

**PROCEEDINGS OF THE FIFTEENTH MEETING  
OF THE  
ALL INDIA COUNCIL FOR TECHNICAL  
EDUCATION**

*held at*

*New Delhi on 7th December, 1961*



सत्यमेव जयते

**MINISTRY OF SCIENTIFIC RESEARCH & CULTURAL AFFAIRS  
GOVERNMENT OF INDIA**

**PROCEEDINGS OF THE 15TH MEETING OF THE ALL INDIA COUNCIL  
FOR TECHNICAL EDUCATION HELD AT NEW DELHI ON 7TH  
DECEMBER, 1961**

The 15th meeting of the All India Council for Technical Education was held at New Delhi on the 7th December, 1961, at 10-30 A.M. Prof. Humayun Kabir, Minister for Scientific Research and Cultural Affairs presided over the deliberations.

2. The following were present

- |                        |    |    |   |
|------------------------|----|----|---|
| 1. Dr. M. M. Das       | .. | .. | Dy. Minister for Scientific Research and Cultural Affairs.  |
| 2. Prof. M. S. Thacker | .. | .. | Educational Adviser (Technical) to the Government of India. |

*Members of Parliament*

- |                               |    |    |              |
|-------------------------------|----|----|--------------|
| 3. Shri Ranbirsingh Chaudhury | .. | .. | Lok Sabha.   |
| 4. Shri K. Santhanam          | .. | .. | Rajya Sabha. |

*Ministries of Government of India*

- |                               |    |    |   |
|-------------------------------|----|----|---|
| 5. Dr. B. D. Kalelkar         | .. | .. | Ministry of Commerce and Industry.  |
| 6. Col. C. L. Seshagiri       | .. | .. | Ministry of Defence.  |
| 7. Shri R. P. Padhi           | .. | .. | Ministry of Finance.  |
| 8. Shri Abdul Qadir           | .. | .. | Ministry of Labour and Employment.  |
| 9. Shri P. N. Bhalla          | .. | .. | Ministry of Steel, Mines and Fuel (Department of Iron and Steel).                         |
| 10. Shri V. K. Rao            | .. | .. | Ministry of Works, Housing and Supply.  |
| 11. Dr. K. L. Rao             | .. | .. | Ministry of Irrigation and Power.   |
| 12. Shri R. Prasad            | .. | .. | Ministry of Home Affairs.   |
| 13. Shri A. C. Ramchandani    | .. | .. | Ministry of Information and Broadcasting.   |
| 14. Shri H. P. Sinha          | .. | .. | Ministry of Transport and Communication (Department of Transport).                        |
| 15. Shri C. P. Vasudevan      | .. | .. | Ministry of Transport and Communication (Department of Communication and Civil Aviation). |
| 16. Shri M. V. Hanumantha Rao | .. | .. | Central Board of Irrigation and Power.  |

*State Governments*

17. Shri K. N. Sinha, Dy. Minister Bihar.  
for Industries, Bihar.
18. Shri A. K. Mehta, Assistant Director of Technical Education, Gujarat.
19. Shri J. B. Nanda, Principal, Kashmir Government Polytechnic, Srinagar.
20. Prof. S. Rajaraman, Director of Technical Education, Kerala.
21. Shri T. N. Tolani, Director of Technical Education, Maharashtra.
22. Shri S. D. Sharma, Minister for Education and Law, Madhya Pradesh.
23. Shri J. G. Abraham, Director of Technical Education, Madras.
24. Shri Anna Rao Ganamukhi, Minister for Education, Mysore.
25. Shri Surajmal, Minister for Public Works, Punjab.
26. Shri V. G. Garde, Director of Technical Education, Rajasthan.
27. Shri M. Zaheer, Joint Secretary, Industries Department, Uttar Pradesh.
28. Dr. D. M. Sen, Secretary, Education Department, West Bengal.
29. Shri A. S. Lall, Director of Employment and Training, Delhi.
30. Shri K. L. Sethi, Education Department, Himachal Pradesh.

*Industry & Commerce*

31. Shri Kanchanlal C. Parikh, All India Organisation of Industrial Employers.
32. Prof. G. M. Nabar, Employers Federation of India.
33. Shri G. Y. Mangrulkar, Do.
34. Shri Sookamal Ghose, Federation of Indian Chambers of Commerce and Industry.

*Labour*

35. Prof. K. V. Subrahmanyam ... All India Trade Union Congress.

*Inter University Board*

36. Dr. A. L. Mudaliar.

*National Council for Rural Higher Education*

37. Shri T. S. Avinashilingam, M. P.

*Association of Principals of Technical Institutions (India)*

38. Dr. T. Sen.

39. Shri G. R. Damodaran.

*University Grants Commission*

40. Dr. B. D. Laroia.

*Professional Bodies*

41. Major General Harkirat Singh ... Institution of Engineers.

42. Shri H. N. Dallas ... Indian Institute of Architects,  
Bombay.

*National Productivity Council*

43. Shri H. D. Shourie.

*Nominees of Government of India*

44. Shri S. K. Bose.

*Chairmen of Regional Committees (Ex-officio)*

45. Lala Shri Ram ... Northern Regional Committee

46. Dr. A. L. Mudaliar ... Southern Regional Committee

*Chairmen of the All India Boards of Technical Studies (Ex-Officio)*

47. Dr. V. K. R. V. Rao ... Commerce.

- Lala Shri Ram ... Textile Technology.

48. Shri M. Fayazuddin ... Architecture and Regional Planning.

49. Dr. G. P. Kane ... Chemical Engineering and Chemical Technology.

*Secretary*

50. Shri G. K. Chandiramani, Joint  
Educational Adviser (Technical)  
to the Government of India.

Sari L. S. Chandrakant, Shri A. B. Chandiramani, Shri Biman Sen, and other officers of the Technical Division of the Ministry of Scientific Research and Cultural Affairs were present.

Dr. D. L. Malhotra and Shri K. L. Joshi of the Planning Commission and Shri S. C. Sen, Principal, Delhi Polytechnic, Delhi attended by special invitation

3. The following members were unable to attend

1. Shri P. N. Kirpal ... .. Educational Adviser to the Government of India.

*Members of Parliament*

2. Shri N. Keshava ... .. Lok Sabha

*Ministries of Government of India*

3. Director, Mechanical Engineering, Railway Board ... .. Ministry of Railways.
4. Shri S. Mullick ... .. Ministry of Food and Agriculture.
5. Shri H. N. Sethna ... .. Department of Atomic Energy.
6. Shri A. B. Guha ... .. Ministry of Steel, Mines and Fuel (Department of Mines and Fuel).

*Planning Commission*

7. Dr. A. N. Khosla

*State Governments*

8. Shri C. V. D. Murthy, Director of Technical Education, Andhra Pradesh ... .. Andhra Pradesh.
9. Minister for Education, Assam ... .. Assam.
10. Shri Bijoynanda, Chief Minister, Orissa ... .. Orissa.
11. Shri S. D. Bahuguna, Director of Education, Manipur ... .. Manipur.
12. Chief Commissioner, Tripura ... .. Tripura.

*Industry and Commerce*

13. Shri B. F. Goodchild ... .. Associated Chambers of Commerce of India.
14. Shri Bharat Ram ... .. Do.
15. Shri R. H. Modi ... .. All India Organisation of Industrial Employers.
16. Prof. M. P. Gandhi ... .. Federation of Indian Chambers of Commerce and Industry.

*Labour*

17. Shri Shantilal Shah ... .. Indian National Trade Union Congress.
18. Shri Michael John ... .. Do.
19. Shri Shanta Ram S. Tawade ... .. Hind Mazdoor Sabha.

*Central Advisory Board of Education*

20. Dr. Mohan Sinha Mehta.

*National Institute of Sciences of India*

21. Prof. R. C. Majumdar.

*University Grants Commissions*

22. Chairman, University Grants Commission.

*Nominees of Government of India*

23. Shri M. Hayath.

*Chairmen of Regional Committees (Ex-Officio)*

24. Shri J. J. Gandhi .. .. Eastern Regional Committee.

25. Shri R. Choksy .. .. Western Regional Committee.

*Chairmen of the All India Boards of Technical Studies (Ex-officio)*

26. Shri N. K. Mitra .. .. Engineering and Metallurgy.

27. Prof. V. N. Adarkar .. .. Applied Art.

Shri J. J. Ghandy .. .. Management.

**Item No. 1—To confirm the minutes of the 14th meeting of the Council**

The Council confirmed the minutes of the 14th meeting with the following modification —

*Paragraph 15*

“The Council noted with regret that the *Central Scheme* of construction of staff quarters has had to be dropped as a sequel to a reduction in the Plan allocation for the Central sector etc. etc.”

**Item No. 2—To report on the action taken on the recommendations/decisions of the Council made at the 14th meeting**

5. The report was recorded.

6. The Council reiterated the need for staff quarters, particularly in locations where no alternative accommodation for staff was available, in order to assure that the institutions would be adequately staffed. The Council, therefore, recommended that the scheme of establishment of a technical institution should be an integrated one which should include wherever necessary, construction of essential staff quarters. The Central assistance for the scheme should extend to the staff quarters constructed.

7. In order to assess the dimensions of the problem of staff quarters, the Council decided that the Secretariat should prepare a detailed note on the present position in respect of the strength of staff in the institutions, staff quarters already available and additional quarters required on a minimum basis etc.

**Item No. 3—To report on the progress of schemes of Technical Education included in the Third Five Year Plan**

8. While noting the progress of schemes under the Third Five Year Plan, the Council decided that detailed reports on the institutions in respect of staff and equipment should also be furnished in future.

9. The Council emphasised that in view of the continuing unsatisfactory position in respect of teaching staff in the institutions, urgent measures should be taken to remedy this situation in accordance with the earlier recommendations made in this behalf. In addition, wherever a new institution was sanctioned for establishment by the State Governments, at least 80% per cent of the staff should be sanctioned on a permanent basis as otherwise, it would be extremely difficult for the institutions to attract suitable candidates for teaching positions.

10. The Council also reiterated its earlier recommendation that if in a particular State the staff position in the existing institutions was unsatisfactory, every care should be exercised in starting new institutions. To multiply institutions in such a situation will give rise to more difficulties which will ultimately be detrimental to standards.

11. In view of the fact that staff and equipment (the latter involving foreign exchange) were crucial factors in the development of technical education under the Third Five Year Plan, the Council recommended that a detailed report on the existing position in respect of these two items should be prepared and the difficulties experienced analysed. The report should be submitted to the Planning Commission and the Central Government for consideration with a view to formulating positive measures to overcome the difficulties.

12. The Council agreed with its Coordinating Committee that the Defence Ministry's Schemes for the provision of part-time courses for A. M. I. E. Examinations should be examined by the Regional Committees as in the case of all other schemes of Technical Education in order to ensure that correct standards will be maintained by the training centres.

**Item No. 4—All India Boards of Technical Studies**

(a) **Matters for report**

(b) **Matters for decision**

**A. Chemical Engineering Board**

13. The Council accepted the recommendation of the Board that the admissions to ten institutions selected by the Board be increased to 60 each and the Regional Committees be asked to formulate detailed proposals in respect of additional instructional facilities for the institutions concerned. The Council also decided that in all these institutions, a certain number of seats be reserved for students belonging to those States where facilities for chemical engineering studies were not available.

14. In view of a large demand anticipated for chemical engineers, the Council decided that early steps be taken to organise additional centres for Degree courses in this field in the States of Gujarat, Kerala, Assam and Madhya Pradesh, in consultation with the State Governments concerned. The places where the courses should be organised be decided in consultation with the Regional Committees concerned.

15. The Council endorsed the recommendation of the Board that no additional centre for Chemical Engineering was necessary for Madras State at this stage.

16. The Council endorsed the recommendation of the Board that the Indian Institute of Science, Bangalore, may restart degree course in Chemical Engineering and conduct it on the basis of a three-year course for graduates in Physics, Chemistry and Mathematics. In view of this, another centre for degree course in Chemical Engineering need not be started in Mysore State at this stage.

17. The Council accepted the recommendation of the Board that degree course in Chemical Engineering be started in Roorkee University.

18. The Council accepted the recommendation of the Board that a three-year degree course in Chemical Engineering for graduates in Physics, Chemistry and Mathematics be organised at certain selected centres.

19. The Council endorsed the recommendation of the Board that the Department of Applied Chemistry, Calcutta University, be requested to reorganise M.Sc. (Tech.) course in Applied Chemistry into a three-year degree course in Chemical Engineering for graduates in Physics, Chemistry and Mathematics.

20. The Council decided to await the detailed schemes to be formulated by the Board in respect of separate degree courses in Chemical Technology.

21. The Council agreed that pending the formulation of detailed schemes by the Board as indicated in para 20 above, the Department of Chemical Technology, Bombay University, may continue the existing courses in Chemical Technology.

22. The Council decided to await the revised schemes to be prepared by the Board for the training of supervisory personnel for chemical industry.

23. The Council agreed with the Board that there was no need at this stage for an additional centre for degree course in Chemical Engineering in Andhra Pradesh.

#### *B. Architecture Board*

24. The Council agreed with the Coordinating Committee and decided that the revised scheme of examinations for part-time students for the National Diploma in Architecture as formulated by the Board be approved with the following modification:—

“The qualifying marks in each of the three papers should be 40 per cent and the aggregate for a pass 50 per cent.”

25. The Council approved the revised standards of instructional facilities for degree or equivalent courses in Architecture as formulated by the Board.

26. The Council agreed that the Delhi School of Planning and Architecture be permitted to conduct examinations for the National Diploma in Architecture. The Council desired that the Architecture Board should lay down in detail the terms and conditions under which the examinations held by the School could be recognised for the award of National Diploma.



### C. Engineering Board

27. The Council endorsed the recommendation of the Board that a separate Surveyors' course at degree or diploma level was not necessary at this stage.

28. The Council approved the scheme of part-time National Diploma courses in Engineering as formulated by the Board.

29. The Council decided that the scheme of five-year integrated degree course in Engineering formulated by the Board be circulated to universities for comments.

### Item No. 5—The Regional Committees

#### (a) Matters for report

#### (b) Matters for decision

#### A. Southern Regional Committee

30. The Council agreed with its Coordinating Committee that in order to secure coordinated development of technical education in each Region, the State Governments should consult the Regional Committees on the implementation of schemes included in the Third Five Year Plan with particular reference to the phasing of the schemes, location of new institutions, pattern of admissions to different courses, estimates of cost etc. The Council also agreed that with the setting up of the State Boards of Technical Education in each State, a stage had been reached at which the functions of the Regional Committees and the State Boards should be clearly defined. The manner in which these two bodies should coordinate their work for the promotion of technical education should be indicated. It was also necessary to define the scope of functions of the State Council of Technical Education *vis-a-vis* the All India Council. The Council decided to set up a Special Committee consisting of the following persons to formulate detailed proposals:

Prof. M. S. Thacker  
 Dr. A. L. Mudaliar  
 Lala Shri Ram  
 Dr. D. M. Sen  
 Shri M. Zaheer  
 Shri T. N. Tolani  
 Shri G. K. Chandiramani

31. The Council approved that admissions to the Kakinada and Anantapur Engineering Colleges be increased to 150 each.

32. The Council approved the following estimates of cost for each of the polytechnics at Nandyal and Nellore, subject to the usual financial scrutiny—

		Rs.
<i>Non-recurring</i>		
Buildings (54,200 sq. ft. plinth)	.. ..	7,86,244.40
Equipment, library and furniture with cost of installation	.. ..	13,75,957.57
	<b>Total</b>	<b>21,62,199.97</b>
<i>Recurring</i>		
Salaries, maintenance and library	.. ..	3,05,000.00

31. The Council recommended the following estimates of cost for the polytechnic at Perinthalamanna (Palghat District) subject to the usual financial scrutiny :—

*Non-recurring*

	Rs.
Buildings (54,200 sq. ft. plinth) .. .. .	7,86,240
Equipment, library and furniture with cost of installation .. .. .	13,75,957
Total .. .. .	21,62,197

*Recurring*

Salary, maintenance and library .. .. .	3,05,000
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32. The Council approved additional hostel accommodation for five institutions in the Southern Region as given below :—

Name of the Institution	Amount of loan recommended
	Rs.
1. Sri Venkateswara University College of Engineering, Tirupathi. .. .. .	13.22 lacs
2. Government Polytechnic, Cannanore .. .. .	4.79 lacs
3. Central Polytechnic, Trivandrum .. .. .	4.79 lacs
4. Combatore Institute of Technology, Coimbatore .. .. .	1.62 lacs
5. Thiagrajar College of Engineering, Madurai .. .. .	1.62 lacs

35. The Council approved an additional estimate of Rs. 14,200 for equipment for the Ceramic Institute, Gudur.

36. The Council approved a total estimate of 54,200 sq. ft. for buildings for the Seshasayee Institute of Technology, Tiruchirapalli, at an estimated cost of Rs. 6.25 lacs.

37. The Council approved an additional estimate of Rs. 8,000 for furniture and Rs. 3,000 for library for the School of Mines, Oorgaum.

38. The Council approved the following estimates of cost for the Engineering College, Kothamangalam, subject to the usual financial scrutiny :—

*Non-recurring*

	Rs.
Building (1,24,200 sq. ft. plinth) .. .. .	18,06,900
Equipment, library and furniture including erection and installation etc. .. .. .	29,04,818
Total .. .. .	47,11,718

*Recurring (Annual ultimate)*

Staff and maintenance .. .. .	7,90,000
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39. The Council approved the following revised estimates for 13 institutions in the Southern Region as indicated below, subject to the usual financial scrutiny :—

Name of the Institution	Revised recommendation		
	Building	Equipment	Recurring
	Rs.	Rs.	Rs.
<i>Andhra Pradesh</i>			
1. Government Proddatur. Polytechnic, .. ..	7,86,240	13,75,957	3,05,000000
2. Government Nizamabad Polytechnic, .. ..	7,86,240	13,75,957	3,05,000000
3. Government Guntur Polytechnic, .. ..	7,86,240	13,75,957	3,05,000000
<i>Madras State</i>			
4. Government Vellore Polytechnic, .. ..	7,86,240	13,99,057	3,05,000000
5. Government Nagercoil Polytechnic, .. ..	7,86,240	13,99,057	3,05,000000
6. Srinivasa Subbaraya Polytechnic, Sirkali .. ..	7,86,240	13,99,057	3,05,000000
<i>Mysore State</i>			
7. Malnad College of Engineering, Hassan .. ..	18,06,900	29,04,818	7,90,000000
8. Government Frazerpet Polytechnic, .. ..	7,86,240	14,10,557	3,05,000000
9. Government Bidar Polytechnic, .. ..	7,86,240	14,10,557	3,05,000000
10. Government Raichur Polytechnic, .. ..	7,86,240	14,10,557	3,05,000000
11. Government Krishnarajpet Polytechnic, .. ..	7,86,240	14,10,557	3,05,000000
<i>Kerala State</i>			
12. Government Kottayam Polytechnic, .. ..	7,86,240	13,75,957	3,05,000000
13. N. S. S. College of Engineering, Palghat .. ..	18,06,900	29,04,818	7,90,000000

40. The Council approved hostel accommodation for two institutions as shown below :—

Name of the Institution	Estimates of cost
	Rs.
1. Polytechnic at Pondicherry .. .. .	2,52,600
2. Engineering College, Gulbarga .. .. .	1,62,000

41. The Council approved a revised estimate of Rs. 7.9 lakhs for recurring expenditure for the Tirupathi Engineering College.

42. The Council approved the recommendations of the Regional Committee that the Standing Reviewing Committees be also entrusted with the responsibility of inspecting institutions to ensure that the conditions of grants-in-aid are fulfilled by the institutions concerned.

43. The Council agreed with the Coordinating Committee that the estimates prepared by the Regional Committee for the conversion of three-year degree course into five year course in the Osmania University Engineering College required to be examined in detail on the basis of estimates already approved for the same purpose under the Special Expansion Programme. The secretariat should carry out the examination and submit revised proposals to the Chairman who may be authorised to approve them on behalf of the Council.

#### B. Western Regional Committee

44. The Council agreed with the Coordinating Committee that the constitution of the Regional Committees provided for the cooption of two persons and as such it was open to any Regional Committee to include in this constituency a representative of the Steel Projects.

45. The Council approved the following estimates of cost for the Gandhian Civil Engineering Institute, Adipur, subject to the usual financial scrutiny :—

#### Non-recurring

	Rs.
Building (15,579 sq. ft. plinth) of new construction and cost of existing building suitably remodelled .. .. .	3,90,380
Equipment, library and furniture .. .. .	5,72,500
	9,62,880
<i>Recurring (ultimate)</i> .. .. .	1,60,704
Loan for hostels for 90 students .. .. .	2,24,100

#### C. Eastern Regional Committee

46. The Council agreed with the Coordinating Committee that to establish a Leather Institute in Bihar at an estimated cost of Rs. 4.357 lakhs (non-recurring) and Rs. 1.02 lakhs (recurring) just for 12 students did not represent

a step in the right direction. Arrangements could be made in institutions outside the State as for instance, at Calcutta and Madras for the training of this limited number of students from Bihar. The Council, therefore decided that this matter should be examined further in consultation with the Regional Committee and the State Government.

47. The Council approved an estimate of Rs. 8 lakhs for additional hostel accommodation for the Birla Institute of Technology, Ranchi.

48. The Council approved an estimate of Rs. 3.76 lakhs for additional hostel accommodation for each of the Colleges at Jorhat and Gauhati.

49. The Council decided that the question of increase in the value of Practical Training Stipends be examined by the Central Government in the light of the policies laid down for similar schemes.

50. The Council approved the following estimates of cost for the Engineering College at Dakhineswar, subject to the usual financial scrutiny :—

*Non-recurring*

	Rs.
Building (1.25 lakhs sq. ft. plinth) .. ..	25 lakhs
Equipment, furniture and library .. ..	22 lakhs
Total .. ..	47 lakhs

*Recurring (Net deficit)*

.. .. ..	5.66 lakhs
Loan for hostel for 375 seats 50% of the student body ..	13.5 lakhs

51. The Council approved hostel accommodation for five institutions as shown below :—

Name of the College	Amount Rs.
1. Bihar College of Engineering, Patna .. ..	1.97 lakhs
2. Muzaffarpur Institute of Technology, Muzaffarpur ..	3.76 lakhs
3. University College of Engineering, Burla .. ..	3.76 lakhs
4. Bihar Institute of Technology, Sindri .. ..	11.54 lakhs
5. Birla Institute of Technology, Ranchi .. ..	8.91 lakhs

**Item No. 6—To consider the report of the Committee on Post-Graduate Engineering Education and Research**

52. The Council was in agreement with the approach made by the Special Committee to the problem of development of Post-graduate Engineering Education and Research and endorsed the various recommendations contained in the Report.

53. The Council decided that after the Report is accepted by Government and Board of Post-graduate Studies in Engineering and Technology may be set up under the aegis of the Council to implement the Report.

**Item No. 7—To consider the Report of the Special Committee for  
Commerce Education**

54. The Council agreed with the aims and objects of B. Com. courses as defined by the Special Committee subject, however, to the modification that while no stress should be laid on specialisation, provision should be made in the scheme of studies for an optional subject to be offered by candidates, wherever possible. Since according to the Special Committee B.Com. course should be regarded as liberal education, the Council recommended that the question of development at this level be considered by the University Grants Commission as an integral part of development of degree courses in the Humanities and Liberal Arts in universities.

55. As regards M. Com. courses and D.C.P. courses the Council decided that these should be treated as particular fields of Technical Education. As such, reorganisation and development of the courses along the lines suggested by the Committee should be brought within the purview of the Council itself for purposes of coordination and maintenance of standard. In order to secure these objectives, the following measures should be adopted :—

- (a) The Board of Studies in Commerce should be reconstituted in order to make this body fully representative of all interests concerned and also to closely associate with it professional institutions as for instance the Institute of Chartered Accountants, the Institute of Costs and Works Accountants, the Institute of Bankers etc. The reconstituted Board should formulate detailed proposals for the development of facilities for D. C. P. courses in the States as also for the development of M.Com. courses at selected centres in accordance with the recommendations of the Special Committee.
- (b) Close liaison should be established between the Board of Management Studies and the Board of Commerce Studies in order to secure coordination between Commerce Education and Management Studies. For this purpose, a Joint Committee of the two Boards should be set up to deal with problems of common interest.

56. As regards Commerce Education at the secondary stage, the Council decided that the recommendations of the Special Committee be forwarded to the Ministry of Education for the consideration of the All India Council for Secondary Education.

**Item No. 8—To consider the report of Shri S. C. Sen on part-time  
and correspondence courses in Engineering & Technology**

57. The Council decided to defer consideration of this item in order to enable the members to study the Report of Shri S. C. Sen in detail.

**Item No. 9—To consider the report of the Expert Committee on the  
establishment of a Central Foundry and Forge Institute**

58. The Council approved the scheme for a Central Foundry and Forge Institute and recommended that early steps be taken to establish the Institute.

**Item No. 10—Scheme for Training of Teachers for Polytechnics**

59. The Council approved the general principles formulated by the Working Group for the training of teachers for polytechnics.

**Item No. 11—To nominate a representative of the All India Council for Technical Education on the General Council of the Institute of Applied Manpower Research**

60. The Council nominated Dr. V. K. R. V. Rao as its representative on the General Council of the Institute of Applied Manpower Research.

**Item No. 12—To receive a note on the present position of acceptance of scheme of revised salary scales for technical teachers by the State Governments**

61. The Council decided that renewed efforts should be made with the State Governments concerned for the acceptance of the revised salary scales as approved by the Central Government. Since the implementation of the revised scales is the minimum necessary for improving the Staff position in institutions, the Council did not favour any partial measures in this respect.

The meeting terminated with a vote of thanks to the Chair.

G. K. CHANDIRAMANI,  
*Secretary,*  
*All India Council for Technical Education*

H. KABBIR,  
*Chairman*  
*All India Council for Technical Education*

**ALL INDIA COUNCIL FOR TECHNICAL EDUCATION**  
**15TH MEETING**

*Date* : 7th December, 1961

*Place* : Commission Room 'G'  
Vigyan Bhavan,  
Maulana Azad Road,  
New Delhi.

*Time* : 10.30 A.M.

**AGENDA**

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**Item No. 1—To confirm the minutes of the 14th meeting of the Council**

The minutes of the 14th meeting of the Council held on the 7th July, 1961 were circulated to members. Comments were received from Shri Avinashilingam Chettiar, M. P. and Shri K. L. Joshi of the Planning Commission. The correct position on the points raised by Shri Avinashilingam was explained to him. No further remarks have been received from Shri Avinashilingam Chettiar.

In the light of the comments received from Shri K.L. Joshi the word 'Central' has been added before the word 'scheme' occurring in the first line of paragraph 115 of the proceedings. The proceedings will now read as follows—

115. "The Council noted with regret that the *Central Scheme* of construction of staff quarters has had to be dropped as a sequel to a reduction in the Plan allocation for the Central Sector, etc., etc."

**Item No. 2 -To report on the action taken on the recommendations/decisions of the Council made at the 14th Meeting**

The All India Council for Technical Education held its 14th meeting on the 7th July, 1961. The action taken on the recommendations/decisions of the Council is reported below—

Recommendations/Decisions	Action taken
<i>(a) Teachers for Technical Institutions</i>	
<p>The Council noted with serious concern the shortage of staff generally in all technical institutions and recommended that no new institution should be established in a State unless the existing institutions were adequately staffed. The Council also reiterated its earlier recommendations that the State Governments should be requested to make every effort to persuade industrial and commercial concerns in their respective areas to assist in the staffing of technical institutions by deputing their experts to do part time teaching work. The Council further recommended that Engineers in the Public Works Departments should be asked to work as teachers for stated periods.</p>	<p>The recommendations of the Council have been brought to the notice of State Governments and Regional Committees.</p> <p>In processing the proposals received from State Governments/private agencies for the establishment of new institutions, the present staff positions in existing institutions in the State will be kept in view.</p>

Recommendations/Decisions	Action taken
<i>(b) Common Examination for admission to Engineering Colleges</i>	
<p>The Council reiterated its previous recommendations regarding the setting up of a Central agency in each State for selecting candidates for admission to technical institutions and pooling of seats in all institutions. In order to meet some special situations, as for instance, the late announcement of the result of some candidates, the Council recommended that the head of each institution should be given discretion to admit upto three candidates provided that these candidates have secured at least 65 per cent marks in qualifying examination and were not rejected by the Central Selection Board of the State.</p>	<p>The States have generally agreed to pool the seats available in all institutions and to set up a Central Selection Board for each State for making admissions. Since the proposal is in various stages of implementation in the States, a detailed note on the final position in respect of each State will be submitted to the Council at the next meeting.</p>
<i>(c) Development of facilities in Industrial Design</i>	
<p>The Council accepted the recommendation of the Applied Art Board that Delhi Polytechnic, Delhi, the Government College of Arts and Crafts, Calcutta, the Government College of Arts and Crafts, Madras and the J. J. Institute of Applied Art Bombay be selected as four centres for the development of facilities in Industrial Design. The admission to these institutions should be open to students of other States where such facilities do not exist to the extent of 50 per cent of the seats available. Also a team of four experts drawn from these institutions should be sent abroad to study the latest developments in Industrial Design, and services of Sir Gordon Russel or alternatively Mr. Hans Schleger may be secured under any one of the Aid Programmes.</p>	<p>The Central Government has accepted the recommendation of the Council regarding the development of four Regional Centres for training in Industrial Design and taken up the question of establishing these centres with the State Governments concerned.</p> <p>The Central Government has also approached the Colombo Plan authorities for the services of Sir Gordon Russel to advise on the development of the four centres.</p>

Recommendations/Decisions	Action taken
<i>(d) Providing facilities in the field of Management Education and Training</i>	
The Council approved Madurai, Lucknow and Allahabad as additional centres for Industrial Management and Business Management courses.	The Central Government has accepted the recommendations of the Council in respect of non-University institutions subject to the usual financial scrutiny. As regards University institutions, the recommendations have been communicated to the University Grants Commission.
The Council recommended a building grant of Rs. 2.53 lakhs (17,000 sq. ft.) to the Delhi University for providing separate accommodation for the department of management studies. The Council also recommended that the pattern of Central assistance for Management Studies should be 50 per cent non-recurring expenditure and 50 per cent for recurring expenditure for a period of five years.	
<i>(e) Change in the pattern of Diploma courses in Engineering and Technology</i>	
The Council was of the view that the entire question of aims and objects of Diploma Courses in Engineering and technology, their contents and standards of training and other aspects should be reviewed in relation to the changing pattern of employment of technical personnel in industry. The courses should be reorganised with a view to training the correct types of technicians required for the industrial development of the country. The Council recommended that a small Expert Committee comprising representatives of industry and technical institutions should be set up for the purpose.	Detailed proposals are being formulated for the setting up of an Expert Committee for the reorganisation of diploma courses.
<i>(f) Expansion of facilities in the field of Chemical Engineering and Chemical Technology</i>	
In order to meet the requirements of Chemical Engineers in the Third and the Fourth Plans, the Council recommended that the admission to the existing centres of Chemical	The matter was further examined by the Chemical Engineering Board at its meeting held on 8th August, 1961 whose recommendations are given under item No. 4 of the agenda.

