

Appendix B Computer Programs

B-1. Listing

A listing and description of some of the current U.S. Army Corps of Engineers computer programs which are suitable for the structural design of elements of rectangular channels are given in Table B-1.

**Table B-1
Computer Programs**

X0022	EFFRAME	Plane Frame on Elastic Foundation (Design)
X0030	CFRAME	Interactive Graphics Plane Frame Analysis
X0031	CWALSHT	Sheet Wall Analysis/Design
X0050	CBEAMC	Analysis of Beam Column Structures with Nonlinear Supports
X0058	CUFRBC	U-Frame Basins/Channels, Design/Analysis
X0067	CASTR	Design/Investigation of Reinforced Concrete Sections
X0075	CSLIDE	Sliding Stability Analysis
X0097	CCHAN	Structural Design of Rectangular Channels
X0153	CTWALL	Analysis of Retaining Walls and Floodwalls

a. *Computer Program CWALSHT.* Program X0031 is suitable for the design or analysis of cantilever and anchored sheetpile walls. The program uses the classical soil mechanics procedures to determine the required depth of penetration for a new wall or to assess the factor of safety for an existing wall. Seepage effects are considered. Earth pressures are determined by input lateral soil coefficients or by the wedge method.

b. *Computer Program CUFRBC.* Program X0058 is suitable for design or analysis of U-frame structures. Loadings may be simple or complex. Earth pressures on walls are determined by using lateral soil coefficients, wedge solutions, or nonlinear lateral force deformation curves. The base of the structure is modeled as a beam on elastic foundation. Table B-2 is given as a guide in selecting the order of magnitude of variation in the modulus of subgrade reaction. Program CUFRBC

computes internal member loads, foundation bearing pressures and factors of safety against sliding, foundation bearing, and flotation.

**Table B-2
Values of Modulus of Subgrade Reaction for Footings / Guide for Order of Magnitude**

Soil Type	Range of k_s , kci*
Loose Sand	30-100
Medium Sand	60-500
Dense Sand	400-800
Clayey Sand (medium)	200-500
Silty Sand (medium)	150-300
Clayey Soil	
$q_u < 4$ ksf	75-150
4 ksf $< q_u < 8$ ksf	150-300
8 ksf $< q_u$	>300

*Local values may be higher or lower than the values shown.

c. *Computer Program CASTR.* Program X0067 is suitable for use in the design for, or investigation of, flexure in reinforced concrete beam-column sections. The program satisfies the requirements of EM 1110-2-2104 and ACI 318.

d. *Computer Program CCHAN.* Program X0097 is suitable for use in the design of rectangular channels. The program is adapted to four channel types; (1) reinforced concrete U-frame structures, (2) reinforced concrete retaining walls with invert pavement slab (except for thrust imposed on it by the retaining wall base), (3) reinforced concrete retaining walls with invert pavement slab and retaining wall bases designed to transmit shear forces between each other, and (4) rigid frame structure with struts at the top of the walls. Each channel type is designed for two loading conditions: (1) channel empty with backfill submerged to selected elevation and (2) channel full with backfill submerged to selected elevation. Flotation requirements are evaluated and satisfied. Earth pressures on walls are determined from the input soil coefficients.

e. *Computer Program CTWALL.* Program X0153 is suitable for assessing the stability of T-type retaining and flood walls in accordance with EM 1110-2-2502, ETL 1110-2-307, and ETL 1110-2-322. CTWALL will assess the overturning, sliding, and flotation stability.