RRJ INSIGHT

ISSUE NO. 5

A technical newsletter by Raths, Raths & Johnson, Inc. for the construction industry.

“Insight: to see into and understand; an item of knowledge gained by this power.”

In this issue of *RRJ Insight*, we take a look back at the beginning of RRJ and offer a little insight into the philosophy of our firm. It is our continued goal to consistently provide our clients with high quality, high value service and to expand our offering to meet the changing needs of our clients. Please feel free to contact us with your comments and suggestions as to how we can serve you better.

INSIDE

Chuck Raths performing early concrete corbel research.

RRJ - A Brief History

In January 1966 Charles Raths opened a one man structural engineering firm called Chas. H. Raths & Associates. This small company, operating out of Chuck Raths' house, was the seed that eventually produced the structural and architectural consulting firm known today as Raths, Raths & Johnson, Inc. (RRJ). Chuck founded RRJ based on his experience as a designer, as a researcher with the Portland Cement Association, and as chief engineer for a large precast concrete producer. **His goal was to put into practice a philosophy based upon quality engineering with particular attention to details.**

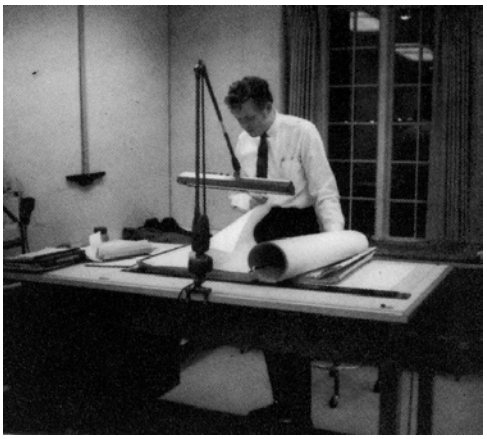
After a short time the firm moved from Chuck's house to a one room office above the Hinsdale Gardening Center. The "Seed Store" location, as it is fondly remembered, saw the firm double in size when Robert Johnson became the second employee in February 1967. Bob's drafting capabilities, combined with Chuck's analysis and design experience, allowed the upstart firm to offer design, shop drawing, and erection drawing services to the precast concrete industry. **Days were spent meeting clients and selling work, and nights were spent doing the work.** The company had the latest in "high-tech" tools for graphics and calculations: T-squares and slide rules.

The long hours paid off for Chuck and Bob, and as business increased additional employees were brought on board, increasing the firm's capabilities and experience. One of these men was Donald Raths. Don joined the firm in 1969, bringing with him additional precast and structural engineering experience. By 1972 the firm was renamed Raths, Raths & Johnson, Inc., with Chuck, Don, and Bob as the owners. Around this time, because of several investigative "problem-solving" type projects, the firm started to redirect its engineering focus. In particular, as more investigative and remedial projects were undertaken, the RRJ Principals realized the firm's talents and abilities were ideally suited to this kind of work, which required **in-depth understanding of engineering fundamentals, great attention to detail, and existing condition documentation.**

A major turning point was reached in 1978, when the Principals decided to direct the firm's efforts entirely toward consulting in the areas of investigation, renovation and testing. Otto C. (Chuck) Guedelhoefer joined RRJ at this time, bringing a strong background in investigative work and advanced structural testing. With another Chuck on board, and the firm's longer term objectives identified, 1979 saw the construction and occupancy of RRJ's own building. The building, located in the Chicago suburb of Willowbrook Illinois, included ample space for expansion, and an **in-house structural testing laboratory.**

The firm's growth and development after 1979 were significant. Staff were added having specific sophisticated technical capabilities, more testing equipment was acquired, computer capabilities were enhanced, and the scope of projects increased **with an emphasis on designing major repairs for damaged and deteriorated structures**. In addition to structurally related engineering work, an increasing share of RRJ's undertakings also addressed architectural engineering aspects of buildings. This included cladding and curtain wall work, combined with testing in the laboratory and at the building site, to determine problem causation and evaluate corrective measures.

Throughout the 1980's and into 1990's the firm continued its deliberate and slow paced growth, **maintaining a focus on advanced engineering combined with practical solutions to real-world problems.** Along with these developments came increased testing capabilities for basic research and client product development. During the 1980's to the present time period, staff development led to Robert Kudder, Kenneth Lies and Kurt Hoigard becoming Principals and leaders of the firm.



Bob Johnson at RRJ's first "graphic workstation."

A new chapter in the leadership of the firm began on January 1, 1995, when Chuck Raths stepped down as RRJ's President, turning the job over to Chuck Guedelhoefer. Chuck Raths' continued affiliation with RRJ as a consultant has allowed him to leave the hectic day-to-day struggle of running a business behind, and focus more of his time doing what he likes best - quality engineering. The remaining Principals **are dedicated to carrying forth Chuck's founding goals of engineering excellence and attention to detail.** We look forward to continued growth while maintaining our established reputation for excellence in the fields of structural and architectural engineering.