Recommendations/Decisions	Action taken
<p>Engineering should be increased to 60 wherever they are less than this number. Also the question of additional centres to be started may be examined by the Board.</p>	
<p><i>(g) Recommendations of the Regional Committees</i></p>	
<p>The Council approved schemes prepared by its Regional Committees for the development of existing institutions and for the establishment of new institutions. The estimated cost of all the above development is Rs. 2,20,52,280 non-recurring, Rs. 28,65,099 recurring (ultimate). The Council also recommended loans of Rs. 85,18,885 for the construction of hostels.</p>	<p>The recommendations of the Council have been accepted by the Central Government subject to the usual financial scrutiny.</p>
<p><i>(h) Scales of fees for Technical Institutions</i></p>	
<p>The Council suggested that the entire question of the scales of tuition fees to be charged by technical institutions should be examined in detail in order to have uniform scales for the country as a whole.</p>	<p>Further data are being collected from the institutions in order to examine the question of scales of fees to be prescribed for various courses.</p>
<p><i>(i) Admission of Students to Polytechnics</i></p>	
<p>In order to avoid wastage in Polytechnics the Council recommended that a detailed investigation into the question of admission to polytechnics, the calibre of students admitted, utilisation of facilities and related aspects of polytechnic education may be carried out through a suitable agency specially selected for the purpose.</p>	<p>Detailed proposals are being formulated to carry out an investigation into the question of admissions to polytechnics.</p>
<p><i>(j) Junior Technical School Certificates</i></p>	
<p>The Council recommended that steps should be taken to secure recognition for junior Technical School Certificates for the purpose of employment in Industry.</p>	<p>Further action is being taken to secure recognition for the certificates of the junior technical schools for employment in Industry.</p>

Recommendations/Decisions	Action taken
<i>(k) Revising the estimated cost of furniture for Degree and Diploma course students in a hostel</i>	

The Council recommended that in view of increased costs, the furniture estimates for a hostel seat should be revised to Rs. 200 for degree course students and Rs. 150 for diploma course students.

The recommendation of the Council has been accepted and the new standards will be adopted in sanctioning proposals for hostels.

*(l) Schemes under the Third Five Year Plan*

The Council stressed the need of providing staff quarters for technical teachers and recommended that the State Governments might be informed that if they so wished, they could divert the provision made for the establishment of new institutions in their Plans to the construction of staff quarters for the existing ones. The Council further recommended that the expenditure incurred on staff quarters should be regarded as an admissible item for the purpose of Central assistance.

The recommendation of the Council is under consideration.

**Item No. 3—To report on the progress of schemes of Technical Education included in the Third Five Year Plan**

The Third Five Year Plan of Technical Education as formulated on the basis of the recommendations of the Working Group was placed before the All India Council at its meeting held on 7th July, 1961. Since then, the State Plans have been modified slightly by the State Governments concerned and the present position as also the progress of the schemes are indicated below :

**STATE PLANS**

2. *Engineering Colleges*—The original Plan of 19 engineering colleges to be established during the Third Plan period remains unaltered. This includes seven Regional Engineering Colleges accepted for those States that had not been allotted any such college in the Second Plan.

In the current year, the following Colleges started functioning—

- (a) Motilal Nehru Engineering College, Allahabad, (Regional College).
- (b) College of Engineering and Technology, Delhi.
- (c) Regional Engineering College, Kozhikode, (Calicut).
- (d) Sardar Vallabhbhai Regional College of Engineering and Technology Surat (Regional College).
- (e) Jalpaiguri Engineering College.
- (f) Engineering College, Kothamangalam (Private Sector).

3. The Government of Orissa also started an Engineering College at Roukela. The State Government had intended that this should be a Regional College included in the Central Plan but since the proposal had not been formally sanctioned by the Central Government, the State Government has proposed that the College may be in the private sector.

4. It was also reported to the Council on the 7th July, 1961, that the Bhagalpur College provided for in the State Third Plan had been started by the State Government in 1960-61.

5. Of the six colleges started during 1961-62, one viz. at Kothamangalam is in the private sector for which the State Plan includes the necessary provision. The College has been sanctioned under the revised "Open Door" policy.

6. *Polytechnics*—The draft Third Five Year Plan as formulated by the Working Group provided for the establishment of 67 polytechnics including 18 institutions sanctioned during the Second Plan period but not started. Since then, the provision has been revised to 70 institutions due to the fact that the Government of Uttar Pradesh has agreed to bring within the scope of development all the existing seven un-approved Overseers' schools in the State instead of four as proposed earlier. The un-approved institutions will be re-organised and developed into full-fledged polytechnics for diploma courses in civil, mechanical and electrical engineering.

7. 13 polytechnics have started functioning in the current year as shown in the Statement at Annexure I.

8. *Girls' Polytechnics*—Out of the 26 institutions included in the State Plans four polytechnics have started functioning at the following centres :—

- (a) Hyderabad.
- (b) Kakinada.
- (c) Trivandrum.
- (d) Bangalore.

9. *Grants-in-aid*—During the current financial year, an amount of Rs. 31 lacs has been allocated to States for purposes of ways and means advance for technical education schemes.

10. *Higher Technological Institutes*—During 1961-62, a common admission examination was held for all the four Higher Technical Institutes. The admissions made to the different Institutes are as given below—

*Kharagpur Institute*

For the first year of the five-year integrated course ..	296
For the second year of the five-year integrated course ..	120

*Bombay Institute*

For the first year of the five-year integrated course ..	121
For the second year of the five-year integrated course ..	102

*Madras Institute*

For the first-year of the five-year integrated course ..	129
For the second year of the five-year integrated course ..	19

*Kanpur Institute*

For the first year of the five-year integrated course . . . . . 102

11. In addition to the above, the Kharagpur Institute admitted 152 students for post-graduate courses and the Bombay Institute 98 students.

12. A consortium of nine leading institutions in the U.S.A. has been formed to assist in the establishment and development of Kanpur Institute. A team of seven American engineering educators have arrived in India to formulate the details of the assistance programme.

13. *College of Engineering and Technology, Delhi*—This College started functioning in August this year when 141 students were admitted to the first year of the five-year integrated course in various branches of Engineering and Technology. The construction of the Institute is in progress. Five British experts are serving at the college.

14. *Grants and Loans*—During 1961-62, it is proposed to sanction a sum of Rs. 150 lakhs for assistance to non-government institutions. So far as State Governments are concerned, the Central assistance had already been allocated against which ways and means advances are being made.

15. It is also proposed to sanction loans amounting to Rs. 170.8 lacs to non-government institutions, State Governments etc. for the construction of hostels.

16. *Part Time Courses*—Early in 1960, the Ministry of Defence with the approval of the Planning Commission and the Ministry of Scientific Research and Cultural Affairs formulated a scheme for training candidates on a part-time basis for A.M.I.E. and other similar professional examinations. Under the scheme, part-time courses have now been organised at 19 centres for about 3,110 students. An expenditure of Rs. 3.65 lacs non-recurring and Rs. 22.13 lacs recurring has been approved by the Government for the purpose.

17. *Merit-cum-Means Scholarships*—1,160 scholarships for degree courses and 540 scholarships for diploma courses have been sanctioned in 1961-62 for first entrants to various technical institutions. The scholarships have been allocated to the institutions in proportion to the admissions made.

18. *Technical Teachers' Training Programme*—During 1961-62, a batch of 1,05 candidates has been selected for training under the Technical Teachers' Training Programme.

Twenty Teacher-trainees belonging to the 1959-60 batch have completed their training and have been appointed as teachers in various institutions.

**Item No. 4—All India Boards of Technical Studies**

(a) **Matters for report**

(b) **Matters for decision**

**A. CHEMICAL ENGINEERING BOARD**

1. (a) *Matters for Report*—The Board held its meeting on the 8th August, 1961.



2. *Admission to Chemical Engineering Courses twice a year*—It was reported at the last meeting of the Council held on 7th July, 1961 that the Chemical Engineering Board had recommended that in order to assure a continuous flow of chemical engineering graduates to industry, admissions to institutions should be made twice a year i.e. in July and November, instead of once a year as at present. The Board also appointed a Sub-Committee to formulate detailed proposals in this regard. After a careful consideration of all aspects of the matter the Sub-Committee expressed the view that unless the present system of examinations in the country was changed, it would not be practicable to make admissions to chemical engineering courses twice a year. The Board agreed with the views of the Sub-Committee and suggested that the original proposal be dropped.

(b) *Matters for Decisions*

3. *Expansion of training facilities in Chemical Engineering and Chemical Technology*—The Board considered the question of expansion of training facilities during the Third and Fourth Plan periods and estimated that in order to meet the demand for chemical engineering graduates (6,500 to 7,000 according to the Planning Commission), the annual admissions should increase from the present figure of 610 to over 1,400. The Board recommended that the required expansion should be undertaken in stages.

4. In the first stage the admission capacity of the existing institutions should be raised to 60 seats wherever it was less than this number. Accordingly, the Board recommended that in the first stage, the admission capacity of the following institutions be raised to 600 (an addition of about 320 seats)—

Name of the institution	Sanctioned annual intake	Proposed additional intake	Total
1	2	3	4
<i>A. Eastern Region</i>			
<i>I. West Bengal</i>			
1. Indian Institute of Technology, Khargpur .. .. .	35 (1st yr. 24) (2nd yr. 11)	25	60
<i>II. Bihar</i>			
1. Bihar Institute of Technology, Sindri (Bihar University) ..	30	30	60
<i>B. Western Region</i>			
<i>III. Maharashtra</i>			
1. Laxminarayan Institute of Technology, Nagpur .. .. .	36	24	60

1	2	3	4
<i>C. Northern Region</i>			
<i>IV. Uttar Pradesh</i>			
1. Indian Institute of Technology, Kanpur .. .. .	15 (1st yr.)	45	60
<i>D. Southern Region</i>			
<i>V. Andhra Pradesh</i>			
1. Deptt. of Chemical, Technology, Osmania University, Hyderabad	30	30	60
2. J. V. D. College of Science and Technology, Waltair (Andhra University) .. .. .	30	30	60
<i>VI. Madras</i>			
1. A. C. College of Technology, Guindy, Madras .. .. .	30	30	60
2. College of Engineering, Annamalai University, Annamalainagar	30	30	60
3. Indian Institute of Technology, Madras .. .. .	15 (1st yr.)	45	60
<i>A. Delhi</i>			
1. Delhi College of Engineering, Delhi	30	30	60
Total .. .. .	281	319	600

5. The above institutions, should be requested to formulate detailed proposals together with estimates of cost for the proposed expansion. The proposals when received should be first examined by the Regional Committees concerned and then by the All India Council.

6. In the second and subsequent stages of development, some additional centres may be started in the course of next 2-3 years depending upon the availability of staff, foreign exchange and other factors. The number of additional centres should be decided from time to time after obtaining more detailed information from the Planning Commission regarding the firm demand for chemical engineers for the development of chemical industry. In locating the new centres, preference should be given to those states where chemical industry has developed or is likely to be developed rapidly under the five-year plans and where training facilities in chemical engineering do not exist. Accordingly, the Board recommended that the States of Gujarat, Assam and Kerala may be considered next since these States do not have facilities for training in Chemical Engineering and Chemical and allied industries are developing there rapidly. The actual location of the centres may be decided in consultation with the State Governments concerned.

7. The Board also considered the proposal of the Coimbatore Institute of Technology, Coimbatore, for starting degree course in Chemical Engineering and noted that in addition to the Indian Institute of Technology, Madras, which is an all-India centre there are at present two centres for Chemical Engineering in Madras State viz.

(a) A. C. College of Technology, Madras University.

(b) The Department of Chemical Engineering, Annamalai University.

The admission capacity of these institutions which is 30 students each at present will be increased to 60 as indicated in para 4 above. In the circumstances, the Board recommended that the question of starting another centre in Madras viz. at the Coimbatore Institute of Technology, Coimbatore, may be deferred for the present.

8. The Coordinating Committee at its meeting held on the 1st November 1960, while considering the recommendations of the Expert Committee on Metallurgy regarding the setting up of an institution at Shimoga in Mysore State for course in Mining and Metallurgy, recommended that the Chemical Engineering Board should examine the question of developing training facilities in Chemical Engineering at suitable engineering colleges in the State. The Chemical Engineering Board considered the matter and noted that if its recommendations regarding the revival of the Chemical Engineering degree course at the Indian Institute of Science, Bangalore were accepted, Mysore State which has no Chemical Engineering Institute at present, will have one centre. If however, the Indian Institute of Science, Bangalore, is considered inadequate to meet the requirements of the State since it is an all-India institution, the question of starting the course in any one of the state technical institutions may be considered in the second stage of development of Chemical Engineering.

9. The Board considered a proposal received from Roorkee University for starting degree course in Chemical Engineering and recommended that the proposal be approved.

10. *Three-year degree course in Chemical Engineering after B.Sc.*—The Board decided that in addition to a five-year integrated degree course in Chemical Engineering after Higher Secondary, a three-year degree course with B.Sc. as admission qualification should be formulated. The B.Sc. degree should be either in the three subjects combination viz. Physics, Chemistry and Mathematics or in Chemistry as main and Physics and Mathematics as subsidiary subjects. The Board appointed a Sub-Committee to prepare a scheme for the three-year degree course.

11. *Revival of Chemical Engineering degree course at the Indian Institute of Science, Bangalore*—The Board recommended that the Indian Institute of Science, Bangalore, may revive its Chemical Engineering degree course and the Institute may conduct the three-year degree course now proposed. The admission to the course should be 60 students each year.

12. *Re-organisation of M.Sc. (Tech.) degree course in Applied Chemistry in the Department of Applied Chemistry, Calcutta University, Calcutta*—The Board recommended that after the scheme for the three-year degree course after B.Sc.

has been formulated, the Department of Applied Chemistry, Calcutta University, may be requested to consider whether it would like to modify the present M.Sc. (Tech.) degree course in Applied Chemistry on that model. The annual admission to this course should be 60 students each year.

13. *Three-year degree course in Chemical Technology*—The Board considered the question of what further revision in the present pattern of Chemical Engineering studies as approved by the Council in 1955 were necessary, in order to meet the changing situations in industry and other sectors. The present pattern envisages that at the under graduate level there should be only one course in Chemical Engineering leading to the first degree in this field and that no parallel course in any branch of Chemical Technology should be conducted. Chemical Technology subjects should only be offered at the post-graduate level after a candidate has obtained the first degree in Chemical Engineering. Provision may, however, be made in the under graduate curriculum of the Chemical Engineering course for the study of the various branches of Chemical Technology as electives in the final year of the course.

14. The Board noted that the experience of some institutions was that Chemical Industry required Chemical Technologists specially trained in particular fields such as Ceramics and Glass, Plastics, Paints and Varnishes, Oils and Waxes, Food, etc. Wherever these various branches of Chemical Technology were offered at post-graduate level for Chemical Engineering graduates, response from the students was extremely poor as at present they find ready employment in industry after graduation and, therefore, there was no incentive for these students to join post-graduate courses. This position is likely to continue for quite a few years. On the other hand, there is an increasing demand in industry not only for Chemical Engineers but also for specially trained Chemical Technologists. In the circumstances, the Board felt that the present pattern of courses in Chemical Engineering and Chemical Technology should be adopted to the changing situation in the country. The Board considered that for this purpose, a three-year degree course in Chemical Technology with B.Sc. as the minimum admission qualification may serve a useful purpose if it were conducted in selected institutions. The Board set up a Sub-Committee to examine the matter in detail and formulate proposals.

15. *Continuation of Chemical Technology courses in the Department of Chemical Technology, Bombay University, Bombay*—The Board recommended that pending a full examination of the question of Chemical Technology courses, the present courses in Chemical Technology in the Department of Chemical Technology, Bombay University, Bombay, may continue.

16. *Supervisory Personnel for Chemical Industry*—The Board was of the view that a stage had been reached at which the entire question of training of supervisory personnel for Chemical Industry should be re-examined so as to decide if diploma courses in certain fields of Chemical Technology were necessary, and, if so, to formulate suitable scheme for the purpose. The scheme of training of Chemical operators for Chemical Industry prepared some time back also required to be re-examined in the light of new developments in Chemical Industry. The Board set up a Sub-Committee to examine the matter in detail and formulate proposals.

17. *Proposal of Venkateswara University to start a degree course in Chemical Engineering*—Venkateswara University has submitted a proposal to start a degree course in Chemical Engineering. The Chemical Engineering Board has, however, recommended that the required expansion of training facilities in Chemical Engineering should be undertaken in stages. In the first stage, the admission capacity of the existing institutions should be raised to 60 seats each year wherever it is less than this number and in the second and subsequent steps the additional centres should be opened depending upon the availability of staff, foreign exchange, etc. In locating new centres, preference should be given to those States in which chemical industries have developed or are likely to be developed rapidly in the five-year plan and where facilities for training in Chemical Engineering do not exist.

18. In Andhra Pradesh, there are at present two centres for Chemical Engineering studies viz.

- (i) Department of Chemical Technology, Osmania University, Hyderabad.
- (ii) J. V. D. College of Science and Technology, Andhra University, Waltair.

The Board has already recommended to increase the admission capacity of both these institutions which is 30 students at present to 60 students each year.

19. In view of the above position, the Chairman of the Chemical Engineering Board has suggested that starting of a degree course in Chemical Engineering at Venkateswara University may be deferred for the present.

#### B. ARCHITECTURE BOARD

##### (a) *Matters for Report*

1. During the period under review the architecture, Board held one meeting on 29th September, 1961.

##### (b) *Matters for Decision*

2. The Coordinating Committee at its meeting held on 1st November, 1960 recommended that the entire system of examinations for part-time courses should be examined by the respective Boards of Studies and recommendations made on the particular system to be followed consistent with the aim and objects of part-time courses. The Architecture Board has now revised the scheme of examination.

The following are the main features of the revised scheme—

1. Students appearing for the examinations at the Intermediate stage and at the Diploma stage do not have to submit Testimonies of Studies;
2. The project work is carried out in an architectural school under the direct supervision of teachers;
3. In the examination scheme marks are awarded for the year's work in all the subjects;

4. Compartmental examinations will be held only for those students who have obtained a minimum of 50 per cent in the aggregate and have failed in one subject.
5. The qualifying marks in all theory papers is 30 per cent as against 50 per cent in the previous scheme. The aggregate for a pass, however, is 50 per cent both in the new scheme and the old scheme.

A copy of the revised Scheme of Examination is placed at Annexure II.

3. *Model list of equipment, staff and accommodation etc.*—The Coordinating Committee at its meeting held on 1st November, 1960, considered the model list of equipment, staff and accommodation drawn up by the Board for institutions conducting National Diploma or first degree courses in Architecture. While generally approving the standards, the Committee suggested certain modifications. The Architecture Board has reviewed the requirements keeping in view the suggestions of the Coordinating Committee and the Standards laid down by the All India Council for Technical Education for engineering institutions. The following are the previous recommendations of the Architecture Board and its revised recommendations in respect of those items for which a reduction was suggested by the Coordinating Committee.

	Previous recommendations	Present recommendations
Class-rooms .. .. .	2,000 sq. ft.	1,500 sq. ft.
Library and Reading Room .. .. .	1,500 sq. ft.	1,500 sq. ft.
Students' Room and Canteen .. .. .	1,300 sq. ft.	900 sq. ft.
Miscellaneous Rooms .. .. .	1,000 sq. ft.	300 sq. ft.
Library and Reading Room .. .. .	Rs. 77,000	Rs. 50,000
Photographic and Model making equipment .. .. .	Rs. 25,000	Rs. 20,000

The Coordinating Committee had suggested that 1,000 sq. ft. would suffice for Library. The Board has expressed the view that in an architectural institution, Library is used intensively by a large number of students, and recommended for the consideration of Coordinating Committee that 1,500 sq. ft. may be approved for Library and Reading Room. Further, there were certain omissions in the original list of equipment drawn up for laboratories and these have now been included.

4. A copy of the revised Model list of equipment, staff and accommodation recommended by the Board is placed at Annexure III.

5. *To recognise the School of Planning and Architecture for conducting its own examinations for the award of National Diplomas in Architecture*—The School of Planning and Architecture is at present affiliated to the All India Council for Technical Education for conducting the National Diploma Course in Architecture. The examination for the Diploma is being held by the All India Council for Technical Education. This is the only institution affiliated to the Council-for conducting courses in Architecture.

6. At its meeting held on 8th February, 1953, the Council adopted the policy of "recognising" institutions and examinations conducted by them for the award of National Diplomas and Certificates while continuing to hold examinations itself wherever necessary. The Council, however, at its meeting held on 22nd February, 1957, decided that it should cease to affiliate institutions and hold examinations as and when the State Board or other suitable organisations in each State are found to be in a position to take over these responsibilities. It was also decided that the Council may endorse the Diplomas and Certificates awarded by the institutions for National Diplomas and Certificates in the appropriate subjects on being satisfied that the students concerned have studied in recognised institutions, that the courses and examinations are of the proper standard and that other necessary requirements have been fulfilled. Such endorsements will carry all-India recognition.

7. In accordance with the above policies laid down by the All India Council, the Board has recommended that the School of Planning and Architecture, Delhi be permitted to hold its own examinations in Architecture and the successful candidates be eligible for the award of National Diplomas.

### C. ENGINEERING BOARD

#### (a) *Matters for Report*

1. During the period under review the Engineering Board held one meeting on 23rd November, 1961.

#### (b) *Matters for Decision*

2. *Surveyors' Courses*—The Estimates Committee for the Ministry of Defence had suggested that steps should be taken to provide Surveyors' Courses both preliminary and advanced in engineering institutions for the Surveyors' Cadre in M.E.S. The Engineering Board which considered the suggestion noted that there was at present a very limited number of posts of Surveyors under the Ministry of Defence and other Departments, and, the future requirements also were not likely to be large. The Board, therefore, felt that there was no need to start separate Surveyors' courses at degree or diploma level in engineering institutions. The Board was also of the view that the usual degree and diploma-holders in Civil Engineering should be in a position to man the Surveyors' Cadre in M.E.S. after a short departmental training as is the practice at present.

3. *Part-time National Diploma Course in Engineering*—The Board approved the scheme of a part-time National Diploma course in Engineering (Civil, Mechanical and Electrical) being conducted by the Delhi Polytechnic for those candidates who have passed the National Certificate Examination in Engineering or its equivalent.

4. The subjects for the four-year part-time Course have been grouped in two parts in such a manner that no subject of part I is carried into the 2nd part for purposes of examination. The Board recommended that examinations for both the parts be conducted by the All India Council for Technical Education.

5. *Five year integrated degree course in Engineering*—As a sequel to the re-organisation of Secondary education in the country the All India Council for Technical Education decided some time back that the first degree courses in Engineering and Technology should be of five years duration with Higher Secondary as the minimum admission qualification. The All India Council also asked its Boards of Studies to formulate detailed syllabii etc. for the five-year Integrated Courses in various fields. Accordingly, the Engineering Board has formulated the syllabii etc. for the new degree courses in Civil, Electrical and Mechanical Engineering. A copy of the Syllabii is given at Annexure IV\*. The first 3 years of the Course are almost common to all the three branches viz., Civil, Electrical and Mechanical Engineering. Specialisation in the respective branches is provided for in the last two years.

6. The Board recommended that engineering colleges should have a minimum of 200 working days in a year excluding annual examinations. There should be 36 working hours in each week of which about 30 hours should be according to a prescribed time table covering lectures and practicals. The remaining six hours should be devoted by the institutions to the development of their own teaching plans and techniques e.g., tutorials, colloquia, seminars optional subjects, humanities etc. The contact hours should lay emphasis on the development of a spirit of inquiry in the student and creative and critical thinking. The Syllabii prepared by the Board are therefore not burdened with too many details but instead give enough guidance to the institutions to develop the courses on their own and attain the general standards indicated.

#### **Item No. 5—The Regional Committees**

##### **(a) Matters for report**

##### **(b) Matters for decision**

#### **A. SOUTHERN REGIONAL COMMITTEE**

##### **(a) Matters for Report**

1. The Committee held a meeting on 24th July, 1961.

2. The Committee was reconstituted with effect from 30th October, 1961 for a further period of three years. The reconstituted committee held its first meeting on 22nd November, 1961 when it unanimously elected Dr. A.L. Mudaliar as Chairman.

##### **(b) Matters for Decision**

3. *Engineering College, Guindy—Continuation of Tele-Communication Engineering course*—This College has been conducting for a number of years a degree course in Telecommunication Engineering. Under the Special Expansion Programme, the admissions to the course were also increased from 20 to 40. In July, 1961 the State Government, however, stopped the course without consulting the All India Council or the Central Government, since the response from the students for admission to this branch of engineering was poor. The matter was therefore referred to the Regional Committee which recommended that the course should continue since according to the Planning

\* Printed separately.



Commission's estimate, the demand for technical personnel in this field would be large and also the All India Council has suggested a separate degree course in Electrical Communication Engineering at the first degree level.

4. The State Government has accepted the above recommendation of the Regional Committee and restarted the course with effect from 1961-62.

5. *Implementation of schemes included in the States Five Year Plans, procedures to be followed*—The Regional Committee observed that the State Governments seemed to be under the impression that once various schemes were included by the Working Group in the Plans and the necessary provision made for the purpose, they could proceed to implement them without any reference to or concurrence of the Regional Committees and the Council. The Regional Committee expressed the view that while the Working Group might indicate the acceptance in principle of particular schemes for the Third Plan, it would still be necessary for the appropriate Committees of the All India Council to examine the details of the scheme before formal approval was given. Otherwise, unilateral implementation of the scheme by State Governments would lead to haphazard and unco-ordinated development of technical education in the country.

6. *Kakinada and Anantapur Engineering Colleges—Increase in admissions*—These institutions, established for a long time have an admission capacity of 120 students for civil, electrical and mechanical engineering. The Third Five Year Plan of the State provides for the expansion of the institutions for an admission of 150 students each. The Regional Committee has examined the question of expansion in detail and recommended additional admission of 30 students each without any extra cost since the standards of instructional facilities adopted for 120 admissions would serve 150 admissions as well.

7. *Establishment of Government polytechnics at Nandyal and Nellore*—The revised Second Five-Year Plan of Andhra Pradesh provided for the establishment of two polytechnics at Nandyal and Nellore with an admission capacity of 120 students for Civil, Electrical and Mechanical Engineering. The institutions started functioning in 1960-61. The Regional Committee has approved the establishment of the institutions and made the following estimates of cost for each :—

*Non-recurring*

	Rs.
Buildings (54,200 sq. ft. plinth) . . . . .	7,86,5240
Equipment, library and furniture with cost of installation . . . . .	13,75,9957
Total . . . . .	21,62,1197

*Recurring*

Salaries, maintenance and library . . . . .	3,05,0000
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8. *Establishment of a Government Polytechnic at Perinthalamanna (Praleghat District)*—The Third Five Year Plan of Kerala State provides for the establishment of a Polytechnic at Perinthalamanna. The Regional Committee

has approved the scheme and recommended the following estimates of cost. The Polytechnic has an admission capacity of 120 students for civil, mechanical and electrical engineering diploma courses.

<i>Non-recurring</i>		Rs.
Buildings (54,200 sq. ft. plinth) .. .. .		7,86,240
Equipment, library and furniture with cost of installation .. .. .		13,75,957
	Total .. .. .	21,62,197

*Recurring*

Salaries, maintenance and library .. .. . 3,05,000

9. *Loans for Hostels*—The Committee has recommended additional hostel accommodation for five institutions as shown below—

Name of the Institutions	Total student body	Hostel accommodation			Percentage of (c) to (b)	Amount of loan recommended
		Earlier provided (i)	Now recommended (ii)	Total (i) & (ii)		
(a)	(b)			(c)	(d)	(e)
(Rs. in lacs)						
1. Sri Venkateswara University College of Engg., Tirupathi ..	600	..	480	480	80%	13.22
2. Government Polytechnic, Cannanore ..	360	..	180	180	50%	4.79
3. Central Polytechnic Trivandrum ..	360	..	180	180	50%	4.79
4. Coimbatore Institute of Technology, Coimbatore ..	600	240	60	300	50%	1.62
5. Thiagrajar College of Engineering, Madurai	600	240	60	300	50%	1.62

10. While the Regional Committee has recommended overall hostel accommodation for 50 per cent of the students in the last four institutions, the recommendation in respect of Sri Venkateswara University is for 80 per cent of the students since the University is residential.

11. *Ceramic Institute, Gudur*—A scheme of development of the Institute was approved by the All India Council sometime back for diploma courses in Glass and Enamel Technology and Pottery and Ceramics, at an estimated cost of Rs. 73,700. At that time, the Ceramic Factory, Gudur was providing certain facilities for the training of the students of the Institute which were taken into account in making the estimates of cost of equipment required for the development Plan. The factory has since expressed its inability to continue to provide the facilities since that is interfering with production work. Therefore, at the request of the State Government for augmenting the facilities at the Institute, the Regional Committee has recommended an additional amount of Rs. 14,200 for certain items of equipment required for the work of the students.

12. *Seshasayee Institute of Technology, Tiruchirapalli*—The original scheme of establishment of the institute approved by the All India Council provided for a building of 50,000 sq. ft. (plinth area) at an estimated cost of Rs. 6.25 lakhs. The institute has already constructed a building of 48,260 sq. ft. (plinth area) at a cost of Rs. 4,58,791. The new standards of a polytechnic as laid down by the Regional Committee provides for building accommodation of 54,200 sq. ft. The Regional Committee has therefore recommended 54,200 sq. ft. for this Institute in accordance with the new standards at an estimated cost of Rs. 6.25 lakhs.

13. *School of Mines, Oorgaum*—The School of Mines, Oorgaum was established in 1957 for National Certificate courses in Mining and Mine Surveying. The estimates of cost of the School as approved earlier included Rs. 9,000 for furniture and Rs. 5,000 for library. The standards for a mining school were subsequently laid down which provide for Rs. 17,000 for furniture and Rs. 8,000 for library. On a reference received from the State Government the Regional Committee has now recommended an additional estimate of Rs. 8,000 for furniture and Rs. 3,000 for library for the School.

