

CRAFT SUMMARY / SYNTHESIS REPORT

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CONTRACT N°: BRE2- CT92 .0403

STARTING DATE: 01.03.1993

DURATION: 31.08.1995

TITLE: Creation of the EDV-based conditions for a more efficient design and manufacture in the wood processing industry

PROJECT COORDINATOR: Entwicklungsgemeinschaft Holzbau
in der DGFH e.V.
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PROPOSERS:

R&D PERFORMERS: LION

Holzbau-AG Brixen
Hüttemann Holz
bocad Holz GmbH
ETS Weisrock
Huber & Sohn
Prefalux SA
Caup
Nebgen
Cordes
Natterer + Dittrich
Rinn
Walloschke + Wossnig
Schwabenhaus
Okal
Autodesk
Cadwork informatik
Dietrich's Holzbau
Friedrich + Lochner
Quadric
Soft-Tech
S+S Datentechnik
Mafell
Grundmann
BURMEK

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EUROPEAN PROGRAMME

The interface for the "DATATRANSFER IN TIMBER INDUSTRY" (DtH-format)

Summary

In March 1993 Research and Development (R&D) was initiated within the framework of the EC-project "Creation of the EDP conditions required for effective planning and manufacturing in the timber industry" (short: Data Transfer in Timber Industry). The project has been finished at 31. August 1995.

The project has delivered:

- It has been developed a working, product-independent interface (DtH-format) for the data transfer in timber construction. softwareprograms of all areas in timber construction (e.g.: planing, construction, static calculation, setting, Tendering/Award/Billing) are able to communicate without the must, to create always a new specific Interface.
- It has been worked out the basic of a catalogue of construction parts. It will contain standard-parts and joinings. Because of this, it will be possible in future, to transfer descriptions of construction parts in a parametric format. This way of descriptions has the advantage compared with the explicit style, that the volume of data can be minimised and mistakes during construction and transfer can be reduced considerable.

The consequences are

- an increasing efficiency of using computers in timber industry,
- minimizing the mistakes of data transfer during the different processes of house designing, planing, costing and constructing,
- quicker planing and realisation of buildings,
- a substantial reduction of the adjustment costs of new soft- or hardware equipment.

The aims has been achieved because of the teamwork of the project-partners. A lot of work in co-ordination and details has been necessary to be righteous to all interests.

The partners participating in the project were (the table of all partners see annex 2)

- the applicants [woodworking companies, architects, engineers, prefab]-house companies, software producers),
- Associations (Bund Deutscher Zimmermeister (BDZ), Bundesverband Deutscher Fertigbau e.V. (BDF) and the Studiengemeinschaft Holzleimbau e. V.,
- the Arbeitsgemeinschaft Holz e. V.,
- the Entwicklungsgemeinschaft Holzbau (EGH) in the Deutsche Gesellschaft für Holzforschung (DGfH),
- the European Commission (EC) and
- the company in charge of the R&D work, LION GmbH.

The execution of the project was guaranteed by financial contributions and the resources of the applicants and by the financial support of the EC, as well as by the provision of staff (technical advisors).

Important is, that the DtH-interface becomes integrated in further more softwareprograms as fast as possible to the benefit of timber construction.

