

PUBLIC WORKS DEPARTMENT REORGANIZATION COMMITTEE.

APPENDIX

TO THE

REPORT

OF THE

PUBLIC WORKS DEPARTMENT REORGANIZATION COMMITTEE

VOLUME III.

MINUTES OF EVIDENCE

Taken at Rangoon, Banlipore, Allahabad, Lahore and Simla

WITH

APPENDICES.

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TABLE OF CONTENTS.

	PAGE.
LIST OF WITNESSES EXAMINED BEFORE THE COMMITTEE	ii
MINUTES OF EVIDENCE	1
APPENDICES	304

LIST OF WITNESSES EXAMINED BEFORE THE COMMITTEE.

At RANGOON, Tuesday, 6th March, 1917.

THE HON'BLE MR. C. H. WOLLASTON, Chief Engineer and Secretary to the Government of Burma, Public Works Department	1
H. E. W. MARTINDALE, Esq., M.R.S.I., Chief Engineer and Joint Secretary to the Government of Burma, Public Works Department	6
J. M. F. PETTERS, Esq., M.R.S.I., M.I.C.E., M.C.I., F.R.G.S., F.Z.S., Sanitary Engineer, Burma	9
B. RAIKES, Esq., Electric Inspector, Burma	12

At RANGOON, Thursday, 8th March, 1917.

THE HON'BLE MR. H. THOMPSON, C.S.I., I.C.S., Financial Commissioner, Burma	15
MAJOR F. BIGGWITHER, I.A., Deputy Commissioner, Yamethin	19
E. J. PULLAR, Esq., F.R.I.B.A., Architect, Rangoon	27
THE HON'BLE MR. J. E. DuBERN, Vice-President, Rangoon Municipality	29
M. OPPENHEIMER, Esq., Representative, Rangoon Trades Association	30

At RANGOON, Friday, 9th March, 1917.

T. O. FOSTER, Esq., F.R.I.B.A., Consulting Architect, Burma	31
G. V. CLARK, Esq., Partner, MESSRS. CLARK AND GREIG, Rangoon	36
MAUNG BA, Assessor, Income TAX, Mandalay	38
T. GIBSON, Esq., MESSRS. C. R. COWIE AND CO., Rangoon	39
F. DUKOFF GORDON, Esq., Accountant-General, Burma	40

At RANGOON, Saturday, 10th March, 1917.

J. P. HARDIMAN, Esq., I.C.S., Deputy Commissioner, Burma	43
R. STANLEY BAKER, Esq., A.M.I.C.E., Executive Engineer, Burma	47
A. P. MORRIS, Esq., A.M.I.C.E., Headmaster, Government School of Engineering, Insein	51

At BANKIPORE, Thursday, 22nd March, 1917.

THE HON'BLE MR. E. G. STANLEY, A.M.I.C.E., M.C.I., Chief Engineer and Secretary to the Government of Bihar and Orissa, Public Works Department, Buildings and Roads Branch	53
BISHUN SWARUP, Esq., Executive Engineer, Bihar and Orissa	63
F. C. TEMPLE, Esq., M.R.S.I., Sanitary Engineer, Bihar and Orissa	66
J. F. MUNNINGS, Esq., A.R.I.B.A., M.C.I., Consulting Architect, Bihar and Orissa	70

At BANKIPORE, Friday, 23rd March, 1917.

F. WOLFORD, Esq., A.R.C.S., WH. Ex., Principal, Bihar School of Engineering and Inspector of Technical Schools, Bihar and Orissa	74
E. C. RYLAND, Esq., Inspector General of Police, Bihar and Orissa	79
J. N. SHAW, Esq., Partner, MESSRS. CRATTERJEE, SHAW AND CO., Contractors, Monghyr	82
F. E. S. MORRISON, Esq., Vice-Chairman, District Board, Bhagalpur	84
F. MAYNARD, Esq., M.I.C.E., M.R.S.I., District Engineer, Gaya	87

At BANKIPORE, Monday, 26th March, 1917.

THE HON'BLE MR. C. E. A. W. OLDHAM, I.C.S., Commissioner, Patna Division	89
E. G. BECKETT, Esq., Agency Engineer, Orissa Feudatory States	95
W. H. WILLIAMS, Esq., M.I.M.E., MESSRS. ARTHUR BUTLER & Co., Muzaffarpur	98

At BANKIPORE, Tuesday, 27th March, 1917.

A. N. MC INTYRE, Esq., A.M.I.E.E., Electric Inspector and Electrical Engineer, Bihar and Orissa	99
THE HON'BLE KHWAJA MUHAMMAD NOOR, Vice-Chairman, Gaya Municipality	102
E. BLABER, Esq., Superintending Engineer, Bihar and Orissa	106

At ALLAHABAD, Thursday, 29th March, 1917.

P. H. TILLARD, Esq., Superintending Engineer, United Provinces	112
RAI BAHADUR BEHARI LAL, Contractor	121
E. F. TIPPLE, Esq., Professor of Mathematics, Thomason Civil Engineering College, Roorkee	122

TABLE OF CONTENTS.

iii

	PAGE.
At ALLAHABAD, Friday, 30th March, 1917.	
A. C. VERRIERES, Esq., C.I.E., Superintending Engineer, United Provinces	131
THE HON'BLE MR. C. F. DE LA FOSSE, Director of Public Instruction, United Provinces	138
THE HON'BLE MR. J. S. CAMPBELL, C.S.I., C.I.E., I.C.S., Member of the Board of Revenue, United Provinces	154
At ALLAHABAD, Monday, 2nd April, 1917.	
F. LISHMAN, Esq., F.R.I.B.A., Consulting Architect, United Provinces	151
KHAN BAHADUR MUNSHI HIRE KHAN, District Engineer, Agra	167
T. GAVIN JONES, Esq., Empire Engineering Co., Ltd., Cawnpore	173
W. G. WOOD, Esq., C.S.I., Principal, Thomason Civil Engineering College, Roorkee	176
W. PARRY, Esq., M.I.C.E., Municipal Engineer, Cawnpore	186
At ALLAHABAD, Tuesday, 3rd April, 1917.	
J. H. ABBOTT, Esq., Partner, MESSRS. ABBOTT BROS., Jhansi	188
H. LANE BROWN, Esq., M.I.C.E., Partner, MESSRS. LANE BROWN AND HEWLETT, Consulting Civil and Sanitary Engineers, Lucknow	192
W. BELL, Esq., Electric Inspector, United Provinces	199
C. H. WEST, Esq., Sanitary Engineer, United Provinces	202
THE HON'BLE MR. W. S. MARRIS, C.I.E., I.C.S., Inspector General of Police, United Provinces (represented by H. WILLIAMSON, Esq.)	206
At LAHORE, Saturday, 7th April, 1917.	
A. R. ASTBURY, Esq., A.M.I.C.E., Sanitary Engineer, Punjab	209
RAI BAHADUR KANHAIYA LAL, Executive Engineer, Punjab	216
B. M. SULLIVAN, Esq., A.R.I.B.A., Consulting Architect, Punjab	224
C. C. T. EASTGATE, Esq., M.I.E.E., Electrical Engineer and Electric Inspector, Punjab	228
At LAHORE, Tuesday, 10th April, 1917.	
THE HON'BLE MR. H. J. MAYNARD, C.S.I., I.C.S., Financial Commissioner, Punjab	233
RAI BAHADUR NARAIN SINGH, Contractor	244
P. R. HEWLETT, Esq., A.M.I.C.E., Partner, MESSRS. LANE BROWN AND HEWLETT, Consulting Civil and Sanitary Engineers, Lucknow	245
A. J. W. KITCHIN, Esq., C.I.E., I.C.S., Deputy Commissioner, Lyallpur	248
F. W. K. YEOMAN, Esq., Superintending Engineer, Punjab	250
At LAHORE, Wednesday, 11th April, 1917.	
C. STEAD, Esq., Personal Assistant to the Inspector General of Police, Punjab	252
THE HON'BLE MR. J. CURRIE, President, Punjab Chamber of Commerce	254
W. S. DORMAN, Esq., M.I.C.E., Executive Engineer, Punjab	256
BAWA BUDH SINGH, Executive Engineer, Punjab (representative of the Punjab Engineers' Association).	262
At SIMLA, Friday, 13th April, 1917.	
H. T. KEELING, Esq., U.S.I., A.M.I.C.E., Chief Engineer and Secretary to the Chief Commissioner in the Public Works Department, Delhi	268
J. BEGG, Esq., F.R.I.B.A., Consulting Architect to the Government of India	280
At SIMLA, Monday, 23rd April, 1917.	
THE HON'BLE SIR REGINALD GAMBLE, Kt., I.C.S., Comptroller and Auditor General	291
ALFRED CHATTERTON, Esq., C.I.E., B.Sc., A.C.G.I., A.M.I.C.E., M.I.M.E., Controller of Home Indents and Priority	298

List of Appendices.

I. Officials and non-officials in Burma, Bihar and Orissa, United Provinces, Delhi and the Punjab who furnished written evidence to the Public Works Department Reorganization Committee in connection with their inquiry but who were not orally examined	304
II. Letter from the Hon'ble Mr. E. G. Stanley, Secretary to the Government of Bihar and Orissa, Public Works Department, to the Secretary, Public Works Department Reorganization Committee, No. 142 T.E., dated the 10th March 1917	304
III. Memorandum prepared by the Government of the United Provinces	307
IV. Memorandum prepared by the Government of the Punjab	310
V. Memorandum prepared by the Chief Commissioner of the Delhi Province	314

APPENDIX I.

LIST OF APPENDICES.

- I. Officials and non-officials in Burma, Bihar and Orissa, United Provinces, Delhi and the Punjab who furnished written evidence to the Public Works Department Reorganization Committee in connection with their inquiry but who were not orally examined.
- II. Letter from the Hon'ble Mr. E. G. Stanley, Secretary to the Government of Bihar and Orissa, Public Works Department, to the Secretary, Public Works Department Reorganization Committee, No. 142-T.E., dated the 10th March 1917.
- III. Memorandum prepared by the Government of the United Provinces.
- IV. Memorandum prepared by the Government of the Punjab.
- V. Memorandum prepared by the Chief Commissioner of the Delhi Province.

