

... we are satisfied that the comparisons established by the (Pay Research) Unit are fair and accurate, and that they provide solid evidence on which to base the pay of the scientific grades".

The IPCS countered this by saying that "Pay Research provides an inadequate and unreliable basis for the determination of pay of scientists in the Civil Service because (1) of the quite different circumstances relating to the aims, functions, organization and staffing policies between research and development in government and in industry; and (2) the pervasive influence of the government (by far the largest single employer of scientists) on the pay of scientists in industry vitiates fair comparisons. The institution therefore considers that the pay of scientists should continue to be based solely on internal relativities."

These statements emphasize the extent of the differences between the parties. The institution pressed for the use of internal relativities to determine salaries and advanced several arguments that purported to show that pay research has several shortcomings when used in the present context. These arguments were chiefly based on the different career patterns of the government scientist and the scientist in industry. Among other factors, this results in significant differences in the ages of people doing similar jobs; for example, the equivalent of the Principal Scientific Officer in industry is nine years younger than his counterpart. The Civil Service tribunal announced their decision on the pay of government scientists on Wednesday. The overall result is a compromise between the increases asked for by the IPCS and that offered by the Civil Service Department. There will be an increase of 5% to all those classes not offered anything in the original offer. Mr. McCall described the award as deplorable.

BOX GIRDERS

Yarra Disaster

THE report of the Royal Commission into the lower Yarra river bridge disaster, published in Australia last week, has apportioned the blame for the disaster among the consulting engineers, the contractors and the bridge authority. The direct result is that the joint consulting engineers Freeman, Fox and Partners of London, and Maunsell and Partners of Melbourne, have been dismissed. To complete the bridge, the Lower Yarra Crossing Authority has instead appointed a team of engineers under its direct control. Dr W. A. Fairhurst, of W. A. Fairhurst and Partners of Glasgow, will

head the team, and a company spokesman said on Tuesday that Dr Fairhurst will be involved as an individual and that the company will not be directly involved.

The commission's report sets out the series of events that led to the tragedy on October 15, 1970, when 35 people lost their lives. A gap of several inches was found between sections 10 and 11 of the west side of the bridge when they were fitted together, and the report states that difficulty in getting the two half girders to the correct relative position "without doubt was due to the fact that the camber curves on the two halves were different not only in amplitude but in the shape of the curve, so that even when connexions had been made at a number of diaphragms it was still necessary to use large forces to make the remaining parts fit."

The large force in this case was applied by means of 80 tons of concrete blocks raised onto the bridge. On September 9, 1970, a buckle was observed and the report says "there can be no doubt that the act of adding the kenteledge"—that is the concrete blocks—"was the precipitating cause of the buckle. . . . The buckle was a clear indication that partial failure of the structure had occurred. The margin of safety against complete collapse must then have been small".

The collapse occurred after an attempt to straighten the buckle on October 15. Previously a buckle had appeared in sections 8/9 on the east side of the bridge, and this had been successfully dealt with in a similar way to the ill-conceived sequence of events that took place on sections 10/11 on the west side. The objective was to remove a series of bolts and so alter the distribution of stress in the buckled structure. The commissioners sum up what followed by saying "... a dramatic change took place. First, the vicious buckle, which up to that stage had been limited to the inner and upper panel, spread into the adjacent two upper panels. This was accompanied by the buckling failure of the upper part of the inner web plate." The report goes on to say "from that time onwards the north half span had inadequate strength to sustain its own weight, and only survived because it was able to bear down on to the south half through the interconnected transverse diaphragms." The collapse of the bridge occurred 50 minutes later which the commissioners feel was a surprisingly long time in the circumstances, and they suggested that "... a small increase in safety margin might have made all the difference".

The plans and calculations of Freeman, Fox and Partners come under close scrutiny in the report, which says that "the calculations contain a great many errors of arithmetic and of

engineering principle and these have gone unchallenged until this commission". The commissioners also stated that "they could not agree with Freeman, Fox and Partners' witnesses that "the design, as it now is, is unquestionably sound". Perhaps the most damning criticism is the following quotation from the report: "We reject ... claims of non-culpability by Freeman, Fox and Partners, and find it hard to believe that those who made such claims can themselves believe them to be true". The report goes on to say "... a basic cause of the tragedy ... was the design inadequacies which led to the safety margins being much too low and certainly lower than the specified values".

Freeman, Fox and Partners in their London office are silent about the report, although Sir Ralph Freeman, one of the senior partners, has been reported in a speech from Melbourne as saying that he categorically denies that the design of the west gate caused or contributed to the collapse. Sir Ralph also stated that he felt that none of the serious allegations made against his firm was well founded.

Indeed the Royal Commission's report and conclusions are the work of three men—Sir Hubert Shirley-Smith, Mr Justice Barber and Professor Bull—and there will be many differing views and opinions on the facts. It is, however, gratifying that a full report has been published. Although a bridge with a similar design collapsed at Milford Haven in June 1970, the whys and wherefores have yet to be made public.

The aspect of this disaster and report which will be of most concern to engineers in Britain is whether it will have any effect on the ability of British firms to bid for contracts abroad. A spokesman at the Institution of Civil Engineers said this week that he did not believe that the report would have any adverse effect. Only time will tell whether this is so.

ATOMIC ENERGY

Aldermaston March

THE Executive Committee of the British Society for Social Responsibility in Science has come out against the decision to transfer the Atomic Weapons Research Establishment at Aldermaston from the UK Atomic Energy Authority to the Ministry of Defence. In a statement issued earlier this week, the committee says that it is opposed to any steps to increase the size of the British defence establishment. It also argues that there are potential dangers in giving a single minister responsibility for the manufacture of nuclear weapons and for