-Kurt R. Hoigard, P.E.
-Charles H. Raths, S.E.

Engineering Analysis Tools

In 1966 when RRJ began, we were using slide rules, time-sharing computers, drafting tools and typewriters. Basically all calculations were done by hand, literally! In those days, calculators, if you were lucky enough to own one, were slow, cumbersome, noisy, mechanical monsters usually at least as large as a typewriter and twice as heavy. Computers filled a small

room and were shared by several users through Teletype machines using punched oil paper which transmitted data over undependable, slow telephone lines.

As technology progressed, the rudimentary analytical tools which had served the profession well for the last 100 years rapidly began to give way to smaller and smaller hand held electronic calculators. In the 1970's, calculators were produced usually costing in excess of $300 which could add, subtract, multiply and divide. *Today, ones with similar capabilities are given away as promotional incentives.* Those with more capabilities including a means to store programs were sold for sums approaching $1000. At the same time the major computer manufacturers providing smaller computers (still the size of desks) which could serve several users simultaneously, while an obscure group by the name of Apple began a bigger revolution. This decade also saw the beginning in automation which was to become widely available and affordable for word processors, personal computers, drafting machines and data acquisition machines.

Perhaps, the most significant change brought about by the PC's to engineering were the availability of the types of analytical tools and the graphical capabilities used to display results. Among the most powerful and versatile analysis tools available to the engineer is the Finite Element Method (FEM) computer program. FEM programs have been available to the engineering community since the late 1960's, but in the early years were expensive to run, had limited or no graphical output, and were user unfriendly. With the availability of high speed personal computers and their advanced graphics capabilities, these difficulties and limitations have been overcome. **RRJ now uses a variety of FEM programs routinely to take advantage of their unique features.**

Basically, FEM programs allow the Engineer to quickly "model" his structure in any number of grid patterns (finite elements) without the arbitrary constraints of other methods. Current versions of FEM programs have superior benefits over more traditional methods of analysis:

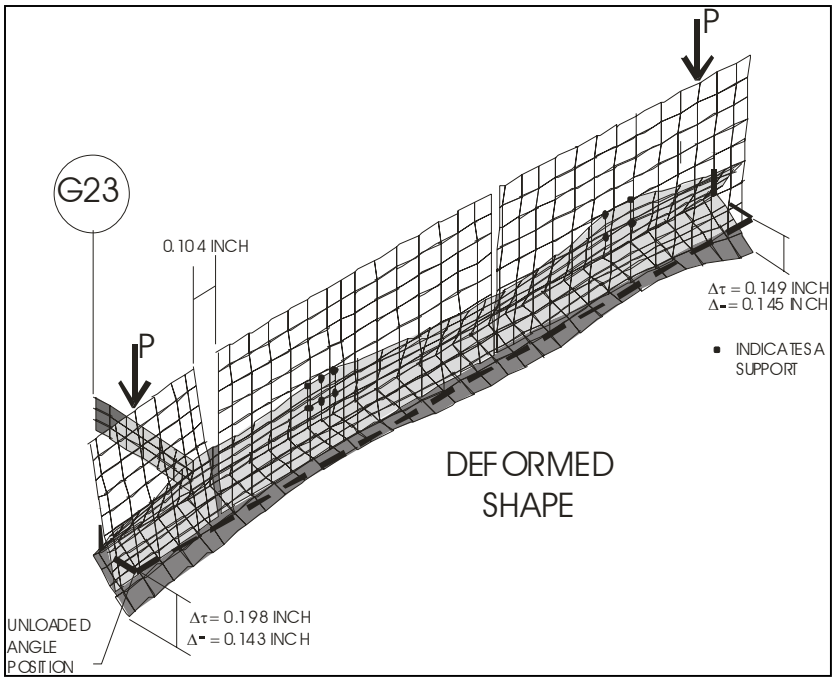
Structures can be modeled on the "macro" scale (entire multi-story buildings) down to the "micro" scale (component connections).

Any numerical result (stress, deflection, etc.) can be printed out graphically. See examples below. This allows the Engineer to check the validity of the analysis and to pinpoint overstress conditions at a glance. The time spent studying voluminous numerical output is reduced considerably.

The graphical results can be enhanced and enlarged for presentation purposes by RRJ staff. See *RRJ Insight, Issue 3*, Communications article. The graphics enhancements give both Engineer and Client a clear, qualitative understanding of the building or component true structural behavior.

It will certainly be interesting to see what the next 30 years will bring to the world of analysis and computing power.

-Kurt L. Salm, S.E., R.A.
-Barbara J. Smith, S.E., P.E.



Finite Element model (from 1996) of relieving angle showing deformed shape.