APPENDIX I.

Officials and non-officials in Burma, Bihar and Orissa, United Provinces, Delhi and the Punjab who furnished written evidence to the Public Works Department Reorganization Committee in connection with their inquiry but who were not orally examined.

Burma.

1. S. Cuther Valu, Esq., Honorary Assistant Engineer, Public Works Department (retired).
2. G. A. Grossett, Esq., Executive Engineer, Mandalay Division, Mandalay.
3. Mopalin Stone Co., Rangoon.

Bihar and Orissa.

4. M. N. Dutta, Esq., Executive Engineer, Bhagalpur Division, Bhagalpur.
5. R. C. Das, Esq., Sub-Engineer, Bankipur.
6. J. N. Das, Esq., Sub-Engineer, Dumka.
7. The Hon'ble Mr. E. L. L. Hammond, I.C.S., Secretary to Government, Financial Department.
8. The Hon'ble Mr. L. F. Morshead, I.C.S., Commissioner, Tirhut Division.
9. The Hon'ble Mr. H. Le Mesurier, C.S.I., C.I.E., I.C.S., Commissioner, Orissa Division.
10. S. C. De, Esq., Sub-Engineer, Purnea.
11. A. H. Vernede, Esq., I.C.S., District Magistrate, Cuttack.

United Provinces.

12. The Hon'ble B. Moti Chand, C.I.E., Benares.
13. Dr. P. P. Phillips, Ph. D. (Gottingen), F.I.C., Professor of Applied Chemistry, Thomason Engineering College, Roorkee.
14. H. P. Jordan, Esq., M.Sc., Professor of Mechanical Engineering, Thomason Engineering College, Roorkee.
15. F. W. Sedgwick, Esq., M.A., M.I.E.E., Professor of Electrical Engineering, Thomason Engineering College, Roorkee.
16. C. J. Veale, Esq., F.R.G.S., Professor of Survey and Drawing, Thomason Engineering College, Roorkee.
17. G. Lacey, Esq., B.Sc., A.I.E.E., Professor of Civil Engineering, Thomason Engineering College, Roorkee.
18. H. Stanley Jevons, Esq., M.A., B.Sc., Professor, Department of Economics, Allahabad University.
19. S. G. Edgar, Esq., B.Sc., Assistant Engineer, Public Works Department.
20. C. H. Hutton, Esq., A.M.I.C.E., Chief Engineer, Public Works Department (retired).
21. M. S. Chodhry, Esq., Zemuindar and General Contractor, Bijnor.

Delhi.

22. S. Farman Ali, Esq., B. A., Assistant Engineer, Womens' Medical College and Hospital, Delhi.

Punjab.

23. H. K. Trevaskis, Esq., I.C.S., Sub-Divisional Officer, Sonapat.
24. H. Harcourt, Esq., I.C.S., Deputy Commissioner, Rohtak District.
25. Sardar Bahadur Sardar Lahna Singh, C.E., Executive Engineer, Gurgaon Provincial Division.
26. Major W. H. C. Forster, D.P.H., I.M.S., Professor of Hygiene, Lahore Medical College.
27. The Hon'ble Rai Bahadur Ram Saran Das, Proprietor, Messrs. R. B. Mehta Ram and Sons, Lahore.

APPENDIX II.

Letter from the Hon'ble Mr. E. G. Stanley, Secretary to the Government of Bihar and Orissa, Public Works Department, to the Secretary, Public Works Department Reorganization Committee, No. 112 T. E., dated the 10th March 1917.

I am directed to invite a reference to Mr. Rose's letter No. 555-E.A., dated the 15th November 1916, requesting the Local Government to furnish the Public Works Department Reorganization Committee with a memorandum of their views in regard to the various matters relating to the execution of civil works in British India

referred to in the draft Resolution forwarded therewith which was subsequently published as Resolution of the Government of India in the Public Works Department No. 06-E.A., dated the 24th November 1916. Briefly the main points into which the Committee have been asked to inquire are whether the methods at present

APPENDIX II—continued.

employed for the execution of Civil works are economical and suitable or whether more might not be done in the way of encouraging private enterprise or of entrusting the construction and upkeep of certain classes of public works to agencies other than departmental. Incidentally the relations of the Public Works Department with other Departments of Government, the possibility of further decentralization within the Department itself, and the adequacy or otherwise of the rules of the Public Works Department Code, will come under the Committee's investigation. Finally they are asked to consider whether any improvement can be effected in the system of education in Government Colleges, and whether adequate provision is made for the practical training of students after they have received their scientific training in English or Indian Colleges.

(2). On all these points the Lieutenant-Governor in Council would prefer to reserve his final opinion until he has had an opportunity of seeing the report of the Committee and the evidence recorded by them. Meanwhile I am to state briefly the present views of the Local Government in regard to the general questions raised and at the same time to draw attention to certain defects in the existing system, which seem to them to call for inquiry, and to indicate the directions in which they consider that improvement might be effected.

(3). In the first place I am to refer to the Local Government's letter No. 1939A., dated the 15th July 1913 (Annexure A) replying to certain inquiries made by the Government of India regarding the possibility of effecting economies in the scale of expenditure on unremunerative public works, and to say that the Lieutenant-Governor in Council has seen no reason to modify the views expressed therein. Under the system followed in this Province, practically all Civil works, both original and repair, are carried out by the Public Works Department, a few only being entrusted to District Boards, who receive 15 per cent. on the estimated cost of the works. By far the greater part of the work is given out on contract after tenders have been invited, different portions of the work, except in the case of very small projects, being entrusted to different contractors. Most of the local contractors are men of small means, who have had no technical or business training and, as a rule, possess little or no building or engineering qualifications. They supply the labour and sometimes some of the materials, and their work in all its details has to be closely supervised and controlled by the officers of the Public Works Department. Having no capital of their own, and the rules of the Public Works Department Code prohibiting any system of advances from Government, these contractors have to work on borrowed capital for which they are required to pay a high rate of interest. The system, though by no means ideal, works fairly well in practice, and although it is frequently charged against the Public Works Department that their work is expensive and that their rates are higher than those paid by local authorities and private persons, it is generally admitted that a high standard of work is required and obtained. In view of the conditions prevailing in this Province, His Honour in Council is unable to suggest any more satisfactory system for the execution of Civil works. The Public Works Department could not execute all their work on a purely departmental basis without a very large increase in their staff; nor are they in a position bound as they are by rigid rules of accounts, to secure the labour they require at reasonable rates. Some economy might be possible in the use of less permanent materials in some of the less important buildings, and this is a matter which is receiving attention at the hands of Government. Some officers also complain that the rules for the supply of stores do not suit present conditions and recommend that they may be revised so as to obviate the necessity of indenting on the Stores Department of the Government of India for most of the materials used by the Public Works Department, Government being given fuller powers to purchase their requirements locally. It would be an undoubted advantage if entire projects could be made over to large firms of master-

contractors who would take over the works from start to finish and who could be relied upon to carry them out efficiently and expeditiously. Not only would this relieve the Public Works Department of a great deal of their work of supervision, thus enabling them to dispense with some of their subordinate supervising establishment, but there would be the additional advantage that once a tender is accepted, the ultimate cost of the project would be definitely known, whereas under the present system, sanctioned estimates are and must be frequently exceeded. The presence and detailed supervision exercised by a number of subordinate Public Works Department officers inevitably tends to hamper the contractors and make the work more costly. The Lieutenant-Governor in Council would be glad to make over more work to reliable firms of master-contractors, but in this Province there are no such firms, and the few that there are in Calcutta will not take up work in the *muffassal* except in the case of large projects, such as the new Capital Works in Patna and the European and Indian Lunatic Asylums at Ranchi, both of which have been made over to Messrs. ———.

(4). On the whole, therefore, His Honour in Council is of opinion that in this Province private enterprise is encouraged as far as possible and that any advance in this direction is dependent on the further development of the building industry in the *muffassal* and the increase in the number of reliable private firms of contractors, both large and small. He only desires to suggest the advisability of relaxing the rule prohibiting the grant of advances in the case of selected contractors. Very few contractors have sufficient capital to carry through an important work, and they must therefore either borrow money and charge heavily so as to cover the interest, or scamp the work in collusion with subordinates of the Department. It is probable that the charge of dishonesty, so frequently levelled against Public Works contractors and subordinates, is largely traceable to the refusal of advances and of payments on account, the rules regarding which might with advantage be simplified.

(5). As regards the execution of Government work through the agency of local bodies, the system was tried in Bengal some years ago and was abandoned. None of the Municipalities and few District Boards possess a sufficiently competent engineering staff to justify any considerable transfer of Government work to their control, while in the first grade districts, which alone employ fully qualified District Engineers, the work of the District Board is more than sufficient to occupy the whole of the District Engineer's time, and it would be impossible for him to take up Government work in addition to his own duties unless he were given very substantial assistance. In this Province the experiment has been tried in a few cases but with not very encouraging results. For example, Public Works in the Palamau District have been entrusted to the District Board, but the Superintending Engineer reports that the work of the District Board staff requires to be closely supervised and that the work done falls far short of the departmental standard attained elsewhere. It has also been pointed out that the District Engineer in such cases is serving two masters, and that the risk of friction is likely, if anything, to increase if, as in a few districts of Bengal, non-official Chairmen of District Boards are appointed. On the other hand, the present system undoubtedly involves a good deal of overlapping and duplication of control in areas in which works are being executed both by the Public Works Department and the District Board, and Government are not convinced that the scheme for utilizing the agency of District Boards employing qualified engineering staff to relieve the Public Works Department of the construction and maintenance of some at least of the Government roads and buildings in the districts concerned, must be abandoned. They propose to give the scheme a further trial whenever conditions appear to them to be favourable.

(6). Although, for the reasons given above, the Lieutenant-Governor in Council is not prepared to recommend any radical changes in the system adopted in this

APPENDIX II—continued.

