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Steve Revay
President

In the first issue of the Revay Report nearly fifteen years ago, I identified our aim by stating that we intended to respond to the needs of our readers by providing information that would directly help them in their day-to-day business and in future objectives.

Further on, I stated that: "We are planning, simply, to bring you information and to keep you up to date in areas where we consider ourselves qualified." I hope that you agree that we kept our word and published information about new developments in the field of project management and dispute resolution.

This issue is no exception. The article ought to be of interest to both project management professionals and those involved in dispute resolution. Communication is the foundation of any relationship and is certainly an essential element of successful construction contracting.

Litigation graphics are nothing more than a means of visual communication which can be as useful in avoiding disputes as in resolving them simply by clarifying complex issues. Computer-generated graphics in general should be a basic tool not only for architects and engineers but also for all the other members of the construction industry.

In the same first issue I requested your comments and suggestions for topics of direct concern. With this issue we are including a simple questionnaire to solicit your comments. I hope that you'll take the time to respond.

LITIGATION GRAPHICS

"Computers will never replace lawyers, but lawyers with computers may replace lawyers without computers."

The Lawyers Weekly, May 26/95

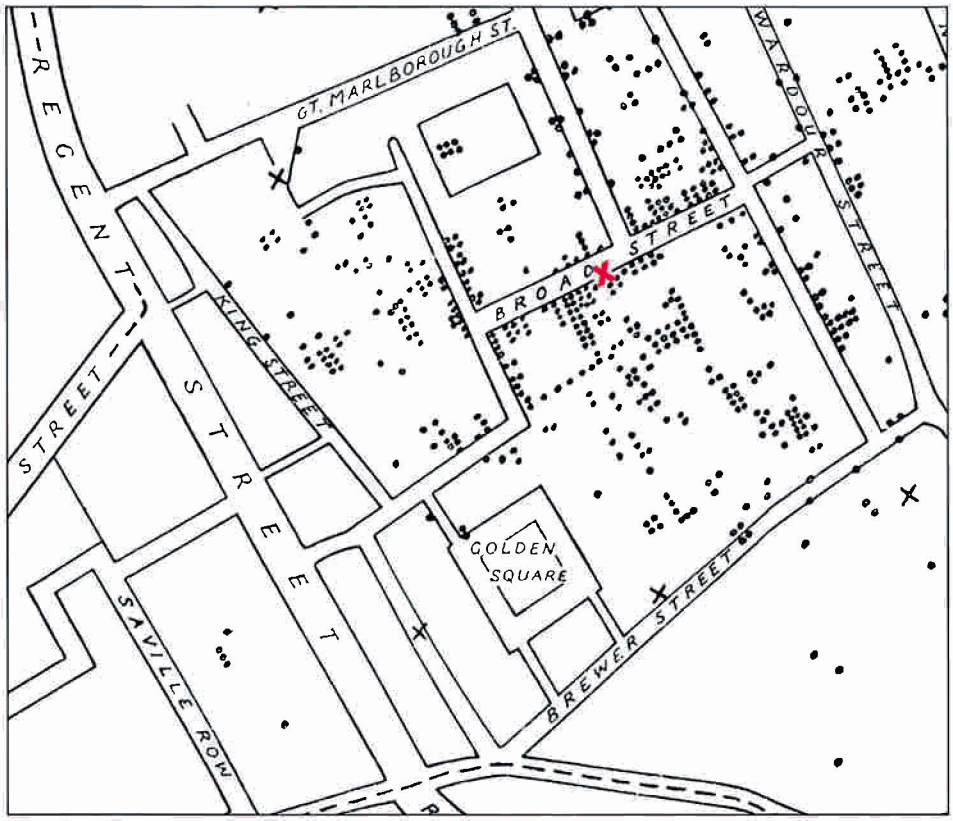

Fig. 1

In 1854, Dr. John Snow was fighting an outbreak of cholera in central London, England. It occurred to him to plot the location of the affected households on a street map of the area. He marked the deaths by dots on the map and, in addition, he identified the area's eleven water pumps by crosses (Figure 1).

Examining the scatter over the surface of the map, Snow observed that cholera occurred almost entirely among those who lived near the Broad Street water pump — not far from Piccadilly Circus. He concluded that the pump was contaminated and had its handle removed. Soon after, the neighbourhood epidemic ended.

The good doctor would have made an excellent expert witness had the cholera outbreak been the subject of a lawsuit: his diagram provided not only a means of arriving at an insight as to what was causing the spread of the disease but also a clear and convincing explanation of his reasoning, much better than statistical data alone could have done.

This early application of graphics to a problem involving numbers shows its power both as an analytical and

communication tool:

- it helps analysis: factual and measured data provide an insight that is immediate and intuitive;
- it helps communication: the insight is communicated quickly and easily to others.

