# LOCAL GOVERNMENT AND ENGINEERING EDUCATION

Harold Beck

The Hatfield Polytechnic at Birklands, St. Albans, U.K.

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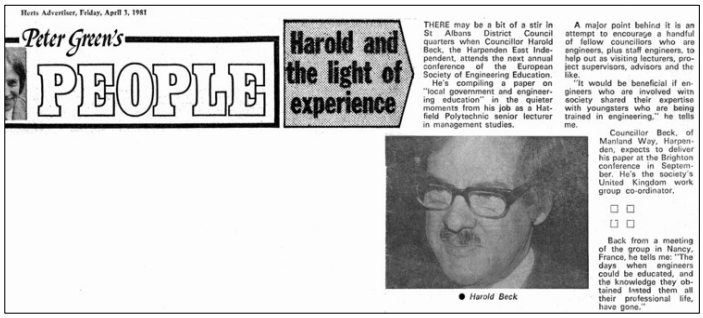

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Peter Green's PEOPLE

**Harold and the light of experience**

THERE may be a bit of a stir in St Albans District Council quarters when Councillor Harold Beck, the Harpenden East Independent, attends the next annual conference of the European Society of Engineering Education.

He's compiling a paper on "local government and engineering education" in the quieter moments from his job as a Hatfield Polytechnic senior lecturer in management studies.

A major point behind it is an attempt to encourage a handful of fellow councillors who are engineers, plus staff engineers, to help out as visiting lecturers, project supervisors, advisors and the like.

"It would be beneficial if engineers who are involved with society shared their expertise with youngsters who are being trained in engineering," he tells me.

Councillor Beck, of Manland Way, Harpenden, expects to deliver his paper at the Brighton conference in September. He's the society's United Kingdom work group co-ordinator.

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Back from a meeting of the group in Nancy, France, he tells me: "The days when engineers could be educated, and the knowledge they obtained instead them all their professional life, have gone."

● Harold Beck

## INTRODUCTION

The purpose of this paper is to indicate in broad terms many of the different kinds-of relationships between engineering education and Local Government. Some of these relationships are illustrated in Figure 1.

In England and Wales, the public sector half of the binary system of higher education is administered through local authorities. Two of the four generic types of authority created in the 1974 Local Government reorganisation, namely metropolitan districts and non-metropolitan counties, have responsibilities for higher education (1). These, together with the atypical Inner London Education Authority, are known as Local Education Authorities (L.E.A.s).

Engineering features strongly in public sector higher education. A large number of. Polytechnics and Colleges originated as technical institutions and their involvement in engineering education has kept pace with the developing needs of industry, commerce and the public services for engineering expertise and skills at a variety of academic and practical levels. Some idea of the public sector activity can be obtained from the fact that in 1979 approximately 1000 full-time and 2000 sandwich engineering degrees were obtained at Polytechnics compared with about 6000 full-time and 2000 sandwich at Universities.

## GENERAL CONTROL BY CENTRAL GOVERNMENT

Administrative monitoring and control by Central Government of public sector higher education is carried out through its Department of Education and Science (D.E.S.). For example, Her Majesty's Inspectors have, ready access to local authority Polytechnics and Colleges and provide independent advisory reports to the D.E.S. Also, although funds for higher education are raised locally by L.E.A.s through the rating system, overall financial allocations are determined by-the D.E.S. Moreover, for degree and. most full-time and sandwich courses the Regional. Advisory Councils, established by L.E.A.s to ensure adequate provision and avoid unnecessary duplication and expense, can only recommend; in these cases it is a Regional Staff Inspector, linked to the D.E.S., who makes the decisions on behalf of the Secretary of State for Education, a Government minister.

