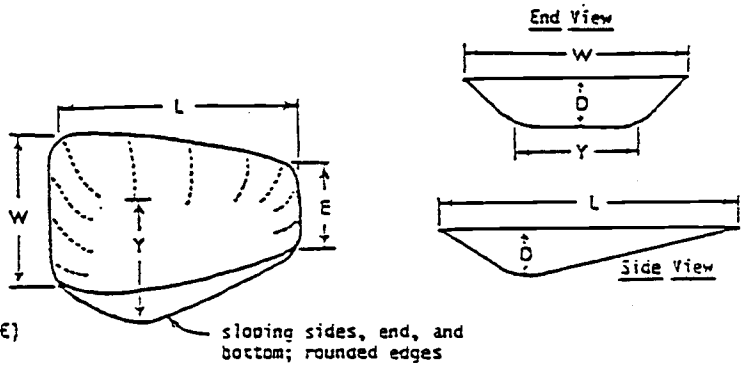


CN| 1 | 8

Required Dimensions:

Length	L
Width, top	W
Width, bottom	Y
Width, end	E
Depth	D

MSV| = L x D x 4 x (W+Y+E)

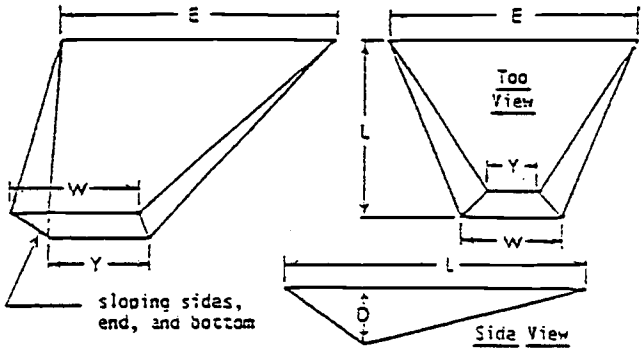


CN| 1 | 9

Required Dimensions:

Length	L
Width, top	W
Width, bottom	Y
Width, end	E
Depth	D

MSV| = L x D x 4 x (W+Y+E)



SECTION III-D

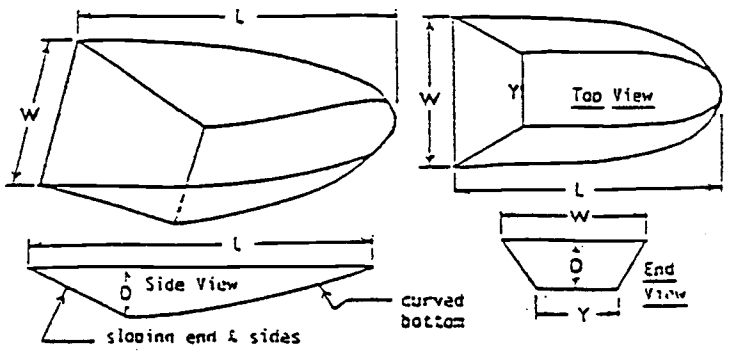
These two drawings show stockponds with a basic surface shape that is SEMI-CIRCULAR or SEMI-ELLIPTICAL. Write the code number for the drawing you select in the box at worksheet item 3, and then proceed to Section IV for further directions.

CNI 2 1 0

Required Dimensions:

Length	L
Width, top	W
Width, bottom	Y
Depth	D

MSVI = L x D x .7 x (W+Y)

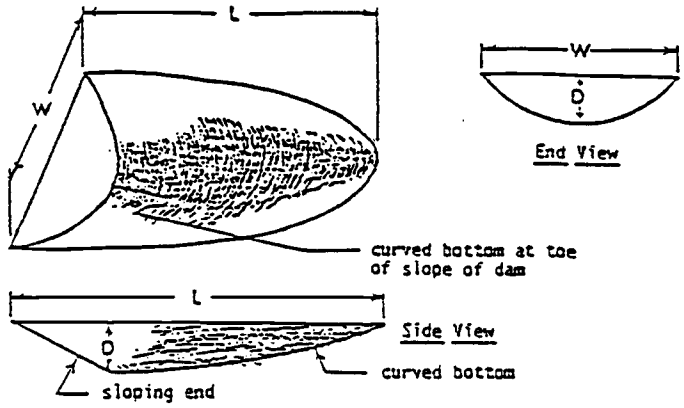


CNI 2 1 1

Required Dimensions:

Length	L
Width	W
Depth	D

MSVI = .11 x L x W x D



SECTION III-E

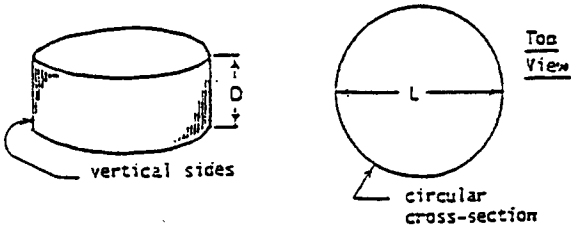
These four drawings show stockponds with a basic surface shape that is CIRCULAR, ELLIPTICAL, or EGG-SHAPED. Write the code number for the drawing you select in the box at worksheet item 3, and then proceed to Section IV for further directions.

CNI 2 | 2

Required Dimensions:

Length (Diameter) L
Depth D

MSVI = L x L x D x 18

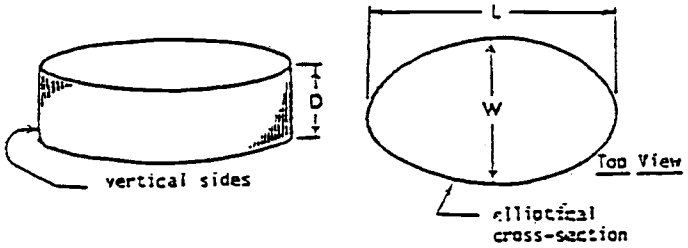


CNI 2 | 3

Required Dimensions:

Length L
Width W
Depth D

MSVI = L x W x D x 18

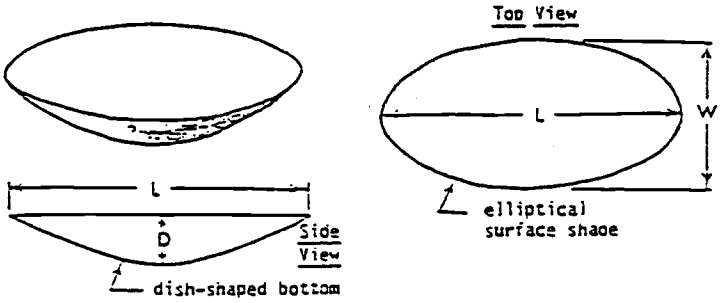


CNI 2 | 4

Required Dimensions:

Length L
Width W
Depth D

MSVI = L x W x D x 12

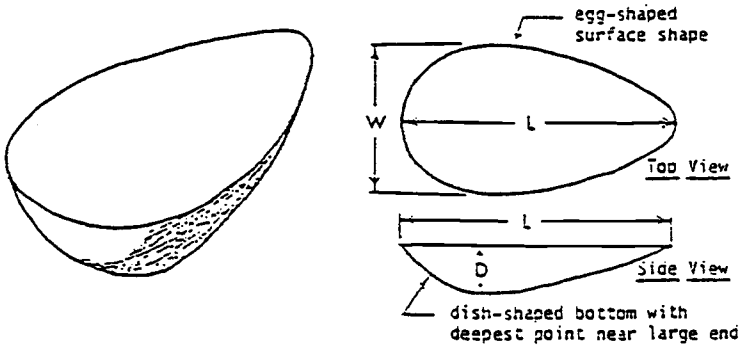


CNI 2 | 5

Required Dimensions:

Length L
Width W
Depth D

MSVI = L x W x D x 13



SECTION IV

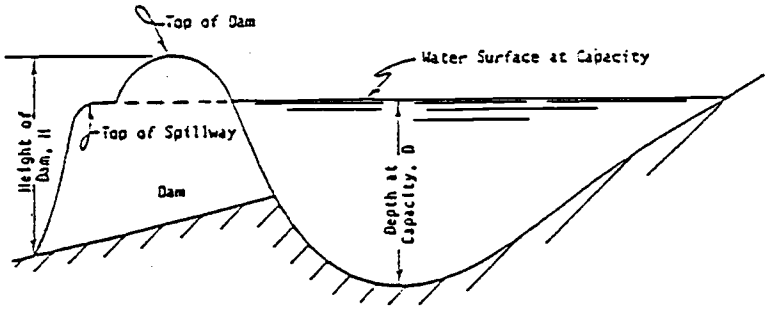
COMPUTING THE ESTIMATED MAXIMUM STORAGE VOLUME (MSV) OF YOUR STOCKPOND

A. Measurements

For each three-dimensional representation shown on the previous pages, a section headed "Required Dimensions" lists the measurements necessary to compute that stockpond's MSV. If the required measurements have not already been taken, you will have to physically obtain them by using equipment such as a tape measure, level and rod, sounding line, or your best estimate.