14. *Establishment of an Engineering College at Kothamangalam (Kerala State)*—The Mar Athanasius College Association sponsored the establishment of an engineering college at Kothamangalam under the revised "Open Door Policy". The State Government of Kerala supported the proposal and underwrote the resources of the sponsors. The State Government also made adequate provision in its Third Five Year Plan for its share of assistance to the College. The proposal was approved in principle by the Chairman of the All India Council.

15. The Regional Committee has made the following estimates of cost for the College, which will have an admission capacity of 120 students.

<i>Non-recurring</i>	Rts.
Buildings (1,24,200 sq. ft. plinth) .. .. .	18,06,900
Equipment, Library and Furniture including erection and installation etc. .. .. .	29,04,818
Total Non-recurring ..	47,11,718
 <i>Recurring (Annual ultimate)</i>	
Staff and maintenance .. .. .	7,90,000

The Regional Committee has not specified the split-up of the admissions to the various branches.

16. *Additional instructional facilities for polytechnics and engineering colleges*—The Committee reviewed its recommendations in respect of the following 12 degree and diploma institutions established during the Second Plan period for which the estimates had been made on the basis of standards laid down sometime back. The standards have since been revised by the Regional Committee. As a sequel to it and also due to increase in the prices of equipment, the Regional Committee has made additional estimates as shown below—

Serial No.	Name of the Institution	Building Grant		Equipment Grant		Recurring Grant		Remarks	
		Previous recommendation	Revised recommendation	Previous recommendation	Revised recommendation	Previous recommendation	Revised recommendation		
1	2	3	4	5	6	7	8	9	
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.		
<i>Andhra Pradesh</i>									
1	Govt. Polytechnic, Proddatur ..	7,59,000	7,86,240	9,04,000	13,75,957	1,60,000	3,05,000		
2	Govt. Polytechnic, Nizamabad ..	7,59,000	7,86,240	9,04,000	13,75,957	1,60,000	3,05,000		
3	Govt. Polytechnic, Guntur ..	7,59,000	7,86,240	9,04,000	13,75,957	1,60,000	3,05,000		
<i>Madras State</i>									
4	Govt. Polytechnic, Vellore ..	7,59,000	7,86,240	9,04,000	13,99,057	1,60,000	3,05,000		
5	Govt. Polytechnic, Nagercoil ..	7,59,000	7,86,240	9,04,000	13,99,057	1,60,000	3,05,000		
6	Srinivasa Subbaraya Polytechnic, Sirkali ..	7,59,000	7,86,240	9,04,000	13,99,057	1,60,000	3,05,000		
<i>Mysore State</i>									
7	Malnad College of Engg., Hassan ..	17,31,500	18,06,900	17,56,000	29,04,818	5,00,000	7,90,000		
8	Govt. Polytechnic, Frazerpet ..	7,59,000	7,86,240	9,04,000	14,10,557	1,60,000	3,05,000		
9	Govt. Polytechnic, Bidar ..	7,59,000	7,86,240	9,04,000	14,10,557	1,60,000	3,05,000		
10	Govt. Polytechnic, Trichur ..	7,59,000	7,86,240	9,04,000	1,40,557	1,60,000	3,05,000		
11	Govt. Polytechnic, Krishnarajapet ..	7,59,000	7,86,240	9,04,000	14,10,557	1,60,000	3,05,000		
<i>Kerala State</i>									
12	Govt. Polytechnic, Kottayam ..	7,59,000	7,86,240	9,04,000	13,75,957	1,60,000	3,05,000		
13	N.S.S. College of Engg., Pulhat ..	15,24,000	18,06,900	16,12,000	29,04,818	3,80,000	7,90,000		

17. *Loans for Hostel*—The Regional Committee recommended loans for Hostel in respect of the following institutions—

Name of the Institution	Total student body	Hostel Accommodation		Total (i) & (ii)	Percentage of (c) to (b)	Amount of loan recommended
		Earlier provided (i)	Now recommended (ii)			
(a)	(b)			(c)	(d)	(e)
Polytechnic at Pondicherry ..	180	..	90	90	50	Rs. 2,52,600
Engineering College, Gulbarga	600	240	60	300	50	1,62,000

18. *Additional staff for University College of Engineering, Tirupathi*—This College was established in 1959 on the recommendations of the All India Council for Technical Education. The estimates were approved on the basis of the then existing standards for four-year degree courses. The institution made a request to the University Grants Commission that since the staff sanctioned earlier was inadequate additional staff should be sanctioned. The matter was examined by the Regional Committee which recommended that since the institution was conducting five-year Integrated Degree Courses, it may adopt the revised standards in respect of staff now formulated for similar institutions. On this basis, the Committee recommended ceiling Rs. 7.9 lakhs for recurring expenditure on staff and maintenance (staff—Rs. 6.9 lakhs; maintenance—Rs. 1.0 lakh).

19. *Standing Reviewing Committee*—The Regional Committee recommended that the Standing Reviewing Committees appointed to watch the progress made in their States may also be entrusted with the inspection work envisaged under the conditions of grant-in-aid laid down while sanctioning establishment, development of private institutions.

20. *Engineering College, Osmania University—Additional Grants*—Consequent on the conversion of 3-year degree course into 4-year course and subsequently to 5-year Integrated Course in the Engineering College Osmania University, the University made a request for additional instructional facilities. On a reference made by the University Grants Commission the Regional Committee assessed the additional requirements as under—

<i>Non-recurring</i>				Rs.
Building (48,100 sq. ft. plinth) .. ..	..	..	..	6.96 lacs
Equipment, Library and Furniture .. ..	..	..	..	14.96 lacs
Total—Non-recurring .. ..				21.92 lacs
<i>Recurring</i>				Rs.
Staff salaries and maintenance .. ..	..	..	..	4.00 lacs

## WESTERN REGIONAL COMMITTEE, 23RD MEETING

*Matters for report*

1. The Committee was reconstituted for a period of three years with effect from 13th October 1961. The reconstituted committee elected Shri R.D. Choksi as its Chairman.

*Matters for decision*

2. The Regional Committee proposed that the composition of the Regional Committees should be enlarged by including a representative of the Steel Projects in the Public Sector situated in the respective regions.

3. *Gandhidham Civil Engineering Institute, Adipur*—This was established in 1950 by Gandhidham Maitri Mandal to cater to the needs of displaced persons from West Pakistan. The State Government of Gujarat have agreed to assist the institution and have underwritten the resources of the Society for its share of expenditure. The Regional Committee recommended the institution for three year diploma course in civil engineering with an annual admission of 60 students, at the following estimated cost—

*Non-recurring*

Building (15,579 sq. ft. plinth) of new construction and cost of existing building suitably remodelled .. .. .	Rs. 3,90,380
Equipment, library and furniture .. .. .	5,72,500
Total—non-recurring .. .. .	9,62,880

<i>Recurring ultimate</i> .. .. .	1,60,764
<i>Loan for hostels for 99 students</i> .. .. .	2,24,100

## EASTERN REGIONAL COMMITTEE

*(a) Matters for report*

1. The Eastern Regional Committee was reconstituted with effect from 10th April 1961 for a further period of three years. The reconstituted Committee held its first meeting on 29th November 1961 when it elected unanimously Shri J.J. Gandhi as Chairman.

*(b) Matters for decision*

2. *Establishment of an Institute of Leather Technology in Bihar*—The Committee recommended the establishment of an institution for Leather Technology with an annual intake of 12 students—6 each for Tanning and Footwear and Leather Goods Manufacture. The estimates of cost of the institution is as shown below—

*Non-recurring*

Buildings (16,300 sq. ft.) .. .. .	Rs. 2,26,700
Equipment, Library and Furniture .. .. .	2,09,000
Total .. .. .	4,35,700

*Recurring*

Net deficit .. .. .	1,02,000
<i>Loan for hostel for 20 students</i> .. .. .	51,000

3. The Regional Committee recommended that the institute should adopt the syllabus framed by the Committee and the examinations should be conducted by the State Board of Technical Education, Bihar.

4. *Birla Institute of Technology, Ranchi*—This Institute was expanded for an additional student body of 542·50 per cent. of these students were provided with hostel accommodation and a loan of Rs. 6·5 lakhs was approved for the purpose. The institution requested that in view of its location, it would be necessary to provide hostel accommodation for the other 50 per cent. of the students. The Regional Committee accepted the request and recommended a loan of Rs. 8 lakhs for hostel for the remaining 276 students.

5. *Hostels for Engineering Colleges, Jorhat and Gauhati*—The Regional Committee assessed the requirements of the Engineering Colleges, Jorhat and Gauhati for the introduction of 5-year Integrated Courses. Since the student body has increased by 120 at each, the Regional Committee has now recommended an additional hostel accommodation of 120 seats at each, at a cost of Rs. 3·76 lakhs.

6. *Increase in the value of Practical Training Stipends*—The Committee observed that the Practical Training places available in the region were not being properly utilised mainly due to the fact that the stipends offered by the Government were not adequate. In order to make full use of the training places, Committee recommended that the stipends should be increased to Rs. 250 in the case of graduates and Rs. 150 in the case of diploma holders. These are the rates of stipends offered by industrial concerns under their own training schemes.

7. *Establishment of an Engineering College at Dakhineswar by West Bengal Government*—The State Third Five Year Plan includes the establishment of an engineering college in Calcutta. The State Government has selected a suitable site for College at Dakhineswar. The College will have an admission capacity of 150 students. The estimates of cost as prepared by the Committee are as given below—

	(Rs. in lacs)
<i>Non-recurring</i>	
Building (1·25 lacs s.ft. plinth) .. .. .	25
Equipment, furniture and library .. .. .	22
<b>Total</b> .. .. .	<b>47</b>
<i>Recurring (Net deficit) .. .. .</i>	
Loan for hostel for 375 seats (50 per cent. of the student body)	113·5

8. The All India Council for Technical Education at its 12th meeting approved the scheme for introduction of 5-year integrated course in Engineering in technical institutions in the country. The Eastern Regional Committee in its 18th meeting held on 12th February, 1960 appointed an Expert Committee to assess the additional requirements of the engineering colleges in the Eastern region intending to introduce 5-year integrated course in Engineering on the

basis of standards approved by the Council. The recommendations of the Expert Committee were considered by the Eastern Regional Committee at its 19th meeting held on 9th September, 1960. The Eastern Regional Committee *inter-alia* have recommended Hostel loans to the following institutions as shown against them. The recommendations of the Committee could not be placed before the Council at its earlier meeting.

Serial No.	Name of the College	Intake	Hostel loan	
			No. of students	Amount
				(Lacs of Rs.)
1	Bihar College of Engineering, Patna	120	60	1.97
2	Muzaffarpur Institute of Technology, Muzaffarpur.	120	120	3.76
3	University College of Engineering, Burla.	120	120	3.76
4	Bihar Institute of Technology, Sindri	316	316	11.54
5	Birla Institute of Technology, Ranchi	270	270	8.91

Action on the recommendations of the Committee on other instructional facilities to the above institutions is being taken separately.

**Item No. 6—To consider the report of the Committee on Post-Graduate Engineering Education and Research**

The Council at its twelfth meeting held on 13th April, 1959, endorsed the recommendation of the Post-Graduate Development Committee that a Commission be set up to evaluate the progress made in post-graduate studies in engineering and technology in the country and to suggest suitable measures for improvement and further development in this field. The matter was considered by the Central Government, which appointed a special Committee in November, 1959 with the following Composition and Terms of Reference—

*Composition*

*Chairman*

1. Prof. M.S. Thacker, Secretary to the Government of India, Ministry of Scientific Research and Cultural Affairs, New Delhi.

*Members*

2. Dr. S. Bhagavantam, Director, Indian Institute of Science, Bangalore.
3. Shri G.K. Chandiramani, Joint Educational Adviser (T), Ministry of Scientific Research and Cultural Affairs, New Delhi.
4. Shri N.S. Gupta, Chief Engineer, Hindustan Construction Company Ltd., Bombay.
5. Dr. D.S. Kothari, Chairman, University Grants Commission, New Delhi.



6. \*Dr. K.S. Krishnan, Director, National Physical Laboratory, New Delhi.
7. Shri P.R. Ramakrishnan, M.P., Principal, Coimbatore Institute of Technology, Coimbatore.
8. Dr. H.L. Roy, Professor Emeritus, College of Engineering and Technology, Jadavpur University, Calcutta.
9. Prof. B. Sen Gupto, Indian Institute of Technology, Madras.

*Member-Secretary*

10. Shri P.K. Kelkar, Director, Indian Institute of Technology, Kanpur.
- Shri K.N. Sundaram, Assistant Educational Adviser, Ministry of Scientific Research and Cultural Affairs, acted as Joint Secretary of the Committee.

*Terms of Reference*

- (a) To visit the various centres of Post-Graduate Studies and Research.
- (b) To evaluate the progress made so far in the development of Post Graduate Courses and Research in Engineering and Technology.
- (c) To examine the difficulties experienced and to suggest modifications and improvements in the existing facilities.
- (d) To examine the advisability of concentrating Post-Graduate courses in selected Institutions for better progress.
- (e) To consider the manner of achieving close co-ordination of Post-Graduate Training and Research with the major developmental and engineering schemes of the country.
- (f) To report on all other aspects of improvement and development of Post-Graduate courses.

2. The Committee submitted its Report to the Minister for Scientific Research and Cultural Affairs on 12th August, 1961. A copy of the Report is given at Annexure V.† The main recommendations of the Committee have been summarised in Chapter VII.

**Item No. 7—To consider the Report of the Special Committee for Commerce Education**

1. The Co-ordinating Committee at its meeting held on 3rd December, 1957 considered the question of reorganisation of Commerce Education in the country. The Committee requested the Chairman of the All India Council for Technical Education to appoint a high powered committee to survey the whole field of commercial education and to assess the present state of employment of commerce graduates with a view to suggesting an integrated pattern of commercial education at all levels. In pursuance of the above decision the Minister of Scientific Research and Cultural Affairs in his capacity as Chairman of the Council appointed a Committee under the Chairmanship of Dr. V.K.R.V. Rao, the then Vice-Chancellor of the Delhi University, with the following terms of reference—

- (a) to enquire into and report on the present position of commerce education in India in all its aspects; and

\*Dr. K.S. Krishnan passed away on 11th June, 1961.

†Printed separately.

- (b) suggest measures for its reorganisation and improvement with particular reference to—
- (i) the aims, organisation and contents of commerce education;
  - (ii) its relationship to existing and proposed courses of education in Business Management;
  - (iii) the inter-relation of Commerce Schools and Colleges with Schools and Colleges of other types; and
  - (iv) all other allied problems.

so that a sound and reasonably uniform system of commerce education suited to the need and resources of our developing economy may be provided for the whole country.

2. The Committee held its first meeting on the 14th August, 1958, when the Chairman of the All India Council for Technical Education inaugurated the proceedings. The Committee discussed in detail its scope of work and the lines on which to carry it out. The Committee decided to collect detailed information regarding the present state of commerce education in the country and also to obtain the views of commercial and industrial organisations, Government departments and other employing authorities regarding the usefulness of present commerce courses, practical training required, employment opportunities available and the manner in which commerce education may be made more useful from the point of view of employment etc. For this purpose the Committee designed suitable questionnaires and issued over 2,500 copies of such questionnaires to Industrial and Business Houses, Chambers of Commerce, Professional Organisations, Universities/Institutions and Government Departments.

3. In addition to issuing Questionnaires, the Committee met a large number of eminent persons in the field of commerce education and industrial and commercial enterprises. The material thus collected was examined by the Committee at its subsequent meetings. In all, the Committee held seven meetings.

4. The Committee completed its task by the middle of this year and submitted its Report to the Minister of Scientific Research and Cultural Affairs in his capacity as Chairman of the All India Council for Technical Education, on the 5th July, 1961. A copy of the Report of the Committee is placed below at Annexure VI.\* The main recommendations of the Committee are as follows—

- (i) In order to provide for efficient personnel in the lower wings in business and commerce as also to reduce the present rush to Colleges, the Committee has recommended the institution of a National Diploma Course in Commercial Practice or D.C.P. The Course should be of two years duration with Matriculation or its equivalent as the admission qualification. The course should be strictly Vocational in content and training and should be offered by junior commercial Schools or Polytechnics or other schools which are

\*Printed separately.

prepared to have a special section for commerce teaching. All institutions imparting instructions for the D.C.P. Course should be registered and should satisfy certain minimum conditions regarding library, equipment and teaching staff. The institutions should also be eligible for government grants. The Committee has further recommended that all other diplomas and certificates should be abolished.

- (ii) It is quite unsound to introduce commerce in the 9th class as suggested by the Secondary Education Commission. The subject should be taught only from the 11th class.
- (iii) The present B. Com. Courses should be revised in such a manner as to give the students more liberal education. The specialisation in commerce should begin at the post-graduate stage. No practical training should be prescribed for B. Com. Courses.
- (iv) M. Com. Course should be so designed as to train specialists in commerce for employment in business and industry at executive level on the one hand and the academic profession on the other. The duration of the course should be two years full-time or three years part-time. The part-time course should be open to commerce graduates who are employed and have at least three years' experience.
- (v) Business Administration should be treated as a separate discipline and be allowed to develop in Universities with sufficient freedom and flexibility.
- (vi) As in the U.K. some measure of coordination should be established between the Universities and the Professional bodies and the latter should grant exemption to commerce graduates from commerce subjects.
- (vii) Practical training should be prescribed only in case of M. Coms. and that too at the completion of academic instruction. There should also be a well organised scheme of practical training for commerce teachers. No practical training should be prescribed for B. Com. students.
- (viii) The number of part-time teachers should be limited and where part-time teachers are employed they should be supported by full-time teachers in the same subjects who can follow up the specialist instruction and also give enough time to the students to solve their difficulties. The teacher student ratio should not exceed 1 : 20 and no teacher should be asked to handle more than two subjects for the different classes. Seminars and tutorials should form a significant part of the work load of a teacher in a commerce institution.
- (ix) Senior teachers should be permitted to do a limited amount of private practice. Private employers and Government departments should be asked to develop the practice of using teachers as consultants in their special fields.

- (x) Commerce Workshops should be established in all Commerce departments of Universities and in Commerce Colleges for making the students familiar with the appliances, forms and documents that are used in Industry or Trade.
- (xi) The teaching methods should be changed so as to include more use of tutorial method, case study and use of Library, *viva-voce* should be made an integral part of the examinations at the Post-Graduate Stage.
- (xii) Adequate facilities should be provided by way of Common rooms, teachers' rooms, Libraries, Museums etc.
- (xiii) Immediate steps should be taken to improve the salary scales of commerce teachers.
- (xiv) An All India Council for Commerce Education should be set up to deal with Commerce and Management Education. The Council should have Boards of Studies and Regional Committees and should function on the same lines as the All India Council for Technical Education.
- (xv) Sufficient funds should be provided in the Third Five Year Plan by the Central and the State Governments for Commerce Education in the country.
- (xvi) A sum of Rs. ten lakhs should be set apart by the Central Government for payment of grants to professional bodies for research, seminars and other activities during the Third Plan Period.
- (xvii) The total financial implications of the recommendations made by the Committee for the improvement of the Commerce Education in the country are as follows—

	(Rs. lakhs)
Improvement of Commerce education at the University level .. .. .	620
Professional institutions .. .. .	10
Central non-recurring grants for D.C.P. Institutions ..	100
All India Council for Commerce Education, Administration	10
Recurring deficit of D.C.P. institutions .. .. .	80

5. The Report of the Special Committee was placed before the Council at its last meeting held on the 7th July, 1961. The Council decided that the Report should be circulated to Universities, State Governments, Ministries of the Central Government and other authorities concerned with Commerce Education for their comments on the various recommendations of the Committee. The Report together with the comments received should be examined by the Coordinating Committee which may formulate detailed proposals for the implementation of the Report. Accordingly the Report was circulated to all the Universities, State Governments etc. for their comments. A copy of the comments received so far from the various universities and State Governments etc. is placed at Annexure VII.

6. The Report of the Special Committee for Commerce Education and the comments received thereon are now placed before the Council for its consideration.

**Item No. 8—To consider the Report of Shri S. C. Sen on Part-time and Correspondence Courses in Engineering & Technology**

1. It was reported to the All India Council for Technical Education at its meeting held on the 7th July, 1961 that the Central Working Group had suggested that provision should be made for 1000 seats at degree level and 5000 seats at diploma level for part-time and correspondence courses. A limited provision has been made in the State Plans for the development of facilities for part-time courses. In the revised Central Plan, a provision of Rs. 55.00 lakhs has been made for the same purpose.

2. It was also reported that Shri S. C. Sen, Principal, Delhi Polytechnic was deputed by the Central Government to visit the U.K., U.S.A. and U.S.S.R. to study the organisational and other aspects of correspondence courses in those countries and submit a detailed report on the lines on which such facilities could be developed in India. Shri Sen has since completed his assignment and submitted a report. A copy of the report is placed at Annexure VIII for the consideration of the Council.

**Item No. 9—To consider the report of the Expert Committee on the establishment of a Central Foundry and Forge Institute**

1. The All India Council for Technical Education at its meeting held in April, 1959, appointed an Expert Committee under the Chairmanship of Dr. A. Nagaraja Rao to prepare a detailed scheme for the establishment of a Foundry and Forge Training Institute. The Committee prepared a draft scheme in March, 1960 and submitted it to the Council. The Council considered the scheme at its meeting held on 30th April, 1960, and resolved as follows—

“The Council recommended for acceptance the scheme prepared by the Expert Committee for the establishment of a Central Institute for Foundry and Forge Technology and suggested that it be located at Ranchi.

The Council was, however, of the view that the Expert Committee should reconsider the question of the intake capacity of the Institute after taking into account the firm requirements of industry for trained personnel in this field. Preference should be given to candidates sponsored by industry for training at the Institute.

In the opinion of the Council, such institutions in specialised fields should not prepare students for degrees of universities but should give their own certificates.

2. Again at the meeting of the All India Council on 7th July, 1961, the question of the Foundry and Forge Institute was discussed in the context of the formulation of the Third Five Year Plan of Technical Education and phasing of the various schemes. The representative of the Ministry of Commerce and Industry stated that in addition to the Heavy Foundry and Machinery Project at Ranchi, another large foundry project was proposed to be established elsewhere in the country during the Third Plan period. For these new projects as also for the expansion of the existing units, large numbers of technical personnel specially trained in Foundry and Forge Technology would be required.

He, therefore, suggested that the capacity of the proposed Foundry and Forge Institute should be reconsidered in the light of these developments and the Institute should be established as soon as possible. The Council accepted the suggestion and decided that the Expert Committee be requested to finalise the scheme on the basis of the latest information available regarding the scope of development of Foundry and Forge industry and the Central Government should take early steps to establish the Institute.

3. In pursuance of the above decisions of the Council, the Expert Committee has re-drafted and finalised the scheme for the establishment of a Central Foundry and Forge Institute at Ranchi. The scheme is given at Annexure IX. The scheme is now placed before the Council for approval.

#### Item No. 10—Scheme for Training of Teachers for Polytechnics

1. A serious problem confronting all technical institutions to-day is the shortage of teachers. What causes concern is not merely the existing shortage, but that it will increase as new institutions are established and the existing ones are expanded. The difficulty in obtaining staff of the right calibre and in required numbers is a serious limitation to a further expansion of Technical Education. In order to meet the present acute shortage, the Central Government instituted in 1959 a programme of training selected candidates as teachers for engineering colleges. No scheme was, however, formulated for the training of teachers for polytechnics. Due to a rapid expansion at polytechnic level, it has now become necessary to initiate such a programme as soon as possible.

2. It was reported to the Council at its last meeting held on 7th July, 1961 that the Chairman had appointed a Working Group to prepare a comprehensive scheme of training of teachers for polytechnics. The Working Group met under the Chairmanship of Shri C. V. D. Murthy on 8th and 9th July, 1961. The Working Group agreed that before a suitable training programme was formulated the Staff structure in polytechnic should be clearly laid down and the number of teachers required at each level, their qualifications, experience etc. indicated. The staff structure as proposed by the All India Council sometime back was examined and it was decided that the following structure in respect of technical teachers should be taken as a basis for preparing the teachers training programme—

Designation of Post	No. of Posts	Qualifications prescribed
Principal .. .. .	One .. .. .	At least a second class degree or equivalent qualification in engineering with not less than 8 years' professional experience of which 4 years should be in teaching.
Heads of Departments	One for each branch of engineering.	At least a second class degree or equivalent qualification in the appropriate branch of engineering with 6 years' professional experience of which 3 years should be in teaching.

Designation of Post	No. of Posts	Qualifications prescribed
Lecturers .. .. .	The exact strength of the Lecturers in each of the Deptts. to be determined by the Regional Committees.	At least a second class degree or equivalent qualification in the appropriate branch of Engineering with at least 2 years' professional experience.
Workshop Superintendent.	One	At least a recognised Diploma or equivalent qualification in Mechanical Engg. with not less than five years' workshop experience in supervisory capacity.
Instructors (The present designation of Assistant Lecturer, Head Draftsman, Demonstrator etc. should be merged under the common designation of Instructors).	The Instructors may be categorised as <i>Senior</i> and <i>Junior</i> . The number in each category should be determined by the Regional Committees.	<i>Senior</i> —First Class Diploma in the appropriate branch of Engineering with at least 3 years' industrial or teaching experience. <i>Junior</i> —First Class Diploma in the appropriate branch of Engineering preferably with one year's industrial experience.

3. In view of the differences in the basic qualifications for the posts of Heads of Departments and Lecturers on the one hand and on the other, Instructors as also the differences in the nature and scope of their teaching work, the Group decided that two separate training programmes should be formulated for these two categories of teachers. The broad outlines of the programmes should be as shown below --

4. *Training of Graduate-Teachers*—In order to equip the teacher-trainee with a sufficient knowledge of the work which diploma-holders are expected to carry out in the professional field and also to correlate their theoretical studies with practical applications, it is necessary to lay emphasis on industrial training for the trainees. The programme should be of two years and arranged in such a manner that the trainees spend more time in industry or in a technical organisation and study the actual problems to be faced by the Diploma-holders when they are employed. In this way the teacher will reorientate his own knowledge of the field to suit the needs of the students.

5. The industrial or practical training should be 18 months long of which about six months should be in a good drawing and design office.

6. After the completion of industrial training, the trainee should work in a polytechnic for the next six months. During this period he should receive pedagogical training, teaching practice and training in laboratory work.

7. The graduate-trainee should be given a stipend of the value of Rs. 300 p.m. in the first year and Rs. 325 in the second year. On completion of the training, he should be appointed as Lecturer on an initial basic salary of Rs. 350 p.m.

8. *Training of Diploma Holders*—The duration of the training programme for a diploma-holder should be three years. The first two years should be practical training in industry or any other suitable technical organisation. This should be followed by a year of supervised teaching practice in an institution. The diploma-trainees should be given every opportunity to better their prospects after the training is over. For this purpose, they should be encouraged to prepare themselves for Sections A and B of the Associate Membership Examination of the Institution of Engineers (India), or any other equivalent examination. Part-time Degree or Advanced Diploma courses should also be organised for their benefit.

9. The diploma-trainees should get a stipend of Rs. 260—20—240. On completion of the training they should be appointed as Instructors in the Senior Scale of Rs. 260—500.

10. *Organisational Aspects*—The entire training programme should be organised and conducted on a regional basis under the direction of four Regional Boards set up for the purpose, one for each region. Each Board should have representatives of industry, State Governments, institutions, Regional Committee and other interests concerned in that region. There should also be a Director of Training for each region appointed by the Central Government, who will carry out the training programme under the over-all direction of the Board and co-ordinate the work.

11. The Group recommended that at least one training centre attached to a well developed Polytechnic should be set up in each State and the State Government concerned should participate in the training programme both organisationally and financially. The manner in which the expenditure should be shared by the States and the Centre may be decided by the Government.

12. *Sub-Committee*—For the purpose of drawing up detailed curricula etc. of the Training Programmes the Working Group appointed a Sub-Committee. The Sub-Committee has just met and its report is awaited.

**Item No. 11—To nominate a representative of the All India Council for Technical Education on the General Council of the Institute of Applied Manpower Research**

The Government of India propose to establish an Institute of Applied Manpower Research for systematic research into manpower problems. The detailed objectives, scope, constitution and estimates of cost of the institute are given at Annexure X. The Institute will be a corporate body registered under the Societies Registration Act 1860. It is proposed to locate the institute in the Campus of the existing Indian Institute of Public Administration, New Delhi.

It is also proposed to associate the All India Council for Technical Education with the Institute by giving it representation on the General Council of the Institute. The Council may nominate its representative on the General Council of the Institute.



**Item No. 12—To receive a Note on the present position of acceptance of scheme of revised salary scales for technical teachers by the State Governments.**

While reviewing the position in respect of the implementation of the recommendations of the All India Council for Technical Education regarding revised pay scales in technical institutions, it was reported to the Council at its meeting held on 7th July, 1961 that the following states had accepted the scheme and proceeded to implement it—

1. Andhra Pradesh.
2. Madhya Pradesh.
3. Assam and
4. Rajasthan.

As regards other states, the position may be summarised as follows—

(a) *Punjab*—Since the last meeting of the Council, the Punjab Government has informed the Government of India that they have accepted the scheme in principle and are taking necessary steps to implement it.

(b) *West Bengal*—It was reported that the West Bengal Government were considering the matter of implementation of the revised pay scales as recommended by the Central Government. It is informally understood from the representatives of the West Bengal Government who attended the working Group meeting (for reviewing the Third Five Year Plan) that they have accepted the revised pay scales and necessary orders for implementing the scheme are being issued.

(c) *Uttar Pradesh*—It is understood from the State Government representatives who attended the meeting of the Working Group (for reviewing the Third Five Year Plan) that the State Government was actively considering the implementation of the revised pay scales.

(d) *Bihar, Gujarat and Maharashtra*—These States are still considering the matter.

(e) *Orissa*—Orissa Government had decided that the pay scales suggested by the Central Government for polytechnics should be adopted with minor modification so as to fit in the model scales in force and prescribed by the State Government for identical posts in other departments. A comparative statement of the scales of Orissa Government and the scales recommended by the Central Government is given below—

Name of the post	Revised scale introduced by State Govt.	Revised scale suggested by Central Govt.
	2	3
Principal	800—1,150	800—1,250
Head of Deptt.	480—860	600—1,000
Lecturer	260—780	350—850
Workshop Supdt.	480—860	350—850

	1	2	3
<b>Senior Instructor</b> (corresponding to the present Asstt. Lecturer and Foreman in the State) .. .. .		260—540	260—500
<b>Junior Instructor</b> (corresponding to the present Instructors in the State) .. .. .		185—325	160—300

The matter was further pursued and it was informally understood from the State representatives who attended the Working Group Meeting that they would consider the matter further. According to the State Government representatives, there may not be any difficulty in adopting the scales of pay recommended for polytechnics by Central Government in toto.

