
DEI

DESKTOP ENGINEERING INT'L INC.

***“Specializing in Computer Aided Engineering
Consulting and Software Development”***

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DESKTOP ENGINEERING BACKGROUND

DESKTOP ENGINEERING INT'L INC. (DEI), specializes in Computer Aided Engineering (CAE). Our consulting engineers and software-engineering specialists are experienced in solving complex problems in both practical and theoretical applications.

To best serve our clients, our firm is organized into two divisions:

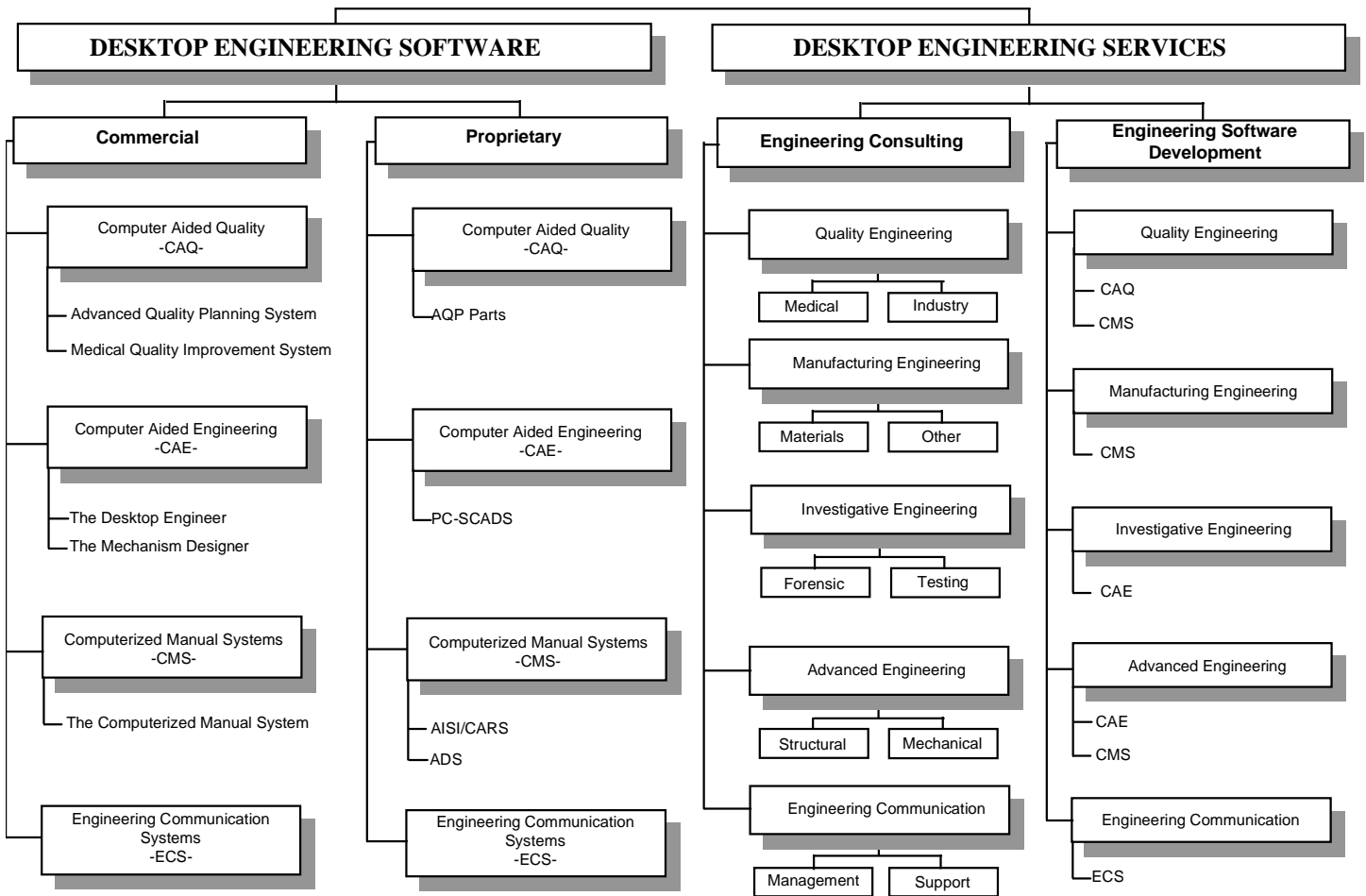
- **Desktop Engineering Software**
- **Desktop Engineering Services**

Practically every major engineering and manufacturing organization in the United States and, thousands more throughout the world uses our unique CAE software products.

Our engineers utilize computer aided analysis techniques, such as finite element method, to provide accurate results for all of our analysis and design products.

Through our association with Columbia University, we have direct access to extensive laboratory and testing facilities, as well as research and development expertise.

Since 1979, we have worked with our commercial, military, government and university clients on a broad range of projects. Regardless of how diverse or complex, client problems have become our challenge.



DESKTOP ENGINEERING SOFTWARE

As experienced mechanical and structural consulting engineers, *DEI* recognized the need for both commercial and proprietary software capable of:

- Solving typical engineering problems without requiring the use of advanced analytical techniques, such as the finite element method.
- Automating the tedious hand calculations performed to establish input parameters required for complex analyses.
- Quickly verifying test and/or analytical results with proven textbook solutions.
- Facilitating parametric or optimizing studies in order to establish the influence of one or more design variables on the resulting design.

COMMERCIAL SOFTWARE

DEI products are currently distributed throughout the world to industry and government clients. Our current commercial products include:

- **THE DESKTOP ENGINEER**

The computerized handbook represents the world's largest known compilation of solutions to engineering equations. The Desktop Engineer is an interactive menu driven program that operates in both Windows and UNIX. It numerically and graphically provides solutions to over 5000 equations required in structural/mechanical engineering applications. These equations, based on the theory of elasticity and strength of materials, have been rigorously researched from over 100 references and represent the results of theoretical efforts by recognized experts of the engineering profession. The Desktop Engineer also calculates geometric section properties for arbitrary two-dimensional thin-walled open cell, closed cell, single cell, multi cell, cross sections. More than thirty nominal section properties, including twelve torsional properties, are calculated.

The Desktop Engineer allows the user to concentrate on the engineering, rather than the bookkeeping, aspects of structural/mechanical calculations.

- **THE MECHANISM DESIGNER**

The Mechanism Designer is an engineering design program, with which the user can create, animate, and optimize standard, or completely new, mechanism types. The Mechanism Designer can model a variety of mechanisms using basic mechanism elements, such as cranks, links, rockers and sliders. Mechanisms are easily defined using a combination of interactive sketches and keyboard entry of exact coordinates. In addition, The Mechanism Designer interfaces with all CAD systems that have the facility to read DXF drawing files.

- **THE COMPUTERIZED MANUAL SYSTEM**

The Computerized Manual System is a combination of a paperless reference manual and computerized handbook to access and apply design information. This system uses state-of-the-art information handling and equation solving techniques that can be adapted to any engineering design or reference manual.

