FARMERS BRANCH

Statement of Qualifications

Preliminary Design Study

For

Interceptor Sewer Tunnel

SEPTEMBER 1988

City of Farmers Branch / Town of Addison

TOWN OF ADDISON

Submitted By: CONSOER, TOWNSEND & ASSOC., INC.

In Association With LICHLITER/JAMESON & ASSOC., INC.
JAY DEE CONTRACTORS, INC.
SOUTHWESTERN LABORATORIES

CT&A

Consoer, Townsend & Associates, Inc.
Consulting Engineers

August 31, 1988

Mr. Jerome V. Murawski, Jr., P.E.
Chairman, Farmers Branch/Addison Sewer
Development Project Committee
13000 William Dodson Parkway
P.O. Box 81901
City of Farmer's Branch, Texas 75380-9010

SUBJECT: **REQUEST FOR QUALIFICATIONS FOR INTERCEPTOR SEWER TUNNEL PRELIMINARY DESIGN STUDY**

Dear Mr. Murawski:

Consoer, Townsend & Associates in association with Lichliter/Jameson and Associates, Jay Dee Contractors and Southwestern Laboratories, is pleased to submit this Statement of Qualifications for the joint City of Farmers Branch and Town of Addison Interceptor Sewer Tunnel Preliminary Design Study.

Consoer, Townsend and Associates will act as the prime member of the team and provide the over-all management and responsibility required for the successful completion of all phases of the project.

We wish to specifically call to your attention our unique approach to include a very experienced and successful sewer tunnel contractor, Jay Dee Contractors Inc., as a member of the preliminary, final design and construction management team. Their experience plus that of the other team members will provide the basic requirements for a successful project, which are constructability within budget restraints, a realistic cost estimate, and the timely completion of the project with the absence of expensive claims and litigation.

The project team welcomes the opportunity to provide our services to the City of Farmers Branch and the Town of Addison. Key staff members are available to meet at your convenience to further discuss our qualifications. We will be pleased to answer any questions or provide any additional information that you may desire.

Respectfully Submitted,

Consoer, Townsend & Associates

Wilbur Van Riper
Regional Manager

I. INFORMATION ABOUT TEAM MEMBER FIRMS

A. PROJECT TEAM DESCRIPTION

The project team is made up of the following firms:
1. Consoer Townsend & Associates Inc.
2. Lichliter/Jameson & Associates, Inc.
3. Jay Dee Contractors, Inc.
4. Southwestern Laboratories

This team brings together the sewer design expertise of a national consulting Engineering firm, Consoer Townsend & Associates, with an office in Houston, Texas and a national sewer tunnel contractor, Jay Dee Contractors, Inc., who have recently completed successful Sewer Tunnel projects in Houston and Dallas, Texas along with the local consulting engineering firm of Lichliter/Jameson to provide surveying and local regulatory and permit requirements and Southwestern Laboratories to provide geotechnical and soil boring reports.

A brief history and description of each Team Member is as follows:

B. DESCRIPTION AND HISTORY

1. CONSOER TOWNSEND & ASSOCIATES

FOUNDED - 1919 in Chicago, Illinois

OFFICE LOCATIONS

Houston Texas; Chicago, Illinois; Nashville, Tennessee; Tacoma, Washington; Erie Pennsylvania; Naples, Florida, St. Louis, Missouri; Atlanta, Georgia; Charlotte, North Carolina; Reedsburg, Wisconsin; and San Juan, Puerto Rico.

SERVICES PROVIDED

Consoer Townsend is a consulting Engineering firm specializing in wastewater collections and treatment including reports, design, and construction management. Multidisciplinary services are provided by separate in-house mechanical, electrical, structural & architectural departments. Other services are provided include water supply, treatment and distribution; transportation, solid waste, and Municipal Engineering.

We wish to emphasize that once a project has reached the construction phase it comes under the jurisdiction of our construction department which manages and staffs the project with our experienced resident Engineers and Inspectors and coordinates the specialized shop drawing reviews and/or construction problems with the original design team, the owner, and the contractor. This procedure provides immediate response and action to construction problems and has resulted in the reduction and successful settlement of claims between the contractor, engineer and owner.

STAFF

Our staff of over 250 people includes over 130 senior, mid-level and junior engineers. Many of the senior engineers have over 25 years continuous service with the firm, resulting in excellent quality control both in design and construction.

CORPORATE PROFILE

In 1986 Consoer Townsend & Associates was purchased by PRC (Planning Research Corporation). Several other firms were purchased by PRC in that same time period and were formed into PRC Engineering. However, each company maintained their own individuality and clients.

In 1987 Ashland Oil Company under the Engineering Branch of Ashland Technology Corporation purchased PRC Engineering and, following the purchase, re-established the identity of the acquired companies. Each of the companies operates independently in all respects, however has the ability to utilize the expertise from any of the Ashland Technology Companies.

The above information is presented to eliminate any confusion with respect to project and client references referred to during the time period when Consoer Townsend & Associates performed work as PRC Engineering.

2. **JAY DEE CONTRACTORS, INC.**

Jay Dee Contractors, Inc. was founded in 1966 by John J. DiPonio primarily to build tunnels and other underground construction projects. Jay Dee's principle offices are located in Livonia, Michigan, with local offices in Texas, Illinois and Wisconsin.

Throughout its 22 year history, Jay Dee has undertaken many types of projects including pump stations, bridges, shafts and water tunnel construction of water and sewer lines. Jay Dee has built more than 68 miles of tunnel on over 69 different projects throughout the states of Texas, Wisconsin, Ohio, Minnesota, Missouri, Michigan, Indiana and Illinois. These tunnels have been built in various types of geological conditions including; hard and soft rock, soils ranging from gravels, sands, silts and clays, and combinations of all these materials.

During the course of completing this work, Jay Dee has gained experience in nearly all types of tunnel construction methods and are considered as industry leaders in developing innovative methods to economically and efficiently complete tunnels. Jay Dee Contractors, Inc. is a world leader in long-distance pipe jacking technology and has built more tunnels with this technique than anyone in the United States.

Jay Dee has produced cost estimates for hundreds of tunnel projects in the US and around the world, for bidding purposes and on a consultant basis. The company receives frequent inquiries from tunnel engineers throughout the country for guidelines on tunnel costs and information regarding tunnel construction methodology.

Jay Dee Contractors, Inc.'s central office is staffed with six engineers, whose tunnel experience individually ranges from three to more than forty years. The company also has more than a dozen field managers, supervisors and engineers with extensive tunnel experience. These field personnel are frequently consulted for review of tunnel methodology and production rates during the formulation of tunnel cost estimates.

Jay Dee Contractors, Inc. is owned by 11 individual stockholders who are all active participants in company management. The primary corporate officers of Jay Dee are listed below:

Thomas S. DiPonio; President and Chief Executive Officer
John DiPonio; Executive Vice President and Secretary
Cornell Timney; Vice President
Glen Rorison; Vice President
Michael A. DiPonio; Vice President and Treasurer

All these principles will be available for input on this project.

3. **LICHLITER/JAMESON & ASSOCIATES, INC.**

Lichliter/Jameson & Associates, Inc. (L/JA) is a consulting engineering and planning firm, with offices located in Dallas, Austin, and Houston, Texas, as well as Phoenix, Arizona and Nashville, Tennessee. L/JA formed in 1972, has grown to a staff level of approximately 200 engineers, planners and technical support personnel. The Dallas Office was opened in 1980 in response to requests from two major clients. Today, the Dallas office has a Computer Aided Design and Drafting (CADD) system and is linked with all five regional offices. The firm has been involved in both the public and private sectors dealing with major water resources projects, development processes, transportation planning and engineering, water and wastewater systems, surveying, and drainage design, including flood control.

Our professional and technical staff is supported by state-of-the-art Computer Aided Design and Drafting (CADD) system comprised by a VAX 11/751 Intergraph Computer and work stations. The applications of this system include land planning; street, highway, bridge and utility design; mapping and graphic presentation functions.

4. **SOUTHWESTERN LABORATORIES**

SWL - A PROFESSIONAL ORGANIZATION

Quality Assurance. That has been the primary concern of Southwestern Laboratories since 1912. Our experienced professional staff is dedicated to providing our clients the competent service necessary to assure them the quality they demand. For this reason our staff has grown to 550 personnel in sixteen (16) offices. With these engineering, scientific and technical personnel, SWL is prepared to assist our clients in many areas of service.

Clients who have dealt with Southwestern Laboratories in the past often don't realize our diversity, because we offer the personalized service of a much smaller firm. Our policies are apparent in the responsive attitude of our staff. Ours is an environment where information and techniques flow between professionals in all of our offices.

We can provide a single consultant or a team selected to suit the special needs of a particular project, both in the field as well as in our fully-equipped laboratories.

Our specific services include:

- Geotechnical engineering and exploration
- Construction materials engineering and testing
- Environmental engineering services
- Asbestos services
- Chemical analysis
- Non-destructive examination
- Welding inspection and testing
- Metals testing and analysis
- Wood products inspection and testing

Southwestern Laboratories is one of the few recognized by the American Association of Laboratory Accreditation -- a fact that reflects our commitment to evaluate and improve our services as well as maintain our high level of quality. It is significant that the strictest standards we follow are part of our own quality assurance program which we developed to enhance and preserve our credibility.

COMPANY ORGANIZATION

Southwestern Laboratories, Inc., is a privately held corporation with all stock owned by about 100 key employees and officers of the firm. It was incorporated under the laws of the State of Texas on September 24, 1917.

The Board of Directors sets policy and overall direction for all facets of the operations. The President of Southwestern Laboratories, Warren N. Lacey, P.E., is located in Dallas and is the Chief Operating Officer of the company. He is responsible for the overall operation.

Managers for each office are located at particular geographic locations (e.g., Dallas, Fort Worth, etc.), and are responsible for the coordination and execution of all engineering, inspection and testing as services assigned to them. These Managers have reporting to them engineering, inspection, and testing personnel as required. They coordinate with the Department Managers as applicable and, when necessary, for technical support.

Department Managers within each office are responsible for the coordination and the execution of engineering, inspection, and testing within their particular service disciplines, such as Nondestructive Examination Department, Metals and Metallurgy Department, Geotechnical Engineering Department. The Department Managers have the responsibility and authority for personnel qualifications and adequate staffing. The Department Managers have reporting to them engineering, inspection and testing personnel as necessary to accomplish the execution of their particular discipline. The Department Managers report directly to the Office Manager. The Manager of the Dallas office is Robert V. Scott. SWL's North Texas Geotechnical Division covers a wide geographical area and operates out of Dallas. The manager of that division is Ralph Barnes, P.E.

SWL's company-wide Quality Assurance Manager is charged with the responsibility for the overall surveillance of all facilities required to assure compliance with the procedures specified in the SWL Quality Assurance Manual. The Quality assurance manager reports directly to the President.

C. CONTACT INFORMATION

CONSOER, TOWNSEND & ASSOCIATES

Consoer, Townsend & Associates (CT&A) will be the prime consultant. All contractual negotiations, billing, and project coordination with the client will be through CT&A. The contact person and address are as follows:

Contact Person - Wilbur Van Riper, P.E.
Title (project) - Project Manager
Address - 9800 Richmond, Suite 600
Houston, Texas 77042

Telephone - (713) 780-2441

LICHLITER/JAMESON & ASSOCIATES, INC.

The name, address and telephone number of the contact person for Lichliter/Jameson, who will perform as subcontractors to CT&A is as follows:

Contact Person - Thomas R. Cravens, P.E.
Title - Dallas Office Manager
Address - 1420 Mockingbird Lane, Suite 300
Dallas, Texas 75247
Telephone - (214) 630-8867

JAY DEE CONTRACTORS

The name, address, and telephone number of the contact person for Jay Dee Contractors, who will perform as subcontractors to CT&A is as follows:

Contact Person - Michael A. DiPonio, P.E.
Title - Vice President
Address: 9300 Airline
Houston, Texas 77037
Telephone - (713) 999-7734

Southwestern Laboratories
The name, address and telephone number of the contact person for Southwestern Laboratories will perform as subcontractors to CT&A is as follows:

Contact Person - Ralph B. Barnes, Jr., P.E.
Title - Vice President/Manager
Address: 2575 Lone Star Drive
Dallas, Texas 75264
Telephone - (214) 631-2700

II. ORGANIZATION

A. DESCRIPTION OF ORGANIZATIONAL RESPONSIBILITIES TO EXECUTE WORK.

1. UNIQUE MAKE-UP OF PROJECT TEAM

When consulting engineers consider methodology, constructability, and construction costs they frequently seek the advice of contractors who are specialists in the type of work being designed. At least this is Consoer Townsend's approach to many large projects where several construction methods could be employed. We have therefore included in our team Jay Dee Contractors Inc. who specialize in sewer tunnel construction. Jay Dee will be an integral part of the team and will function throughout all phases of the project, from report through design and construction phases. Their people will be assigned specifically to this project with specific tasks in all phases of the project as indicated in the following organization charts and description of responsibilities. Jay Dee Contractors will provide a unique depth of experience and insight especially relating to Risk Sharing, claim review, constructability and cost estimates. Lichliter/Jameson is a very well qualified consulting engineering firm with offices in Dallas and Houston which allows for maximum coordination within the team structure and knowledge of local governmental, regulatory and highway permit requirements.

Southwestern Laboratories also have offices in Dallas and Houston but more importantly have provided geotechnical services for many large tunnel projects in Dallas.

2. ORGANIZATIONAL RESPONSIBILITIES

Consoer Townsend & Associates will be the prime contractor with the Project Manager, Wilbur Van Riper, in overall charge of the work. Both CT & A and Lichliter/Jameson will have project engineers in charge of the respective tasks assigned to each company in the report, design, and construction phase. Jay Dee Contractors will have a full time project engineer assigned during the construction phase who will assist the CT&A resident engineer with detailed inspection of construction. During the report and design phase Jay Dee will perform their assigned tasks and work closely with the CT&A project manager and project engineer.

During all phases of the work a quality assurance/quality control committee will be formed with a member from CT&A, Lichliter/Jameson and Jay Dee Contractors. Critical path tasks and milestone review points will be developed along with review check lists which will require approval signatures from QA/QC committee, the project manager and the task assignee.

The general breakdowns of tasks between team members, generally for all phases of work is as follows:

Consoer Townsend & Associates:

- Preparation of report • Design • Hydraulics • Structural • Specifications • Drafting • Coordinating soil report • Construction management

Lichliter/Jameson:

- Topographic surveys • Horizontal and vertical control • Right of way and easements • Permits • Field coordination of geotechnical work • Public relations • As builts • Traffic control • Existing utility information

Jay Dee Contractors:

- Tunnel Construction cost estimates o Tunnel Constructability • Design input with CT&A • Tunnel Safety • Tunnel Specification and risk sharing input with CT&A • Construction management with CT&A

Southwestern Laboratories

- Preliminary soil borings • final soil borings
- Preparation of soil report • instrumentation
- De watering • Design coordination with Jay Dee & CT&A

3. ORGANIZATION CHARTS

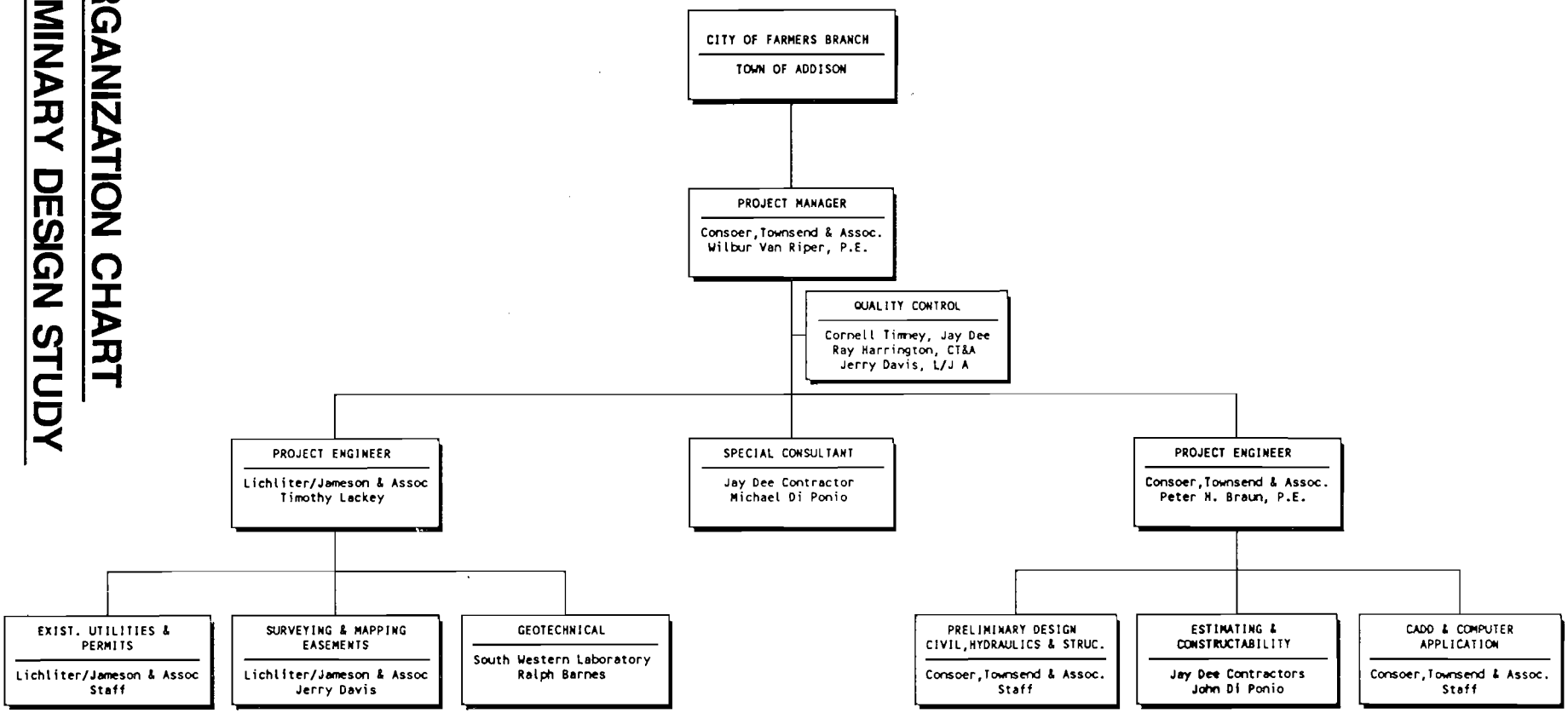
In order to illustrate our total organizational and management approach for this project, from preliminary report to final completion of construction, we have prepared a separate organizational chart for each phase of the work.

These separate charts are important since each phase of the project (report, design & construction management) require different degrees of involvement and expertise from each of the team members. We wish to emphasize that the same team will be involved in all three phases of the project.

The organizational charts are included in the following pages.

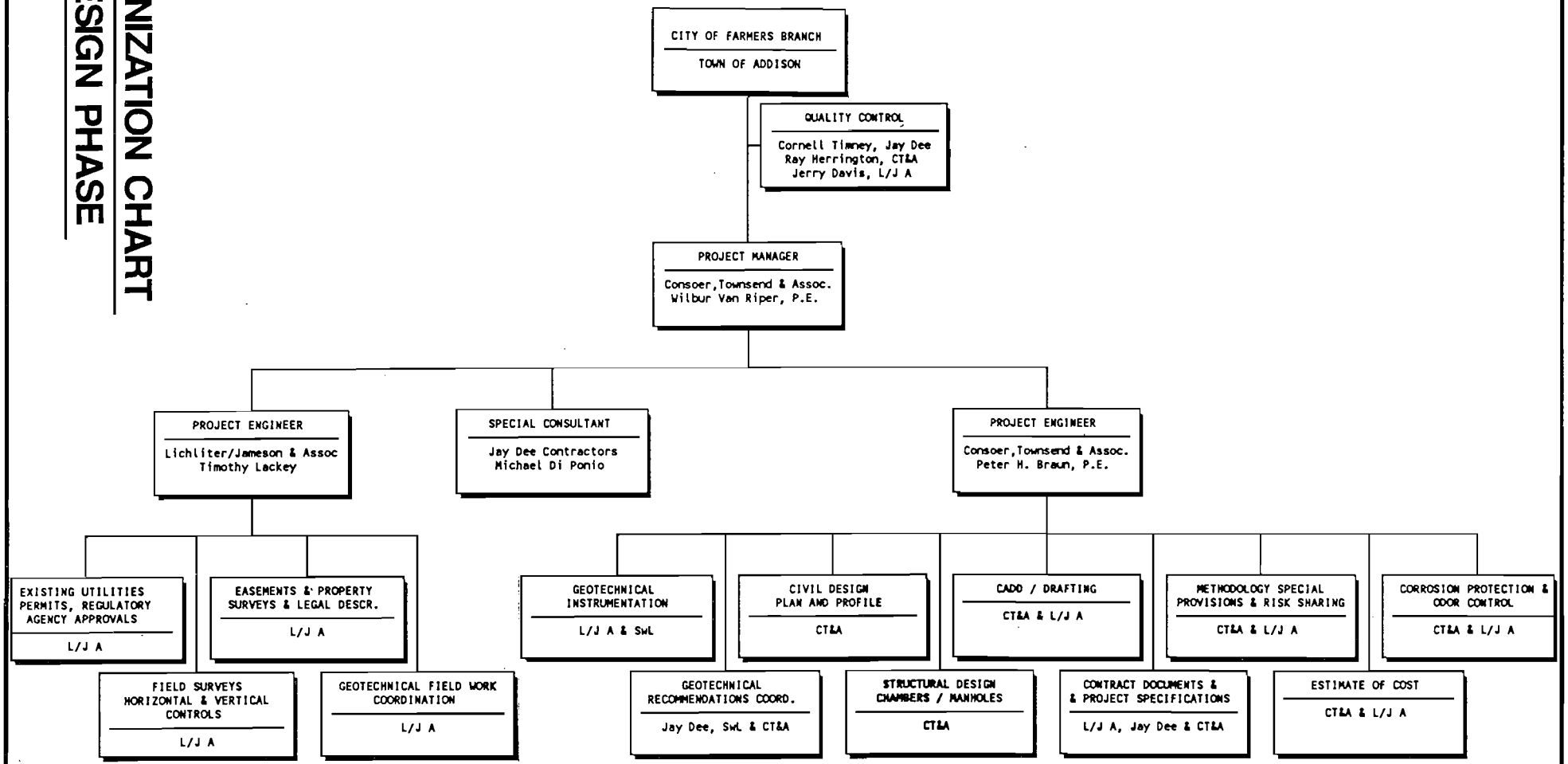
ORGANIZATION CHART

PRELIMINARY DESIGN STUDY

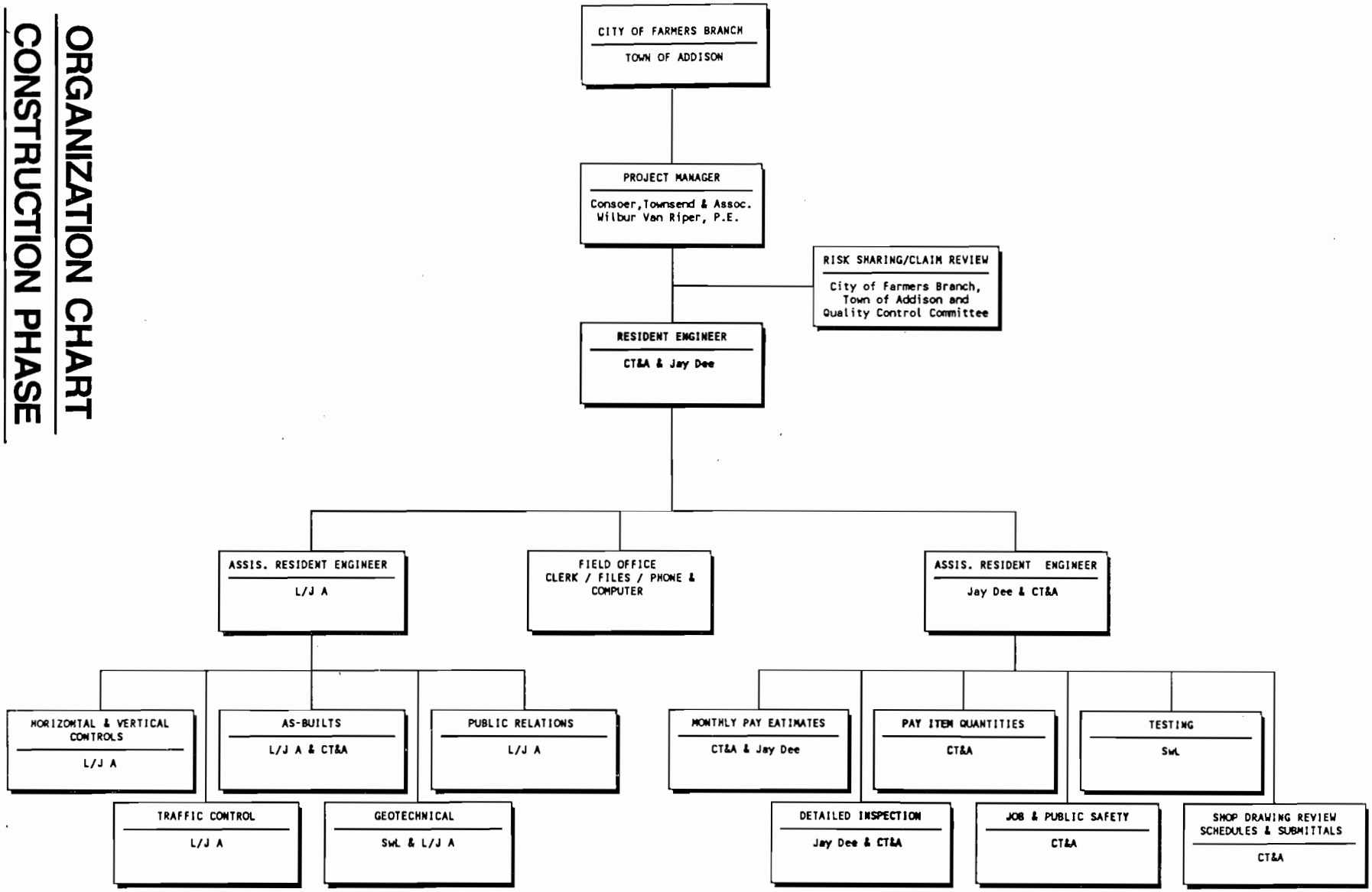


ORGANIZATION CHART

DESIGN PHASE



ORGANIZATION CHART
CONSTRUCTION PHASE



III. EXPERIENCES

A. TEAM EXPERIENCES

The team members have worked with each other in the following relationships:

1. Consoer Townsend and Jay Dee Contractors

   a. Keegan's Bayou interceptor tunnel design 72" and 60" (see following experience description) - Michael DiPonio provided assistance in soil boring analysis, tunnel alignment and cost estimating.

   b. DuPage County Illinois - Leask Lane interceptor sewer (see following experience description) - Jay Dee was the contractor on this project.

2. Consoer Townsend and Southwestern Labs

   a. Austin Texas - report and design of 48" interceptor including 500 feet of rock tunnel (see following description) - Southwestern Labs provided preliminary and final geotechnical report and soil borings.

3. Lichliter/Jameson and Southwestern Labs

   a. Three projects in the Dallas area relating to utility construction and geotechnical conditions.

   b. Two projects in the Austin area including a large water project for the City of Austin.

B. EXPERIENCE OF TEAM FIRMS

1. Consoer Townsend & Associates

   Over the past 69 years Consoer Townsend's primary expertise and experience is in wastewater engineering, providing on most projects a complete range of services to the client from preliminary report to design to construction management including detailed inspection. This experience is divided evenly between the design and construction of large wastewater treatment plants and interceptor and lateral sanitary sewer systems throughout the United States and several other countries.

   Except for geotechnical CT&A provides complete in-

house services including mechanical, electrical, structural and architectural departments. The key people in these as well as civil departments will have been with the firm for many years (15-35) and have become experts in their field relative to wastewater design, and construction.

Since this project involves Interceptor Sanitary Sewers in tunnel and open cut we have only described, in the following pages, the most recent projects which involve sewer tunnel construction.

We wish to emphasize our relevant experience on the City of Houston Keegan's Bayou Interceptor Tunnel Project since it is very similar to the proposed Farmers Branch - Addison Project both in cost and size and services required. Both projects are located in urban commercialized and residential areas requiring consideration for traffic control, existing utilities, underground and overhead, geotechnical, including instrumentation relative to structural and pavement settlement, approval and permits from utility companies, highway department regulatory agencies and governmental bodies; consideration for corrosion protection from flow high velocity and hydrogen sulphide; design of deep shaft manhole chambers, and odor control. Particular attention was paid to hydraulics in connection with flow velocity and elimination of turbulence at entrance chambers and manholes throughout the system where vertical drops were required, thereby minimizing erosion and generation of hydrogen sulfide gas and odors by smooth laminar flow.

We also wish to emphasize our 25 years of sewer and tunnel construction experience in the Nashville, Tennessee area. Most of these tunnels were constructed in rock and the proposed project geology indicates that rock shale will be present. We have successfully constructed approximately 6,000,000 L.F. of sewers in the Nashville area including tunnels, with no serious legal problems or lawsuits by the contractors. This is only possible by attention to detail and <u>experience</u> of design and construction management teams.

We wish to point out that our expertise is sewer construction including sewer tunnels, which is <u>not</u> the same technology employed in the construction of subways and roadway tunnels or massive underground structures used as storage basins by some cities.

A specific listing of several relevant projects is as follows:

CONSOER, TOWNSEND & ASSOCIATES

REPRESENTATIVE TUNNEL EXPERIENCE

Keegan's Bayou - Facility Planning & Route Study Report, Houston Texas - Report and Route study for 18,000 L.F. deep tunnels and 14,000 L.F. open cut 72" to 36" diameter intercepter sewers and 90 MGD influent Pump Station including coordinating geotechnical report, preliminary designs flow monitoring, and cost estimates, and preliminary field surveys.

Construction Cost: $22,000,000 Completion Date: 1986

Client & Contact Person:
City of Houston
Dept. of Public Works, Wastewater Div.
City Hall Annex
Houston, Texas 77251

Charles Settle (713) 247-2507

Contractor:
N/A in Report Phase

Keegan's Bayou Intercepter Sewers and 90 MGD Pump Station Design - Preparation of plans, specifications, cost estimate, final geotechnical report and shop Dwg. review during construction. This project is the design and construction phase services authorized after approval of the Facility Planning and Route Study Report above, consisting of +/- 18,000 L.F. deep tunnels 72" to 54", 14,000 L.F. open cut 48" to 36" and 90 MGD pumping station +/- 50 feet deep and 50 feet in diameter. Tunnel and open cut through urban commercial and residential streets and under two major state highways.

