

**Optical discs - their application in mass data storage**

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**ABSTRACT**

Much of the building designer's time is taken up correlating the various sources of information so as to incorporate it in the design within a limited time span. The building information service should be able to provide him or her by the up-to-date information in a user friendly format. Optical disc technology makes it possible to combine different forms of building data into images which can be mass stored and randomly accessed on a single disc, with the minimal response time by personal computer or CAD-workstation. In this paper the use of various forms of optical disc technology in construction industry and the prototype video disc produced by VTT are described.

**INTRODUCTION**

The key question in building information service is to provide the relevant information quickly and accurately. This means that the up-to-date information provided should be made available to the designer within the time span he has reserved for making his design decisions. In this respect information ordered by mail seems of little use. The information should also be presented to designers in a user friendly format. Information technology in the form of personal computers or CAD-workstation seem to offer the necessary infrastructure for an efficient dissemination of building information.

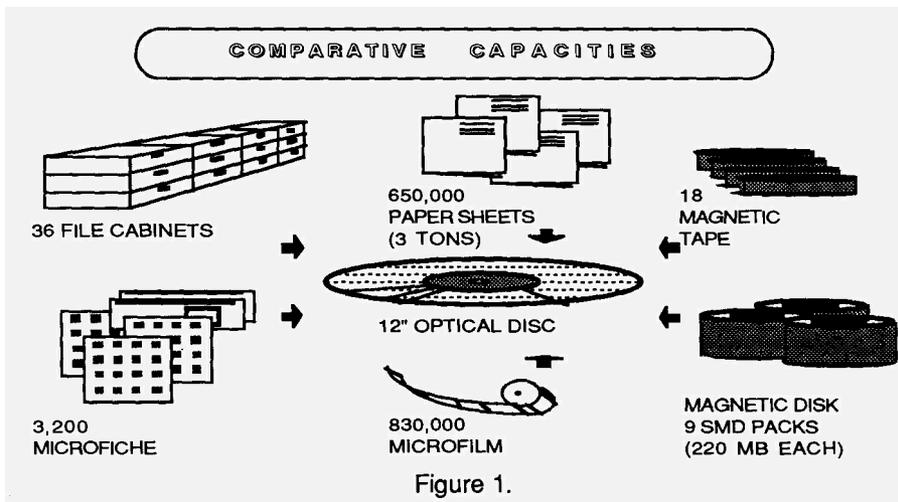
Micros themselves are not sufficient. Expert systems, advanced data-base techniques, digital image processing, cheap mass storage and optical storage media offers the enhancement needed. This presentation will focus on the use of optical data storage technology for building information service.

Optical disc technology is by no means unfamiliar to those who have browsed the record shops recently. But it is not only the entertainment industry which has realized the benefits of Laser beam technology - highly accurate input and retrieval in a compact environment. As a means of mass data storage the technology is invaluable for education and professional use; also in the construction industry.

Much of the building designer's time is taken up correlating the various sources of information so as to incorporate it in the design. Normally this necessitates taking into consideration standards, norms, product catalogues, costs, environmental factors and construction methods.

Optical disc technology makes it possible to combine all these forms of data into images which can be mass stored and randomly accessed on a single disc, with the minimal response time. Furthermore, being compatible with PC's it supports the micro revolution, and adds yet another dimension to their ever increasing utility. The sheer capacity of optical storage is well illustrated here in a powerful application which brings even archives into an active media. Furthermore, everything can be explained or illustrated in full-detail without undue concern for the ultimate volume of material. Figure 1.

The ability to use text, illustrative frames and video sequences brings about a highly effective tool which can be used for teaching, training and reference, even on-site. E.g. Depicting how to attach a particular component. The same accurate and professional data can also therefore be easily accessed by the inexperienced, in a way readily understood.



For similar reasons, in marketing, the technology speaks to the client in a simple and convincing manner. Through the interactive possibilities the client may access information on a company or its products in a way most appropriate to him through Point of Purchase displays.