- **THE ADVANCED QUALITY PLANNING SYSTEM**

The Advanced Quality Planning System automates an organization's operating and/or quality procedures in order to provide consistency in applying the procedures and meeting the reporting requirements. It also provides a mechanism for incorporating continuous improvement by verifying and updating the process. The system includes tools for project planning, control and tracking as well as diagnostic tools and documentation and database management tools. It also provides an online reference guide used to access the procedures and intelligent checklist to verify the application of the procedure.

- **THE MEDICAL QUALITY IMPROVEMENT SYSTEM**

The Medical Quality Improvement System will provide a computerized means of entering, retrieving, processing and maintaining patient information. The program will store all available data regarding patient visits, treatments and outcomes in a patient breast care database. It will provide an interactive and intuitive means of collecting this data. This database will facilitate the evaluation of patient risk factors and provide a variety of reporting options for patient follow-up and practice management. The use of this system will integrate patient management with other hospital systems and it can potentially provide a single point of entry for patient data. It will also monitor Medical Quality Improvement by simplifying the entry and access of patient data, improving reporting capabilities, computing risk factors, providing diagnostic controls and furnishing statistical information.

PROPRIETARY SOFTWARE

DEI is responsible for the maintenance, support, marketing, production and distribution of products developed by *DEI* for major industrial clients. Our current proprietary products include:

- **AISI/CARS**

AISI/CARS is a computerized version of the Automotive Steel Design Manual sponsored by the American Iron and Steel Institute and the Auto/Steel partnership. It provides a paperless reference manual and automates the equations and design procedures found in the manual.

- **AQP/PARTS**

AQP Parts is an advanced Quality Planning System developed for AK Steel to computerize the process used for tooling development of automotive sheet metal products.

- **ADS**

ADS is a computerized version of the Aluminum Design Manual sponsored by the Aluminum Association. It includes access to all the information found in the manual as well as an automated specification for the Aluminum building industry and computerized design tools.

DESKTOP ENGINEERING SERVICES

DEI has a straightforward approach to finding and applying solutions to our clients projects. Listen, ask, define, refine, execute. This requires listening to the client, asking detailed questions, defining initial requirements and refining the requirements to produce detailed specification documents that reduce ambiguity to as near zero as practical. These steps provide the basis for a goals oriented solution that will be executed within the allocated time and budget estimate.

DEI provides *Engineering Software Development Services* and *Engineering Consulting Services* in five key areas. They are:

- **QUALITY ENGINEERING** - Perhaps the most potentially explosive growth area in engineering in the coming decade and beyond, is the field of Quality Engineering. We provide Computer-Aided Quality (CAQ) solutions that will guarantee consistent quality in a product or service, if followed properly by users. Manufacturing Engineering solutions developed by *DEI* have applied a production-like environment. CAQ solutions can apply to *any company or organization* that methodically uses certain steps and procedures to deliver a quality product or service. The method by which a company or organization goes through these steps will determine how well they produce their product, from both a quality and cost point of view. *DEI* has developed an Advanced Quality Planning model to automate that method. While each potential environment for the use of The Advanced Quality Planning System will have nuances that are unique, the application of this model is quite generic. The logic and the formulas are the same. For example, the model developed for the automobile industry for the production of parts can be used by the medical industry to efficiently move a patient through a hospital stay.
- **MANUFACTURING ENGINEERING** - *DEI* successfully developed a system for the American Iron and Steel Institute to assist the customers of the steel industry to make more efficient use of steel. This led to the present contract with the Aluminum Association to produce a similar result. *DEI* has not only computerized the documents used in manufacturing, but also the actual steps, procedures and processes themselves.

The same computerized engineering requirements that apply to the Materials Industry also apply to all manufacturing industries that are procedure based, regardless of the product. *DEI* can computerize their systems, procedures, and manuals to help them manufacture their products more efficiently by using a *DEI* proprietary software package known as DE/CMS.

- **INVESTIGATIVE ENGINEERING** - *DEI* has provided expertise for attorneys and their clients, for determining the cause of structural and/or mechanical failures for many years. Additionally, it has involved investigative cost and schedule estimating. *DEI* has developed and designed “jury friendly” graphics used by attorneys in the courtroom to demonstrate their client's position.
- **ADVANCED ENGINEERING** - *DEI* has excelled in providing computer aided engineering solutions, in both a Structural and Mechanical environment, as has been documented earlier. This work is generally performed on a consulting basis. While many of our clients possess the necessary Advanced Engineering techniques, the skill and tools of *DEI* enable these techniques to be used properly and efficiently. Many of today's engineers, while well equipped with Advanced Engineering skills, have lost the first order analysis capabilities of basic engineering. This credible foundation has allowed *DEI* to expand its applications to other areas.

- **ENGINEERING COMMUNICATION - DESKTOP ENGINEERING INT'L INC.** provides consulting services that enable clients to improve communication of engineering data to both external customers and internal audiences. This combination of practical methods and techniques, along with appropriate computerized tools, is referred to by *DEI* as Engineering Communication.

Major engineering projects typically result in the development of large quantities of “core information”. Often, the communication of this information is provided on an after-the-fact basis. Typically, interested parties sort through the core information to create communication messages for Management Progress Reports, Presentations, Printed Reports, Technical Magazine Articles, Customized Internet/Intranet Sites, etc.

DEI provides engineering communications consulting services for proactively organizing and disseminating core information for major engineering projects. We design and implement a structure and information system based on pre-defined communication goals and deliver the desired information using methods that are tailored to meet the goals.

Some areas where *DEI's* expertise in engineering communication can be applied include:

- Internet / Intranet Communications
- Customized Presentation Software
- Electronic Documentation and Reporting
- Large Computer Model Results Viewing
- Image & Data Transfer
- Optimization of Existing Engineering Tools
- Internal Project Progress Reporting
- Engineering Project Final Reports

Engineering Communications Systems (ECS), the computer aided tools used to communicate the desired information, may be customized versions of commercially available software or software developed by *DEI* specifically for our clients. Engineering Communication Systems (ECS) developed by *DEI* are designed to improve the process of transferring engineering and technical knowledge, using various media applications, from the minds of the originators to the minds of the targeted audiences.

ENGINEERING SOFTWARE DEVELOPMENT

DEI offers a broad range of software development services. Whether the finished product is to be used in-house by the client, marketed in a narrow industry niche, or commercialized to a wide prospective customer base, *DEI* can supply all necessary services to successfully develop and market a software product. *DEI* services including development of new proprietary programs, as well as enhancements to existing proprietary programs.

The software development processes, as performed by *DEI*, typically consists of the following integral phases:

- **Project Definition**
- **Specification of Requirements**
- **Design and Documentation**
- **Program Development**
- **Testing**
- **Installation**
- **Operation and Maintenance**
- **Support**
- **Distribution**
- **Security**
- **Communication/Marketing**

The following information explains the phases typically included in our software development process and identifies the QA/QC procedures that are accomplished during those phases. Many of these procedures were derived from the recommended guidelines published by the American Nuclear Society for the validation of scientific and engineering software.