Province for the execution of Civil works, there are many matters of detail in regard to which there is room for improvement. This is especially so in connection with the question of procedure. The superior officers of the Public Works Department are overburdened with petty routine, accounts and office work which occupy a large portion of their time to the detriment of their more important duties of supervision and local investigation. It has been suggested in some quarters that it might be possible to relieve Public Works Department officers of the greater part of their accounts work and to transfer it to the office of the Accountant-General or of the Collector. It should be possible to simplify the procedure for the preparation and submission of projects, for the framing of estimates, for obtaining administrative approval, etc. A Commissioner of a Division writes "There is an unanimous opinion that the Public Works Department Code is unduly restrictive. This is particularly the case in regard to buildings in charge of Civil Officers. Apparently the Executive Engineer may not take any notice of the most obvious defects or need for repairs in such a building without a form of requisition, nor again may he do the necessary work without sanction from a number of higher authorities. I have recently signed the proceedings of half a dozen Committees called to decide on the site for latrines to be fixed in the compound of various Courts and residences. The average duration of the proceedings in these cases has been from four to six months, and the signature of four local officers—the Superintending and Chief Engineers, the Head of the Department concerned, and the Commissioner—are all necessary before the work can be done." Another officer writes: "The time left to all the officers of the Department from the Chief Engineer downwards for inspecting works in progress is quite inadequate. These officers are first and foremost Engineers..... They are not Accountants, and it would be a great boon if they could be relieved of the duty of making payments, keeping accounts and filling in all manner of returnsThe amount of petty works which under current rules have to be referred to the Executive Engineer is altogether excessive. The whitewashing of a public building and the petty repairs to a residence, form the subject of detailed estimates which obtain far more scrutiny and examination from the higher officials of the Department than does the work itself." It would be easy to multiply examples but the above are typical instances.

(7). There is a general complaint that the rules of the Code are far too elaborate and rigid and that they do not sufficiently allow for differences in local conditions nor give enough discretion to Local Governments. In the opinion of the Lieutenant-Governor in Council the criticism is justified. He is not aware whether the question of the construction of and assessment of rent on residential buildings falls within the scope of the Committee's inquiry, but here too there are widespread complaints against the rules of the Code dealing with this subject. Under the rules, the admissible outlay on a house is calculated on the average pay of the occupant, but no account is taken of the possible variations in the cost of the site nor of the price of labour and materials due to exceptional circumstances. The rent is calculated, not on the market value, as in the case of private houses, but according to departmental rules. The tenant is compelled to live in the house, his rent is fixed for him, no latitude is allowed, and the rules of the Code secure Government against any possibility of loss, whatever may happen, even where the capital expenditure has been swelled to meet the administrative requirements of Government or to remedy mistakes made in the past when the house was constructed or acquired. Instances could be quoted of undoubted hardship resulting from the operation of the rules, and it has been suggested that a reasonable alternative to the present system would be to recognize that each and every officer requires adequate accommodation according to his rank, leaving it to the Local Government to allot the houses and fix the rental irrespective of the cost of constructing the building. The recent decision of the Government of India

contained in their letter No. 030-A of the 14th February 1917, declining to allow the Local Government to write back to the head "Establishment and Tools and Plant" a sum equivalent to 6.54 per cent. of the cost of the residences which are being built by Messrs. _____ for Government officers in the new Capital, is an illustration of the anomaly which a strict application of the Code rules may occasion. If the work had been done on the ordinary system of petty contracts, the Public Works Department establishment which it would have been necessary to entertain and which has been more than saved by making over the work to Messrs. _____, would not have been charged against the capital cost of the residences. Thus the result of giving the contract to Messrs. _____ is that the tenants will have to pay a much higher rent for the already highly rented houses which they have to occupy in the new Capital, while Government derive the double advantage of an increased rent roll and a saving in expenditure. In the opinion of the Lieutenant-Governor in Council there is a strong case for reconsidering and revising the rules of the Code in this and other matters.

(8). In regard to the remaining points into which the Committee are inquiring, His Honour in Council desires to say very little at this stage. Some decentralization within the Department has been effected already but more is desirable, especially in the direction of giving wider powers to Superintending Engineers. As regards the relations *inter se* of the various sub-divisions of the Roads and Buildings Branch of the Public Works Department, I am to say that they are believed to be generally satisfactory as also are the relations of the Department with other Departments of Government, but into all such matters the personal equation largely enters. The system of education in the Engineering Colleges appears, on the whole, to be sufficient to meet the needs of private agency as well as of Government if it could be combined with a longer and more effective course of practical training. Without going into details, I am to invite a reference to the evidence of Mr. Heaton, the Principal of the Engineering College, Sibpur, and Mr. Walford, the Principal of the Bihar School of Engineering, with whose views His Honour in Council is in general agreement.

ANNEXURE A.

Letter from the Hon'ble Mr. E. R. Gardiner, Secretary to the Government of Bihar and Orissa, Public Works Department, to the Secretary to the Government of India, Public Works Department, No. 1939-A., dated the 15th July 1913.

I am directed to acknowledge the receipt of your letter No. 908-A. G., dated the 3rd September 1912, on the subject of a possible reduction in the scale of expenditure on unremunerative public works. The Government of India are of opinion that, assuming that proper economy is observed in regard to the scale of accommodation provided for public and administrative offices and buildings, any further reduction of cost must lie either, (1) in the reduction of rates, or (2) in the adoption of a cheaper class of construction for minor buildings. They enquire whether the Local Government consider that economy is possible in these or any other directions.

(2). The Lieutenant-Governor in Council has given the matter his careful consideration after consulting Commissioners of Divisions and selected officers of the Public Works Department. As to the first point raised by the Government of India, namely, the possibility of reducing of rates, the majority of officers consulted are of opinion that, considering the standard of works rightly insisted upon by the Public Works Department the rates are not capable of any general reduction. With this opinion the Lieutenant-Governor in Council agrees. The rates are based on the actual cost of materials and labour with an additional allowance of 12½ per cent. on account of the contractors' charges. As the Government of India are aware there has been a very marked increase of recent years in the cost of labour and materials for all descrip-

APPENDIX II—concluded.

tions of work to which rates for a given specification must respond. It is by no means certain that the rise will not continue owing to economic causes beyond the control of the Department.

(3). As regards the suggestion that the rates paid by the Public Works Department to contractors for materials and work are in excess of those paid by the general public, several of the officers consulted admit that an impression to this effect does exist although they have been unable to adduce any concrete instances in proof of its correctness. The data for complete examination of this question are necessarily scanty as a detailed scrutiny of private builders' accounts is not possible. In fact only two definite cases have been quoted, both of which are in favour of the Public Works Department rates. The District Officer of Monghyr reports that it has been brought to his notice that the _____ Company paid higher rates for a factory building recently created at _____ than those current in the Public Works Department and the Executive Engineer of Patna furnishes a schedule of rates now being paid by a private builder on certain residences at present under construction in Bankipore, which shows that out of nine rates quoted for the main items of work four are the same as the Public Works Department rates, four are higher and one only is slightly less. Assuming, however, that there is some basis for the impression the comparison is not altogether fair to the Public Works Department as the nature and stringency of the deed of contract will have a considerable bearing on the question. It is generally admitted that the standard of work carried out by the private parties in the *mofussil* is considerably lower than that of the Public Works Department so that no useful comparison of rates can well be made. Private builders frequently work without any specification and are less exacting in their supervision. Moreover, in the majority of cases they are able to make advances to contractors, a practice which is prohibited by the rules of the Public Works Department. The latter point as several officers have noted, is one that must have a considerable effect on the profits of a large number of contractors who take contracts under the Public Works Department as they are compelled to finance their works by loans from local bankers at a heavy rate of interest. It is for consideration whether the rules should not be relaxed so as to admit of advances being made to contractors of known probity under proper safeguards.

(4). As to the second point noted by the Government of India, namely, the adoption of a cheaper class of construction for minor buildings, the Lieutenant-Governor in Council is of opinion that there is here some opening for increased economy. It has been the practice for many years to adopt cheaper methods of construction for minor buildings such as the use of brick in mud mortar and tiled roofs rather than *pucca* brick work and terraced roofs as commonly used for more important works. But the direction in which economy may be looked for is in the adoption of somewhat less stringent specifications and

in the relaxation of certain rigid building rules or customs that have acquired the force of rules in dealing with works of minor importance. The first of these points has already attracted the attention of Executive Officers in their endeavours to keep down rising rates. For example, the use of an inferior class of bricks for plastered buildings and of lower grades of mortar than the standard grade of 1 to 2 for unimportant works are expedients for keeping down cost that have frequently been adopted by Executive Engineers in recent years. The issue of further instructions on this point is at present under the consideration of the Local Government.

(5). The question of the relaxation of building rules for minor buildings is one that has already been taken up by this Government and the orders on the points have recently issued. It has been customary in the past to follow for all buildings without exception loads for calculation of floor joists suitable to the most heavily loaded buildings. Extravagant expenditure in foundations has frequently occurred owing to the inclusion of excessive assumed live loads in calculation and to the limiting of foundation pressures to a figure suitable to the alluvial soil of Calcutta without reference to actual prevailing conditions, will doubtless lead to economy.

(6). With regard to the enquiry made in paragraph 4 of your letter on the subject of a definite comparison between *kutch* and *pucca* buildings including maintenance charges available records do not furnish any very conclusive figures on these heads as no Capital and Revenue Accounts are kept for the majority of *pucca* buildings which are non-residential. There is no doubt that economy does result from the use of a cheaper form of construction for minor buildings, but in the case of this province such a system is not a reversion to an older policy but one which has been regularly followed. In view of the heavy annual recurring cost required for repairs to *katch* buildings the Lieutenant-Governor in Council doubts whether so far as the types of construction go there is any scope for further economy.

