

THE SHIRE ENGINEER OF N.S.W.,
HIS DUTIES, QUALIFICATIONS AND PRIVILEGES.

BY L. G. BUCKNELL, B.E.,
Late Shire Engineer and Clerk, Gadara Shire, Tumut.

*(A Paper read before the Sydney University Engineering Society,
October 28th, 1914.)*

The Shire Engineer of New South Wales was born on 1st January, 1907. Prior to that date the State was not divided into shires, hence the Shire Engineer was an unknown quantity. All country engineering developmental work was then done by officers of the Public Works Department stationed at various centres. They were styled, at different times, Road Superintendents, Resident Engineers, District Assistant Engineers, and District Works Officers. Their principal duties were: (1) To maintain all roads and bridges in their districts; (2) to further develop those districts by the construction of new roads and bridges. For these purposes each district had allotted to it an Annual Government Grant of money. Their work was closely watched by supervising Engineers from Head Office. A great advantage in this system was that all the Resident Engineers were trained in the same school, so that there was uniformity of road and bridge construction throughout the State. All culverts and bridges were constructed from standard designs, which saved considerable work in regard to calculation and drawing, besides ensuring a uniform standard of excellence.

These drawings of standard types of bridges and culverts were prepared in the Sydney office, thus reducing the local Engineers' opportunity for expert designing. Still, with all this system, there was left ample scope for an Engineer to impress his personality on his district and show originality and skill.

The local Engineer's salary varied from £250 to £450 per annum. Added to this was £175 a year equipment allowance, as, of course, it was necessary for the Engineer to have a means of getting over his district. The usual equipment was a buggy and pair, with generally a sulky as well, and a spare

horse or two. Motor-cars in those times were not sufficiently reliable or economical. Most of the Resident Engineers had assistants, whose salaries varied from £100 to £200, with £75 equipment. When their training was complete, and an opening occurred, the assistants became Resident Engineers.

The Resident Engineers had very little opportunity of carrying out municipal works, such as kerbing and guttering, town drainage, street making, etc., for the reason that as soon as a town grew to a population of about 1,000 it became incorporated; that is, was made into a municipality, and became responsible through its elected aldermen for all its own local works. The areas of these municipalities extended outward from the centre of the towns to a radius of from one to six or seven miles.

I remember what annoyance and inconvenience used to be caused by the existence of these municipalities. Having to depend on their own local rates for their revenue, they never had enough to keep their roads in anything like the same condition as those outside their area, maintained by the Government. Frequently in wet winters the Engineer used to find himself in the anomalous position of being in his office in town, in the centre of his district, yet entirely isolated therefrom, and almost unable to traverse the quagmire which separated him on all sides from his own roads; or, on the other hand, to be bowling along his own first-class metalled roads, and nearing home with tired horses, when on the side of the road would appear the ominous letters M.B. (municipal boundary), and from then to home would be plug, plug, plug, with horses done up, night coming on, and temper all to glory. This state of affairs has, I think, pretty well disappeared by the Government stepping in and giving large grants to some municipalities, and by curtailing their areas in other cases.

On January 1st, 1907, the Local Government Act came into operation in New South Wales. Under this Act the existing municipalities remained, and the balance of the area of the Central and Eastern Divisions of the State were divided into 134 shires, varying in size from the Kuring-gai Shire, with headquarters at Gordon, which contains 36 square miles to the Lachlan Shire, Condobolin, with 5,730 square miles. These, central and eastern, are the Territorial Divisions of the State, adopted by the Lands Department for slightly altered conditions of the Land Act. The Western Division extends from beyond Dubbo to the South Australian Border. In this division, settlement is very sparse, and road construction is almost unknown. So far, it has not been thought desirable to extend the operations of the Local Government Act into this division, and the development of the country is carried on by members of the Works Department on lines similar to those already described.