As regards Degree Colleges, the University College at Burla is expected to accept the scales recommended by the University Grants Commission.

(f) *Madras*—At the last meeting, the Council was apprised of the position in respect of Madras State. Madras has not only accepted the pay scales but has changed the staff structure of technical institutions in the State in order to fit into its own pattern. A comparative statement of the revised scales as introduced by the State Government and the scales recommended by the Central Government is given below—

Name of the Post	Revised scale introduced by State Govt.	Scales of pay recommended by the Central Govt.
1	2	3
<i>Engineering Colleges</i>		
Principal .. .. .	1,100—50—1,300 plus special pay (1) Rs. 200 for Post-Graduate Instt. (2) Rs. 100 for degree institution.	1,500—1,800 Chief Engineer P.W.D. State.
Professor .. .. .	1,100—50—1,300 for post-graduate courses. 600—1,100 for Associate Professor.	1,100—1,300 S.E. State P.W.D.; and in institutions with P.G. courses in addition to the above scale Prof. to be paid Rs. 250 as personal pay.
Asstt. Prof. & Workshop Supdt.	No such category exists.	600—1,150.
Lecturer .. .. . (Asstt. Prof. as categorised by the State Govt.)	350—25—850	350—350—330—380—30—590—E.B.—30—770—40—850.

1	2	3
<i>Polytechnics</i>		
Principal ..	600—1,000	800—1,250
Head of Deptt. ..	350—650	600—1,000
Lecturer ..	275—425	350—850
Workshop Supdt. ..	350—650	350—850
Senior Instructor ..	225—375	260—500
Junior Instructor ..	175—275	160—300

It is, however, understood from the representatives of the State Government who attended the last Working Group's meeting that the State Government is still considering the acceptance of the revised scales as recommended by the Central Government. They, however, pointed out their difficulties and gave indication that it may not be possible for them to accept the Central Government revised scales due to various difficulties.

*Mysore*—The Government of Mysore had informed that they had revised the scales of teachers in their technical institutions on the basis of their pay commission's recommendations. The revised scales introduced by the State Government in their technical institutions, however, do not compare with those suggested by the Central Government. A comparative statement of the scales now accepted by the State Government and the pay scales recommended by the Central Government is given below:

Name of the Post	Revised scale introduced by the State Govt.	Scales of pay recommended by Central Government
1	2	3
<i>Engineering Colleges</i>		
Principal ..	600—1,000 plus spl. pay of Rs. 100.	1,300—1,800 = C.E. State P.W.D.
Professor ..	400—900	900—1,300 = S.E. State P.W.D. plus Rs. 250 spl. pay for post-graduate.
Asstt. Professor	300—600	600—1,150
Lecturer ..	230—500	350—850
<i>Polytechnics</i>		
Principal ..	(i) 300—700 plus Rs. 35 S.P. (ii) 350—800 (iii) 600—1,000 plus 100 S.P.	800—1,250
Head of Deptt. ..	300—700 Do.	600—1,000
Lecturer ..	200—375	350—850
Asstt. Lecturer ..	150—320	260—500 (Senior Instructor)
Demonstrator ..	110—220 or 150 320 in case of diploma holders.	160—300 (Junior Instructor)

(h) Kerala—At its last meeting held on 7th July the Council was informed that the Government of Kerala had not accepted the scales. A comparative statement of the scales now introduced by the Kerala State and those recommended by the Central Government is given below—

Name of Post	Revised scale introduced by State Govt.	Scales of pay recommended by Central Govt.
<i>Engineering Colleges</i>		
Principal	1,000—1,200	1,200—1,500 = C.E. State P.W.D.
Professor	800—1,000	1,000—1,200 = Dy. C.E. State P.W.D. plus Rs. 250 special pay for post-graduate.
Asstt. Professor	475—700	600—1,150
Workshop Instructor and 1st Grade Instructor.	250—500	300—560 (Associate Lecturers).
Lecturer	300—550	350—850
<i>Polytechnics</i>		
Principal	500—800 plus Rs. 100 Spl. pay.	800—1,250
Head of Deptt.	300—550	600—1,000
Lecturer	300—550	350—850
Instructor & 1st grade Instructor) (No such posts as Sr. & Jr. Instructors exist.	300—550	260—500 (Senior Instructors 160—300).

The State Government has further informed that in view of the general salary structure in the State it would not be possible to revise the salary scales of technical teachers any further.

The Council may consider the following points (a) whether the modified pay scales adopted by various States, e.g. Madras, Kerala etc. should be accepted as an interim measure and if so, whether those states should be eligible for Central assistance. (b) whether the matter should be pursued further till all the State Governments accepted the revised scales recommended by the Central Government.

*Any other Business*

The Council at its meeting held on the 7th July, 1961 recommended the following revised estimates for the St. Xavier's Technical Institute, Bombay under item No. 7 Regional Committees vide paragraph 44 of the proceedings—

	Rs.
Building (Plinth area 26,535 sq. ft.) .. ..	5,30,700
Equipment, Library and Furniture .. ..	1,30,000
<b>Total</b> ..	<b>6,60,700</b>

The estimated amount of Rs. 1,30,000 indicated above was inadvertently shown less by Rs. 200. The revised estimates recommended by the Council may therefore be corrected to read as follows—

	Rs.
Building (Plinth area 26,535 sq. ft.) .. ..	5,30,700
Equipment, Library and Furniture .. ..	1,30,200
<b>Total</b> ..	<b>6,60,900</b>

# ANNEXURES

**ANNEXURE I**

(Item No. 3)

**Polytechnics started in 1961-62**

1. Nowgong Polytechnic, Nowgong (Assam).
2. Jhajjar Polytechnic, Jhajjar (Punjab).
3. Shri Krishan Lal Jhaveri Polytechnic, Broach (Gujarat).
4. Government Polytechnic, Pondicherry (Pondicherry).
5. Malda Polytechnic, Malda (West Bengal).
6. Govind Ballabh Pant Polytechnic, Delhi (Delhi).
7. Government Polytechnic, Kolhapur (Maharashtra).
8. Government Polytechnic, Ratnagiri (Maharashtra).
9. Government Polytechnic, Khamagaon, (Maharashtra).
10. Government Polytechnic, Perinthalamanna (Kerala).
11. Government Polytechnic, Srikakulam (Andhra Pradesh).
12. Government Polytechnic, Raichur (Mysore).
13. Government Polytechnic, Frazerpet (Mysore).

ANNEXURE II  
[Item No. 4(B)]

**Scheme of Examination**

NATIONAL DIPLOMA IN ARCHITECTURE

*Intermediate Examination (Fourth Year N.D. Arch.)*

1. An Examination on the following Theory Papers—

Paper	Subject	Marks Examina- tion	Duration (Hrs.)	Marks Year's work	Total
I	History of Architecture and Culture .. ..	40	3	10	50
II	Sociology & Civics .. ..	40	3	10	50
III	Architectural Construction and Materials .. ..	40	30	10	50
IV	Applied Mechanics .. ..	40	3	10	50
V	Surveying & Levelling .. ..	40	3	10	50
VI	Architectural Design with Viva-Voce .. ..	100	18	25*	125
		300		75	375

\*For time problems throughout the year.

2. An Examination on the following Practical Papers—

Surveying & Levelling .. .. 50 3 50

3. Valuation of the Sessional Records of the following subjects—

I Architectural Construction  
and Materials .. .. 50 50

II Architectural Design .. .. 150 150

*Final Examination (Seventh Year N.D. Arch.)*

1. An Examination on the following Theory Papers—

Paper	Subject	Marks Examina- tion	Duration (Hrs.)	Marks Year's work	Total
I	Architectural Design with Viva-Voce .. ..	125	18	25	150
II	Theory and Design of Structure .. ..	40	3	10	50
III	Architectural Practical Cons- truction .. ..	40	3	10	50
IV	Specification and Material .. ..	40	3	10	50
V	Service and Equipment .. ..	40	3	10	50
VI	Professional Practice .. ..	40	3	10	50
		325		75	400



2. An Examination in the Sessional Records and Viva-Voce of the following—

	Paper	Marks	Total
I	Architectural Design ..	150	150
II	Architectural Practical Construction .. ..	50	50
III	Planning and Landscape ..	50	50
		250	250
An Examination of the Architectural Thesis with Viva-Voce		200	200

*Rules of Examinations*

*Pass percentage*—The marks required for passing the different examinations shall be those set out below—

The minimum marks required for passing the Intermediate and Final Examinations shall be as follows—

- (i) 30 per cent in examination marks in each paper, separately, in Theory.
- (ii) 40 per cent in each paper “Examination marks plus year’s work done” during the session relating to that paper, separately in theory and practical.
- (iii) 40 per cent in each Sessional Record and Practical Examination.
- (iv) 40 per cent in Project Work or Architectural Thesis.
- (v) 50 per cent in the aggregate of the marks for the whole examinations.

Any student for the Final Examination for the National Diploma Course in Architecture who has obtained at least 55 per cent of the aggregate marks, but has failed in not more than any two papers of theory and/or practical and/or in Sessional Record and/or Architectural Thesis, as the case may be, obtaining not less than 30 per cent marks in each of those papers may be declared to have passed the examination, provided that for every mark by which he is short of the minimum pass marks in the papers of theory and/or Practical and/or in Sessional Record and/or architectural Thesis, he has secured three additional marks in the aggregate above 55 per cent.

*Compartment in Intermediate Examination*—Any candidate who has obtained not less than 50 per cent of the aggregate marks but has failed in one of the subjects either in theory or in practical prescribed for the Intermediate Examination and obtaining not less than 30 per cent marks in that subject, may be admitted to the compartment examination in that subject only to be held in September of the same year on payment of the same examination fees as prescribed for the Annual Examination and shall be declared to have passed the examination if he secures the prescribed percentage of marks in that subject. A candidate to whom this concession is granted may be allowed to pursue the course of study for the next higher class but if the candidate fails to pass or fails to appear in the compartment examination he shall not be permitted to

continue his course of study for the next higher class but shall take the examination again in all the subjects prescribed for the Intermediate Examination, as the case may be.

The above rule will also apply to the First, Second, Third, Fifth and Sixth Years Internal Promotion Examinations.

Provided that in case of a candidate who passes the Intermediate Examination by compartment only the minimum pass marks i.e. 40 per cent shall be taken as marks obtained in the Compartment Examination for purposes of arriving at the aggregate marks obtained in the examination.

*Classification of Results*—Candidates who pass the Intermediate and Final Examinations in Architecture shall be awarded classes as follows—

- |   |                           |
|---|---------------------------|
| (i) Those obtaining 50 per cent and above but below two-thirds of the aggregate marks in the Examination . . .    | II Class                  |
| (ii) Those obtaining two-thirds and above but below three-fourths of the aggregate marks in the Examination . . . | I Class                   |
| (iii) Those obtaining not less than three-fourths and above of the aggregate marks in the Examination . . .       | I Class with Distinction. |

*Ex-Studentship*—A candidate who had applied for admission to a Board's Examination after having completed the required percentage of lectures and having appeared is declared unsuccessful at the examination may on the recommendation of the Director of the School be placed by the Controller of Examinations on the register of ex-students, subject to the following conditions—

- (a) A candidate who has failed in the National Diploma Examination but has passed in (i) Architectural Sessional Examination and (ii) Architectural Thesis, may, on the recommendation of the Director of the School, be permitted to appear as an ex-student, at a subsequent examination. Any candidate who appears as an ex-student and passes the National Diploma will be awarded as Pass class.
- (b) A candidate may be allowed to enrol himself as an ex-student only for three consecutive examinations held in succession to the latest year in which he has appeared and failed as a regular student.
- (c) All applications for registration of ex-students shall be made before a date to be prescribed by the Director of the School.
- (d) The fee for enrolment of ex-students shall be Rs. 20 payable for each academic year along with the application for registration as an ex-student. If a candidate being eligible to take the examination as an ex-student, fails for good reasons to enrol himself in any year or years according to the provision of clause (c) above, his name may nevertheless be placed on the register of ex-students on payment of the arrears of enrolment fees with effect from the year in which he was first eligible for enrolment.
- (e) An ex-student on this register may on payment of the prescribed fee be admitted to the Final Examination on presentation of the required certificates including that of good moral character given by his employer and countersigned by the Director of the School.

ANNEXURE III

[Item No. 4(B)]

Standard list of accommodation, staff and equipment for institutions conducting the National Diploma or equivalent degree course in Architecture

(Basis annual intake of 30 students)

- (a) Staff.
- (b) Buildings.
- (c) Furniture and Equipment for studios, Class rooms, library and reading room, including books.
- (d) Furniture and Equipment for office and Administration Blocks.
- (e) Equipment for Physics Laboratory.
- (f) Equipment for Chemistry Laboratory.
- (g) Equipment for Surveying Laboratory.
- (h) Equipment for Material Testing Laboratory.
- (k) Equipment for Workshop Practice.

*Staff*

The Staff for the architecture and also allied subject should have a permanent corps supplemented by visiting lecturers and specialists from practising architects. For an institution conducting only National Diploma or equivalent Degree Course in Architecture admitting 30 students annually, the following full-time staff strength is recommended—

Description of Staff	No.	Pay Scales
<i>Technical Staff</i>		
(a) Prof. and Head of the Deptt. . . . .	1	Rs. 1,300—100—1,600.
or		
Associate Professor . . . . .	1	Rs. 1,000—50—1,500.
(b) Assistant Prof./Reader including one for Structural Engineering.	5	Rs. 600—40—1,000—50/2—1,150.
(c) Lecturers including one for Fine Arts . . . . .	5	Rs. 350—350—380—30—590—EB—30—770—40—850.
<i>Non-Technical Staff</i>		
1. Stenographer . . . . .	1	
2. Clerks . . . . .	2	
3. Librarian . . . . .	1	
4. Photographer . . . . .	1	
5. Library Attendants . . . . .	1	
6. Peons . . . . .	6	

For Studio work, wherever possible visiting lecturers from practising architects, should be appointed. In addition they should be invited to deliver lectures on special subjects. The permanent staff corps has been calculated on the basis of the following work-load—

Professors	..	..	..	9 Hours.
Assistant Professors	..	..	..	15 Hours.
Lecturers	..	..	..	18 Hours.

If practising Architects are available for Studio work, the strength of the permanent staff should be reduced taking into consideration the quality of such teaching assistance. The staff appointed should possess the following qualifications—

- (1) *Professor—Essential*—Degree or equivalent diploma of a recognised University or institutions in Architecture with 10 years' of professional experience. *Desirable*: (i) Teaching experience, (ii) corporate membership of a professional institution.
- (2) *Associate Professor or Reader—Essential*—Same as above but the professional experience may be reduced to 5 years. *Desirable*: Teaching experience.
- (3) *Asstt. Prof. or Reader—Essential*—Same as above but the professional experience may be reduced to 3 years. *Desirable*: Teaching experience.
- (4) *Lecturer—Architecture—Essential*—Same as above with 2 years' professional experience. *Desirable*: Teaching experience.
- (5) *Lecturer—Art*—Diploma of a recognised Art School with two years' professional or teaching experience.

### BUILDINGS

#### *Unit No. 1—Accommodation for Department of Architecture in an Engineering College*

	<i>Sq. ft.</i>
1. 5 studios each of 1,200 sq. ft. for 30 students (40'×30' each studio)	6,000
2. 3 Class rooms (2 × 450) (1 × 600)	1,500
3. Museum (Material bureau)	600
4. Crit Room	900
5. Library & reading room	1,500
6. Store rooms (each 150 sq. ft.) 2 Nos.	300
7. Professors' room & meeting room	300
8. Asstt. Professor's room	900
9. Staff room	400
10. Lady students' common room	300
11. Student's Canteen	600
12. Art room	900
13. Office Room	300
14. Miscellaneous Room	300
Total effective floor space	14,800

Allowing 33 $\frac{1}{3}$ per cent for wall thickness verandahs, staircases, sanitary blocks. 42% .. .. .	6,216
Say ..	21,016

Rs.

Ascertaining average building rate at Rs. 15 per sq. ft. including water connection, Electricity installation and drainage fittings @Rs. 15 per sq. ft. .. .. .	3,15,240
21016 s. ft. $\times$ 15 .. .. .	3,15,240
Estimated cost of the Block .. .. .	3,15,240

When the course is conducted in an independent school, the following additional accommodation should be provided.

*Unit No. 2(i)—Laboratories & Workshops*

Science Laboratory .. .. .	1,200
Additional plinth area @ 42% .. .. .	504
	1,704

*(ii) Workshops*

General Workshop .. .. .	2,000
Stores .. .. .	600
	2,600
Additional plinth area @ 10% .. .. .	260
	2,860
Total Floor area .. .. .	4,564

Estimate cost @Rs. 10 sq. ft. for workshops and Rs. 15 per sq. ft. for Laboratory .. .. . i.e. say Rs.	54,160
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*Equipment*

1. 5 Studios, Class Rooms .. .. .	45,000
2. Library Reading Room including Books .. .. .	50,000
3. Office Administration Block .. .. .	45,000
4. Physics & Chemistry Laboratory .. .. .	11,800
5. Surveying Instruments .. .. .	60,000
6. Material Testing Laboratory .. .. .	95,000
7. Workshop .. .. .	72,500
	3,79,300

*Note*—Detailed schedules of furniture and equipment in respect of the seven items are given in the following pages.

FURNITURE AND EQUIPMENT FOR STUDIOS, CLASS ROOMS  
LIBRARY AND READING ROOMS (for 30 students only).

*Furniture*

Serial No.	Description of Equipment	Nos.	Rate Rs.	Total cost Rs.
1	2	3	4	5
<i>Studio</i>				
1.	Drawing Tables with drawers ..	30	110	3,300
2.	Drawing Stools .. ..	30	12	360
3.	Office Table .. ..	1	150	150
4.	Chair with arms .. ..	1	25	25
5.	Black Board .. ..	1	150	150
6.	Steel filing cupboard .. ..	2	1,000	2,000
7.	Lecture Stand .. ..	1	20	20
				6,005
<i>Equipment</i>				
	Drawing Board & T Sq. .. ..	30	45	1,350
Estimated cost for furniture and equipment for 5 studios—				
			Furniture ..	30,020
			Equipment ..	1,350
Say				31,375
<i>Class Rooms</i>				
1.	Chairs without arms .. ..	210	16	3,360
2.	Classroom tables .. ..	210	30	6,300
3.	Platform tables .. ..	3	120	360
4.	Arm chairs .. ..	3	25	75
5.	Black Board .. ..	3	150	450
6.	Lecture stands .. ..	3	20	60
				10,605
<i>Art Rooms</i>				
	Tables .. ..	30	80	2,400
	Stools .. ..	30	12	360
	Table .. ..	1	80	80
	Chair .. ..	1	20	20
	Platform .. ..	1	50	50
				2,910
Total estimated cost of furniture and equipment .. .. Say ..				
				45,000

*Library and Reading room*

	Nos.	Total cost in Rs.
Book Stacks .. .. .	30	120
Index .. .. .	1,000	1,000
Magazine Stands .. .. .	900	900
Reading Table .. .. .	4 × 250	1,000
Chairs .. .. .	50 × 30	1,500
Tables .. .. .	4 × 125	500
Arms .. .. .	4 × 20	80
Plan filing table .. .. .	2 × 1,000	2,000
	<b>Total</b>	<b>7,820</b>
Books .. .. .		41,080
Equipment: 1 Typewriter .. .. .		1,000
		<b>42,080</b>
Total estimated cost of furniture and equipment .. .. .		50,000
	Say	50,000

**FURNITURE AND EQUIPMENT FOR OFFICE AND ADMINISTRATION BLOCK**

Serial No.	Description of Equipment	No.	Rate Rs.	Total cost Rs.
1	2	3	4	5
<i>Furniture</i>				
1.	Notice Board .. .. .	2	75	150
2.	Peon Benches .. .. .	..	..	150
3.	Special Chair .. .. .	1	50	50
4.	Superior Chairs .. .. .	12	30	360
5.	Cane Chair with arms .. .. .	36	20	720
6.	Table for Principal .. .. .	1	250	250
7.	Table for teaching staff .. .. .	12	150	1,800
8.	Office Table .. .. .	3	80	240
9.	Side Racks .. .. .	15	60	900
10.	Steel cupboard .. .. .	5	270	1,350
11.	Staff Room Dining Table .. .. .	1	250	250
12.	Chairs .. .. .	8	20	160
13.	Easy Chairs .. .. .	8	50	400

FURNITURE & EQUIPMENT FOR OFFICE AND ADMINISTRATION  
BLOCK—*contd.*

1	2	3	4	5
<i>Furniture—contd.</i>				
14. Coffee table .. .. .		2	40	80
15. Ladies Lounge .. .. .		4	30	120
16. Coffee Table .. .. .		1	40	40
17. Dressing Table .. .. .		1	200	200
18. Students Common Room—				
Chairs .. .. .		30	20	600
Dining Table .. .. .		6	100	600
Coffee Tables .. .. .		8	30	240
Pingpong .. .. .		..	..	350
Carrom—Tables .. .. .		6	50	300
Total .. .. .		..	..	9,310
<i>Equipment</i>				
1. Clocks .. .. .		12	80	960
2. Typewriters .. .. .		2	1,000	2,000
3. Duplicator .. .. .		1	1,500	1,500
4. Audio Visual .. .. .		..	..	10,000
5. Model-making equipments .. .. .		..	..	15,000
6. Photographic equipment .. .. .		..	..	15,000
Total .. .. .		..	..	34,460
Total estimated cost of equipment and furniture			Say Rs. 45,000	

PHYSICS LABORATORY EQUIPMENTS

	Quantity
1. Fortin's Barometer .. .. .	1
2. Young's modulus Searle's apparatus .. .. .	2
3. Balance (Physical) .. .. .	2
4. Simple pendulum .. .. .	6
5. Boyle's law apparatus .. .. .	2
6. Resonance apparatus .. .. .	2
7. Weight boxes (Supr.) .. .. .	4
8. Tuning forks .. .. .	2
	(set complete)
9. Copper & Zinc chips .. .. .	..
10. Calorimeters with wooden boxes .. .. .	2
11. Thermometers (half degree) .. .. .	6
12. Concave mirrors (F=cm.—25 cm). .. .. .	6



PHYSICS LABORATORY EQUIPMENTS—*contd.*

	Quantity
13. Concave lenses 1 (F6=cm.—25 cm.) .. .. .	6
14. Optical benches (Supr.) .. .. .	2
15. Prisms (3" × 3" × 3") .. .. .	6
16. Travelling microscopes=3 and telescope .. .. .	3+1
17. Glass slabs (4"×3"×1") .. .. .	6
18. Wheat stone bridges .. .. .	2
19. Ammeters (0—3 amp.) .. .. .	3
20. Voltmeter (0—3 volt.) .. .. .	3
21. Voltmeters (glass) .. .. .	2
22. Tangent galvanometers .. .. .	2
23. Rheostat of different ranges .. .. .	3
24. Resistance boxes (0 100 ohms). .. .. .	2
25. Eureka wires=1 real .. .. .	..
26. Connecting wire of copper .. .. .	4 lbs.
27. Vernier Calipers .. .. .	3
28. Screw gauges .. .. .	3
29. Spherometers .. .. .	3
30. Stop watches .. .. .	2
31. Meter rods .. .. .	6
32. Retort stands .. .. .	6
33. Pinch cocks .. .. .	6
34. Rubber tube .. .. .	• 20 yds.
35. Mercury .. .. .	1 lb.
36. Copper sulphate crystals .. .. .	5 lbs.
37. Nitric acid .. .. .	1 lb.
38. Caustic soda .. .. .	1 lb.
39. Sand paper .. .. .	6 sheets
40. Reversing keys .. .. .	3
41. Single way keys .. .. .	3
42. ½ Kilograms weights .. .. .	10
43. Reading lenses .. .. .	3
44. Beakers (500 cc) .. .. .	6
Large size .. .. .	6
45. Funnels .. .. .	6
46. Sonometer .. .. .	1
47. Spectrometer .. .. .	1
48. Magnets (4½") .. .. .	3
49. Compass needles .. .. .	6
50. Deflection Magnetometer .. .. .	2

PHYSICS LABORATORY EQUIPMENTS—*contd.*

51. Accumulators (Oxide)	..	..	..	..	3
52. Battery	..	..	..	..	2
53. Unknown resistances	..	..	..	..	6
54. Weston Galvanometer	..	..	..	..	3
55. Post Office boxes	..	..	..	..	2
56. Potentiometers	..	..	..	..	2
57. Electroplating apparatus	..	..	..	..	2
58. X-ray bulb	..	..	..	..	1
59. Induction coil	..	..	..	..	2
60. Vacuum tubes	..	..	..	..	2
61. Transformer (small model)	..	..	..	..	1
62. Coloured slides (Newton's) for showing the formation of drift colours	..	..	..	..	..
Total estimated cost				..	Say 5,500

## CHEMISTRY LABORATORY

*List of Apparatus*

					Quantity Nos.
1. Reagent Bottles N.M. 8 oz. Capacity	..	..	..	..	240
Reagent Bottles N.M. 1 lb. Capacity	..	..	..	..	24
Reagent Bottles W.M. 4 oz. Capacity	..	..	..	..	72
2. Indicator Bottles	..	..	..	..	24
3. Bottles 2½ litres	..	..	..	..	6
Bottles 4 litres	..	..	..	..	3
4. Burettes (a) 25 cc capacity	..	..	..	..	3
(b) 50 cc capacity	..	..	..	..	36
5. Pipettes (a) 10 cc capacity	..	..	..	..	36
(b) 25 cc capacity	..	..	..	..	6
6. Conical flasks, 250 cc capacity	..	..	..	..	24
7. Beakers (a) 50 cc capacity	..	..	..	..	18
(b) 250 cc capacity	..	..	..	..	18
(c) 400 cc capacity	..	..	..	..	18
(d) 1,000 cc capacity	..	..	..	..	3
8. Watch glass (a) 2" diameter	..	..	..	..	18
(b) 3" diameter	..	..	..	..	18
9. Weighing Bottles 20 cc capacity	..	..	..	..	12
10. Funnels (a) 1½" diameter	..	..	..	..	18
(b) 2½" diameter	..	..	..	..	18
(c) 4" diameter	..	..	..	..	3
(d) 6" diameter	..	..	..	..	2

CHEMISTRY LABORATORY— <i>contd.</i>						Nos.
11. Desiccators with lids 5" dia.	..	..	..	..	..	12
12. Blue glass pieces 3" 1+ $\frac{1}{2}$ "	..	..	..	..	..	12
13. Mouth blow pipes	..	..	..	..	..	12
14. Tongs	..	..	..	..	..	12
15. Test tube holders	..	..	..	..	..	12
16. Test tube (ordinary size)	..	..	..	..	..	2 gross
17. Test tube stands (wooden) preferably with metallic upper plates with holes	..	..	..	..	..	12 Nos.
18. Iron stands (with rings and B. Heads)	..	..	..	..	..	12
19. Cork Borers (complete set of three)	..	..	..	..	..	12
20. Triangular files	..	..	..	..	..	1
21. Round file	..	..	..	..	..	1
22. Cork Press	..	..	..	..	..	1
23. Corks (assorted)	..	..	..	..	..	1
24. Rubber Tubing	(a) for burners	..	..	..	..	20 ft.
	(b) for burettes	..	..	..	..	3
						Nos.
25. Burners according to the gas supply	..	..	..	..	..	24
26. Wire gauze with asbestos	..	..	..	..	..	24
27. Crucibles	(a) (China) 25 cc cap.	..	..	..	..	24
	(b) (Silica) 25 cc ,,	..	..	..	..	12
28. Pestle and Mortar	(a) 6" diameter	..	..	..	..	2
	(b) 8" diameter	..	..	..	..	1
29. Scissors	..	..	..	..	..	11
30. Balances	(a) Rough	..	..	..	..	1
	(b) Analytical	..	..	..	..	2
31. Weight boxes (Analytical)	..	..	..	..	..	3
32. Water Baths (each with at least six rings of diff. sizes), 6" diameter	..	..	..	..	..	3
33. Ovens	..	..	..	..	..	1
						lbs.
34. Glass rods	..	..	..	..	..	5
35. Glass tubes	..	..	..	..	..	5
						Nos.
36. Viscosity apparatus	..	..	..	..	..	2
37. Graduated flasks	(a) 100 cc. cap.	..	..	..	..	12
	(b) 250 cc. cap.	..	..	..	..	12
	(c) 500 cc. cap.	..	..	..	..	1
	(d) 1000 cc. cap.	..	..	..	..	1

CHEMISTRY LABORATORY— <i>concl'd.</i>				Nos.
38. Measuring Cylinders	(a)	10 cc capacity	.. ..	4
	(b)	25 cc capacity	.. ..	1
	(c)	100 cc capacity	.. ..	3
39. Ignition tubes	..	..	.. ..	6 doz.
40. Pipe clay triangles	..	..	.. ..	Nos. 18
41. Test tube Brushes	..	..	.. ..	18
42. China Dishes	..	..	.. ..	12
43. Thermometers	(a)	110 °C.	.. ..	6
	(b)	360°C.	.. ..	1
44. Hydrometers B8 B's	(a)	for light liquids	.. ..	1
	(b)	for heavy liquids	.. ..	1
45. Condensers	..	..	.. ..	2
46. Distillation flasks 1000 cc. cap.	..	..	.. ..	2
47. Separating funnels, 500 cc. cap.	..	..	.. ..	1
48. Kipps apparatus 500 cc. cap.	..	..	.. ..	2
49. Gas jars (ordinary size)	..	..	.. ..	6
50. Filter paper whatsmen 100 sheets pkt.	..	..	.. ..	6
51. Chemicals	..	..	.. ..	Lump sum
52. Gas plant and fittings	..	..	.. ..	Lump sum
53. Miscellaneous for sales tax and cartage charges etc. 10%	..	..	.. ..	
Total estimates cost				say Rs.8,300

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**SURVEY LABORATORY**


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Serial No.	Description	Quantity
1	2	3
1.	Ordinary Theodolite (transiting type) including accessories	5
2.	Theodolite (transit type) including accessories (Precision)	3
3.	Engineers Level-Carl Zeiss Jena-030 .. ..	2
4.	Wye Level .. ..	3
5.	Ordinary Dumpy Level .. ..	10
6.	Levelling staff—top—with telescope type 14' high	15
7.	Plane table ordinary with accessories .. ..	12
8.	Plane table with telescope Aledade with all accessories	1
9.	Prismatic Compass 4" dia. with tripod etc. .. ..	12
10.	Prismatic Compass—Pocket size .. ..	1
11.	Metallic Tape chesterman 100' long .. ..	12
12.	Metallic Tape chesterman 50' long .. ..	12
13.	Steel Ban 100' long 3/8" wide .. ..	13