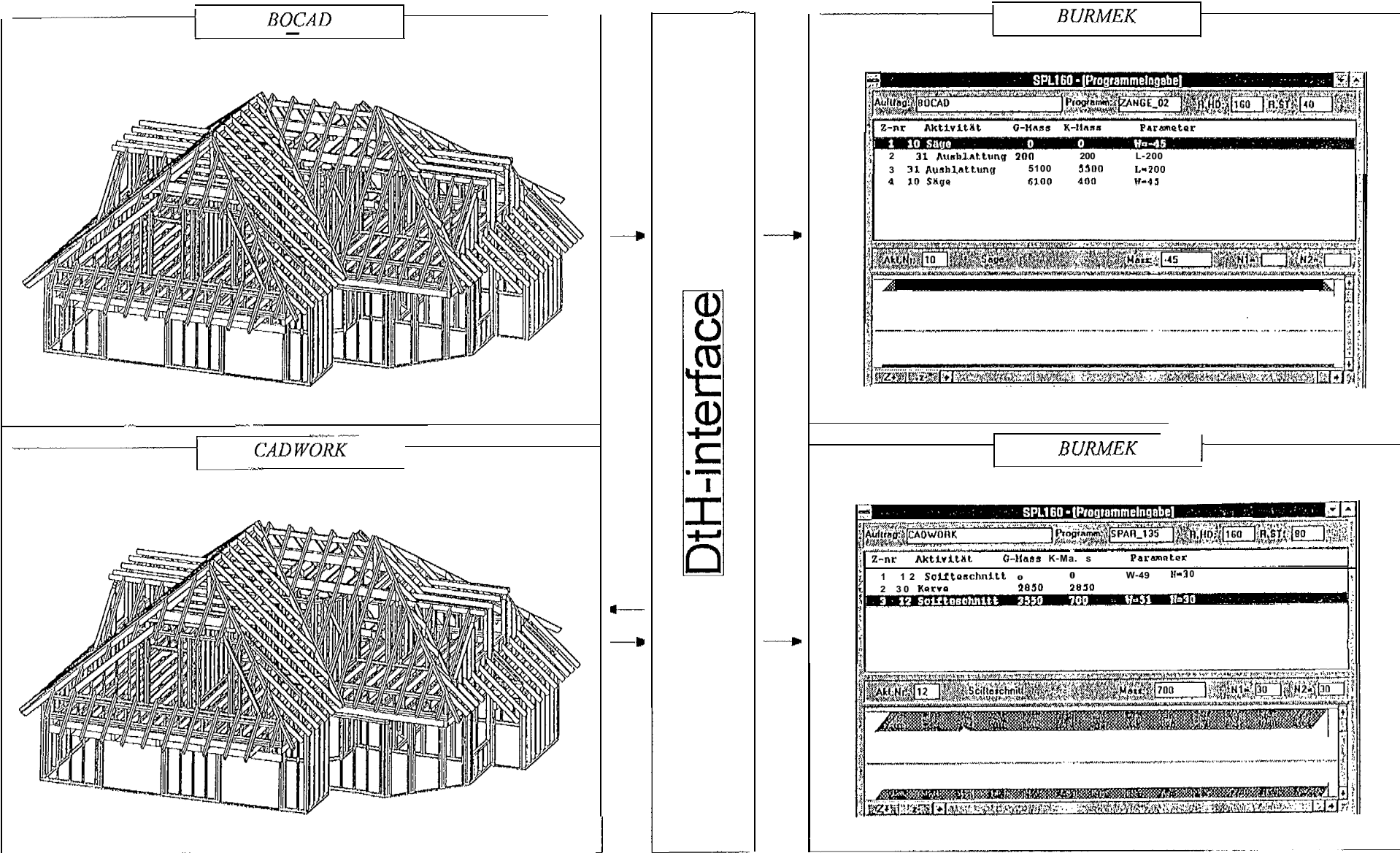


Fig. 1: Data transfer of a timber construction using the DtH-interface. The transfer took place from the construction program BOCAD both construction program CAD WORK and from both to the software of a wood processing machine of BURMEK.

The primary focus

This project addresses the following questions:

- What data structures are required to represent all the main structures which are required in the timber processing an construction.
- What catalogue of construction parts are required to satisfy most of the needs of the construction industry?
- What methods are required for software programs to transfer data effectively?
- Which helps can be designed, to simplify the implementation of the interface in software programs?

Definition of data structures

This resulted in the requirement of a new solution approach, by setting up a new data definition group, consisting of users with EDP knowledge from all fields of the applicants along with employees of LION GmbH and DGfH.

