ALAN K. WELCH

Date of Birth: 5th January 1938

Academic Qualifications: University: Birmingham

Degree: B.Sc.(Hons 2A) Civil Eng.

Year: 1958

University: Southampton

Degree: Ph.D.

Year: 1969

Professional Qualifications: Chartered Civil Engineer, U.K.

Member, Institution of Civil Engineers (1970-94)

Fellow, British Interplanetary Society

Fellow, Royal Astronomical Society

Professional Experience:

2001 Retired

1995 to 2001

Independent Consultant Finite Element Analysis associated with the Dungeness

Nuclear Power Station. This covered the in-situ restraint

system to the super heaters and non-linear concrete analysis

of the supporting physical tests using the ADINA system.

Other consultancy work included cement kiln support

structures, a tender design for a concrete floating oil

storage vessel and the tender for the South Arne gravity

platform. The first was carried out using PAFEC and the

other two using LUSAS at both the client’s office and on

a home P.C.

The P.C used is a P200 Pro with 32 Mbytes of memory on

which are mounted LUSAS, ANSYS-ED, M S Office Pro

and Publisher.

Following the reward of the South Arne gravity platform responsible

for a complete analysis was performed including self-weight,

prestress, hydrostatic, thermal and environmental loads.

Other smaller analyses included the plasticity and large

deformation analyses of the seal on Revithoussa LNG

in Greece and of large multi-cell water tanks subject to

environmental loading.

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| 1990 to 1994 | Taywood Engineering Limited |
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| Chief Design Engineer Analytical Department | Responsible for all structural analysis (including global F.E.) of the 500,000 bbls oil storage tank (GBT) for the BP Harding Field.  Based in Oslo responsible for a series of Finite Element Analysis checks on the Heidrun GBS for Norwegian Contractors.  Responsible for preliminary F.E structural analysis for Troll West concrete semi-submersible during concept design and basic engineering phases. |

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|  | A major item has been the analysis of the caissons for the Storebaelt Bridge. Continuation of previous activities within reorganised analysis group. Other recent items have included analysis of the Dockland Light Railway bridge during its construction period. |

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| 1986-1989 | Taylor Woodrow Services Limited |
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| Development Team Manager, Engineering Analysis and Design Section, Engineering Systems Dept., Computing Services Division | Continuation of previous activities, the computers having been upgraded during this period to a Prime 9755 and an IBM 3083. Have worked with ADINA R & D (the suppliers of ADINA) in order to incorporate the improvements into their latest codes. These have undergone detailed testing in order to prove their suitability as replacements to the TW modified versions of Adina. Other changes to the ADINA codes have addressed the creep model. This has been extensively modified in order to solve more currently the behaviour of concrete for use as a radioactive waste backfill material.  During this period presented a lecture at MIT on mathematical modelling of concrete. |
|  | During this period PC computers have been introduced into the design office and a number of engineering packages have been evaluated and introduced. The QA of these and programs on the Prime and IBM computers has been my  responsibility including the definition of suitable test problems, production of documentation and liaison with our own and external auditors.  As part of the QA of the finite element systems support is given to NAFEMS (National Agency for Finite Element Methods and Standards). Some of my time has involved attending the Working Group for Statics for NAFEMS. This work includes the design of suitable benchmarks creation of contracts for packages of work required by NAFEMS and vetting potential contractors.  A further F.E. package (SESAM) was taken on for a limited period and its potential investigated. This involved a detailed involvement with the tendering for offshore re-analysis work.  A number of major structures have been analysed during this period including reinforced and prestressed PWR containment structures, a number of prestressed pressure vessel test structures and a multispan prestressed bridge. Analyses supporting the re-design of the PWR polar crane support corbels have been performed. Also, a study of the consequences of dropping a nuclear flask onto a number of R.C. structures has been carried out, this work including the validation of the Adina code for application to this class of problem by comparison with the CEGB impact tests. |