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SURVEY LABORATORY—*contd.*

1	2	3
14.	Steel Band 50' long 3/8" wide	3
15.	Ranging rods T.W. 8' high etc.	60
16.	Cross staff open type	6
17.	Cross staff octagonal type	6
18.	Chain	12
19.	Optical square 90' large	2
20.	Box Sextant	2
21.	Abney's level with vernier micrometer screw etc.	1
22.	Burrell's hand level	1
23.	Indian Clinometer	1
24.	Pantograph 36"	2
25.	Planimeter sliding bar pattern	4
26.	Magnifying glass	5
27.	Stop watch 100 Div.	2
28.	Spirit levels	12
29.	Surveying Umbrella 36" dia.	12
30.	Steel Arrows	12 doz.
Total estimated cost		say Rs. 60,000

## EQUIPMENT FOR MATERIAL TESTING LABORATORY

Sl. No.	Equipment	Specification & Purpose	Number Required
1	2	3	4
<i>GENERAL</i>			
1.	Universal Testing Machine	Capacity : 50 tons—To test specimens in tension, compression, transverse flexure-grips to accommodate specimens from 0.1" to 3" (tubes etc.)	1
2.	Semi-automatic balances	Capacity : 10 Kgm. for sieve analysis etc. of fine aggregate	1
3.	Do.	Capacity : 100 Kgm. for coarse aggregate and other heavier weighments	1
4.	Stop watches		6
5.	Proving rings	50 tons	1
6.	Proving rings	10 tons	1
Estimated Cost		..	Rs. 54,600

EQUIPMENT FOR MATERIAL TESTING LABORATORY—*contd.*

1	2	3	4
<i>Cement &amp; Concrete Testing</i>			
<i>A. Cement</i>			
7.	Vicat's Needles and accessories.	I.S.S. setting time of cement ..	3
8.	Le Chatelier's Fork's ..	I.S.S. Soundness .. ..	3
9.	Mortar Cubes .. ..	I.S.S. Comp. strength ..	12
10.	Briquette Gang Moulds	I.S.S. Tensile strength ..	4
11.	Tensile testing machine	I.S.S. ten strength .. ..	1
12.	Mortar Cube Vibrator ..	I.S.S. Comp-strength with time switch etc. .. ..	12
13.	Spatula .. ..	I.S.S. .. ..	1
14.	Flow table .. ..	A.S.T.M. .. ..	1
Estimated Cost ..			Rs. 8,430
<i>B. Aggregate</i>			
<i>(a) Fine</i>			Sets
15.	Standard Sieve sets ..	I.S.S. Fineness Modulus (Nos. 7, 14, 25, 52, 100 Lid & Pan) ..	3
16.	Sieve Shaker .. ..	I.S.S. Do. .. ..	1
Estimated Cost ..			Rs. 1,360
<i>(b) Coarse</i>			Sets
17.	Standard Sieve sets ..	3/16", 3/8", 3/4", 1-1/2" ..	3
18.	Aggregate crushing strength moulds.	I.S.S. To determine suitability of concrete for a given job ..	1
19.	Attrition testing machine	I.S.S. To determine suitability of aggregate under dynamic loading as in roads .. ..	1
Estimated Cost ..			Rs. 5,850
<i>C. Concrete</i>			
20.	4" (or nearest metric equivalent) cube moulds.	I.S.S. Comp. strength ..	12
21.	6" (Do.)	Do. .. ..	12
22.	6" × 12" cylinders ..	I.S.S. A.S.T.M. Comp. strength and Elastic Modulour ..	6
23.	Slump cone and rod ..	I.S.S.—Workability .. ..	3

EQUIPMENT FOR MATERIAL TESTING LABORATORY—*contd.*

1	2	3	4
24. Vibrators	.. ..	Consolidation (with step down transformer etc.)	3
	(i) Immersion	.. ..	1
	(ii) Surface	.. ..	1
	(iii) Form work	.. ..	1
25. Beam Moulds	.. ..	I.S.S. Transverse Bending	3
26. Concrete Lab mixer	.. ..	Portable and Manually operated 3/4 cu. ft.	1
27. Concrete Lab mixer	.. ..	Fixed—electrically operated cap. 2 cu. ft.	1
28. Storage—Bins	.. ..	A battery of 6 where graded aggregate between standard adjacent sieve Nos. is stored—Design of mixes—May be fabricated locally	1
29. Length comparator	.. ..	AIMIL	1
Estimated Cost			Rs. 6,880

*Strain Measuring Equipment*

30. Extensometer	.. ..	Lindley's : Rods 3/4" and below	1
31.		Rod 3/4" and above	1
32. Demountable strain gauge	.. ..	Whitmore—8" Gauge length	1
33. Lam's extensometer	.. ..	Optical with mirror rollers	1
34. Dial gauges with magnetic holders, stands etc.	.. ..	To read to 1/10,000 in. to 1/25,000 in.	6
35. Electric strain indicator with selector switches (Philips)	.. ..	Conjunction with resistance wire strain gauges	1
Estimated Cost			Rs. 4,300

*Steel Testing Equipment*

36. Azod Impact Testing Machine.	.. ..	ISS Resistance to sudden shocks due to stress concentration	1
37. Fatigue Testing Machine	.. ..	Alternating loads on steel specimens to determine their resistance to dynamic loading	1
Estimated Cost			Rs. 9,000

## EQUIPMENT FOR MATERIAL TESTING LABORATORY—concl'd.

1	2	3	4
<i>Soil Testing Equipment</i>			
38.	Liquid limit Appl. ..	To find clay contents etc. ..	3
39.	Consolidometer ..	To find rate of settlement ..	1
40.	Unconfined Comp. ..	To find comp strength of soil and bearing capacity ..	1
41.	Director spear App. ..	To find angle of internal friction and pence-bearing capacity of soils .. .. .	1
42.	Earth Augurs Screw ..	.. .. .	1
43.	Earth Ordinary ..	.. .. .	1
44.	Hydrometers ..	.. .. .	2
45.	Mechanical Analysis App. ..	.. .. .	1
46.	Ovens 0 to 150° C. ..	.. .. .	
47.	Plate Bearing App. ..	.. .. .	
48.	C.B.R. Appl. ..	.. .. .	
49.	Abbott's Compactometer	Estimated Costs ..	Rs. 1,400
50.	Miscellaneous items ..		Rs. 5,000
Total estimated cost of <i>Material and Equipment</i>			say Rs. 95,000

## EQUIPMENT FOR WORKSHOP

S.No.	Equipment	Specifications and purpose	No. Required
1	2	3	4
<i>Carpentry</i>			
<i>A. Wood Working Machines</i>			
	Band saw .. ..	16" wheel cap. $\frac{1}{4}$ to 1" ..	
	Circular saw .. ..	12" ..	
	Planner .. ..	12" blades 2 H.P. with Motor ..	1
	Jig saw .. ..	.. .. .	1
<i>B. Misc. Equipment</i>			
	Tables .. ..	9 × 5 .. .. .	3
	Vices-wood lined .. ..	9" .. .. .	12
	Chisels $\frac{1}{4}$ " to 2" set incl. grooving & C .. ..	.. .. .	6
	Jack Planes .. ..	18" one 12" three 14" five 9" three	12



EQUIPMENT FOR WORKSHOP—*contd.*

1	2	3	4
Metal planes (iron)	.. Stanley 14"	.. ..	12
Hand saw	.. .. 18"	.. ..	12
Brace	.. .. 6'—0"	.. ..	6
Try Sq. (metallic)	.. ..	.. ..	12
Folding Scales	.. ..	.. ..	12
Flexible steel tapes	.. 6' length	.. ..	12
Hand drill	.. .. 1/4"	.. ..	3
Bevel Angle	.. .. 6"	.. ..	6
Spanur set	.. ..	.. ..	1
Marking Gauge	.. ..	.. ..	12
Adjustible spokeshave	.. ..	.. ..	3
Rakhet Brace	.. .. Stanley	.. ..	1
Augur Bit set	.. ..	.. ..	1
Screw Dividers	.. 3", 6", 8", 10", 12"	.. ..	2
Divider	.. .. 6"	.. ..	2
Calipers outside	.. .. 6"	.. ..	2
inside	.. ..	.. ..	2
Files	.. .. Bastard 8" × 10"	.. ..	12
File smooth	.. .. 10"—6"	.. ..	12
File ½ round	.. .. 10"—6'	.. ..	12
round	.. .. 10"—6"	.. ..	12
File Rasp	.. .. 10"—6"	.. ..	12
Triangular file	.. ..	.. ..	1 gross
Pliers	.. .. 6"—8"	.. ..	6
Sheet cutter	.. .. 6"	.. ..	1
Hammer	.. .. 1 lb.	.. ..	Nos. 12
	.. .. 2 lb.	.. ..	6
	.. .. 3 lb.	.. ..	6
Emery stone	.. ..	.. ..	6
Drill lits	.. .. 1/16" to ½" I.T.	.. ..	1
Oil can	.. ..	.. ..	1
<i>Foundry</i>			
Cupola	.. ..	.. ..	1
Foundry Sand	.. .. I.S.S.	.. ..	1,600 cu.ft.
Trowels of different shapes	.. ..	.. ..	2 dozen.
Pans	.. ..	.. ..	12
Spades	.. ..	.. ..	6
Spirit levels	.. ..	.. ..	6

## EQUIPMENT FOR WORKSHOP—concl'd.

1	2	3	4
<i>Smithy</i>			
Forges	..	..	4
Power hammer	..	Small .. ..	1
Sledge hammers	..	.. ..	4
Hand hammers	..	.. ..	8
Anvils	..	.. ..	4
Air Blower	..	.. ..	1
<i>Welding</i>			
Welding set with D.C. converter	..	..	1
Welding rods	..	.. ..	100
Welding shields	..	.. ..	3
<i>Spraying</i>			
<i>Fitters</i>			
Lathes	..	Harihar MB Type .. .. (1 of 4'—6" 1 of 6'—0" 1 of 1'—9").	3
Drilling Machines	..	Praga $\frac{1}{2}$ " capacity .. ..	1
Bench Grinder	..	6" speed well type .. ..	1
Milling Machine	..	.. ..	1
Vices	..	.. ..	6
Hammers	..	.. ..	12
Chisels	..	.. ..	12
Files of different grades	12"	.. ..	24
	6"	.. ..	24
Hacksaw Blades	..	1 gross @ Rs. 3 per doz.	
Outside calipers	..	8" .. ..	3
Inside calipers	..	8" .. ..	3
Dividers	..	8" .. ..	3
Steel scale	..	.. ..	25
Emery stone	..	.. ..	6
Oil can	..	.. ..	2
Face plate	..	.. ..	1
Total estimated cost of Equipment			say Rs. 72,500

## ANNEXURE VII

### Comments received from the Universities on the Report of the Special Committee for Commerce Education

*Osmania University, Hyderabad*

*Commerce education below and beside the University level*—No comments.

(a) *Major comments on the recommendations on Commerce education at the University level*—There does not seem to be sufficient reconciliation between the Committee's almost opposite recommendations of a liberal bias of the B.Com. course, on one side, and its directly practical utility for the employer on the other. In our view, it is better to organise the B.Com. course as a fairly liberal course with some bias towards certain practical subjects like Accountancy, Mercantile Law and Business Organisation, and then develop special Diploma Courses for a year or so in relation to the requirements of employment in different major business or industrial occupations, for example, Secretarial Practice, Banking, Insurance, Marketing and Labour Management.

(b) *The structure of the M.Com. course, recommended by the Committee (page 29-30. para 6.15)*—is in our view, to be improved qualitatively with an import into it of sufficient academic standards consistent with a University post-graduate course. To illustrate the point the subject of "Labour Legislation", suggested by the Committee, has to be replaced by "Labour Economics and Labour Management" (incidentally, as we have at the M.Com. level here). Secondly, half the M.Com. course as suggested by the Committee consists of optional subjects. Looking at the recent trends in imparting knowledge at the University level, it is worthwhile to incorporate, even at the Master's level, a greater proportion of compulsory branches of learning. Hence two out of the eight subjects may be optional. Thirdly, the curriculum, as suggested by the Committee, lacks the emphasis, even slightly, on Business Administration, which, in these days of growing economic administration, is a necessity for every post-graduate student of Commerce.

To have M.B.A. courses separately is no consolation for the M.Com. students (incidentally, we have "Business administration" as a compulsory subject at the M.Com. level).

(c) On the question of research on the part of the University teachers, the Committee's observations (page 30, para 6.16) seem to imply a rather inadequate emphasis on the need for research and give priority to research "of a practical character." While practical examples helpful in instruction are worth accumulating, it cannot be overlooked, that good research in the field of Applied Economics and Commerce requires great emphasis on economic analysis and on the basic techniques of research, and that at the level of research a high degree of fusion between Economics and Commerce, though differently organised as departments, is very necessary, if the research output is not to be "pedestrian" in character.

(d) We do not agree with the Committee's recommendations in favour of evening classes for the M.Com. Degree under the existing conditions, because the requirements of written work and seminar instruction as well as those of extensive study with concentration on matters of technical interest, cannot be adequately satisfied by the part-time students. Instead, Diploma courses in Business Administration may be offered for employees in industry or government.

(e) The M.B.A. course may be organised separately from the M.Com. course so as to be more directly utilitarian, consisting of the case method of instruction, continuous practical training, partial instruction by practical men and a minimum degree of theoretical analysis.

(f) As regards the Committee's recommendation of an "All-India Council for Commerce Education" (page 59, para 11-17) we do not know whether it is particularly necessary to have it, over and above the Inter-University Board and the University Grants Commission. It may, if created, mainly concern itself with Diplomas, non-University education in Commerce and even with the M.B.A. course to some extent. Such requirements as laboratories, equipment and building specifications which apply to engineering courses and therefore, call for an All-India Board of Technical Education to supervise these matters, are fairly absent in this case.

*Some minor comments—*(a) At the B.Com. stage the retention of one optional subject, as obtains in our Universities today is useful, in order to develop a little more intensively the student's particular interests; it does not destroy the otherwise liberal character of the course.

(b) The recommendation of 'interview' by a board including businessmen for selecting the students for the B.Com. course seems to be luxurious refinement of our usual methods of admission.

(c) Some element of divergence between the M.Com. curricula of different Universities may be permitted so that special regional needs may be catered to and the specialist knowledge of particular teachers availed of, at least in respect of the optional subjects.

*Aligarh University, Aligarh*

We have gone through the report and are largely in agreement with its recommendations for providing the country with a sound and uniform system of Commerce Education consistent with the needs and resources of our developing economy.

Our comments are given below —

Our syllabus at the B.Com. level is more or less of the same pattern as recommended by the Committee which favours a broad-based knowledge in liberal education. Our students are studying subjects like English, General Education, Hindi, Urdu, Theology and many other papers which the Committee has included in the Syllabus of the B.Com. degree courses. We agree that specialisation at this level is not desirable but it should be on a uniform basis embracing all the universities.

*M.Com.*—We agree with the suggestion put forth by the Committee that there should be two streams of Commerce Education at the post-graduate level (1) M.Com. meant for specialisation in Commerce and (2) M.B.A. which concerns itself in developing managerial capabilities of the graduates of all disciplines. Since the planned development of India will diversify our economy, it is advisable that the specialisation at M.Com. level should be entrusted to the Department of Applied Commerce, Department of Accounts and Department of Industrial and Commercial Laws. Visualising this need, the Faculty of Commerce during the Second Five Year Plan instituted the Post-graduate D.B.A. as a separate discipline. We also intend to start M.B.A. classes on the lines suggested by the Committee but the fulfilment of this scheme depends entirely on the U.G.C. At the moment, in the absence of M.B.A. course, M.Com. has been given Business-Administration bias: which is contrary to the recommendations of the Committee. However, the syllabus can be revised on the lines indicated by the Committee provided sufficient finances are available. Though on a modest scale, the Faculty also associates some persons possessing professional experience in teaching. The suggestion of the Committee to associate part-time specialists along with a whole-time teacher is notable but it will also involve additional expenditure in the creation of parallel posts.

*Practical Training*—This is a long felt desire of the Universities to impart practical education to the students but it has serious limitations and cannot succeed unless the teachers and the industrialists work in collaboration with each other and tackle the problems of industry on co-operative basis. Also, it requires the nationalised undertaking like banks, insurance offices etc. to extend training facilities to the post-graduate students during the period of their study. We, however, feel that practical training will be useful if the trainees are absorbed in the similar type of work. But in the absence of such opportunities of employment, in service training after employment will be more useful than the type of training during the course of study.

*Workshop*—The suggestion for the Commerce museum or workshop is sound. The Department has been trying to get the necessary grant for this purpose but it has not yet materialised.

The Department appreciates the recommendations of the Committee and is of the view that, if implemented, the Commerce graduates will be better qualified to contribute to the economic development of the country. It must be however added that these changes will have far reaching financial implications but this is an essential pre-requisite for effective improvement in Commerce education. There is no denying the fact that these measures will improve the quality of Commerce students but it would be in all fairness that posts befitting their qualifications be reserved for them, exclusively a privilege which does not exist at the moment.

*Poona University, Poona*

(1) The Special Committee has recommended that there should be only 12 papers for the final examination. Out of these, there may be four language groups, three in the Economics group and five in the Commerce group. The Committee also emphasises the necessity to increase the 'liberal' element

in the Commerce Courses with special emphasis on language and literature (p. 21 Report).

In the University of Poona, a student has to offer 18 papers in all, and enough scope has been already provided for in 'liberal element'. It is not desirable that the Poona University should reduce the number of papers from 18 to 12. It does not mean, however, that some adjustment is not possible within the framework now accepted by the University. But, we are not in favour of any radical change in the Course at this time.

2. We agree with the observations of the Committee (p. 25) that M.Com. Courses should not include management subjects. At the M.Com. level an effort should be made to provide for specialisation and the courses should be arranged accordingly.

3. We agree with the recommendation (p. 25) that separate courses in 'Business Administration' should be started by the Universities designed to prepare students for management duties in Commerce and Industry. These courses should be open to only first class and second class students even from other faculties like Arts, Science and Engineering. Syndicate and Seminar methods could be adopted only for these courses and not for B.Com. and M.Com. Courses.

4. We agree with the recommendation (p.29) that admission to the post-graduate classes in Commerce should be restricted. In our opinion, it should be restricted to those who have obtained either a first or second class at the B.Com. examination.

5. The Committee has recommended on page 29 of the report a model course for M.Com. examination. We do not agree with the arrangement of papers suggested and feel that each University should have freedom in preparation of the courses at the post-graduate level.

6. We agree with the recommendation of the Committee (p. 29) that generally, M.Com. teaching should be confined to established centres of trade and industry.

7. The Committee has made a very important recommendation that there should not be more than sixty students in a class if the quality of commercial education is to be improved. The Committee has further observed on page 52, that there should be a ceiling for a college teaching, only B.Com. and M. Com. Courses. In the opinion of the Committee, 600 students should constitute the ceiling. We entirely agree with this recommendation. We believe that unless numbers are restricted, the problems of both teaching and standards of education will remain unsolved in the Poona University.

#### *Banaras Hindu University, Banaras*

The Board of Studies in Commerce after a thorough examination of the Report of the Special Committee came to the following conclusions unanimously and resolved that these be communicated to the All India Council for Technical Education:—

(i) The Board feels that emphasis has not been given to the teaching of Hindi, the national language, by the Committee. It holds that 'command over

English, Hindi and regional language is essential' instead of merely 'English and a regional language' as emphasised by the Committee for example in para 3·5 (and at other places too) of the Report.

(ii) The Board concurs with the recommendation of the Committee in regard to the institution of a National Diploma Course in Commercial Practice or D.C.P. (para 4·18 of the Report). The recommendations in that regard should be accepted and implemented at an early date.

(iii) The Board, while it agrees with the Committee's view that 'students wanting to take up a career in Commerce should have a strong basic foundation in elementary knowledge before they start specialising either for a vocation or a profession' (para 11·2 of the Report), does not agree with the recommendation of the Committee that 'Commerce as a group should be taught only in the 11th Class', and feels that Class IX of the Higher Secondary stage is the proper stage at which the students should begin studying Commerce in its general and elementary form so that they may be able to judge their own capacities and tastes and be able to decide whether they will take up a career in Commerce and go in for further studies in this branch of discipline.

(iv) The Board agrees with the views of the Committee that specialisation can profitably start only at the M.Com. stage, that the B.Com. Courses should be liberal and broad-based and that emphasis should be given to the study of languages—not merely English and a regional language as suggested by the Committee, but English, Hindi and a regional language as suggested in (i) above, (para 11·3). The Board, however, does not agree with the view that 'there would be no place for optional groups' at the B.Com. level (para 11·3). The provision of a limited number of optional groups will not run counter to the making of the B.Com. degree a 'hall-mark of liberal education' with a strong bias towards interest in and some knowledge of business and commerce. It will, in addition, to catering to the different tastes of the students, provide an opportunity of bringing the commerce students in close touch with such subjects as sociology, politics, psychology, applied economics etc., if these subjects are also included in the optional group. In a three-year degree course, the optional group can have a place only in the third year of the course and there again the number of optional papers should be not more than two. The Board agrees with the view of the Committee that the load on the Commerce students at the B.Com. stage is very heavy and that it should be reduced.

(v) The Board agrees with the recommendations of the Committee contained in 11·4 and 11·5 (i) to (vi) in regard to Commerce courses at the post-graduate stage. It, however, does not approve of the scheme of M. Com. courses, suggested in the later part of 6·15. The sort of specialisation envisaged in the scheme will not be fair or proper—in fact it may worsen the situation—mainly because in most of the spheres of specialisation suggested in the scheme there are specialised professional institutions, and for appointments in all such spheres preference will continue to be given to those who qualify from such Institutes. The specialisation as suggested will, therefore, be of no practical value. The Board feels that fields of specialisation as suggested below can serve the purpose much better :

*Group A*

1. Management of Public Enterprises.
2. Industrial Relations and Personnel Management.
3. Major Industries of India.
4. Business Finance.

*Group B*

1. Marketing.
2. Materials Management.
3. Foreign Trade Management.
4. Insurance.

*Group C*

1. Statistics.
2. Business Taxation.
3. Business Finance.
4. Management Accounting.

*Group D*

1. Statistics.
2. Business Taxation.
3. Co-operation.
4. Applied Statistics.

*Group E*

1. Marketing.
2. Industrial Relations and Personnel Management.
3. Management Practice.
4. Management Accounting.

The scheme of compulsory papers as suggested by the Committee does not seem appropriate. The knowledge of subjects as 'Industrial and Commercial Planning' and 'Financial Analysis and Forecasting' should be considered essential and these together with 'Advanced Business Economics' and 'Business Taxation' or 'Business Administration' should comprise the compulsory part of the M.Com. courses.

(v) The Board feels that it would not be feasible to associate the 'representatives' of professional organisations with the Boards of Studies and other bodies of the University as recommended by the Committee. The present system of inviting professional experts in their personal capacity to serve in such bodies should be continued. However, association of 'representatives' of professional bodies would be useful at the All-India level, i.e. they may be represented on the All-India Council for Commerce Education, to be constituted as per recommendation of the Committee.

(vi) The Board agrees that occasional lectures and participation in seminars and discussions by men from industry and business would be useful.



(iii) As regards the practical training, the Board agrees that it cannot be introduced at the B.Com. stage. At the M.Com. stage, practical training, sandwiched between, the Previous and Final years of study, as at present in this University, has worked well and is useful. It should be retained in this form and should be similarly organised at other places too instead of the arrangement proposed by the Committee, viz., 'the practical training will have to follow the completion of academic instruction and may be a condition to be fulfilled before the actual conferment of the degree'. (11·8). In this University, every M.Com. (Previous) student is sent out for practical training for 90 working days in a house of repute connected with industry, trade or commerce. On the completion of this training he is required to submit his diary of practical training to the University which is valued as a paper at the M.Com. (Final) stage. This system of sandwiched practical training enables better co-ordination and promotion of a balance in theoretical knowledge and the practical training.

(iv) The Board is in general agreement with the recommendations contained in paragraphs 11·9, 11·10, 11·12 and in subsequent paragraphs of Chapter 11. It however strongly feels that—

- (a) the teacher-pupil ratio should in no case exceed 1 : 15; it should preferably be 1:10; and not 1: 20 as suggested by the Committee; and
- (b) suggestions relating to schemes of practical training for teachers, for establishment of Commerce workshops and for provision of other facilities for students and teachers, as suggested by the Committee, should be given a high priority.

(v) The Board recognises the multi-disciplinary contact and harmony required for Business Administration course but feels strongly that such contact and harmony is consistent with treating it as a part of the same discipline as the commerce studies and not as a separate discipline as recommended by the Committee in para 6·10. This seems to be implicitly recognised in the recommendation of the Committee also in para 6·9 when it emphasised the need for holding consultation with the Commerce Departments of the Indian Universities and the All India Board of Studies in Commerce 'before finalising their ideas on the syllabus content of a two-year full-time course for an M.B.A. degree'. The Board agrees with the objectives of the M.B.A. course and the method of its teaching suggested by the Committee and makes the following recommendations for the institution of M.B.A. courses in the Universities under the Commerce or Social Sciences Faculty —

- (a) M.B.A. course should be treated as part of the same discipline as Commerce.
- (b) It should be a one-year course after a post-graduate degree in Commerce, Arts or Science or a Bachelor's degree in technological courses (where such a degree is awarded after five years of Pre-University or Higher Secondary (11th year education).
- (c) Graduates who have been working for at least five years in some executive post in business should also be eligible for admission to such courses.

- (d) The M.B.A. Examination should comprise 4 papers of 100 marks each, as below, and a dissertation of 200 marks —
- Paper I—Management Practice.  
 Paper II—Production Management.  
 Paper III—Business Policy.  
 Paper IV—Higher Management Control.
- (e) The method of teaching shall essentially comprise seminars, group discussions, syndicate and case methods.

It is felt that students who wish to go in for a purely business career should be given such further intensive training for a year with a view to developing initiative, analysis, recognition of relevant issues and decision-making (para 6.9).

*Jadavpur University, Jadavpur*

No comments.

*P.S.G. College of Technology, Coimbatore*

The Committee has not discussed the question whether Commerce Education should be a University discipline at all to be gathered in an Arts College. The Committee simply says "There can be no denying the fact that almost by definition and indeed by virtue of the fact that Commerce Education is a University Discipline, it must fulfil the broad liberal requirements of university education". This very assumption that Commerce education is a part of University education leads the committee to speak of the liberal subjects and vocational subjects which must find a place in the Commerce curriculum. It is a moot point whether commerce education should not be straightway considered as a professional course like medical and engineering etc., and therefore should be imparted in a special institution rather than in an Arts College. It is because of the hesitation to treat commerce education as a professional education we have been teaching the commerce subjects in arts institutions making ourselves liable to the charge that the commerce education imparted in the colleges is highly theoretical and useless. If as the committee says businessmen want only brainy young men and they do not show any special preference for the commerce graduate, the proper thing will be to throw open the commerce education to students of any branch of arts education and to give this education in a special professional institution. The only justification for having the commerce education in Arts Colleges seems to be that many of the subjects which would form part of the professional curriculum in Commerce are already being taught in Arts Colleges. It is this which has led to Commerce Education being tacked on to Arts Colleges. The teachers of commerce subjects naturally deal with the subjects concerned just as they would do for a course in economics or sociology etc. They fail to impart a vocational bias which is essential in order to make the course appear practical and make the commerce degree holder a desirable employee.

It seems proper to make a distinction between vocational education and vocational training. The Committee suggests some subjects which are to form part of a liberal education and suggests some other with vocational bias which will develop personality traits or impart specialised commercial knowledge.

What vocational education? It means the acquisition of basic knowledge required for the practice of any branch of commerce. This is better provided in a commerce college where the teachers are all men with practical knowledge of different branches of commerce rather than in an Arts College where the equipment and bent of mind of professors are completely different from that required for providing a vocational bias to instruction.

The proper solution to the problem would be to have separate commerce colleges where vocational education is given in the forenoon and detail the students in the afternoon to some firms where they can have practical knowledge of their sphere of study. This type of correlation would make the commerce graduate a professional degree holder and would increase his value in the sphere of commerce. It is a state of affairs in which a man who has to get practical knowledge is being subjected to a lot of theoretical instruction which is responsible for the commerce graduate being valued so lightly. If businessmen emphasise what they need is young men with good general education and choose students of any faculty not necessarily of commerce it does not mean that they would not value a young man with good general education along with a commerce knowledge and training. The Committee itself quotes the view of the Bengal Chamber of Commerce and Industry to the effect that Commerce graduates have done better than Arts graduates especially if they are good students.

What the committee says about throwing open the M.B.A. course to all graduates including those in Arts and Sciences would apply equally to commerce course in colleges.

As the Committee points out in para 5.1 Arts Colleges which specialise in commerce subjects only, it is such type of institutions that should obtain and B. Com. should not be taught in any colleges where B.A., and B. Sc., are taught. Such differentiation of commerce colleges from the rest would invest them with the status of professional colleges comparable to engineering college or a medical college.

Today what takes place in the case of B. Com. curriculum is that most of the subjects taught for the B.A. class in economics are taught to them and to give a commercial look Accountancy and its allied subjects, business statistics Trade and Transport etc., are added to the curriculum. These are also treated more or less on theoretical bias and the student has no opportunity to know how these are actually practised in the commercial world. Had Commerce colleges been separate and the subjects were handled by men with practical experience the state of affairs lamented by the Committee in para 5.4 would not have happened. If we adopt the method of admitting to such special commerce colleges young men who have already taken a degree in economics or had taken at some stage a course in economics, there will be no need to load the syllabus for the commerce curriculum as mentioned by the committee in para 5.5. If commerce education has to be thrown open not only to graduates in economics but others also then the other alternative is to have separate commerce colleges where all the subjects like Economics, Economic Development etc., would have been given a commercial bias during instruction unlike what is being done at present in the Arts Colleges. The Committee seems to give access to the idea of providing liberal education as a part of commerce

curriculum. Why should this be so much stressed upon while we do not insist in the case of engineering and medical degrees? We cannot have it both ways to give young men of the liberal education which they need as well as practical commercial education. They cannot be combined in the same curriculum. The general education degree must precede professional qualifications. It is an attempt to do both at the same time that has resulted in commerce graduate being in an anomalous position of not having sufficient liberal education or commerce education.

The conclusion of the Committee in para 5·6 "What we need therefore is B. Com. degree that without losing its basic utilitarian character of commerce Education will increase the commerce graduates ability to express himself lucidly and with logic and at the same time stimulate in him initiative, confidence and analytical ability, as also build up his character and make him aware of his social responsibilities. It is also important that a practical outlook should be encouraged in his approach to the problems in studies for his B. Com. degree". This is a statement which obliterates all the distinction that must obtain between an Arts degree and a professional degree. It confuses both and the recommendations of the Committee that follow in para 5·7 do not appear to improve in any way the acceptability of the commerce graduates to the business world. The committee has misunderstood the emphasis of the businessmen on their needing young men of ability and therefore proceed to throw open the doors of liberal education in commerce education. The proper thing for the committee would have been to suggest that this liberal education should already have been obtained and only those who have not had such liberal education should be admitted to the professional course of commerce.