When Local Government came into force the Works Department handed over all purely local works to the Shire Councils, but anything in the shape of national works was retained and placed under the supervision of District Works Officers, of which there are 17 in the State, including those in the Western Division. These District Works Officers control such works as Harbour Works, Government Buildings, bridges over £2,000, large sewerage and water supply works, swamp drainage, river works, etc., etc. This leaves the purely local works to be carried out by the Shire Councils.

The permanent officers of a Shire Council are the clerk and the Engineer, who between them are responsible for the whole management of their shire.

One of the sections of the Local Government Act provides for the employment of the Shire Engineer, stipulates his duties, and fixes a standard of qualification.

I will deal first with his qualifications, and will read from the Act and Regulations:—

“No person shall be appointed as Engineer to a shire unless he holds either a valid certificate or an interim certificate as Engineer.

“Any person holding and producing to the Engineering Examination Committee the certificate—

- (a) of Corporate Membership of the Institute of Civil Engineers, or
- (b) of a degree in Engineering of the University of Sydney, or
- (g) of having served to the satisfaction of the Committee a pupilage of not less than three years to a recognised Civil Engineer,

shall be entitled, on producing satisfactory evidence of character, and on payment of a fee of one guinea, to receive from the Committee a ‘Certificate of Qualification’ to be an Engineer to a shire or municipality.”

If the clause ended here an Engineering Graduate would be qualified to act as Shire Engineer, and, of course, the theoretical knowledge attained during the University course is far in advance of what is required to fulfil the ordinary duties appertaining to the position. But it must be recognised that knowledge gained in the University alone is not sufficient, especially when it is taken into consideration the fact that the most important duties of the Shire Engineer include administration and the economical husbanding of the Council’s funds, and also the management of the working men. For these duties something more than a University training is quite necessary; therefore was added the following to the above quoted Clause in the Act:—

“Provided that applicants for certificates shall also furnish evidence of having, for not less than two years, had responsible control of the design and construction of works such as are usually carried out by Shire and Municipal Engineers.”

This would appear to put the inexperienced graduate quite out of the running, except that since the original Act was passed the following Clause has been added:—

“INTERIM CERTIFICATE AS ENGINEER.

“Any person who has had adequate professional training as defined above, but has not, in the opinion of the Committee, had the necessary practical experience in such works as are usually carried out by Shire or Municipal Engineers, may, on furnishing satisfactory evidence of character, be granted an interim certificate for two years, which may be extended to three years should the Committee deem such extension desirable. At the expiration of this period, or during the currency thereof, the Committee may issue to such person a certificate of qualification as Engineer. Provided (1) that he has fulfilled the prescribed conditions as to character; (2) that he produces a certificate from the Councils by whom he was employed that his character, conduct, and services have been satisfactory.”

This addition to the Act takes away the young graduate's disability to become a qualified Shire Engineer. But it is doubtful if this will be effective, for the reason that when a Council, composed usually of country farmers and such like, are about to appoint an Engineer they will usually pass over the highly educated, inexperienced man while practical men are offering. So that the question still remains, how is a graduate to become a Shire Engineer. The position is not such as lends itself to the employment of cadets, or Assistant Engineers, as the shires can afford only one Engineer, and, generally speaking, there's only enough work for one Engineer to a shire. At the same time this matter of Engineering Cadets in shires is one of great importance, and is receiving serious consideration at the hands of the authorities, and I understand there is to be a conference shortly to deal with this question. It is easily seen that, according to the Act interpreted above, it is almost impossible for a locally-trained man to become a Shire Engineer; and as those Engineers now in employment gradually go out of the running, their position will have to be filled by men who have had the necessary training in other countries where such is available at a cadet's salary. This is a deplorable state of affairs, and the local man should certainly be given an opportunity to fill these positions, which present to the young Engineer such good fields for practical training.

The whole position appears to me more or less contradictory, as, unless a candidate for certificate has one of several

qualifications, some of which I have previously mentioned, he has to pass an examination which requires a considerable amount of theoretical training, as shown by a set of examination papers which I have added to the back of the printed proofs, and which I will leave you to look over at your leisure. No doubt they would be child's play to any one here present, but I am prepared to gamble pretty heavily about the majority of Shire Engineers being able to get a pass percentage in them.