Construction Cost: $22,000,000

Completion Dates:
Pump Station - Complete 1988
Contractor - SPAW-GLASS
Contact - Elias Mageaes, Project Supt.
(713) 529-4451; (713) 779-1979
Sewers - Under Construction
Complete 1989
Contractor - E.P. Brady Inc.
Contact - Dan Brady,
(713) 691-0923

Client & Contact Person:
City of Houston
Dept. of Public Works, Wastewater Div.
City Hall Annex
Houston, Texas 77251

Anthony Crisci (713) 247-2541
Manager Civil Construction Section

Bear Creek Interceptor, City of Austin, Texas - Facility Planning and Route Study Report and preparation of plans and specifications for 20,000 L.F. of 48" & 42" sanitary interceptor, with +/- 1,000 feet in tunnel through rock. This interceptor provides service for 19,500 acre watershed and requires +/- 10,000 L.F. of easement preparation.

Construction Cost: +/- $2,500,000

Completion Date:
Facility Planning and Route Study Report - Complete 1987
Design Submitted to City for for review - complete 1989

Client & Contact Person:
City of Austin
Water & Wastewater Utility
625 E. 10th St., Ste. 5023
Avanti Plaza
Austin, Texas 78701

A. Douglas Rademaker (512) 322-2921

Leask Lane East Branch Interceptor, DuPage County Illinois - Design and General Inspection of construction for 30" sanitary interceptor - 4,670 L.F. in open cut and 3,960 L.F. in tunnel +/- 40-50 feet deep.

Construction Cost: $2,390,000

Completion Date: 1986

Client & Contact Person:
DuPage County Dept. of Public Works
421 County Farm Road
Wheaton, Illinois

Gregory W. Wilcox (312) 682-7137

Contractor:
Jay Dee Contractors
38881 School Craft Road
Livonia, Michigan 48150

John DiPonio (313) 591-3400
Glen Rorison (313) 591-3400

Sanitary Interceptor Sewers, Open Cut and Rock Tunnel - Nashville, Tennessee - Consoer Townsend has been providing wastewater reports, designs and construction management tot he Nashville Davidson County, Tennessee Department of Public Works for the past 25 years. Approximately 6,000,000 L.F. of sewers ranging from 8" to 108" were constructed with contract values of $190,000,000 which amounts to approximately $500,000,000 at todays construction value. Much of Nashville's geology consists of rock formations, therefore many of the interceptors ranging between 48" to 108" were partially constructed in rock tunnels ranging between 500 feet and 6,000 feet per contract.

Construction Cost: Avg./yr. $8,000,000

Completion Date: 1963 to 1988

Client & Contact Person:
Dept. of Water & Sewerage Services
Metropolitan Government of
Nashville-Davidson County

L.L. Williams, Director (615) 259-6597

Contractor:
W.L. Hailey

Ed Jackson (615) 255-3161

Tunnel and Reservoir (TARP) MSD O'Hare WWTP Pumping Station, Chicago, Illinois - This project is an illustration of one of many projects which we have designed involving large hydraulic structures below grade which include structural, mechanical, electrical and instrumentation functions. The pump station pumps wastewater from the TARP tunnel system treatment in the O'Hare Plant. It includes the construction of three reinforced concrete shafts, 48" in diameter extending 180 feet below grade. Two of the shafts contain three pumps each. The third shaft is a chamber which includes regulating gates and a screen for removing hand debris from the sewage before entering the plant. All of the pumps, screens and other station functions are monitored and remotely control by a computer at the O'Hare Plant.

Construction Cost: $11,000,000 Completion Date: 1982

Client & Contact Person:
Metropolitan Sanitary District
100 East Erie Street
Chicago, Illinois 60611

Raymond Rimkus, General Supt. (312) 751-5600

Contractor:
Paschen Contractors

Bill Paschen (312) 278-4700

Browns Creek Force Main, Intercepting Sewer and River Crossing - Nashville, Tennessee - Design of 17,000 lineal feet of force main from the Brown's Creek Crossing Pumping Station to the Central Wastewater Treatment Plant. Includes a 1,470 lineal feet of 60-inch force main crossing under the Cumberland River.

Construction Cost: $10,000,000 Completion Date: 1981

Client & Contact Person:
Metropolitan Government of
Nashville & Davidson County
211 Union Street
Nashville, Tennessee 37219

Gene A. Johnson, Assistant Director
Water and Wastewater (615) 259-7200

Contractor:
Pattertson E. Wilber

Frank Pattertson, President (205) 663-7531

Brown's Creek Interceptor Sewer - Nashville, Tennessee - This project provided for the installation of approximately 7,600 L.F. of 42-inch and 36-inch interceptor sewer in a heavy industrial area. The project included 5 short, lined tunnels under various arterial highways, interstate highways and railroads totaling about 400 feet of 6 foot diameter. One long tunnel 600 feet in length was tunneled in rock 6-feet in diameter with cover varying from 15 to 65-feet in depth. The tunnel was unlined and immediatley adjacent to a major regional electrical substation and numerous electrical transmission line towers. Excavation was aided by a rock boring tunneling machine. Services included project planning, route analysis, surveying and complete design services for contract document preparation.

Construction Cost: $2,900,000 Completion Date: 1987

Client & Contact Person:
Dept. of Water & Sewerage Services
Metropolitan Government of Nashville-
Davidson County
1600 2nd Avenue North
Nashville, Tennessee

L.L. Williams, Director (615) 259-6597

Contractor:
W.L. Hailey

Ed Jackson (615) 255-3161

Farmingdale Interceptor Sewer - DuPage County, Illinois - Design, general and detailed inspection for Interceptor Sewer including 10,200 l.f. of 24 inch diameter pipe and 1,820 l.f. of 24 inch in tunnel. Prepared Operations and Maintenance Manual.

Construction Cost: $1,800,000 Completion Date: 1986

Client & Contact Person:
DuPage County
Department of Public Works
421 County Farm Road
Wheaton, Illinois

Gregory W. Wilcox (312) 682-7137

Contractor:
Loitz Brothers

William Loitz (815) 465-2155

Knollwood-West Interceptor - DuPage County, Illinois - Design detailed and general inspection and preparation of Operation and Maintenance Manuals. Interceptor lines include 10,600 l.f. of 54 inch pipeline, 3,200 l.f. of 54 inch in tunnel, and two 30-inch pressure mains of 2,140 l.f. each.

Construction Cost: $4,050,000 Completion Date: 1986

Client & Contact Person:
DuPage County
Department of Public Works
421 County Farm Road
Wheaton, Illinois

Gregory W. Wilcox (312) 682-7137

Contractor:
S.A. Healy

John Rusnak, Supt. (312) 485-0857

2. Jay Dee Contractors, Inc.

Jay Dee Contractors, Inc. has experience in all phases of tunnel engineering, design and construction. Many of the tunnel projects that it undertakes are improved through Jay Dee's revisions to the original design.They have a broad background working with numerous Owners and Engineers throughout the country during the construction phase of tunnel projects, Jay Dee has first-hand experience in cost estimating, tunnel design, geotechnical engineering, tunnel construction methodology, sewer hydraulics, corrosion protection systems, tunnel safety, risk management and risk sharing concepts, and tunnel maintenance and repair experience which provides a broad base of support for a tunnel project design team.

Jay Dee Contractors, Inc. primarily focuses its energies on the construction phase of tunnel projects; however, it has consulted on informally with numerous design firms to provide guidance in their efforts to design tunnel projects that are cost effective and constructable. Jay Dee has provided such assistance to Consoer Townsend during the design phase of a recent tunnel project for the City of Houston. Jay Dee also worked closely with Consoer Townsend during the construction of the Leask Lane sewer tunnel project for the County of DuPage, Illinois. As a result of these successful collaborations, Jay Dee Contractors, Inc. has joined Consoer Townsend as a team member for the design of this project.

Listed below are digests of a few recent tunnel construction projects that Jay Dee has successfully completed. Each of these projects possess features and conditions which are equivalent to those that can be anticipated on the proposed project. Some of these projects posed difficulties during the construction phase which could have been avoided during the original design. With Jay Dee's in-depth experience on these and more than 60 other tunnel projects, this design team will have an extraordinary ability to avoid problems and satisfy the owner's needs.

Shown on the following page is a partial list of tunnel projects for which Jay Dee has developed detailed cost estimates during the past few years. Each of these cost estimates were developed by a team of estimators who followed a consistent, standardized format. This format allows for balanced pricing of bid items, accurate costing of

individual work phases and incorporates complete audit trails for each cost item. Each estimate is bound into a complete, concise report. On average Jay Dee's engineering department produces a minimum of one complete detailed project estimate per month, although at times more than seven projects have been estimated in one month. At the Selection Committee's request these prior cost estimate reports will be made available for their review.

A specific listing of several relevant projects is as follows:

JAY DEE CONTRACTORS, INC.

REPRESENTATIVE TUNNEL EXPERIENCE

East Blue Interceptor D-56, Section III - Kansas City, Missouri. - Project included 5,400 lft of 42" intercepting sewer in tunnel. The tunnel was excavated with a tunneling machine and braced with steelribs and timber lagging. 42" RCP was transported into the tunnel and grouted in place. The project involved tunneling in silty clays, shale and limestone including several mixed face situations. Due to erroneous geotechnical information supplied by the Engineer the project required extensive revisions to the tunnel construction methodology and equipment which led to a 17.6% increase in construction cost for the project.

Construction Cost: $3,418,770 Completion Date: June, 1985

Client & Contact Person:
City of Kansas City
Water & Pollution Control Dept.
5th Floor, City Hall
Kansas City, Missouri 64106

Kenneth Burkhead, Sr.
(913) 573-5400

Engineer & Contact Person:
Black & Veatch
P.O. Box 8405
Kansas City, Missouri
64114

A.C. Peterson
(913) 967-2000

Middle Beltline Interceptor, Beaver Lake Branch - St. Paul - Minnesota - The project involved 2,623 lft of 42" intercepting sewer in tunnel. The original design specified mandatory compressed air tunneling methods with steel liner plates tunnel supports. Jay Dee Contractors, Inc., as tunnel subcontractor, proposed a more feasible methodology which saved the client $300,000. The tunnel was successfully excavated with a tunneling machine under free-air conditions and braced with steel ribs and timber lagging. 42" RCP were transported into the tunnel and grouted in place.

Construction Cost: $4,155,252 Completion Date: April, 1988

Client & Contact Person:
Metropolitan Waste
Control Commission
350 Metro Square Bldg.
St. Paul, Minnesota 55101

Timothy Keegan, P.E.
(612) 222-8423

Engineer & Contact Person:
Orr, Schelen & Mayeron
2021 East Hennepin Ave.
Minneapolis, Minnesota
55413

John P. Baldalich, P.E.
(612) 331-8660

Prime Contractor & Contact:
Barbarossa & Sons, Inc.
P.O. Box 367
Osseo, Minnesota 55369

Mr. Paul Flykt
(612) 524-4146

Tunnel Consultant & Contact:
Jenny Engineering
2 Edison Place
Springfield, New Jersey
07081
Josef F. Zurawski, P.E.
(201) 379-6699

Northside Sewer Relief Project #9, #11 & #5R - Houston, Texas - These three projects included 8,935 lft of 72" intercepting sewer and 14, 140 lft of 90" intercepting sewer in tunnel. The 72" interceptors were built by the jacked pipe method where 72" RCP were jacked in place as the tunnel was excavated with a tunneling machine. The 90" interceptor was excavated with a tunneling machine and braced with steel ribs and timber lagging. The 90" pipe was cast monolithically within the tunnel.

Construction Cost: $20,195,055

Completion Date: June, 1988

Client & Contact Person:
City of Houston
Department of Public Works
P.O. Box 1562
3800 City Hall Annex
Houston, Texas 77251

Anthony Crisci
(713) 247-2541

Engineer & Contact Person:
Lockwood, Andrews & Newnam
1500 City West Blvd.
Houston, Texas
77042

Wayne Stevens
(713) 266-6900

Sanitary Sewer Force Main in Industrial Blvd. - Dallas, Texas - Project involved 5,400 lft of 60" PCCP force main and was originally designed for installation in open trench. BRH - Garver, the prime contractor, subcontracted the work to Jay Dee who redesigned the facilities for a more economical installation in tunnel. The tunnel was excavated with a tunneling machine and braced with steel ribs and timber lagging. The 60" PCCP was transported into the tunnel and grouted in place.

Construction Cost: $2,210,000

Completion Date: November, 1986

Client & Contact Person:
City of Dallas
Water Utilities Dept.
1500 Marilla St.
Dallas, Texas 75201

Mike Forte
(214) 670-8708

Prime Contractor & Contact Person:
BRH - Garver, Inc.
9900 Hwy 225
Houston, Texas
77017

Michael Garver
(713) 477-1196

Leask Lane Ext. East Branch Interceptor Sewer - DuPage County, Illinois - Project included 3,960 lft of 30" RCP in tunnel and 4,664 lft of 30" RCP in open trench. Tue tunnel was excavated by hand-mining methods and braced with timber lagging. The 30" RCP was transported into the tunnel and grouted in place.

Construction Cost: $2,354,215

Completion Date: January, 1986

Client & Contact Person:
DuPage County, DPW
Department of Public Works
421 North County Farm Rd.
Wheaton, Illinois 30187

Rod Ivery
(312) 682-7527

Engineer:
PRC Consoer Townsend
303 East Wacker Dr.
Chicago, Illinois
60601

Fred Gilbertson
(312) 938-0300

JAY DEE CONTRACTORS, INC.
RECENT TUNNEL COST ESTIMATES

DATE	LOCATION	OWNER	DESCRIPTION	BID RESULTS NO. OF BIDS	BID RESULTS LOW BID	JAY DEE CONTRACTOR'S BID	JAY DEE CONTRACTOR'S RANK	
8/2/88	HOUSTON, TX	HOUSTON, DPW	3,100 LF OF 84''SEWER TUNNEL	6	$5,569,375	$5,569,375	1	
7/22/88	HOUSTON, TX	CWA	3,900 LF OF 102''WATER TUNNEL	7	$7,472,935	$12,861,475	6	*
7/13/88	DETROIT, MI	M.D.O.T.	680 LF OF 72''SEWER TUNNEL	4	$684,308	$1,003,439	4	
7/12/88	MILWAUKEE, WI	M.M.S.D.	2,347 LF OF 84''SEWER TUNNEL	6	$2,726,214	$2,859,099	2	
7/11/88	MILWAUKEE, WI	MILWAUKEE, DPW	1,029 LF OF 108''SEWER TUNNEL	3	$1,682,030	$1,682,030	1	
7/11/88	MILWAUKEE, WI	MILWAUKEE, DPW	1845 LF OF 54-60''SEWER TUNNEL	2	$1,845,015	$2,181,050	2	
6/3/88	HOUSTON, TX	HOUSTON, DPW	6,325 LF OF 78''SEWER TUNNEL	7	$7,973,000	$8,109,803	2	
4/27/88	NEW YORK, N.Y.	NEW YORK, DPW	7,451 LF OF 48''SEWER TUNNEL	2	$36,706,140	$38,800,000	2	***
4/5/88	HOUSTON, TX	HOUSTON, DPW	10,000 LF OF 84''SEWER TUNNEL	7	$4,994,816	$6,400,000	4	*
1/26/88	HOUSTON, TX	HOUSTON, DPW	13,000 LF OF 60-72''SWR TUNNEL	7	$8,820,942	$10,485,960	5	*
11/17/87	CHICAGO, IL	M.S.D.G.C.	5,437 LF OF 27'' SEWER TUNNEL	5	$3,282,300	$4,391,537	3	*
7/14/87	CHICAGO, IL	M.S.D.G.C.	10,153 LF OF 48''SEWER TUNNEL	6	$5,450,000	$6,846,288	4	*
6/10/87	ST. PAUL, MN	M.W.C.C.	2,623 LF OF 42''SEWER TUNNEL	4	$9,597,420	$9,597,420	1	**
5/27/87	DETROIT, MI	DETROIT, DPW	2,775 LF OF 66''SEWER TUNNEL	6	$2,435,000	$2,618,680	3	*
3/17/87	HOUSTON, TX	HOUSTON, DPW	14140 LF OF 84-90''SEWER TUNNE	2	$12,441,105	$12,441,105	1	***
3/11/87	MILWAUKEE, WI	M.M.S.D.	4,663 LF OF 108''SEWER TUNNEL	4	$15,224,495	$15,727,000	2	***
3/3/87	MILWAUKEE, WI	M.M.S.D.	5.535 LF OF 60''SEWER TUNNEL	5	$3,289,584	$3,587,310	2	
2/20/87	MILWAUKEE, WI	MILWAUKEE, DPW	1,556 LF OF 60''SEWER TUNNEL	2	$1,488,599	$1,607,927	2	
1/7/87	MILWAUKEE, WI	M.M.S.D.	1,712 LF OF 48'' OPEN CUT	5	$1,219,363	$1,649,979	3	
12/23/86	HOUSTON, TX	HOUSTON, DPW	7672 LF OF 60-72''SEWER TUNNEL	4	$6,646,980	$6,767,165	2	
12/16/86	DALLAS, TX	DALLAS, DPW	8,246 LF OF 60''PCCP IN TUNNEL	5	$3,432,000	$4,544,005	3	**
12/18/86	MILWAUKEE, WI	MILWAUKEE, DPW	834 LF OF 60''SEWER TUNNEL	4	$1,234,323	$1,571,409	4	
12/4/86	MILWAUKEE, WI	MILWAUKEE, DPW	250 LF OF 48''SEWER TUNNEL	3	$548,392	$787,335	2	
12/2/86	HOUSTON, TX	HOUSTON, DPW	3,281 LF OF 108''SEWER TUNNEL	3	$4,994,756	$6,609,000	3	*
9/24/86	MILWAUKEE, WI	M.M.S.D.	512 LF OF 66''SEWER TUNNEL	2	$1,865,965	$3,050,341	2	
9/23/86	ST. LOUIS, MO	M.S.L.S.D.	4,219 LF OF 36''SEWER TUNNEL	6	$5,287,763	$7,468,743	6	
8/27/86	MILWAUKEE, WI	M.M.S.D.	5,150 LF OF 108''SEWER TUNNEL	3	$11,861,108	$11,861,108	1	
8/26/86	KANSAS CITY, MO	KANSAS CITY,DPW	2,779 LF OF 54''SEWER TUNNEL	5	$1,603,152	$1,821,606	3	
8/12/86	ST. PAUL, MN	M.M.W.C.	3,640 LF OF 60''SEWER TUNNEL	3	$7,773,000	$9,179,000	2	**
11/30/84	DUPAGE, IL	DUPAGE CTY, DPW	8,624 LF OF 30''SEWER TUNNEL	11	$2,923,443	$2,923,443	1	**
8/26/84	ALEXANDRIA, EGYPT	A.G.O.S.T.	10 MI. OF 6, 7 & 8' SWR TUNNEL	7	$26,923,932	$42,634,000	5	***
7/17/84	AUSTIN, TX	AUSTIN, DPW	29,368 LF OF 84'' TUNNEL	14	$7,469,851	$15,402,028	10	***

* - Jay Dee Prepared Estimate But Did Not Bid.
** - Jay Dee Sub-Quoted Part of Bid Price.
*** - Jay Dee Bid as Member of a Joint Venture with other Contractors.

3. Lichliter/Jameson & Associates

Our professional standards have been established through knowledge gained from a wide range of municipal and surveying services provided across most of Texas and much of the nation. This experience, combined with the diversified backgrounds of our survey and engineering design staff, enables L/JA to provide all types of engineering design and surveying services.

Lichliter/Jameson & Associates has experience in the design of underground wastewater facilities in the DFW metroplex. Location of existing utilities and coordination with the utility companies is a very important part of this project. Lichliter/Jameson & Associates has worked with the local utility companies, highway department, regulatory agencies and governmental bodies and will be able to provide the coordination required for this project.

L/JA places a high value on communication both outside the organization and within the company divisions and regions. The communications we maintain within our office and region ensures that we acquire sufficient data regarding a project and that the project is carried out with the client's interests in mind.

A specific listing of several municipal projects is as follows:

WASTEWATER EXPERIENCE

Woodhill Apartments Offsite Sanitary Sewer - Denton, Texas - Project included 4,500 linear feet 12" sanitary sewer. The sanitary sewer will help to relieve the over capacity flows in southeast Denton. The project was designed according to the City of Denton specifications. L/JA provided design surveying, right-of-way acquisition plats, engineering plans, construction staking and construction administration. Completion date: 1986.

Construction Cost: $240,000
Contractor: Albenesius Contracting Co.

Client: John Pass Investments
7557 Rambler Road, Suite 1000
Dallas, Texas 75231

Contact: Mr. Barry Thompson
(214) 363-6375

Camp Wisdom Crossing - Dallas, Texas - The project included eight-inch to 15-inch sanitary sewer (3,000 linear feet). The project also consisted of surveying and design of major thoroughfares, water, sewer and drainage for this multi-use development. Other features include a six-lane divided street and looped collector street. Completion date: 1987.

Construction Cost: $1,600,000
Contractor: Weaver Construction Co. (Utilities)
Austin Paving (Paving)

Client: Camp Wisdom/Clark Road
Joint Venture
c/o Folsum Investments
16475 Dallas Parkway, Suite 800
Dallas, Texas 75248

Contact: Mr. Bobby McMillan
(214) 931-7400

Garden Oaks I & II - Grand Prairie, Texas - This detached single-family development consists of approximately 66 acres. Project included six-inch sanitary sewer (8,000 linear feet), eight-inch sanitary sewer (1,000 linear feet), and ten-inch sanitary sewer (3,000 linear feet). Project also included boundary and acquisition surveys, assisted in zoning, platting services, construction staking and construction administration. Completion date: 1985

Construction Cost: $1,200,000
Contractor: Lightning Construction Co. (Utility)
Texas Bitulithic Co. (Paving)

Client: Gemcraft
(713) 968-6600
4265 San Felipe, Suite 1100
Houston, Texas 77027

Contact: Mr. Jerry Torgeson

Sanitary Sewer - Mesquite, Texas - The project included an eight-inch sanitary sewer (4,000 linear feet) and served an approximately 58 acre commercial retail site near Galloway Road and I-30 in Mesquite, Texas. L/JA also provided design surveys, engineering plans and specifications, construction staking and construction administration for the project. Completion date: 1985

Construction Cost: $500,000
Contractor: Lightning Construction Co. (Utility)
Austin Paving (Paving)

Client: Prestonwood Development Corp.
5485 Belt Line Road, Suite 300
Dallas, Texas 75240

Contact: Mr. Jerry Yoder
(214) 239-8000

Wastewater Treatment Facility - Fort Bend County, Texas - Design and preparation and contract administration of a 0.5 mgd contact stabilization Interim Wastewater Treatment facility. The facility was designed for an ultimate expansion to 1.0 mgd. Completion Date: 1984.

Construction Cost: $675,000
Contractor: TEC Industries

Client: Brazos River Authority
P.O. Box 7555
Waco, Texas 76710

Contact: Mr. Roy Roberts
(817) 776-1441

Palmer Plantation Regional Wastewater Treatment Facility - Houston, Texas - Surveying, design and the preparation of contract documents, construction drawings and technical specifications for a 0.2 mgd contact stabilization Interim Wastewater Treatment Facility and a 0.6 mgd (First Phase) of the Regional Facility. We are currently in the construction phase of the Regional Plant, and activated sludge treatment system that can be operated in the complete-mix, contact stabilization, and extended aeration modes. Completion Date: 1988.

Construction Cost (1st Phase): $1,200,000
Contractor: Galin Spencer

Clients: Palmer Plantation
Municipal Utility District No. 1
Palmer Plantation M.U.D. No. 2
Fort Bend County M.U.D. No. 49
c/o Philben & Philben
6363 Woodway, Suite 725
Houston, Texas 77057

Contact: Mr. Paul Philben
(713) 783-4120

City of Woodbranch Village, Texas - L/JA is currently preparing preliminary engineering plan, facility plan, environmental information document and water conservation plan for Woodbranch Village. The project involves providing wastewater collection to existing residences that are not served, upgrading the existing wastewater collection system and rehabilitation and expanding the wastewater treatment plant. Completion Date: 1989.

Construction Cost: 1,000,000
Contractor: N/A

Client: City of Woodbranch Village
P.O. Box 2735
Humble, Texas 77347

Contact: Mr. John Hudson
(713) 540-1047

City of Sugar Land Utility Phasing Plan - Sugar Land, Texas - L/JA is performing a complete water and sewer utilities phasing plan for the City of Sugar Land to meet the ultimate needs of 106,000 people and 30,500 equivalent single-family connections covering an area of 11 square miles. Completion Date: 1988. The project includes:

1. Population and utility demand projections;
2. Complete inventory of City facilities;
3. Analysis of existing and proposed water supply, water storage, water distribution, wastewater collection, wastewater pumping, and wastewater treatment capacities and the ability to meet future demands;
4. Determination of system deficiencies;
5. Proposed improvements, establishment of priorities and construction schedules, and the preparation of cost estimates;
6. Utility phasing plan to guide future C.I.P. expenditures and provide information to establish future user fees.

Client: City of Sugar Land
225 Guenther Street
Sugar Land, Texas 77478

Contact: Ms. Debbie Pena
(713) 491-3522

4. Southwestern Laboratories

Southwestern Laboratories has been continuously engaged in geotechnical engineering in the Dallas area for more than 40 years, and have offices in Houston and 16 other locations in Louisiana and Texas. SwL, company wide, has a total employment of over 600 professional and technical personnel of which more than 30 are geotechnical engineers or geologists. Southwestern Laboratories also maintains broad capabilities in laboratory testing of soil, shale, and rock.

As part of our consulting services, we perform geotechnical reconnaissance for feasibility studies on tracts of land. Our field sampling and mapping processes are used to locate potentially valuable subsurface deposits. We also investigate the cause of foundation related building distress and provide a full range of ground instrumentation to detect potentially harmful movement and vibration.

Locally, SWL has more than 50 employees engaged solely in geotechnical services. These staff and equipment are presented in detail later in this section. The following highlights demonstrate our local capabilities.

- Fourteen geotechnical engineers (nine registered professional engineers in Texas) and engineering geologists with a total of over 135 years of professional experience.

- Thirteen truck mounted drill rigs with appropriate tools and support equipment (5 rigs less than 5 years old and 10 less than 10 years old).

- Quality Control Program, under the direction of Mr. William R. Stowe, covering all laboratory procedures and equipment.

A listing of several relevant projects is as follows:

SOUTHWESTERN LABORATORIES

REPRESENTATIVE TUNNEL EXPERIENCE

Dart Transit Tunnels - SWL issued the design geotechnical report for two miles of twin bore, 20-foot diameter tunnels beneath Central Expressway from Haskell Avenue to Mockingbird Lane. Tunnel depths were up to 100 feet with portal and cut and cover section on the north end. SWI was responsible for all field explorations including angle borings over 150 feet deep with company owned and operated drill rigs, all laboratory testing for engineering properties of soil and rock, and an interpretive design geotechnical report for both bored tunnels, access shafts and cut and cover section of the project.

Owner & Contact Person:
Dallas Area Rapid Transit
601 Pacific Avenue
Dallas, Texas 75202

Ms. Nancy Hatten (214) 658-6272

Client & Contact Person:
PBDC
1701 N. Market
Dallas, Texas 75202

Paul Byrne (214) 747-7245

Wycliff Tunnel - This project involved a detailed feasibility study for costing of a 3,000 foot vehicular tunnel beneath Harry Hines Boulevard and an active railroad in Dallas, Texas. Tunnel Depth was up to 50 feet in soft sediments below the groundwater table. SWL was responsible for all field explorations, laboratory testing and geotechnical interpretive report on the open cut options and sections of the project including dewatering.

Owner & Contact Person:
City of Dallas
320 E. Jefferson
Dallas, Texas 75203

Bill Jesssup (214) 948-4250

Client & Contact Person:
HDR Infrastructure
12700 Hillcrest Road
Dallas, Texas

Jack Schnettler (214) 960-4000

North Central Drainage Outfall (Phases I and II) - Project involved design of two miles of up to 16 foot diameter storm water outfall tunnel from Central Expressway to the Trinity River. The east portion of the project involves primarily bored tunnels in limestone and shale and the west portion cut and cover construction. SWL was responsible for all field explorations and laboratory tests and geotechnical interpretive reports for design of cut and cover sections and tunnel access shafts. Preliminary and detailed feasibility studies for costing completed.

Owner & Contact Person:
City of Dallas
Department of Public Works
320 E. Jefferson
Dallas, Texas 75203

Chris Agnew (214) 320-6191

Client & Contact Persons:
Huitt-Zollars, Inc.
3131 McKinney Avenue
Suite 600
Dallas, Texas 75204

Robert Zollars (214) 871-3311

and

Albert H. Halff Associates
8616 Northwest Plaza Drive
Dallas, Texas

Don Brock (214) 739-0094

North Central Expressway Drainage Tunnel - The project involved design of storm drainage tunnel along Central Expressway. Tunel diameterr was up to 16 feet and connected to the east/west outfall described above. SWL services on this project involved all field explorations and testing and laboratory testing.

Owner & Contact Person:
State Department of Highways
and Public Transportation
P.O. Box 3067
Dallas, Texas 75221

Charles Little (214) 320-6191

C. INDIVIDUAL EXPERIENCE

1. Key Personnel

The following is a brief description of each of the key members of the team and the area of responsibility each would be assigned.

WILBUR H. VAN RIPER, P.E.
PROJECT MANAGER - CT&A

Mr. Van Riper is a highly experienced civil engineer with 33 years of service with Consoer Townsend & Associates on municipal engineering projects. He has served as the project manager for many large public sector sewer projects throughout Texas and the U.S. He has special expertise in project supervision and coordination. Mr. Van Riper is currently project manager on the City of Houston Keegan's Bayou Interceptor Tunnel Sewer Project for which report and design phase for the large diameter trunk sewer is near completion, and the project is now under construction.

Mr. Van Riper's experience includes a wide variety of sanitary sewer projects, pumping stations, force main and plant rehabilitation projects from design through construction. He has served many clients continually over 10 to 25 year periods.

PETER H. BRAUN, P.E.
PROJECT ENGINEER - CT&A

Mr. Braun has over 30 years of experience with Consoer Townsend & Associates in civil design and construction management for numerous projects throughout the U.S.A. varying in complexity and size. For the past 15 years, he has been project manager for City of Houston sewer and water projects, Harris and Montgomery County drainage and roadway projects. Most recently he was the project engineer on the Keegan's Bayou 95 MGD influent pump station and the 13,000 lineal foot Bissonnet Interceptor Sewer Tunnel, which is part of the Keegan's Bayou system.

TIMOTHY E. LACKEY, P.E., R.P.S.
PROJECT ENGINEER - L/JA

Mr. Lackey is assigned to the Dallas office of Lichliter Jameson and as a registered surveyor he will be in charge of the preparation of all easements, right of way, and field related topographic and land surveys. As a result of his work in the Dallas area he is familiar with permit requirements and local governmental regulatory requirements.