Central Government control is however, on the whole, of a general nature. Thus, engineering is not usually distinguished from other disciplines when decisions are being made at national level about public sector higher education. The different basis of funding required for engineering and other laboratory-intensive disciplines as distinct from "classroom" subjects are, of course, considered by the D.E.S. but this takes the form of calculations on decisions taken locally rather than nationally. Occasionally, a specific initiative may be exercised by the D.E.S. such as in its sponsoring of "enhanced" engineering degree courses in a small number of Polytechnics. In this as in other instances the response to the D.E.S. approach was left entirely to the discretion of each Polytechnic and its L.E.A. Thus, engineering education is not subject to specific control by Central Government; local authorities have considerable autonomy in determining its nature and level. It should however be added that at the time of writing (April 1981) the system of control is under active review by both D.E.S. and L.E.A.s.

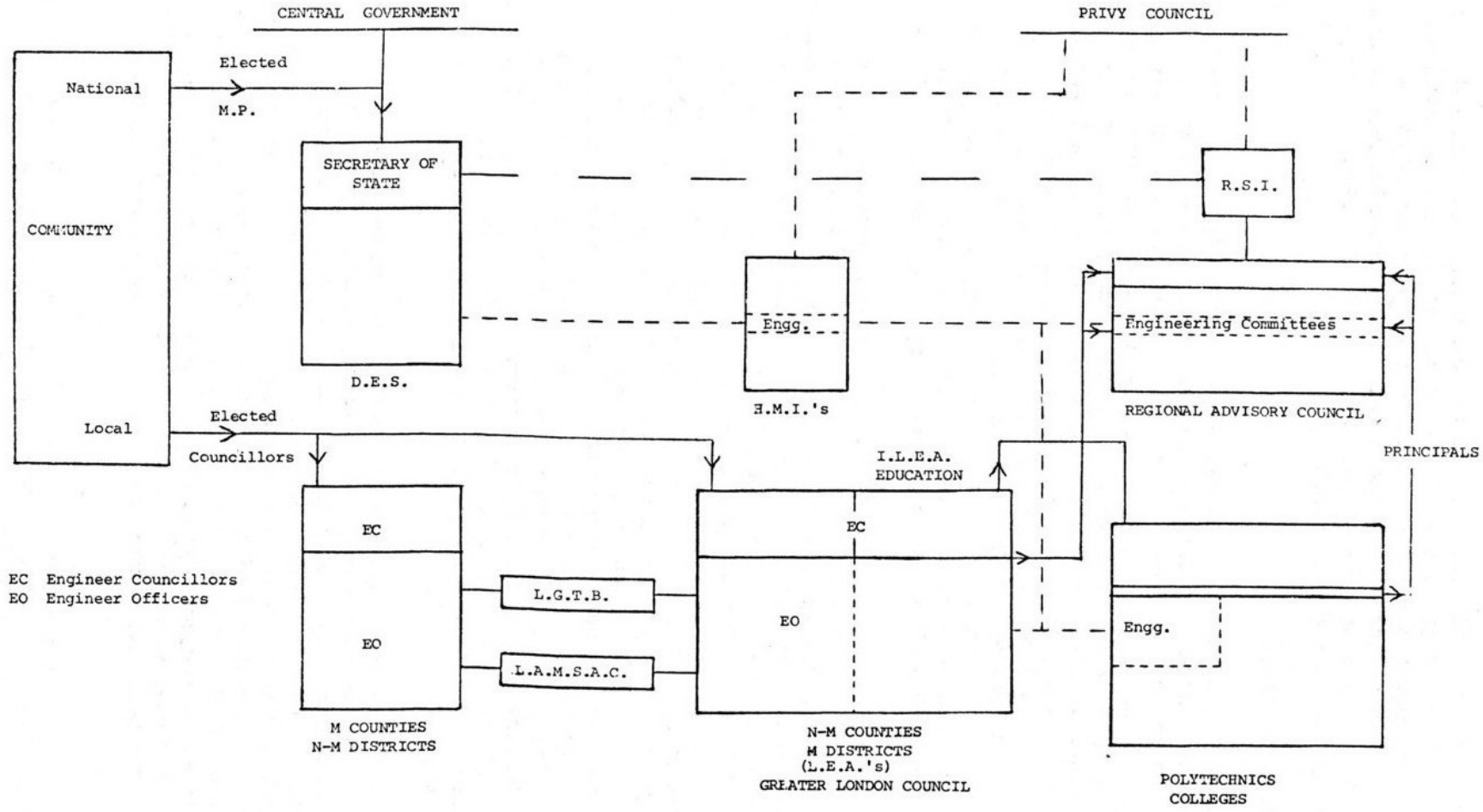


Figure 1 RELATIONSHIPS BETWEEN LOCAL GOVERNMENT AND ENGINEERING EDUCATION IN ENGLAND AND WALES (ILLUSTRATIVE)