There is no doubt that both theoretical training and practical experience are necessary, but the trouble appears to me to lie in the fact that if a man has had the experience and the theoretical training necessary to enable him to hold the statutory qualification—well, one wonders why he is still looking for a job. And a sensible Council would perhaps look for a young man with his future all before him and a career to make. One way out of the difficulty would be for two or three shires to jointly appoint an Engineer and Assistant; or for one shire, instead of appointing two men as Engineer and clerk, to appoint one man to the dual position, with an Assistant to co-operate with him in either or both capacities. Either of these alternatives would enable the young Engineer to gain the necessary field experience. But although either of these courses is permissible by the Act, and was at first availed of by various shires, yet the tendency is growing to provide each shire with an independent Engineer.

Another way that has occurred to me by which it may be possible for a young graduate to gain the necessary experience, is to apply for a position and furnish a statement with his application that, having passed the statutory examination, he is willing, in order to gain the necessary field experience, to forego portion of the advertised salary, such portion to be paid to a Consulting Engineer with the necessary experience, such Consulting Engineer to spend one day a week or one day a month in the shire as required. This arrangement should easily be carried out in the smaller shires near the city, and out-back it is probable that arrangements could be made for the assistance of a neighbouring Engineer. By this means a young man could start on at least £200 a year, and in two years would be qualified to fill the independent position.

I have dwelt at considerable length on this question of the qualification of the Engineer, because I thought it was the question that would most interest the younger members of my audience.

I will pass on now to the duties of the Engineer, which are provided for in the Act as follows:—

“The Engineer shall do all such acts as the Act, Ordinances and Regulations impose upon him, and carry out the

duties assigned to him by the Council or President; and, in particular, he shall perform the following duties, and have the following powers, under the direction of the President:—

- (a) Engage and dismiss, for works authorised by the Council and not under contract, workmen employed at daily or weekly wages.
- (b) Suspend any workman employed at daily or weekly wages, provided he shall forthwith report the suspension to the Council.
- (c) Certify all accounts for works done, materials supplied, or wages due.
- (d) Have charge of materials and implements for works.
- (e) Give to contractors performing works, other than those specified in contracts, orders for the same in writing only, keeping duplicates thereof, duly entered in a book to be kept by him for that purpose.
- (f) Superintend the execution or repair of works.
- (g) Give security for the due performance of his duties, if requested by the Council, for the care of the Council's funds, and for such purpose and in such form as the Council shall consider requisite."

In addition to this, there are certain books to be kept and forms to be adopted which ensure method and regularity in the performance of the Engineer's duties.

Salaries.—The salaries paid to the Shire Engineers are a very variable quantity. The lowest paid for a small shire is, I think, about £250 a year, and the highest I know of is something like £600 or £700 for three large shires, the average for one good shire being from £350 to £450. And this salary compares favourably with that of most influential members of society in a country town, such as bank managers, surveyors, etc. With a salary of £400 a man can marry and join in all the social duties of his town and become an influence in that town. His duties take him so much into the country that he soon may become on intimate terms in all the country homes. So that, from a social point of view, the position of Shire Engineer may be made most enjoyable.

Another attractive feature in the position is that the Engineer's time is necessarily more or less his own. Much of his time is taken up in travelling when no record can be kept, and often enough by getting an early start he gets his day's work done by lunch time. Naturally, therefore, his hours cannot be restricted. Then again, there might be some event which he wants to attend some distance away from headquarters. A Shire Engineer is always on duty when inspecting any road, so that he can be at any part of his shire at any time in reason. In this way there are any amount of privileges which an En-