You should have little problem obtaining the length (L) and width (W) measurements. There may be some difficulty, however, in determining the depth (D) of your pond. Depth should be taken as the vertical distance from the top of the spillway to the deepest point in the stockpond. NOTE: THE TOP OF THE SPILLWAY IS NORMALLY A SUBSTANTIAL DISTANCE BELOW THE TOP OF THE DAM. BE SURE TO MEASURE ONLY TO THE TOP OF THE SPILLWAY (WHICH MARKS THE MAXIMUM WATER LEVEL), AND NOT TO THE TOP OF THE DAM.

If the pond is presently full, a few trials with a weighted tape measure or calibrated sounding line should locate the deepest point. If the pond is empty, the deepest point is obvious, but remember that the depth must still be measured as the vertical distance from the deepest point to the top of the spillway.



In the case where the pond is only partially filled, it is probably easiest to first locate and measure the deepest point in the pond as explained above, and then add to it the vertical distance from the water surface to the top of the spillway, thus obtaining the total depth (D) from the top of the spillway to the bottom of the pond.

The height of the dam (H) is measured vertically from the downstream toe to the top of the dam.

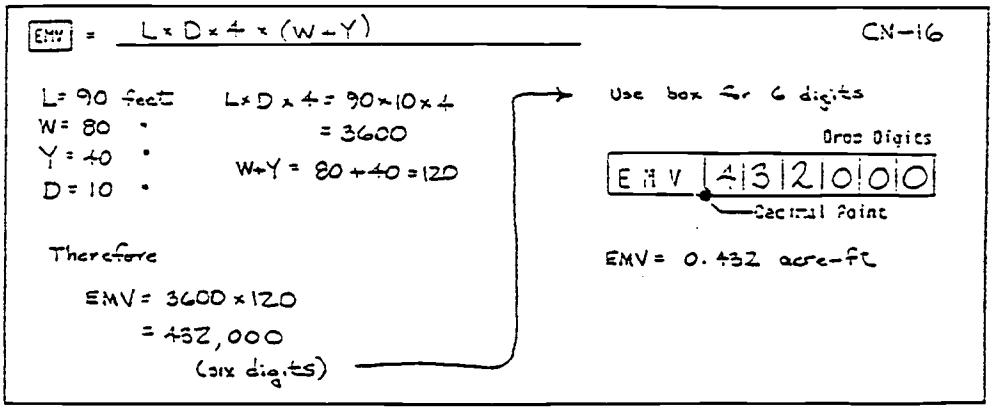
B. Calculations

The first step in calculating the maximum storage volume of your stockpond is to write down in the space provided in worksheet item 6 the appropriate MSV formula. This is obtained by referring to the three-dimensional figure you specified in worksheet item 3.

Now perform the required calculations using the measurements you recorded in worksheet item 4. The result of your calculation should be a number containing 5, 6, 7, or 8 digits.

The answer you obtain is then placed in the corresponding box in worksheet item 7; that is, an 8-digit result is written in the "8-digit answer" box, and so forth. The box automatically inserts the decimal point and drops insignificant digits. The resulting number is the volume of your stockpond in acre-feet.

An example using the stockpond sketch in Section I is worked out below:

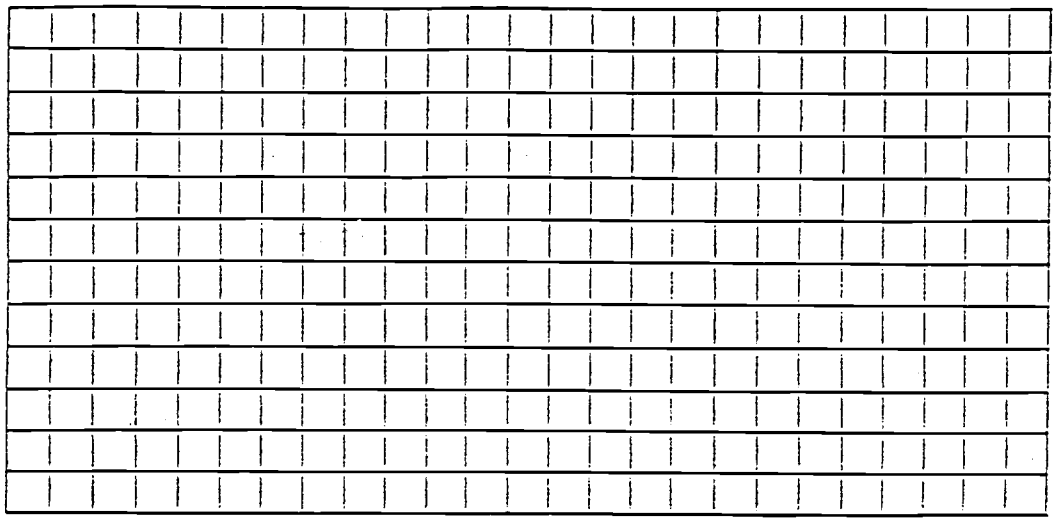


Finally, transfer to the statement of claimant form the measurements required by Question 7.

WORKSHEET

1. Name of stockpond: _____

2. Surface shape, location of dam, spillway, and deepest point:



3. Code number of selected figure: CN| | (From Section III).

4. Required dimensions for volume computation:

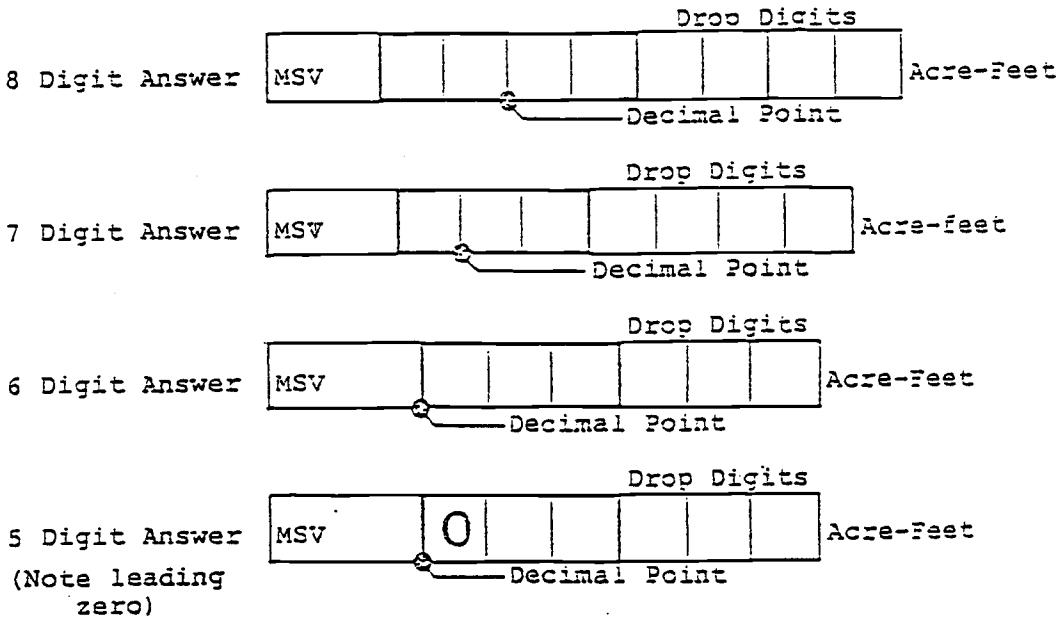
Length, Top	L	= _____	feet
Length, Bottom	M	= _____	feet
Width, Top	W	= _____	feet
Width, Bottom	Y	= _____	feet
Width, End	E	= _____	feet
Depth	D	= _____	feet
Height of Dam	H	= _____	feet

5. Calculations: Transfer the equation associated with the figure selected from Section III to the space following. Do the required calculations using the dimensions of your stockpond listed above.

WORKSHEET (continued)

MSV = _____

7. Maximum Storage Volume (MSV). Transfer the answer you calculated in the previous step to the appropriate box below.



When transferring the volume calculated above to your statement of claimant form, retain only the digits (and decimal point) located within the heavily outlined portion of the box.