## LOCAL GOVERNMENT CONTROLS

Much of the autonomy of L.E.A.s is passed on to the educational institutions themselves. However, some controls are retained, especially regarding income and expenditure. Formally, these controls are exercised by Councillors who are elected members of the community but Officers of the Council also play a significant part. Thus committees of Councillors, advised by Officers, determine the financial allocations to each Polytechnic and College. Also, Councillors are appointed to the Board of Governors of each institution of higher education and generally one of those so appointed becomes Chairman of the Board. Furthermore each L.E.A. may appoint a Councillor to serve on -the Regional Advisory Council (though in many cases an Officer attends instead) and can thus be involved in the provision of higher education over a very large geographical area.

L.E.A.s have some direct involvement in engineering education, for example through capital allocations for equipment. Typically, each Polytechnic and College specifies to its local authority its requirements bearing in mind the amount of money likely to be available. The list of equipment with estimated costs is considered by a committee of Councillors guided not only by Officers but by other sources of advice such as H.M.I.s and advisory committees comprising industrial as well as educational members. Councillors can and sometimes do query particular items of equipment and may bring about a change in the list. Once approved the institution may purchase the equipment through the local authority, typically on the authorisation of the Chairman of the Board of Governors but with items over a specified amount requiring D.E.S. approval in addition. It should be noted that though the proportion of money allocated for engineering education is determined within the Polytechnics and Colleges and not by the local authorities, there are national norms which by incorporation in advice given to the institutions can exert a regulating influence.

Another direct link. between Local Government and engineering education is through representation on the Regional Advisory Councils' subject committees, which carry out the detailed examination of existing and proposed courses. Because normally only a minority of authorities in a Region are directly involved with a particular committee, those appointed to serve face considerable difficulty in communicating and consulting with the other authorities. It is worth noting, too, that appointments from local authorities to subject committees are generally made from their Education departments, even when the subject concerned is of major interest to another function of the authorities, as is the case with civil engineering.

It should be emphasised that on the whole, decisions about the nature and level of any particular discipline or subject are devolved to the educational institutions themselves.

## ACADEMIC CONTROL

Regional Advisory Councils require an outline of the content of each course so that they may carry out the functions assigned to them by the L.E.A.s. In declining to recommend approval of a course on the grounds of, say, undesirable local duplication or in suggesting, for example, a modification that would better meet the needs of industry, the Councils are exercising very little, if any, control of academic content. The significant details of content are for the educational institutions to decide in collaboration with the Council for National Academic Awards (C,N.A.A.) and/or various professional bodies.

With regard to research and consultancy activities, the level in each Polytechnic and College is dependent on the support given by the controlling L.E.A., particularly with regard to the setting of teaching performance ratios which are in general adversely affected by non-teaching academic activities. Again, however, the educational institutions themselves are given virtually complete autonomy in the choice of topics for research and consultancy.

## LOCAL AUTHORITY INVOLVEMENT IN ENGINEERING TRAINING

Each of the four generic types of local authority employ a number of engineers as Officers, whose professional standing range from chartered engineers through technician engineers to engineering technicians. Appendix 1 indicates the pattern for a sample of non-metropolitan authorities. In some disciplines the ratio of chartered to technician engineers and its implications for training is under review, it being suggested that there are too many chartered engineers performing technician jobs (2).

The distribution of specialist engineering disciplines within local authorities reflect the functions of the particular type of authority. For example, a non-metropolitan county with its major responsibility for roads employs highways engineers in considerable numbers. Technology-based disciplines, such as electrical and electronic engineering, hardly feature at all in the staffing of local authorities.