- **PROJECT DEFINITION**

After a problem is defined, *DEI* formulates a management plan that describes the following:

- The organization of the project
- The activities to be performed
- The schedule to be followed
- The responsibilities of each participant in the project

The management plan also addresses required QA/QC activities including:

- Defining the levels of evaluation
- Assigning testing responsibilities
- Determining software development products to be used
- Defining procedures for QA/QC verification of results

- **SPECIFICATION OF REQUIREMENTS**

DEI identifies the requirements which the software must satisfy and documents them in the Technical Specification. This process may involve several iterations, and the requirements may be modified in later phases as a better understanding of the problem is gained. QA/QC activities include:

- Identification of operating environments (e.g. Open systems)
- Definition of the QA/QC plan
- Verification of the technical specification requirements
- Development of preliminary test plans

- **DESIGN AND DOCUMENTATION**

During the Design Phase, *DEI* defines the algorithms, information flow, processing steps, data structures, and other aspects of the software which satisfy the Technical Specification. This information is documented in a Programmer's Design Guide, along with descriptions of required software support, estimated storage, and other information pertinent to the operating environment. Other program documentation initiated during the Design Phase includes a preliminary User's Manual. The User's Manual serves the dual purpose of explaining software usage and acting to guide development in ensuring that all major functions are properly implemented. QA/QC operations at this point include:

- Design verification
- Verification of the preliminary program documentation
- Update and verification of the test plans

- **PROGRAM DEVELOPMENT**

DEI implements the software design by writing code in the required language. This phase includes static checks such as compilation and preliminary functional checkout. The program documentation is also updated to reflect additional information known at this point. QA/QC activities include:

- Verification of the source code
- Verification of the updated program documentation
- Development of test databases
- Verification of the test plan and databases

- **TESTING**

Testing is performed at various stages of program development, followed at the end by a formal testing. QA/QC activities include:

- Unit testing of individual modules to ensure modules are working properly
- Integration testing to ensure proper integration of all modules and components
- Verification testing to ensure the program was developed in accordance with the program documentation
- Acceptance testing by the customer to ensure the program meets customer requirements

- **INSTALLATION**

DEI installs the program within its operational environment, and the program documentation is updated to completely and accurately describe the program. QA/QC activities include:

- Verification of the installation
- Verification of the final program documentation
- Preparation of the final QA/QC report

- **OPERATION AND MAINTENANCE**

DEI monitors the program as it is employed within its operational environment. It is modified as necessary to correct problems and to respond to changing requirements. Depending upon the nature and extent of a given modification, some or all of the development activities may have to be repeated, and the documentation associated with the program will have to be revised. QA/QC activities depend upon the modifications performed and may include re-verifying all the development activities associated with those modifications. The key is to maintain consistency and traceability among the development products.

In addition to the standard procedures outlined, *DEI* also maintains the integrity of the software by using the *DEI* Corrections, Enhancement, Improvement (CIE) System for tracking and correcting reported errors, providing software updates to authorized users, and informing users of current development plans. Upon receipt of an error report, our general error classification scheme guides our response so that the proper remedy level is exercised within the designated time schedule.

- **SUPPORT**

DEI provides support to authorized users. We recognize the critical importance of providing quality communication and support to users at all levels in order for them to easily and correctly apply systems developed by *DEI* to their projects. Consequently, our support encompasses many aspects, including:

Documentation:

- User's manual for installation and software use
- Programmer's Design Guide for detailed functionality descriptions
- On-line help for assistance during usage
- Application manuals containing detailed case studies

Customer Support:

- Direct phone support Hot Line ('800' number), Email and FAX support line
- Support call record keeping and tracking mechanism to foster complete problem resolution and to rate support effectiveness – (incorporates use of *DEI* client Service Request forms)
- Error reporting and enhancement updates (see also 'Operation and Maintenance' discussed previously)
- Response to verbal or written inquiries regarding software usage, upgrade suggestions, and/or other issues

Training:

- Basic training is provided to introduce new users to the system, tailored to address their specific area of application
- Advanced training is provided (when applicable) to provide additional information in order to improve user proficiency
- Training is provided at Customers sites, *DEI* Technical Centers, or at some other mutually agreed location

User Seminars and Conferences:

When possible, *DEI* provides a forum for users to

- Share their experiences and knowledge regarding the product usage and application
- Discuss new features and future upgrades
- Provide input for future releases of the program

Engineering Consultation:

DEI provides engineering consultation to

- Provide assistance in resolving difficult technical problems
- Help the user apply the software to specific problems
- Develop customized interfaces to other project software

• **DISTRIBUTION**

DEI manages distribution of several software packages to existing and new authorized users. This includes all production functions necessary to produce the software and associated documentation.

• **SECURITY**

DEI undertakes every effort necessary to assure that security procedures are exercised and that the integrity of software is preserved. This includes both hardware considerations (e.g. restricting access, as necessary, to the certain network) and preserving the software modules from unauthorized modification, deletion, duplication, etc.

• **COMMUNICATION/MARKETING**

In order to improve the quantity and quality of a software system usage, *DEI* provides efforts to identify additional users. This activity involves communication/marketing of the present capabilities of the system and of applications, which illustrate the advantages that the system has brought to existing projects.

ENGINEERING CONSULTING

Desktop Engineering consultants utilize state-of-the-art computer-aided engineering technology to design and analyze structures and mechanical components and systems. In addition, we apply our analytic expertise to the investigation of mechanical/structural failures, including forensic applications, and to testing of materials. We provide the following services:

- Structural/Mechanical Engineering analyses
- Investigation and assessment of failures
- Forensic Engineering
- Structural design
- Engineering Communication
- Testing of hazardous, non-hazardous and advanced materials
- Preparation of Advanced Quality Planning Systems
- Preparation of technical procedures, requirements and specifications
- Training for Computer Aided Analytical techniques, as well as Computer Aided Design/Engineering (CAD/CAE) and Computer Aided Quality (CAQ)
- Integration of **Desktop Engineering** Workstations

Desktop Engineering consultants are professionals qualified to study, explain and quantify complex structural behavior utilizing state-of-the-art analytical tools to deliver concise, accurate and cost conscious solutions. We have provided our services to both commercial and government projects and we have obtained the necessary Government/Commercial security clearance, when required.

Our engineers utilize state-of-the-art computer aided analysis techniques to provide reliable analytical results and to achieve the best design possible.

Customizing software and developing analytical techniques designed to perform tasks more efficiently are typical of the **Desktop Engineering** approach. In addition to using proprietary software packages, we also have expertise with many commercial finite element applications. For all analyses, we select the application software best suited for specific project and client requirements. *DEI* has provided simplified and complex finite element solutions using both microcomputers and mainframes, as required. **Desktop Engineering** consultants have also demonstrated expertise with advanced analytical techniques such as superelement analysis, cyclic symmetry, component modal synthesis and fracture mechanics.