Turning to the curriculum recommended by the Committee for the B. Com. degree, it is pointed out that specialisation at B.Com. stage is not desirable, is acceptable. But its arids in subjects in economics and commerce group will lead to unfortunate results as in the past of teaching in the theoretical way the economics group subjects unless those are to be separately taught in commerce group where they would be taught with a practical bias. Hence the hopes expressed by the committee in para 5·1 that the commerce will be made more acceptable by the subjects recommended by them is too sanguine.

In para 5·8 the committee recommends only the appointment of part-time teachers with professional experience in commerce subjects. They fail to emphasise that even the subjects in economics group have to be differently orientated when being taught to commerce students.

The committee has correctly divided commercial education into (1) Pre-University stage (2) Undergraduate stage, (3) Post-Graduate stage and (4) Professional stage.

In the Pre-University stage it is expected to provide personnel at lower levels. The object at this stage is to enable one to take immediate employment. Hence the course has to be strictly practical. At present the needs of the stage are provided by

- (1) instruction in some commercial subjects of the higher secondary schools and (2) instruction in commercial institutions or polytechnics.

In the Higher Secondary Schools, the commerce group consists of subjects like Commercial Practice, Book Keeping, Commercial Geography or elements of economics and civics and Shorthand and Typewriting. These subjects were intended to give a definitely vocational bias. Students were expected either to acquire a taste in commercial subjects so that they will go to university for higher education in commerce or directly get absorbed in commercial establishments. As for the former the committee correctly concludes on the basis of opinion received by it that there can be divergence of opinion. As for entering into commercial establishments the secondary school course of further training in the strictly vocational subjects of book keeping, shorthand and typewriting or secretarial practice was not sufficient. Even those who go to the University do not seem to show any great superiority over others because not enough of their time has been used for liberal education and for language training. The Committee concludes "Thus the introduction of the so called commerce stream from the 9th class for a period of 3 years falls between the two stools. It neither enables the students for immediate employment nor does it give them the special advance in the acquiring of commercial education at the university level" (Para 4.5). Therefore the Committee takes the question whether commercial stream should be retained at all at the higher secondary level. "They say students seeking higher education in commerce need rigorous training in humanities, social science, mathematics and the language. What is really needed is to develop a mental ability and intellectual discipline among students rather than fill them with descriptions of commercial practices and techniques. It is unlikely that people will be able to undertake advance work of either an academic or a technical nature without a sound educational background. Many of the present day problems of higher education in commerce and their origin to education given to students prior to their entry to universities (4.6). This passage shows again the obsession of the committee that the view of the businessmen that they value young men of intelligence but the committee has concluded that the commercial stream should be withdrawn in its present form from the higher secondary course and that only in the 11th standard by which stage the student would have acquired adequate general education, a commercial subject of economics and commercial geography can be introduced, and that there should be no other optional subject offered for commerce. This concession is given to the 11th standard only because the pupils will go to the university for further degree in commerce. As for others who do not go to the university general education must stop at 10th class and if they want to go to commercial establishments they should have vocational education in commerce which should consist of two subjects commonly taught in the commercial institutions of the State Diploma or Government Diploma examinations. The subjects are to be strictly vocational in character and train people concerned in the schools that will enable them to fill up the clerical and other junior posts without which commercial establishments and industry cannot be operated" (para 4.9).

The view of the committee expressed in this context that the National Diploma has been a failure due to its being more or less a duplication of the B. Com. course is correct. The committee does not make a distinction between vocational education and vocational training and therefore when it discusses commercial education at the Pre-University stage it is using two terms as if

they were indistinguishable. The National Diploma made it obligatory for every candidate to undergo a period of practical training in a recognised industry and commercial concern that form a vocational training part while the other subjects form the vocational education part but this committee does not provide for any vocational training. It only provides for 7 commercial compulsory subjects and one optional subject from out of 5.

There is nothing practical about this course. In the beginning of the chapter, the committee has stated that for clerical posts subjects in the secondary school and the commercial subjects covered by the diplomas and subjects were not found sufficient and without further training in such vocational subjects the pupils were not wanted by the commercial establishments. What the committee should have done is that they should have made the national diploma provide for the tool subjects required in the clerical stage and left the B. Com. degree subjects like commercial geography, economics etc. Their recommendation that economics subjects must owe their start from the secondary schools may be accepted on the ground that at that stage the student must have more time for general education than for any vocational education but once the school stage is finished, the provision will be made for terminal courses in commercial subjects.

Further in the subjects recommended by the Committee typewriting is made compulsory subject. Since the commercial institutes will be expected to provide all the facilities to acquire knowledge in typewriting and shorthand there is no need for schools taking up this work. Its place can be taken up by the paper on economics and economics statistics. It is definitely possible to provide elementary course in economics which should be providing a good basis for understanding commercial geography, elements of commerce, banking practice, salesmanship etc.

#### *Delhi Polytechnic, Delhi*

1. The B. Com. course of Indian Universities is proposed to be more generalised and not of honours standard. At present, except the Calcutta University, no other university permits this course to be offered on part-time basis. From the Report it is not clear whether the new generalised B. Com. course would also be offered as a part-time course. However, at the Delhi Polytechnic, the full-time B. Com. course has been discontinued.

2. The N. D. (Com.) course of the All India Council for Technical Education has been recommended to be abolished as

- (i) it resembles the B. Com. course too closely ;
- (ii) in India, a degree is preferred to a National Diploma ; and
- (iii) its duration is too long.

(i) is true only in respect of academic contents, but the N.D. (Com.) contains a definite vocational bias. This is offered in several institutions in the south as 3 years' full-time course. But at the Delhi Polytechnic, it is a 4 years' part-time course and has been progressively gaining in popularity with those who are engaged in commercial occupations by day. Also, the duration of four years after Matriculation is not longer than that of the B. Com. course after the Higher Secondary Examination.

3. A new Diploma Course in Commercial Practice, 2 years' full-time or 3 years' part-time, after Higher Secondary has been proposed. This appears to be very similar to the old Government Commercial Diploma course in various States which was given up 15 to 20 years ago at the Delhi Polytechnic and at many other institutions. However, the admission qualification being Higher Secondary and not Matric, the standard would presumably be higher, but it would still be academically lower than the present N. D. (Com.) course. In the Report, a suggestion has been made that for the better students of this course, there should be opportunities for higher studies but the details have not been given. If potentially good students are to be attracted to the proposed Diploma Course in Commercial practice, such opportunities for higher education must be clearly defined beforehand.

In view of the above, it would be inopportune and pre-mature to abolish the N. D. (Com.) course. On the other hand, the course should be diversified so as to lead to specialisation in the four broad commercial occupations, viz., (i) Auditing and Accounts, (ii) Secretarial Practice, (iii) Insurance, and (iv) Banking. At present, different professional bodies, viz., Institute of Chartered (or Costs and Works) Accountants; Company Law Administration, Govt. of India; Federation of Indian Insurance Works Institutes, and the Institute of Bankers (India) offer these courses respectively. Though the preparatory subjects of these courses are very similar viz., Commerce, Book-keeping, Economics, Mercantile Law, Commercial Geography and Business English, each body follows a separate scheme of examination and there has been no attempt to make the preparatory stage common to all. In any case, except the Institute of Chartered Accountants, no other body requires obligatory formal instruction in an educational institution.

In our opinion, therefore, the N. D. (Com.) course should be reorganised into two stages (i) basic and (ii) advanced, in order to achieve specialisation in the four broad commercial areas. The contents of the basic course would be common as indicated above. Its duration may be 12 to 18 months (full-time) or 2 to 2½ years (part-time). The advanced stage should be spread over 2 years part-time. The N. D. (Com.) course would be open either to persons who have passed the Higher Secondary Examination with commercial subjects or alternatively to those who have passed the new Diploma Course in Commercial Practice. The latter group may even be granted exemption in certain subjects.

If a student passes the N. D. (Com.) examination, leading to a particular profession, he may be exempted from the whole or part of the Associate Membership Examination of that professional body. This is the practice with National Certificate and Diploma holders in the United Kingdom. The exact details have, however, to be worked out carefully in consultation with each professional body.

The only other point to be decided is whether such a course would be called National Diploma or Higher National Certificate. In the U. K. only part time courses are called National Certificate, the name National Diploma being reserved for full time courses. The National Diploma course covers a wide range of subjects than the National Certificate course, but in a particular subject the standard of teaching is not very different.

If our suggestions are accepted, the Delhi Polytechnic may continue to offer the revised National Diploma Course in Commerce as well as the new Diploma in Commercial Practice by day and/or evening, as may be expedient. Otherwise, there will be hardly any course which can be offered at the Commerce Department of the Delhi Polytechnic, which will have to be closed down.

*Annamalai University*

*B. Com. Course*—The University is in broad agreement with the recommendations of the Committee regarding (a) the need to increase the “liberal” element in Commerce education, (b) specialisation in technical fields “should be left to the post graduate” stage, as too much specialisation ‘overloads’ the syllabus and (c) the Commerce syllabus should be organised to place more emphasis on Commerce tool subjects like accountancy, law, economics and business organisation and statistics for languages. Yet the University would like to suggest the following modifications in the scheme suggested on page 21.

Scheme suggested	Modification
<b>Language group</b>	
1. English—2	.. (1) accepted but the 2nd paper may lay special emphasis on Precis writing, business correspondence in addition to the usual features of a second paper in English.
2. Regional language—2	.. (2) An European language other than English or Hindi is suggested as the Regional language could have been studied and some proficiency obtained by the student before he joins B. Com. 1 Year Class.
<b>Economics group</b>	
3. Economic Analysis	.. Accepted.
4. Economic Department	.. May be substituted by Banking and Currency.
5. Economic Geography	.. May be renamed “Economics and Commercial Geography”.
<b>Commerce group</b>	
6. Mercantile Law—1	.. Accepted.
7. Business Organisation—1	.. Accepted.
8. Accountancy—2	.. Accepted.
9. Business Statistics or Co-operation—1	.. As the B. Com. graduates in this part of the country look forward to their employment in co-operative Department (from the experience of the past and the plan proposals to co-operativism more and more sectors of the Economy). Co-operation should be offered an alternative subject and the Universities may be given option to offer one of the two alternative subjects.



It is also recommended by the Committee that "only 10 of the above 12 papers will figure in the final examination, paper in each language group being left for sessional and class work". Knowing as we do the general psychology of the students, it is too early and premature to leave two papers without University Examination. The students will treat them as of less significance and tend to neglect them while the teachers will be given certain power in the exercise of which they will be exposed to complaints of favouritism etc. whatever be the integrity and honesty actually displayed by them. Teachers are not placed strongly enough to withstand malicious and subtle reproaches. Hence the University could suggest that all the papers should be included in the University Examination and the proposal to introduce sessional and class marks be dropped.

*M. Com. Course*--Remarks on the M. Com. Course are given below--

*M. Com. Course p. 29 of the Report--Compulsory subjects--4 papers*

1. *Economics and Business Statistics*--Accepted.
2. *Labour Legislation*--Alternatively "Advanced Accountancy" should be offered.
3. *Taxation*--This may be renamed "Taxation and Public Enterprise as the economy is purposively extending its socialised sector by establishing heavy industrial units, not to mention public utilities, irrigation and power projects. Further, Planning Commission should be run on commercial lines and yield profits from the commencement of III Plan period.
4. *Business Economics* --Accepted.

*Specialised subjects (Any one group) P. 30 of the Report*

The list given on P. 30 contains 7 groups of which one group with 4 papers is to be offered for the course. To this but must be added as group (8) "Rural Economics and Co-operation, theory, law and practice" and Group (9) Income and other direct taxes--Theory, Law and Practice. The need for offering Group (8) has already been explained in connection with B. Com. Course. That is for those students who stop with B. Com. Degree. In M. Com. also this subject deserved a place, particularly in view of the anxiety of the Ministry of Community Development to introduce a fullfledged Cooperation Degree Course and our reply some time back to the effect that "Rural Economics and Co-operation" is figuring prominently in the graduate and post-graduate courses of the Economics and Commerce Department.

*Viva and Essay*--The proposal on P. 30 of the Report to have Viva and to allot a maximum of 50 marks is acceptable. But the proposal to have an examination on "Essay" may be dropped since essay has been found to be a gamble for the students and it does not bring out the real merit of the student. So most of the departments of the Faculty of Arts have dropped it. Some of them have introduced a Dissertation on a subject involving field work. This may be adopted in the place of "Essay" particularly in view of the remarks of the Committee in the same page to this effect :

"We suggest that high priority be given to the development of research of a practical character in the field of commerce and management".

## ANNEXURE VIII

Item No. 8 of Agenda

**Part-time and correspondence course in Engineering & Technology  
in U.S.A. U.K., Sweden and U.S.S.R.**OBSERVATIONS BY SHRI S. C. SEN, PRINCIPAL, DELHI POLYTECHNIC,  
DELHI-6.*From 23rd February to 24th April, 1961.*

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*Explanations to abbreviations used in this Report*

A.N. = Afternoon.	Ill. = Illinois.
Approx. = Approximate.	lab. = Laboratory.
Appr. = Apprentice.	N.C. = National Certificate.
Arch. = Architecture.	N.D. = National Diploma.
A.I.C.T.E. = All India Council for Technical Education.	N.H.S.C. = National Home Study Council.
B.I.E.T. = British Institute of Engineering Technology.	N.K.I. = Correspondence Institute, Stockholm.
C.E.G.B. = Central Electricity Generating Board.	N.U.E.A. = National University Extension Association.
cl. = Class.	O.N.C. = Ordinary National Certificate, Diploma.
E.C.P.D. = Engineers' Council for Professional Development.	O.N.D. =
Engg. = Engineering.	Rly. = Railways.
F.N. = forenoon.	R.S.F.S.R. = Russian Republic of U.S.S.R.
G.C.E.(A) = General Certificate Education (Advanced).	Spl. = Special.
G.C.E.(O) = General Certificate Education (Ordinary).	S.R.C.A. = Scientific Research and Cultural Affairs.
H.N.C. = Higher National Certificate.	T.H.S. = Technical High School.
H.N.D. = Higher National Diploma.	TISCO = Tata Iron and Steel Company
hrs. = hours.	TELCO = Tata Engineering Locomotive Company.
I.C.S. = International Correspondence Schools.	U.P.S.C. = Union Public Service Commission.
I.I.T. = Indian Institute of Technology.	V.J.T.I. = Victoria Jubilee Technical Institute.
Ind. = India.	Yr. = year.

## 1. INTRODUCTION

1.0. *Assignment*—“The Working Group on Technical Education appreciated that a useful avenue of increasing the output of engineers suitable for normal maintenance and even construction jobs could be envisaged by the introduction of part-time courses in the existing polytechnics and other institutions providing facilities for the purpose for persons possessing necessary basic educational qualifications and engaged in engineering occupations. The way in which part-time courses, short-term courses, correspondence courses and sandwich courses should be planned need to be examined further. . . . . it was felt that correspondence courses should be of special value in imparting instruction to persons already in employment, mostly with a view to improving the knowledge and skill in their present employment. . . . . The Working Group recommended that the Chairman might consider this question in a small Committee and secure further data in regard to the organisation of such courses in countries like the U.S.S.R., the U.S. and the U. K. by visits, if necessary, and the Committee should be in a position to prepare a workable scheme for implementation in the Third Plan.”\* I am grateful to the Government of India for their confidence in entrusting this assignment to me.

1.1. At the instance of Prof. M. S. Thacker and to see the organisation of correspondence courses in India, I visited the British Institute of Engineering and Technology (B.I.E.T.), and met the representative of the International Correspondence Schools (I.C.S.) at Bombay, on 12th February, 1961.

1.2. My programme, as directed by Government, was—

U.S.A.	.. 3 weeks	} detailed itinerary in Annexure I.
U.K.	.. 2 weeks	
U.S.S.R.	.. 2 weeks	
Sweden	.. 1 week (added later).	

I left India (Calcutta) on the 23rd of February, 1961 (A.N.) and returned to Delhi on the 24th of April, 1961 (F. N.).

## 2. OBJECTIVES

(Analysis of the Working Group/All India Council for Technical Education's targets).

2.1. '*Part-time Courses*'—use the class-rooms, laboratories, equipment, library of regular engineering colleges/institutes outside normal hours and in vacations; hence, without additional investment a greater out-turn of students results. Co-operative Courses, as in U.S.A. or Sandwich/Block Release Courses, as in U.K., which require alternate periods of full-time attendance in institutions and industry may also be included.

'*Correspondence Courses*'—depend mostly on exchange of letters between the institution and students, but may include oral instruction using the premises, equipment, library etc. of regular institutions by arrangement.

---

\* Planning Commission Working Group on Technical Education & Vocational Training, page 68, para 105.

Before joining part-time/correspondence courses, students should be already in training/employment. Planning in India must ensure this pre-requisite.

2.2. In III Plan period, no additional out-turn of diploma/Degree level engineers is envisaged through part-time/correspondence courses. Actually, 3,500 additional engineers (and not only 2,000 A.M.I.Es. and foreign trained engineers)\* may be expected through A.M.I.E. (Ind.) Examination, Jadavpur University's evening Degree courses and Delhi Polytechnic's evening N.D. courses.

Recently, the A.I.C.T.E. recommended the increase of seats from 1961 to 1966 to cover the demand/supply position in IV Plan as below :—

*Degree*—13,850 (100 colleges) to 19,137 (19 existing and new colleges plus expansion of I.I.T.'s. and other colleges).

*Diploma*—25,571 (196 polytechnics) to 37,391 (67 existing and new polytechnics plus expansion).

*Part-time correspondence courses*

*Degree level*—1,000 seats. *Diploma level*—5,000 seats. Thus, in III Plan period even without part-time/correspondence courses, practically all Engineers may be trained in full-time institutions. Even in IV Plan period, they are expected to contribute less than 3% towards Degree and 10% towards Diploma out-turn.

The Working Group anticipated a total expenditure of Rs. 2.89 crores for part-time and correspondence courses in III Plan period, which works to about Rs. 500.00 per capita per annum—fairly adequate. A.I.C.T.E. recommended only Rs. 50 lakhs, less than Rs. 100.00 per capita per year—totally inadequate.

Clearly the A.I.C.T.E. proposes to try out pilot part-time/correspondence courses in III Plan period, not for immediate requirements, but for rapidly expanding technical education facilities later.

2.3. Part-time/correspondence course trained engineers are to be suitable for “normal maintenance and even construction jobs”; by implication, not so much for educational, research or design development work.

2.4. The Working Group anticipated a wastage of 75% for correspondence and part-time students. The A.I.C.T.E., however, appears to have taken it at about 50%. The latter is obviously more desirable, but an interim and conservative figure of 60% would be safer to adopt.

2.5. Observations around the world have convinced me of the wisdom of, the cautious approach of the Working Group: A.I.C.T.E. Within these limits my task is (i) to suggest a short-term programme for III Plan and (ii) to indicate a longer programme, for IV and subsequent Plans.

### 3. OBSERVATIONS IN JAPAN

On my way to U.S.A., I halted in Tokyo from the 24th of February, 1961 (A.N.) to the 25th of February, 1961. On the 25th (A.N.), I visited the Tokyo Institute of Technology, Japan's best centre for technical education. Compared with many new technological institutions of India, its buildings, space,

\* Working Group's Report page 38, Table 13, Footnote.

equipment are poor and funds are inadequate. Professors do very good work all the same and at rather low salaries. There are no correspondence, part-time courses at Degree/Diploma level. Altogether, rather disappointing for an industrialised country like Japan, but it would be wrong to generalise on the scanty information I have.

#### F. OBSERVATIONS IN U.S.A.

4-0. Compulsory schooling in U.S.A. extends to the age of 16 years. The Junior School ends at IX class. The Senior School has X, XI and XII classes, after which the High School Examination is taken. For admission to engineering colleges/institutes, only students who have passed the High School, Technical High School or equivalent course with Physics, Chemistry, Mathematics etc. (and some technological subjects for T.H.S.) are eligible.

4-01. Universities, Colleges and Institutes are free to frame courses and make academic awards. But for national or even regional acceptance, they must be approved by recognised 'accrediting' bodies.

4-02. For Engineering studies at Degree or Diploma level or even for State Licence Examination courses by far the most authoritative 'accrediting' agency is the Engineers' Council for Professional Development, established in 1932.

\*The ECPD, is a conference of engineering bodies, organised to assist in and to advance education for engineering and to further the intellectual development of individuals who are or may become engineers.

The participating bodies are the American Society of Civil Engineers, the American Institute of Mining, Metallurgical, and Petroleum Engineers, The American Society of Mechanical Engineers, the American Institute of Electrical, Engineers, the American Society for Engineering Education, the American Institute of Chemical Engineers, the National Council of State Boards of Engineering Examiners, and the Engineering Institute of Canada.

*Purpose*—The exclusive purpose of ECPD shall be to advance and promote scientific and engineering education with a view to the promotion of the public welfare through the development of better educated engineers."

There are also regional accrediting bodies like the Western Colleges Association, American Council of Education, etc.

#### 4-1. Degree level courses in engineering

4-10. These are mostly full-time, some co-operative and some evening courses. Some universities/colleges offer also correspondence courses in several subjects up to the 2nd year level.

Out of about 400 engineering colleges, ECPD had approved only 162 for day courses and only 12 (as on 30-9-60), located at big industrial centres, for evening courses at Degree level.

19 ECPD accredited institutions (as on 30-9-60), generally located in or around big industrial centres, offer co-operative curricula in conjunction with industry which require alternate periods of full-time attendance at college and in industry. One section of students attends classes while the other section holds jobs in industry. After a Semester/Quarter they change places.

\* ECPD 28th Annual Report, page 59.

"After a nationwide study financed by the Ford Foundation for the Advancement of Education and conducted by the Edison Foundation, the Committee found that co-operative education increases student motivation, enables thousands who might otherwise drop out to go on through college, and permits enrolments to be boosted from 15 to 60 per cent with relatively little increase in costs for buildings and staff. The Study concluded: "The programme should be extended far beyond the small number of colleges now using it. It makes sense for both men and women."\*

4.11. *Duration of Courses*—1 regular academic session is broken up generally into 2 Semesters and summer vacation/term or 3 Quarters and summer vacation/term.

*Full-time*—4 years=8 Semesters or 12 Quarters. Some universities/colleges offer combined degree courses of 5 yrs.=10 Semesters/15 Quarters—in arts and engineering, as in Columbia University, New York.

*Part-time*—8 to 12 years, generally 9 or 10 years.

*Co-operative*—generally 5 years.

4.12. *Credits*—required for full-time, part-time and co-operative courses—approximately 140 Semester hours or 210 Quarter hours. One credit is equivalent to one hour's lecture per week for a Semester or Quarter, which requires 2 additional hours for home preparation, i.e., a total of 3 hours work per week. Thus, for a 4-year full-time curriculum, approximately 17/18 credit courses, 26—30 hours per week, have to be taken each Semester/Quarter. For part-time courses, about 6—8 credits, 10—12 hours per week are permissible which require about 18 Semesters i.e., 9 years of study, unless additional summer/correspondence courses are taken to reduce the period 6 to 8 years, which is very difficult.

4.13. *Admission eligibility*—The top 2/5th of students passing out of High Schools with Physics, Chemistry, Maths., English etc. as subjects are admitted. Previous industrial experience is not necessary. Students of co-operative courses are obviously already engaged in industry. Evening students are usually employed in industry, but not necessarily so.

4.14. *Admission age*—Full-time students—usually 18 yrs.; evening students—usually 21 and upwards, but may be younger. According to Dean Boyce, Academic Vice-President of Illinois Institute of Technology, Chicago, to profit by evening degree courses students should preferably join at 22 years or later and possess a good industrial background; also, his average part-time student is not so good as his full-time student.

4.2. *State Licensing Examinations*—In every State of U.S.A. there are laws which prescribe licensure and regulate the practice of professions primarily for the protection of the public. Such professions are Engineering and Land Surveying, Architecture, Public Accountancy, Nursing, Dentistry, Medicine etc. These laws vary from State to State. Some relevant extracts from the Laws of the State of New York, a typical State, are given below—

4.21. "Definition"

\* Readers' Digest U.S. edition, August, 1961.



*Engineer*—A person who holds himself out as able to perform any professional service, such as consultation, investigation, evaluation, planning, design, or operation, in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works, or projects, wherein the safeguarding of life, health or property is concerned or involved, when such professional service requires the application of engineering principles and data.

*Land Surveyor*—surveys areas for their correct determination and description, and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and sub-divisions thereof.”

4-22. “*Examination*, is in three parts

*Professional engineering*

Part I—Structural design and supervision of construction of buildings and similar structures.

Part II—Practical application of the basic engineering sciences.

Part III—Practical application of engineering principles and methods.”

4-23. “*Eligibility for entry to the Examination*—(i) Applicants who are not graduates of a registered program on the basis of high school graduation and 12 years of experience of a satisfactory grade and character. Professional education which did not result in a degree from a registered curriculum is evaluated upon submission of acceptable credentials and given a rating in equivalent number of years. For each rated year, two years of the credit toward the required total of 12 years may be granted.

(ii) Graduates from a registered engineering program in lieu of four years of the eight years of experience required of graduates. Thus, such an applicant, in order to be admitted to the Licensure examination, must possess at least four years of practical experience of satisfactory grade and character. The Board of Examiners consider this period to be a minimum internship following graduation.

(iii) To be acceptable experience should be broad in scope and of such nature as to develop and mature the applicant’s engineering knowledge and judgment.”

4-3. *Diploma Courses*

4-30. Several hundred institutions, variously known as Junior Colleges, City Colleges, Technical Institutes, Community Colleges, University Extension Centres, etc. give engineering training at this level. Junior/City Colleges, as in the West Coast and University Extension Centres, as in Wisconsin and Pennsylvania, offer :

(i) Freshman (1st) and Sophomore (2nd) year Degree Courses of local universities—full-time day only;

(ii) 2 years’ day or 5 years’ evening courses for the Associateship in Arts Degree, a terminal qualification accepted by industry, which enables passed students to join industrial appointments at the sub-professional level ; and

(iii) shorter Extension courses (usually evening) for adults in industry to acquire further education in specific vocations.

Technical Institutes and Community Colleges all over U.S.A. offer only courses at (ii) and (iii) above.

4-31. *Admission qualifications*—High School Certificate or equivalent with appropriate credits.

A Technical Institute passed student can earn a good salary as a Technician and without being a professional engineer. So, he not very frequently proceeds to a Degree Course; credits earned are not transferable.

#### 4-4. *Correspondence Courses in Engineering*

4-41. These are offered widely in U.S.A., mainly by—Correspondence Institutes of the Commercial type, e.g., International Correspondence Schools, Scranton, Pa., American Schools, Chicago, National Technical Schools, Los Angeles etc. The most well known schools are members of the National Home Study Council, Washington D.C., an accrediting body recognised by the U.S. Office of Education.

Their courses do not qualify for approved degrees/diplomas, though many are very popular, particularly those for retraining of persons in new skills and new technological developments. Notably in the field of Electronics and radio and Television, excellent courses have been developed at the Technician's level in recent years by institutions like National Technical Schools, Los Angeles; DeVry Technical Institute, Chicago; National Radio Institute, Washington D.C.; which even include Laboratory experimental work.

I.C.S. and probably other Correspondence Schools offer systematic courses for persons already at work to prepare for State Licence Examinations for Engineers, Suervyors, Architects etc.

*Cost*—Private Correspondence Schools run as commercial corporations. The income from students' fees not only pays for all costs, but even substantial profits to shareholders. The cost per student is, therefore, quite considerable, though mass production methods tend to reduce them somewhat.

*Staff*—Most of them maintain a core of permanent teachers, coordinators and administrators, but for specialist subjects the help of part-time teachers is also taken. Staff members are usually professional persons, but the I.C.S. at Scranton has developed a system whereby young persons, mostly women from high schools are trained over many years to act as teachers in very narrow fields, without being professionally qualified.

This arrangement may work as a "mass production" effort at elementary stages, but cannot be satisfactory for professional education at higher levels.

*Books, Lessons etc.*—I.C.S. at Scranton is the subsidiary of International Text Books Ltd., a big publishing house, their own and other text books are used, but the I.C.S. depends much more on specially written lesson materials which are not based on text books at all. Other big Correspondence Schools in U.S.A. more or less follow the same method.

4-42. *Correspondence Divisions of State/Private Universities, e.g., Wisconsin, California, Nebraska, Chicago, etc.*—52 such institutions, accredited by the "N.U.E.A."

\*National University Extension Association Minneapolis, Minn, is the professional organisation through which colleges and universities engaged in university extension, adult education and other public services co-operate in the maintenance and improvement of educational practices.

\**Bachelor's Degree level*—Most universities and colleges allow one or two years of correspondence working, but no institute gives any degree on the basis of correspondence credit alone.

\**Graduate i.e., Post-B.Sc. level*—Only a few institutions offer credit for such courses. Many do not accept graduate credit earned by correspondence. Correspondence courses can nevertheless be used in many cases by graduate students to satisfy undergraduate prerequisites or for subject matter content.

*Final Examination*—For College credit a student must pass a final examination at the end of the course, given under supervision and of the same standard as for the corresponding full-time course.

*Diploma level*—Hardly  $\frac{1}{2}$  Technical Institutes offer Correspondence programmes accredited by ECPD. They include Laboratory instruction in approved Colleges/Works.

*Non-credit programme*—For professional and cultural learning of adults without regard to college or high school credit, single courses and course sequences, special courses for individual and group study are offered; certificate of achievement is granted for satisfactory accomplishment.

\**Group Study*—Where several friends wish to study the same subject, the correspondence outline provides a flexible guide to progressive study. In many instances arrangements can be made for personal visits with the instructors or with other specialists.

The better N.U.E.A. correspondence institutions have developed techniques of instruction by correspondence *e.g.* preparation of lesson materials, grading of students' work, and maintenance of academic record of each student to a very high degree to make instruction really effective. Generally, they work at higher academic levels than private. Correspondence Schools, but organisationally the latter are more remarkable.

*Cost*—These courses are self supporting *i.e.* expenses are met from students' fees. Charge per student is, therefore, quite high.

*Staff*—Many teachers on the permanent University staff co-operate on extra payment. The help of part-time teacher from outside is also taken.

*Books, etc.*—By and large, standard text books are used and lessons and study guides are based on them.

However, very little has been attempted or achieved regarding laboratory instruction for correspondence students.