MICHAEL DI PONIO, P.E.
SPECIAL CONSULTANT - JAY DEE CONTRACTORS

Michael Di Ponio is the project manager for the Dallas and Houston Tunnel Projects constructed by Jay Dee Contractors and will act as special consultant with the project managers and project engineers through all phases of work, concentrating on cost estimating, risk sharing provisions of the contract documents, constructability tunnel shaft locations, and soil and dewatering analysis.

CORNELL TIMNEY
QUALITY CONTROL - JAY DEE CONTRACTORS

Cornell Timney has 40 years of tunnel experience, the last 18 with Jay Dee Contractors and as Chief Engineer for Jay Dee will be a member of the Quality Control Committee and also work with Michael and John Di Ponio especially with constructability and cost estimates.

RAY HARRINGTON, P.E.
QUALITY CONTROL - CONSOER, TOWNSEND & ASSOCIATES

Prior to joining CT&A in 1982, Mr. Harrington served for 12 years as director of the Nashville-Davidson County Tennessee Department of Water and Sewage Service and in that capacity supervised a $300,000.00 program which included many sewer interceptors and tunnel projects that were designed and managed by CT&A. As a member of the Quality Control Committee, his main area of responsibility, in view of his legal training and management positions, will be in the review of contract documents and contractor claims during construction.

JERRY A. DAVIS, R.P.S
QUALITY CONTROL - L/JA

Mr. Davis will be a member of the Quality Control Committee with responsibility for all surveying, and field oriented controls, and easements. Mr. Davis is a registered public surveyor in the State of Texas with 20 years of experience.

2. **Professional Histories**

The professional histories of key personnel for all team members are included in the following pages:

CONSOER, TOWNSEND & ASSOCIATES

Professional History

NAME: Wilbur H. Van Riper, P.E.

TITLE: Texas Region Engineering Manager

REGISTRATION: Registered Professional Engineer, Texas, Illinois and Pennsylvania

EDUCATION: Bachelor of Science in Civil Engineering
University of Mississippi, 1952

MEMBERSHIPS: Texas Society of Professional Engineers
Association of Energy Engineers and Certified Energy Managers
American Public Works Association

QUALIFICATIONS

Mr. Van Riper has 33 years of municipal engineering experience with Consoer Townsend and Associates and for the past 3 years the Texas Region Engineering Manager. Prior assignments include nine years as western Pennsylvania Regional Manager and 21 years as a Design Engineer and Project Manager in the Chicago metropolitan area.

RELEVANT EXPERIENCE

Project Director for Engineering report for the Lower Colorado River Authority for a regional wastewater study consisting of approximately 100 square miles incorporating Lake Marble Falls and communities surrounding Lake Travis, Lake Marble Falls and Lake L.B.J. in Burnet and Llano counties, west of Austin, Texas. The study presented alternate regional and separate wastewater systems and treatment plants, including financial analysis, phasing and environmental considerations.

Project Manager for engineering report, design and construction of City of Austin, Bear Creek Interceptor Project, consisting of approximately 20,000 feet of sanitary sewer interceptor in open cut and rock tunnel ranging in size from 30 to 42 inches in diameter, with an estimated construction cost of $2,200,000.00 The report phase of this project has been completed and the design is in progress.

Project Manager for report and design of approximately eight miles of sanitary relief sewers, ranging in size form 36 to 72 inches in diameter, with +/- 20,000 feet in soft tunneling clay, a deep tunnel 88 MGD pumping station for the City of Houston, Texas. This project eliminates four wastewater plants and one large pumping station and is located in an urban area in southwest Houston with an estimated construction cost of +/- $20,000,000.00.

Project Manager for construction management for a +/- $16,000,000 sewer rehabilitation project including thirteen separate contracts for the City of Houston. This is an EPA funded project and work includes documentation relative to cost effective removal of inflow/infiltration and final performance evaluation report, as well as detailed inspection, preparation of cost estimates, and weekly reports summarizing construction progress and cost on a line by line, contract by contract basis.

Project Manager responsible for report, design and construction of a combined relief sewer for the central area of teh City of Park Ridge. Sewers ranged in size from 18 to 84 inches over a distance of approximately 4 miles. The storm water discharged to the Des Plaines River and dry weather sanitary flow was diverted to Metropolitan Sanitary District interceptors. The design included large intercepting and diversion chambers, tunneling under railroads, headwalls and cofferdams, and construction in the center of the City and along with storm water flow requirements.

CONSOER, TOWNSEND & ASSOCIATES

Professional History

NAME:	Peter H. Braun, P.E. R.P.S.
TITLE:	Sr. Project Engineer
REGISTRATIONS:	Registered Proffesional Engineer - Texas Registered Public Surveyor - Texas
EDUCATION:	Chicago Technical College B.S., Civil Engineering, 1965
MEMBERSHIPS:	Water Pollution Control Federation Association of Consulting Municipal Engineers National and Texas Society of Proffesional Engineers Texas Good Roads/Transportation Association

QUALIFICATIONS

Mr. Braun has over 30 years experience in civil design and construction management for numerous projects throughout the country varying in complexity and size. For the past 15 years he has been project manager for a number of Houston water and sewer projects. Most recently, he was the project engineer on the City of Houston $20,000.00 Keegan's Bayou Wastewater project.

RELEVANT EXPERIENCE

Project Engineer responsible for developing facility planning and diversion sewer route study report for the 20 square mile Keegan's Bayou wastewater service area in southwest Houston. Report included cost effective evaluation of alternate routes to divert flows from four wastewater treatement plants to the new Keegan's Bayou regional plant, flow monitoring to establish base and wet weather flows in existing system, evaluation of future flow from undeveloped portion of service area and preliminary sizing and cost estimates for recommended improvements.

Project Engineer in responsible chance of preliminary topographical surveys, easement acquisition surveys, design and preparation of plans and other contract documents for the construction of approximately 13,000 feet of 30-inch to 42-inch sanitary sewer in open cut and 17,000 feet of 60-inch and 72-inch sanitary sewer in tunnel, and a 90 MGD pump station for the City of Houston Keegan's Bayou project.

Project Engineer responsible for coordination of field surveys, right of way mapping and discriptions, preparation of plans specifications and cost estimates for six miles of 72-inch diversions sewers from the existing Walnut Creek WWTP to the Heuse River Regional WWTP.

Project Engineer in responsible chance of the Donnelson-Pennington Benb (? sp.) interception sewer project including field surveys, design and general supervision of construction for 12 miles of 19-inch thru 40-inch interception sewers. Project included several stream crossings, railroad and highway tunnel crossings.

CONSOER, TOWNSEND & ASSOCIATES

Professional History

NAME: Ray Harrington, P.E.

TITLE: Vice President

REGISTRATION: Professional Engineer - Tennessee
Licensed to Practice Law - Tennessee

EDUCATION: Vanderbilt University, B.S. Civil Engineering, 1949
University of Michigan, M.S. Public Health Engineering, 1957
YMCA Law School, Bachelor of Law, 1962
YMCA Law School, Doctor of Jurisprudence, 1971

MEMBERSHIPS: Public Works Association
National Association of County Officials
American Waterworks Association
Association of Metropolitan Sewerage Agencies
Tennessee Society of Professional Engineers
Association of Metropolitan Water Agencies

QUALIFICATIONS

As a Vice President of Consoer, Townsend & Associates he is responsible for all plases of environmental and public works engineering. Mr. Harrington is in responsible charge of employees performing design and preparation of plans and specifications, and general construction inspection of water supply, treatment and pollution control facilities; community development and urban renewal projects; sanitary sewers, and the preparation of related engineering reports. He also is responsible for quality assurance/quality control, client relations and all regulatory liaison contacts.

RELEVANT EXPERIENCE

Served as director of the Metropolitan Department of Water and Sewerage Services for 12 years. During this time, under his direction and total supervision, a master water plan was developed for Metropolitan Nashville-Davidson County, Tennessee that projected water use demands through the year 2000. This project involves a total land area (excluding water) of 323,148 acres serving a 1980 population of 505,557 to a projected population of 649,750 at a total estimated cost of $45,000,000 projected over the next twenty years.

Responsible for additional projects representing over $300,000,000 in construction value. Significant projects include the following:

- Central Wastewater Treatment Plant
- Whites Creek Wastewater Treatment Plant
- Brown's Creek Force Main and Pumping Station
- West Park Force Main and Pumping Station
- K.R. Harrington Water Filtration Plant
- Extensive lateral sewer and water main extentions.

In responsible charge of working with Financial Consultants in developing the necessary financial arrangemens to construct water and sewerage facilities.

During service with Metropolitan Government worked closely with Planning Commission on subdivision development work. Worked with EPA and State on regulations regarding water and wastewater legislation.

Professional History

CORNELL TIMNEY
VICE PRESIDENT,
SENIOR ESTIMATOR AND CHIEF ENGINEER,
TUNNEL EQUIPMENT MANAGER

EDUCATION: B. S. in Mechanical Engineering;
Wayne State University
Detroit, Michigan

QUALIFICATIONS: Cornell Timney has accumulated over 40 years of experience in all phases of tunnel construction and engineering. Mr. Timney has held a senior management position with Jay Dee Contractors, Inc. for 18 years. His experience includes cost estimating, job cost analysis and control, construction claims development and negotiation, sewer tunnel inspection, sewer tunnel maintenance and repair, tunnel and shaft bracing design, tunnel ventilation system design, sewer hydraulic design, corrosion protection lining system design and installation, and tunnel construction project management, and tunnel equipment management. Since joining Jay Dee, Mr. Timney has been involved in every Jay Dee tunnel project; either directly as part of the bid estimating and project management team, or indirectly on an oversight basis to review the cost estimate and construction methodology.

As Tunnel Equipment Manager for Jay Dee, Mr. Timney's responsibilities include the selection, design, fabrication, refurbishment and/or purchase of the tunneling machines and support equipment that are utilized on the company's tunnel projects. He has extensive experience on more than 65 tunnel projects where he developed and applied many state-of-the-art features of mechanized tunnel boring machines in to satisfy tunnel project's geotechnical conditions, working room constraints and other requirements. In addition, he is responsible for the performance, reliability and adaptability of these machines such that they can be integrated into an efficient tunnel construction system.

Prior to joining Jay Dee, Mr. Timney worked for 22 years for the City of Detroit, Department of Public Works; 2 years as instrument man on a survey crew, 4 years as inspector on sewer and water tunnel construction projects and 16 years as General Foreman for sewer and water maintenance. His responsibilities as General Foreman included the coordination of Water and Sewer Department construction crews on multiple projects ranging from utility maintenance projects, minor and major repair projects, and new construction of water and sewer mains in tunnel throughout the Detroit Metropolitan Area.

Professional History

JOHN D. DIPONIO, P.E.
VICE PRESIDENT,
CHIEF ESTIMATOR AND ENGINEER,
ENGINEERING DEPARTMENT MANAGER

PROFESSIONAL REGISTRATIONS: Michigan, Wisconsin

EDUCATION: B. S. in Civil Engineering;
Michigan State University
East Lansing, Michigan

MEMBERSHIPS: American Society of Civil Engineers (ASCE)

QUALIFICATIONS: John D. DiPonio has over eleven years of experience in tunnel construction and engineering. His experience includes tunnel and shaft bracing design, cost estimating, tunnel construction project engineering, construction methodology, construction claims development and negotiation, and project budgetary control.

Mr. DiPonio has managed the estimating and engineering department of Jay Dee Contractors, Inc. for the past seven years. During this time he has developed a computer based estimating system to accurately and efficiently produce detailed cost estimates for tunnel construction projects. With this system, Mr. DiPonio has produced complete, detailed cost estimates for more than 150 tunnel projects.

His department has primary responsibility for cost estimating and proposal preparation for bidding on tunnel projects. If Jay Dee is successful in procuring the contract, Mr. DiPonio's department is responsible for developing the design of the tunnel access shafts, tunnel support system and other other temporary structures required. On many projects, Mr. DiPonio has developed value engineering proposals which involve revisions to the original design of the facility. These revisions have improved the function, construct-ability and over-all quality while providing for a substantial savings to the owner.

Prior to assuming the management of the estimating and engineering department, Mr. DiPonio has worked on numerous Jay Dee tunnel construction projects as a tunnel laborer, field engineer and Project Engineer. As Project Engineer his responsibilities included engineering layout of the work, tunnel alignment and control, supervision of tunneling operations, project quality control and handled all technical correspondence with the project owner. Prior to becoming Project Engineer and between project assignments, Mr. DiPonio worked as a estimating engineer as part of the estimating department of Jay Dee Contractors, Inc..

Professional History

MICHAEL A. DIPONIO, PE.
VICE PRESIDENT AND TREASURER,
TEXAS REGIONAL MANAGER

PROFESSIONAL REGISTRATIONS: Michigan

EDUCATION: B. S. in Civil Engineering;
Michigan Technological University
Houghton, Michigan

Master in Business Administration
University of Detroit
Detroit, Michigan

QUALIFICATIONS: Michael DiPonio has accumulated over nine years of experience in most phases of tunnel construction and engineering. His experience includes cost estimating, job cost analysis and control, tunnel safety, risk management, construction claims development and negotiation, geotechnical analysis, and tunnel construction project management.

During the last three years, Mr. DiPonio has successfully managed two tunnel construction contracts for the City of Houston's Northside Sewer Relief Program. His responsibilities included development of construction methodology, project scheduling, budgetary control of job costs and project administration. Mr. DiPonio participated in the bid estimating and proposal preparation team for obtaining these two projects and for numerous other tunnel projects throughout Texas including the City of Dallas, Cadiz St. Force Main subcontract, the City of Houston's Northside Sewer Relief Project #5R which was successfully built by Greenfield - Jay Dee Joint Venture, and the Northside Sewer Relief Project #12B for which Jay Dee is currently awaiting award.

Mr. DiPonio has participated in numerous tunnel engineering seminars across the country including the 1980 Engineering News Record seminar on Sewage Treatment Facility Design and Construction, the 1981 Rapid Excavation and Tunneling Conference in San Francisco, and the University of Colorado 1983 seminar on Tunnels: Design, Construction and Instrumentation. He has made presentations on tunnel construction for the Michigan Safety Conference, the University of Wisconsin's 1982 Small Size Tunneling Seminar, LAW Engineering's 1987 Conference on Tunneling in Houston, and to the Texas Concrete Pipe Association.

LICHLITER/JAMESON & ASSOCIATES, INC.

Professional History

NAME:	TIMOTHY E. LACKEY, P.E., R.P.S.
TITLE:	Project Engineer
REGISTRATION:	Registered Professional Engineer, Texas Registered Public Surveyor, Texas
EDUCATION:	Masters of Business Administration University of Dallas, 1987
	Bachelor of Science, Civil Engineering Texas A & M University, 1978
MEMBERSHIPS:	American Society of Civil Engineering Texas Society of Professional Engineers Texas Surveyors Association

Qualifications

Tim Lackey's professional experience includes involvement in the planning, engineering and construction management of municipal improvements throughout the State of Texas.

Relevent Experience

Surveying: He has been responsible for all types of surveying, ranging from boundary and topographic surveys to construction and as-built surveys. He has directed field efforts for route surveys and roadway design. He has supervised the collection of field data, calculation of property lines, and preparation of final plats and legal descriptions. Has prepared exhibits and instruments for obtaining right-of-way.

Infrastructure Developments: Mr. Lackey designed the streets, water, sewer and drainage facilities to serve Coit Commercial Center, an office park in Plano, Texas. The project required 2,500 linear feet of collector street, with parallel utilities to accommodate future development.

As project manager, he supervised the design of 5,000 linear feet of paving facilities in the Creek Crossing Addition of Mesquite, Texas. The infrastructure served 1,200 acres of future development. The project required a 260 linear foot bridge along with 2,500 linear feet of storm sewer facilities.

Drainage Projects: Mr. Lackey was involved in flood plain reclamation of property along Hutton Branch Creek in Carrollton, Texas. The project required design of a seventy foot wide concrete lined channel, and 100,000 cubic yards of fill material, along with processing HEC-2 analysis through the Federal Emergency Management Agency. The flood plain was remapped and later developed into Trinity Crossing Apartments.

As project manager, he was responsible for the design of a 60 foot channel for flood plain reclamation along stream 2B5, a tributary of South Mesquite Creek, in Mesquite, Texas. The project conveyed 5,000 cfs through an industrial park. Approximately 15 acres of land was reclaimed through channelization.

LICHLITER/JAMESON & ASSOCIATES, INC.

Professional History

NAME:	JERRY A. DAVIS, R.P.S.
TITLE:	Vice President, Surveying and Mapping
REGISTRATION:	Registered Public Surveyor, Texas
EDUCATION:	International Correspondence School, Surveying and Mapping
MEMBERSHIP:	Texas Surveyors Association

Qualifications

Jerry Davis' experience in land surveying, mapping and calculations includes extensive involvement for nearly 20 years in municipal and land development projects throughout the State of Texas.

Relevent Experience

Surveying: Responsible for all surveying performed by the firm including boundary, design, topographic, construction, and as-builts and for control of first and second order accuracy. Supervised data collection for field surveys, analysis of field data for delineation of property lines, and preparation of survey plats and legal descriptions of conveyance of land throughout the state.

Calculations: Utilizing a coordinate geometry program aided by computers and high speed plotters, Mr. Davis was responsible for all calculations required for land subdivision in several development areas exceeding 500 acres.

Public Works: Mr. Davis has performed control, alignment, topographic and construction and as-built surveys for a wide range of public works projects including storm sewers, water lines and water and wastewater treatment facilities.

Representative Projects:

- I-10 and Beltway 8 Interchange, SDHPT, District 12, Houston, Texas
- West Belt Toll Road, Harris County Toll Road Authority, Houston, Texas
- Park Row Boulevard, Harris County, Houston, Texas
- I-45 Waterline Project, City of Houston, Department of Public Works, Houston, Texas
- Voss Road Twin Bridges and Roadway, City of Houston Department of Public Works, Houston, Texas

LICHLITER/JAMESON & ASSOCIATES, INC.

Professional History

NAME:	PAUL L. LIPPKE, P.E.
TITLE:	Houston Region Manager, Land Development
REGISTRATION:	Registered Professional Engineer, Texas, Illinois, Wisconsin and Indiana
EDUCATION:	Bachelor of Science, Civil Engineering Georgia Institute of Technology, 1968
MEMBERSHIPS:	National Society of Professional Engineers American Society of Civil Engineers

Qualifications

Paul L. Lippke has over 20 years experience in the engineering and construction of multi-disciplined civil engineering projects. He has been responsible for design and construction of large-scale projects, which have included large-scale flood control facilities, wastewater collection facilities, and major land development projects.

Relevent Experience

As Project Engineer for Cosoer, Townsend & Associates, he worked with Mr. Wilbur Van Riper on a feasibility study of the Fort Sheridan, Illinois sanitary collection and wastewater treatment facilities for the Department of the Army.

Mr. Lippke has extensive knowledge of construction management. He was general manager for construction companies specializing in mass grading, reservoirs, storm sewers, detention basins, sanitary sewers, water mains, paving, lighting and landscaping. His over-all total design and construction responsibility has exceeded $150 million.

Mr. Lippke was responsible for an 80,000,000 gallon levee and flood storage reservoir that included sheet pile cut-off wall and multi-pipe controlled discharge structure and dam for a 600 acre site. He had similar experience on a 75,000,000 gallon/429 acre project. In addition, Mr. Lippke was the Senior Project Manager on a $22,000,000 flood control project in Fort Bend County, Texas.

Mr. Lippke has extensive experience in site design and planning. As Project Engineer, he was responsible for engineering and cost feasibility studies for planned unit developments ranging from a 600-acre project to a 20,000-acre project. These projects included land usage investigation, site planning, sanitary sewer, storm sewer, flood control, water supply, roadways, and park and recreational design.

As Chief Engineer, Mr. Lippke was responsible for site design and construction of office and industrial parks. His projects included a highly-successful 340-acre industrial park and two 30-acre office parks.

Ralph B. Barnes, Jr., P.E.

Vice President/Manager
North Texas Geotechnical Engineering Division
Dallas, Texas

B.S.C.E., University of Arkansas - 1970
M.S.C.E., University of Arkansas - 1971

Professional Engineer Registration:

Texas and Arkansas

Professional Affiliations:

American Society of Civil Engineers (ASCE)
National Society of Professional Engineers (NSPE)
Texas Society of Professional Engineers (TSPE)

Ralph Barnes has accumulated over 17 years of professional engineering experience since joining SWL in 1971. In his present position of Division Manager, he has technical and management responsibilities for engineering and field services provided by the North Texas Geotechnical Division.

During his career with SWL, Mr. Barnes has directed the geotechnical engineering for many major projects including: City Center I and II in Fort Worth; The Crescent Office/Hotel Complex in Dallas; 15 miles of effluent pipeline in Midland, Texas; 22 miles of 84-inch raw water transmission line in east Texas; Midland Regional Airport; Lonestar Steel's Coke Oven Batteries and Furnace Complex in Lonestar, Texas, and 1.6 miles of Levee and Channel Relocation of the Trinity River in northwest Fort Worth.

He currently serves as Project Manager for SWL's geotechnical design studies for the Dallas Area Rapid Transit System and SWL's recently completed geotechnical design report for General Dynamic's new northwest Fort Worth facilities that include over 600,000 square feet of occupied space.

Mr. Barnes is a member of the Chi Epsilon Honor Society and was named Engineer of the Year in 1988 by the Mid-Cities Chapter of TSPE.

Bruce Bailey, Ph.D., P.E.

Senior Project Manager
North Texas Geotechnical Engineering Division

B.A. - University of Iowa - 1964
B.S.C.E. - University of Iowa - 1965
M.S.C.E. - University of Iowa - 1966
Ph.D. - University of Iowa - 1972

Professional Engineer Registrations:

Texas, Oklahoma, Arkansas, Missouri

Professional Affiliations:

American Society of Civil Engineers (ASCE)
National Society of Professional Engineers (NSPE)
International Society for Soil Mechanics
& Foundation Engineering
National Water Well Association

Bruce Bailey has accumulated over 20 years of professional engineering experience in Texas and the midwest, and more recently, as Senior Project Manager with SWL in Dallas. He also served as an Assistant Professor of Civil Engineering at North Dakota State University from 1970 to 1973.

During his career, Mr. Bailey has assumed technical and managerial responsibilities on a variety of projects including highrises, office, commercial, municipal and school buildings, excavation bracing and dewatering, levees, embankment dams and dam safety inspections, power plants, transmission lines, highways, pavements, railways, bridges, industrial plants, river front and docking facilities, surface mining equipment facilities, and water and wastewater treatment plant structures, slope failure studies, geotechnical instrumentation, hazardous waste management and groundwater monitoring studies, RCRA Part B permits, "Superfund" site and other geo-environmental studies, inspection and testing of geotechnical construction on numerous projects. He has served a Project Manager and Senior Geotechnical Engineer for SWL on a study of 3000 feet of vehicular transit tunnel for the City of Dallas and currently serves as Senior Geotechnical Engineer on SWL's design study for two miles of 20 foot diameter twin bored tunnels for the Dallas Area Rapid Transit System.

Robert C. Sneed

Senior Geologist
North Texas Geotechnical Engineering Division

B.S. - Geology - Texas A & M University - 1960

Professional Affiliations:

Member of The National Water Well Association
Licensed Water Well Driller: License No. 2484

Bob Sneed has accumulated over 25 years of experience in providing geological studies throughout the United States. He began his career with Spencer J. Buchanan and Associates, where his responsibilities included geologic report preparation, sample testing, field operations supervision, and general consulting. Since then, he served as Staff Geologist for Teledyne Geotech before joining SWL in 1971.

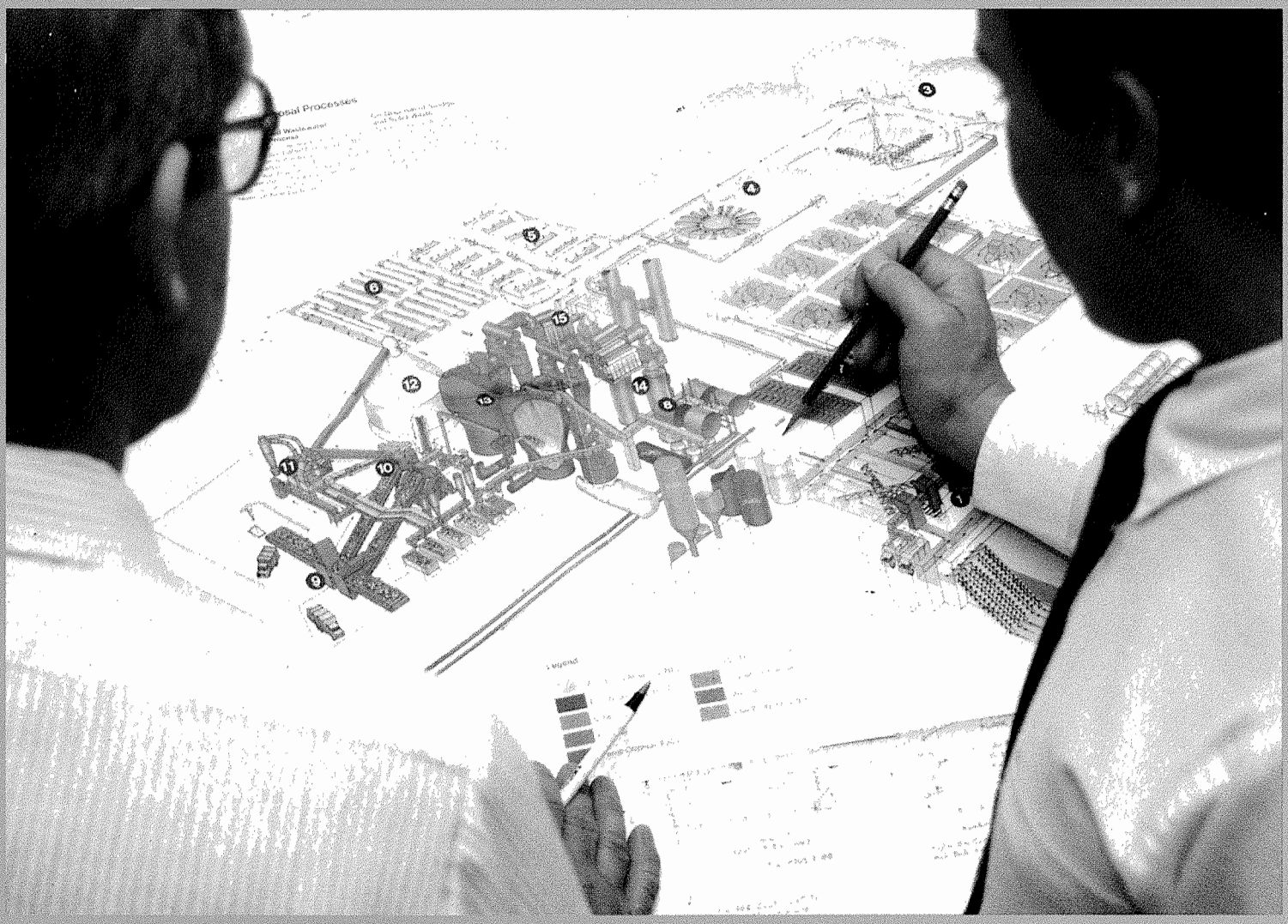
His experience also includes, but not limited to, the following:

Earthen Dam Exploration, Mineral Exploration, Landfill Site Exploration, Installation of Monitor Wells, Electric Logging, Geologic Mapping, Groundwater Studies, and Construction and Design of wells for underground coal gasification.

Some of his major projects include: Sanford Dam, Red Draw Dam, ARCO Coal's underground coal gasification in Texas, Colorado, and Wyoming; Texas Utilities Lignite Exploration near Rockdale and Tatum, Texas; and numerous projects involving installation of monitor wells. Mr. Sneed has experience in diverse applications of geo-electric logging such as mineral exploration, selection and installation of seismic stations to register remote underground atomic blasts, and exploration for materials used in the production of cement and construction materials for Gifford-Hill, General Portland Cement, Lone Star Industries, and several other major manufacturing companies.

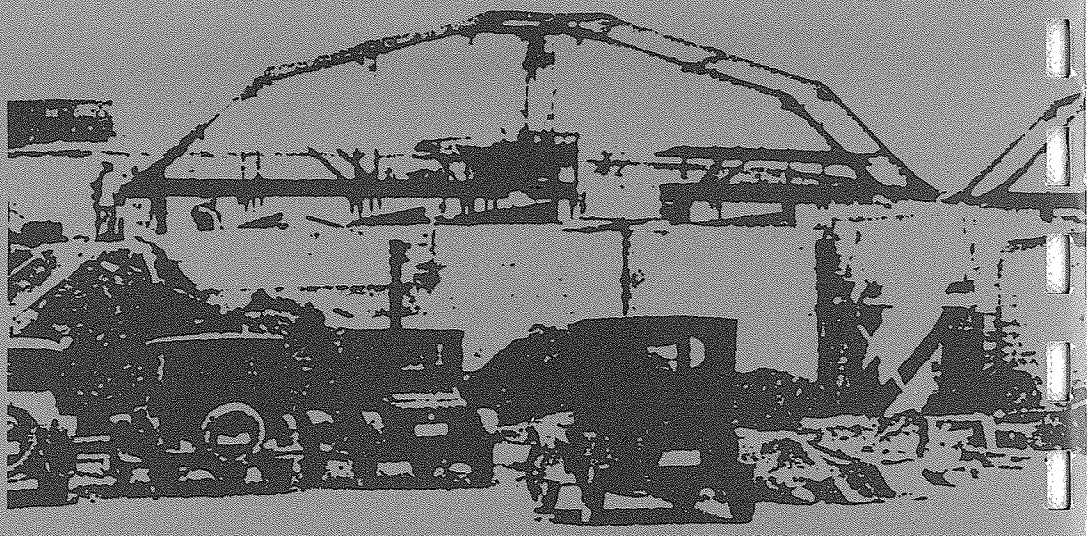
responsive, responsible

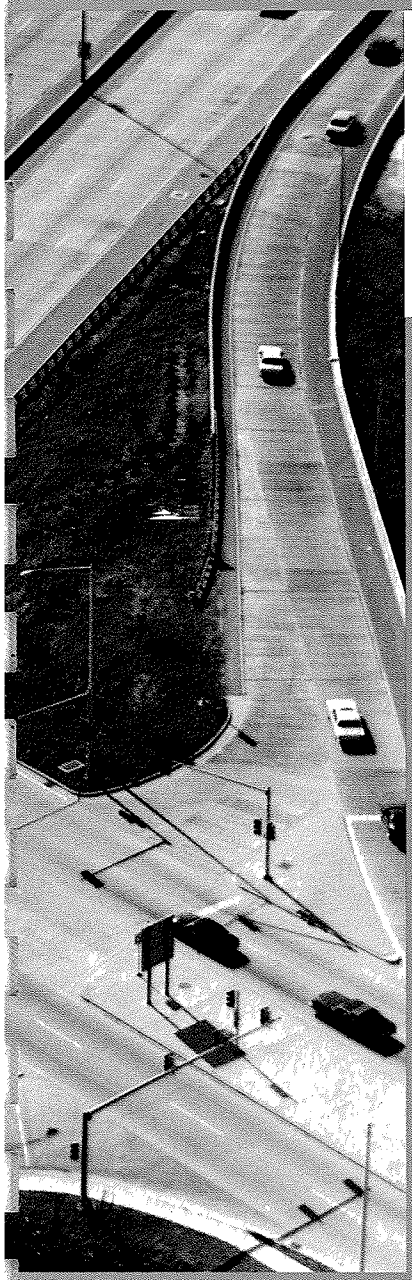
CONSOER, TOWNSEND & ASSOCIATES, INC. Consulting Engineers

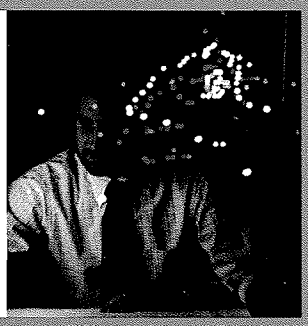


Consoer, Townsend & Associates has provided engineering, architecture, planning and operational assistance to municipalities, counties, states, special districts, branches of the Federal government and private industry throughout the United States and overseas.