(7). As regards the suggestion of the Government of India that it might be possible to reduce the superior establishment by extending charges of supervision, all the officers agree in deprecating any reduction in the superior supervising agency which they consider could only be effected at the cost of efficiency. With this opinion the Lieutenant-Governor in Council agrees. So far as this province is concerned it would be most unwise to extend existing charges most of which are already recognized as being if anything too large for effective supervision. In view, moreover, of the fact that the commonest accusation made against the Public Works Department is that the contractors are forced to keep their rates high in order to satisfy the illegitimate demands of the subordinate establishment, His Honour in Council is unable to support a measure which must necessarily weaken the supervision exercised over the lower grades of the service.

APPENDIX III.

Memorandum prepared by the Government of the United Provinces.

It must be admitted that Public Works Department efficiency has been on the wane of late years due to the pressure of multifarious duties having grown too great for the superior staff. Moreover, this staff is now deplorably mixed. Our Imperial Engineers, though unequal, are good on the whole, except for certain Indian recruits in recent years. They are lacking however in *esprit de corps*, and many of them carry on their work with a detached air as if they were not part of the machinery of Government and were under no obligation to protect Government against its own mistakes. The Imperial and Provincial cleavage has not proved successful in the Public Works Department or at least it is now out of date. But whatever changes be made in this direction we shall still have to be satisfied with an insuffi-

cient cadre of inadequately equipped men, while the work is steadily increasing. There is a widespread impression that malpractices are rife in the subordinate ranks, and that the old Public Works Department standard of efficiency is no longer attainable, unless we can return to the former practice of entire supervision by gazetted officers. The cost of this would now be too great with the growing demands for new works and the political aspirations of the country. Moreover, the recruitment of a sufficient number of young engineers would result in embarrassing blocks hereafter. We should therefore drop aiming at the impossible and be contented with the next best thing.

(2). The work done by the Department is good and durable. Recent inquiries into the comparative cost

APPENDIX III—*continued.*

of specific buildings erected by private agency and the Public Works Department prove that, after allowing for the departmental charges, the cost of this class of work is not unduly expensive. But the methods followed are somewhat inelastic and the procedure requires more adaptability. A greater variety of standards is wanted to suit different conditions and finances, even at the risk of some additional cost in the long run.

(3). From both the industrial and political aspects, there is a real need for larger openings to contracting firms of all kinds. The more we decentralize work and the less direct we make our executive control of public works, the more opportunities will India offer to private civil and specialized engineers. At present the best products of Rurki College cannot compete with those of European establishments, nor is there at present any scope for employing passed students outside the Public Works Department, save in large centres. The profession of civil engineering needs exalting in the public mind and being made attractive to the best indigenous talent. A good deal should be possible in this direction by making Rurki the means of obtaining a valued University degree. In fact, the time has come for Rurki to extend its functions.

(4). We should aim at divesting the Public Works Department of all duties which can be assumed fairly efficiently by other agencies. For instance, we should entrust all unimportant work to local agencies. When this was last tried in these provinces, in the early eighties, it degenerated into a dual control of works in every district and that very naturally proved to be both inefficient and costly. The change was probably made too suddenly and on too large a scale. We should profit by the mistakes then made and now act more cautiously, confining the experiment to a few selected districts in the first instance. In fact, the present dearth of qualified engineers and the non-existence of reliable firms gives us no option at the outset. For the execution of large works, established building firms should be encouraged to become reliable, and the necessary initiative for the creation of new contracting firms should also, in due course, respond to adequate measures taken to attain that end. Among other forms of encouragement which suggest themselves, one of the most suitable might be to maintain Government lists of qualified contractors classed according to their competency, as judged by their capacity to execute works more or less without direct supervision. The actual Government charges for supervision and inspection might vary inversely with the competence and reliability of any firm. The magnitude of the works already executed by any firm would be one criterion of competence. A tentative scale of percentage charges for Government supervision could be adopted to suit the classification of the firms, and the saving in cost of supervision, in each case, could be handed over to the firm on the completion of the work as a bonus for relieving Government of the duty. Existing firms would be classed on their past record, subject to revision periodically. Promotion from class to class could also be permitted on the production of proof of the employment of a qualified private staff. But whatever concession be made to qualified firms, it would be necessary for the Public Works Department to retain full discrimination to decide the actual extent of supervision and inspection necessary in each case.

(5). Tendering for the execution of large works, or groups of minor works, in each centre, should continue to be open to all listed contractors as now, whether classed as qualified under the proposed system or not. But other things being equal, qualified contractors would be given prior claim to the contracts. In this way the unqualified men who now contract only for the supply of work erected under Government supervision will find their proper place as sub-contractors of qualified firms. Eventually the Government subordinate staff could be curtailed, apart from any delegation of duties to local bodies.

(6). The question of designs for Government structures should always be kept quite separate from the subsequent matters of execution and supervision. As a rule, separate

firms should be entrusted with the design and execution of a work. The dual office of designer and builder is anomalous as the interests at stake are antagonistic. Suitable fees based on the home practice would be paid for rough and final designs and working details. The payment of the full fees should depend on the acceptance in whole or in part of the designs. We cannot hope to get competent private agencies for designs for many years to come, and the bulk of the work must therefore continue to devolve on the Public Works Department. In order to carry out this duty effectually and without delay it has long been recognized that a central designing section acting in close conjunction with the Consulting Architect is essential. All essential details would be drawn out in this technical or designing section as well as specifications, and the contracting firms would only be expected to supply themselves with the less important working details such as are now left to the supervisory establishment.

(7). Owing to the unusual shortage of staff since the outbreak of war the Local Government decided to entrust the design and erection of certain school buildings to a private firm of consulting engineers (Messrs. ———) already established in India, on the firm's own terms. The contracts are for supply of buildings under the control of the Director of Public Instruction who is empowered to call on Public Works Department officers should he consider this necessary. The agreements did not provide for either inspection or supervision by the Public Works Department, and hence it is impossible to arrive at any early decision as to the results. But the few buildings so far completed have recently been inspected by Superintending Engineers in as thorough a manner as possible at this late stage, with the result that the work appears generally to be sound and, so far as can now be ascertained, Government has got fair value for its money. The constructional methods followed were not altogether up to Public Works Department standard and the roofs are likely to give trouble. It looks as though the supervision were not as thorough as in the case of Public Works Department works.

(8). The following is a summary of the views of this Government under the particular points of information mentioned in paragraph 2 of Government of India resolution no. 06-E.A., dated the 24th November, 1916 :—

(i). (1). The methods of the Buildings and Roads Branch of the Public Works Department are economical so long as the superior staff is maintained at an adequate strength. The cost of work is likely to increase with any relaxation of departmental methods or delegation of powers to local bodies.

(2). The operations of this branch of the Public Works Department cover a wide range of duties under a single control, and it is difficult to conceive how they could be discharged in a cheaper manner under any system of divided control. But as the Public Works Department in the United Provinces has long been shorthanded, the methods are no longer either economical or suitable.

(3). It has been held in certain quarters that the methods followed in the preparation of projects are unbusiness-like, in that they result in serious delays. This defect is however inevitable so long as other departments rely so much on the engineers to discover their real needs at the initial stage. In fact, the necessary safeguards against waste of energy in designing are, to a large extent, responsible for this complaint. The remedies for this are two-fold, *viz.*, the insistence on the drawing up of schedules of demands whenever new buildings are wanted and the centralising of all designs of importance.

(4). One defect of the departmental system now in force is the tendency to specialize and sub-divide with the laudable object of increased efficiency. While a few expert advisers are needed they should continue to be recruited on a temporary basis so far as the needs of the Department are concerned. Any recruitment of specialists to the permanent cadre of the Department would lead to difficulties besides being a retrograde step in the development of the country.

APPENDIX III—continued.

(ii). (1). Private enterprise generally is not sufficiently encouraged at present and the Public Works Department is overburdened with work.

In some directions, such as in electrical and mechanical installations and the distribution system of water-works, private enterprise has usually been relied on in spite of the fact that departmental work would have been cheaper, as lately proved in the case of the electrical fittings in Government buildings. Steel bridges, roofs and office fittings are frequently entrusted to well-known qualified firms, but local building firms have usually proved to be both unreliable and expensive.

(2). Some relief can be obtained by handing over the maintenance of buildings of other departments to the departments concerned, subject to the advice of the Public Works Department. The Inspector General of Police and the Director of Land Records and Agriculture are already in charge of all minor buildings of their departments. The Inspector General of Prisons goes further and maintains all prison buildings, the Public Works Department assisting only with the more technical work. On the same lines the Collector might perhaps assume charge of the revenue buildings (*katcheries*, *tahsils*, etc.) and where possible other Heads of Departments may similarly be entrusted with such work. But the charge of Government and circuit houses, Secretariat buildings, as well as all residential buildings borne on the Capital and Revenue Accounts, would be retained by the Public Works Department.

(3). Next, except in the hill districts which offer little scope for private enterprise, it is desirable, in the interests of the industrial development of the country, to entrust the execution of all ordinary imperial and provincial works of a minor character and the upkeep of all provincial and local roads to local bodies, subject to adequate safeguards. A suitable limit of cost up to which local bodies might be permitted to undertake original imperial and provincial works would be Rs. 10,000 both for buildings and roads. Safeguards would take the form of retaining the preparation of the projects and inspections of the works in the hands of the Public Works Department.

(4). Similar but modified safeguards would be necessary in the case of local works costing over Rs. 3,000 each, the control of which would be vested in local bodies. Such projects should be approved generally by the Executive Engineer and the execution of the work would be subject to that officer's inspections.

(5). The execution of all major works, *i.e.*, works costing over Rs. 10,000, should continue to be controlled by the Public Works Department, which would entrust them only to qualified firms where such are forthcoming in response to adequate financial encouragement. The supervision of local major works would devolve on the local engineer so far as the responsible Public Works Department officer considers this to be necessary.

Major local projects should be approved at the usual two stages if not actually prepared by the Public Works Department.

(iii). (1). The changes suggested under (ii) postulate the reorganization of the Public Works Department staff much on the lines adopted in these provinces in 1882. Most of the existing district staff of the Public Works Department would go over to the district boards. The rest would be retained as Assistant Engineers or subordinates of the Public Works Department. Executive Engineers as divisional engineers would be in charge of imperial and provincial projects of all kinds. They would inspect all imperial and provincial works entrusted to the charge of local bodies, such as municipal and district boards; as well as assist with projects for, and the inspection of, local works as proposed under (ii).