Our experience with materials and structures, both in analysis and testing, under static, dynamic and fracture conditions, at room temperature, as well as extreme temperatures, together with the available facilities of the Carlton laboratory, provide the expertise needed to investigate almost any material or structure. **Desktop Engineering** has also developed extensive expertise in the analysis of composite materials.

Desktop Engineering consultants have also participated in many local and national seminars and conferences. Staff members have authored many papers on related subjects and have served on technical committees.

We provide for projects of any scope, from the timely resolution of small design and analysis tasks to the organization, management and execution of large projects.

TYPICAL ENGINEERING SERVICES

Desktop Engineering Consultants are specialized in all aspects of CAE. Typical consulting services have included:

- Structural/Mechanical analyses
- Simplified and complex finite element analyses
- Investigation and assessment of failures
- Forensic Engineering
- Stress evaluation
- Fluid-structure interaction, soil-structure interaction, structure-structure interaction studies
- Structural design (concrete, steel, composite material, plastics and advanced materials)
- Fracture Mechanics
- Fatigue and creep analyses
- Design/Analysis to conform to local and national codes and agencies: AISC, Aluminum, ACI, ASME, NRC, UBC, AASHTO, AREA, ASTM, ANSI, AISI
- Testing of hazardous, non-hazardous and advanced materials
- Preparation, supervision and evaluation of testing programs
- Feasibility studies
- Preparation of technical procedures, requirements and specifications
- Training for analysis and design, computer aided analytical techniques, computer aided design/engineering (CAD/CAE)
- Integration of CAD/CAE workstations
- Computer generated presentations
- Cost/schedule analyses
- Web development
- Engineering database applications
- Advanced Quality Planning

TYPICAL ENGINEERING ANALYSES

Simplified and complex finite element analyses are performed using proprietary and commercial computer applications. Types of Analyses performed include:

STATIC ANALYSIS

- Dead Load
- Live Load
- Wind Load (wind, hurricane, tornado)
- Pressure Load (internal, external)
- Equivalent Static Load
- Thermal Loads

HEAT TRANSFER ANALYSIS

- Convection
- Radiation
- Conduction
- Heat Flow
- Internal Heat Generation
- Transient

DYNAMIC ANALYSIS

- Eigenvalue
- Seismic
- Equipment Vibration
- External Vibration
- Vortex Shedding
- Pressure
- Water Hammer
- Fluid
- Hydrodynamic
- Pyro Shock
- Impact Loads
- Random Vibration
- Response Spectra

NON-LINEAR ANALYSIS

- Material Properties (nonlinear elastic, plastic)
- Geometric (Large deformation, buckling, gaps)
- Creep
- Fatigue
- Swelling & Shrinking
- Non-linear Supports
- Differential Stiffeners

ADVANCED TECHNIQUES

- Superelement/substructuring
- Cyclic Symmetry
- Modal Synthesis
- Fracture Mechanics

TYPICAL ENGINEERING PROJECTS

Desktop Engineering Consultants have worked on analysis and design projects ranging from microchips to power plants. Typical projects have included:

CIVIL/STRUCTURAL ENGINEERING

- Buildings (Steel, Concrete, Masonry, Timber)
- Space Frames
- Foundations, Concrete Slabs
- Scaffolding
- Bridges, Stacks
- Walkways, Railways
- Elevated Train Stations
- Pyro Shock, Impact Loads
- Random Vibration

NUCLEAR/FOSSIL POWER PLANTS

- Containment Structure
- Foundations
- Reactor Vessel
- Auxiliary Buildings and Structures
- Equipment (Cranes, Generators, etc.)
- Hyperbolic Parabolic Cooling Tower
- Steam Generators
- Piping Systems and Supports

MECHANICAL/ELECTRICAL EQUIPMENT

- Laser Chip and Submount
- Equipment Supports/Foundations/Packaging
- Pressure Vessels
- Piping Systems and Valves
- High Speed Centrifuge Rotors
- High Pressure Oil Filter Base Plates
- Optical Tracking Equipment
- Microchip Connectors and Circuit Boards
- Automotive Parts
- Ball Bearing Assemblies
- Rotary Engines
- Heat Exchangers
- Ovenable Trays

AIRCRAFT/SPACECRAFT COMPONENTS

- Spacecraft Structures
- Parabolic Reflectors
- Towers
- Antenna
- Solar Array
- Equipment Modules
- Missiles
- Aircraft Landing Gear

INVESTIGATIVE/FORENSIC ENGINEERING

- Artificial Limbs
- Biomedical Engineering Devices
- Medical Lifting Devices
- Reinforced Concrete Construction
- Concrete Slabs, Potholes
- Scaffolding
- Cranes, Buses
- Power Plant Equipment
- Residential Construction
- Commercial Roof Deterioration
- Automotive Panel (doors, hoods, etc.)

TESTING OF MATERIALS

- Classical and Advanced Materials
- High Temperature Creep
- Fatigue
- Fracture
- Dent Resistance
- Cast Steel
- Cast Iron Columns
- Acoustics
- Concrete Compressive Strength

DESKTOP ENGINEERING CLIENTS

DESKTOP ENGINEERING SOFTWARE

DEI Engineering software products are currently being marketed worldwide. Copies of our programs have been sold to Fortune 100 companies, government agencies and universities.

Major industry clients have included:

- Allied Bendix
- Bechtel
- Boeing
- British Steel
- Caterpillar
- Dupont
- Exxon Fairchild
- General Motors
- Honeywell
- IBM
- John Deere
- Martin Marietta
- Morton Thiokol
- Rockwell International
- Spar Aerospace
- Westinghouse
- AK Steel Corporation
- BMW
- Borg Warner Automotive
- Canadair
- Chrysler
- Eastman Kodak
- Ford
- General Electric
- Grumman
- Hughes Aircraft
- Ingersoll Rand
- Lockheed
- McDonnell Douglas
- Northrop
- Schlumberger
- TRW
- Volvo

Major government clients have included:

- Argonne Nat'l Labs
- Brookhaven Nat'l Lab
- Federal Aviation Admin.
- Los Alamos Nat'l Lab
- NASA Langley Research
- NASA Research
- Naval Air Engineering
- Naval Experimental Diving
- Naval Ordnance Station
- Naval Surface Warfare
- New York Power Authority
- NYC Transit Authority
- US Army Corps of Engineers
- USDA – Forest Service
- Atomic Energy of Canada
- Dept. of Water & Power - Los Angeles
- Lawrence Livermore Nat'l Lab
- NASA Goddard Research
- NASA Lewis Research
- Naval Air Development
- Naval Aviation Depot
- Naval Ocean Systems
- Naval Research Lab
- Naval Underwater Systems
- NYC Dept. of Transportation
- Sandia Nat'l Lab
- US Dept. of Energy
- US Postal Service

DESKTOP ENGINEERING SERVICES

DEI has provided services for projects of various sizes and scopes, from the timely resolution of small design and analysis tools to the organization, management and execution of larger projects.