This was achieved by setting up a data definition group within the main project which:

- Defines the main structures in use and how they can be represented.
- Data definition for both software an user specific information.
- An investigation into the standards used by collecting information from participating users like architects, engineers and carpenters.
- Agreeing on a standard which is compliant as far as possible with the timber processing industry

The Members of the data definition group, see annex 2.

The basic structures were largely fixed by the data definition group. Prof Osterrieder's HOLZBAU product model (definition see annex 1) was defined as a basis.

The HOLZBAU production model along with its associated structures and inclusive parameters is based upon an appreciation of the data emanating from the planning and erection of wood construction. The principle of data definition is not to strive to capture data in a generally geometric form, but in one specific to timber construction. This specifically includes parametric description of planning data. It was shown from this, that on the one hand a considerable parametric capability is possible within timber construction, on the other hand, such arrangements do not currently exist to a great extent. Data which is not, or currently not, parametrically describable, is transferred to the structures by way of explicit instructions of the appropriate geometry sizes. As it must be assumed, that the "standardisation level" - the capability of clearly identifying construction parts or connectors by means of an identifier - has different values with different software producers, both possibilities are currently provided in the definitions for specific sizes.

The HOLZBAU product model will describe the final state of a timber construction plant by data which is as redundancy free as possible and in a construction specific form. The API's contain no intelligence. Any operational procedures are worked out by the application programs using the data obtained through the API's.

Catalogue group for construction parts

The parameters (variable structures) for the description of data were defined by a catalogue group (BKG) for construction parts (*members* see *annex 2*), and were also produced by the efforts of information suppliers (applicants). The preparation and subsequent administration of the execution of the described work was done by LION.

The BKG's tasks *were* defined as followed:

- Definition and compilation of frequently occurring construction elements, connections and constructions as thoroughly as possible, in order to give "life" to the data model created in the data definition group.
- Checking the data definition for completeness from a practical point of view.
- Laying down general valid standards, or defining "quasi standards" when there are not any standards, such as in hall or wood frame construction.

Information about processing instructions, consideration of existing standards and of course users' wishes were also important.

Because of the different requirement profiles of single user circles (construction families) it was agreed to first work out these circles and to give priority to the processing of the corresponding requirements.

[In summary the following results came from the construction parts catalogue groups:

- Carry out a questionnaire campaign amongst the users in timber construction,
- Collection of materials,
- Checking data definition for completeness and practical suitability,
- Initiating recording of new parameters of definitions,
- Tabular representation of the construction parts in house construction,
- Determining of the wood cross section standard,

All entities were checked as to how far additional attribute fields should still be recorded from a practical viewpoint and the data definitions groups were to discussions or decisions. For instance the requirement for as many as possible interlocks, because otherwise more complex construction elements or constructions could not be described.

The construction parts catalogue could not be completed in the time scale of the project. Updates will always be required as new construction methods are introduced or existing ones are modified. The further development of the construction parts catalogue is planned to be a separate research project, any interested parties should contact Martin Fischer, DGfH, Munich (you find the complete address at the end of the report).

Application program interface (API)

In practice, communication conducts using a project database, based on the corresponding data model. The structure of the data model defines the necessary interrelationships as well as which information is to be managed.

These data can be written and read via the project database interface. The interface will be available in the form of a function library, which protects the data to protect from unauthorised access. The following interfaces should be programmed:

- STEP-ASCII (writing only)
- API (writing and reading)
- GAEB-ASCII (writing only)

Since during the course of the project, a variety of different documents and information types occur, which under some circumstances could result from the various revision phases, at least the exchange information has to be managed. Two alternatives were examined: centralised and decentralised project management. The API concept and the project database to which it is linked were developed on the basis of these two proposals, meaning that it draws on both solutions. Due to provision of uniform APIs, any program can

be connected. The APIs were defined and developed in a way that minimises the cost of programming the program interfaces.