(2). Besides imperial and provincial major works and residences, the Executive Engineer will retain charge of all river training works and public improvements as well as works of the Archaeological Department. His services would continue to be available for contribution works.

(3). Each Executive Engineer will require at least one Assistant Engineer as a personal assistant. In this way it should soon be found possible to reduce the number

of executive charges from 16 to 10 which would make them once more coterminous with the civil divisions. A return to the former three circles of superintendence should also be possible, thus liberating the fourth Superintending Engineer for duty as Deputy Chief Engineer at headquarters. The duties of this officer would be to relieve the Chief Engineer of his less important duties and to control the proposed central designing section of the Chief Engineer's office. Such a post is a real necessity in these provinces whatever lines be followed in the reorganization. An Assistant Engineer would be attached to this technical section and the post would be filled in rotation by experienced Assistant Engineers.

(4). The Sanitary Engineer's staff has never been organized on a permanent basis. The work done is for local bodies and must always fluctuate with their needs: it consists entirely of municipal projects which are sometimes carried out by the sanitary staff, but is more often entrusted to the ordinary Public Works Department staff or to the municipal boards.

The engineering staff of the Sanitary Branch is on a temporary basis, except for the Sanitary Engineer himself who is an officer of the imperial engineer establishment holding the rank of Superintending Engineer, and an Executive Engineer who is also of the imperial establishment. The latter officer is liable to be brought back to the ordinary Buildings and Roads work at any time should the need arise. There are two Assistant Engineers each on a five years' covenant who were selected by the Secretary of State for India. Both of these officers had considerable experience of sanitary works in England before they came to India in 1914. The remainder of the engineering staff of the Sanitary Engineer is taken on from year to year.

(5). From time to time suggestions have been made that officers of the permanent establishment should specialize in the Sanitary Engineer's Branch, but it is questionable if this would work as well as getting men from home with experience of sanitary work who, after obtaining a knowledge of the conditions in India, would eventually be fitted to hold the appointment of Sanitary Engineer to Government. At present there is difficulty in staffing municipal engineers' posts in a satisfactory manner, and it seems necessary to devise a cadre to include both municipal engineers and the Sanitary Engineer's staff on a *quasi*-permanent basis.

(6). Similarly, engineers specially recruited for district boards would be borne on such a list and controlled by the Local Government.

(7). The architectural side of the Department should remain to a large extent advisory and become more educational. Projects for large buildings will continue to be prepared by the Consulting Architect working in co-operation with the proposed central designing section.

(8). The staffing of famine works would naturally be entrusted to local boards, subject to general control of the Collector who would have the services of the Executive Engineer as adviser.

(iv). Generally, the Public Works Department meets the needs of other departments, though often in a dilatory and unbusiness-like manner. The Chief Engineer urgently needs the assistance of the Deputy at headquarters to relieve him of his less important duties and to supervise the proposed central designing section of the office. This improvement will go far to remove the charge of unbusiness-like methods now levelled at the Department.

Further, local rules are needed to govern the operations of the various sub-divisions of the Buildings and Roads Branch where they overlap. This matter is already being attended to and the relations generally between these sub-divisions are satisfactory.

(v). (1). Decentralization within the Department depends on the qualifications of the staff and experience shows that no increased efficiency is to be obtained by any further advance in this direction. On the other hand, there is a real need for more centralising in the matter of designs. Our standard plans are sadly out of date and we have no adequate machinery for dealing effectually with this at present. Important bridge

APPENDIX III—concluded.

work needs some specialization—especially the reinforced concrete type which is now being largely adopted. There is also a need of collaborating with the Consulting Architect at headquarters over large building schemes to a greater extent than the Chief Engineer can be expected to do.

Incidentally the existence of such a technical branch would also result in accelerating business while the Chief Engineer is on tour or, in his capacity as Secretary, is engaged at council meetings or on committees.

(2). The delegation of powers needs some extending. Executive Engineers' powers of sanctioning estimates and acceptance of tenders should be permitted on a sliding scale depending on length of service, up to a maximum of Rs. 10,000. The 5 per cent. limitation on Executive Engineers' powers of passing excesses over estimates should be increased to 10 per cent. in the case of senior officers. This would reduce the need of so many revised estimates without any material risk.

(vi). (1). Any drastic changes of organization must be followed by material alterations in the Public Works Department Code rules, and these changes could only be made after careful consideration by a representative committee.

(2). There is one point which has always affected the convenient accounting for Public Works Department works. It is the fact that the end of the financial year does not correspond with the end of the working season. This makes it impossible to work closely to allotments and results in vague budgeting and some real abuses. Rightly or wrongly inexperienced officers think that they are expected to utilize allotments in full. They often imagine that failure to work up to their allotments is considered discreditable. Hence, while over-payments take place in some cases, lapses are reported in others at a very late date. This seriously upsets the budget for the new year. It would suit far better if all savings on incomplete works at the end of the year could be carried over and added to the budget grant when liberated in the following year; but to this there are probably insuperable financial objections.

(3). Similarly, the progress of large works executed by contract extending over a series of years, should, so far as the requirements of the Financial Department permit, be freed from budget limitations. Any such limitations naturally hamper operations and thus tend to increase the cost of building.

(4). The maintenance estimates for buildings, as now prepared, involve some unnecessary work owing to the fact that they are prepared long before the actual requirements can be stated. Special rules seem to be necessary to meet this defect. Repairs might be permitted within budget limits, subject to estimates being sanctioned by the 30th November of each year.

(5). *Stores*.—There should be an efficient purchasing agency for valuable imported materials of all kinds at

the chief ports and none should be allowed to go outside this without approval of the Chief Engineer. The present testing establishment at Calcutta could be expanded to suit. Officers responsible for the execution of works should be empowered to use this agency, subject to safeguarding limits.

(vii). *Rurki College*.—(1). This no longer attracts the best material available. The recruits now turned out are professionally inferior to British engineers and greatly lacking in energy and initiative. The teaching is inadequate and not sufficiently practical. The college needs reorganization as a training college solely for civil engineers with a sound knowledge of architecture, sanitary engineering and electricity. Post-graduate courses should be instituted in railway, sanitary and electrical engineering.

(2). It may be found possible to include advanced courses in mechanical engineering at this college, but this must be optional. Mechanical engineers, as such, should be taught elsewhere at an industrial or polytechnical school near a commercial centre.

Rurki College must be purged of its adjuncts such as subordinate and technical classes. It should be given a definite status in the University, so that its students may have the chance of obtaining a degree in engineering, and thus made more attractive to those who have had a full general education.

(3). Polytechnical schools framed to cater for the industrial development of the provinces will have to be created near industrial centres *inter alia* for the supply of subordinates of all kinds. Here severely practical instruction should be alternated with workshop training. The education and training should cover a wide range of technical and mechanical work including the building trades and the practical sides of railway and road construction, hydraulics and electricity. A certain number of selected students might be given opportunities for taking an advanced course of mechanical engineering at Rurki as a means of obtaining a special diploma.

(viii). *Practical course*.—As an engineer student is not immediately of value until after undergoing a course of training on works for a period of at least two years, some facilities must be provided for such training at the expense of the students both from English and Indian colleges. Usually this can be managed on Government works, but arrangements might also be made for this with private firms as the opportunity offers. Such a course will have to be supervised by a special officer as a superintendent of apprentice engineers. The one or more students holding guaranteed posts would undergo the same course, but would be in receipt of a salary instead of having to pay fees. The broader question of any remission of the fees generally to encourage the public to adopt civil engineering as a profession is beyond the scope of this memorandum.

APPENDIX IV.

Memorandum prepared by the Government of the Punjab.

I.—Whether the methods at present adopted for the execution of Civil Works are economical and suitable for the purposes for which they were devised.

It is assumed that the Committee is acquainted with the methods at present in vogue and it is unnecessary to describe them in detail.

Briefly speaking, however, the operations of the Public Works Department are divided into two main heads—

- (1). Original Works.
- (2). Maintenance and repairs.

The methods and adopted for carrying out these are—

- (a). By contract.
- (b). By Departmental agency.

The contract method is used for the great majority of works and repairs—in fact, whenever it is possible to do so. Departmental agency is only resorted to when the work done is not easily susceptible of measure-

ment such as—for instance, petty repairs of metalled roads and petty odd job repairs to buildings. In practically all cases the entire projects for an original work or estimates for repairs are prepared by the Department (in consultation, in the case of works done for other departments, with the Head of the Department concerned). Normally, as already stated, the execution of the work is entrusted to local contractors. As a rule the contractor possesses only slight technical knowledge so that the laying out of the work and its entire supervision, account-keeping, measurements, etc., devolve on the Public Works Department.

The above is the normal procedure to which however there are occasional exceptions as will be described in paragraph II below.

It is now to be considered whether this procedure is—

- (a) suitable,
- (b) economical.

APPENDIX IV—continued.

(a). As regards the execution of works it will be seen from the above that the Buildings and Roads Branch of the Public Works Department is in effect a body of consulting and inspecting engineers permanently retained by Government.

The suitability of this system is obvious in the cases (which are unavoidably frequent)—

(1) of constant changes in the design of a project necessitating sometimes its complete recasting,

(2) delays due not only to the above cause but to financial reasons which may result in postponement or even in abandonment of the work concerned.

The staff employed on the preparation of such projects, being in permanent employment has its hands full, not only with projects but with maintenance and routine work, and such delays and postponements involve no extra expenditure as would be the case were private agencies employed. Something has been done to simplify the preparation of projects by the adoption of standard plans for various types of Government buildings, but the Lieutenant-Governor thinks that more could be done in this direction thereby securing more speed and economy. He also thinks that as regards types of buildings and materials used insufficient consideration is given to local variations of climate, etc., but these are matters for arrangement locally.

The above statements, however, deal with one aspect of the Branch, viz., its duties as regards execution of works.

In addition to this its duties are many and varied.