gineer can avail himself of without in any way prejudicing his position or his duties. He can, with advantage to his employers, occupy 75 per cent. of his time in his sulky or car, and his office work is by no means irksome or monotonous. So that the life can be made very interesting from a social point of view, provided he is not unduly harassed by an unsatisfactory body of councillors. This is not often the case, but of course there might at any time be one or two who can give considerable trouble and annoyance. The usual Shire Council consists of six members, elected triennially by the ratepayers, and every year one of the six is elected President. The President is the actual head of the Council, the employees and the administration. But, generally speaking, the President leaves practically everything to the clerk and Engineer; and if they are satisfactory they are practically free from supervision. Of course, often enough there may be a troublesome radical on the Council, who, too ignorant to make his influence felt in a fair way, makes up by continually nagging at the officers and trying to make their positions unbearable. For instance, once in my shire a Councillor such as I have described brought up at a meeting that he had been told that a certain workman employed under the Engineer had been seen carrying stones for road repairs in a bag, and he wanted to know if that was the way the Engineer had his work done. I happened to know the circumstances, which were that the man in question was travelling home in his sulky after his week's work, when he saw a dangerous rabbit hole in the road. There was loose road metal about, and he used his horse's nose-bag to carry it and fill the hole. I explained this, and that I had often done the same myself, even with my handkerchief or my hat. The thing passed off, of course; but it was enough to show that this Councillor was looking for a chance to trip me up. However, with care and a philosophical temperament, this sort of man can be ignored. It is very seldom that more than one will be on the same Council.

The Shire Engineer is often enough the local Pooh Bah! For instance, when in Tumut, I held the following positions:—Shire Engineer, Shire Clerk, Valuer, Sanitary Inspector, Returning Officer, Inspector of Public Vehicles, Inspector of Noxious Weeds, and probably several more that I can't remember. There are not many cases now in which the one officer has the dual position of Engineer and clerk. From my own experience I should say it is easily the best way for a shire to be worked. With an assistant, preferably a good book-keeper, to keep the books, to stay in the office, collect rates, and carry out the routine office work, the Engineer and clerk is free to attend to the more important duties, carry out all Engineering works, and control all correspondence, and attend personally on Council meetings.

The other duties mentioned, such as Sanitary Inspector, Valuer, etc., are more or less sinecures, and come along in the ordinary course of events. After a year or two in a shire an observant Engineer has an absolute knowledge of every square mile of his area. It is surprising how familiar every feature becomes, especially in hilly districts where drains and water-tables and crossings are constantly needing attention.

What I always considered the most interesting work in a shire was what might be called pioneering work. That is to get out beyond the main roads and extend them into the mountain ranges, or to a new gold mine or settlement. Such roads usually start as the roughest bush tracks; and in mountainous country these tracks, in order to get a fairly level cross section, follow more or less the tops of ridges and spurs. This method invariably leads to impossible grades, and it is the Engineer's province to go along with his instrument and convert these impossible grades of one in nothing into first-class roads, with grades not steeper than 1 in 15. This means exploration, location and survey similar to that required for a railway; and also, what is more interesting still, the work of construction and the realisation of one's design. There's a place called Lobb's Hole, in the Gadara Shire, a copper mine. To get there bullock teams used to follow the tops of spurs to within a couple of miles, whence everything had to be taken up or down by pack-horses. A trafficable road had to be made. This seemed impossible, as Lobb's Hole is a gorge surrounded by precipitate walls. However, by following a long valley, a grade of 1 in 13 was found, and a road made 13 miles long, with nine river crossings, at a cost of £4,000.

During the eight years I was in Tumut I had the privilege of locating and carrying out upwards of 50 miles of such roads. During the same time there were about 30 bridges built, of different sizes. The usual design for country bridges has been the timber plain beam or truss spans. But now, with the lessening supply of useful timber, it is becoming necessary to use either steel or reinforced concrete. The latter especially is coming more and more into vogue for short spans.

Other works are kerbing and guttering and street-making in the smaller towns, small town water supplies, river bank protection, wharf building, public baths, erection and control, etc., etc.