These functions provide an application-specific high-level language which can be safely and simply used for operating the project database. The interface enables database-independent access to planning data for those participating in the planning process in the areas of design, supporting frameworks and production in timber construction. The realisation of functional contexts and the implementation of stored information in production target times for production machines must occur via of the respective user program.

The development of the APIs was in the "C" programming language and is designed to be as operating system-independent as possible. To make it possible to port the system to different hardware and database systems only minimal modifications at the program code are required. Currently, Raima Data Manager database software is being used, since this software manufacturer is permitting prototype testing to be carried out at no additional cost. At present, an interface is available for HP, RS6000 and DOS-PC platforms. The participating software companies were provided with all versions, including tools and handbook.

To open a new project using the system, the software sets up empty data structures and key data. special scripts are used to define a new project so that the basic framework is there the first time a project is defined. Special tables are set up which are used to perform translation between specific data formats automatically. import and export is based on the STEP format described in Prof. Osterrieder's HOLZBAU product model, and is accompanied by sources designed to be of help in developing applications. By means of a further program, AVA data stored in the project database is read out, converted and written in the format of a GAEB.

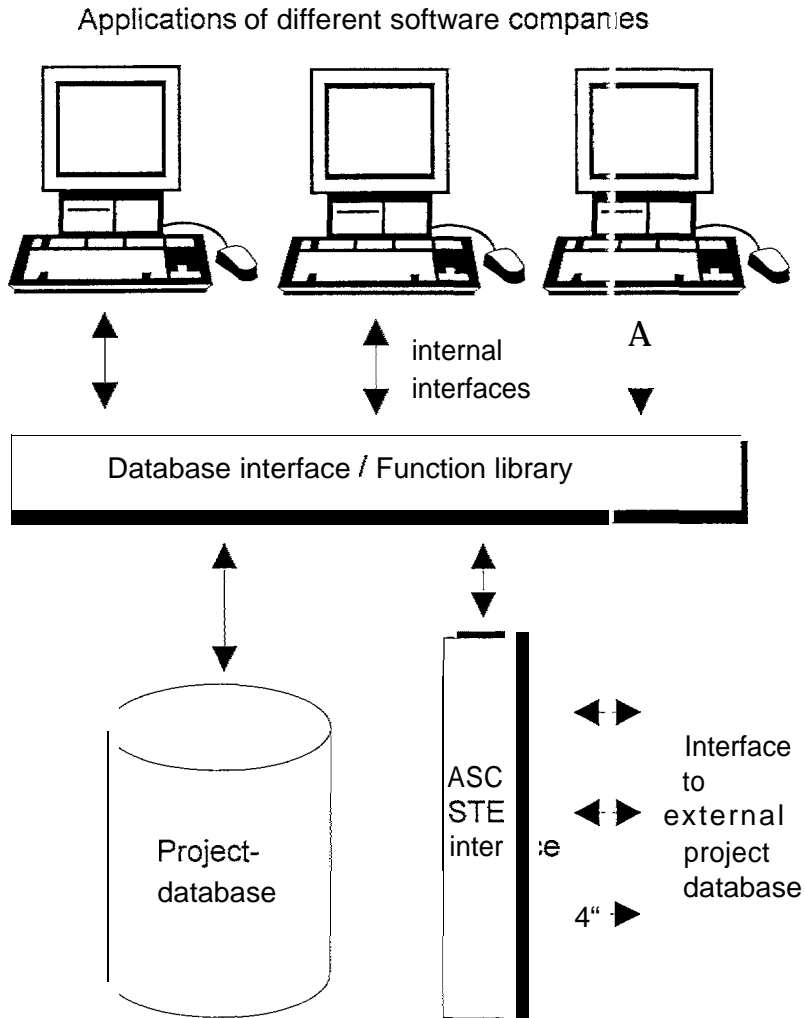


Fig. 3: Relationship between applications, interfaces, and the project database

Realisation in the software companies

After realisation of the in figure 3 pointed out solution the necessary test; were made at the software companies and the results were fed back to the development section.

