

NOTES ON THE CALCULATION OF CABLE NETS[©]

by

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1. Introduction

These Notes were developed over some 30 years by the author and Horst Berger¹. They are presented here to make them generally available. Their format is a little old fashioned. (A modest defense of FORTRAN programs is that FORTRAN subroutines can easily be mixed with C++ programs today.) A more ideal format is given by the JAVA programs of Keith MacBain at <http://www-ec.njit.edu/civil/gateway.html>.

The term *cable nets* is meant to include both cable nets and fabric structures. While both cable net models and finite element models can be used for fabric structures², cable net models are commonly used in the design of fabric structures because they are very physical and very simple. Cable nets versus finite element models is an old argument which will not be settled here.

The contents of these notes are as follows:

- Chapter 2 talks about plotting
- Chapter 3 describes the radial tent. (A special case.)
- Chapter 4 describes the *grid method* which is the basic method used in these notes. It includes a method for generating simple node maps and a discussion of designing for constant stress.
- Chapter 5 describes the patterning of fabric structures.
- Chapter 6 describes the use of the grid method to design shells.
- Chapter 7 describes the use of the grid method to design cable nets whose elements have constant length.

With regard to portability, we have had good luck running the code described here on several platforms. The only persistent problem seems to be with use of fonts in the graphics routines. In some cases the load module does not include the fonts required leaving them to the compiler used. So that if you do not have a FORTRAN compiler, the text in the graphics routines is lost. The fontpath call must also be correct and it typically must be adjusted when moving to a new system. These problems are all solvable. For help please contact the author at spillers@adm.njit.edu. It is the intention to provide a better description of the computer programs listed here. They appear in their present form to allow access to interested users. These Notes will be expanded in the near future.

¹ *Light Structures, Structures of Light* by Horst Berger, Birkhauser Verlag, Basel, 1996.

² *Analysis of Geometrically Nonlinear Structures* by Robert Levy and William R. Spillers, Chapman Hall, New York, 1995.

While these Notes attempt to give credit to those who have developed the ideas discussed here, fabric structures are now a rather mature subject whose developers are in some cases forgotten. The author regrets any omissions of this type.