Today, using a computer, Dr. Snow would be able to make his graphics even more powerful by adding an extra dimension to his chart: **time**.

For example, he could animate his chart so that the dots appear in the same sequence as the actual outbreaks. Those closest to the contaminated well would presumably appear first and the animation would show, in vivid colour, how the epidemic spread not just in space but also in time.

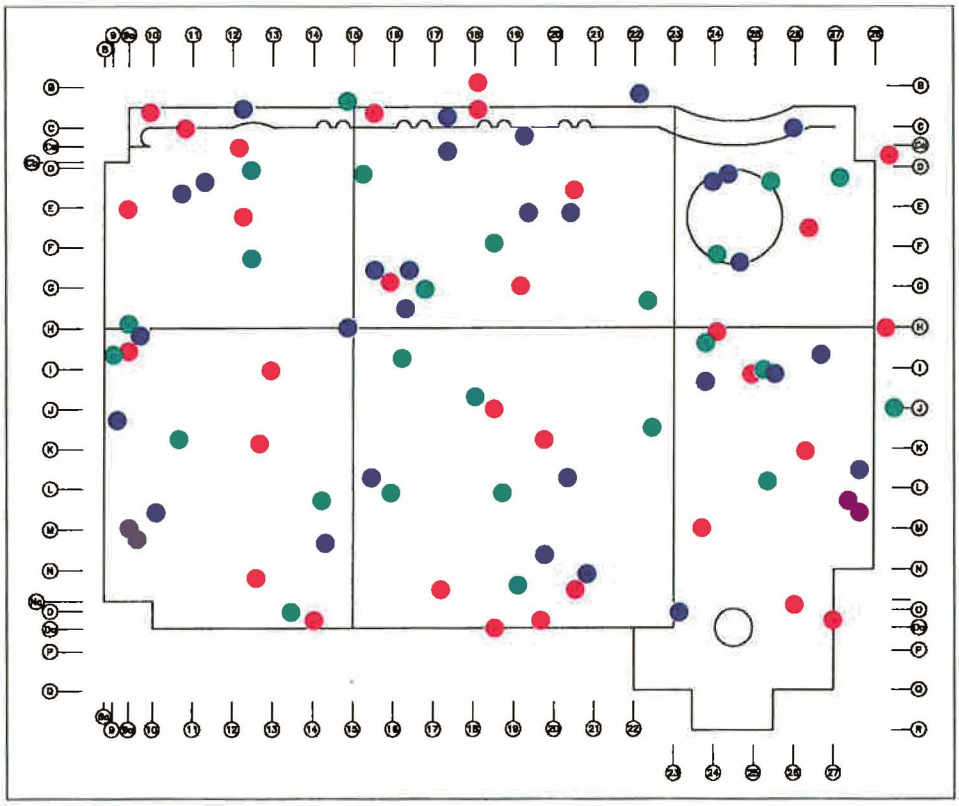

Fig. 2

Graphics in general, and computer graphics in particular, are just as useful in analyzing and explaining complex construction claims and disputes. With the arrival of the latest generation of computers, animation is now within comparatively easy reach even for complex situations.

Figure 2 shows a graphic analysis of a construction claim remarkably similar in concept to the analysis used by Dr. Snow almost 150 years ago (for the purpose of this article, the diagram has been simplified and made unre-cognizable). It has to do with a modern plague which sometimes seems just as dangerous for a construction project as a cholera epidemic was to a defenceless population in times past: a severe outbreak of change notices and change orders.

Each dot in the diagram represents a change order to be performed by two different subcontractors, distinguished by the colour of the dots. Each dot has hidden attributes, not shown in the diagram but recorded in a database, such as the number of the change order, its date plus other back-up information.

Attaching a date characteristic to each dot means that the diagram can be animated, with the dots appearing in the proper time sequence.

Several advantages of the diagram and its animation are evident:

- when all the changes are shown spread over the floor area, the number of dots grips the attention of the viewer and immediately conveys a clear message, even to the layman, of the extent of the problem;
- overlapping simultaneous dots show areas of interference where two trades had to work together;
- the distribution of the dots shows that they occurred all over the place — an indication of general chaos, lack or organization and possibly deficient plans and specifications, rather than localized problems;
- the analyst can zoom in on a particular area and reveal the data at several levels of detail, focusing down from a broad overview to the fine detail of any particular change.
- animating the chart, with individual dots appearing in the time sequence of the changes , shows the work that had to be performed simultaneously in different locations, or at different times in the same location.

The next example (Figure 3) shows the possibilities of animation when applied to a complex construction project a multi-storey office building. For obvious reasons, the diagrams have been simplified and made unrecog-nizable. The dispute, in this case, centred on various delays and problems caused by an interruption in the delivery of steel to the building site.