Following the pilot phase the software companies adapted their application programs to make use of the interface. LION provided the function library, software tools for testing or the required hardware system platforms and Documentation for this to be achieved.

A testing phase with interchange between the software developers and LION enabled the system to be developed to a reliable level for use.

At the presentation on the 24-month-meeting in Bochum, it could be shown that the roof construction of a prefabricated wooden house can be described in a construction software and exchanged to the software of a joining machine, using the interface. [In the meantime, all the necessary parts for wall construction, such as boards, insulation and so on can be transferred.

The developments became realized by the the software companies in *annex 2*. They have largely integrated the interface in their products.

Testing by the applicant companies

The testing of data transfer by means of the software solution development was to be carried out by the applicant companies using practical examples and in co-operation with the software companies and the R&D contractors. For this purpose, the companies made available their personnel, space, computers and machines. This practical testing phase was preceded by intensive training of the users all of the new software functions. Only by involving all of the different participating software producers did this make sense.

A prerequisite of the testing phase was a strong spirit of co-operation on the part of the applicants, because testing newly developed software is not the same thing as using a tried and tested commercial product.

Here are an example:

The *SCHWABENHAUS* company manufactures some 300 houses a year at its plants in Ölbronn and Heringen. In Heringen, the roofs and ceilings are manufactured, and the walls in Ölbronn. Since the complete planning process is carried out in Heringen, data transfer is unusually important for the Schwabenhäus company. Currently, data for ceilings and roofs is sent to a BURMEK system for automatic processing such as sawing, drilling and milling. In the future, an automatic control unit is planned for Heringen, meaning that production will take place in Heringen. Production data will once again be transferred automatically.

In light of its current status, this description within the HOLZBAU product model can be transferred to many different wooden house systems and roof structures.

Exploitation aspects

With the end of the project a working interface is generally available, including the necessary tools. From now on, the results of the project (software inclusive the detailed manual) can be obtained and used by any interested software company at a trifling handling charge.

The first step towards an industry standard has been established because the most of the participating software companies (see annex 2) in the timber construction industry have implemented their software using the data transfer methods and have taken a major part in the development.

The DGfH will give support to the further development of the standards which have evolved from this project. This includes the database development and maintenance, the data structures and the construction parts catalogue. [It is assumed that this standard will be built on the progress already made. the DGfH will promote this aims.

- The above mentioned tasks will be supported by the committee "Timber construction and computer" founded by the DGfH on the 24th March 1995. This committee consists of, at present, 45 experts of construction and software.
- The first meeting of a group optimizing the Data structures and the interface took place at the 24. Nov. 1995 in Munich.
- A project to continue the catalogue of construction parts (1-95048) is applied and has been rated with the highest priority.

Following events are planned, to present the results:

- A presentation on the technical meeting of the BDF at the 21./22. of March 1996 in Cloppenburg.
- A presentation on the faire "Wood Construction And Finish '96" in Friedrichshafen at the 3rd May 1996, 15.30-17.00 o'clock. There will be demonstrated the data transfer using the interface. The admission fee will be 30. - DM. Please announce timely at DGfH, because the quantity of admission tickets is limited.
- Workshops are planned to eliminate touching fears and give information of the newest standard of technique.

We thank all the participants for the level of committed co-operation, this includes the software houses, the working groups, and those who have made a positive contribution to the project in the testing of the software, this has enabled data transfer to become a practical proposition for the wood processing industry. We hope that the lead established will be further developed and enhance the efficiency of the industry in general. We welcome interested users, software companies, and wood processing organisations in Europe who would like to participate, make input or provide contribution:, to contact the DGfH for more information on this project.