It is entrusted with the maintenance of the main Communications and Provincial buildings of the Province.

It advises Local Bodies on professional matters and scrutinises (and where advisable undertakes the preparation and execution of) their projects.

As advisers to Government departments it forms a valuable aid in the development of the Province.

It keeps continuous records of local resources, rates, statistics, etc., etc., collects Government rents, and takes action under the various Acts of Government.

Its Secretariat advises the Local Government on matters appertaining to Railway development.

These many duties all fit in with one another and ensure the full employment of the *personnel* in the most efficient way possible.

The officers of the Department are transferred from station to station in the course of their service so that as they rise to higher positions involving administrative capabilities they attain an intimate knowledge of the resources and conditions of the various parts of the Province.

It is held therefore that under the existing conditions the present methods are suitable.

(b). As regards economy. In considering this aspect of the case we may view the figures giving the actual cost to Government of its establishment and compare them as far as possible with the figures that would be obtained were the alternative introduced, viz., the entrusting of works to agencies other than departmental.

Taking the figures obtained from the Annual Administration Report of actual outlay for the past five years we find that in this Province so far as Provincial Works and Repairs are concerned the following percentage was reached in the cost of establishment employed by the Public Works Department:—

Year.	Cost of works and repairs.	Establishment charges.	Percentage.
	Rs.	Rs.	
1911-12	44,18,600	7,76,389	17-57
1912-13	50,25,434	7,81,303	15-54
1913-14	65,32,723	8,67,207	13-27
1914-15	59,86,471	8,99,576	15-03
1915-16	41,49,010	9,21,665	22-21
AVERAGE	52,22,447	8,49,228	16-26

At first sight these figures would appear to lend weight to the idea that private agencies could undertake works at a lower percentage and that it would pay Government from the financial point of view to employ them.

The operations of this Branch, however, are not confined to Provincial works alone. Taking into account the total actual work done during the same period the results are as follows:—

Year.	Total expenditure under all Fund Heads on Works and Repairs.	Total cost of Establishment.	Percentage.
	Rs.	Rs.	
1911-12	58,60,763	9,07,459	15-48
1912-13	70,19,601	9,72,835	13-85
1913-14	81,95,419	10,80,871	12-67
1914-15	71,41,640	9,88,035	13-83
1915-16	57,57,616	9,88,972	17-18
AVERAGE	67,83,007	9,77,634	14-41

In addition to the above, detailed projects have been prepared during the past five years—

(i) for Provincial works amounting to Rs. 6,28,837 some of which have been abandoned and others deferred indefinitely;

(ii) for Local Bodies amounting to Rs. 1,26,98,000 for which no charge was made. Only a portion of the latter have been carried out (it is difficult to calculate the exact amount).

With private engineering firms the customary practice is generally speaking to divide their total charges (usually 10 per cent.) into two equal parts, viz., one-half for the preparation of the project and working drawings, and the other for supervision of the execution of the work. To make the above table of figures comparable with the charges of a private firm it would be equivalent to adding half the value of the projects prepared on to

* Assuming that none of the Local Body projects were carried out. the column of total expenditure.* If this were done the above average percentage becomes further reduced to 12-04.

Alternative projects have in many cases been prepared, but these have not been taken into account nor has any allowance been made for the advice given gratuitously to Local Bodies, etc., which has its monetary value and for which a private firm would ordinarily exact charges.

It would appear therefore that as far as economy is concerned the present system would compare not unfavourably with that of employing private agency. It must be remembered further that the introduction of such a system will even when fully established cause a reduction only, and not a complete abolition of Public Works Department establishment charges. At the same time the Lieutenant-Governor thinks that the present system has this defect that the cadre being a fixed one cannot be contracted in years when financial stringency compels a reduction in the Public Works budget, though it can be expanded by the employment of Temporary Engineers to meet an unusual press of work. Were it not for the deputation of so many Public Works Officers to Military duty the superior staff would have been excessive last year and this when the allotments have had to be cut down to a minimum. This, he considers, is an argument in favour of the change.

II.—Whether under the existing system private enterprise is sufficiently encouraged and whether it is possible and desirable to entrust the construction and upkeep of certain classes of Public Works to agencies other than departmental, and if so, upon what lines such change should be effected.

In the foregoing pages an endeavour has been made to show that the present system is in ordinary conditions

APPENDIX IV—continued.

fairly economical and generally suitable. They have dealt solely with normal conditions under which work has been carried out, *i.e.*, entirely by departmental agency with the employment of local contractors. Private agencies, however, have been employed whenever it has been advisable to do so, *i.e.*, large works involving expert knowledge which is beyond the scope of the Public Works Engineer, as for instance the details of the machinery of the Simla Hydro-Electric Scheme, Sanitary Projects including the supply of hot and cold water, Water Closets, etc. In such cases the drawing up of the details of the projects and the supply and erection of the machinery, etc., has been entrusted to private firms who specialise in these particular branches. These instances however are not common.

We have now to consider whether it is possible and desirable to encourage this procedure to a further extent.

This procedure is encouraged to its fullest extent in England and the reason is not far to seek. The lines on which works are undertaken in England are far more liberal and costly than they are here or will be for very many years to come, and there is an enormous scope not only for large engineering firms but for experts in all the minor branches of Engineering.

As an instance the construction of a large building may be taken. In such a case, at home, the design would in all probability be obtained through public or limited competition. In such cases a consulting architect called the "Assessor" collects and lays down the requirements and cost, etc., of the proposed building in a schedule called the "Conditions of Competition," judges the designs sent in by the competing architects and advises as to which design should be accepted.

The successful architect prepares the design, specification, etc., in detail, and is responsible for the successful execution and completion of the work. The building work is entrusted to a firm of building contractors. Highly specialised work such as ornamental ceilings, metal work, sanitary fittings, electrical work, stained glass, etc., is not executed by the contractor, but by sub-contractors selected (by competitive tendering) by the architect as the work proceeds. They are paid by the contractor who has included sums (previously specified by the architect) in his tender for these items of work. The system throughout of close competition keeps the prices to an efficient working minimum.

In this province large firms of Consulting Engineers and Contractors are practically non-existent and cases of their being employed by Government under existing conditions would be so few and far between that they could not hope for financial success. Were such firms to exist however and were means given for their encouragement it must be admitted that the class of workmanship they would turn out would probably be superior to that done by the direct agency of the Department the *personnel* of which are of necessity jacks of all trades. Not only would their knowledge of detail be superior but the amount of direct supervision given by the Engineer-in-charge would be greater and more efficient than that of an ordinary Executive Engineer who has to do a large number of inspections daily.

Assuming therefore that the further encouragement of private enterprise would tend to greater efficiency, if not to economy, and also that it would encourage industrial activity and tend to react on the educational system of the country in an advantageous way, we have now to consider the lines upon which effect should gradually be given to such changes.

In the Government Resolution which is now being considered it is suggested that much work of a simple and unimportant character which is now undertaken and supervised by highly salaried officers of Government could be carried out at a reduced cost under contract subject to Government inspection. It is further urged that local bodies should be encouraged and enabled to arrange more extensively for the execution of their own works by their own staff or private agency.

While the Local Government is inclined to agree with the latter suggestion it is of the opinion that as regards the former, encouragement should be given to private agency for the construction of large and important works rather than works of a simple and unimportant character.

The ultimate result of this policy would be (1) the increase in the responsibility and numbers of the staffs of the Local Bodies, (2) the reduction of the staff of the Public Works Department and their change from constructing Engineers into Inspectors of Works.

As regards the Local Bodies the effect would be a healthy one and in keeping with the policy of local self-government which the Local Government has always had in view. It is felt, however, that such increase in responsibility would necessitate the adoption of a more efficient system of recruitment of the Local Body staffs. This point will be dealt with later.

As regards the Public Works Department, Buildings and Roads Branch, the effect would be the gradual reduction of establishment with the introduction of private agencies.

Speaking broadly the Public Works Department should gradually hand over all its maintenance, repairs and minor works to local bodies who would receive the necessary funds and would increase their staff as required. The routine work which is inseparable from them, such as the returns, road and arboricultural tables, collection of rents, etc., would gradually go over to the local bodies, the Buildings and Roads Branch gradually reducing its minor and routine work and confining itself to the larger and more important original works which would be carried out by private agency under their supervision. This again would necessitate considerable reorganization of their staff. The method suggested for this is given later.

For the initial stages the procedure suggested is that Government would engage engineers in private practice and authorize them for a percentage to prepare projects and arrange for the execution of works commensurate with the qualifications of the Engineer concerned. This would result in the gradual building up of a class of private practitioners to whom works of increasing importance could be entrusted as their reliability became more assured.

The private practitioner would employ contractors with the approval of Government on the same lines as such contractors are now employed by Government. He would submit measurements and bills to the Executive Engineer who would then become a Government Inspector for check and payment and his work would be under the direct supervision of this officer. As the reliability of such a private practitioner became more assured a further step might be tried of omitting the check of measurements, etc., and relying merely on a general survey of the work concerned. In this way a reliable and capable class, both of individuals and private firms would come into existence and with them would come the gradual reduction of the departmental staff. It must be realized that with the gradual introduction of reliable firms and the further development of the province there will be a considerable tendency for such firms to specialize in the various branches of engineering. Such a tendency will of necessity lead to greater efficiency and as such it is to be encouraged—but to enable the Department to keep pace with this tendency it is necessary to enlarge their horizon gradually and to recruit and train a staff of engineers who will be capable of inspecting with efficiency the works entrusted to specialists of various kinds.

III.—*Whether any changes recommended by the Committee necessitate any modification of the organization of the staff of the Public Works Department, and if so, what.*

As pointed out above the changes suggested would result in a modification of the organization of the staff

APPENDIX IV—*continued.*

not only of the Public Works Department but of Local Bodies.