**MEANS OF OPTICAL STORAGE**

Optically information is stored in one of two ways. Colour and video sequences by analogue; sound, text and stills by digital means. There are many physical forms in which information can be stored although the optical hard disc is the most commercially available. Note that the hard disc appears in two forms either blank (individual) or already pressed (replicated). Figure 2.

As yet the development of erasable disc technology is not so far advanced and therefore the 'Write Once' concept remains the principal disadvantage of the storage media. However, information which necessitates constant updating can be super-imposed onto the images from the computer. Furthermore, the non-erasable feature may be advantageous where accidental erasure would prove costly or where it is preferable for the agent (publisher) to sell a product which cannot be edited.

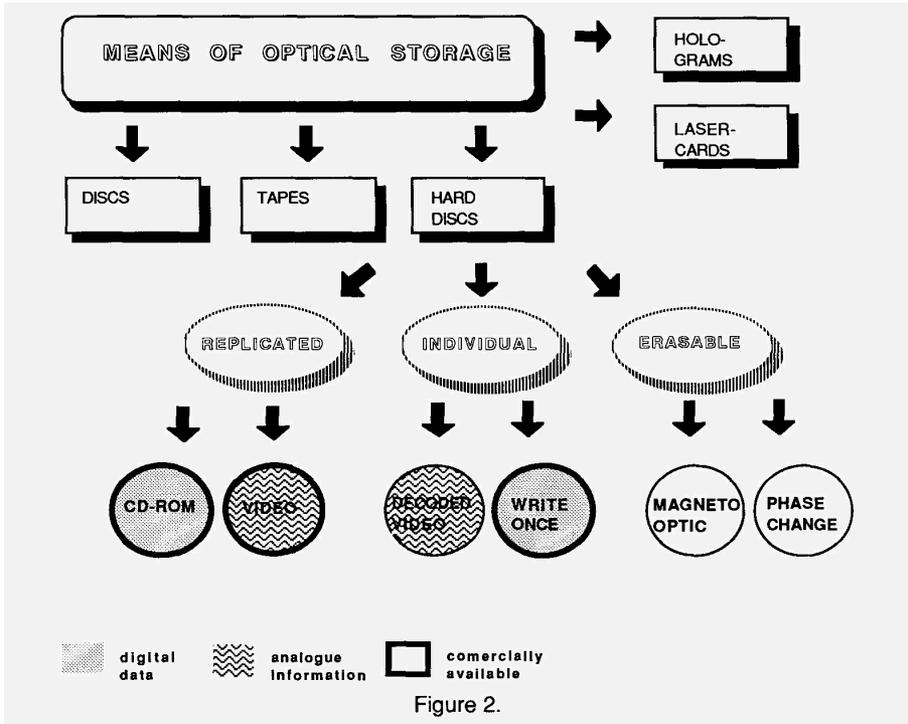


Figure 2.

There has been considerable disagreement over the various disc sizes being used. The Laser Vision Standard refers to 12 inch video discs but the recently introduced prototype decoded discs are still based on 8 inch discs. For CD-ROM's the standardization procedure is somewhat more complete and for WORM-discs almost entirely lacking.

Since erasable disc technology offers more and more attractive possibilities it is a domain in which there is much research and development. At present this is centred on the finding of the most appropriate material for either the opto- magnetic or phase change method of storage.

To return to the design environment, not only is it possible to integrate many various forms of archival media, optical disc technology is compatible with and brings together the various domains of computer aided design, data-management and expert systems.

### Related hard/software

However, none of this is possible without the integrating tools. Interface software and integrated cards have mainly been developed in both the U.S.A. and Japan, thus posing problems of video compatibility. Nevertheless, the past few months have seen the introduction into Europe of fully compatible systems. While applying digital disc technology some tailoring of the interface program might be needed.