Major clients have included:

- Aeroflex Laboratories, Inc.
- Air Products & Chemicals
- AK Steel Corp.
- Aluminum Association
- American Electric Power Corp
- American Iron & Steel Institute
- Amp, Inc.
- Arizona Public Service
- Bechtel Power Corp.
- Berman, Paley Esq.
- Burns and Roe, Inc.
- Cigna Property & Casualty
- Consarc
- Consolidated Edison Co.
- Controlex / EANCO
- Duke Power Co
- E.I. Du Pont De Nemours & Co.
- Ebasco Services
- Energy Research Corp.
- Entergy Corp.
- Framatome-Cogema
- GE, Ltd. Electro Optics Division
- General Public Utilities
- Gibbs and Hill, Inc.
- Hackensack Medical Center
- Hardin Construction Co.
- High, Swartz Esq.
- Hoffmann-La Roche
- Illinois Power Co.
- International Iron and Steel Institute
- ITT
- John Deere, Inc. Rotary Engine Div.
- LCM Engineering
- Lev Zetlin Associates, Inc.
- Lockheed Electronics
- Louisiana Power and Light
- Lurgi Corporation of America
- Martin Marietta
- Metropolitan Transportation Authority
- New York City Transit Authority
- New York Power Authority
- Northeast Technology Corp.
- Northeast Utilities
- NUS Corp.
- Parsons Brinkerhoff-FG, Inc
- Peabody and Wind Engineering Co.
- Porsche Engineering Services
- Public Service Electric and Gas Co.
- Purolator Products, Inc.
- RCA, Inc. Astro Electronics
- Riker, Danzig Esq.
- Safeco
- Sargent & Lundy Engineers
- Southern Boiler and Tank Works, Inc.
- Spar-Aerospace
- Stewart, Sokol, Esq.
- Treadwell Corp.
- U.S. Generating
- U.S. Nuclear Regulatory Commission
- United Engineers & Constructors
- USS, Division of USX
- Weidlinger Associates
- WESTEC Services, Inc.
- Westinghouse Electric Corp.

DESKTOP ENGINEERING PROJECTS

ENGINEERING SOFTWARE DEVELOPMENT

In addition to our commercial software packages, *DEI* has developed many proprietary software programs, that provide low cost and efficient solutions to complex structural problems. We have developed proprietary software for clients such as AISI, DuPont, AMP, Metropolitan Transit Authority, Control Data Corporation, New York Power Authority, Port Authority of New York and New Jersey, General Electric and others. These programs have been developed for microcomputers and mainframes.

DEI developed a Computerized Application and Reference Systems (CARS) of the Automotive Steel Design Manual published by AISI. The Computerized Application Mode of CARS is essentially a computerized handbook. It uses state-of-the-art equation solving techniques to quickly and selectively accesses design procedures, tables, equations, figures and other information found in the Manual. It also provides database operations, such as keyword searches and report generation.

Desktop Engineering consultants and software developers have developed a computerized structural database, analysis and rating system for the elevated track structures of the New York City Transit Authority. The Automated Structural Inventory System (ASIS) creates and maintains required structural data for the elevated lines including stringers, girders and columns and their connectors. In addition, the program processes data on structural damage and repairs. The Automated Structural Analysis Program (ASAP) calculates the stresses in stringers, girders, columns and their connections subjected to dead, live, wind, centrifugal and traction loads. Both programs are interactive, menu driven, and interface with each other and are compatible with Intergraph's DMRS database management system.

DEI developed a material and geometric non-linear analysis program for AMP Incorporated. This program, designed to operate on microcomputers, workstations and super-minicomputers, analyzes computer connectors to determine deflections and stresses.

DEI developed a Windows-based computerized data acquisition and monitoring system for stamping presses. PPMS provides parallelism and time history records and features real time numerical and graphical display, press and die databases, sensor calibration options, and cycle comparison routines.

DEI developed the Fluid Flow Graphical Display program for Johnson & Johnson. The program provides curve fitting and multiple results display of proprietary fluid flow properties. The program features cubic and polynomial curve fitting, scaleable and autoscale options, and export routines for both DOS and Windows operating systems.

DEI has participated in the development of a Traffic Control Signs GIS application for Parsons Brinckeroff FH Inc. This system, used by the State of New Jersey and others, is based on a relational database used to store information about a location of a given vehicle traffic control sign. A customized version of the Microstation CAD system has been integrated to locate and display a landbase of roads as well as a sign plan drawing for each road in the database.

DEI developed The Aluminum Design System (ADS), a computerized version of The Aluminum Design Manual sponsored by The Aluminum Association. ADS is a computerized system for the design and analysis of building structures and provides the capability to check whether a member will satisfy the ASD and LRFD specifications. ADS also provides extensive Material and Section databases and includes portions of The Desktop Engineer structural analysis program.

DEI developed a program for Hackensack University Medical Center to determine the quantitative assessment of a patient's risk of developing breast cancer. This assessment can be based on multiple risk factors. Several sophisticated models have been incorporated to assist in more precise risk assessments based on information provided by the patient. As the patient database is updated with patient history and outcome information, new HUMC Breast Cancer Risk Assessment Models can be formulated and incorporated.

ENGINEERING CONSULTING

DEI consultants have worked on analysis and design projects ranging from microchips to power plants. These projects encompass many industries including:

- Civil/Structural Engineering
- Nuclear/Fossil Power Plants
- Mechanical/Electrical Equipment
- Aircraft/Spacecraft Components
- Investigative/Forensic Engineering

• CIVIL/STRUCTURAL ENGINEERING

Desktop Engineering has performed state-of-the-art analysis and design of structures and buildings having simple and complex geometric configurations. Projects have included bridges, tanks, stacks, space frames, as well as conventional buildings. Many of these projects exhibit complex structural behavior when subjected to complex loading conditions such as dynamic, thermal and nonlinear effects.

Desktop Engineering consultants developed a finite element model of the Manhattan Bridge Rehabilitation Project using advanced modeling techniques such as superelement and cyclic symmetry methodologies. Torsional deflections of the bridge deck and adequacy of deteriorated structural connections were examined.

The George Washington Bridge was analyzed to investigate seismic effects using a three-dimensional finite element model. This analysis also included a soil structure interaction study.

A copper converter owned and operated by Inspiration Copper Co. of Inspiration, Arizona was analyzed for extreme thermal cycling conditions. **Desktop Engineering** has performed dynamic and static analyses of tall stacks and silos. A vortex shedding study of a furnace waste gas stack was completed for Italmimpianti of America, New York, NY. A dynamic analysis of a tall coal silo at Wyodak Station, Wyoming was performed to explain oscillatory behavior during concentric coal withdrawal.