Consoer, Townsend & Associates has built its reputation on its ability to solve complex problems and select cost effective remedies.







responsive, responsible

When Arthur W. Consoer returned to Chicago from World War I, he came to a city undergoing rapid growth. As a Civil Engineer, he recognized that post-war municipal and industrial development had to be well planned. This development, he felt, should focus not only on immediate needs, but also on the long term.

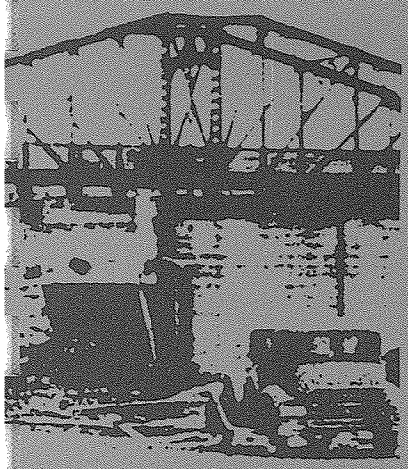
With this in mind, Mr. Consoer established a firm whose goal was to develop a reputation for reliability, integrity and engineering proficiency. Like most engineers, A.W. Consoer was concerned that his projects be professionally responsible . . . meeting state-of-the-art engineering techniques. However, he also felt that successful engineering needed to be responsive . . . providing solutions for people's needs. He established a firm in which he would be personally accountable to the needs of his clients and those who would be the beneficiaries of his projects. A.W. Consoer's personal involvement insured that developers and municipal officials could entrust their goals to the firm.

Responsible

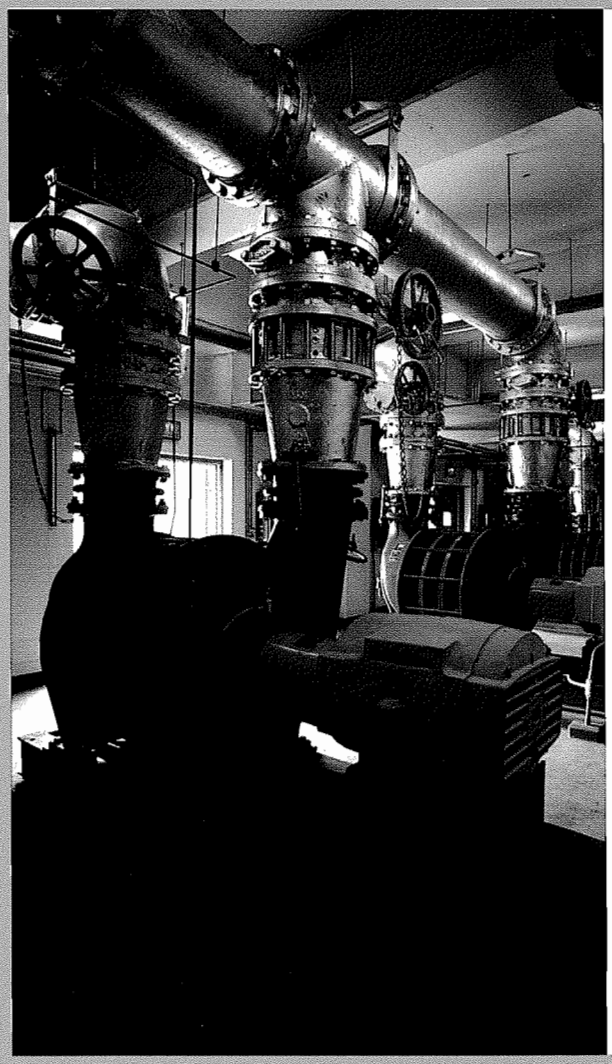
Today, Consoer Townsend's engineers, architects and planners are experienced at solving individual technical problems with vision, as well as efficiency and economy. Through ongoing training, extensive project experience, and the acquisition of new talent from the nation's top professional schools, Consoer, Townsend & Associates is able to maintain its position on the leading edge of engineering design and project management.

Responsive

Consoer, Townsend & Associates continues to help its clients promote economic and municipal growth. With a broad range of engineering expertise, Consoer, Townsend & Associates has the ability to form specialized project teams, which respond to specific client needs.



Nearly 70 years after A. W. Consoer started the firm, Consoer, Townsend & Associates maintains the same sense of responsibility and reliability towards its clients.



Blowers provide air for activated sludge process.

Sophisticated laboratory techniques help assure safe drinking water.

environmental engineering

Water Supply

With the rapid expansion of residential, commercial and industrial areas, adequate water supply continues to be a major concern of public agencies and industrial firms. The Safe Drinking Water Act has imposed stringent requirements on water treatment facilities. Personnel familiar with applicable regulations are available to assist in the design or modification of facilities to meet the existing standards.

With a staff dedicated solely to designing and managing the construction of plants and systems for treatment, storage and distribution, water supply is a prime specialty of Consoer, Townsend and Associates.

Wastewater

Consoer Townsend has designed sewage collection and treatment facilities for large and small communities throughout the United States. Innovative treatment processes are adapted to difficult wastewater treatment situations.

Consoer, Townsend & Associates has successfully completed hundreds of wastewater management projects involving planning, design and program management for systems throughout the world. The projects have ranged in size from a few thousand gallons per day to over 1,500 million gallons per day. These projects have served the needs of industries, institutions, municipalities and military facilities.

responsive, responsible

Wastewater reclamation programs developed by Consoer, Townsend & Associates include innovative technologies to reclaim treatment plant effluent and use reclaimed waters to replenish depleting groundwater basins.

Solid Waste Management

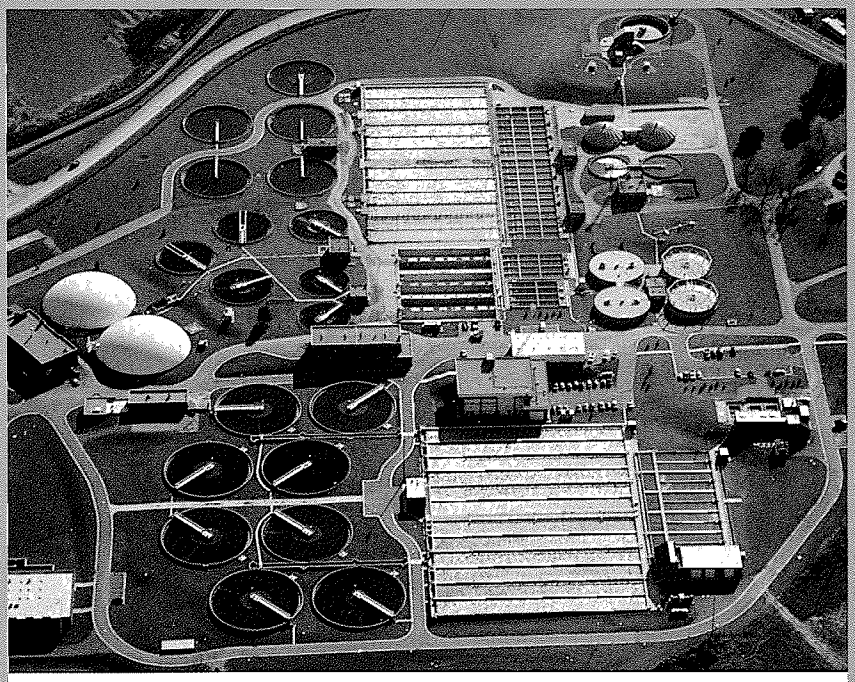
Consoer Townsend experts are helping municipalities deal with the ever increasing generation of solid wastes. The firm studies, on a continuing basis, the entire field of solid waste management. Consoer Townsend's staff advise, recommend and design solutions for all phases of administration, collection, storage, processing, recycling and resource recovery to ultimate disposal. Projects include transfer stations, landfills, incinerators, metals recovery and refuse-derived fueled facilities.

Combining specialists from several emerging disciplines, Consoer Townsend has responded to client needs by designing innovative solid waste management and treatment operations and processes. These include unique co-disposal facilities, and the development of fully automatic, computer controlled combustion systems.

Hazardous/Industrial Waste Management

Consoer, Townsend & Associates has combined its expertise in groundwater protection, storm water control, waste analyses, leachate collection, monitoring and treatment to assist government and industry in the control of hazardous and industrial wastes. For a large Silicon Valley semiconductor research facility, Consoer Townsend designed a plant to treat variable laboratory wastes containing more than 600 organic chemicals. The firm has prepared environmental audits for both private industry and military facilities throughout the nation, and Consoer Townsend personnel have gained a thorough awareness of federal procedures through a contract providing technical enforcement support to the United States Environmental Protection Agency.

Seventh addition to Nine Springs Wastewater Treatment Plant, Madison, Wisconsin, incorporated ammonia reduction and ultraviolet light disinfection.



Instrumentation and control panels for solid waste, water and wastewater treatment facilities merge operational simplicity with up-to-date technology.

Public awareness about past improper waste disposal practices have made hazardous waste generators more accountable for their waste management practices.

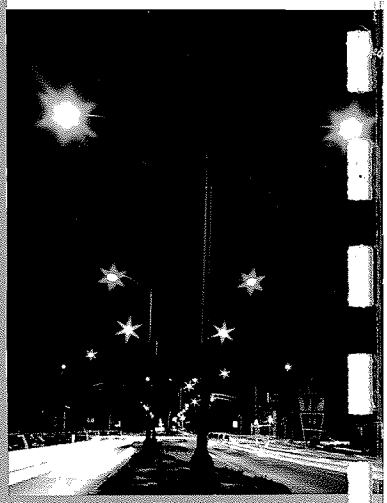
municipal engineering

Consoer, Townsend & Associates has experienced personnel available to handle every phase of municipal engineering, from planning through operations. Municipalities, as well as commercial, industrial and residential land developers, depend on Consoer Townsend's complete engineering services to produce studies and designs for sanitary and storm sewers, storm water management plans, water mains, streets, lighting and traffic signal systems, and other infrastructure improvements.

Over the years, literally hundreds of communities have retained Consoer, Townsend & Associates to serve as City or Village Engineers. In some cases, the firm has held the position for more than six decades.

Consoer, Townsend & Associates has been involved in the development of entirely new, planned communities, such as Columbia, Maryland, and Woodlands, Texas, as well as thousands of new subdivisions. The firm has been instrumental in assisting municipalities to provide services to newly annexed property.

Consoer Townsend's engineers, architects and planners are available to provide professional expertise anywhere clients seek advice.



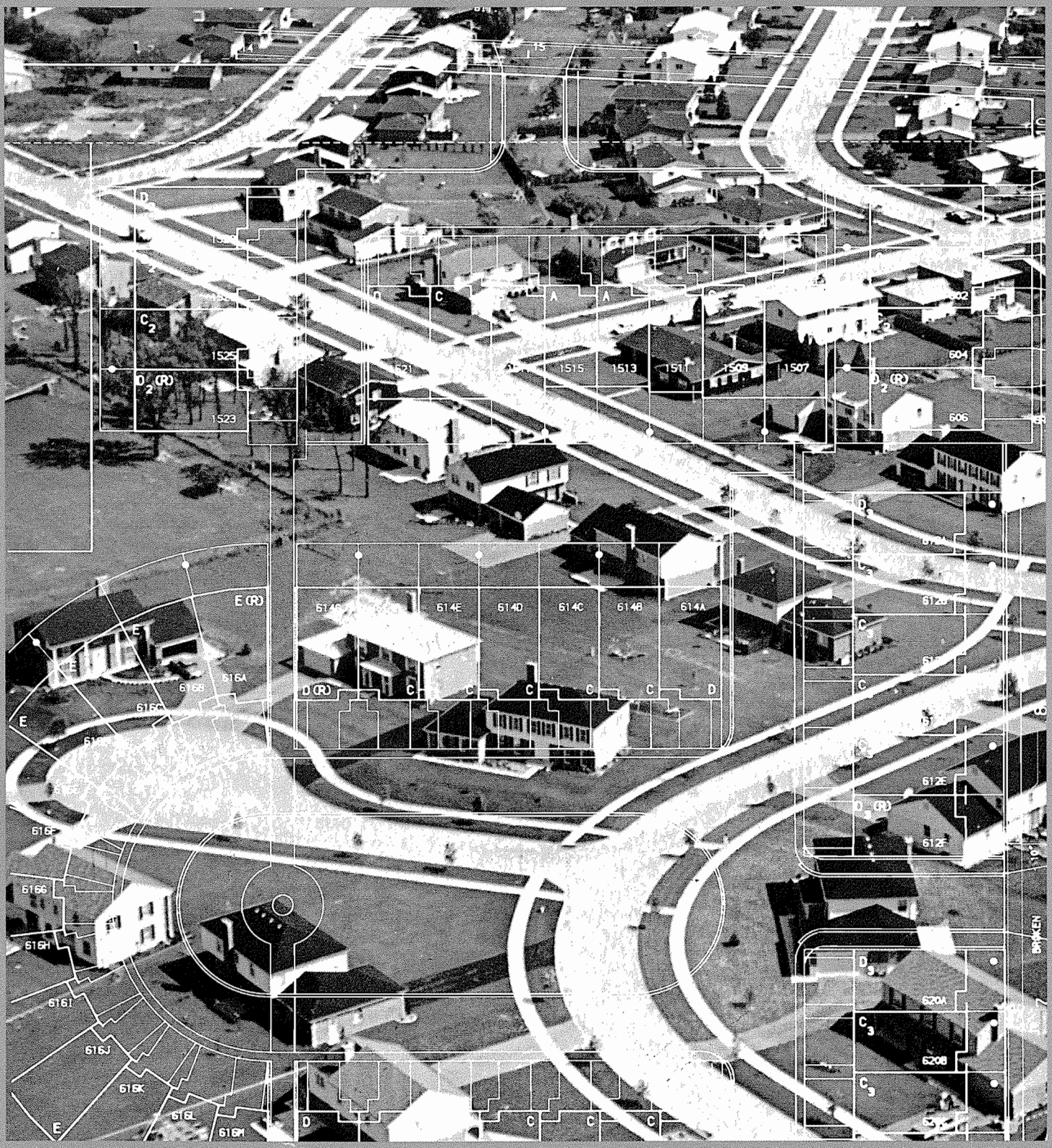
Street lighting is designed for safety and energy efficiency.

Riverfront Plaza provides casual setting for downtown office workers.

responsive, responsible

Miniparks help beautify urban neighborhoods.

Consoer Townsend assists both private developers and municipalities to achieve high quality residential communities.



Consoer, Townsend & Associates has been involved in the development of a major portion of the nation's transportation system.

transportation

Since the founding of Consoer, Townsend & Associates in 1919, transportation engineering has been one of the firm's specialties. A unique blend of knowledge and experience keeps the firm at the forefront of planning and design for all modes of transporting people, goods and services. As engineers headquartered in one of the largest cities in the nation, Consoer Townsend knows the impact of good transportation facilities.

Consoer, Townsend & Associates has prepared traffic studies; environmental reports; location-design studies; preliminary and detailed design; contract plans and specifications and estimates; and general and detailed construction observation for all aspects of transportation facilities.

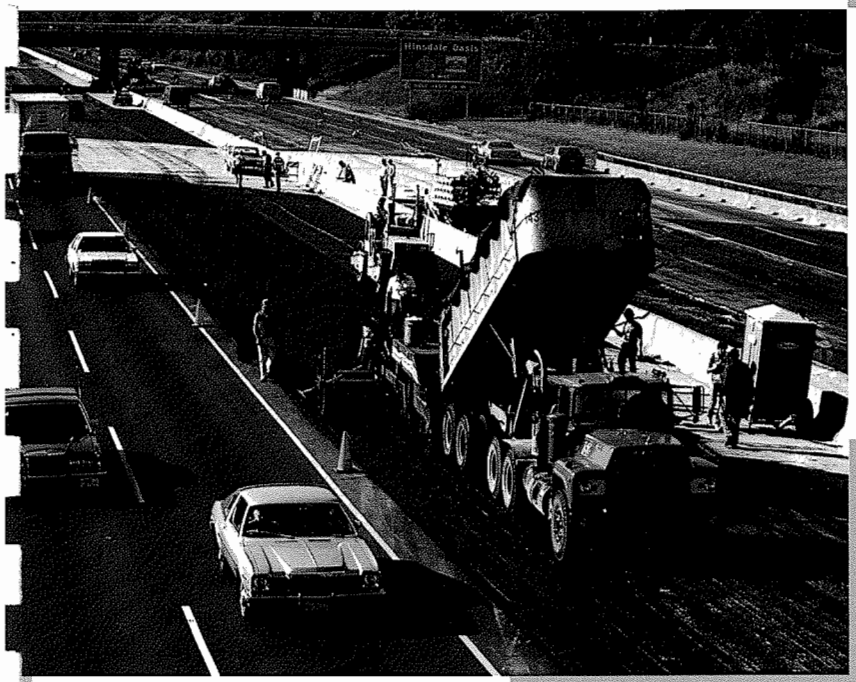
Roadways and Bridges

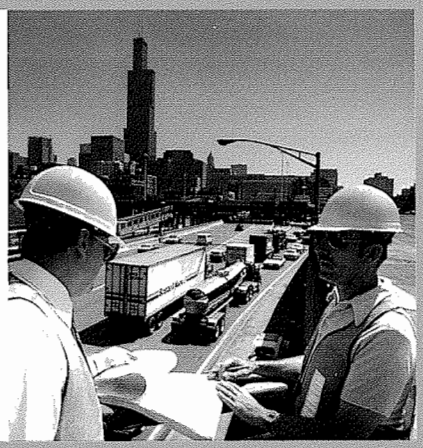
Consoer, Townsend & Associates is a leader in comprehensive highway planning and design. The broad range of roadway and bridge projects designed by Consoer Townsend attests to the firm's ability to design for varying conditions and locations.

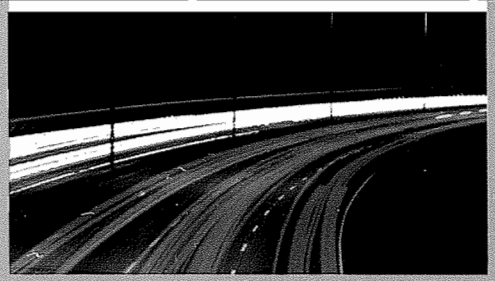
Consoer Townsend pioneered techniques of traffic assignment and projections and cost-benefit analysis. Procedures utilizing mathematical models, real time traffic and vehicle simulation and systems analysis constitute today's basic tools for traffic and transportation studies. Consoer Townsend regularly combines these quantitative tools with effective public participation programs to insure that projects serve public needs and attain public support.

responsive, responsible

Consoer, Townsend & Associates has completed more than 20 projects at O'Hare International Airport, Chicago.







Providing construction related services to the full range of transportation projects.

Since its inception, Consoer, Townsend & Associates has been involved in the development of a major portion of the interstate highway network. More recently, Consoer Townsend has prepared plans for the repair and rehabilitation of freeways, secondary roads and bridges under funding programs by the Federal Highway Administration.

Bridge and roadway design, traffic signalization, and lighting have assisted municipalities, shopping centers, hotels, hospitals, industrial parks, college campuses and recreational complexes solve complex transportation and traffic problems.

Consoer Townsend can be depended upon to find cost effective solutions to complex problems. For example, complex traffic, location and structural problems were solved by Consoer Townsend's innovative design of a bridge over a Chicago area road which also serves as a taxiway for one of the world's busiest airports — O'Hare International.

Airport Facilities

Consoer, Townsend & Associates has utilized its multi-disciplinary engineering, architecture and planning services to meet the needs of the nation's growing airports.

Airport master plans; apron, runway and taxiway design; terminal, maintenance and other structures; utilities; lighting systems; navigational aids; treatment facilities; and site development projects have all been undertaken by Consoer, Townsend & Associates. Large city airports assisted by Consoer Townsend include O'Hare, Midway and Meigs Airports in Chicago, Nashville Metropolitan Airport, San Francisco International Airport, and General Mitchell Field in Milwaukee, Wisconsin. Smaller facilities include Davenport, Iowa, Sault Sainte Marie, Michigan, DuPage County, Illinois and the Glenview Naval Air Station in Illinois.

Railroad and Rapid Transit Facilities

Consoer Townsend can be called upon to assist in a variety of rail related transportation issues. In the field of mass transit Consoer Townsend can be relied upon to combine its seven decades of experience with the latest in technology, safety and comfort.

responsive, responsible

Consoer, Townsend & Associates offers complete architectural services from concept through design and construction.

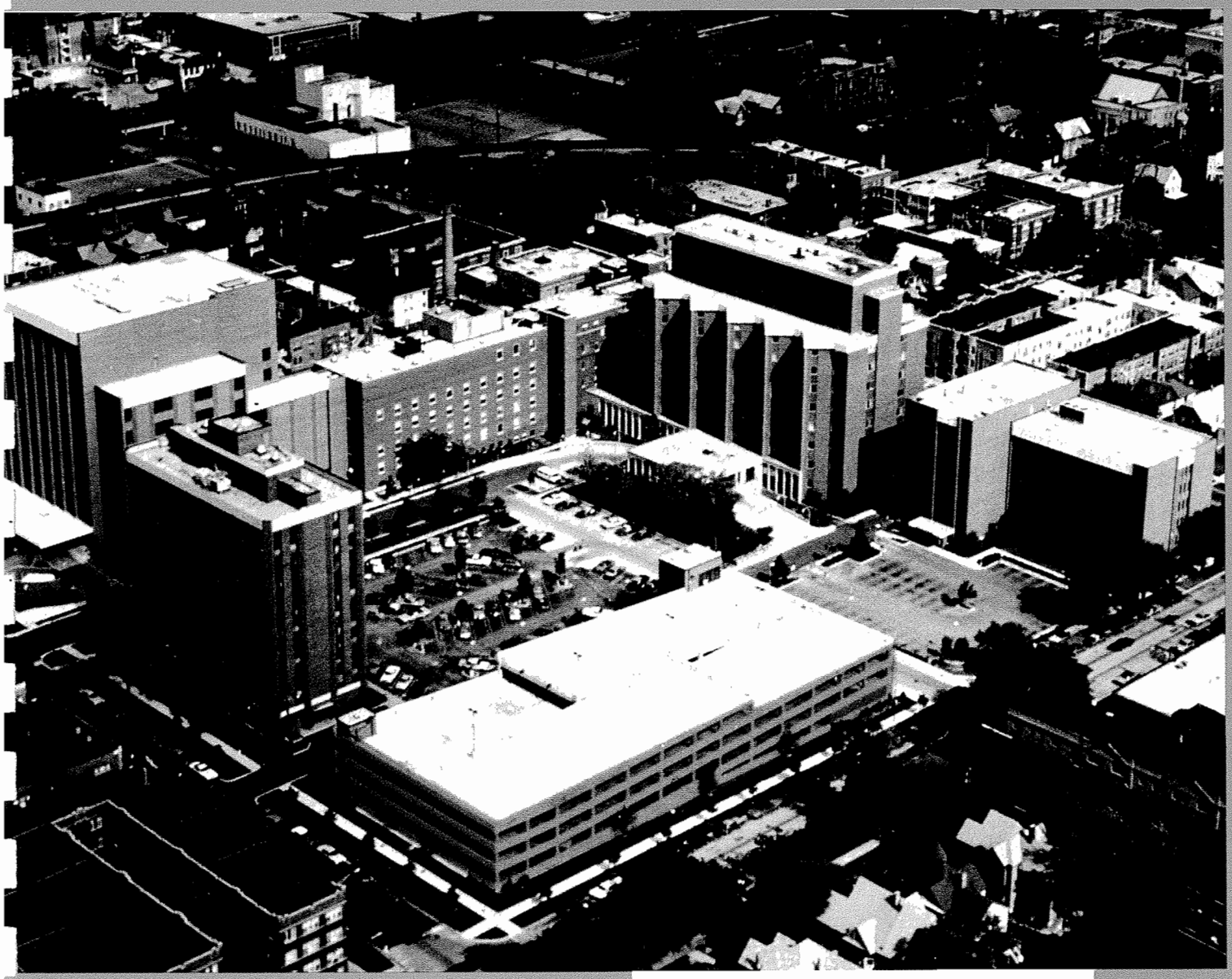
architechture and building systems

Power generation, distribution and instrumentation are major activities of the firm's electrical group.

Effectiveness and value describe the range of buildings designed by Consoer, Townsend & Associates.

The firm's architects design for economy and flexibility, as well as for effect. In a unique, award winning project, Consoer Townsend designed a multi-use emergency operations center for the City of Santa Clara, California. The facility, designed to serve as municipal headquarters in case of emergencies — such as floods, earthquake, or even nuclear explosion — serves the City on an ongoing basis as a communications center, police training facility, and emergency vehicle storage facility. Flexible design of public works maintenance facilities by Consoer, Townsend & Associates has helped many communities reduce operation and maintenance costs.

In architectural design, concepts stem from a problem, and the theme evolves around planning. Taking careful account of location, functional and budgetary restraints, Consoer Townsend architects work together with the firm's engineers and planners in the design of public works facilities, housing and health care facilities, office buildings, airports, schools, industrial structures and religious institutions.



Ravenswood Hospital, Chicago, involved design and construction services for 10 major construction projects over 18 years.

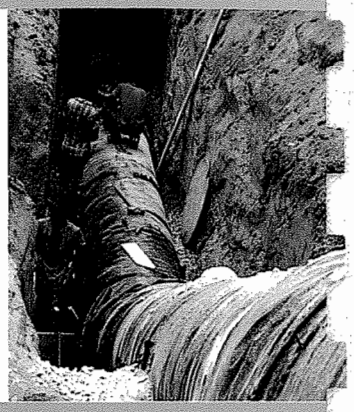
Mechanical, Electrical and Structural Engineering

Major public works facilities, industrial institutions and commercial organizations require specialized engineering expertise. Supporting Consoer Townsend's environmental, transportation, municipal and architectural engineers is a broad based group of mechanical, electrical and structural specialists. This group can be called upon to support Consoer Townsend's facility design and construction management activities, as well as the specialized needs of clients.

Energy efficiency is a primary concern of designs undertaken by Consoer, Townsend & Associates. Our mechanical and electrical groups provide support in the design of power generation and distribution, instrumentation, lighting, plumbing, heating, ventilating, and air conditioning systems in conjunction with the development of major facilities.

Energy efficiency and environmental soundness highlight Consoer Townsend designs.

responsive,
responsible



Curb and gutter layout
for municipal projects.

construction services

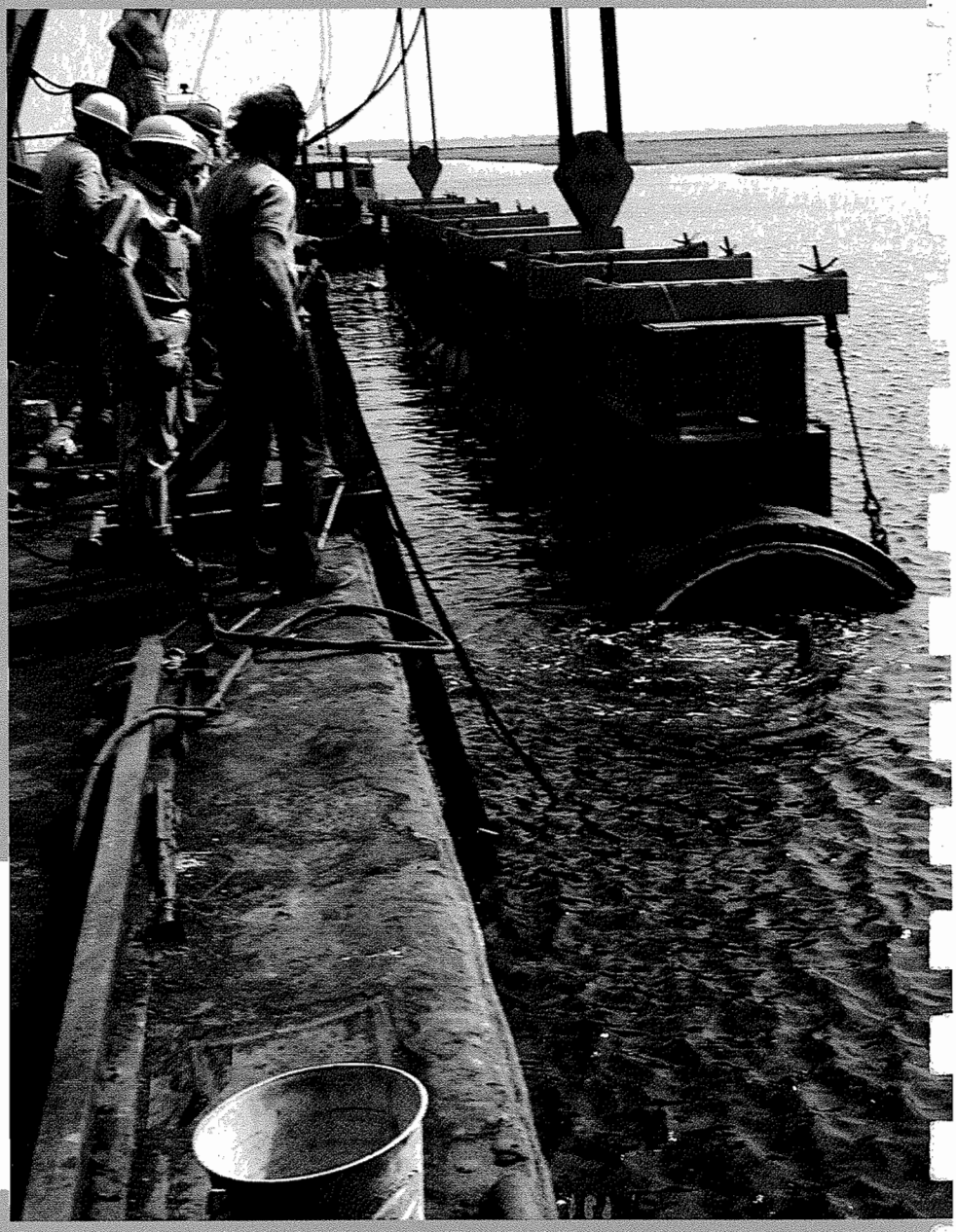
Inspecting installation o
submerged piping fo
an ocean outf

Services provided by Consoer, Townsend & Associates go beyond basic design, engineering and construction supervision. The firm is prepared to help clients define construction programs, manage them, provide general and field engineering during construction, review shop drawings, provide start-up services, train operating personnel and operate completed facilities.