The equipment used by the researchers at VTT was as follows:

For interactive video disc

- PC, 20 MB hard disk, 1.2 MB floppy disks, MS - DOS 3.20, EGA card.
- MIC 2000 - I kit. (& Toolbox program)
- SONY Video disc player LDP - 1500 P, SONY Monitor PVM-2010 QM
- Tencore Version 2.03 Author's program software

For WORM-discs

- OSI LD-1200 optical disc drive (& interface software)
- VIEW-program and data base management software.

### Properties

CD-ROMS are capable of storing some 200,000 pages of text (A4) and as a result of their compact form provide a practical means of distributing information such as building codes and standards, building product information etc.

WORM-Discs are suitable for both text and drawing data bases and are capable of storing at least 600,000 pages of text (A4). This corresponds to 1 Gigabyte of data - much the same as one year's data for an average sized construction company. The majority of optical storage will no doubt be in this form in the future.

Video-discs hold a key role in that they are able to store both digital and analogue data. For this reason they are open to many and various applications from marketing to design. One side of a video disc can hold as many as 54,000 frames, sufficient for several product catalogues or 36 mins. of video sequence, enough for ten or more training sequences.

APPLICATIONS

CD-ROMS offer the most economical way of applying optical disc technology. In the construction field it is the publishers who are first to benefit from this means. e.g. SWEETs Catalogue File will be come available on CD-ROM in 1989 and will be called Electronic SWEET's.

WORM-discs have been used for full text data bases and provide a system capable of rapid retrieval and extensive editing facilities such as correcting text, changing font and scaling. The edited version can then be separately stored in quite the same way as the user would save to conventional magnetic media. A Danish software company has developed the necessary interface for such a text data base system based on the Apollo Workstation and the OSI LD-1200 laser disc. The system is currently being extended to handle drawing data bases which will require an entirely different interface.

Although the need for extensive drawing data bases has not really materialized yet in the construction industry, the machine industry is already familiar with the problems of handling some 300,000 drawings per year by conventional means. Together with a good data file management program, the optical device can provide the designer or contractor with an efficient means of organizing and retrieving drawings as well as a tool for showing proposals, comparing designs and reviewing model solutions.

Despite the initial costs of the disc drive, software and even the discs themselves being rather high, one must take into consideration the capacity whereby each side is capable of storing 2,500 drawings. (A1 @ 400 kb each. ) Comparable to the average annual output of 5- 6 person architect's office keeping all versions of each drawing. The Dammam Girls' College Construction Project (87,000 m2 illustrates an application admirably:

A1 Drawings	1,355
A4 Drawings	1,410
Specifications	754 pages
Reports	4,000 pages
Correspondence	<u>1.5 m of files</u>
	<u>Less than a single side</u>

There are very good scanners now, freely available on the market, and at copy-service outlets, which can convert paper drawings into digital archives. However, since these scans inevitably require considerable editing in order for the text and symbols to be of later use it would be preferable if all old drawings are archived by means of micro-film. Should a drawing then be required, a scan may be taken from the micro-film. As new drawings are created so they may be added to the optical digital archive. The information stored on an optical disc will have a life span of some 30 years.

By means of combining video discs, CAD micro programs and other reasonably priced, mass-marketed software necessary to the designer's environment, it is possible to store construction and product detail images both in digital and analogue form. Data file management programs also make it possible to organize and retrieve images very readily. Although MIT {1} has conducted research in this area it is by no means fully commercially developed and software houses are becoming increasingly involved in the aspects of integration. Being based on conventional disc operating systems and a valid video disc standard, integrated video disc systems present a less restricted media than the more specifically equipment oriented WORM disc systems.

Video discs have been adopted by the larger real estate agencies of the U.S.A. for showing photo-images of the properties listed on file. A German publisher has recently produced a disc comprising photo-images of construction products and fittings. Some universities are investigating the possible educative interactive video applications in the field of architecture. These and many other applications illustrate well the advantages of analogue storage over purely digital means.