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|  | The work continues to involve an advisory role both in engineering and in the application of computers to engineering problems, across a wide range of topics. |
| 1984 -1986 | Taylor Woodrow Services Limited |
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| Deputy Head, Engineering Systems Dept., Computing Services Division (Development Team Manager, Engineering Systems) | Managing a team of engineers and mathematicians producing and using engineering systems on the Prime 750, Prime 9750 and IBM 3033. This includes a continuation of the previous activities listed for the period 1976-1983 below. During this period a second major finite element package, ADINA, has been introduced together with its associated pre and post processors, ADINA-IN and ADINA-PLOT. This has been used to investigate a range of non-linear problems under my supervision and guidance including soil excavation, buckling and large displacement and reinforced concrete analysis.  For the latter major modifications were introduced to improve the material modelling capabilities.  The two finite element packages have been applied to many problems, either personally or under my guidance. These include the analysis of a number of offshore structures, prestressed concrete silos, a composite bridge and the seismic analysis of ductwork and supports. Also, an oncoming commitment is to advise the design offices associated with PWR and AGR nuclear power stations. |
| 1976 - 1983 | Taylor Woodrow Construction Limited |
| Assistant Head of Computer Applications Group, Design and Research Division Assistant Head of Computer (Assistant Chief Design Engineer) | Responsible for installation of a Prime 300 for in-house timesharing and subsequent upgrades to Prime 400 and Prime 750. This involved developing accounting and reporting procedures and education of users in both system and application areas. Responsible for the installation, maintenance and use of many major programs and packages including GENESYS and its subsystems for frame analysis and portal frame design, PAFEC for finite element analysis, PROCESS for process plant |
|  | simulation and NAG for the solution of mathematical problems. In addition to these has been many other programs which have been developed, in-house or acquired externally of which knowledge has been obtained by direct use or by working with and advising other users. These include programs for reinforced concrete analysis and design, structural analysis, slip circle calculation, sheet pile design, stress and thermal computation and surveying programs. |
|  | A further major area of involvement has been with seismic response by SRSS and CQC methods, including soil-structure interaction. In the field of finite elements very wide experience has been obtained in linear and static analysis, dynamic response and in a full range of element types. Problems solved included structures associated with offshore engineering, nuclear power, wind energy and floating breakwaters.  Extension of codes based on dynamic relaxation to cater for nonlinear behaviour of reinforced concrete under static and dynamic loads has also been carried out. Other duties during this period have been involvement in the pressure tests of the Hartlepool and Heysham prestressed concrete pressure vessels and in tests of the high pressure facilities at the AMTE site. At the second Heysham test responsibility extended to that of acting as the Taylor Woodrow representative on the Test Control Panel responsible for controlling the test and issuing the test certificate. Computers used: Prime 300, 400 and 750. |
| 1970 - 1976 | Taylor Woodrow Construction Limited |
| Assistant Head of Computer Applications Group of Design and Research Division | Responsible for the engineering work processed on the in-house and external bureaux computers. This involves planning new applications, programming, advising on programming and assistance in using programs or packages. Major applications of the computer, carried out in this period, were the Staples Corner flyover, HTR pressure vessel design and analysis, North Sea gravity structures and large |
|  | irrigation docks and road works for Taylor Woodrow International Ltd. Coupled with a large proportion of this work has been a consultancy and advisory function for structural and general engineering problems. This includes theoretical stress analysis, application of dynamic relaxation and finite element methods, including SESAM and NASTRAN, and solution of mathematical problems. Computers used include IBM 360 and 370 and external timesharing and batch computers on both IBM and CDC equipment. |
| 1965 - 1970 | Taylor Woodrow Construction Limited |
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| Civil Engineer, Pressure Vessel Group | During this period, time was divided between a Ph.D. submission and in the build up of the Taylor Woodrow Computer Applications Group. The Ph.D. thesis was based on work being carried out for pressure vessel analysis using dynamic relaxation. This method was initially used for the Hartlepool and Heysham pressure vessel designs, and on a wide range of problems since, including a high pressure anechoic vessel, stresses in bridges and dock floors and for general stress analysis. Computer applications developed during this period included Dacca airport earthworks program, highway setting out programs for the Midland Link portion of the M6 motorway and pipe design optimisation programs for the Romanian irrigation scheme. Computers used included IBM 7094, 1401 and 360. |
| 1961 - 1965 | Taylor Woodrow Construction Limited |
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| Assistant Civil Engineer,  Pressure Vessel Group | Responsible for the development of analysis techniques for Wylfa prestressed concrete pressure vessel and computer programming for determination of prestress forces, prestress duct setting out and temporary works design. Computing was mainly carried out on an IBM 7094. |
| 1958 - 1961 | De Havilland Aircraft Co. |
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| Stress Analyst | Stress analysis of components of the Blue Streak missile, test equipment, ground handling and launch structures. |

PUBLICATIONS

The Design of Pod Boiler PV's with Particular Reference to Hartlepool Nuclear Power Station. D.Langan, M. O'Flynn and A.K. Welch. SMiRT, Berlin, September 1972.

The Value of Instrumentation in the Assessment of Vessel Performance During Construction and Service. R.D. Browne, P.B. Bamforth and A.K. Welch. International Conference on Experience in Design, Construction and Operation of PCPV's, York University, September 1975.

Speedtrack to the Moon. A.K. Welch and R.B. Warren. Joint Meeting of First U.S. Maglev Transportation Conference and First Lunar Development Symposium, Atlantic City, September 1986.

Evaluation of Material Models for Reinforced Concrete Structures. Computer & Structures, Vol. 24, No. 2 pp 225-232, 1986.

Nonlinear Analysis of Concrete Structures. K.J. Bathe, J. Wakzak, A.K. Welch and N. Mistry. Seventh ADINA Conference, Boston, 1989.

Review of Benchmark T3 and Presentation of a Suitable Replacement. A.K. Welch, Benchmark, January 1989.

Design and Analyses of the Reinforced Concrete Support Corbels for the Polar Crane in the Reactor Containment Building of Sizewell 'B' Power Station, by A.A. Paton and A.K. Welch, I.C.E. Conference on Civil Engineering in the Nuclear Industry, Windermere, March 1991.