The two generic types which are also education authorities employ engineers covering a wide range of both application-based and technology-based disciplines as academic staff in their Polytechnics and Colleges. However, although on the payroll of the L.E.A.s they are in a special category of employee governed by a number of statutory instruments which do not apply to staff employed elsewhere in the authority. They are not therefore considered to be Officers of the authority itself and are excluded from further consideration as such in this paper.

Practical training Local authorities are closely involved in training schemes in which newly qualified engineering entrants study and practice engineering under the supervision of a chartered engineer. For example, in a scheme drawn up by. the County Surveyors' Society in conjunction with the Institutions of Civil Engineers, Municipal Engineers and Highways Engineers, graduates in civil or structural engineering are trained for six years "under agreement" to reach chartered status. Much of the training is on the job but there are also special short courses arranged, many of them given by the local authority's own engineering staff.

There is a corresponding scheme for the education and training of civil engineering technicians for the highways function. It is also reported that local authorities are viewing with increasing favour the expertise and outlook of sandwich course graduates and are providing placements for sandwich students in increasing numbers.

Costs Most of the cost of practical training is not specifically identified, it being considered an integral part of a chartered engineer's duties to provide supervision and tuition. Thus, although in one authority less than £20,000 out of a total engineering department budget of about £20M is set aside for training, the cost of the actual effort must be many times this amount. There is likely to be increasing pressure to identify and estimate these hidden costs.

External courses Much of the £20,000 or its corresponding amount is used to procure courses from organisations external to the department concerned. These courses, many of which are provided by public sector educational institutions, can be of a specialist technical nature, for personal skills development and for training in various aspects of management.

As an example, the Centre for Management Studies of Hatfield Polytechnic, whose L.E.A. is Hertfordshire County Council, provides a course in two 2-week blocks, at preferential rates, for that Council's Highways department. Most of the participants are engineers in the department but a minority of places are reserved for their administrator colleagues together with one or two for highways engineers employed by central government and stationed locally in Hertfordshire. The "mix" of course membership facilitates on the job teamwork. There is a considerable emphasis on:

- personal skills development (e.g in public speaking, interviewing, running public meetings and presenting cases)
- concepts of behaviour and their application to personnel. and industrial relations problems
- current legislation. (e.g. regarding health and safety)
- the specific management systems in the Highways department.

An unusual feature for this type of course is that students are assessed, by open-book examination.

L.G.T.B. Local Government Training Board is funded by a special allocation of over £4M, made by Central Government on the recommendation of local authorities. Its essential functions are to advise local authorities and initiate action on the training of the 1 million or so people in Local Government employment.

The L.G.T.B. has no involvement in the initial formation of chartered engineers at Universities and Polytechnics nor in their subsequent practical training. This is largely because the engineering institutions are already closely linked directly with higher education and local authorities. The Board is

engaged in the management development of professionals but has a policy of not discriminating between professions or disciplines.

The position of the L.G.T.B. is quite different in-the case of engineering technicians since it is able to influence engineering education and training at this level. It is particularly favourably .disposed towards and involved in Technician Education Council (T.E.C.) courses and awards as they facilitate career development from craft to technician grade. Moreover it is possible through T.E.C. courses for a technician to change from one function to another, such as from building control officer to highways technician, without having to start again from the beginning.

L.A.M.S.A.C. (Local Authorities Management Services And Computers Committee) is financed jointly by Local and Central Government to provide advisory and consultancy services which aim at helping local authorities to make the best use of their available resources, At the present time its engineering education activities are limited but there are plans to increase commitment in this field, for example by providing training in the application of computers to specific types of engineering work.

## ENGINEER OFFICERS

Relationships between Local Government and engineering education can be perceived by individual engineers appointed as officers of local authorities as quite different from those envisaged by their associated organisations. A pilot survey has been carried out among non-metropolitan authorities - one county council (and therefore also an L.E.A.) and three district councils - to establish some facts and obtain views on engineering education from individual engineers. Principal- foci of the survey were to gather preliminary information on dissimilar non-technical attributes, involvement in life/death decisions and links with engineering education, as a follow-up to previous consideration of these topics (3).