As regards the staffs of Local Bodies it is felt that even under the present conditions the system for recruiting the engineering staff is unsatisfactory. Under existing rules it is obligatory for District Boards, when making appointments connected with works the proper discharge of which requires some professional skill, to obtain the previous sanction of the Sanitary Engineer to Government in the case of sanitary works, and of the Superintending Engineer, Public Works Department, of the Circle concerned in the case of other works. Any member of the establishment so entertained is liable to discharge if the Sanitary Engineer or the Executive Engineer of the Division is of opinion that he is incompetent. Similarly municipalities of the first class are required to obtain the previous approval of the Chief Engineer, Public Works Department, to the appointment of a Municipal Engineer, and in the case of other municipalities of the Superintending Engineer, Public Works Department. As regards sanitary works, the previous approval of the Sanitary Engineer to Government is necessary. No engineer of a municipality of the first class can be dismissed without the approval of the Local Government and of other municipalities without the approval of the Commissioner of the Division. Each particular Municipality or District Board is entirely self-centred as far as its recruitments are concerned. There is no system of inter-transfer or satisfactory system of promotion.

If their selection of an engineer happens to be a good one the individual concerned realizes his value after a short time and eventually demands a salary which the Body concerned is not justified in paying with the result that he betters himself elsewhere and the Local Body is left to make another selection from the open market.

Should their selection be a bad one it probably takes them considerable time to realize the fact and even then they are probably actuated by feelings of pity in deciding whether to dispense with his services and so throw him out of work.

Thirdly, the engineer himself may be unfortunate in not establishing cordial relations with certain members of the Committee in which case he has either to put up with constant friction or resign.

The condition of the ordinary Municipal or District Engineers would, it is considered, be greatly ameliorated if it could be arranged that they should be all brought on to one cadre.

Transfers could then be arranged in the interests of Local Bodies generally and a proper scale of promotion be fixed enabling engineers to rise in position from small outlying stations to larger and more central ones involving greater responsibility and higher pay.

The gradual introduction of the changes suggested would emphasize the necessity of bringing the Local Body Engineers on to a proper footing and as the increase in their staff would be accompanied by a reduction in the staff of the Public Works Department their ranks could be augmented as required from this source. They would remain for the purposes of general routine and execution of works under the direct control of the Local Body, but for promotion and transfers the Local Bodies would act on the advice of the Public Works Department or of whatever agency takes its place. In this respect their position would be analogous to that of a Divisional Accountant who, although under the direct orders of the Executive Engineer, is for purposes of pay, transfer, etc., under the Accountant-General.

The effect of the changes proposed in the Public Works Department will be the gradual reduction of their numbers. The only effective way to regulate this is to gradually close down the recruitment of permanent engineers and employ only temporary ones as required. This arrangement is by no means satisfactory, but it is inevitable while the system of procedure of the Department is in a state of transition. It will however afford

a scope for Indian engineers who would be employed on the temporary establishment and would be judged by their own merits. (During the last two years about 15 Indians trained in Engineering in the University of London, Durham, and Glasgow and the King's College and Crystal Palace have sought employment in the Public Works Department, Buildings and Roads Branch, but owing to the reduction of establishment on account of curtailment of expenditure during the war none of them could be given employment.)

When the ultimate end is attained, and a large class of reliable firms of consulting engineers and contractors exists, the Department will have dwindled down to a small number of Inspectors of Works governed by the Head of the Department who will be Chief Inspector or Director of Works and Secretary to Government. The Inspectors would correspond to the present Superintending Engineers who would have Assistant Inspectors under them. The result of the proposed system would be the gradual elimination of junior appointments, and in the various branches where specialising is necessary, it would probably be convenient to recruit occasionally from well known firms.

In other cases appointments on the permanent establishment should be preceded by a thorough training at Home on the particular branch of work on which the engineer concerned is required to specialise.

IV.—Whether the Public Works Department meets the needs of other Departments of the Administration and whether the relations inter se of the various Sub-Divisions of the Buildings and Roads Branch, Sanitary, Architectural, Electrical and Civil Engineering are satisfactory.

(a). The relations between the Public Works Department and other Departments of the Administration will first be dealt with. These are considered to be eminently satisfactory. The smooth and efficient working of the Department in executing the demands of other departments depends to a very great extent on the existence of friendly relations between the officers concerned, and the Public Works Department has always seen that the members of its staff make a point of becoming personally acquainted with the officers of other departments. Such relations resulting where possible in the substitution of personal interviews for lengthy correspondence, and tend greatly to the smooth working and efficiency of the undertakings of the Department.

The only item in inter-departmental relations which requires especial mention is perhaps that of for Government officials' residences. The construction and maintenance of these is perhaps the most thankless task allotted to the Department. Not only is it impossible to design a residence to suit all possible tenants, but Government officials are inclined to be far more exacting as regards interior details and more especially annual repairs than they would be with an ordinary landlord.

(b). The relations *inter se* of the sub-divisions of the Buildings and Roads Branch.

In dealing with this it would perhaps be as well to state briefly the duties of the various branches—

Sanitary.—In this Province there is a Sanitary Engineer who is of Superintending Engineer rank; he has a Personal Assistant, a staff of surveyor and draughtsmen and an office. His duties are to advise Government and Local Bodies in all matters relating to drainage and water-supply; he draws up schemes for Government and also for Local Bodies; he reports to Government on the condition of schemes which are in operation. Where necessary he also arranges for the execution of the sanitary works, but more commonly their execution is entrusted to the Executive Engineers, or to Local Bodies. He is a member of the Sanitary Board and controls the working of the Boiler Inspector's Department under the Boiler Act. The post of Sanitary Engineer was created in 1900; his relations to the other branches and departments are considered to be satisfactory.

APPENDIX IV—concluded.

Architectural.—A Consulting Architect to the Punjab Government was appointed on 19th January 1914, on a five-year covenant. His duties are to advise Government on all matters connected with architecture and town-planning, and to prepare designs for civil works. He is assisted by a staff of draughtsmen and a Correspondence Clerk. He does not undertake the execution of civil works. The several departments of Government are permitted to address him direct, and his services are being utilized to an increasing degree by them.

An extension of the policy of specialization appears advisable in the case of architectural and town-planning work, and it is considered that the quality of work might be considerably improved if the Consulting Architect were in certain cases to undertake the supervision of work with the aid of an Architectural Assistant. The services of skilled English Foremen might be entertained for short periods to diffuse among the local *mistris* improved methods of working.

Electrical.—There is an Electrical Engineer to the Local Government who also performs the duty of an Electric Inspector under the Electricity Act. He is assisted by an Assistant Electrical Engineer. He is an executive officer and undertakes the execution of electrical works, and the preparation of electrical projects, both for the Local Government and for local bodies. His services have been much in request by Native States desiring to initiate electrical schemes.

The remaining branch is that of the Civil Engineers who of course form the main bulk of the Department.

As regards their *inter se* relations the Sanitary Engineer, Consulting Architect and Electrical Engineer may be regarded as the specialists in the Department, and the relations between them and the remainder of the Department are entirely satisfactory.

With the gradual introduction of more up-to-date methods, however, it is felt that the duties of these "Specialists" will become more and more onerous, and an enlargement of their respective branches and the introduction of other specialists is inevitable if the present system for carrying out Public Works is retained.

V.—*Whether further decentralization within the Public Works Department itself is desirable, and if so, to what extent and in what direction.*

It is not considered that any further decentralization within the Public Works Department is desirable. The scale of responsibility attached to the various ranks of the Department is suitable.

VI.—*Whether the Public Works Department Code, which regulates the execution and maintenance of Civil Works, is unduly restrictive, and if so, in what direction change is desirable.*

This issue appears to be intimately connected with the first point dealt with above. It is not considered that the Public Works Department Code, as altered to date, is unduly restrictive in any way. A new edition of the Public Works Department Code, embodying all the many alterations made since last edition, is urgently required and in such revision further simplification would doubtless be found feasible.

VII.—*Whether the system of education in Government Engineering Colleges is organised on a sufficiently broad basis to meet the needs of private agency as well as of Government. Whether it attracts suitable candidates, and whether the standard of instruction is sufficiently advanced to provide fully qualified Civil Engineers for employment by Government, Local Bodies and private engineering and contracting firms, and if not, in what directions, and to what extent, improvement is required.*

Since the abolition of Cooper's Hill there are no Government Engineering Colleges in England, so this item concerns solely the existing institutions in India.

With the present conditions of supply and demand it is considered that the existing system is satisfactory and meets with the necessary requirements.

With the steady advance in the science of engineering the necessity for keeping the curriculum of our colleges up-to-date is obvious and it is presumed that this is being done. With the existence of caste and social prejudice in this country it is considered that the present system of training engineers and upper and lower subordinates in the same institution is perhaps open to criticism, and it is suggested that Engineering Colleges should confine themselves to the training of engineers only, subordinates being relegated to other smaller institutions. This however is too large a question to be fully discussed in this memorandum.

VIII.—*Whether adequate provision is made for the practical training on works of students who have received their scientific education in English or Indian Colleges.*

In the practical training of students on works there are certain difficulties. The Executive Engineers employed on the most important works are usually very busy men, and they have little time to spare for the tuition and guidance of apprentices. Moreover good executive officers do not always possess the qualities necessary to a teacher.

However it is considered that Government should undertake this duty, and, having done so, should carefully consider the best ways and means to give the student every opportunity of acquiring experience. To this end it is necessary for the Chief Engineer to consider carefully that the executive officer is suited to the task. An honorarium might be paid to the officer if the student is considered to have spent his time advantageously. The student might during his period of practical training be entrusted with actual duties to perform carrying some small measure of responsibility with them.

The extent to which Government should undertake this provision of practical training need be limited only by the numbers of officers suited to the duty, and the existence of suitable works in progress.

With the rapid strides that are being made in engineering science it is a matter for serious consideration whether greater encouragement should not be given to officers, when on leave at home, to bring themselves up-to-date, by studying the latest methods and practices. A system of "Study Leave" on the lines of leave granted to officers of the Indian Medical Service would have many advantages especially in view of the tendency to which reference has previously been made of specialising in the various branches of Civil Engineering. Officers having in this way gained specialised knowledge will be able to impart it to junior officers and students training under them and thus encourage young engineers to continue learning their profession and avoiding the tendency to stagnate which unfortunately is rather common in this country.