Maintaining operations during construction requires close coordination between facility operators, engineers and construction contractors. Through experience on the full range of public works and industrial projects, Consoer Townsend has developed reliable management techniques to minimize disruption caused by major construction programs, allowing facilities to continue to service the community during construction.

On projects as diverse as the Nashville, Tennessee Central Wastewater Treatment Plant and the new Atlanta, Georgia Courthouse, Consoer Townsend has assisted facility owners in the full range of program management services.

Consoer Townsend provides a single professional organization with the ability to manage, coordinate and control design, procurement and construction on a fast track basis.



Inspection of concrete pour.

Water main installation , Trinidad.

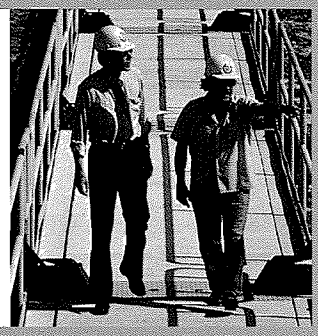
Construction services for complex projects involving innovative design technologies.

responsive, responsible

Start-up and debugging of newly completed facilities.

Training plant operating personnel.

Process inspection at wastewater treatment facility.



operational services

Projecting future project costs.

For nearly 70 years Consoer, Townsend & Associates has operated under the belief that clients are entitled to complete and extended service after completion of construction. To assist in the efficient and economical operation of public works facilities, Consoer Townsend personnel are available to help facility operation and maintenance meet both design and client expectation.

Consoer Townsend personnel initiated the practice of Operations and Maintenance Manuals for wastewater treatment plants well before the Water Pollution Control Act mandated them for all EPA funded projects. Current guidelines for required manuals closely parallel the format of earlier manuals prepared by the firm.

Consoer Townsend's broad base of experience assures that no minor feature of any project fails to receive expert attention from an engineer experienced in that type of work. Personnel experienced in design, research, facility operation, equipment, plant management, training and technical writing are available to assist in every project we undertake.

services

The strength of Consoer Townsend's organization is based upon the firm's record of performance. More important, however, is the combined experience and ability of men and women now doing the work entrusted to this engineering firm.

Municipalities, special districts, government agencies, private industry, and the general public continue to depend on the people at Consoer, Townsend & Associates to help shoulder the responsibility of developing facilities which will last long into the future.

Consoer, Townsend & Associates is unique in its depth of experienced personnel. Each project receives the individual attention of senior management of the firm. It is this proud tradition of responsibility and reliability that Consoer, Townsend & Associates continues to maintain.

Services

Environmental Engineering
Wastewater Collection and Treatment
Water Supply, Treatment, Storage and Distribution
Solid Waste Management
Hazardous/Industrial Waste Management

Municipal Engineering
Capital Improvements
Sewers
Drainage
Lighting
Urban Renewal

Transportation Engineering
Roadways and Bridges
Airport Facilities
Rail and Rapid Transit
Parking Facilities

Architectural Engineering
Public Works Facilities
Airports
Schools
Health Care Facilities
Office Buildings
Industrial Facilities
Religious Institutions

Construction Services
Program Management
Construction Field Engineering
Resident Engineering

Operational Services
Operations and Maintenance Manuals
Facility Start-Up
Operations and Maintenance Reviews
Operator Training
Facility Management
Contract Operations

Support Services
Electrical Engineering
Mechanical Engineering
Structural Engineering

Consoer, Townsend & Associates, Inc.

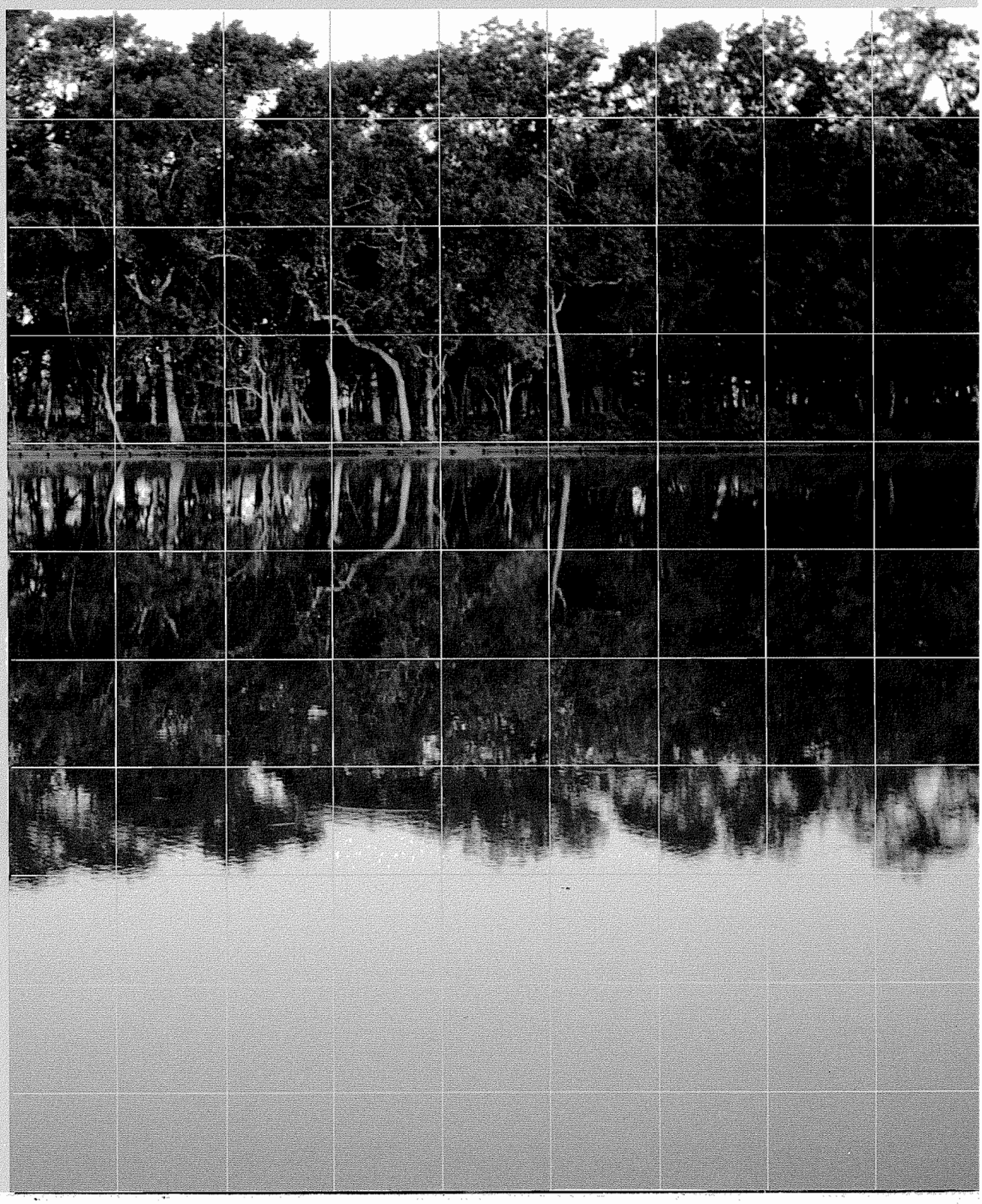
Principal Offices

Headquarters
303 East Wacker Drive, Suite 600
Chicago, Illinois 60601
(312) 938-0300

404 James Robertson Parkway
Nashville, Tennessee 37219
(615) 244-8864

Branch Offices:
Atlanta, Georgia
Charlotte, North Carolina
Erie, Pennsylvania
Naples, Florida
Reedsburg, Wisconsin
St. Louis, Missouri
San Juan, Puerto Rico
Tacoma, Washington

About The Company



About The Company

- Lichliter/Jameson & Associates is a consulting firm offering civil engineering, planning and surveying services for land development, transportation and public works projects. We work in both the public and private sectors. Our clients include private developers, commercial and industrial firms, municipalities, and government agencies.

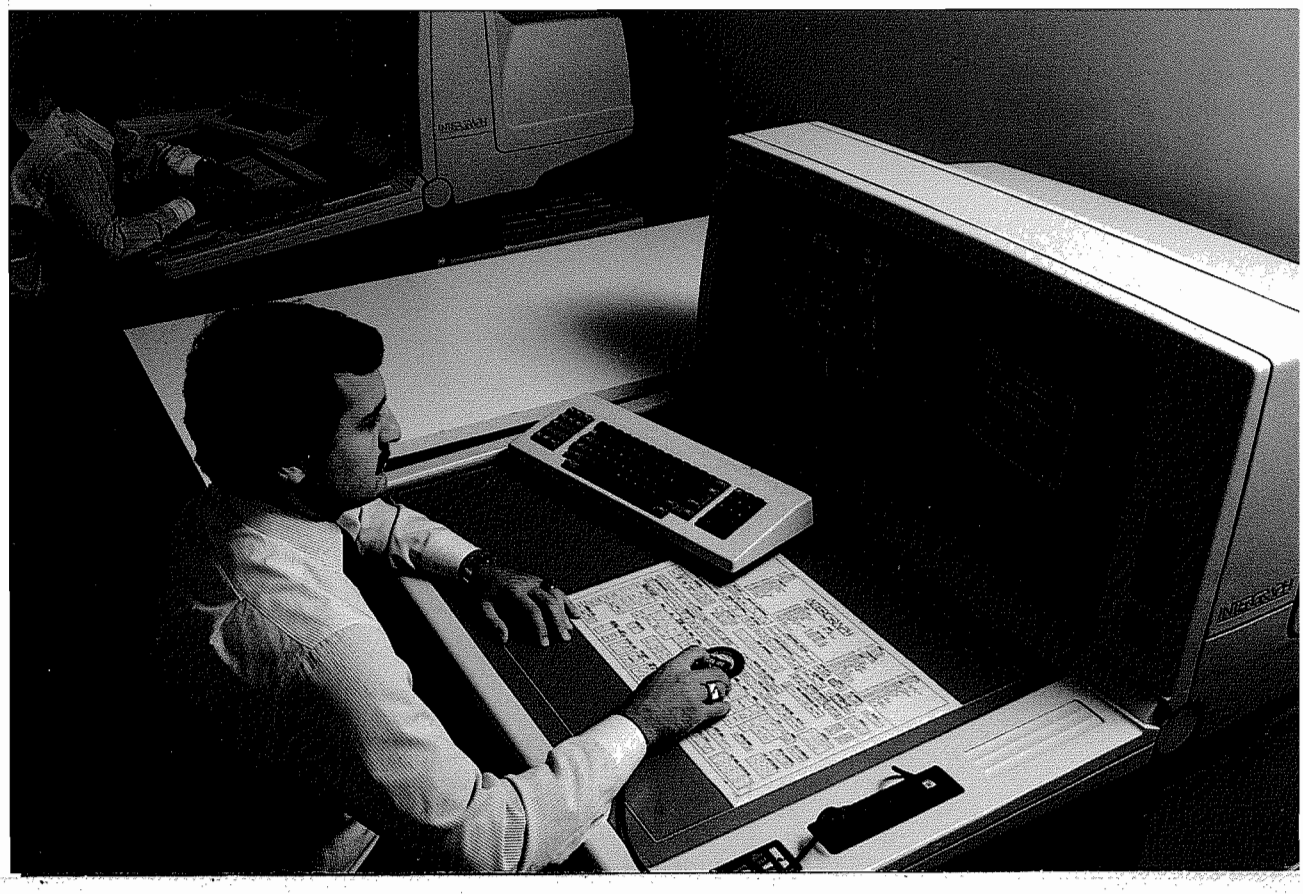
- L/JA has grown consistently since the company was founded in 1972. We have also diversified, by applying our expertise and standards to new markets. L/JA's success has been due primarily to the success of our clients and their projects—which have been challenging. Through our experience we have learned to communicate and work effectively as a team, both within our company and with a client's staff.

- The result is engineering with perspective.

- Because our people have always been treated as an asset at L/JA, we offer an enthusiastic staff, whose responsiveness pays off in project momentum and a genuine team spirit. Our clients enjoy the confidence that the L/JA professionals who are here today will be here tomorrow, with the benefit of more experience and more engineering value.

■ Service is the cornerstone of the L/JA corporate philosophy. Our services are designed to improve the engineering process as well as the product; they progress from feasibility through construction. Scheduling deadlines and budgets are responsibilities we take seriously. And over the years, we have continuously demonstrated our ability to manage a project to completion.

■ At Lichliter/Jameson & Associates we value both our clients and their projects —as evidenced by the many long-standing client relationships we have built over the years. Our top priorities remain: to respond quickly and effectively, to make the process smooth and simple, and to find the correct engineering solution for a project, from every perspective.



Services

■ Public Works

Hydrologic Studies
Stormwater Control
Flood Protection Facilities
Water Supply & Treatment
Water Distribution Systems
Wastewater Treatment Facilities
Wastewater Collection Systems

■ Surveying

Cadastral Surveys
- Boundary & Public Lands
- Subdivision Surveys & Plats
- Title Surveys

Design Surveys & Construction Stakeout
Topographic & Plainimetric Surveys
Hydrographic Surveys

■ Transportation

Transportation Planning
Highways, Expressways & Tollroads
Highway & Railroad Bridges
Rail Transit & Railroads
Traffic Engineering

■ Land Development

Feasibility Analysis
Environmental Assessment
Land Use Planning/Zoning
Roadway, Drainage & Utility Engineering
Special Financing Districts
Construction Administration

Houston

Eleven-One-Eleven Brooklet Drive
Suite 100
Houston, Texas 77099-3596
713/561-5190

Dallas

1420 Mockingbird Lane
Suite 300
Dallas, Texas 75247-4906
214/630-8867

Austin

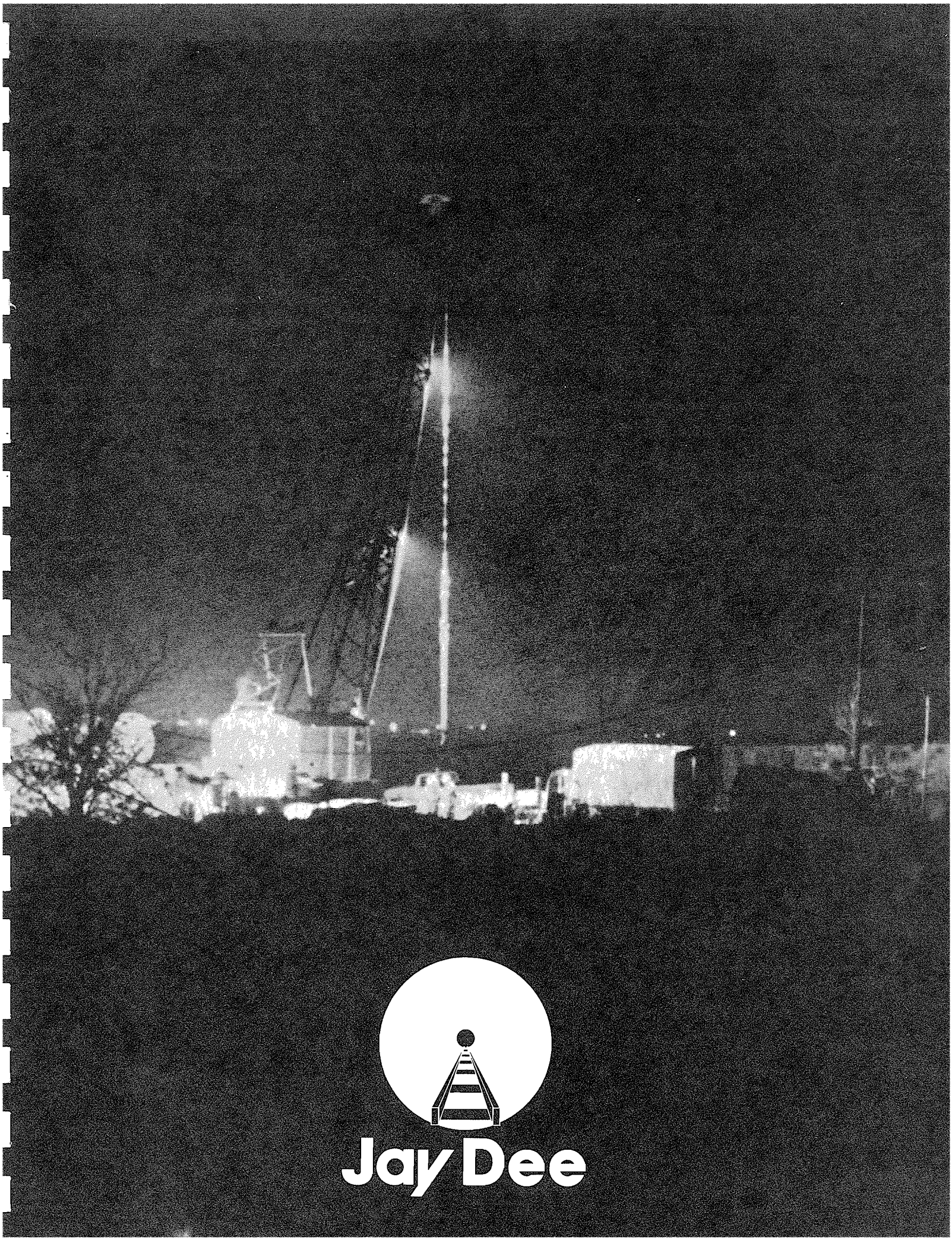
7745 Chevy Chase Drive
Suite 166
Austin, Texas 78752-1508
512/452-2562

Phoenix

Hendrich, Lichliter, Jameson & Associates, Inc.
426 North 44th Street
Suite 134
Phoenix, Arizona 85008
602/231-0931


DENTGRASS DRIVE (60' R.O.W.)

The L/JA Management Team


Jay Dee

Jay Dee was founded in 1966, by John Di Ponio, in Detroit, Michigan. Through the years, we have grown to several corporations, expanding in both area of interest and geography.

Jay Dee represents a diverse combination of people, equipment and experience. We are forerunners in the jacking of reinforced concrete pipe for long distances. Jay Dee designs, builds and serves as consultants on tunnels, pump stations, underground structures and other related projects.

Jay Dee operates, leases and sells from a large fleet of tunnel boring machines, tunnel back-up equipment, earth drills, rock drills and heavy construction equipment. Contact us about your particular needs.

Front cover — Night shift mining in Orland Park, Illinois on a tunnel project for the Metropolitan Sanitary District of Greater Chicago.

Left — Shaft excavation for M.S.D.G.C., Connecting Structure 6A, T.A.R.P. Program.

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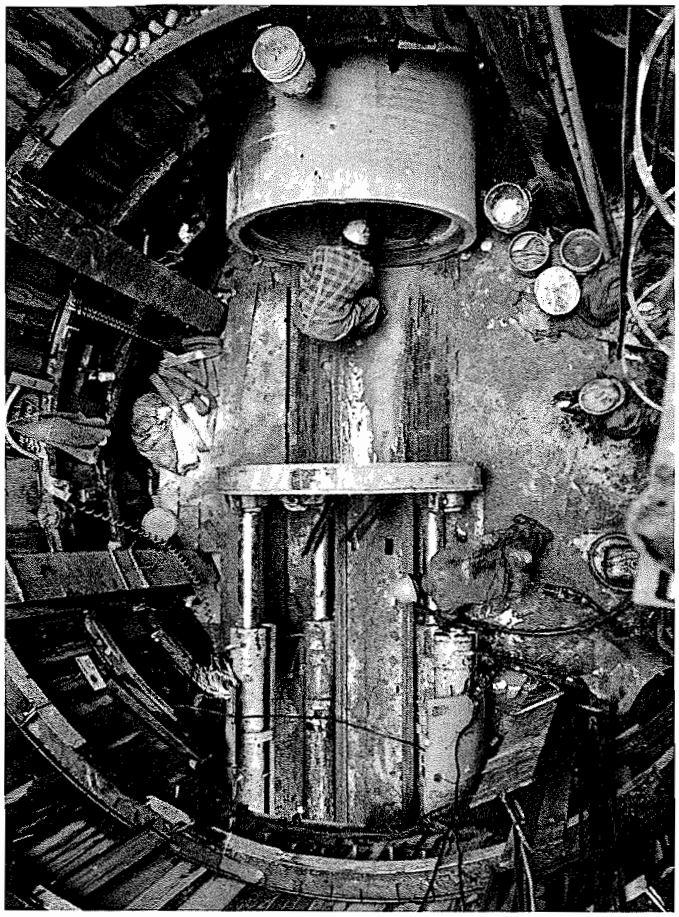
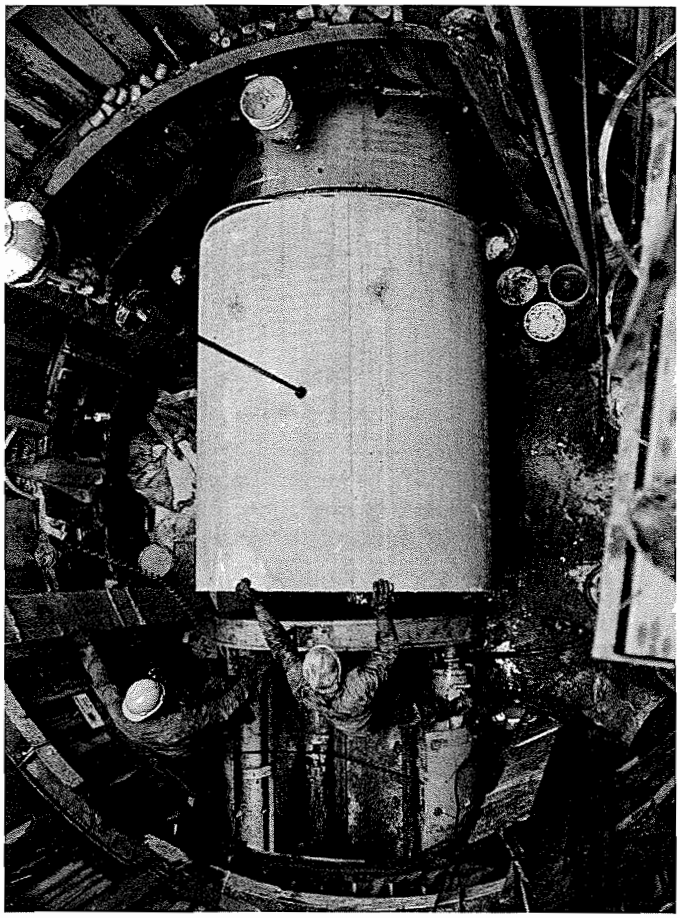
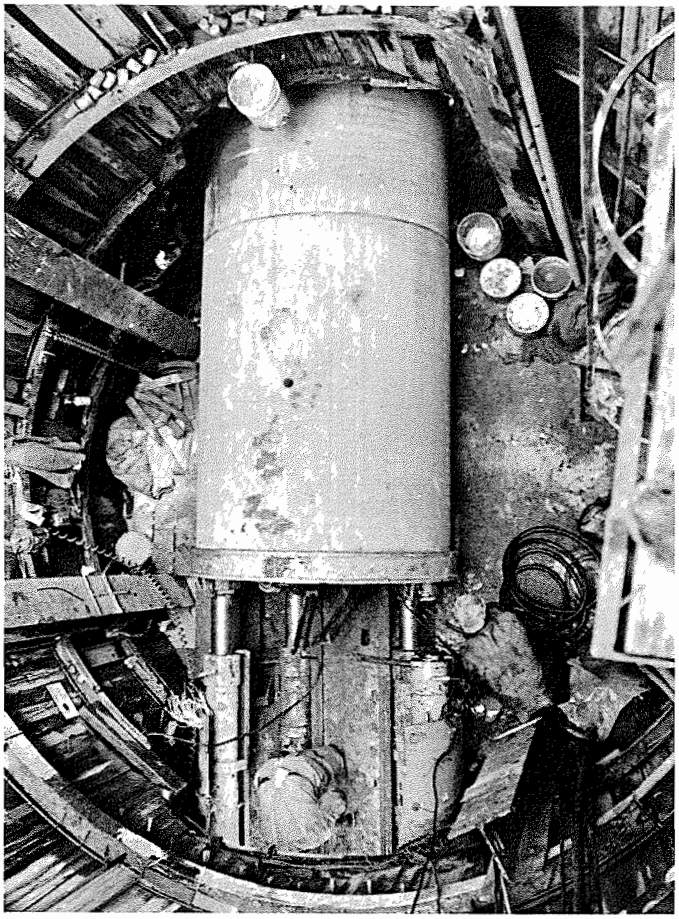
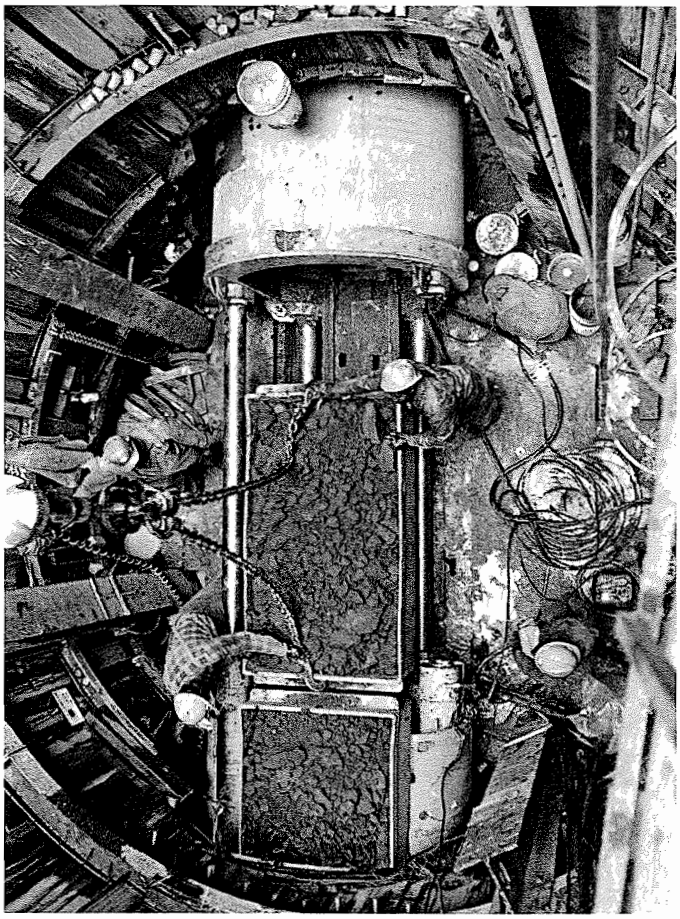








Jacking Pipe

Jacking pipe for underground conduits is not a new method. Tunnelers have used this method since the turn of the century. But, jacking pipe for long distances, for long tunnel projects, is a modern technique.

Jay Dee has been using the jack pipe method since it's founding. Much of the equipment and procedures used today were pioneered by Jay Dee employees. The combination of modern mining machinery, laser alignment, bentonite lubrication and high pressure jacking equipment, has given us the ability to jack runs of reinforced concrete pipe 1600 feet long.

Reinforced concrete pipe from 42 inches to 102 inches I. D. has economically been mechanically mined and jacked. As the price of steel, lumber and concrete increase, the range of diameters where jacking pipe would be competitive will increase.

Many governmental agencies, consultants, engineering firms and industrial firms are recognizing the potential and economics of sewers and underground conduits built by jack pipe methods. Pipe jacking is accepted and specified by:

Metropolitan Sanitary District of Greater Chicago
City of Chicago, Illinois
State of Illinois
State of Michigan
City of Detroit, Michigan
Oakland County, Michigan

Top left — Hydraulic jacks are retracted. The locomotive with muck cars has been driven under the conveyor.

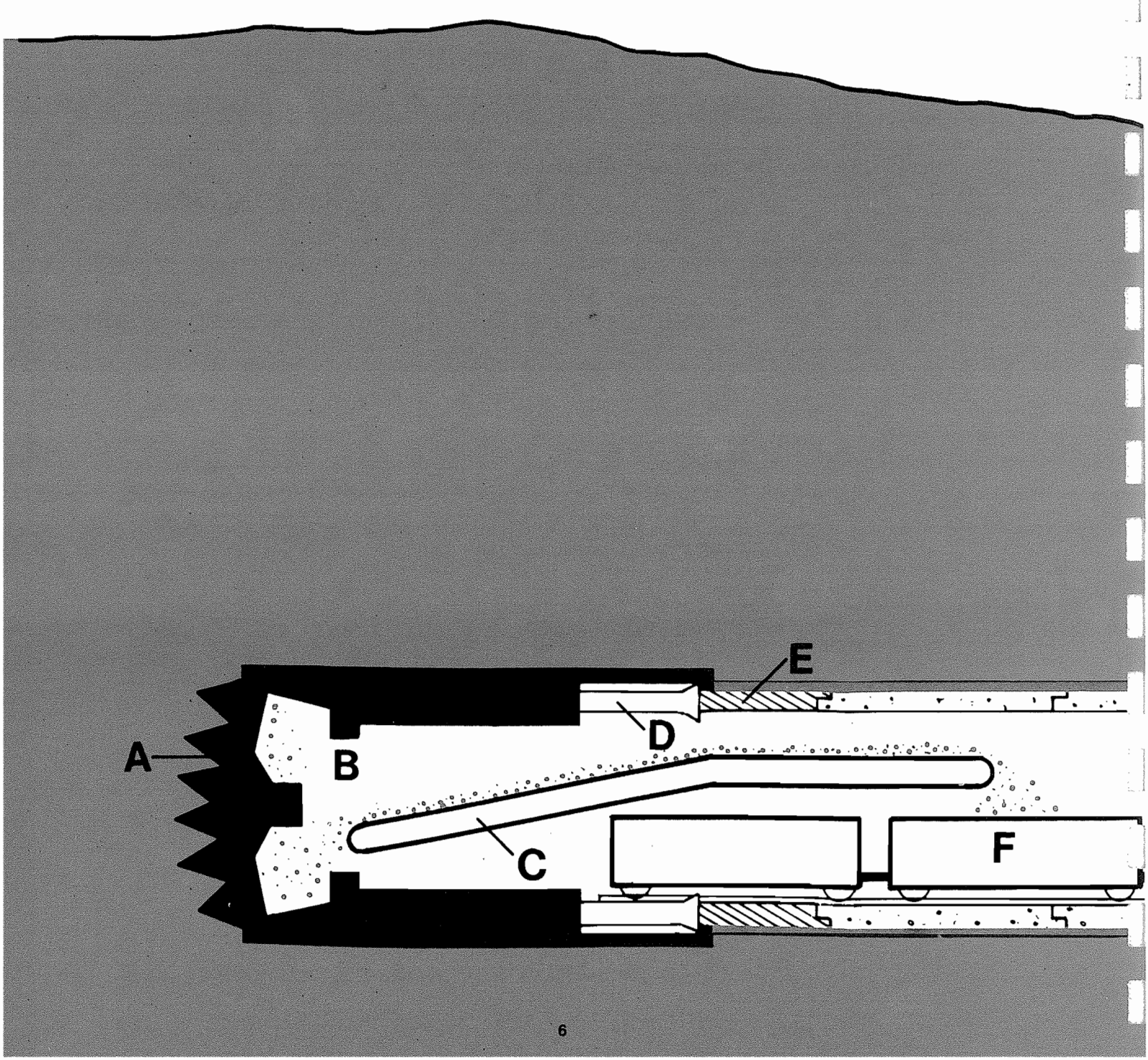
Top right — Reinforced concrete pipe is lowered onto the launch pad.