There were 16 county and 8 district respondents. Ages ranged from the 25-34 to the 55-64 groups. All but one of the respondents belonged to one or more. of the three engineering institutions, namely Municipal, Civil and Highways. It was interesting to note that half the district respondents were corporate members of all three institutions whereas the county engineers cited corporate membership of one or two only.

Value of engineering education Another distinction was that whereas most district respondents considered analytical skills, a logical approach and a methodical process of problem-solving to be features of engineering education of particular value in their work as officers, the majority of county engineers rated the understanding of technical matters most highly, probably reflecting the greater population of engineers and the more specialist structure of county engineering activities.

Disadvantages of engineering education There was little difference in pattern between district and county officers in other aspects surveyed. Nearly a third considered that their engineering education contained nothing which placed them at a disadvantage in their later careers. Some did, however, discover that the technical content had been obsolescent and also observed with regret that it was difficult to keep up to date. Some respondents thought that omissions in their initial formation - such as in management, accountancy and law had been a considerable drawback to them.

One respondent considered that the professionalism acquired by engineers during their formation inhibited the effective multi-disciplinary team effort essential for local authority work. Another stated that the-scientific training. of engineers made them disinclined to generalise on a subject and so prevented them from expressing themselves in a way in which committees could understand.

Changes in non-technical attributes Asked about the changes which had taken place in their non-technical attributes the only two respondents who indicated that there had been no change were the two youngest who were both in the 25-34 age group.

About half cited management skills, especially those relating to financial disciplines and cost-effectiveness. Four had taken a C.N.A.A. Diploma in Management Studies course and two had become members of the British Institute of Management.

Also featured were changes in attitude resulting from the development of various kinds of understanding - of other departments, other disciplines, Councillor/Officer relationships, community relationships, laymen and the needs of the public. Mention was also made of understanding party politics with a view

to predicting possible changes in policy, acquiring knowledge of the manipulative processes by which decisions are obtained and using diplomacy.

Two of the Officers had purposefully set about developing their skill at using the English language, others described changes in attitude such as a realisation that Officers are servants of the public and that the rejection by Councillors of a technically correct solution is not intended as a personal insult. However, one or two Officers responded along the lines of "society should adopt my engineering approach."

Quality of life implications All but two engineer Officer respondents considered themselves involved in work with quality of life implications and most also cited life/death issues. Work described in one or both of these categories included:-

Development control

Designing drainage, and flood control schemes

Developing public transport facilities

Supervising grass-cutting

Assessing traffic noise and offering double glazing

Designing road improvement, road safety, accident remedial and traffic management schemes

Preparing Emergency and Civil Defence plans

Supervising road maintenance, especially with regard to winter gritting and salting.

The road gritting and salting responsibility was clearly the cause of much concern to a number of engineer Officers in both county and district authorities. The reasons why this apparently mundane Matter assumes life/death proportions become apparent when the major issues associated with this work are identified (Appendix 2).

Involvement in engineering education The responses showed that most of the Officer involvement in engineering education is confined to the practical training schemes. The amount of lecturing in educational

institutions was very limited and in any case took place in early career and was on purely technical topics. Only five respondents reported recent or current external educational involvement and this was mostly in an advisory capacity in connection with technician training and giving lectures to technical societies. Only one Officer clearly identified a non-technical aspect of engineering work as the basis of an input to the external educational system. This took the form of a session for a management course on the effect of economic pressures on local government engineering activities. It is clear that direct feedback by engineer Officers to undergraduates on some of the non-technical realities of engineering jobs is almost non-existent.

## ENGINEER COUNCILLORS

The pilot survey of Councillors with engineering backgrounds was restricted to three non-metropolitan district authorities in S.E. England; at the time of the survey, non-metropolitan counties among others were in the campaigning phase leading up to their four-yearly elections.