The presentation is recorded on a video cassette. It starts by taking the viewer around, through and above (and under, if necessary) the building to show its design and structure. There is a recorded verbal commentary so that the cassette can be viewed on its own, or the animation can be silent to enable a presenter to give his or her comments.

The animation can be stopped at any moment to investigate a particular view of the building.

This stage of the animation serves two functions:

- to record the effect of the interruption of steel delivery on the progress of construction as it actually happened, and
- to compare the as-built progress of construction to the same

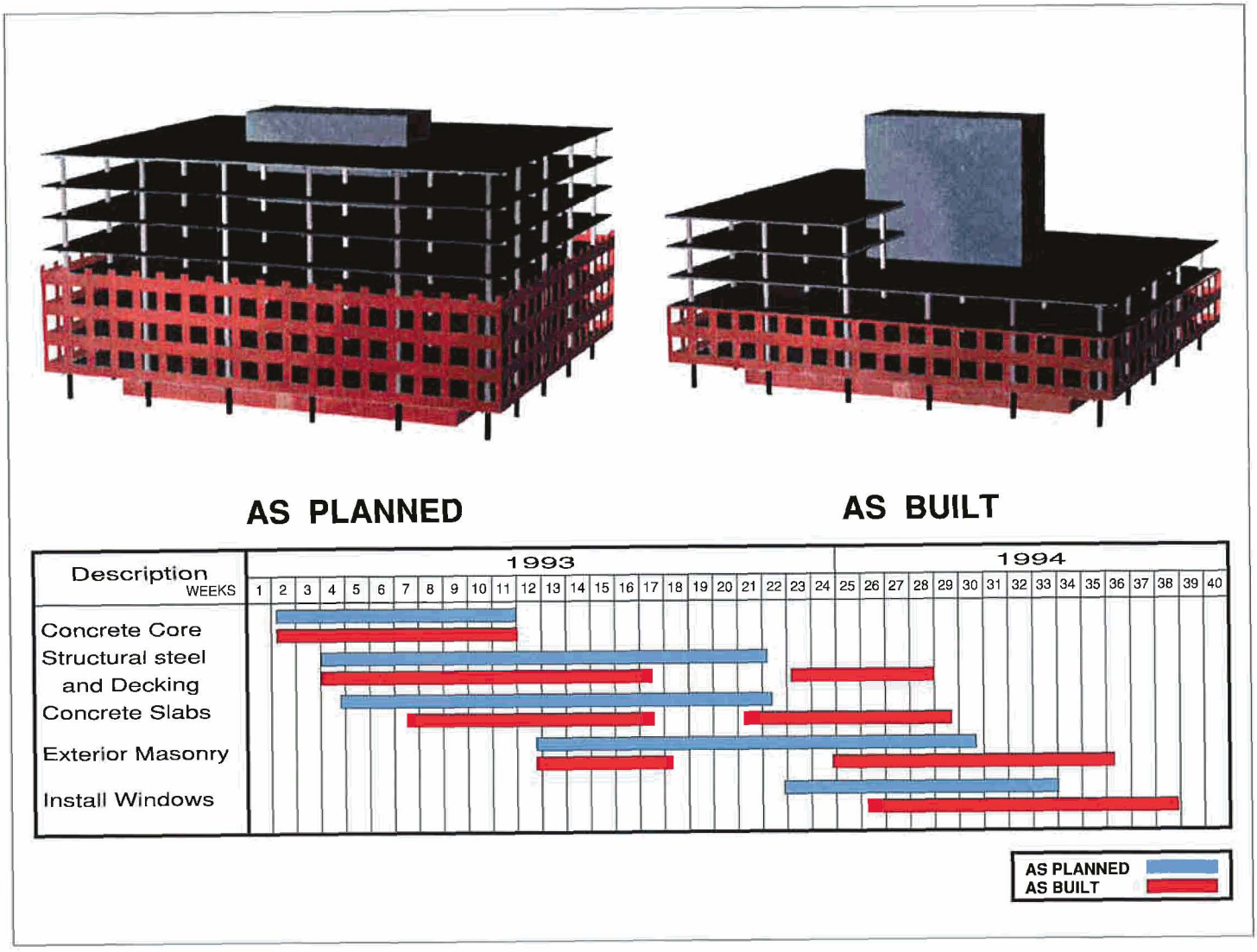

Fig. 3

process as scheduled by the general contractor.

Fig. 3 shows a frame of the animation, arrested at a given date. On the left, the building is shown at a stage of construction as planned; on the right, the frame shows the as-built stage which, obviously, lags behind the progress as planned.

The animation shows the process continuously from start to finish, with both views of the building growing side by side but at different rates.

Along the bottom of the screen, a bar chart shows the time scale of the events, with a vertical line moving across the chart synchronized with the animation above. The animation can be stopped at any given date.