#### 4.5. *Further remarks*

4.50. The question of rapid expansion of facilities of technical education at all levels has been engaging the attention of educators in U.S.A. In 1956, at the annual convention of the American Society of Engineering Education

\* From N.U.E.A. Division of Correspondence Study's 'A Guide to Correspondence Study in Colleges and Universities'.

(A.S.E.E.) at Ames, Iowa, I attended a symposium on this subject. The potentialities of closed circuit television, radio, expansion of colleges, additional colleges, rationalised methods of teaching, part-time course, etc., were discussed but I do not remember correspondence courses being mentioned.

4·51. *Scholarships, stipends, extra paid leave etc.*—Technical education is not free in U.S.A., but there are numerous scholarships, stipends, etc. from private foundations and other sources. Also, most students get good pay for full-time or part-time work. So, lack, of funds need not worry any student of merit. There is no provision for extra paid leave to enable students to undergo part-time or correspondence course and prepare for examination.

4·52. *Industrial training/employment*—It is not difficult for a Degree or Diploma (Part-time or full-time) student to get full-time or part-time work on fair remuneration in Industry.

4·6. *Summary*—(i) Evening degree students in Engineering entering after high school at 20 years cannot get their Degree before they are 28 to 30. Over this long period they must maintain themselves (and their families as well) through well-paid employment and *at one place*. The Degree Course is identical whether for full-time day or part-time evening students.

Evening Degree courses have limited possibility.

(ii) Co-operative Degree courses in Engineering and other fields are gaining in popularity “as one substantial means to extend and improve higher education in America”.

(iii) The Carnegie Credit System of U.S.A. permits no relaxation in the total period of study for older, maturer and more highly motivated part-time students.

(iv) Except for Co-operative curricula, there is little liaison between the college and industry in respect of the carrier of a particular student. Industry does not pay for his educational expenses, nor gives him additional paid leave for his study. However, scholarships and stipends for able students are plentiful.

(v) Private correspondence institutions offer no courses leading to approved degrees and only a few for diplomas, but many of their courses are very useful for technical training and re-training.

(vi) Correspondence divisions of many universities offer good courses, used by many students not as the primary programme of study, but mostly to accelerate their pace of study beyond the two years college level. Also they do not provide for laboratory work. Short period courses for specialist training at higher levels are quite common.

(vii) The better correspondence schools have developed techniques of instruction by correspondence, e.g. preparation of lesson materials, grading of students' work, maintenance of students' academic records etc. to a very high degree of effectiveness.

(viii) In Humanities, Mathematics and even in several scientific and technological subjects, for which laboratory demonstration or practical work is not essential, correspondence courses offered in U.S.A. compare well with resident courses at Degree level for the 1st and 2nd years of full-time study.

(i) The Professional Institutes and the E.C.P.D. do not hold examinations, but only accredit courses of Universities/Colleges.

## 5. OBSERVATIONS IN U. K.

5-0. Compulsory schooling in UK. extends up to 15 years of age. Young persons may then enter industry and continue alongside with part-time day and /or evening classes of various types until they qualify as Craftsmen, Technicians or Technologists. For those who continue in schools, the General Certificate of Education (Ordinary Level), comparable with Indian Matriculation, is usually taken at 16 years and the G.C.E. (Advanced Level), comparable with Indian Intermediate Examination, at 18 years. For joining a university, pass in G.C.E. (A) is necessary. In this Chapter different programmes of technical education are discussed briefly.

5-1. 5-10. \*There are 550 technical colleges in England and Wales, not including those institutes which have evening courses only. (There may be 50/60 more in Scotland).

Work is carried on at every level, from general education courses for youngsters leaving school at fifteen up to post-graduate courses. The pattern of courses is flexible, so that boys and girls can start courses at various ages and levels and transfer freely from one to another. . . .

5-11. \*The main methods of study are

*Part-time Courses in the Evening*—This has been the traditional method of study in a technical college, though many of the two million evening students at present enrolled are in evening institutes and not in technical colleges. By itself it cannot be considered a satisfactory method of studying for present-day needs.

*Part-time Courses in the Day time*—Most of the students taking these are employed by firms who release them for one or two days a week. Day release is obligatory for many indentured apprentices under agreed training schemes, some of which required evening study as well. Some firms give day release to other employees also.

*Full-time Courses before employment.*

*Full-time courses during employment*—Some firms enable promising employees to take full-time courses and finance them during the course. Other students receive financial help from the local education authority.

*Sandwich courses*—These consist of alternate periods (usually about six months) of study in college and training in an industrial or commercial firm. If the student is employed by a firm and released for periods of study in a college, he is said to be *industry-based*. If he enters at a college which arranges the practical training periods with one or more firms, he is *college-based*. Most firms pay the students' wages during their practical training periods; many firms which support industry-based students also finance the students during their college periods.

\* Britain's Future & Technical Education. page 4, U.K. Ministry of Education 1969.

5.2, *Technical personnel* in U.K. is divided in four broad categories—

- (i) Technologists—usually fully qualified engineers or applied scientists;
- (ii) Technicians—who hold “a wide range of responsible jobs involving a higher level of scientific and technical knowledge than that needed by craftsmen, but below that needed by technologists”;
- (iii) Craftsmen; and
- (iv) Operatives.

5.3. *Opportunities for technical education available at various levels*

5.31. *Technologists*—(i) Degree courses in universities/colleges; usually full-time. Duration— $\frac{3}{4}$  years.

*Admission qualifications*—G.C.E.(A) level with Physics, Chemistry, Maths etc. Age entry/leaving—usually 18/22 years.

*Part-time courses*—Only of London University. Less and less institutions offer them now. Duration— $\frac{5}{6}$  years or more. Age entry/leaving—usually 20/26 years.

(ii) *Diploma in Technology (Dip. Tech.) courses of the National Council of Technological Awards*—A Government body; Sandwich type—6 months full-time in College and 6 months full-time in industry; Duration—4 (some 5) years in Colleges of Advanced Technology. Broadly equivalent in standard to a university honours degree.

*Admission Qualifications, age etc.*—As for full-time Degree courses.

(iii) *Ordinary and Higher National*  $\frac{\text{Certificate part-time day and/or evening}}{\text{Diploma full-time or sandwich day}}$

*Administered by Joint Examinations Committees on which the Ministry of Education and the Institutions of Electrical, Mechanical, Civil Engineering etc. co-operate.*—Individual colleges/institutes get their courses/examinations

approved by the J.E.C.'s for the award of  $\frac{\text{O.N.C.'s}}{\text{H.N.C.'s}}$  and  $\frac{\text{O.N.D.'s}}{\text{H.N.D.'s}}$ .

\**National Certificate*—“The normal age for entry into National Certificate courses is sixteen. The entry requirements are either (a) full-time education up to sixteen; (b) satisfactory completion of a preliminary course at an evening institute or technical college; or (c) the General Certificate of Education Ordinary Level with passes in suitable subjects, which may admit the student direct to the second year of the course. Most National Certificate courses provide for three years of part-time study leading to an Ordinary National Certificate: this requires a high standard of Mathematics and a grasp of scientific principles comparable with that required at the Advanced Level of the General Certificate of Education. The Higher National Certificate may be taken after two further years of part-time study. In practice, many of the successful students take longer to obtain Ordinary and Higher National Certificates.”

*Age at leaving*—23 to 24 years.

\* U.K. White Paper Cmd. 1254, “Better Opportunities in Technical Education” para 34

*Minimum time of study per session*—Average 180 hours a year; in part-time day courses the minimum is normally exceeded. In practice, about 220 hours is more usual or 280 hours when the students also attend in the evening once a week. In a few colleges—330 hours. The British Government proposes to increase the number universally to 240 hours, but they prefer 330 hours as soon as possible.

In order to qualify as a technologist, a National Certificate student often has to spend a year of part-time study between the Ordinary and Higher National Certificate courses broadening in basic mathematical and scientific knowledge. After the Higher National Certificate course a further period of study is needed to meet the educational requirements of the professional institutions: this may take from one to three years, according to the subject.

However, only those students who pass in several subjects of the O.N.C. and H.N.C. and endorsements examinations with credit may expect to get exemptions from parts or the whole of the I. Mech. E. I. Elect.E/I. Civil. E. examinations.

\**National Diploma—Full-time or Sandwich Day Courses*—The Ordinary National Diploma course lasts two years; the student enters it at 16, and the standard reached is a little higher than that of the Ordinary National Certificate. Some of the students proceed to the Higher National Certificate and others take Higher National Diploma courses, where they are joined by sixth formers who have gained one or two passes at the Advanced level in the General Certificate of Education, and by students from technical colleges who have obtained an Ordinary National Certificate. The Higher National Diploma courses usually last 3 years. They take the students beyond the level of the Higher National Certificate and go further to satisfy the academic requirements of the relevant professional institution." Age at entry/leaving —16—21 years.

(iv) *Institution of Civil, Elec., Mech. etc. Engineers—Associate Membership Examinations Sections A, B, and (C)*—These do not require college attendance. Presumably, candidates who do not pass O.N.C. and H.N.C. examinations with the requisite credits and endorsements to earn exemption from Associate Membership Examinations take correspondence courses, of B.I.E.T., I.C.S., etc.

The following figures will prove that as a channel for attaining professional qualifications

These examinations are of little importance nowadays:—

58% to 60% of new A.M.I. Mech. E. and A.M.I. E. Es and 6% of new A.M.I.C.Es. qualify through Higher National Certificate, with additional endorsements; only 3% and 7% of new A.M.I. Mech.Es.and A. M.I.E.Es. respectively and 20% of new A.M.I. C.Es. qualify through I. Mech. E./I.E.E./I.C.E. examinations.

\*U.K. White Paper Comad. 1244. "Better Opportunities Technical Education" App. B. 2(d).

**\*\*The British Government's latest views on the subject of training Technologists are---**

"Part-time courses have served the industry well and will continue to be available for those who want them. But as the structure of industry and commerce becomes more and more complex, and as technology develops more and more quickly, part-time courses *cannot* be relied upon to produce enough highly qualified men and women. The intention is, therefore, that the bulk of the extra 5.500 should come from institution full-time and sandwich courses.

The sandwich course is probably the key to a really big expansion of technical education at the advanced level. Many industrialists find that in addition to, or even instead of, university trained scientists and engineers, they need men and women who have "grown up" in industry, and combine sound academic education with the immediate grasp of shop-floor problems that can only be acquired through personal acquaintance with the actual production processes and the people engaged on them. In the past, such men began as apprentices and worked their way up "the hard way", through evening study. But it is no longer possible either to expect enough able people to acquire good qualifications in this way or to give them the broad education they need.

The sandwich course gives time for a broad and comprehensive education allied to substantial industrial experience, and it had the advantage that a young man embarking on it has usually already become a member of his firm and keeps in touch with it during his years of training. . . . . The British Government, therefore, hope "This high and valuable qualification (Dip. Tech.) will be gained by a growing population of students who take advanced courses of technical education." . . . . . But, † it would also be premature to deny this opportunity (N.C. course) of obtaining professional qualifications to students who can only undertake part-time study. Those who have done sufficiently well in Ordinary National Certificate Course should continue to be able to go on to an advanced full-time or sandwich course and those who have gained a Higher National Certificate to go on part-time study to professional qualifications."

5.32 *Technicians*—Different avenues for training as below

(a) Former craftsmen who have trained themselves for higher technological responsibilities;

(b) Craft courses, the latest stages of which are in fact of 'technician's standard e.g., the present Machine Shop Engineering course (City & Guilds).

Admission qualifications—4 or 5 years of Secondary School. Usual age at entry—16 years,—leaving—20/21 years.

(c) *Technicians' courses following successful completion of craft courses*—Such "end on" courses are available in building, furniture, repair & maintenance of motor vehicles, printing etc.

Usual age at entry—20/21 years; leaving—22 years.

\* U.K. Ministry of Education publication: *Britain's Future and Technical Education* page 9.

† U.K. White Paper of Jan. 1961 "Better Opportunities in Technical Education", para 36, page 12.



(d) *Courses designed for technicians*—Only three such ready—electrical engineering; tele-communication engineering; mechanical engineering.

*Admission qualifications*—Usually Intermediate of C & G course or later. Now proposed—5 years in Secondary School.

Age at entry—normally 16; leaving 21/22 years, if course is part-time.

(e) *National Certificate Courses*—See chapter 5·31 (iii).

They will continue to be necessary as part-time method of qualifying as high grade technicians; also, as a route to professional qualifications.

5·33 *Craftsmen*—City & Guild's Craft (part-time) courses are regularly reviewed by the City & Guilds of London institutes, the regional examining unions of the colleges, in consultation with industry and the Ministry of Education. Entry: after 5 years of Secondary School, i.e., usually 16 years. Age at leaving—Intermediate 19 years; Final 21 years.

5·34. *Operatives*—Ministry of Labour's figures show that only about 34% of boys and 7% of the girls leaving school enter apprenticeship or learnerships in skilled occupations. Most of the remainder go into the occupations in which there is as yet no provision for day release to attend technical colleges and often none for systematic training in industry.

*City & Guild's Courses*—Duration 3 months to 3/4 years. The British Government's proposal is to provide part-time courses, for operatives and craftsmen of varying durations. They also welcome the ever increasing number of Works Training Schools, as in A.E.I. Works (Trafford Park, Manchester), which give not only workshop practice, but also theoretical lessons in particular crafts as full-time day courses.

#### 5·4. *Correspondence Courses*—

5·41. Private Correspondence Schools have operated in U.K. for nearly 3/4th of a century. International Correspondence Schools (I.C.S.) and British Institute of Engineering Technology, (formerly T.I.G.B.) offer technical and non-technical correspondence courses at various levels. The Technical courses are mostly for their own Diplomas and a few for the examinations of some of the lesser professional bodies, e.g., British Institute of Radio Engineers. Even now, the I.C.S. offer the following courses for the Institution of Mechanical/Civil Engineers, but none for the Institution of Electrical Engineers.

I. Mech. E./I.C.E. Joint Part I Exam.		I. Mech. E. Part II.		
Section A	Section B.	Group A.	Group B.	Group C.
Mathematics, Heat, Light & Sound, Applied Mechanics, Principles of Electricity, Engg. Drawing.	Strength of Materials & Theory of Structures.	Theory of Machines, Properties of Strength of Materials.	Applied Ther- modynamics. Mechanics of Fluids, Metallurgy. Theory of Structures, Work Study.	Automo- bile Engg.

These Correspondence Schools, like those in U.S.A., depend entirely on students' fees and make profits. They prepare study lessons guides on the basis of standard text-books. Their staff are both full-time and part-time. Fees charged are also pretty high, though much less than in U.S.A. The topmost Correspondence Schools also offer on contract courses of comparatively short duration to public bodies like the B.B.C., Post Office etc.

5.42. (i) However, for 2 important professions, 'Nautical Engineering' and 'Navigation', correspondence courses have been the only practical method of education for long and several old institutions in important port towns offer them. A good feature of these courses is that students are encouraged to come to school for consultation for short periods when they are in port. Also they are required to attend school for 3 to 4 months for lectures etc. before they take the final Master's, Extra Master's Engineers' etc. examinations. At sea also, each mariner is helped by his senior at his studies.

(ii) Quite recently, the British Central Electricity Generating Board has developed and used 9 months' correspondence courses for training 'Boiler Operators' and 'Turbine Operators'. Within the last 2/3 years a 2½ years' correspondence course on 'Modern Power Station Practice' for Supervisory Engineers, to which fully qualified engineers may be admitted, has also been offered.

Books, lesson materials etc. are supplied by the C.E.G.B.

Staff—C.E.B.'s own full-time staff as part-time teachers on extra payment.

Charges—For Boiler & Turbine Operator Courses:—only £2/2/- per student per course, which are returned to him on successful completion. For Supervisory Engineers—£7/7/-, of which £5/5/- are returned on completion.

All these courses are reported to have proved very useful for improving the technical competence of the staff of the C.E. G.B., which has now developed a substantial Correspondence Education Department.

5.43. All the same, unlike U.S.A, no University/College in U.K. offers any Correspondence Course at any level. Correspondence courses do not qualify anyone for recognised qualifications for Technologists, Technicians etc. No well known institution will give any credit to correspondence courses for further studies and as far as I could gather, the Ministry of Education does not approve them as worthwhile educational activity. The official British thought cannot be a guide to India in respect of Correspondence Courses.

5.5. *Industrial training employment*—In a society aspiring towards full employment, this is easy to ensure. Even young apprentices nowadays get substantial stipends.

5.6. *Summary*—(i) In a welfare State like Britain, every capable student should get scholarship, stipend etc. to pursue a full-time degree or a course in engineering. So, evening degree courses of London University of five or six years or more are gradually disappearing;

(ii) Instead, Diploma Tech. courses for quick turnover of technologists of the Sandwich/Block Release type, requiring alternate full-time periods in college and industry are being increasingly encouraged in Colleges of Advanced Technology. Almost all students are sponsored by industry;

(iii) Fully evening National Certificate or City & Guild's courses are too hard and fatiguing for the average student doing industrial work by day. Such courses are also discouraged;

(iv) Industry often finds it difficult to arrange release for 1 or 2 days per week for its employees to attend technical colleges/institutes;

(v) Instead, full-time Block Release or Sandwich National Certificate/Diploma Courses (Ordinary or Higher) are now preferred;

(vi) Still, part-time day and/or evening O.N.C. and H.N.C. courses will continue for long for training technologists and technicians;

(vii) Those who get the H.N.C. with appropriate credits may gain additional endorsements by part-time study and in due course qualify for the Associate Membership of Institution of Civil Engineers/Mechanical Engineers Electrical Engineers/Chemical Engineers etc.;

(viii) About 60% A.M.I. Mech. Es. and A.M.I.E.Es. and only 6% A.M. I.C.Es. come through National Certificate/Diploma channel, but only very few through I. Mech. E., I.E.E. or I.C.E. examinations;

(ix) Examinations for National Certificate/Diploma are held by Joint Examinations Boards on which the Ministry of Education and the professional institutions (Civil, Electrical Mechanical, Chemical etc.) cooperate;

(x) The advantages of the National Certificate/Diploma channel are that they allow step by step education of young persons on part-time basis from 16 years onwards, each step taking out more than 2/3 years. Only the best proceed to acquire full professional qualifications. Others complete parts according to ability;

(xi) Correspondence courses have long been in use in U.K. for retraining purposes. There are only a few courses of the coaching type offered by B.I.E.T., I.C.S. for Sections A. and B. (in parts only) Examinations of the Institution of Civil, Mechanical & Radio Engineers, presumably because O.N.C./H.N.C. courses requiring part-time attendance in institutions are so widespread that most students may qualify through them for professional membership.

## 6. OBSERVATIONS IN SWEDEN

\*6.0. A short survey of the Swedish school system is given below, so that the system of technical education at higher levels may be easily understood—

“Elementary School (folkskola), Lower Secondary School (realskola) and Upper Secondary School (gymnasium).

6.01. Compulsory education.....has comprised *the obligatory elementary school*, folkskolan, for 7 years (plus one year's continuation, the classes in which are held only for a short time during the year and consist mainly of vocational training). In certain school districts—chiefly the cities, and covering about 1/5th of the country's population—compulsory schooling lasts for 8 years. Schooling usually begins at the age of 7. ....

6.02. *Secondary School Education* is given in several different types of schools. The state secondary school is called *högre allmänt läroverk*, and consists

\*The Swedish Institute handbook (1952) —‘Higher Education in Sweden’, pp. 7—12.

of 2 sections, the lower secondary school (realskola) and upper secondary school (gymnasium). In addition, there are separate lower secondary schools, state and co-educational (samrealskolor), and municipal (kommunala mellanskolor). There is also still a number of municipal upper secondary schools (kommunala gymnasier) and private secondary schools (private läroverk).

Despite these many types of schools, however, secondary school education constitutes a uniform system. All lower secondary schools lead up to the Lower Certificate Examination (realexamen), all upper secondary schools to the Matriculation Examination (studentexamen).

6-03. The upper secondary school (gymnasium) has two main divisions: humanities and science. During the first year of the 3-year *gymnasium* and the first 2 years of the 4-year *gymnasium*, the subjects are, broadly speaking, the same as in the realskola, the most important exception is that Latin, instead of physics and chemistry, is studied in the humanistic course. In the two upper forms of the *gymnasium*, however, the studies are specialized. There are only 5 compulsory subjects, viz., religion, Swedish, and history (common to both courses), and French and Latin in the humanistic course and English and Mathematics in the science course. In addition, each student must choose one group comprising 2 or 3 subjects out of 18 possible groups; besides this he may choose an extra subject. In most cases, therefore, 7-9 subjects are studied, apart from drawing, gymnastics, and singing. *Through the choice of subjects the studies are given a definite aim, in accordance with the student's future plans*

Students take the *studentexamen* which may be regarded as the equivalent of the English *matriculation* or university entrance examination and the French *baccalauréat*. There is no exact equivalent in America, but the Swedish examination requirements are such that a Swedish student can usually obtain an American Bachelor of Science or Bachelor of Arts degree after 2 years' study.

6-04. There are also upper secondary schools with the emphasis laid on vocational training, principally technical and commercial schools.

For vocational training of various kinds there is a large number of different educational institutions—state, municipal and private. They can be based either on the elementary school, lower secondary school or upper secondary school.

Facilities for technical study at the professional and sub-professional levels are summarised below:—

6-1. *Professional Level*—Two higher level institutions, namely The Royal Institute of Technology, Stockholm and Chalmers Institute of Technology, Gothenburg and *not the universities* offer courses in Engineering & Technology upto Doctorate level. These are like the Massachusetts Institute of Technology in U.S.A. and the Imperial College of Science & Technology, London.

6-11. The courses, all full-time, lead to the following Final Examinations, which are probably higher in standard than the Bachelor's Degree courses in U.K. and U.S.A.

Civilingenjörsexamen in most subjects; Arkitektexamen for Architecture; Bergingenjörsexamen for Mining;

Duration—4 years, —Mining & Metallurgy—4½ yrs. 3 months' obligatory practical training before the 3rd year.

Admission qualifications—Studentexamen (Science) or Final examination from Technical Gymnasium with Maths. (general and special courses), Physics, Chemistry and Drawing etc. Usually, selection is made on the basis of the results in Studentexamen, practical experience and other tests.

Age entry—18/19 years; leaving—24 years.

6.12. *Higher courses*—(i) *Licentiate of Technology*—corresponding to Master's degree—two subjects + a scientific treatise & (ii) *Doctor of Technology*—printed thesis to be defended publicly.

*Part-time courses are not available at the professional level.*

6.2. *Sub-professional level*—2 main classifications—

6.21. For *läroverksläringstjänster*—Diploma courses in State Technical Colleges (tekniska läroverk) of two types—administered by the National Board of Vocational Education, Sweden—(i) *Technical gymnasia* (gymnasielinje)—3 years' full-time. *No part-time course*; (ii) *Specialised Technical Schools* (fackskolelinje)—2 years' *full-time*/3-4 yrs.' evening. (Note—NKI and Hermods offer equivalent correspondence courses also). "Their objective is to impart instruction on Engineering fundamentals with emphasis on Mathematics and the Natural Sciences and to teach their pupils how to perform varied assignments in any one field of Engineering." (1) ..... "The technical training is equally comprehensive in both cases, but the pupils in the "gymnasielinje" study of general subjects (especially languages) to a greater extent than those in the fackskolelinje." (2)

Various Faculties are; General Technology; Building Construction; House-building; Civil Engineering; Cellulose Technology; Electrical Engineering; Technology of Dyeing and Finishing; Aeronautics; Foundry Engineering; Mining; Chemical Engineering; Mechanical Engineering; Heat and Power; Mercantile Engineering; Manufacturing Engineering; Paper Technology; Production Engineering; Naval Architecture; Textile; Teletechnics; and Heating and Sanitary Engineering.(1)

Admission qualifications—For (i) *Technical Gymnasium*—Proficiency in Swedish, Mathematics, Physics, Chemistry, Drawing (German and English) at Intermediate School level by passing Realskola examination or special test; Practical experience in industry—at least 2 months' prior to admission and 6 months before final examination.

Age at entry—minimum 16—average 19 years; leaving—20/22 years.

(ii) *Specialised Technical Schools*—as above, but greater proficiency in Maths. is required for admission to Mechanical Engineering; Heat & Power; Manufacturing Engineering; Electrical Engineering; and Tele-technics; *prior practical experience for day students*—at least 2 years and for evening students—only 2 months.

(1) National Bd. of Voc. Education, Sweden pamphlet on "Subprofessional Engg. Training—Technical College", p.1—5.

(2) NKI SKOLAN pamphlet "Training for Technical Certificates in collaboration with local authorities and business enterprises", p. 1.

Age at entry—minimum 17, average 23 years; leaving—day students 25-27 years, evening 26/27 years.

Academic session lasts for 39 weeks, 273 days including days for entrance and final examinations.

Full-time—37-39 class room hrs/week (45 minutes/hr.)

Part-time—16 class room hrs/week (45 minutes/hr.)

Education is free and liberal stipends are given to full-time students, and allowances and loans to needy evening students.

No liaison between industry and college for students' training/employment.

*\*Final Examination*—“Graduation (Final) Examinations in Engineering are held once a year and at a time fixed by the Board of Vocational Education. Candidates are divided into Examination groups of not more than 16 pupils each. The examinations, which cover 3-4 subjects and last for a maximum of 4 hours are conducted by those teachers who have taught the subjects in the last year. The Board's Examination Commissioners decide which part of the course the examinee is to embrace. Attendance at examinations is compulsory for commissioners and voluntary for the school board. Other persons may be present by special invitation, but otherwise the examination is not public. Reports are kept of the proceedings and signed by the Headmaster and Examination Commissioners<sup>(1)</sup>.”

At present, Technical Gymnasias are overfull but specialised Technical Schools can take more students. The reason may be that the entrants to the latter who must have 2 years prior compulsory practical experience are older men and cannot quit their jobs and afford to lose good salaries. Also, unlike the former the latter cannot qualify for admission to Institutes of Technology (equivalent to Degree courses).

About 20% of the Technical Gymnasias graduates are expected to go on to Institutes of Technology or some other form of higher education.

6.22. *For Institute Engineers*—Courses of lower standard in Municipal or private Technical Schools/Institutes.

*Faculties of study*—Practically the same as for *laröverksingenjörer*, but as the students at the Technical Schools have a lower standard of previous knowledge than at the Technical Colleges the instruction cannot, within the time allowed, be carried as far in all subjects.

(i) *Teknikerkurs*—Lower course—for technical assistants, foremen, overseers, etc. Duration—day—3 terms (1½ yrs.), evening—6 terms (3 years). Each term consists of 18-21 weeks at school.

*Admission qualifications*—Elementary School *Folkskola Examination*+ Continuation School.

Age—at entry—day—min. 16-17 years; evening—15-16 years; leaving—day/evening—about 19 years.

\* National Board of Voc. Education Sweden Pamphlet on “Sub-professional Engg-Training-Tech Colleges” P 1-5

(1) National Board of Vocat. p. 7-8 Educational.

*Practical training*—Day students—6 months altogether. Evening students—2 months before 5th term; 6 months before 6th term; 12 months before 10th term.

(ii) *Högre fackkurs*—consecutive course—after *Teknikerkurs*—for certain lower grade engineering work.

*Duration*—Day—2 terms (1 year) Evening—4 terms (2 years).

*Academic session and hours per week*—As for *Läroverksingenjörer*.

### 6.3. *Correspondence courses:*

6.30. \**“Correspondence tuition is recognised to have a very good academic and social status in Sweden . . . . . Sweden is a large country (about 173,230 sq. miles, i.e., almost twice as large as the whole of the U.K.) with a small population (4,400,000), which necessitates special measures.*

Work done in the field of Supervisory Correspondence Study has been very successful in Sweden . . . . .

The average examination marks have been very satisfactory indeed and some pupils have proved to be outstandingly good.”

There are 2 very large correspondence institutions in Sweden, viz., *Hermod's* at Malmö and *N.K.I.* at Stockholm, each enrolling over 150,000 students from elementary school to gymnasium and in some subjects even university level. They have often made experiments and initiated measures for correspondence instruction, which have been accepted by the State for spread of education at elementary to upper secondary levels for Humanistic, Science and Technological studies.

*Professional level*—Engineering courses are not offered by correspondence

6.31. *Sub-professional level*—A great variety of correspondence courses in Engineering of various durations and at various levels has been developed. But the most important is that for the External *Ingenjörsexamen* at Technical Gymnasia or Specialised Technical Schools levels by private study for the Government sponsored certificate of *Läroverksingenjörer*.

This was introduced in 1959 on the report of a Government Committee to meet the steeply rising demand for Diploma Level Engineers, not possible through Technical Gymnasia or Specialised Technical Schools.

In addition to theoretical subjects, this course also comprises many practical ones requiring special laboratory courses at Technical Gymnasia, Specialised Technical Schools etc. and personal consultation with expert teachers. The Government regulations also require the student to take about 40 tests of different kinds at technical colleges. For this purpose, the *N.K.I.* has developed a 5 year course which can be taken anywhere in Sweden by an appropriate combination of private correspondence study, oral instruction and guidance in groups in the students' places of residence, without extra expenditure on buildings, equipment and without employing permanent teachers. Oral instruction is given by local course leaders and part-time teachers and on one full evening per week to reduce travelling time to the minimum (generally not

\* *Hermod's* pamphlets.

more than 1 hour each day). Much general laboratory/practical work is done at the local Grammar and Vocational School respectively. Also, in some subjects concentrated practice courses are given by prior arrangement in Technical Colleges well before the final tests and finally revision and preparatory courses.

Hermods also offer similar courses of 3-4 years' duration in cooperation with State Technical Schools at Stockholm and Malmö with regard to accommodation, laboratory equipment and to some extent teachers on payment, where students are brought 2-3 times, 6-7 weeks each time for instruction in Technical subjects. Thus, 4-5 months' student-teacher contact for the whole course is ensured, particularly in subjects like Engineering Drawing, Mechanical/Electrical Engineering, Laboratory work, Workshop Practice etc.

The Swedish Government do not yet contribute financially towards these correspondence courses, the entire cost being paid by students who earn substantial salaries in industrial work. But it is expected that Government will soon pay for part of the educational costs.

6.4. *Industrial Training/Employment*—Sweden being very short of manpower, industry readily offers training or employment with substantial stipends/pay in the hope of retaining new but trained workers.