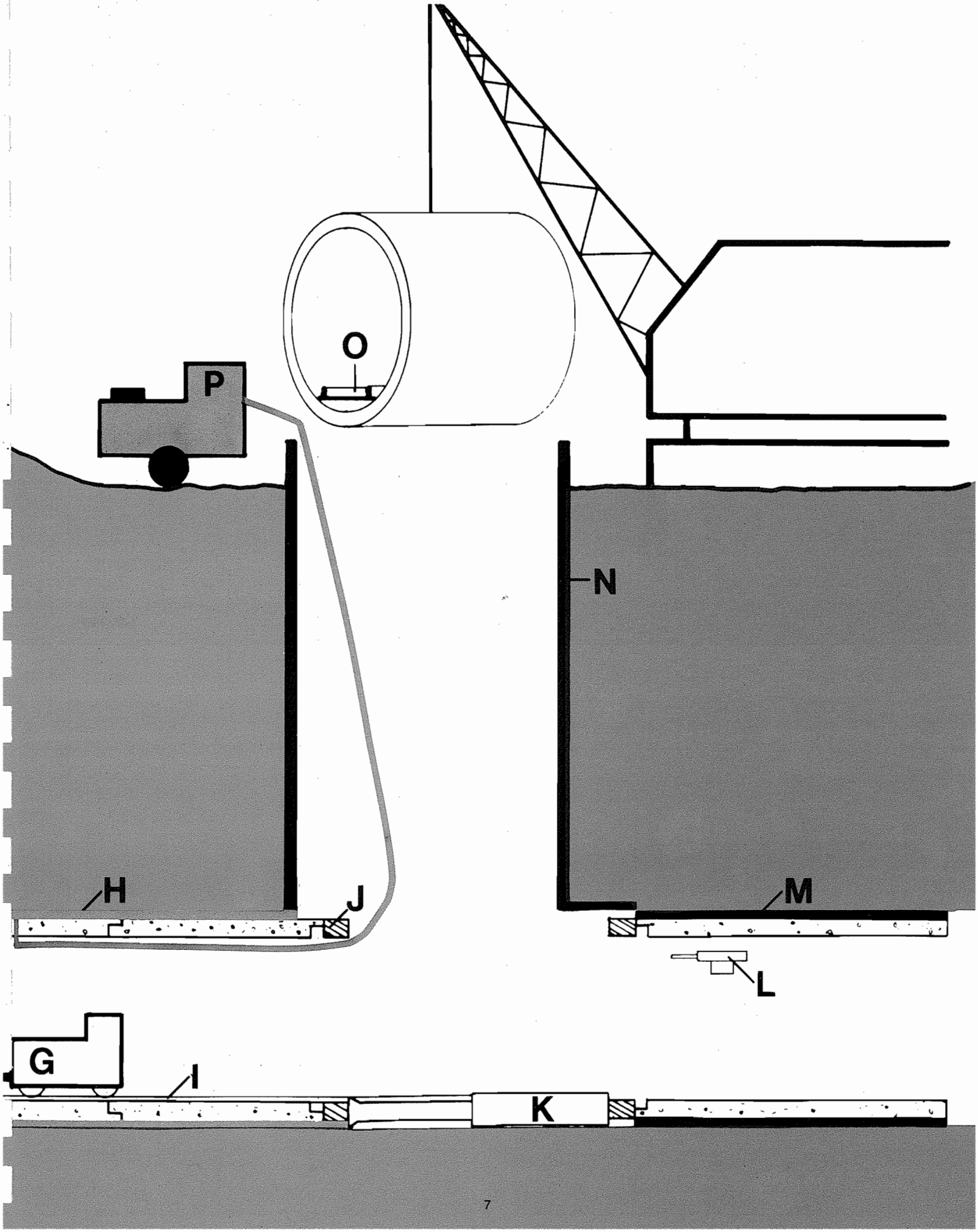
Bottom left — Jacks are extended, pushing the reinforced concrete pipe as the mining machine tunnels forward.

Bottom right — Jacks are fully extended. Muck is brought into shaft by locomotive and lifted out of shaft.

Jacked Tunnel Construction Technique

A. Shielded mining machine
B. Target pit
C. Belt conveyor
D. Push jacks
E. Steel jacking can
F. Muck cars
G. Battery operated dinky
H. Bentonite slurry lubricant (applied from inside of pipe)
I. Track
J. Steel jacking ring
K. 2 to 6 hydraulic jacks (arranged at or below spring line)
L. Laser beam (back in tunnel to avoid vibration)
M. Grout
N. Shaft
O. Track section
P. Bentonite pump and mixer

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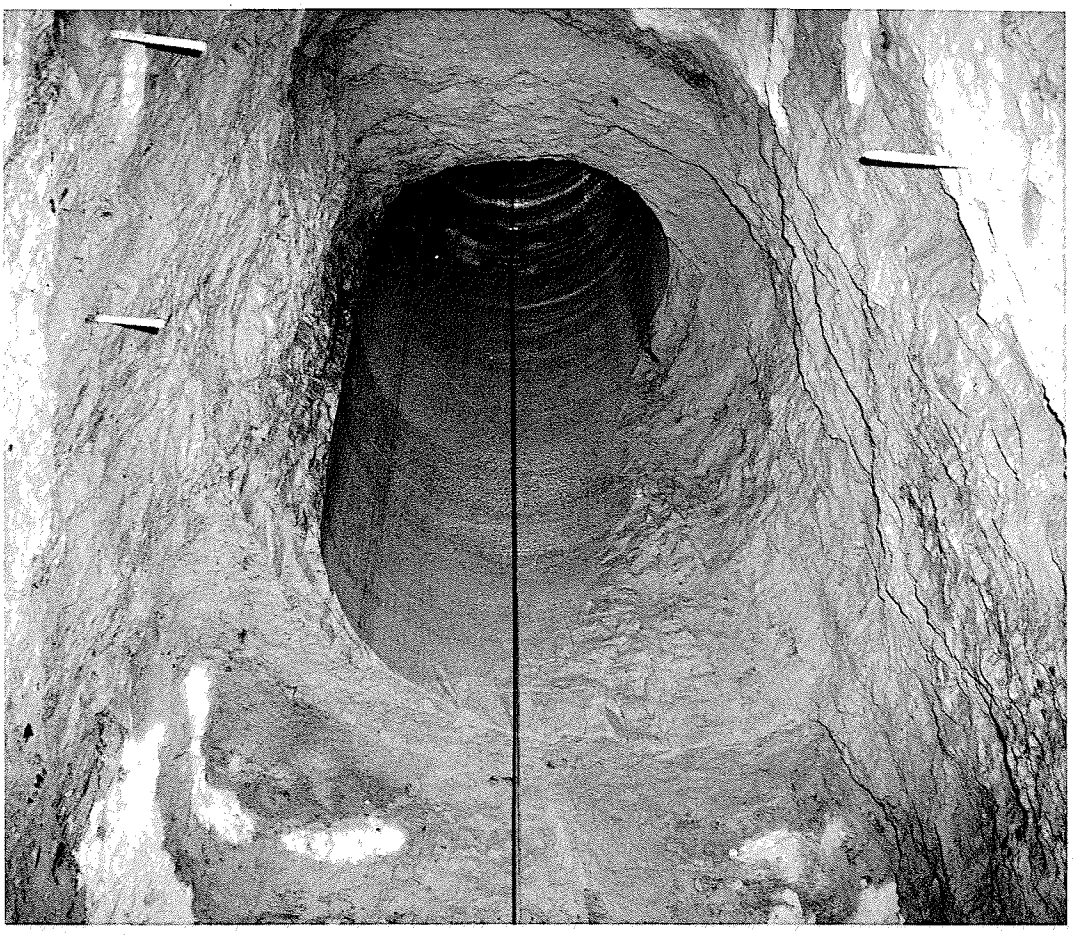
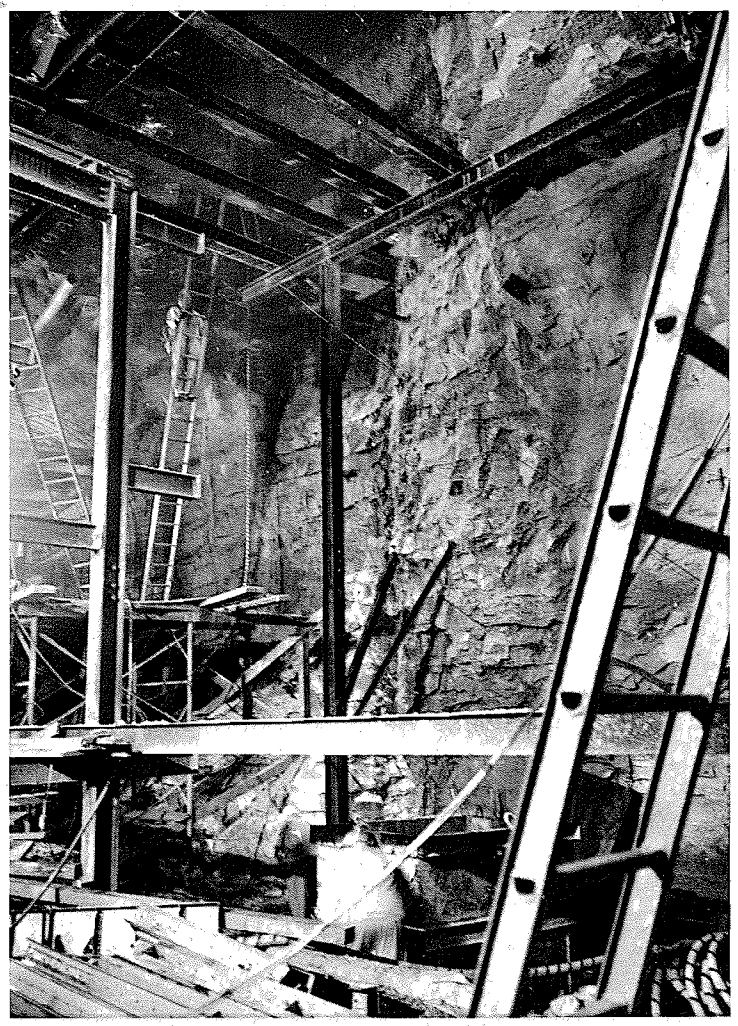
Right — Raise bore and boot development, 220′ deep — McCook, Illinois.

Bottom left — Boot development in limestone, 250′ deep — Alsip, Illinois.

Bottom right — Underground pump room with temporary scaffold for concrete placement and rock bolting, 250′ deep — Alsip, Illinois.

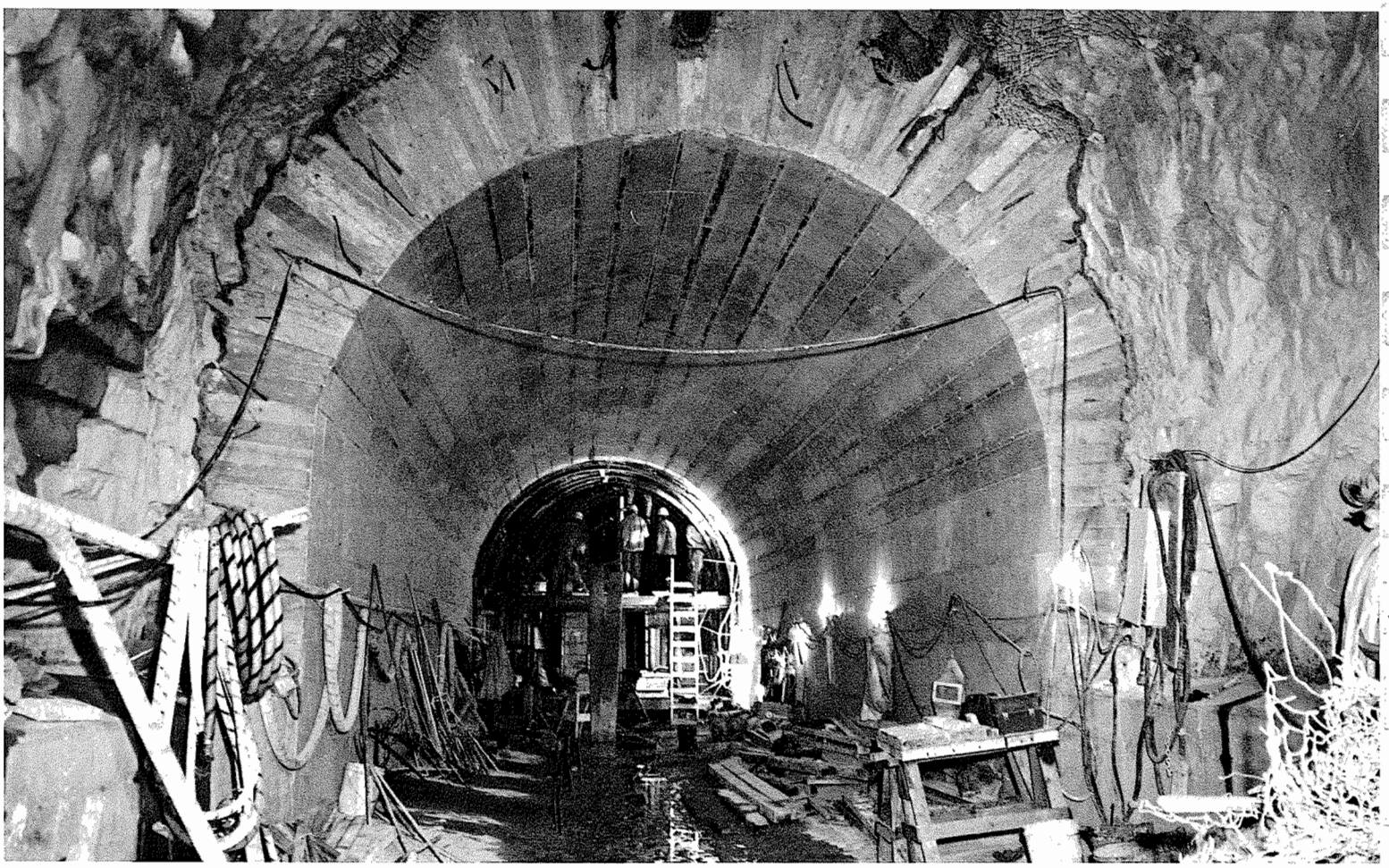
Next page — Horseshoe rock tunnel with concrete curb and invert — Alsip, Illinois.

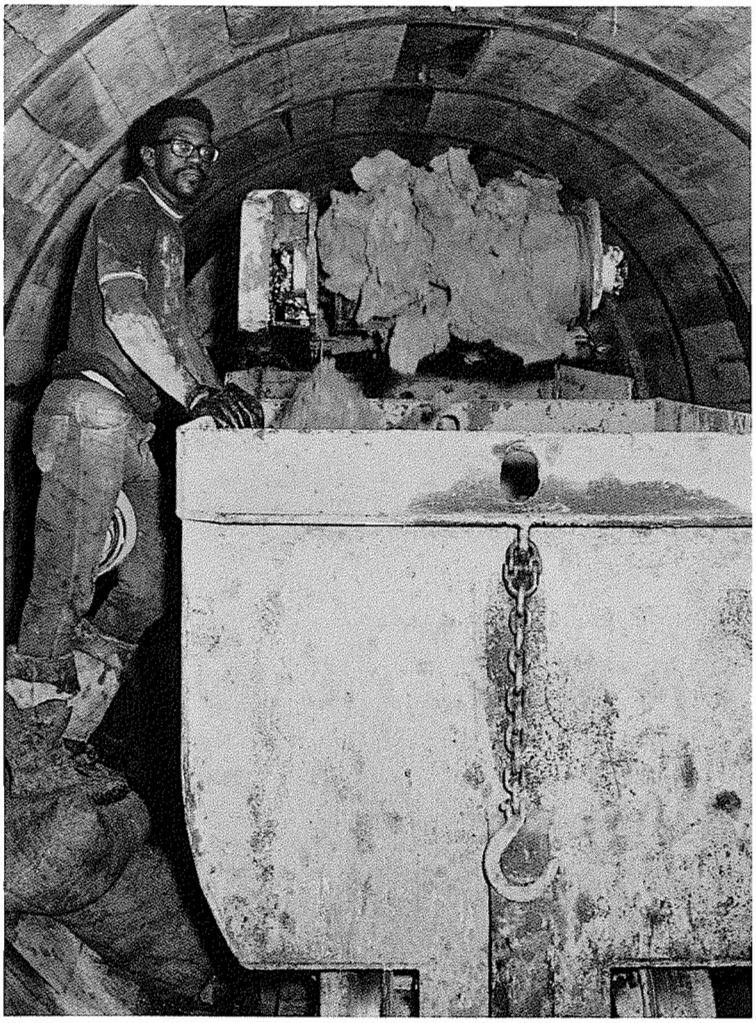




Mining in Rock

Jay Dee has worked to depths exceeding 250 feet in both mining and concrete operations. Using both hand mining (drill and blast) and machine boring methods, we have constructed many complicated excavations in rock. Projects completed involved rock bolting, cement grouting and chemical grouting. Some projects have used raise bore techniques. As designer, consultant or contractor, Jay Dee will work in all areas of underground construction.





Soft Ground Tunnels and Open Cut

Top left — Horseshoe monolithic concrete sewer in rock — Alsip, Illinois.

Bottom far left — Muck conveyor and muck car in 102'' rib and lagging tunnel — Lansing, Illinois.

Bottom left — 91'' rib and lagging tunnel — Prospect Heights, Illinois.

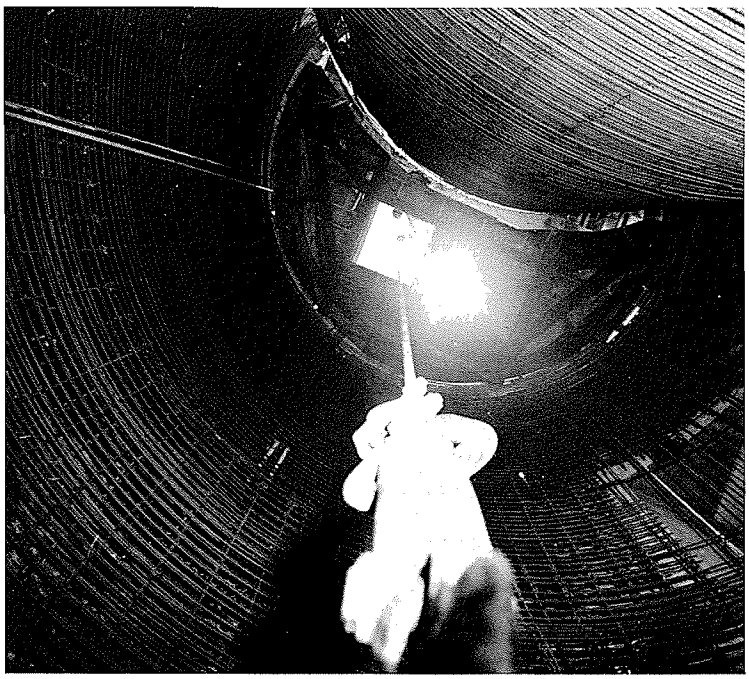
Below — 120'' R.C.P. sewer in open cut — Redford Township, Michigan.

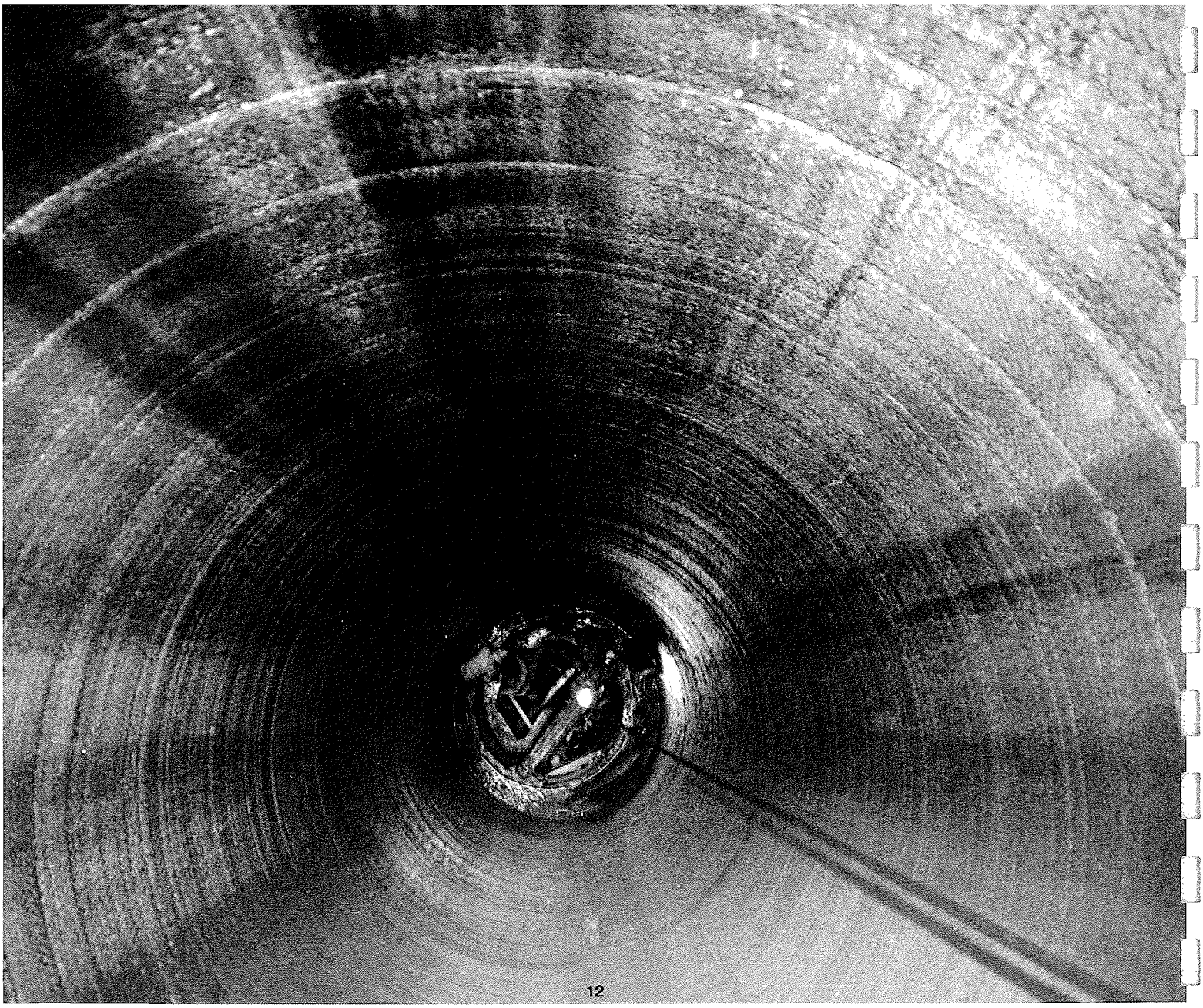
Jay Dee has built tunnels through clay, sand and gravel, hard pan, and silts using both hand and machine mining methods. We have lined these tunnels in a variety of ways, including:

Rib and Lagging
Liner Plates
Pushing Steel Cans and Jack Pipe

To complete these tunnels, we have placed monolithic concrete or reinforced concrete pipe inside the primary lining.

Jay Dee has also constructed many projects by open cut methods, involving open trench, steel sheeting, sand-box, and other procedures.





Shafts and Connecting Structures

Jay Dee has designed and constructed many types of shafts. These shafts are used for building structures, work shafts for tunnel projects, drop manholes, and deep wells for pump stations.

Shafts are built in soft ground with steel beams, wood sheeting, liner plates, and concrete. Shafts in rock involve grouting, rock bolting, rock dowelling and wire mesh.

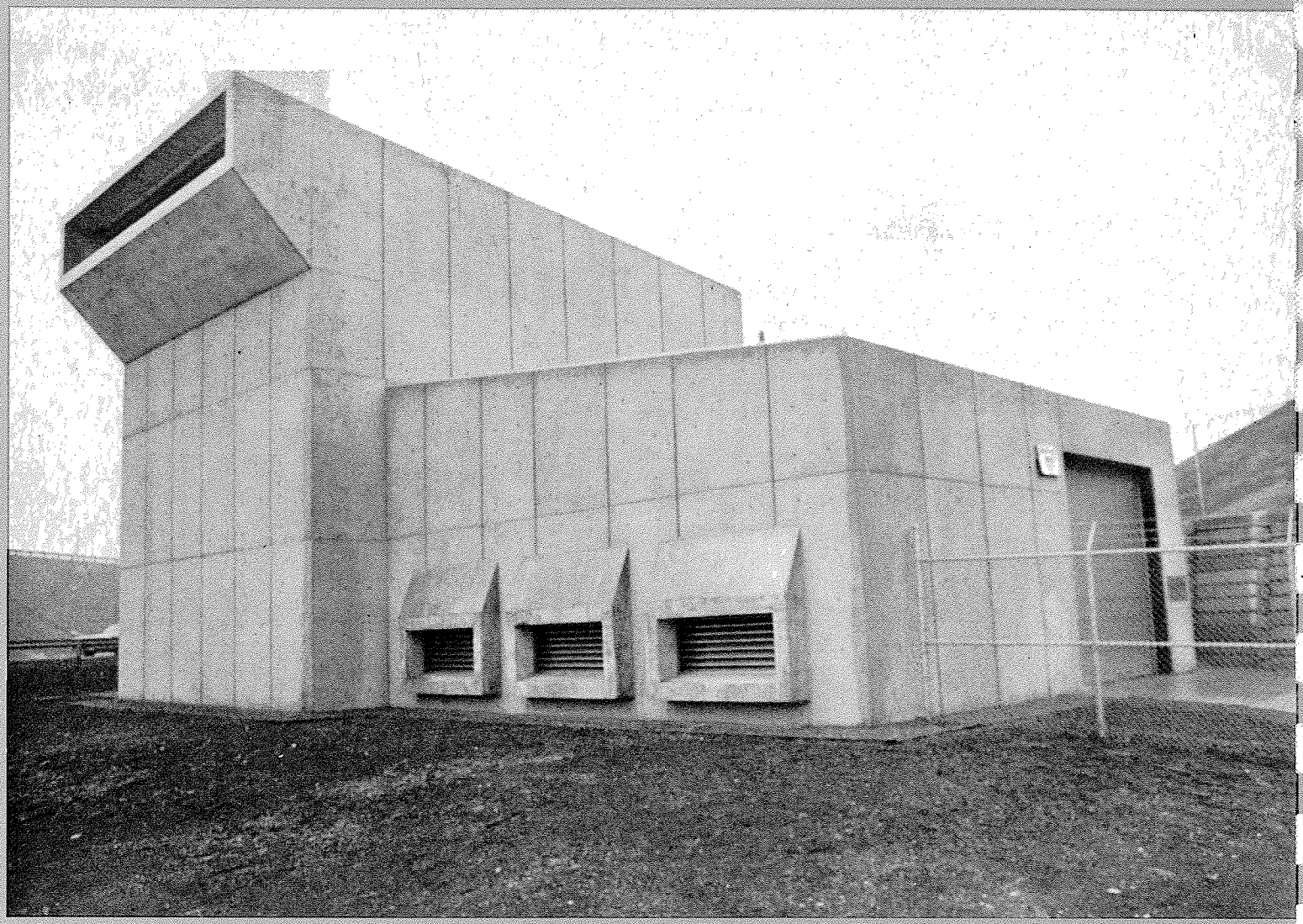
Each material has its own advantages. Soil conditions and space requirements govern the most economical design. Jay Dee has complete facilities to help with your shaft or structure requirements.

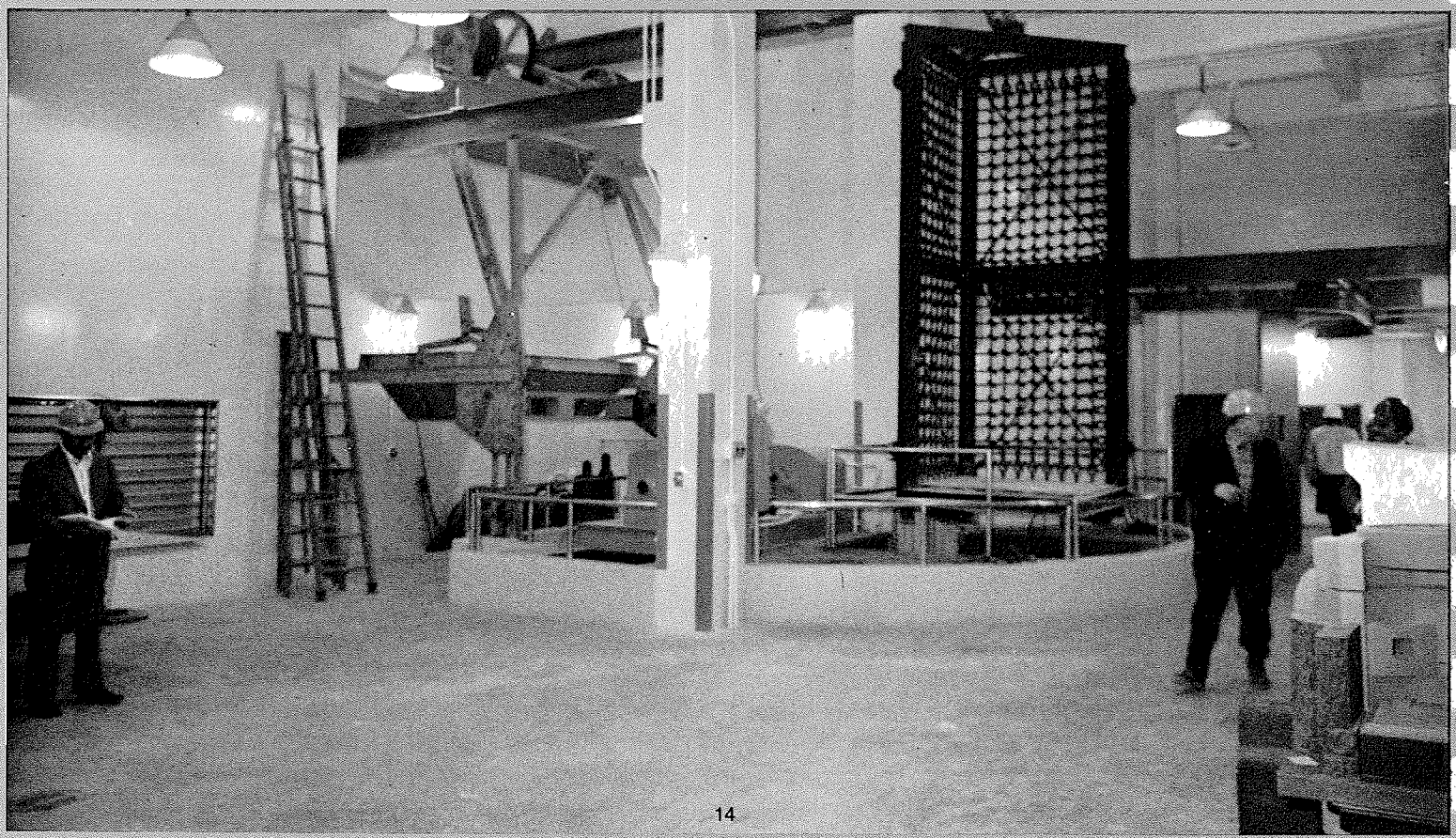
Top far left — Looking up at pre-hung re-steel and work platform on a portion of a shaft to be slipformed.