The exercise is very useful because it shows with great clarity how the interruption affects the cladding which, on the left, is progressing smoothly up the facade while, on the right, reaches a certain level and can go no further. The installation of steel stops and other trades can go no further, are backed up as in a traffic jam, and stand idle or move to other jobs.

The full version of the animation would, of course, show much more detail. If necessary, it is possible, for example, to zoom in and examine in close-up view a column/beam connection, explode it and put it back together again, and — if required — even count the bolts.

The cost of animation can vary from very reasonable to quite high, for a complex project. It is therefore very important to establish the absolute minimum necessary to prove and/or illustrate the problem in question.

Using computer animation in court means carrying around a portable computer and a projection device. Luckily, those are becoming smaller, lighter, and cheaper. Alternatively, once the animation is completed on the computer, the finished product can be transferred to video tape and played back on an ordinary VCR in court. Some of the flexibility, however, will be lost in the process.

Animation is particularly useful as a "teaching" tool — for example, to explain in court an analytical process, such as so-called delay analysis using the "snapshot method" which is rather abstract and not particularly intuitive. For educational purposes, flexibility is not important and tapes can be used very successfully.

When using any kind of graphics as an analytical tool, it should be borne in mind that graphics can also lie. Computer graphics in particular can lie — unintentionally but nevertheless

quite shamelessly — since the work is done by a machine. A well presented lie can be quite convincing, an animation more so than a static picture which gives the viewer more time for a detailed check. It is therefore very important that, at any stage, the animation progress can be shown to correspond to the facts established by documentary evidence. The process of creating the animation must be transparent and demonstrable.

There is another danger. When graphic presentation becomes an end in itself, embelished and elaborated beyond the basic minimum required for communication, it becomes self-defeating. This often happens when the person who prepares the graphics or the animation is a graphic designer or a computer expert; the result is too much clever design and special effects, at the expense of content.

Most of the thought and work must be invested in the development or even invention of just the right graphics tool for a particular task; with a minimum of extraneous material. It requires imagination and experience and familiarity both with construction and graphics.

There is no shortage of people with construction experience. There are also plenty of graphic designers, most of them computer-literate. When dealing with a construction problem, the difficulty lies in bringing together the two kinds of expertise and investing enough time and effort in the task at hand to produce the right kind of graphic tool. In a complex litigation, however, the result can make all the difference.

Paul Sandori

WHAT WE'RE UP TO IN TORONTO:

Mark Doyle and **Charles Leonard** are involved in a major expansion of a convention centre where RAL have been retained by the developer to provide schedule review and monitoring services, as well as a review of delay and other claims. **Matthew Nicholas** is working with them in preparing a preliminary risk analysis on the schedule to assess the probability of meeting various end dates.

Brian Foster is analyzing disputes in the industrial and process plant sectors, including a gas cracker turnaround, a power distribution system at a shopping mall and an electrical retrofit of a garbage incinerator in the U.S.A.

Our cost experts, **Trevor Minstrell** and **Bob Hall**, are doing an analysis of the capital cost of a major transportation project as part of a review of the economics of a potential privatisation package. They are also working on the preparation of the construction schedule for the bidders on a multi-million dollar expansion of an automotive plant.

Paul Sandori has been invited to prepare a paper on post-construction liability in Canada. He will present the paper in October 1995, at the conference of the Centre International du Bâtiment in Tokyo.

Paul is currently conducting a multi-party mediation between a municipality, general contractor and consultants. Several other mediations are pending, proving that methods of alternative dispute resolution are getting a wide acceptance in the construction industry.

Beatrijs Williams and **Jarvin Wang** are currently preparing project documentation in anticipation of litigation on a large industrial project for which the claim amounts to several million dollars. This document control process involves the compilation of a very large database of all documentation on the project, which will be used for both an affidavit of documents and a source of relevant information for the legal team.

On the same project, **Mark Doyle** is helping the client in presenting their case to an arbitration panel.

Beatrijs is also working on several smaller claims. In an effort to make our services more affordable for small to medium-size clients, we are encouraging them to become active participants in certain aspects of the claim preparation process.

Lowell Kirsh, our technical assistant, is currently preparing an animation which will illustrate a delay claim. The technical input is provided by senior staff members.

For the past two years, four of our consultants have been working at the offices of a municipal transit corporation, where they are providing construction management services to support the client's construction staff:

Bill Fraser is the project manager and acts as the resident superintendent on specific contracts. **Don Hicks** has written the Construction Management Manual. He also reviews specifications and pre-tender documents.

Herschel Baldsing prepares schedules for special projects and acts as a construction engineer on specific contracts.

Bob Plewes is the construction safety officer responsible for safety on all construction department projects.

The Revay Report is published by Revay and Associates Limited, a firm of Management Consultants and Construction Economists with particular expertise in preparing and analyzing construction claims.

CONTACT INFORMATION

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