Desktop Engineering performed the seismic analysis and design of chemical plant structures, including the development of computer aided engineering tools, for DuPont. An elevated walkway was modified and redesigned for the New York Power Authority.

Response spectra have been developed for steel and concrete structures, hospitals and high-rise buildings.

• NUCLEAR/FOSSIL POWER PLANTS

Desktop Engineering has provided services for Nuclear and Fossil Power Plants (oil and coal-fired plants, boiling and pressurized water power plants, and breeder reactors) for clients such as PSE&G, Con Edison, GPU, TVA and NYPA. We have been actively involved with all phases of design, analysis and field modifications for containment buildings, mechanical systems, foundations and footings, steam generator and turbine generator pedestals, and piping systems.

Desktop Engineering consultants have participated in research and development projects with the Nuclear Regulatory Commission and have worked with large A/E firms such as EBASCO, Burns and Roe and Foster-Wheeler.

We are familiar with related specifications and codes including Nuclear Regulatory guides, ANSI standards and ASME Boiler and Pressure Vessel codes. Design of nuclear power piping systems and supports have typically included rigorous adherence to a number of design standards and criteria including NRC Regulatory Guides and ANSI, ASME and AISC codes.

DESKTOP ENGINEERING PROJECTS

DEI engineers have participated in Integrated Design Inspections (IDI) which are established by the Inspection & Enforcement Division of US Nuclear Regulatory Commission. This detailed design inspection includes all disciplines and is performed on nuclear plants that are in the near term operating license stage. Sophisticated analyses have been performed to qualify system design for seismic loadings, support movements, extreme temperature variations and hydrodynamic loadings. Retrofit analyses have required refinement in analytical techniques in order to account for support flexibility, dynamic support motions and probabilistic evaluation of loads and responses.

Desktop Engineering consultants has applied their knowledge of finite element computer programs to analyze unique structural systems subjected to complex loadings. These analyses include soil-structure and fluid-structure interaction, seismic analysis, machine vibration, impact loads, hydrodynamic loads, thermal loads, tornado, as well as dead and live loads.

Desktop Engineering has performed seismic, impact and thermal analyses of spent fuel racks, heat exchanger supports, foundation and steel containments, for various nuclear power plants. **Desktop Engineering** has been extensively involved in the analysis and design of vessels, snubbers, diverters, piping and pipe support systems.

• MECHANICAL/ELECTRICAL EQUIPMENT

Desktop Engineering has performed structural analyses and designs of mechanical and electrical components and their subassemblies varying in scope from the thermal analysis of a small semiconductor chip to the dynamic analysis and design of large equipment pedestals.

The analysis and design of a ball bearing assembly for Controlex/Eanco included the study of the assembly operational behavior when subjected to high thermal loads. A parametric study of a high power laser mount and submount assembly for heat transfer and thermal stresses was performed for General Electric.

The analysis and design of complex rotary engine parts subjected to temperature and pressure loading was performed for Curtis Wright and John Deere. These components were highly irregular in shape and required internal stress investigation at many component cross-sections.

Fluid-structure interaction was investigated in a project for E.I. DuPont de Nemours & Co. involving centrifuge rotors subjected to high angular velocities and accelerations at the rotor extremities of more than one million "G's". The analyses required the utilization of high strength and exotic materials to withstand unusually high internal stresses.

Displacement criteria and fatigue life span were investigated in several projects for Purolator Inc. involving high-pressure oil filter baseplates. CAD/CAM software was utilized to develop complex models, which were then interfaced with computer-aided analysis programs.

A dynamic transfer function analysis was performed for Lockheed Electronics Co. on an optical equipment pedestal. An enforced acceleration representing a nearby explosive blast was imposed on a detailed structural model. Analysis data was then used to design a closed-loop servo actuation system to control the position of the optical equipment.

A heat transfer and structural analysis of high temperature, molten carbonate fuel cells was performed for Energy Research Corporation and the Department of Energy (DOE). A stress analysis of a shell and tube type heat exchanger in accordance with the ASME code was performed for Martin Marietta.

Analyses have also been performed on electrical control panels, cranes, vessels and storage tanks.

- **AIRCRAFT/SPACECRAFT COMPONENTS**

Desktop Engineering has provided analytical consulting services for communication, weather and defense related satellite programs. The scope of this work has varied from the analysis and design of components to the analysis and design of entire spacecrafts.

Satellite and satellite components have been studied by **Desktop Engineering** for various clients including RCA Astro Electronics, GE Electro Optics, McConnell Douglas, SPAR and Martin Marietta. These satellites have been built for commercial use and government agencies, such as the Air Force and NASA.

Typical spacecraft components have included laser telescopes, parabolic reflectors, antennas, solar array panels, robotics arms and equipment modules, each presenting unique design problems to satisfy size, weight, and operational requirements. Spacecraft and their components must satisfy stringent design requirements and undergo rigorous tests to demonstrate structural integrity during launch, orbit, operation and extreme environmental condition. Loads to which the spacecraft and its components are subjected in these environments include random and harmonic vibrations, mechanical loadings and thermal loadings.

Dynamic and eigenvalue analyses have been performed on aircraft substructures such as a forward wing actuator for Aeroflex Laboratories. One such project involved investigating the dynamic characteristics of a thin compression screw at various extension positions. The results of this analysis were used to optimize the structural design by reducing the component weight while maintaining structural integrity.

- **INVESTIGATIVE/FORENSIC ENGINEERING**

Desktop Engineering has investigated numerous structural failures and applied our expertise to forensic applications.

Desktop Engineering has performed investigative failure analyses of piping systems and components. This included the evaluation and redesign of failed piping systems and valves, as well as the modification of existing systems exhibiting excessive deflections.

Collapse studies have been performed to verify structural integrity, as well as to investigate structural failures. **Desktop Engineering** was involved in determining the cause of the hyperbolic parabolic cooling tower scaffold collapse at the Pleasant Power Station at Willow Island, West Virginia. We also determined the possible effects of a progressive non-linear collapse of the space frame roof of the New York Convention Center.

Desktop Engineering has investigated the chassis and mechanical systems of shuttle buses. A medical lifting device for invalid patients was analyzed for stability by performing a geometric, non-linear analysis.

Desktop Engineering investigated pothole formations considering temperature, traffic, moisture and material properties. **Desktop Engineering** has reviewed heavy reinforced concrete design and construction for a nuclear power plant.

A structural analysis of an ovenable tray to investigate the optimum design, by minimizing deflections and tray weight, was performed for Celenese.

Desktop Engineering investigated the cause of the delaminating of a roof coating material considering various types of distress, exposures and material lots.

Desktop Engineering investigated the structural integrity of a concrete conduit for the New York City Transit Authority.

- **TESTING OF MATERIALS**

In both consulting and research, **Desktop Engineering** has a long history of work on all types of structures and structural materials including a broad testing experience with classical and advanced materials under many loading conditions and environments.

