

# Department of Ocean & Resources Engineering

*Seminar*

## **CableCAD - A Design Tool for Strength and Fatigue Analysis of Cables**

by

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### **Abstract**

An overview of a software package developed in Hawaii for CAD, stress analysis and fatigue analysis of cables will be described. Today, there are many marine applications that require sophisticated cables that perform different functions such as tethered remotely operated vehicle (ROV) cables, power cables and communication cables. These cables have components with complex helical geometries that require specialized analysis models to predict structural performance. CableCAD has been developed as a tool to facilitate parametric design studies for cables and ropes.

This program simplifies the layout of cable geometry with an easy-to-use graphical user interface. Loads including tension, twist, bending, cable outer pressure, component internal and external pressures, clamping and temperature change can be applied to this geometry. Cable response to loads is determined by FEA, formulated specifically for cable structures. Utilizing known properties of cable geometry, the program automatically generates a finite element mesh, transparent to the user. The program requires very little model generation and computation times compared with other conventional finite element codes. Upon solution, overall cable response plots such as cable strain, reaction torque or end rotation can be viewed. In addition cable deformation plots, component contact force plots and contour plots of von Mises Hencky effective stress distribution can be presented for all components.

A recent upgrade to this program includes a fatigue analysis model. Fluctuating tensile and bending loads can be applied to the cable and a fatigue analysis produces cycles-to-failure curves for each helical layer in the cable. Also, cable cross-section plots, dissected three-dimensional cable plots and all analysis plots and numerical results are available to facilitate generation of cable design summary and reports.