It is somewhat difficult to identify those Councillors who are recognised engineers or who carry out engineering work. Most will include the relevant information in their election literature but this is not generally collected centrally in a local authority area, other perhaps than inaccessibly in the headquarters of the political parties in that area.

Due to an unusual combination of circumstances, reliable information on the number of engineers elected as members has been obtained for one non-metropolitan district council in S.E. England. Over the past seven years, this council, with a full complement of nearly sixty members (the total has changed due to population and boundary alterations over this period), has included 5 or 6 chartered engineers and for some of the time 1 recognised technician engineer. The numbers have varied due to the preferences of the public at the polls. In addition, at least four other Councillors with science or engineering qualifications are or have been engaged in engineering work in local industry. In recent years, out of four

Mayors two have been chartered engineers while out of four Deputy Mayors one has been a chartered engineer and another had a strong engineering background. In one of these years both members of the Mayorality were engineers.

The factors which influence the involvement of engineers as Councillors include:-

(a) the nature of local industry, e.g. high technology, engineering

(b) the extent to which local industry encourages staff participation in local government

(c) the political balance in the locality and the attitude of local party organisations to qualified professionals.

In the particular district concerned, all these factors appear to be favourable to engineer participation through the three main parties represented on the Council. Conditions are likely to be no less favourable in numerous other districts and counties up and down the country. On this basis there are therefore likely to be large numbers of engineers, probably upwards of 1000, involved in Local Government as Councillors.

In the event, the response to the pilot survey either confirmed the difficulty of contacting engineer Councillors or indicated that the one known council is unusual or unique. Further investigations will be carried out to elucidate these points.

General survey results The seven Councillor respondents to the survey covered the age range 25-34 to over 65 and the age at first election as a Councillor varied from 26 to 49. One was a Polytechnic lecturer - members of staff of public sector educational institutions are eligible for election to local authorities other than their own L.E.A. Another was a senior partner in a firm of consultant engineers. The remainder were employed in industry. A wide range of engineering disciplines was represented.

The motivation to enter Local Government as Councillors was not based on engineering zeal. Reasons given included "interested in politics since age of 16", "wanted an outside interest", "interested in the village" and "out of the blue I was asked if I would consider becoming a Councillor by standing at the forthcoming election - I said I would, I did and I am."

Offices held include chairmanship of committees covering a diversity of functions e.g. health, leisure, museums, properties, staff and salaries, plans and highways. In addition, some had acted as officers (e.g. leader or secretary) of the political party groups within their councils.

Value of engineering education Although engineering did not feature in the reasons for becoming Councillors, most found aspects of engineering education of value in Council work e.g. ability to grasp technical innovations in the Council, use specialist knowledge (e.g. in acoustics) to bear on some decisions, analyse and question the logic of reports to committees etc.

Disadvantages and changes Responses regarding disadvantageous effects on Council work of engineering education, as well as the changes that had occurred in the non-technical attributes of the engineer Councillors, could be divided into two categories:-

1) adapting to new situations as they arose.

   e.g. increasing reading speed, listening sympathetically and endeavouring to help with electors' personal problems, developing committee skills, submerging strongly held views based on logical analysis, throwing logic aside where appropriate and instead following the line that sometimes "in politics it pays to be thoroughly unreasonable."

2) endeavouring to change the situation, or accept a permanent mismatch to it, without themselves changing.

   e.g. the practice of engineers in industry of working to specifications and making quick irreversible decisions should be adopted in Local Government, frustration that the industrial engineering approach is not understood by council members and Officers.

Quality of life implications The quality of life activities cited by Councillors included most of those put forward by the Officers but Finance was added and there was an emphasis on Planning and Development,

especially with regard to leisure and recreation. To the list of life/death activities were added Environment Health and Cemeteries.

Involvement in engineering education None of the Councillors were involved in engineering education. The only remotely connected citation was of one Councillor who was engaged in a secondary school/industry project.

## CONCLUSIONS

Relationships between Local Government and engineering education are very complex - much more so than appears from this paper. The high degree of administrative and academic autonomy accorded by Central Government to Local Education Authorities is noted. Academic control is devolved to the educational institutions themselves, moderated by various external organisations. However in the case of practical training within Local Government service for recognition as chartered engineers the professional engineering institutions are dominant.