In the laboratory, extensive testing programs have been conducted on high temperature creep of superalloys for application to turbine design.

Fatigue tests have been performed on high strength steel wires from the main cables of suspension bridges (the Williamsburg in New York and the Golden Gate in San Francisco) to assess the condition of those bridges.

Tests of indentation resistance and energy of car doors and hoods, and the development of a portable testing device for that purpose have been among the extensive test programs conducted by **Desktop Engineering**.

The significance of cracks and voids in the cast steel spherical nodes used in the space frame of a large metropolitan convention center has been investigated. A complete testing program of cast iron columns, from an old (1860s) mill building in Massachusetts, to develop the applicable column design curve for use in the redesign of the building for residences and shops, has been conducted.

Desktop Engineering's experience with materials and structures, both in analysis and testing, under static, dynamic and fracture condition, at room temperature, as well as extreme temperatures, together with the available facilities of the Carlton laboratory, provide the expertise needed to investigate almost any material of structure.

Other projects in which *DEI* has provided consulting services include the following:

AEROFLEX LABORATORIES INC., Plainview, NY

- Starship I aircraft component design

AIR PRODUCTS & CHEMICALS, Wichita, KS

- Reactor Vessel Stress and Fatigue Analysis

AK STEEL CORPORATION, Middletown, OH

- Advanced Quality Planning for Automotive Parts

ALTO LAZIO NUCLEAR STATION, Italy

- Flow Diverter: Complete design of structural, mechanical and electrical control systems

AMERICAN ELECTRIC POWER, New York, NY

- D.C. Cook Nuclear Power Plant

AMERICAN IRON AND STEEL INSTITUTE, Southfield, MI

- Automotive Steel Design Manual Computerization
- Technical and Marketing Communications

AMP INC., Harrisburg, PA

- Development of customized material and geometric nonlinear finite element analysis program

ANGRA NUCLEAR STATION (BRAZIL)

- Vessels and Tanks (Cat. D): analysis and design
- Filter Plenums: Seismic analysis of air handling systems

BELL LABORATORIES BUILDING, Murray Hill, NJ

- Vibration analysis of floor with critical equipment

BURNS & ROE, INC., Oradell, NJ

- Washington Public Power Supply System - Hanford Unit 2, Richland, Washington

CATAWBA NUCLEAR STATION, Charlotte, NC

- Steel containment: Stability analysis

CLINTON NUCLEAR STATION, Clinton, IL

- High Density Fuel Storage Racks: Seismic and impact analysis
- Flow Diverter: Complete design of structural, mechanical and electrical control systems

CONSARC, Rancocas, NJ

- Elevated Temperature Vacuum Retort Failure Analysis

CONTROLEX/EANCO, Croton Falls, NY

- Throttle Bearing Assembly

D.C. COOK NUCLEAR STATION, Bridgman, MI

- Electric Control Panels: Seismic analysis and design
- Category I Piping Systems: Analysis and design of piping supports

E.I. DUPONT DE NEMOURS & CO., Newark, DE

- Chemical Plant Response Spectrum Analysis
- Centrifuge Rotor
- Enhancement and maintenance of in house structural analysis system

EBASCO SERVICES, New York, NY

- Houston Lighting & Power - Allen Creek Nuclear Power Plant

ENERGY RESEARCH CORP., Danbury, CT

- Moltencarbonate Fuel Cell Structural and Thermal Analyses

FRUCTOSE PROCESS PLANT, Savanna, IL

- Structural Steel Frame: Investigation and remedial action to resolve construction problems

GE LTD. - ELECTRO OPTICS DIVISION, Quebec, Canada

- MDAC Photodetector Module Analysis & Design
- High Power Laser Chip Analysis

GENERAL PUBLIC UTILITIES, PARSIPPANY, NJ

- Oyster Creek Nuclear Power Plant

HACKENSACK UNIVERSITY MEDICAL CENTER, Hackensack, NJ

- Health Risk Management System

HOFFMANN-LA ROCHE PLANT, Nutley, NJ

- Structural Analysis and Design: Evaluation of existing floor system for increased loadings and modifications

INTERNATIONAL IRON & STEEL INSTITUTE

- Ultralight Steel Auto Body Project Management & Support
- Ultralight Steel Auto Closures Project Management & Support

ITT DEFENSE COMMUNICATIONS DIVISION, Nutley, NJ

- Silicon chip thermal analysis

ITT MARLOW PUMP, Midland Park, NJ

- Diaphragm pump component design

JOHN DEERE, INC., ROTARY ENGINE DIVISION, Woodridge, NJ

- Rotary engine design and analysis

KORI NUCLEAR STATION (KOREA)

- Filter Plenums: Seismic analysis of air handling systems

LOCKHEED ELECTRONICS, Plainfield, NJ

- Transfer functions for an optical equipment pedestal

MARTIN MARIETTA, Oak Ridge, TN

- Stress Analysis of Heat Exchanger to ASME Code

METROPOLITAN TRANSPORTATION AUTHORITY, New York, NY

- NYCTA Elevated Lines Structural Survey Phase III

NEW YORK CITY TRANSIT AUTHORITY

- Subway Overpass

NEW YORK POWER AUTHORITY, New York, NY

- James A. Fitzpatrick Nuclear Power Plant
- Indian Point Nuclear Power Plant

NRS INDEPENDENT DESIGN VERIFICATION PROGRAM

- Clinton
- Nine Mile Point
- Vogtle
- South Texas

NRC INTEGRATED DESIGN INSPECTIONS

- Byron Unit No. 1
- River Bend
- Seabrook Unit No. 1
- Perry Unit No. 1

O'CONNOR, MCGUINNESS, ESQ., White Plains, NY

- Failure Analysis of Lift Aid Device for Immobile Patients

OYSTER CREEK NUCLEAR STATION, Forked River, NJ

- Spent Fuel Pool: Thermal and structural analysis
- Radwaste Building: Modification to existing building
- Fuel Rack Drop analysis: Determine safe path over reactor vessel

PARSONS BRINKERHOFF-FG, INC., Princeton, NJ

- Burlington County Sign Management System
- NJ DOT Sign Management System

PORSCHE ENGINEERING SERVICES, INC., Troy, MI

- Ultralight Steel Auto Closures Program Support

PR ASSOCIATES, INC., Detroit, MI

- Technical Communications

PUROLATOR PRODUCTS INC.