Top left — Shaft for a connecting structure to a deep drop manhole.

Bottom left — Drilled drop shaft (in rock) showing concrete base in place.

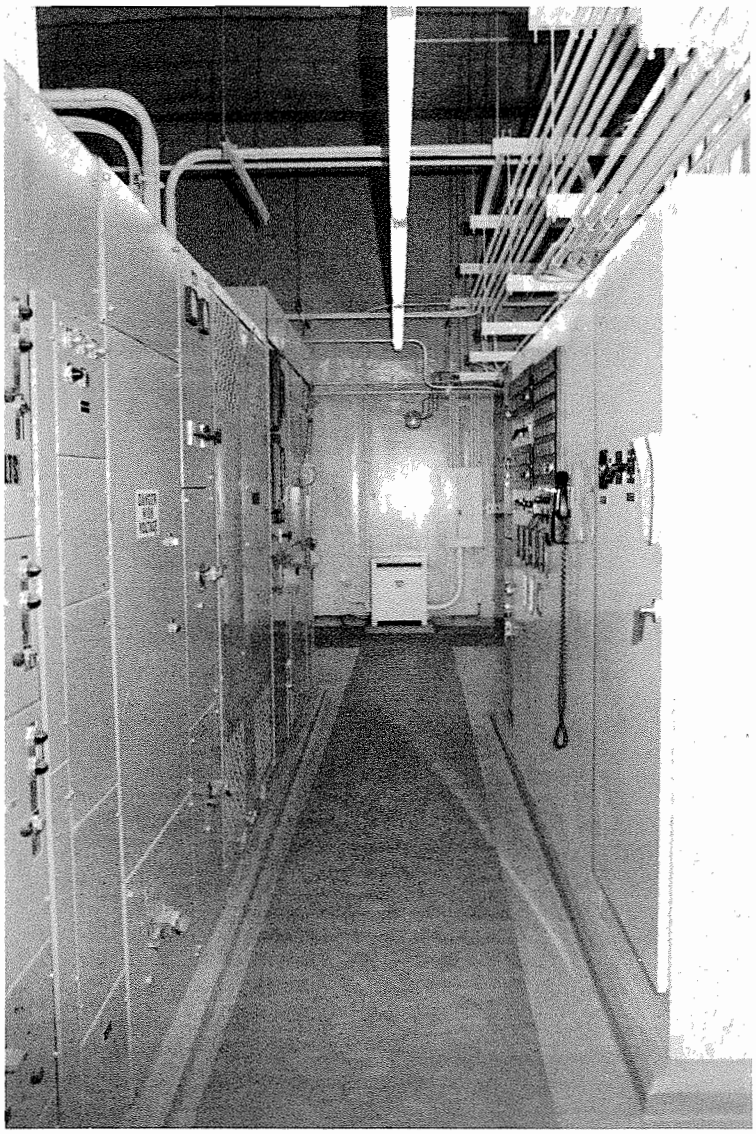
Above — 60′ diameter shaft for pump station, 105′ deep — Detroit, Michigan.

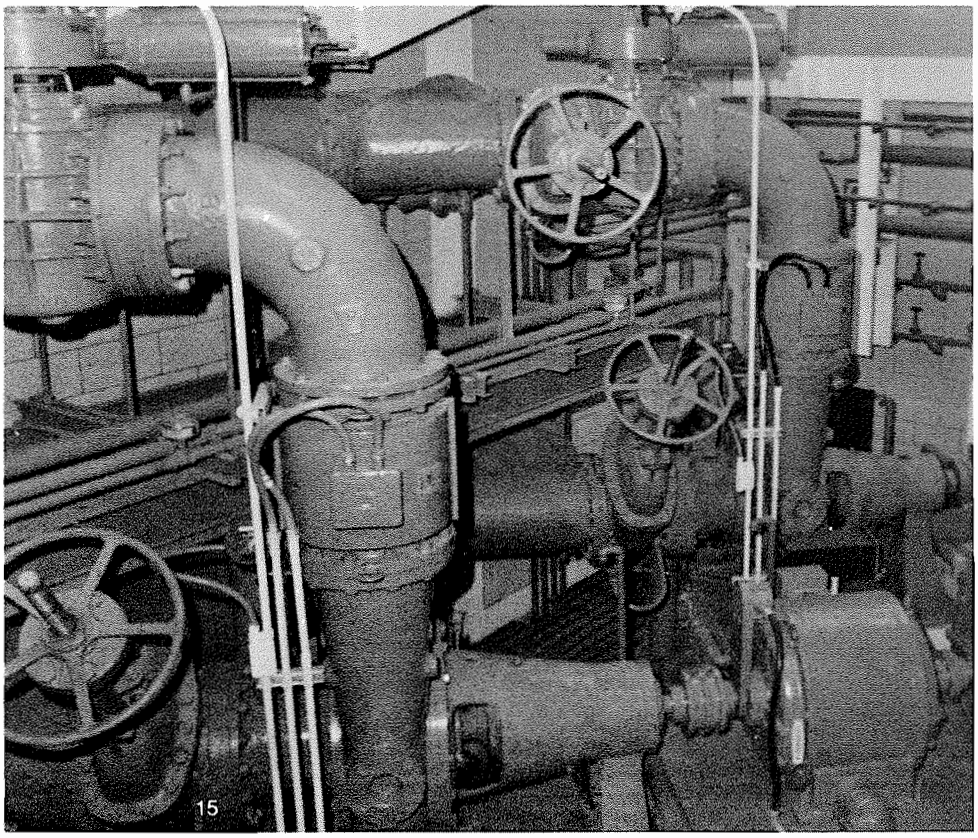




Pump Stations

Jay Dee has constructed a variety of pump stations, including submersible pumps and drywell types. Recently, we built several for the Metropolitan Sanitary District of Greater Chicago, that won national awards. The largest was a 20,000 G. P. M. drywell type that pumps sewage against 250 feet of head. Pre-hung reinforcing steel and slip form concrete placement were used in the construction.





Top left — Superstructure of a pump station for the Metropolitan Sanitary District of Greater Chicago.

Bottom left — Debris basket and bar-screen rake inside pump station.

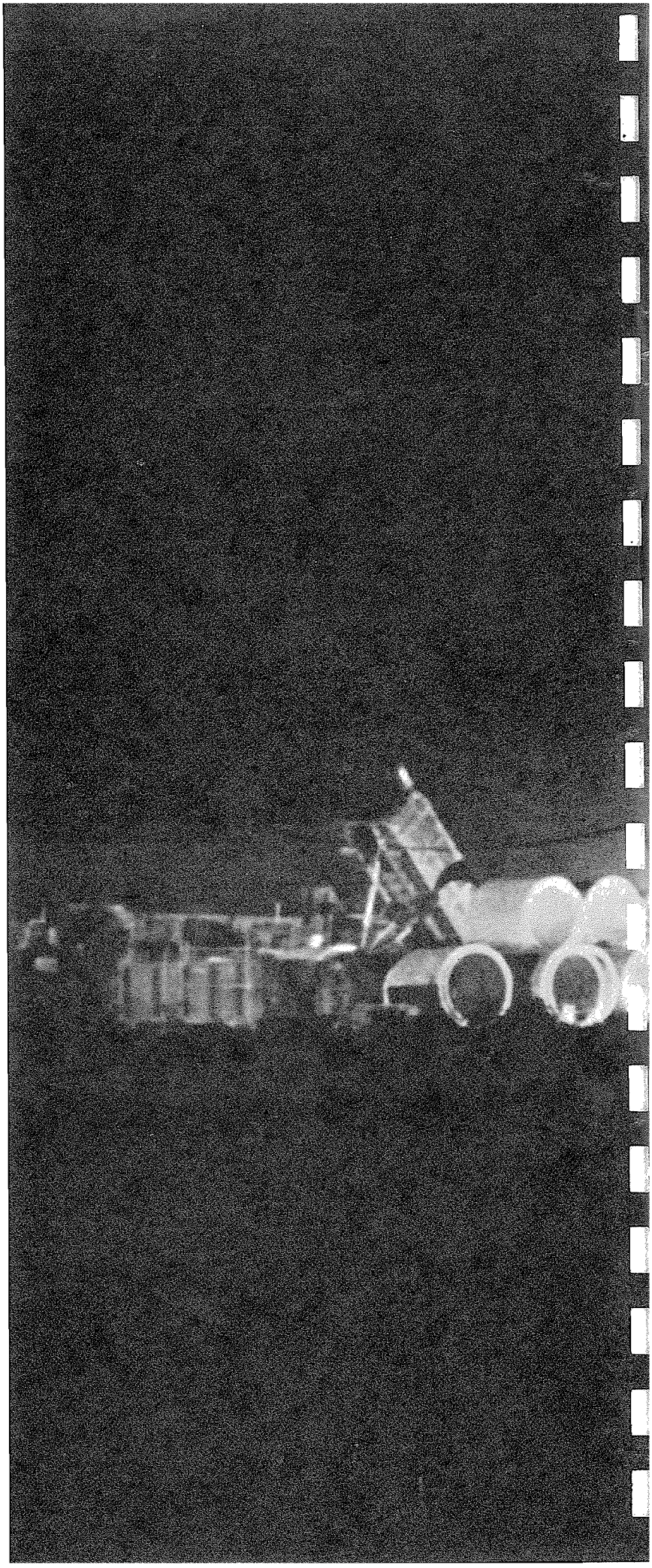
Top right — Starters and telemeter equipment controlling pump station.

Bottom right — Two 5000 GPM pumps in pump room, 250′ deep.

Jay Dee moves men and machinery worldwide; building, consulting, or supplying equipment on all types of projects. For information on how we can serve you, please contact:

JAY DEE CONTRACTORS, INC.
38881 SCHOOLCRAFT ROAD
LIVONIA, MICHIGAN 48150
(313) 591-3400

THOMAS S. DIPONIO
PRESIDENT



SwL SOUTHWESTERN LABORATORIES

Geotechnical engineering
Materials engineering
Nondestructive examination
Metallurgical engineering
Environmental engineering
Analytical services

Integrity.

Since 1912, Southwestern Laboratories (SWL), has helped ensure the structural integrity of countless buildings, highways, refineries, oil rigs, power poles, dams, bridges, and airports—by testing materials and inspecting construction performance. We have helped industry protect the environment by measuring for harmful substances in the air, water, and earth. We have helped owners and developers determine their land potential and develop efficient solutions for their project foundation design. Through our services we have made a host of large and small products safer, stronger and more economical. In effect, we have helped clients achieve better results.

Our client list has grown, mainly by referral and repeat business, to the point that we are now ranked as one of the top five laboratories in the nation. We are also one of the few recognized by the American Association of Laboratory Accreditation— a fact that reflects our sincere commitment to evaluate and improve our services, as well as maintain our high level of quality. It is significant that the strictest standards we follow are part of our own quality assurance program which we developed to enhance and preserve our credibility. *And our integrity.*

Our size and versatility are a reflection of our dependable performance in examination and test assignments. Today, with approximately 500 people in 16 offices throughout the Southwest, we provide expertise in geotechnical, construction materials, environmental, and metallurgical engineering. We offer specialists in the field of nondestructive examination, mechanical testing and analytical services. To provide these services we use an impressive list of sophisticated testing and examination equipment—but what we actually provide is assurance as we seek to understand the inherent factors before arriving at solutions.

Clients who have dealt with Southwestern Laboratories in the past often don't realize our diversity, because we offer the personalized service of a much smaller firm. Our policies are apparent in the responsive attitude of our staff. Ours is an environment where information and techniques flow between professionals in all of our offices.

This effective blend of talent enables us to offer an impressive range of services designed to satisfy our clients and their needs.

That's what we mean by integrity.

GEOTECHNICAL ENGINEERING

The complex material beneath the ground's surface must be evaluated before a man-made project can be built. To be successful a project must attain proper interaction of soils and foundation systems.

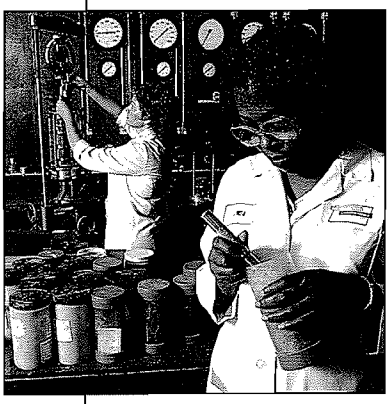
SWL's geotechnical engineering services range from initial site evaluation to development of complete site-specific engineering criteria. Our geotechnical work involves recommendations for the selection, design, and construction of effective foundation systems.

We perform more than 3,000 subsurface investigations each year for structural foundations, embankments, and earth retaining structures. For exploration and sampling, we have a fleet of more than 30 drilling rigs capable of shallow boring as well as deep rock penetration. We also have all-terrain vehicles to access difficult sites.

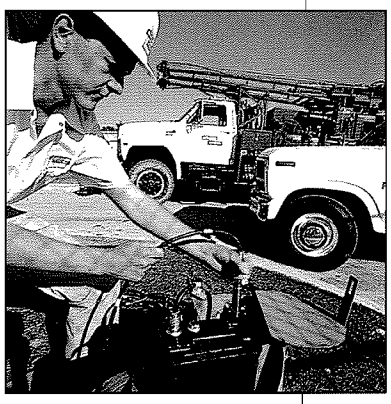
Our geotechnical engineers analyze and interpret the results of test programs designed to measure the engineering properties of subsurface soils. Our reports recommend foundation types, predict performance, suggest construction sequences, and identify potential construction problems. Once underway, we observe soils-related construction to verify subsurface conditions, and to help ensure that anomalies are quickly discovered and resolved.

As part of our consulting services, we perform geotechnical reconnaissance for feasibility studies on tracts of land. Our field sampling and mapping processes are used to locate potentially valuable subsurface deposits. We also investigate the cause of foundation-related building distress and provide a full range of ground instrumentation to detect potentially harmful movement and vibration.

In all of our work we have joined the design group as professionals with a strong team attitude. The results are always better value, better safety, and better quality in geotechnical engineering for the client.



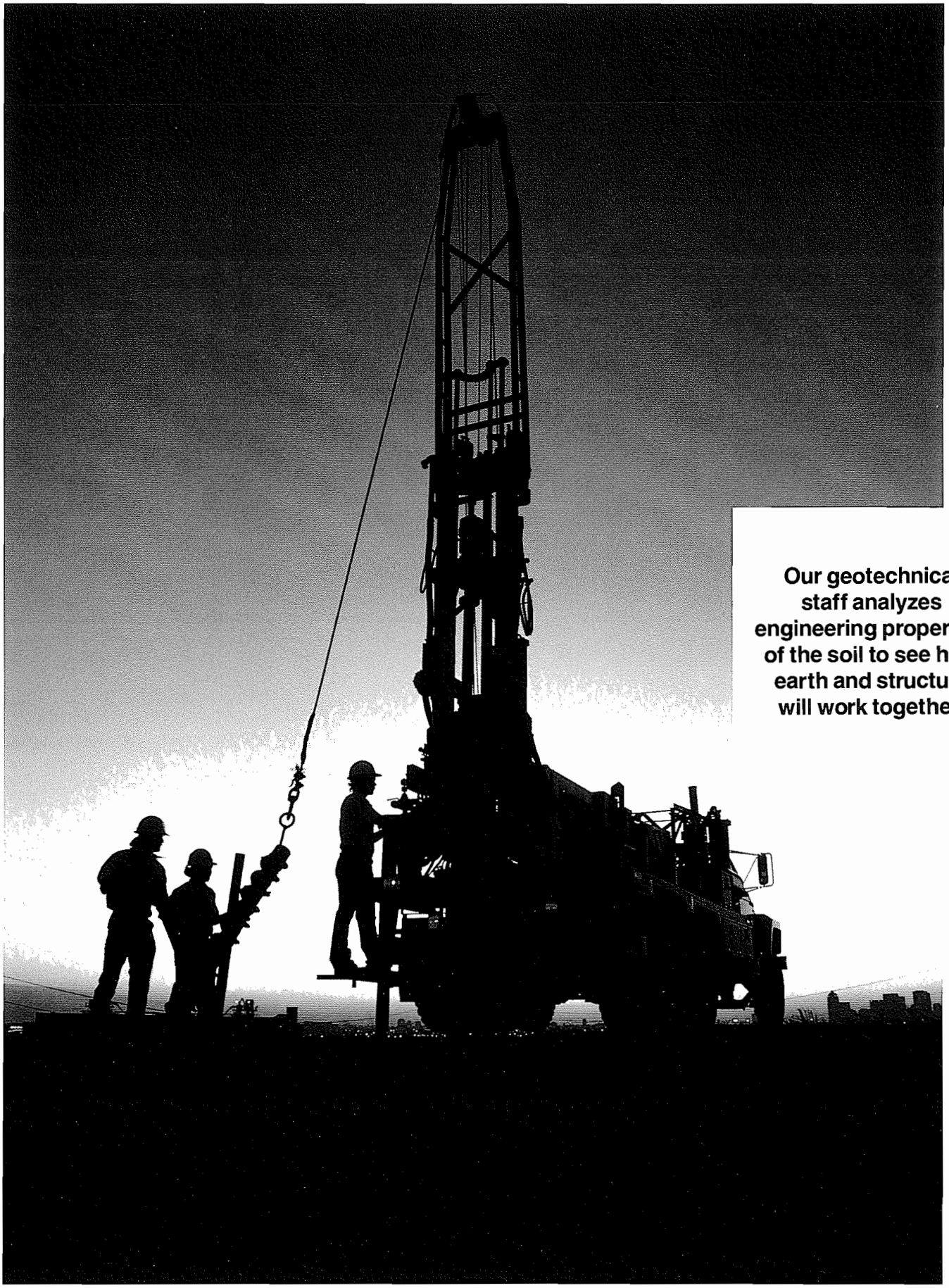
Grain size, triaxial strength, permeability, consolidation, and direct shear are some tests used to determine soil engineering properties.



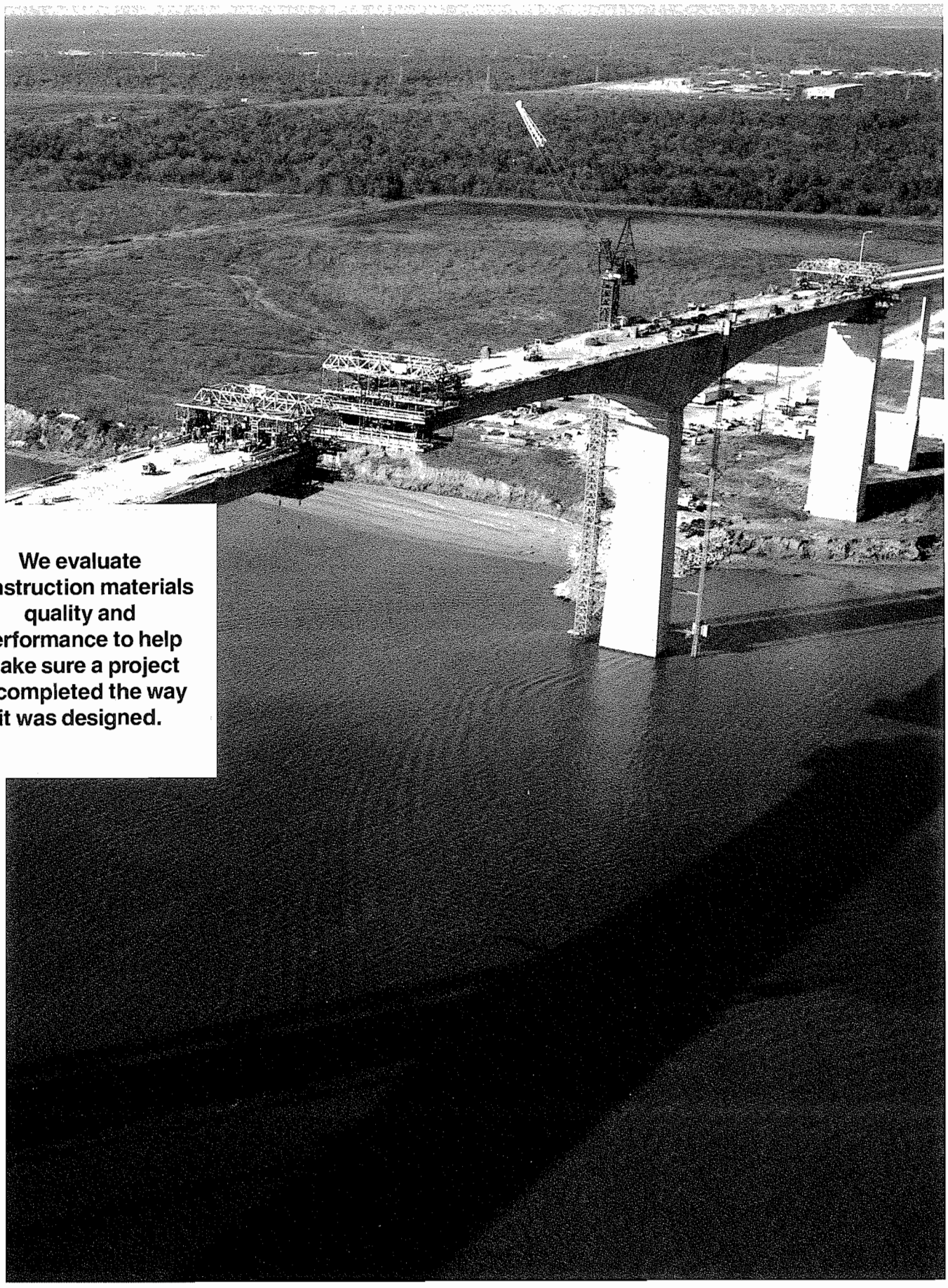
Experience with foundation systems includes monitoring drilled piers, underreamed footings, spread footings, mat foundations, driven piles, and rock anchor installations.

Geotechnical analysis continues past design to inspection of the actual foundation construction, particularly earth-work and footing preparation.

At right, efficient dispatching of equipment from a network of SWL offices means quick results for clients with remote or multiple sites.



Our geotechnical staff analyzes engineering properties of the soil to see how earth and structure will work together.



We evaluate construction materials quality and performance to help make sure a project is completed the way it was designed.

CONSTRUCTION MATERIALS ENGINEERING

Quality is a basic concept. Quality assurance in construction is one of our most valuable and essential services.

The process from planning and design through construction completion is a long and intricate one. Our involvement helps prevent deviations that can affect the quality or compromise the design. It's that simple, and that complicated.

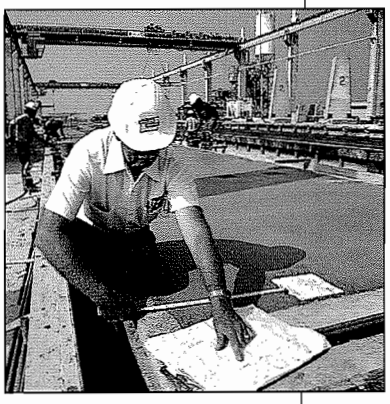
SWL has a staff of materials engineers and engineering technicians, trained to know structural adequacy of construction materials. On a single project, we may be called upon to verify quality of soils and materials used in the construction of foundations, the steel and concrete used in the critical structural framing, and finally the roof composition and curtain wall system.

Concrete. Our staff and facilities are equipped to evaluate the many factors that affect the quality of concrete used in pavements and structures. The projects range from runways to highrises. Our equipment, including instrumentation used in the field and at the concrete plant, enables us to confirm and demonstrate that concrete is produced to specific requirements. We also design and prepare concrete mixes, often using full scale trial batches that contain all specified qualities.

We have helped pioneer the use of concrete additives such as fly ash cement and super plasticizers in some of the first high-strength concrete used in office towers. We develop quality control plans for a project which begin at the concept stage and continue throughout concrete placement.

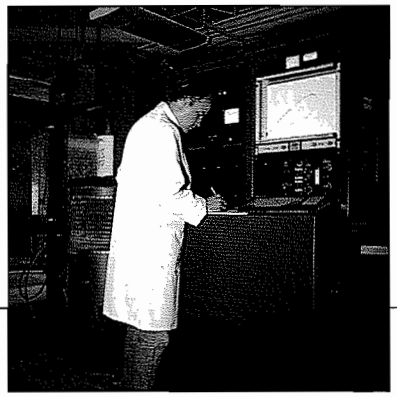
Roofing. SWL has earned an exceptional reputation in the monitoring of roofing systems. We test insulation, bitumen felts, and aggregate for conformance. We recommend preventative maintenance programs and provide site inspections to help make sure a roof is installed the way it was designed.

Slump, air entrainment, unit weight, and cylinder or beam tests are made at reasonable intervals to monitor uniformity and consistency of concrete during placement.



Fabrication inspection of pre-cast, pre-tensioned, and post-tensioned concrete structural members includes checking the stressing sequence and required tensioning forces.

At left, SWL has provided concrete mix designs, long-range creep tests, and quality control on projects with structural concrete strength requirements as high as 10,000 psi.



Concrete test cylinders are tested in a computer controlled testing machine which gives direct data printout of strength criteria.

CONSTRUCTION MATERIALS ENGINEERING

Structural Steel. For more than 50 years, we have worked with design teams to monitor both welded and bolted systems in structural steel fabrication and erection. With structural steel, our responsibility is to inspect the details that add up to completion of a high strength system in compliance with design requirements.

We continue to play a vital role in the changing skylines of cities throughout the Southwest. Our welding inspectors inspected the first highrise structure to have totally welded connections, and more recently, monitored the tallest steel and concrete composite structural frame building in the world.

Windows and Curtain Walls. Our facilities include testing chambers which can hold glass composites up to 600 square feet. Using concentrated and high wind loading, we conduct exposed static testing for air and water infiltration and structural adequacy. We also provide job-site testing to determine the quality of installation.

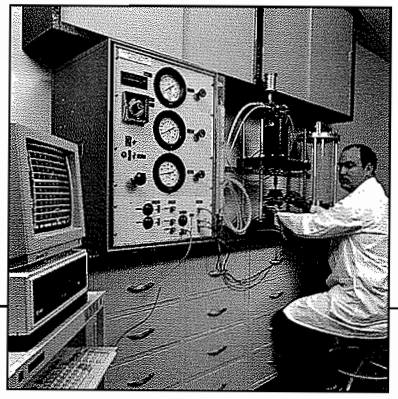
Timber Products. Through a series of tests and visual inspections at the wood preserving plants and in the field, we provide a comprehensive range of timber testing services. We inspect and qualify poles, piles, lumber cross ties, switch ties, and crossarms for utility companies, public power districts, state highway departments, railroads, and local municipalities. We also evaluate wood preservatives and develop procurement specifications.

Bituminous Materials. The successful use of asphaltic pavement is the culmination of detailed specifications, aggregate integrity, careful mix design, and adequate monitoring as it is produced at the plant and placed in the field. SWL provides conventional bituminous materials testing which includes plant and laydown inspection and mix designs.

In addition, we have a full service bituminous laboratory which evaluates binders and mixture properties. SWL has participated in the research and development of asphalt cement modifiers and asphalt binders to enhance asphalt cement performance.

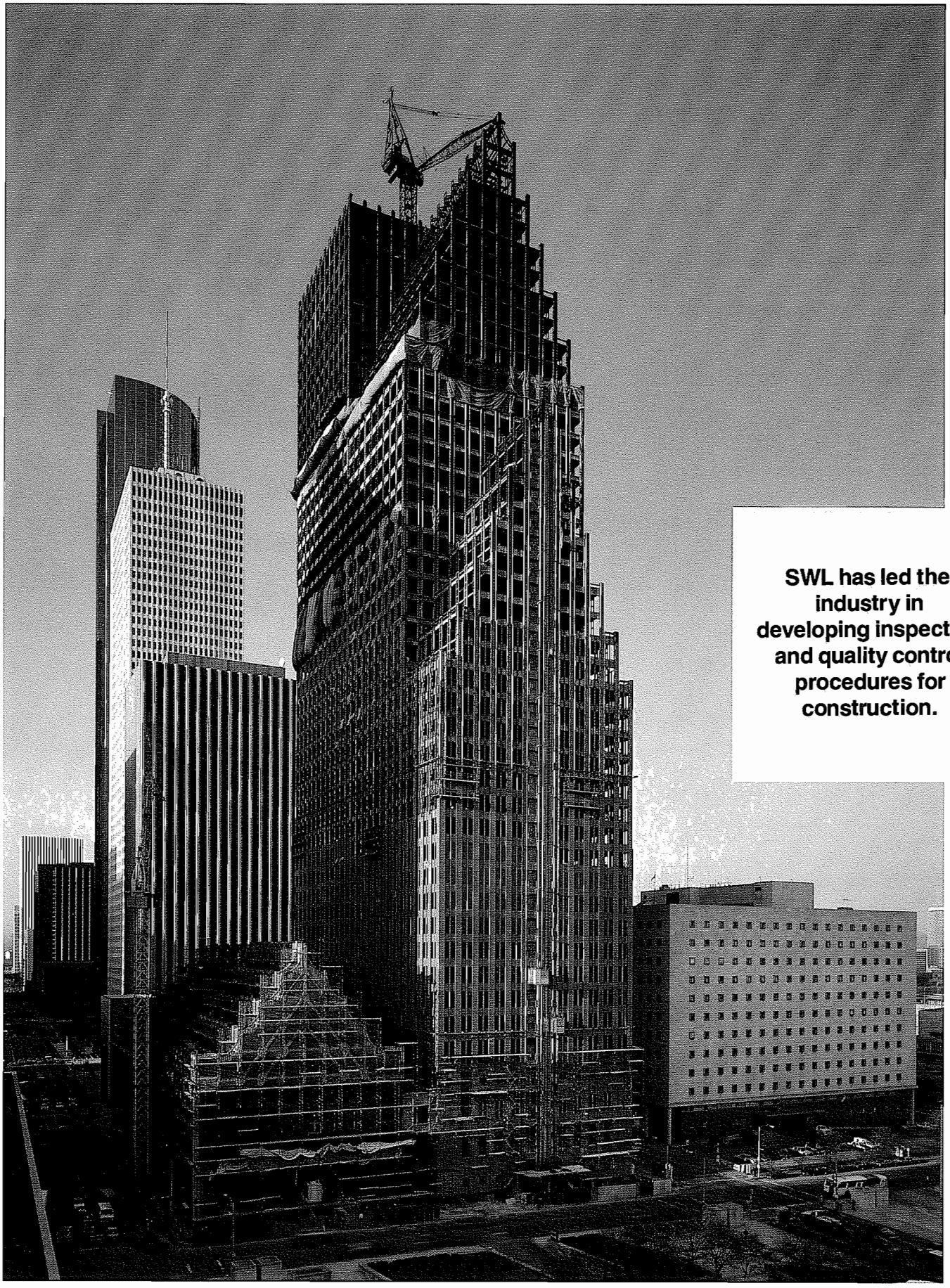
Welding inspection concerns weld metal type, size, joint alignment, bevel, root face and opening, pre-heat and interpass temperatures, sequencing and proper environment, all vital to a sound structural connection.