APPENDIX V.

Memorandum prepared by the Chief Commissioner of the Delhi Province.

(2). In Northern India, at all events, work is carried out almost entirely through the agency of piece-workers.

There is very little direct departmental work, nor is it usual to employ contractors, in the sense in which the word is understood in Europe. Though the work is,

APPENDIX V—continued.

in the main, efficiently carried out, the system requires the maintenance of a large supervising establishment, and it carries with it two very pronounced disadvantages. In first place, the efforts of the supervising establishment are frequently wasted in carrying out operations which do not require a highly trained and specialized establishment. The consequence is not only a waste of power but a loss of efficiency, in so far as the procedure as to estimating, accounting, etc., which might not be out of place when applied to a large and costly work, is altogether unnecessary when applied to works of minor importance. In the second place, the system, in so far as it places the whole of the public engineering work of the country in the hands of a Government department, tends to check the growth both of private engineering enterprise and of a body of reliable contractors, capable of designing and executing works of any importance.

(3). The system is not, of course, directly due to the action of Government; it has grown up out of the necessities of the situation. We have had to face in the past not only an entire lack of educated labour, capable of designing and executing public works, but a low standard of morality in the labouring class which prevented it evolving men who could be trusted to carry out work with a reasonable degree of honesty. But in the interval since the Public Works Department was founded, circumstances have arisen which in my opinion require us to attempt to work gradually up to a system of 'contracting' in the proper sense of the term. It is not to be expected that the change, if it can be effected, can be more than gradual. It will obviously be many years before we can with safety rely on a procedure under which our Public Works Officers can sketch out the main lines of a work and call for tenders for its detailed design and its execution. This would imply that contractors should maintain their own engineering staff, or should at all events themselves have some engineering training. We cannot expect this, unless contracts of considerable importance are given to them; and it is just these contracts which cannot be given to firms which have no better equipment than the contractor as we now know him. Even, therefore, if we should ultimately be successful in introducing a more complete 'contracting' system, there must be a transitional period, possibly for considerable duration, during which contractors are gradually making themselves fitted for taking up work on other than a purely piece-work basis.

(4). The case for a change in procedure however appears to be very strong. It is advisable on political grounds, since it will afford a wider opening for educated Indians in private as apart from Government work; and it is advisable on grounds of ultimate efficiency, since it will encourage the specialization in the building and engineering trades without which any real advance is impossible. I feel the latter argument to be a very strong one. One cannot for instance help being struck at present by the absence of men of the foreman class, capable of doing good work whether in bricklaying, stonework or carpentry. The responsibility for supervising such work now rests with a Government Engineer; he has at his disposal men with a general training, very often purely theoretical, and it is useless in the circumstances to expect really good detailed work from the piece-worker. There is no one with expert knowledge either to instruct or supervise the workmen; and the consequence is that whatever the general merits of the work carried out by the Public Works Department, the actual details are frequently very bad indeed. I fancy that in regard to sanitary work, the need for which is increasing every day in India, the case is likely to be still worse unless we can encourage the growth of reliable contractors. Here the result of bad work is not so much an aesthetic misfortune, as a positive danger to health.

(5). The preliminary steps which I would advocate to secure the gradual devolution of work to contractors would be (1) the undertaking of the greater part of repair work on buildings of the civil departments concerned, (2) the calling for tenders for all small works for which standard plans exist; (3) the refusal to carry out 'con-

tribution works' for private bodies. These steps, which seem obvious, and call for no explanation, might be followed in time by calling for both designs and estimates for larger works of which the plans present little real difficulty, such as district offices, jails, and police stations.

(6). It would probably in the first instance be necessary to accept the position that there would be no financial gain in this procedure; indeed it is likely that there would be some financial loss, since until there is sufficient competition among competent contractors, there would be little likelihood of the better men working to present rates. We should have to look to the possibility of securing lower rates when a state of full competition is established. We should also in the first instance probably have to face some decline in efficiency, but this is a feature which we have had to face—and shall have to face increasingly in the future—in pursuit of the policy of creating wider openings for Indians.

(7). The gradual extension of this policy would of course, result in our ultimately maintaining our Public Works Department in a supervising and consulting capacity rather than as an executive body. It has been suggested in some quarters, that we should, in order to facilitate the transition to this stage, entrust a larger share of Government work to local body engineers. My own experience tells against this proposal. I am naturally in favour of any procedure which would require local bodies to employ engineers of definite qualifications, but the resources at the disposal of local bodies in Northern India do not as a rule allow them to employ men of any considerable professional standing. It has been suggested that they should be grouped together in order to allow them to employ men of a better class. I do not think this feasible. The divided responsibility which this proposal involves would ultimately result in trouble which could only be solved by placing the local body engineers under some central authority, say the Commissioner, and lending their services to a group of Boards or Municipalities. The result would be the creation of a secondary Public Works Service, practically in the employ of Government, but with so small a cadre as to offer no prospects to good men. And it would certainly do nothing towards the creation of an independent engineering profession. The proposal seems to offer far less prospect of ultimate success than the alternative already discussed, *viz.*, deliberately to face the loss of efficiency and economy which might result from allowing civil and departmental officers to offer at first small and then larger works to public tender among private practitioners, under the general supervision of a Government Consulting Engineer.

(8). It is a matter for consideration whether it should not be laid down that in giving out all contracts over a certain limit, the contractor should employ an engineer of specified qualifications. I feel strongly that no progress can be made in developing a really reliable class of contractors so long as they remain, as at present, mere purveyors of labour. Some of them have acquired by experience a certain rough and ready acquaintance with the methods of building and road making; but the majority limit their attainments to the science of dealing unfaithfully with Public Works Department subordinates and ministerial officers. If we are to get rid of the subordinate engineering establishment and at the same time to encourage the growth of the private practitioner, it appears to me obvious that we must compel the contractor to employ a skilled engineering subordinate.

(9). I now turn to certain minor points which are discussed in the Resolution under reference. The relations *inter se* of the various sub-divisions of the Buildings and Roads Branch, Sanitary, Architectural, and Electrical engineering, are not at present unsatisfactory, but I think that there would be a considerable gain in bringing them all to one regular cadre. The fact that special conditions and rates of pay apply to some of these posts must always tend to make some difference in the relations of the holders with other members of the service. I should, with Mr. Keeling, prefer to see the Chief Engineer called the Director of Public Works; and I think

APPENDIX V—concluded.

he should be given definite sanctioning powers as the head of a department. At present he appears to possess powers only as a Secretary to a Local Government. I also think that it would be advisable to mark more definitely than is done in some provinces, the direct subordination of the Architect, Sanitary Engineer, and Electric Inspector to the Director of Public Works. We have found it advisable in the Delhi Administration to treat these officers purely as designing and inspecting officers subject to the Chief Engineer, and the system appears to have obvious advantages.

(10). As regards the question of further decentralization within the Public Works Department, as at present constituted, I think there are few among those who have had to work in close connection with the Public Works Department who do not feel that the present system of working is unduly cumbrous. Apart from minor restrictions in regard to such expenditure as stationery, printing, etc., in which the Public Works Department seems to have secured less devolution than other civil departments, I think that considerably increased powers should be given to Executive Engineers in regard to appointment of work charged establishment. Their power should also be increased in respect of contracts, as to which the limit is now Rs. 5,000 though here I would insist that the Executive Engineer should be obliged in every case to call for tenders by public advertisement. Nothing, in my opinion, is likely to improve the present conditions regarding contracting so much as public calling for tenders. I am also in favour of giving increased powers to Superintending Engineers in regard to technical sanction. I doubt whether a review of a large number of estimates which have come up to the Local Government for technical sanction would reveal many modifications of importance in their details; while the delay incidental to their examination is a matter of common experience. The civil heads of departments who deal with applications for administrative sanction, frequently find works held up for long periods during which the elaborate procedure for technical sanction is being carried out, and it is very doubtful whether the gain in efficiency affords any real compensation for the obvious disadvantages of the present procedure.

(11). It is a little difficult to answer the question whether the Public Works Code is unduly restrictive, because it has become exceedingly difficult for anyone who is not gifted with the patience of an antiquarian, to discuss the rulings of this obscurantist publication on any particular point. It is an unpleasant commentary on the business capacity of the Indian Government that

it should have for so many years attempted to regulate the actions of an important department by this farago of ill-arranged and ill-digested regulations. But as regards details I would point out as unduly restrictive the ruling requiring an estimate for all kinds of work, since it is clear that there are many minor items and expenditure which do not require to be dealt with under the formal estimate procedure; and I should also be prepared to allow the Superintending Engineer a freer hand in reappropriating funds from one work to another. It appears to me that the departments concerned would be better served by a statement from him showing the progress of those works affecting them which are entrusted to him, than by being consulted as regards the reappropriation of funds from one work to another. If they find that a work is unnecessarily delayed they have their remedy in a complaint to the Chief Engineer; whereas the necessity for applying for reappropriation of funds leads to much infructuous correspondence and is liable to involve lapses towards the end of the financial year. I have already noted on the necessity for granting increased powers in respect of establishments charged to works; I understand that much difficulty is experienced on account of the restrictions imposed in this respect.

(12). I have not a first hand acquaintance with the work of audit as applied to the Public Works Department, but the complaints on this subject are so common among the engineering staff, that I hope that the Committee will take the opportunity to overhaul the system. If the complaints which one hears are correct—and they are so universal that they cannot be without foundation—the audit system is both cumbrous and inefficient as a real check audit. I admit that in the case of the Delhi Administration these complaints are less common because we have here a system of pre-audit—based on that introduced at the instance of the Durbar Committee in 1911 in regard to Durbar Expenditure which dispenses with much correspondence, and gives us the services of an Audit Officer whose personal contact with the Executive Officers removes many of the objections felt elsewhere. His inspection notes have also been of great value to the Local Administration. But I am strongly of opinion that where one is dealing as in the case of the Public Works Department, mainly with non-recurring expenditure, a check audit something of the type of that carried out by the better class of local fund auditors is of more use than the purely accounts audit now maintained for Public Works accounts.

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