- Fa-800 fuel filter design

RCA INC. - ASTRO ELECTRONICS, Princeton, NJ

- Defense Meteorological Satellite program
- RCA communication satellite programs - SATCOM, GSTAR, SPACENET, DBS
- Customized Software Development

RIKER, DANZIG, SCHERER, HYLAND & PERRETTI

- Ocean Pointe Condominium Association, Inc.
- Carlyle Towers

SALEM NUCLEAR STATION

- Auxiliary Feedwater Tank: Tornado missile evaluation
- Steam Generators: Analysis of degraded snubbers and supports
- Piping Analysis: Design and analysis of large and small bore piping

SAVANNAH HYATT REGENCY HOTEL, Savannah, SC

- Prestressed Concrete Frame: Investigation of field problems

SEARS SHOPPING MALL, Long Island, NY

- Investigation of collapse of masonry block wall

SPAR, Ste-Anne-De-Belleuve, Canada

- Commercial Satellite Programs - RADARSAT, MSAT & HISPASAT
- Freedom Space Station

THE ALUMUNUM ASSOCIATION, Washington, DC

- Aluminum Design Manual Computerization

TREADWELL CORP., New York, NY

- Inspiration Copper Co., Inspiration, Arizona
- Italmimpianti of America, Inc., New York, NY

UNITED ENGINEERS & CONSTRUCTORS, Philadelphia, PA

- Pleasant Station Power Plant

USS, DIVISION OF USX, Troy, MI

- Door Dent Test

VA HOSPITALS, PA

- Structural Steel Frame: Investigation and remedial action to resolve construction problems

WATERFORD III NUCLEAR PLANT, Waterford, LA

- Common Basemat: Analysis of cracks and potential effects upon structural integrity

WEIDLINGER ASSOCIATES, New York, NY

- Manhattan Bridge Rehabilitation Project
- New York Convention and Exhibition Center
- NATO Conventional Weapon Systems

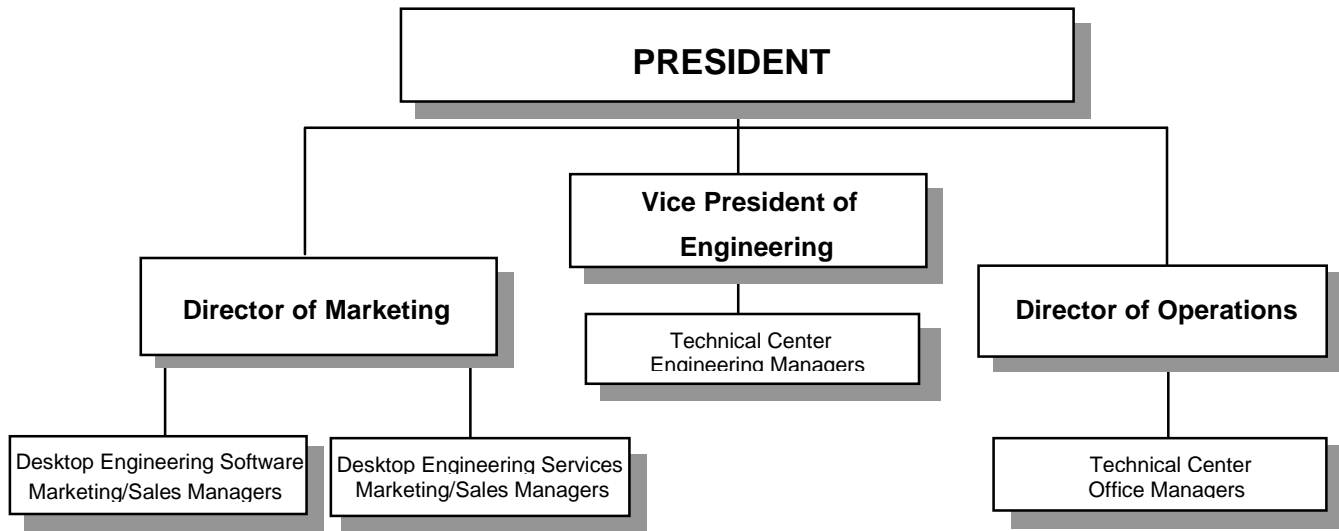
WILLOW ISLAND POWER STATION, St. Mary's, WV

- Hyperbolic Cooling Tower: Investigation of scaffold collapse during construction

DESKTOP ENGINEERING KEY PERSONNEL

DEI key personnel are responsible for the management of the operations and activities of the corporation:

- Daniel V. Schiavello, President and Chief Executive Officer
- Jeffrey J. Walters, Vice President of Engineering and Chief Operating Officer



DANIEL V. SCHIAVELLO, PRESIDENT

Mr. Schiavello is widely recognized for his expertise in structural and mechanical analytical techniques. He has participated in a wide range of projects, including: analysis of defense and communication satellites and satellite components (including dynamic and thermal effects), static, seismic, and thermal analysis of nuclear power plants, and vibration analyses of military and nonmilitary mechanical systems. Mr. Schiavello is recognized for his expertise in the application of general-purpose finite element programs.

In addition to his consulting activities, Mr. Schiavello originated the concept and directed the development of The Desktop Engineer, an interactive database program for microcomputers that represents the world's largest known compilation of solutions to structural/mechanical engineering equations. He has also lectured and written various papers on static and dynamic analyses.

Mr. Schiavello has been a technical advisor for AISI/CARS, a computerized version of American Iron and Steel Institute's Automotive Design Manual. He serves as consultant to the AISI Task Force on Automotive Steel Design, as well as the computerization and marketing subcommittees.

Mr. Schiavello has provided his expertise in investigative and forensic engineering projects, including such items as scaffold collapse, reinforced concrete construction, concrete slabs, piping systems and many others.

He received M.S. and B.S. degrees in Civil Engineering from Columbia University, School of Engineering and Applied Science, New York, NY. Mr. Schiavello is a member of ASCE, ASME, ACI, and the New York Academy of Sciences.

Mr. Schiavello owns 95% of the company and has vested power of authority of the Board of Directors to negotiate and execute contracts. He is responsible for the general operation of the business and maintains authority over the officers of the corporation.

JEFFREY J. WALTERS, P.E., VICE PRESIDENT OF ENGINEERING

Mr. Walters specializes in providing project management and technical expertise on structural and mechanical finite element analyses, CAE software development and forensic investigation projects.

Mr. Walters has designed, analyzed and investigated a variety of structures, buildings, and equipment for static, dynamic and thermal loads for the industrial, chemical, nuclear, automotive and aerospace industries. Mr. Walters has made extensive use of analytical methods and computer programs.

Mr. Walters has directed the development of specialty software programs that operate on microcomputers, workstations and mainframes. Notably, Mr. Walters directed the development of two computerized manuals; AISI/CARS, a computerized version of American Iron and Steel Institute's Automotive Steel Design Manual and ADS, a computerized version of The Aluminum Association's Aluminum Design Manual.

Mr. Walters has provided expert consulting in investigative and forensic engineering projects including structural design, construction methods, schedule and cost analyses, and failure analysis.

Mr. Walters received his M.S. degree in Civil Engineering from Manhattan College, New York, NY and his B.S. degree in Civil Engineering from Lehigh University, Bethlehem, PA. He has lectured and authored various papers on dynamic analysis and engineering software development. He is a member of ASCE and is a licensed Professional Engineer in the States of New Jersey and Delaware.

Mr. Walters is responsible for the general management and supervision of the engineering and programming staff. He is also the Director of Quality Assurance and Technical Documentation.

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