Inspectors at wood preserving plants in Texas, Ark., La., and Miss. inspect and test timber products for physical characteristics, manufacturing imperfections, and preservative treatment.

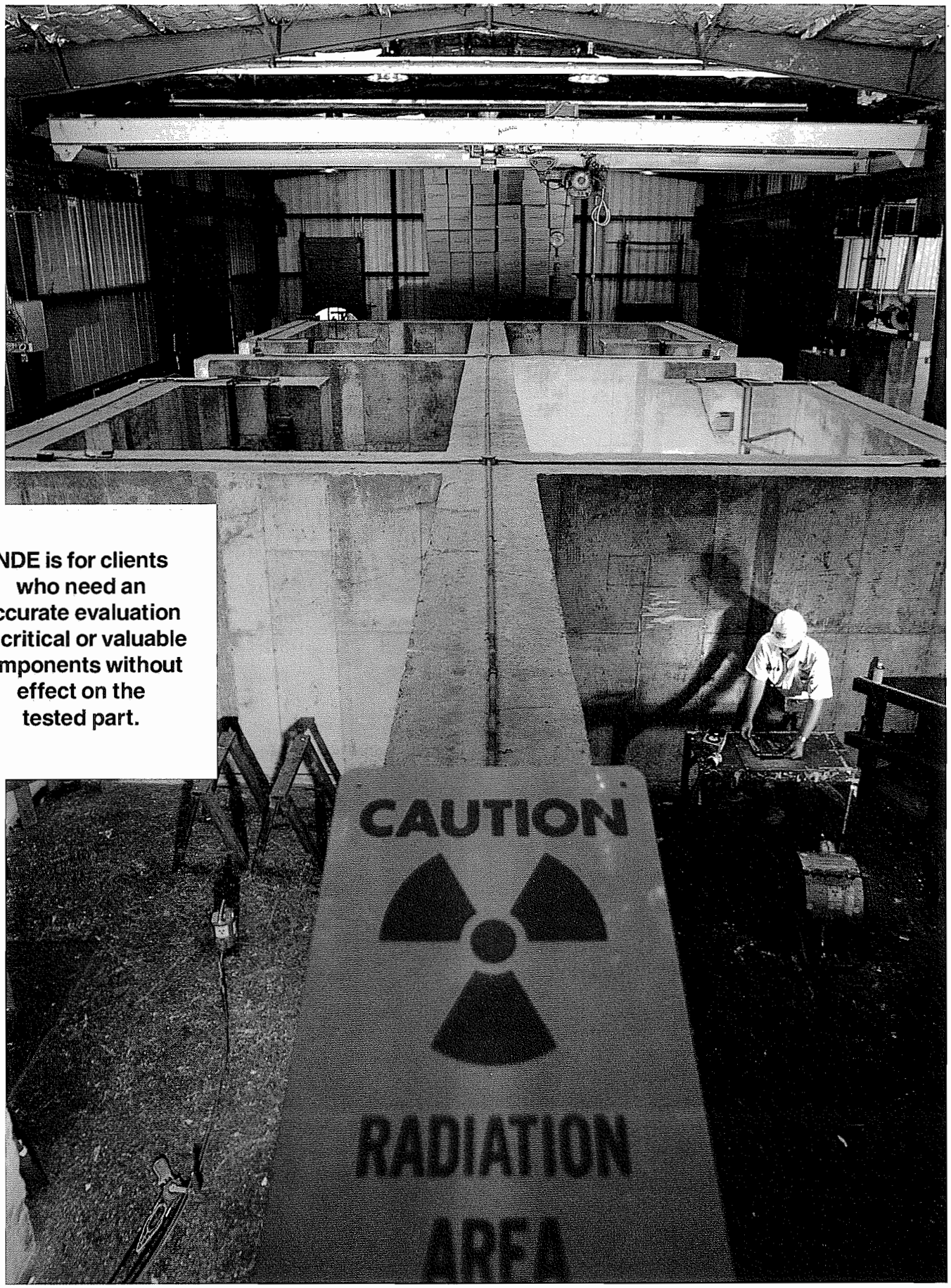


Our Resilient Modulus Device predicts bituminous mixture performance and determines fatigue resistance and moisture susceptibility. With our associated Environmental Chamber stress/strain properties at various conditions can be determined.

At right, our tests and inspections are closely coordinated with complicated construction schedules to help prevent entry of non-complying materials.



SWL has led the industry in developing inspection and quality control procedures for construction.



NDE is for clients who need an accurate evaluation of critical or valuable components without effect on the tested part.

NONDESTRUCTIVE EXAMINATION

Southwestern Laboratories has proved itself a leader in the development and application of nondestructive examination (NDE) techniques. Our NDE services are developed for use at critical stages in the manufacturing process to optimize production and assure quality of a finished product.

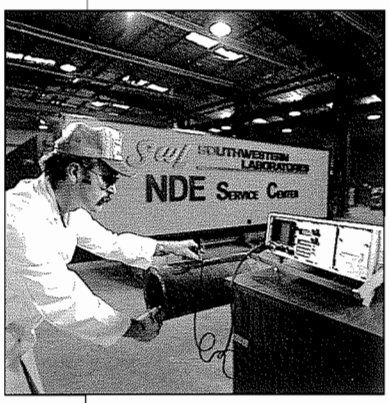
We offer diversity and capability, including the largest in-house NDE facility in Texas, with radiographic, ultrasonic, magnetic particle, liquid penetrant, and pachometer testing. With an extensive network of laboratory and mobile facilities, we can conduct full scale nondestructive investigations in the laboratory, fabrication shop, or on a specific site.

We serve clients with oil, manufacturing, construction, nuclear, and industrial backgrounds, but our services can be applied to any project with a need for the nondestructive process. Our NDE projects have included examining handguns for courtroom evidence and oil paintings for concealed masterpieces.

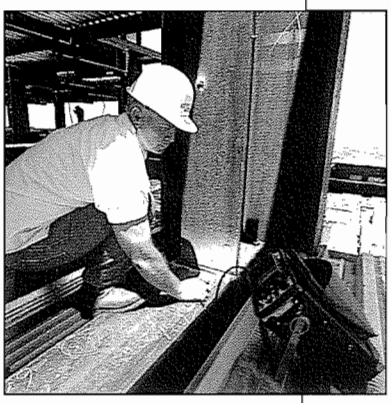
Our NDE staff is certified in accordance with SNT-TC-1A, and can perform examination to all major codes and specifications. In addition, our inspectors have expertise in radiographic procedures which can evaluate corrosion, erosion, wall thickness and certain discontinuities in valve bodies, pipes, forgings, castings, weldments, and fittings while they are still in service.

Newer techniques that have been applied recently are "flash" radiography and mapping of UT indications with a computer scan.

Up-to-the-minute training is critical in this expanding high technology field. We are an innovative group, and many of our experimental efforts have paid off with customized testing procedures for individual clients.



An immersion ultrasonic inspection unit with the latest computer-driven scanning capability is used to test directly on the surface or immersed when component size dictates.



Ultrasonic testing is used in the field to verify the structural integrity of field welds and the absence of laminar tearing in the adjacent parent metal in massive structures.

At left, radiographic shooting bays, served by overhead cranes, are large enough to handle the largest castings, headers, valves, forgings and other products for examination.

With the permanent film record provided by NDE radiography, we can serve as Level III consultants or third-party expert witnesses.

METALLURGICAL ENGINEERING

Countless products and facilities we rely on every day depend on metal quality and its manufacture, fabrication, and assembly. Southwestern Laboratories has an outstanding facility for specialized testing, inspection and consultation in the uses of metals.

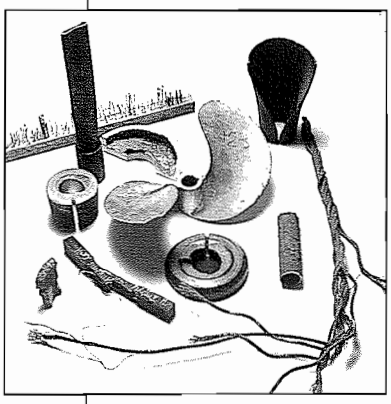
With the increased emphasis on getting the most from a metal without impairing safety and performance, metal failure is always a serious problem. We are one of the few materials firms to provide complete failure analysis. This failure analysis, along with hardness testing and metallography, can be performed in the field as well.

Our metallurgists use microscopy to examine the innermost aspects of metal specimens, and determine the cause of material degradation and failure. Their findings can be used to improve the product for future applications, or to determine the area of responsibility involved in its faulty performance.

We use microprocessor-controlled mechanical systems to test for tensile, yield, metal elongation, reduction of area, ductility and impact, using specimens prepared in our own machine shop. Strain gauges are often utilized to monitor performance of prototypes as well as production parts in service measuring actual stress levels under service loading. We use computer-controlled x-ray fluorescence, with wet chemistry for reference, to determine metal composition.

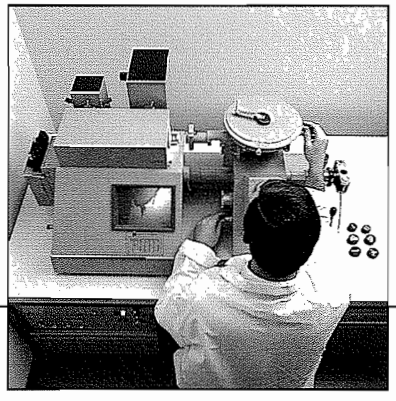
Welding procedure and welder qualification services are available to all areas of the fabrication industry, both on-site and in our laboratories.

The data and engineering reports that we generate from these tests are prepared by experienced chemists and metallurgical engineers. Whatever the project, we have the resources to investigate, measure, analyze, and pass judgment on the quality of metal in all forms and uses.



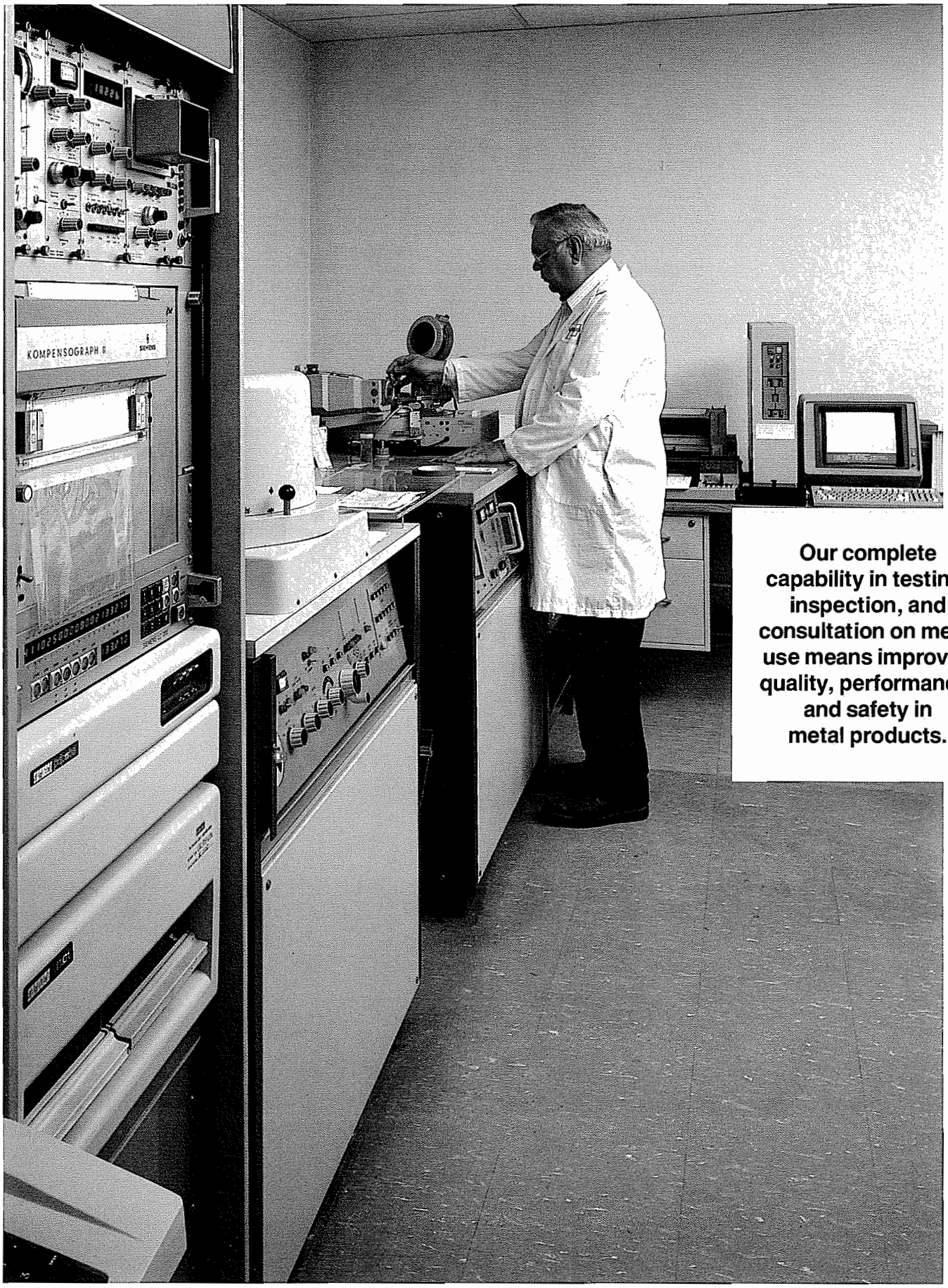
Metal failure analysis can lead to more enlightened material selection and improved product performance.

Our automated testing system records tensile and compression test results on a CRT screen, with key results printed on command.

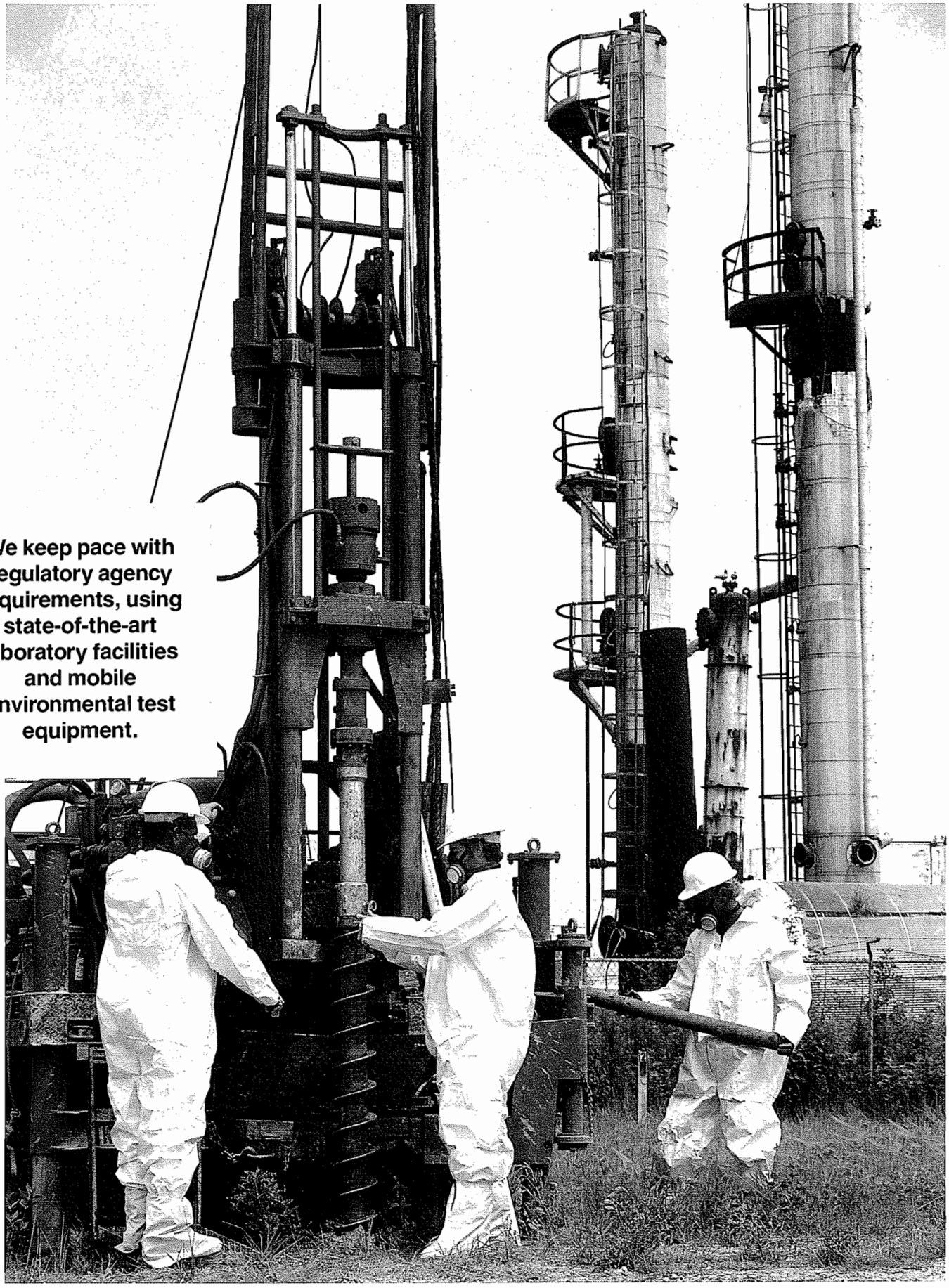


Analytical studies reveal grain size, inclusion counts, proper heat treating, contamination and microscopic abnormalities.

At right, our most widely used equipment in metals chemistry is the x-ray spectrometer and x-ray diffractor which are used to analyze and identify a wide range of metals, non-metals, and compounds.



Our complete capability in testing, inspection, and consultation on metal use means improved quality, performance, and safety in metal products.



We keep pace with regulatory agency requirements, using state-of-the-art laboratory facilities and mobile environmental test equipment.

ENVIRONMENTAL ENGINEERING

To us, an environment is a space as small as an automobile or as large as the Gulf of Mexico. It can involve any aspect of the air, the water, or the earth. We monitor, define, and analyze contamination of processes that affect the quality of all environments.

We work closely with manufacturers, utility, petrochemical and industrial clients, as well as local, state and federal regulatory agencies to provide in-depth problem analysis. We develop data and the recommendations needed to assist with complex solutions.

One service is the preparation of Environmental Site Assessments to evaluate properties for potential purchasers and lenders. If necessary, we have the equipment and analytical capabilities to sample and test soils, waters, and wastes at the site.

Our source emissions tests use equipment developed by our own personnel to determine compliance with EPA, state, and local air pollution regulations. We offer groundwater monitoring with identification and characterization of pollutants, and assist in evaluations of landfill and other disposal systems. In all cases, we can assist our clients in the presentation of technical data to the regulatory agency.

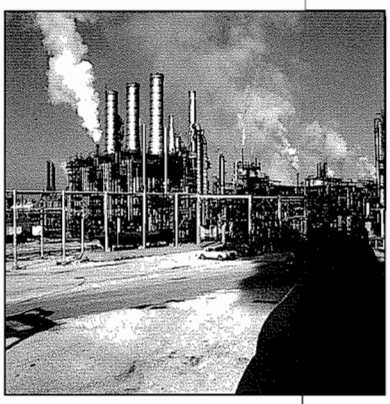
Our certified inspectors inspect schools and other buildings for asbestos containing materials in accordance with the Asbestos Emergency Response Act (AHERA).

We also provide environmental testing in the workplace. Using NIOSH and OSHA guidelines, we measure contaminant exposure—whether that means asbestos in a school classroom or carbon monoxide in a parking garage. For clients in marine operations, we test fire safety, air compressors, navigational systems and hazardous vapors for compliance with the Coast Guard regulations.

In addition, we perform environmental evaluations to determine product compliance with health codes or manufacturer specifications.

We have demonstrated that we consistently provide accurate, thorough, and efficient test results and recommendations. In this small way, we are proud to contribute to the quality of life on our planet.

Water tests include complete chemical, biological, and bacteriological analysis as well as routine discharge permit monitoring.



Air pollution tests include source sampling, high volume and ambient air analysis for gases and particulates.

At left, monitoring well installation at hazardous waste sites is a highly specialized service that must be performed under rigorous safety procedures.

Gas Chromatograph/Mass Spectrometer analyzes for organic contaminants in air, soil, water, and sludges.

ANALYTICAL SERVICES

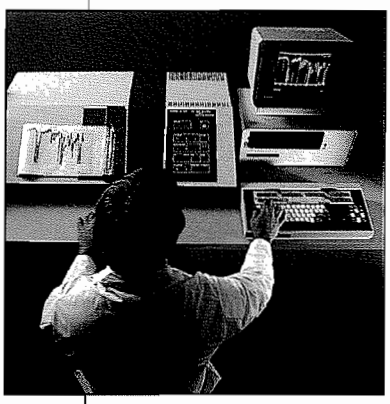
When we began as an analytical laboratory more than 75 years ago, our tests were primarily related to agriculture. Today, our analytical chemists use extensive equipment and instrumentation to test and analyze many complex substances including metals, water and air pollutants, petroleum products, cosmetics, foods, pharmaceuticals—even nuclear waste.

We offer comprehensive analytical services directly to our clients as well as support to the metallurgy, environmental, soils, and materials engineering services of the company. We perform independent studies for clients in need of comparative testing and objective reporting—on substances as diverse as popcorn and boiler vessels.

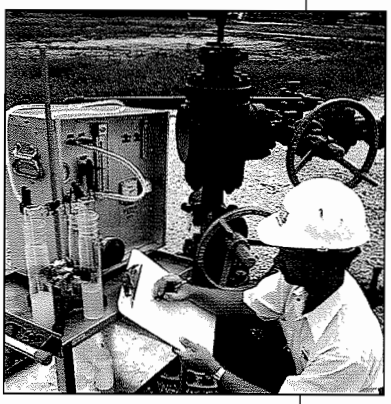
Our complete petroleum capabilities include all tests required by Federal Emission Standards and the Texas Railroad Commission Rule 36. We provide product specification tests for fuel oil, diesel, gasoline, lube oils, and pipeline products. Tests of crude include all physical characteristics and chemical properties. We also develop and evaluate vapor recovery systems. Our Geochemistry includes total organic carbon analysis of rock samples as an initial step of basic screening in source-rock evaluation.

Our innovative staff keeps pace with industry, supported by our in-house program for quality assurance and continuing education. Frequently we work with industry to help it comply with new governmental regulations.

Southwestern Laboratories has a staff of qualified chemists versed in a broad spectrum of technology and analytical processes. Supported by the most sophisticated instrumentation available, they provide a vital link in the chain of SWL testing and reporting services.



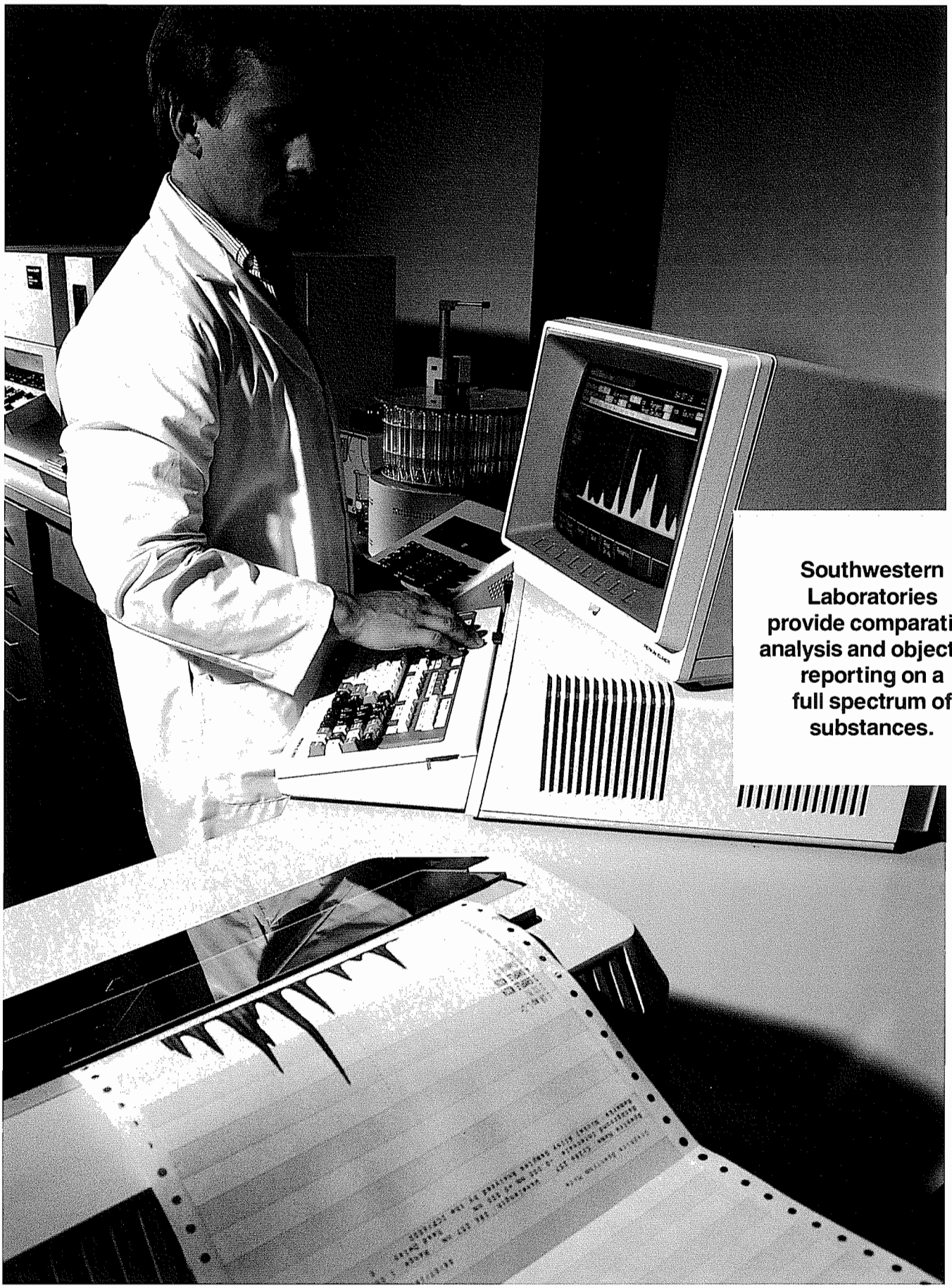
Our scanning, infrared spectrophotometer identifies and fingerprints organic compounds, often for the preliminary identification of organics and all types of polymers.



We use a complete range of ASTM and other standards to analyze gas, oil, and gasoline in the laboratory and the field.

Atomic absorption spectrophotometers are basic equipment in chemical analysis, offering extremely low detection limits for such materials as hazardous waste, fly ash, and cement.

At right, an inductively-coupled plasma emission spectrophotometer with multi-element capabilities is used to detect metals in alloys, water, wastewater, and hazardous waste.



Southwestern Laboratories provide comparative analysis and objective reporting on a full spectrum of substances.

SOUTHWESTERN LABORATORIES' SERVICES

Geotechnical Engineering
Site feasibility studies
Foundation design analyses
Construction monitoring
Construction materials source studies
Full-scale load tests
Ground vibration monitoring
Foundation settlement monitoring
Monitoring well installation
Locating and defining mineral deposits

Construction Materials Engineering
Development of quality assurance and quality control programs
Mix designs for concrete, bituminous pavements and soil cement
Field inspection and laboratory testing of concrete, asphaltic pavements and masonry
Research and development of asphalt cement modifiers
Asphalt binder evaluations
Nondestructive testing of concrete structures and pavements
Soils compaction and stabilization tests and inspection
Structural steel fabrication and erection inspection
Roofing inspection, evaluation, and monitoring
Window and curtain wall testing
Refractory and insulation testing
Paint and coating testing

Wood Products Inspection and Testing
Piles
Poles and crossarms
Timber and lumber
Cross ties and switch ties
Analysis of wood preservatives
Preservative retention
Preservative penetration
Evaluation of existing structures
Development of specifications

Nondestructive Examination
Ultrasonic
Radiography
Magnetic particle
Liquid penetrant
Reinforcing steel location
NDE Level III consultant services

Metallurgical Engineering
Failure investigation
Material selection
Coating/plating testing
Metallographic studies
Corrosion analysis
Accelerated environmental testing
Stress analysis
Heat treating studies
Elastomer evaluation
Expert testimony
Insitu Metallography

Mechanical Testing
Tensile testing
Compression testing
Hardness testing
Impact testing
Bend testing
Welding procedure and welder qualification
Strain gauge application
Fatigue testing

Environmental Services
Water and air pollution monitoring and testing
EPA, TACB, TWC, NPDES, FDA, and OSHA compliance testing
Waste discharge permits
Groundwater contamination analysis
Pesticides and herbicides analysis
Priority pollution determinations
Hazardous waste analysis
Solvents and chlorinated hydrocarbon analysis
Asbestos analysis and abatement
Environmental site assessments

Analytical Services
Metals
Petroleum
Coal
Agricultural
Foods
Water
Major Instrumental techniques available
X-ray fluorescence and diffraction
Flame/Non-flame atomic absorption
Plasma emission spectrometry
Gas chromatography/Mass spectrometry
Gas chromatography
Infrared spectrophotometry
UV/VIS spectrophotometry
Fluorescence spectrophotometry
Calorimetry
Polarizing and phase contrast microscopy
Organic elemental analysis
Transmission electron microscopy

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