Another matter which greatly interests the Engineer is the possession of an up-to-date plant or working outfit. A good many of the shires have the following, in addition to ordinary tools and ploughs and scoops: (1) Road grader, which is used in level country for giving the necessary convexity to a road, by cutting the two sides with a blade drawn at a slight angle from the horizontal, and diagonally to the line of road. By

this means, after two or three trips up one side and down the other, the two water-tables are cut, and the material nicely spread on the crown or convexity in the centre. This machine is also admirably adapted for light side cuttings. (2) Stone crusher. (3) Portable engines to work the crusher and for other purposes. (4) Traction engine and waggons, for the carting of metal, or gravel, or timber. (5) Roller. (6) Pile driver and other bridge plant. (7) Pipe-making plant. This is for making concrete pipes for carrying flood water under roads in place of culverts. With the growing scarcity of timber for culverts, and the high freight on earthenware or monier pipes, this latter plant is very effective in the more remote shires.

Shire revenue is made up primarily of local rates. In those shires where such local rates are not considered by the Government to be sufficient for the requirements, a subsidy or endowment is given to make up the balance. The total revenues of the shires vary from £2,257 to £30,000 per annum. The administrative expenditure, including salaries, allowances to Councillors, office rent, stationery, etc., absorb from £300 to £1,500, leaving amounts varying from £1,800 to £28,000 for the actual carrying out of work. This work may be divided into maintenance of existing works and construction of new works.

The former is usually done by maintenance men, who become permanent employees of the shire, and are generally, through culling out the weak, a good class of men and considerably relied on by the Engineer, with whom they become on fairly close terms. A new Engineer going to a shire will usually find these men loyal and agreeable, and, if treated properly, a great assistance while he is learning his district. The construction work is done in some shires by contract, in others by day labour gangs. Opinions differ as to which is the better system.

There is another point which I want to bring out, namely, in my opinion the New South Wales Act does not provide for sufficient supervision over the Shire Engineer; whereas the work of the clerk is closely examined every six months by a certificated auditor, and his accounts and statements further scrutinised by the Local Government Branch of the Public Works Department, and further still, he is supervised every year by a Treasury Inspector; so that, however wrong he may go, he is pulled up within six months at the latest. Yet, with all this supervision over the clerk, the Engineer's work is seldom or never inspected by an expert officer. During 1912 the expenditure on Public Works in the shires amounted to £773,479. This was public money, and was spent by the shires with practically no outside supervision. The Engineers have gained their credentials and qualifications in different schools

in different parts of the world. This alone is enough to preclude the possibility of anything like uniformity in the highways of the State. Add to this that at the inception of Local Government, when there were more positions to be filled than there were qualified men for them, certain only partially qualified men obtained the positions, and still hold them by right of service. And add further that the expert knowledge of an Engineer, however good, is liable at any time to be overridden and set at naught by his employers, the Councillors, who naturally are more or less ignorant of the work to be done. Then it strikes one that there should be some supervising man or body of men whose duty it is to periodically inspect the work done in the shires. This would be of great assistance to the Engineers, who could consult the Inspecting Engineer on any point on which he has doubts; it would stiffen the Engineer in his opposition to his Council on occasions when his expert knowledge is questioned, and it would give the Councillors greater confidence in their Engineer.

I can give a very small example of this from my own experience. On an important road in the shire was a hill with a grade of 1 in 9. I was instructed to report on the reduction of this grade. I went to considerable trouble, prepared sections and estimates, and showed that the grade on the existing road could be reduced to 1 in 13 for £500, whereas by a small deviation through private property, a grade of 1 in 19 could be got for £300. To my mind, and from an engineering point of view, there was no question that the deviation should have been adopted. But the personal element came in. The Councillors were a real good lot of fellows—all land owners—and the owner of the land through which the deviation was surveyed was a good fellow, and approached his friends in the Council in a perfectly open way—pointed out the damage that would be done to his paddock, and asked them to consider his claim. The result was a fight between the landowner on his own behalf, and me on behalf of the community at large. The community got the knock-out, the result being that for all time every vehicle that uses that road from any part of the State has to negotiate a steep 1 in 13 grade instead of an easy 1 in 19; besides, of course, the actual throwing away of £200. It was a considerable time before the work was actually put in hand, and had there been a Consulting Engineer to refer to, I could have gone on fighting, and must eventually have won. This is not a matter which interests only the residents on that particular road, but it interests all who may ever use that road for all time; and when it is remembered that there may be several such instances in every shire by now, it can be seen how desirable it is for some more definite supervision over the expenditure of these public moneys.