#### INTERACTIVE VIDEO DISC PROTOTYPE

Since the Laboratory is concerned mainly with researching what will be available to the contractors and designers, most of the work has been carried out using standard hard/software. The focus of the work has been on the technical aspects of building an interactive video disc

system, rather than on the content itself which requires entirely different expertise.

For this reason a prototype disc was produced which necessitated evaluation of the various means of presenting and storing images to disc, the comparative image quality and various forms of source materials for stills and sequences. The evaluation of different video standards was also an important area of work. Methods which have been traditionally used to depict particular issues in the construction field were also assessed and redefined where they were found to be less effective on the video monitor. E.g. Original images presented in a horizontal rather than vertical orientation to fit the screen better, bolder drawing lines and text somewhat larger than normal.

#### Video disc mastertape production

Being both relatively cheap and freely available the animation camera technique was chosen as the most appropriate means of achieving the necessary 25 separate still frames per second for the mastertape. The original photography was carried out using 35 mm film which was later converted by digital film scanner into 1 inch tape. It was noticed that although there was some loss of quality due to the inherent multiple copying process this was negligible compared with the possible loss due to incorrect camera aperture settings.

Although 1 inch or U-Matic high band master video tape is generally preferred by the disc mastering companies other less expensive forms of video recording media were tested, e.g. U-Matic low band, VHS and SONY 8mm. However it was found that unless extreme care was taken over mixing, the limitations of narrower tapes were obviated. It was thought that since the 8 mm system is so very different in its characteristics it would be worth further investigation.

The whole process of pre-mastering is very exacting, especially in respect of the conversion from tape originals, time coding, and frame matching . In this the company producing the actual disc may be able to provide useful technical guidelines. Until there are specialists in this field it remains a vital task for the video disc management.

Prototype Contents

The video disc produced includes analogue information in the form of 8 video sequences, (total running time 64 minutes) and 2 x 4,175 still frames. The areas covered by this material are as follows:

PRESENTATION	SUBJECT	VIDEO	STILLS
Catalogue	RATU construction methods	14 mins.	2390
"	Interior surface coatings	—	225
Regulations	Structural fire regulations	—	160
Company	Partek group	11 mins.	—
"	VTT Building division	09 mins.	—
Product	SONY	13 mins.	070
Training	Laying parquet flooring	07 mins.	—
"	University of Lund	—	400
"	CAD in construction. VTT	—	270
Demonstration	Visualization in architecture	06 mins.	—
Archiving	Old Finnish city of Porvoo	—	620
Mapping	Helsinki city area	—	110
"	Turku plot study	03 mins.	—
Testing	Picture quality/CAD drawings	01 min.	020

During the project only few sequences of the disc were used for interactive video disc programming. The various forms of information used in construction industry are there for further studies.

Interactive RATU

The RATU catalogue, from which material for the disc was taken, is derived from the RT-catalogue (of Finnish construction material and product information, design and construction method descriptions and building regulations). RATU contains about 200 information cards which describe construction methods on-site. The video is shown to its best advantage compared with conventional means when a particular method can be rapidly accessed through the interactive program, programmed by authors' language, and illustrated by means of video demonstration.

## CONCLUSIONS

### Present

As a result of its capabilities, especially the colour accuracy, the video disc has already proven to be a very practical media for construction material and component suppliers to present their product information to the designers. As a tool in the architect's office the video disc adds powerful opportunities for CAD interface and archiving. Sales personnel can also benefit greatly from the same media. In training, the interactive nature presents a whole new dimension of practical example which can even be brought on-site.

Optical disc technology in general offers enormous benefits in mass data storage; CD-ROM especially for the wide distribution of digital data bases and WORM discs for archiving applications.

### Future

The whole gamut of computer science and optical disc technology will continue to break new boundaries of integration and application. All this will have a profound impact on the construction industry. For the architect it is by no means inconceivable that he will be able to dispense with the small scale model. Video technology, combined with 3-D CAD and even filmed sequences, will enable animated design and the erasable disc will bring mass editable data storage to the desk-top.

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