For more information please contact:

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Annex 1: Definition of terms:

API	Application Program Interface, which enable software manufacturers to enjoy joint access to data, and the ability to process it (see F.6).
AVA	Tendering/Awarding/Billing (A usschreibung/ V ergabe/ A brechnung) Tendering of practical building work, Awarding/Charging after finding out who is the convenient/cheapest supplier, Billing of all finished building work
AVA-Software	Software programme for all AVA-tasks
CAD	Computer Aided Design, computerbased drawing and constructing
CAM	Computer Aided Manufacturing
description, explicit	Using this method, the component part has to be constructed to show/transfer it.
description, parametric	Using this method, a declaration sufficed to show/transfer the component. The volume of data is substantial less than with the explicit method.
entity	object, element of data structure
GAEB	Common Board Electronics in the Building Industry (G emeinsamer A usschuss E lektronik im B auwesen). Norming committee in Germany, consisting of experts of the building industry, of Software companies etc. General goal is the development and adjustment of rules and formats for data exchange in the field of AVA-Software.
Phar Lap Software	Software-development-Company in USA for developing DOS-Extender software
Product model HOLZBAU	Data model for the definition of interfaces for design, statics and manufacturing developed by Prof. Osterrieder, to give all participating partners which are involved common access to all data. The structure and description is corresponding to the STEP syntax. See also special description in Annex 5 - Data structures (<i>Projektschnittstelle Holzbau, Version 7.04, F. 5</i>).
STEP	Standard for the Exchange of Product data, International standard of product data description and product data exchange (ISO 10303), which features in addition to 3D-geometric- and graphical data also data for product structure, cost evaluation or release of product description.

Annex 2:

ORGANISATION:	
Prof. Dr. Coiling, Mr. Fischer EGH (Entwicklungsgemeinschaft Holzbau) in the Deutschen Gesellschaft für Holzforschung e.V. (DGfH), Munich	project organisation
Mr. Braun, Breithaupt, Burkart, Wahle, LION, Bochum/Köln	R&D company
Mr. Egle, engineer bureau Egle, Traunstein	technical co-ordination, development of the postprocessor to Burmek
Dr. Kögler, EC, Brüssel, Belgian	project organisation of EC
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USER:
Blumer BSB, Waldstatt, Schweiz
Caup, Pfungstadt
Cordes, Rotenburg
Ets. Weisrock, Saulcy sur Meurthe, France
Holzbau Ag, Brixen, Italian
Huber & Son, Bachmering
Hüttemann Holz, Olsberg
Natterer & Dittrich, Munich
Nebgen, Reutlingen
Okal, Salzhemendorf
Prefalux SA, Junglinster, Luxembourg
Rinn, Heuchelheim
Schwabenhaus, Maulbronn/Heringen
Walloschke&Wossnig Arch., Augsburg

SOFTWARE COMPANIES:
Autodesk, Munich
Bocad, Bochum
Burmek AB, Nassjö, Sweden
Cadwork informatik, Hildesheim
Dietrich's Holzbau, Munich
Friedrich&Lochner, Stuttgart
Grundmann EDV-Systems, Hasenfelde
Mafell, Oberndorf

Quadric, Taufkirchen
S+S Datentechnik, Wermelskirchen
Soft-Tech, Neustadt

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Studiengemeinschaft Holzleimbau e.V., Dusseldorf

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Mr. Emmer	ITE-Ingenieurbüro,
Mr. Heuke	CAD
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Prof. Osterrieder	Engineer bureau Osterrieder, Static
Mr. Wulfes	QCC, AVA
Mr. Fischer	EGH
Mr. Meyer	BDF
Mr. Burkart	LION, software development (until spring 1995)
Mr. Wahle	LION, software development (from spring 1995)
Mr. Breithaupt	LION EDInet (until summer 1994)
Mr. Braun	LION, Architecture and construction (from Summer 1994)

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