In one part of this paper I dwelt on the attractions attached to the position of a Shire Engineer from a social point of view. There is no doubt that these attractions exist, and, moreover, there is ample scope for originality and engineering work, especially in the mountainous and coastal shires; and without a doubt the practical experience to be gained in the way of general administration and husbanding of Councils' funds, in the way of dealing tactfully with Councillors and the public generally, and more especially in the dealings with the working men, such practical experience will be of great assistance to an Engineer in the beginning of his career.

But two points must seriously be borne in mind. Firstly, while a man remains a Shire Engineer he is not going to earn an income of more than about £500 a year at the outside; secondly, while a man remains a Shire Engineer, his name is not going to reverberate over the world for engineering feats of magnitude. The Local Government Engineer has no North Shore Bridge or Burrenjack Dam to design or construct. No, if you have high ambitions you may only look on the position of Shire Engineer as a stepping stone for something bigger. The trouble is, where are you going to get the something bigger in this country? There is very little scope for private practice, and only one or two of the very highest and most capable Engineers in the Works Department get over £700 a year, and that after years of hard and earnest toil. Whereas another man has only to put up his name with the magical letters M.B. after it, and in a year or two he is living in comfort and comparative opulence.

To give you an idea of the class of work most usual in a shire, I have here on the table a few specifications of works, which have been carried out in my own and other shires. They are not as good a collection as perhaps I should have got, but I am now pretty well out of touch with the Councils.

Before closing I must mention that the majority of Local Government Engineers in this State a few years ago formed themselves, at the instigation of their Secretary (Mr. G. A. Taylor) into an Association, from which Association has sprung the Institute of Local Government Engineers of Australasia—a body of quite recent birth, but one which is ambitious enough to want all Australasian Engineers, whether actually connected with Local Government or not, to become its members. This body has now a certain legal status; it is recognised by the Minister and the Public Works Department in all matters connected with the Local Government Engineer. It has members in every State in the Commonwealth and in New Zealand; holds annual conferences, and issues its minutes following on the methods of the British Institute. Only Engineers holding statutory qualifications can become members of this Institute, and generally it is a body that has, in its short life,

sprung into considerable prominence in the engineering world. This prominence is mainly due to the very energetic Secretary, Mr. Taylor, who is also editor of "Building," a paper which devotes itself greatly to the interests and doings of the Local Government Engineers of the Commonwealth. This Institute and the paper are to be highly commended by all branches of the profession for the hard fight it has put up for the improvement in the status of the Local Government Engineer. It recognises that many Councils consider a good working foreman, with a knowledge of the level and a salary of £3 or £4 a week, just as good, if not better, than a highly qualified Engineer. The Institute is opposing this stand tooth and nail, with the contention that a highly qualified and better-paid officer will save to the Council in better and more economical work his screw ten times over in a year. This is the chief point the Institute has taken up, and it is a point in which our Association can join hands with them; that is broadly the recognition of the Engineer as the chief force in the opening up and developing of a new country.

Let me conclude with a poem, "The Builders of the Highways," which the Institute has taken for its motto:—

"THE BUILDERS OF THE HIGHWAYS."

To the builders of the highways that skirt the canyon's brink,
 To the men that bind the road-bed fast,
 To the men that grade and the men that blast
 I raise my glass and drink.

Their's the great endeavour and the deed of high emprise;
 For they fight their fight with naked hands,
 'Gainst forest, swamps, and shifting sands,
 And the fury of the skies.

For them no flaring banners when a bitter fight is won;
 No cheering thousands in the street
 Their gallant heroes ever greet,
 Though dauntless deeds be done.

To the Engineers, the wizards, whose word brooks no delay,
 Hearing, the sleeping glens awake,
 The snow-plumed hills obeisance make;
 And lo, the open way!