Many of the links which have been designed into the system or have developed naturally are no doubt contributing to making public sector engineering education cost-effective and relevant to the varied needs of society whether it be in industry or the public services, including the local authorities themselves. Nevertheless it is probable that some of the arrangements, for example representational, while admirable in principle are not working well in practice and that opportunities of considerable potential value, such as feedback by engineer Councillors of experience in society, are not being taken up.

The pilot survey indicates that approach and attitude are regarded by engineer Officers and Councillors alike as ranking beside specific knowledge and skills in promoting effectiveness in Local Government. This lends support to the view that we need to look again at initial formation to see that appropriate non-technical attributes are not suppressed or destroyed but where possible fostered. It is also clear that while in recent years improvements have been made in the initial education and training of engineers for employment in local authorities, there are still a number of major deficiencies in knowledge and skills perceived by the engineer Officers themselves and it is therefore important that both initial and continuing engineering education, and particularly the latter, should receive closer scrutiny. The pilot survey has provided much useful experience on which the design of a more definitive survey can be based.

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# ENGINEERS EMPLOYED IN LOCAL GOVERNMENT

## Illustrative Patterns

Non-Metropolitan County Council, per 1M population:-

| | |
|---|---|
| Chartered Engineers (C.Eng.) | 70 |
| In training for recognition as chartered engineers | 20 |
| Technician Engineers (T.Eng.) (Higher Technician Grade) | 10 |
| In training for recognition as Technician Engineers (Technician Grade) | 10 |
| Higher Technicians | 30 |
| Technicians | 30 |
| TOTAL | 170 |

Non-Metropolitan District Council, per 0.1M population:-

| | |
|---|---|
| Chartered Engineers (C.Eng.) (1 Chief, 1 Principal, 2 Senior Engineers) | 4 |
| Technician Engineers (T.Eng.) (2 Assistant Engineers, 1 Engineering Technician) | 3 |
| Engineering Technicians | 5 |
| Trainee for Engineering Technician Grade | 1 |
| TOTAL | 13 |

## Summary of Situation

## WINTER ROAD SURFACE TREATMENT

In many parts of England, the main form of road surface treatment necessary during the winter is the spreading of a mixture of grit and salt. This always takes place on selected roads when conditions are definitely icy. A difficult situation arises, however, when the weather is at the borderline of icy conditions, especially when meteorological forecasts state "temperature will be below zero but surfaces are expected to remain dry."

Engineer Officers are closely involved in the salting and gritting operations. The quality of the grit/salt mixture, its effectiveness, its purchase and storage at suitable points, the vehicles and equipment used, the roads selected, the routes followed, the speed at which the work is done, etc., etc., generally come under the aegis of the technical services or highways department, in which there is a preponderance of engineers, including a number with identified management responsibilities.

When a borderline meteorological forecast is received, most authorities do not automatically call out the gritting/salting teams for that may involve unnecessary expenditure and an excess of corrosive salt on the roads, both of which result in complaints by members of the public. Moreover in an unexpectedly harsh winter there may be shortages of grit/salt mixture, not just locally but nationally, or it may be difficult to move supplies from central stocks because of the same wintry Conditions. It may therefore become necessary to conserve whatever local stocks there are.

One aid to decision-making about borderline conditions is to carry out local tests on parts of the road system particularly prone to ice formation. How many test points should there be and where should they be located? What tests should be carried out, who should carry out the tests (which are often needed in: the middle of the night), how should the results be collated and who should make the final decision about gritting and salting on that particular occasion? These are questions to which engineer Officers usually have to supply the answers and Councillors, engineering or otherwise, have to approve in broad outline.

For the vast majority of occasions the whole scheme works well and achieves. a satisfactory balance between the many conflicting requirements outlined. Occasionally, however, with the system working as intended, a decision is taken not to treat the surfaces but unexpected conditions occur which cause icy patches on the roads. This has led to loss of life.