

# THE DELTA ADVANTAGE

Design Topics for Precasters

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## Getting the Edge in Vault Estimation

By Ronald Thornton, PE

Accurate material estimates are critical in the competitive environment of precast vaults. Estimators are often faced with the challenge of putting a price to a structure for which no structural design is given. Unless there are design capabilities in house, one either has to make an educated guess, perhaps based on similar units done in the past, or else depend on an outside consultant to provide a preliminary design.

**DP\_Vault** is a new software product developed by Delta Engineers, PC that takes much of the guesswork out of vault estimation. Although the program is designed for use by non-engineers, it is highly recommended that users possess some basic knowledge of reinforced concrete design.

**DP\_Vault** allows the user to select from various components to be considered, then guides him or her through a preliminary design by inputting the dimensions of the structure, member thicknesses, concrete strength, design load, and basic soil condition. The design load may be selected from HS20, HS25 or None.

Components include base slab, mono or integral base riser, middle riser sections, mono top riser and cover slab. Each component has a separate screen with inputs for bar cover, bar size and spacing. Wall designs give the option for either one or two layers of reinforcing. For simplicity, the default bar spacing has been set to 6" at all design locations. The user may change the spacing at will then click a button to estimate the corresponding bar size. The program checks each element at critical locations for flexure, shear, and cracking. Red and green lights immediately display the adequacy of the selected combination. A red light alerts the user that one or more parameters must be changed.

The volume of concrete and weight is computed and displayed for each component. The amount of reinforcing, in pounds, is estimated from the area-of-steel provided over the surface area of the element and, therefore, is independent of bar size.

Mono base and top risers are analyzed for bending moment using a unique algorithm that estimates plate coefficients based on the ratio of length to element height. Riser walls are analyzed using moment distribution.

**DP\_Vault** also provides a handy buoyancy check in addition to its preliminary design and materials estimating functions. This feature allows the user to vary the base extension, water table depth, and required safety factor.

Although **DP\_Vault** is highly functional as a design program, results should always be considered preliminary should never be used for fabrication until they are reviewed and verified by a qualified engineer.

For more information on **DP\_Vault**, please contact Ronald Thornton, PE at Delta Engineers or, for a complete demonstration, visit us at booth #915 at this year's MCPX in Salt Lake City.



Screen shot at left from **DP\_Vault** cover slab design

## Delta Rep to Teach QC Course at MCPX

Ron Thornton has been selected by NPCA to instruct the Basics of Quality Control course at this year's MCPX in Salt Lake City. The program will focus primarily on aggregate testing for sieve analysis and surface moisture but will also cover rebound number of hardened concrete. Contact NPCA for further information or registration.

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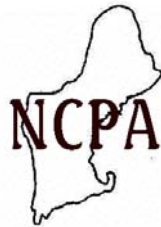
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*Delta Engineers, P.C. provides specialized services to the precast/prestressed concrete industry including:*

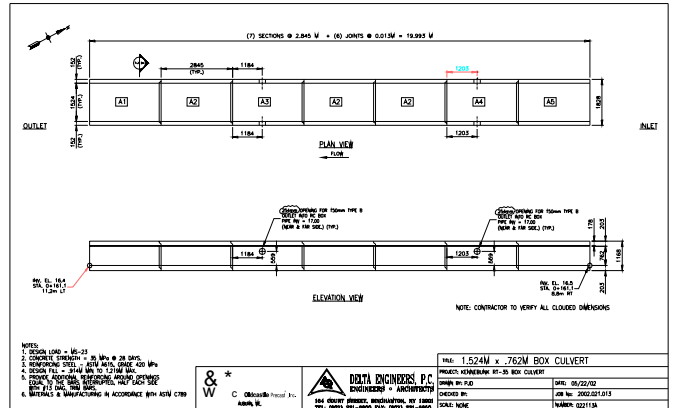
- Structural design and analysis
- Erection plans
- Detailed shop drawings
- Plant automation consulting

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## Featured Project

Rt 35 Box Culvert, Kennebunk, Me  
Produced by: Superior Precast, Auburn, Me  
Structural Design and Shop Dwg's by: Delta Engineers, P.C.



This project consisted of 20 meters of 1.52m X .76m reinforced concrete box culvert. Culvert sections were designed for MS23 loading (HS25) with .9m to 1.2m of earth cover. Openings were cast into two of the sections for lateral drain outlets.