6.5. *Summary*—(i) Sweden has no part-time or correspondence courses for Engineering training persons at Degree level;

(ii) But, at all levels below technologists, i.e., technicians and craftsmen, there are such courses;

(iii) Particularly, the special courses by private study (correspondence, consultation, lab./workshop practice in technical colleges and preparation guidance) for Ingenjörsexamen;

(iv) Participation of private correspondence institutions in this programme is worthy of note;

(v) The National Board of Vocational Education of the Swedish Government conducts Engineering Examinations, pays cost of full-time and part-time courses and for such students' stipends, loans etc., but does not pay for correspondence courses in Engineering;

(vi) Professional Institutions do not hold their own examinations for professional memberships;

(vii) There is a multiplicity of qualifications at sub-professional level, but they do not generally go step by step like the National Certificate/Diploma scheme of U.K.;

(viii) Sweden being Short of manpower, training/employment opportunities with good pay at all levels are very good.

## 7. OBSERVATIONS IN U.S.S.R.

7.0. *Note*—From U.S.S.R. I have brought some 'Study Plans and a U.S.S.R. Government Decree regarding facilities to be granted to students of part-time and correspondence courses in Technology in the Russian language. Some English translations are awaited from the U.S.S.R. Ministry of Higher Education in Moscow. Therefore, this chapter is based entirely on memory



and my notes of my talks through interpreters with educationists in several technical institutions in that country. Some details may not be absolutely accurate, but the general pattern is easily discernible.

#### 7.1. *Outline of Soviet educational system*

7.10. According to the Supreme Soviet Decree of 1958, every normal child must attend school of the 1st stage from 7—15 years, much of the last year to be spent on manual work in industry, agriculture or other productive effort. Formerly, compulsory schooling was from 7—14 years. As yet, not all schools have been able to change over to the 8 year system, which necessitates interim adjustments at the higher education stage. After 15 many young persons go to work, but many proceed to the secondary school stage of 3 years also.

7.11. At the Secondary stage, they may take (i) General Courses, which often include Workshop Practice and (ii) Specialised Technical Courses of 3 years' duration in Technicums. Young pupils from the 7th (now raised to 8th) grade and upwards of the 1st stage school may join a Technicum for a 4½ years course, but older pupils from the 10th grade (of Secondary Schools) are preferred. On passing the Final Examination after course (i) or (ii), they get the Matriculation Certificate.

7.12. Only those who possess the Matriculation Certificate, may take the competitive test (with appropriate subjects) for admission to join a University for Sciences & Humanities or Polytechnical or Specialised Technical Institute for Engineering courses at the Specialist Diploma level, which correspond to University Degree courses in U.K./U.S.A. etc. Education is free in U.S.S.R. and at the higher educational institutions/universities most students receive maintenance stipends. Cost is met entirely by U.S.S.R./Republic Governments.

#### 7.2. *Specialist 'Diploma' Institutes in Engg./Technology*

7.20. As in Germany, Sweden, Holland etc., universities in U.S.S.R. (except the new Friendship University in Moscow) do not teach Engineering/Technology. Instead, at the corresponding level there are —

(i) Large Polytechnical Institutes (original 3 at Leningrad, Kiev and Warsaw, started in 1899) resembling Indian Institutes of Technology and each offering a large variety of courses (full-time, part-time and some also correspondence);

(ii) Specialised Technical Institutes, e.g., Energetic Institute and Machine Building Institute of Moscow, Central Asian Textile Institute of Tashkent, which also offer many full-time and part-time and some correspondence courses within the particular field of Technology;

(iii) Correspondence Polytechnic Institutes, e.g., North Western (Kalinin) Polytechnic Institute by Correspondence, Leningrad, administered by the R.S.F.S.R. Government and the All Union Polytechnic Correspondence Institute of Moscow, administered by the U.S.S.R. Government both offering a large variety of technological courses;

(iv) Factory Higher Educational Schools—6 in number—e.g. Likhachev Automobile Plant, Moscow; Elektorsila, Leningrad; Dneiprostroi, Ukraine, etc. primarily for students who work in these factories;

(v) Special schools, e.g., Railways, Communications (Postal Department) etc. run by corresponding Ministries (as in India), but following the same pattern more or less, as Polytechnical Institutes.

Institutes of all the above types have large complement of specialist full-time staff and comparatively few part-time staff members and serve the cause of technical education equally.

Over 50% of students qualify for 'Diploma' by correspondence courses. This proportion is gradually increasing. Next in proportion are the students of full-time courses and part-time courses give the least out-turn, may be 15% of total. 30—35% of students are girls.

7.21. *Duration*—Full-time courses: 5 years to the Final Examination + 6 months for a Diploma project on a special problem. When this project is approved, the student is eligible for the award of the Diploma. Total 5½ years. At Leningrad Polytechnic Institute—6 years. Evening/correspondence courses: 1 year more than full-time course, i.e., 6½ years. Each session lasts 2 terms and 34 weeks from September to June, inclusive. Two examinations are held per year. Vacations—Winter—2 periods of 10 days each—Total 20 days. Summer—2 months. Evening classes are held 4 times a week from 6–10 p.m. 4 class periods, each of 45 minutes each time, i.e., 16 class periods/week or 12 hours' instruction.

7.22. *Admission qualifications*—(i) Matriculation Certificate from a Secondary School/Technicum with Physics, Chemistry, Maths., Russian, Foreign language etc. as subjects.

(ii) Passing a competitive admission test with the following subjects—

- (1) Russian language—written.
- (2) Mathematics—2 Exams.—oral & written.
- (3) Physics—oral.
- \* (4) Foreign Language—oral.

7.23. *Age limits*

Minimum—17 years; Maximum—35 years.

Actual—

Full-time .. .. .	19 years.
Evening .. .. .	21 years.
Correspondence—	
Minimum .. .. .	22 years.
Maximum .. .. .	35 years.

7.24. *Other general information*—(1) There are two categories of full-time students (i) straight from schools and (ii) from factories. In August, 1960, Leningrad Polytechnic Institute admitted half of its students from schools and half from factories. In matters of admission Government's policy is to give preference to students from factories, as they are more experienced and mature.

\*Not for admission to evening or correspondence course.

(2) *Student Teacher Ratio*

University/Central Polytechnic Institute	.. .. .	10—12 : 1
Evening	.. .. .	20—25 : 1
Correspondence	.. .. .	50 : 1

(3) *Study Plans*—The Government of the U.S.S.R. (Ministry of Higher and Professional Education), which in consultation with the Republic Governments, coordinate higher education in the country, have prepared about 500 plans for higher study for different professions. In Engineering and Technology alone the number would be 150 to 200. A big institution like the Leningrad Polytechnic Institute offers 16 specialist Study Plans in 8 faculties for 10,000 day students alone plus Evening Department; North Western Polytechnic Institute by Correspondence, Leningrad has 31 specialities in 8 faculties, 22,000 students, 360 teachers + 500 part-time specialists; the Moscow Energetic Institute offers in 9 faculties: 10,000 day and 4,000 evening students; its associated Correspondence Polytechnic Institute—23,000 students and 400 teachers. All Union Correspondence Polytechnical Institute, Moscow has 63 specialities in 9 faculties; the Tashkent Polytechnic Institute offers in 10 faculties for 10,000 students. These Study Plans are made separately for full-time, part-time and correspondence courses and are suggestive rather than absolutely binding. They include such information as subject-wise lecture/laboratory/workshop hours, periodical tests/controlled examinations, final examinations and details of the final diploma project. Any institute wanting to offer a new course or a variant of an established course to suit the particular local conditions makes proposals to the Ministry of the Republic concerned, which after due scrutiny approves it with or without amendment.

For full-time courses, the Study Plans are generally designed as below—

I Year (condensed year)—Chemistry, Maths., foreign language, History of the Communist Party.

II year—Continuation of I year work+Elementary Engineering subjects.

III year onwards—Specialisation on a wide basis.

7.25. *Routine of Studies*—The academic session begins in September every year.

*Full-time course*—1 year students coming straight from schools work for 5 hours each day at the factory and attend college 3 times a week, 4 periods each time by day and/or evening according to convenience and arrangements. The factory work is designed to get these students acquainted with in the particular field and plant in which they will work in future.

Those who come from factories start attending college in the 2nd term a February. In the 1st term, they are given the option to continue their industrial work or take rest, without losing pay while preparing for full-time college work.

In the 2nd year, both groups attend the same full-time course. After the 3rd year, students work in appointed factories for 4 weeks during the terms; after the 5th year, for 8 weeks and after the 6th year, for 6 months. In the 7th year they work on a particular Diploma project or thesis, which they defend at the Final Examination.

At the Leningrad Polytechnic Institute, in the 1st year students must work in factories in or near Leningrad, but in later years, they may take training in specialised factories anywhere. After completing their course of studies, the students need not go back to the same factory, but they must join factories to which they are allotted by the Polytechnic institute on the demand of the local or regional Economic Council. Their places of work and apartments for residence after leaving college are guaranteed. Students are, however, consulted by Special Committees about three months before they graduate.

7-26. *Part-time courses*—Students come from factories, research institutes etc. Though according to the Study Plans the duration of a part-time course is only one year more than the corresponding full-time course, a student may take more time to complete it. The actual routine of work is decided on the local conditions, but as a rule most of the work is done in the evening. Part-time students have to take 60% of the lectures taken by full-time students and all laboratory work. For this purpose, they get additional paid leave for 30—40 days per year and approximately 6 months at the end of the course for preparation for Final Examination and for writing the Diploma project.

7-27. *Correspondence Courses*—(1) Students are located at places often very remote from Correspondence institutions to which they belong.

(2) A student gets text-books and periodical study guides/lessons from his Central Correspondence institution by mail. He goes through them and works out check papers and exercises and sends them back to the institute according to programme and instructions. After correction and assessment the institute returns them to him. At reasonable intervals, controlled test papers are answered and marked.

(2a) For instructional help, the student goes periodically to the Consultation Points/Centres where teacher/s on the pay roll of the Central Institute orally clear/s his difficulties. In addition, by convenient local arrangement, he spends about 40 days a year in a local technical institute for laboratory work and further oral instruction in preparation for the annual examination. If a student is somewhat backward, he can make up during the vacations, otherwise he lags behind in time. This process goes on until at the end of the academic session the annual examination of the institute is taken.

(3) The same routine continues throughout the course. At the end, he gets paid leave for six months to prepare for the final examination and to write the Diploma project. A Correspondence student must attend 20% of the lectures taken by full-time students and all laboratory work.

Finally, the Diploma examination is taken and passed; six months later, the project is submitted to the Examining Commission of the Republic or Union Government. If he defends successfully, the student is awarded the Diploma.

(4) In some cases, a student may go to a Branch Institute of the Central Correspondence Institute, usually attached to a full-time day and evening Technical Institute of the area with its own laboratories, etc. for consultation or laboratory experiments. Alternatively, he may visit the Central Institute itself throughout his course or at the end of the course.

(5) At most Central Correspondence Institutes laboratories for students' benefit are being constantly developed, but until now not more than 2-3 year's practical work can be done in them. For the remainder, the facilities of neighbouring Central and Regional Polytechnic institutions are used freely. For instance, the students of All Union Correspondence Polytechnic Institute of Moscow do much laboratory work in evening at the Energetic Institute of Moscow by arrangement.

(6) The All Union Polytechnic Correspondence Institute of Moscow formerly had many students from almost all Republics with Consultation Points or Branch Institutes in several places. There was a Branch Institute at the Central Asian Polytechnic Institute at Tashkent. Now the Tashkent Polytechnic Institute has grown very large and has a big Correspondence Division of its own, with which the branch of the Moscow Correspondence Institute has merged. Tashkent Correspondence courses are now taken by students of all Central Asian Republics in the U.S.S.R. The tendency is progressively to have a Correspondence Department or Associated Correspondence Institute along with every big Regional Institute.

(7) *Percentage of completion*

Full-time	.. ..	90%
Evening	.. ..	70%
Correspondence	.. ..	50 to 60% (the U.S.S.R. Govt. proposes to improve on this figure in future).

(8) *Time taken to complete the courses*—The following figures relating to the students graduating from the Automechanics Department of the Moscow Correspondence Institute in 1960 are typical:

Completed in 5 yrs. (1 yr. ahead of time)	..	22	} 89, i.e., over 80%.
Completed in 6 yrs. (on time)	..	50	
Completed in 7 yrs. (1 yr. more than the minimum time).	..	17	
Completed in 8 yrs. (2 yrs. more than the minimum time).	{	8	}
Completed in 9 yrs. (3 yrs. more than the minimum time).	{	7	
Completed in 10 yrs. (4 yrs. more than the minimum time).	{	2	
Completed in 11 yrs. (5 yrs. more than the minimum time).	{	3	
Total	..	109	

The reasons for delay in completion are students' academic deficiencies, sickness, change of work or residence etc. About half of the students admitted to the 1st year have to give up by the end of the 2nd year.

7-28. *Examination Body*—The Final examination for full-time, part-time and correspondence students is held by the Examination Commission, appointed by the Republic or U.S.S.R. Government as the case may be. All other examinations are held internally.

7-29. *Free Tuition, Scholarships, Leave etc.*—The State provides free tuition, stipends from Roubles 30 to 40 p.m. depending on the particular speciality and the year of study, free books, free one way travel and residence and food at low cost for distant students coming to Branch or Central Correspondence Institute, extra 40 days' paid leave per year and again for 6 months at the end, i.e., about 1 year altogether.

Cost approximate	Full-	Evening	Corres-
	time		pondence
	Roubles	Roubles	Roubles
Humanities . . . . .	4000	2000	1330
Engineering . . . . .	6000	3000	2000
Agriculture . . . . .	7000	3500	2300

The above costs include laboratory, staff, library, stipends and other recurring costs, but not capital expenditure on buildings and equipment.

### 7-3. *Technicum Level*

7-30. Due to shortage of time I could visit only one Technicum—for Welding Technology in Moscow. I was told that the pattern is more or less the same for all Technicums. Extracts from my notes are given below:—

*Specialities*—Technology and treatment of cutting of metals; Technicians of welding; Mechanics to look after gas and electric welding machines; Rare gas welding; Mechanics of compressors and refrigerator.

Two Departments—1500 students.

(i) Day

(ii) Evening for workers by day.

7-31. *Admission*—After 7 years of Secondary School or higher. According to the new law, students must have completed the 8th class in school before joining Technicum, but students who have passed 10 grades are preferred. Those joining after 7th grade at school go after one year at the Technicum to a factory for one year's experience, but during this period they attend classes at the Technicum for 4 evenings, 4 hours each day, i.e., 16 hours and 12 classroom hours per week.

7-32. *Duration*—After 7th, 8th or 9th grade at school—8 Semesters, i.e., 4 years +  $\frac{1}{2}$  year for Diploma project. Admission to the 1st year of the Technicum is made by admission tests. Those who have completed the 10th class of school are given admission directly to the 3rd year of the Technicum, thereby reducing the course to 2 $\frac{1}{2}$  years only.

7-33. *Plan of Study*—Students of all specialities who join after 7 grades at School follow a common course:—

1 year—History of Communist Party; Russian; Physics; Chemistry; Maths.; Foreign language—English or German; Drawing; Workshop Practice; General Fitting.

II & III yrs.—Technology of Contact and Arc welding; Structural Welding; Bases of Automation and Mechanisation of welding jobs.

IV year—as for II and III years+Testing of welded structures; and Organisation and Design of Welding Production.

Physics, Chemistry and Maths., for I year students after 7th, 8th or 9th grade at school are taught in a condensed manner, but at the same level as at the secondary school. Students find some difficulty initially, but ultimately they reach the requisite standard.

7.34. After completing 4 years' theory work, full-time students join a factory for 3 months, 2 months for further industrial experience and 1 month for getting materials for the project and spend additional 2 months for writing up the project for the Diploma. The final examination is held by the State Examination Commission (U.S.S.R.), consisting of representatives from the Ministry of Higher Education, City of Moscow, Economic and Industrial bodies of Moscow.

7.35. Technicum passed students must do two years' factory work before joining a Senior Specialist institute. After that period, about 85% of them go to senior institutions. Only 5% may join Senior Technical Institutes directly.

7.36. Evening Department—Average age at entry—25 years (60% of students between 24 and 26 years). Students are generally older because they are working in factories. They attend Technicums in the evenings for 16 hours (12 classroom hours) per week. They do no welding practice within the Technicum as they do so in the factories, but from 1962 they will do some kinds of welding work within the institution, which are not practised in their factories. Generally, however, in all welding factories all kinds of welding are done.

Evening students may join senior institutions directly on passing out from a Technicum, because they already have ample practical experience of welding.

7.37. Teaching staff are the same for Day and Evening Departments. Optimum hours of teaching per teacher 24 hours per week (approximately half of them for lectures and half for practicals). Teachers are paid for overtime work at the end of the academic session. They get two months' paid leave in the summer.

7.4. *Summary*—(i) The U.S.S.R. has accepted without reservation part-time (including Works Tech. College courses of the Sandwich type) and correspondence courses as natural methods for training Engineering personnel on a large scale for their growing industries, also as essential service in an egalitarian society.

(ii) Half of the technical personnel are trained through correspondence, both at professional Diploma level or sub-professional Technicum level and the proportion is gradually increasing.

(iii) From these premises, the Government make boldly whatever arrangements are necessary to make Correspondence and Part time courses academically satisfactory. These include free tuition and books, cheap travel and accommodation, extra paid leave and consultation points, Branch Institutes and laboratory training for really effective instruction of students.

(iv) The relative cost of training a correspondence, evening and full-time student is 1 : 1½ : 3. The teacher to student ratios are—Day courses 10-12 : 1; Evening courses—20-25 : 1; and Correspondence courses—50 : 1.

(v) Finding employment/training opportunities is no problem in U.S.S.R. Economic councils are responsible for this.

(vi) Contrary to the belief held by many in India, though Technicum and Diploma courses are really specialised, yet besides technological specialities they include plenty of fundamental sciences and humanities.

This is not surprising, as the period of training is much longer than in India and very rarely a Russian can qualify as Diploma specialist before he is 28—30 and has got considerable industrial experience also. Even at the Technicum level, he would be at least 22—25 before he is fully qualified and experienced.

(vii) A big drawback from the Indian point of view is that the Specialist Diploma course takes too long and the student who cannot pursue the whole of it cannot get a terminal qualification at an intermediate stage. Also, though the Technicum passed student may join a Polytechnic institute, he does not get any reduction in the duration of the Diploma course. However, in the context of the Soviet Society, this is not so important, because in his job the student is paid according to his capacity.

(viii) The best lesson to India of the Soviet system is that given the urge quite as good Engineers can be trained by part-time and correspondence courses in Engineering as by full-time courses and at much less cost.

## 8. FACILITIES IN INDIA

8.1. *Degree Level*—Though well over 100 institutions of all kinds offer full-time courses in Engineering and Technology, very few part-time courses are yet available in India.

8.11. *Indian Railways*—Special Class Apprentices for Mechanical Transport (Power) Department, recruited by the U.P.S.C. (formerly F.P.S.C.) trained at the Jamalpur Railway Workshops & Technical School and with guaranteed Class I service after the completion of training are the topmost Locomotive Engineers of the country today. The Technical School has a Principal and a few other teachers with particular experience of Railway practice. Specialists from the Production Departments also give part-time lectures in senior classes.

*Duration of course*—4 years Sandwich or cooperative—3 months' full-time at school alternately with 3 months' full-time in the workshops throughout. When at the workshops, the apprentices attend the Technical School on 2 evenings per week, approximately 2 hours per evening.

*Curriculum of studies*—Each apprentice must pass the Section B Examination of the Institution of Engineers (India) (formerly of the Institution of Mechanical Engineers, London), with certain Mechanical Engineering subjects within 4 years. Otherwise, his apprenticeship is extended.



*Admission Procedure*--Competitive Admission Examination held by U.P.S.C. every year for students who have passed I.Sc. or equivalent Examination with Physics, Chemistry & Mathematics as subjects. 6--10 topmost candidates are selected on merit, after a medical examination. Soon there will be an admission examination for candidates who have passed the Higher Secondary Examination, and for them the apprenticeship course will be increased to 5 years.

Age at entry---

Minimum 17-18 years age at passing out --min. 21/22 yrs.--

Stipends to meet Boarding & Lodging costs are given by Government to each apprentice:--

	Rs.
I Year	150 p.m.
II year	200 p.m.
III year	} Junior Officers' scale.
IV year	

*Comments*---(i) Academic standard is at Degree level, but specialist experience (of Loco Engineering) considerably more;

(ii) Comparable with Co-operative courses (U.S.A.), Dip. Tech., Courses (U.K.), Engineers' Diploma courses (U.S.S.R.);

(iii) 4 years are sufficient, because of high quality of students, intensive apprenticeship course and substantial stipends and other facilities;

(iv) Number of students too few - increase easily practicable;

(v) The system of training has stood the test of time and deserves application to other fields of industry.

8.12. *Jadavpur University, Calcutta*, has since 1958 offered evening Degree Courses in Elect./Mech./Civil Engg. for persons who have passed the State Diploma Examination in Engineering of the 3 years' full-time National Certificate (A.I.C.T.E.) standard and are employed full-time in industry.

*Duration*--4 years--6 evenings per week, 3 hours per evening i.e., 18 hours per week.

*Age at entry*--approx. 20--22 yrs.; leaving--24--26 years--1st batch due to complete course in 1962.

*Staff*--The regular University staff teach evening classes in addition to day classes on extra remuneration for extra work. Part-time staff also help.

*Examinations*--The same 4 University examinations in 4 years, as taken by full-time Degree students. No exemption is given for passing the State Diploma Examination, except that attendance in Workshop Practice classes may be waived in some cases. Much of the work already done has therefore to be unnecessarily repeated.

*Comments*---(i) Designed as full-time courses and primarily for adolescents of 17/18 years, they are not meant for older persons of 20/22 years, gone successfully through a 3 years State Diploma course and already working in the profession;

(ii) As no exemption is given to evening students from any part of the course/examination, 4 years is too short. This means too many periods per week—too exacting on students who work during the day;

(iii) Only the best students may expect to pass within the minimum time and high wastage is likely;

(iv) Those not completing the full course do not earn an Intermediate Diploma/Certificate;

(v) Students join after at least 9 months' industrial experience—an advantage.

8.13. *Delhi Polytechnic, Delhi* has offered within the last 18 years the following part-time courses in Engineering/Technology:—

(1) *National Diploma in Architecture*—7 years' part-time morning and evening course for Matriculates with Science, Maths. & Drawing and 18 months' previous architectural experience. Along with the Architecture Department, this course was transferred to the School of Planning & Architecture, Delhi in October, 1959, where it is still offered successfully.

(2) *National Diploma in Elec./Mech./Civil Engineering*—Started in 1958 for persons who have passed the National Certificate or equivalent examination and are engaged in Engineering operation, maintenance or design development work during the day.

*Duration*—4 years' part-time evening and/or day, approximately 12½ hours per week. Courses of 3 years' duration, 16 hours per week were tried for 2 years, but given up. Average age at entry—19 years; leaving—22-23 years.

*A.I.C.T.E. Examinations*—Part I, after 2 years' study and Part II, at the end of the 4 years' course.

*Staff*—The full-time Polytechnic staff teach these classes almost entirely. They get extra remuneration, if the actual teaching load exceeds the optimum load per week laid down. Part-time teachers are also engaged from time to time for specialist subjects, but very few are available.

*Comments*—(i) No minimum period of practical experience is required before joining this course and fresh N.C. (Engg.)/State Diploma Examination passed students are admitted on merit. Being immature, many often neglect their full-time training/work, disadvantage compared with the Jadavpur practice;

(ii) Like the Degree course, the present N. D. (Engg.) syllabus is designed for full-time adolescents rather than for older part-time students with Engineering background. Also, requires revision to produce specialist maintenance/operation engineers;

(iii) The repetition of N.C. (Engg.) syllabus is avoided and two A.I.C.T.E. Examinations are advantageous over Jadavpur's 4 exams. in 4 years;

(iv) There is no intermediate qualification for students unable to complete the N.D. course.

8-12. *Institution of Engineers (India)* -For Corporate Membership (A.M.I.E.) the sequence of examinations to be passed is—

*Studentship*—Of approximately I.Sc. standard, from which I.Sc. or State Diploma Examination passed applicants are exempted.

*Section 'A'*—Of approximately Intermediate Engineering Degree standard. The average State Diploma course covers much of the syllabus, but no exemption is given for completing it.

*Section 'B'*—Approximately of Degree standard. Engineering graduates are exempted;

*Section 'C'*—Professional examination based on reports of professional work and project.

The Institution does not require formal attendance in any theory or laboratory course.

Recognised Engineering Colleges have left this work to private correspondence and coaching institutes, with no facility for laboratory work.

The exceptions are—

(1) *Calcutta Technical School*—Which provides evening courses for students engaged in industry etc. to appear in Section A and B of the A.M.I.E. (India) Examinations. Duration— 2 years for Section A and 2 more years for Section B—Total 4 years ; 3 evenings per week, 6-8 p.m.

(2) *Ministry of Defence centres*—Only very recently the Ministry of Defence has started part-time engineering courses consisting of lectures and tutorial classes in various subjects for Sections 'A' and 'B' Examinations of the Institution of Engineers (India) at 12 different centres, to which 7 more centres will soon be added, all over the country.

As a first step, the scheme is intended for training service men/civilians in Defence Establishments all over the country.

*Duration*—

Section A—78 weeks	..	} Two afternoons/week approx. 6 hours each
Section B—75 weeks	..	

*Admission qualifications*—I.Sc./State Dip. in Engg.

NOTE—The Defence Ministry also proposes to run courses at Kanpur for Parts II and III examinations for the Associate Membership of the Aeronautical Society of India and in Bangalore for the Associate Membership Examination of the Institution of Tele-communications Engineers (India).

*Comments*—(i) Annexure 2 gives the number of students appeared and passed in Studentship, & Sections A and B examinations over several years. Clearly, (a) comparatively few take and very few pass the Studentship Exam. and the pass percentages are only (b) Section A—about 12 per cent (c) Section B—about 16 per cent. Thus the A.M.I.E. channel is extremely wasteful and the results are totally incommensurate with the efforts.

(ii) The large failure rate appears to be because (a) students not coming through the State Diploma Channel take no formal instruction, but only correspondence or coaching courses in private institutes, without laboratory work;

(b) the employers give them no leave or time off to complete their studies quickly; (c) many are not serious nor disciplined to study hard over a number of years.

(iii) N.C. (Engg.)/State Diploma passed students are said to do much better in Section A Exam. and the Institution may soon restrict 'Studentship' to them only and stop the Studentship Examination:

(iv) If State Diploma holders are exempted also from many subjects of the Section A Exam. there will be a larger and more qualified body of 'Students' and the pass percentages would improve.

8.2. *Diploma level*—Though Diploma level courses in Engineering have been in existence in the country for over a century and well over 200 institutes offer them now, deplorably few are part-time:

8.21. *Calcutta Technical School*—For over 30 to 35 years this institution has run 4 years' part-time day and evening Diploma courses in Electrical/Mechanical Engineering of the West Bengal Board of Apprenticeship Training, recognised by the Department of Education, West Bengal, as equivalent to L.M.E./L.E.E. Diplomas for young student apprentices. They attend workshops on 4 full days and the School on 2 days (10-30 a.m.—8-00 p.m., with 3½ hours recess) a week.

*Admission qualifications*—I.Sc. or equivalent or Admission Examination of Apprenticeship Board. Minimum age at entry—16 years.

Now, the School also offers part-time State Diploma Courses in Engineering (E/M/C) of 5 years, equivalent to N.C. on 2 days—10 a.m. to 8 p.m.—12 hours a week.

*Admission qualifications*—Matriculation or equivalent with Maths. & Science—at least II Division, through a competitive admission examination. Students serve apprenticeships on stipends of Rs. 90 p.m. and upwards. Their average quality is good, many having passed I.Sc. in I division and joined part-time instead of full-time courses on financial considerations. Employment opportunities are so good that many get well-paid posts on ships and factories even before completion.

*Staff*—Mostly permanent, a few part-time.

*Comments*—(i) Pass percentages are low, probably because there are no full-time students to set standards.

(ii) Calcutta's heavy industry, still largely European controlled, has always supported the Apprenticeship Training Scheme for staff recruitment and not shirked giving scholarships, stipends and whole day release to students; so the scheme has succeeded very well.

(iii) The Board of Apprenticeship Training, West Bengal, is unique in the country. It has worked well for many years and has gathered the cooperation of nearly 200 industrial concerns of the Calcutta area: so much so, that others *aspire* to join the Apprenticeship Scheme, but not all are admitted.

8.22. *Madras*—Central Polytechnic, Madras—5 years' part-time State Diploma courses/examinations of the State Board of Technical Education, open to Matriculates who are working in factories during the day.

*Attendance*

1 day—7 a.m. to 4-30 p.m. with 1½ hrs. recess. }  
 +½ day—7 a.m. to 12 noon } per week.  
 \*+3 evenings—of 2 hrs. each. }

The Institution selects the students. Important workshops in the Madras area are the Southern Railways' workshops and the Integral Coach Factory at Perambur.

17—19 hrs/week—too tiring for young students.

8-23. Ordnance Factories at Jabalpur offer for their own personnel 5 years' evening courses of the State Diploma standard, but the students naturally have much practical engineering experience. Details are not readily available.

8-3. *Part-time courses for specialised training in industry etc.*

8-31. Tata Iron & Steel Co. at Jamshedpur, has long run a Technical School, which coordinates factory work with technical studies at various levels.

(1) Graduate apprenticeship from holders of Degrees in Electrical Engineering/Mechanical Engineering/Metallurgy of Indian or foreign universities.

Class of Apprentices	Class of Degree	University
A1	I	Indian
A2	I	Foreign
B	II	Indian

*Duration*—2 yrs.; 1½ yrs.' Sandwich course, alternate weeks of full-time work in school and at works. The last 6 months are spent on full-time specialised training at works and attendance at the technical school on 3-4 evenings/week. The course goes beyond the Bachelor's degree standard and lays emphasis on works practice.

A2 class get much higher stipends than A1 class, who in turn get more than B class apprentices.

(2) C class apprentices at *trade level* for Matriculates—*Duration*—4 yrs.

Sandwich course—alternate periods of 6 months in Technical school and at works.

*Academic subjects*—Mathematics, Chemistry, Physics, Workshop Technology etc. at City & Guilds level. For 3 years, works training is common; in the final year (probation period), specialised work in one Workshop/Department.

There is a similar system of training at the I.I.S. Co., Burnpur, the details of which are not known to me.

\*Some exemption is given to students from such work which they have done in their factories.

8.32. Cadetship 'Dufferin', P. & T. Department, Ordnance Factories and Armed Forces have long given coordinated professional training and technical courses on part-time basis for their employees. More recently, Nangal Fertilizers, Sindri Fertilizers, Integral Coach Factory, Perambur (Madras), Locomotive Works, Chittaranjan, and other public sector factories have started Works Technical Schools, primarily for training artisans, craftsmen and supervisors.

#### 8.4. *National Certificate and Diploma Courses of the AICTE*

8.40. Started in 1942 as All India Certificate and Diploma courses in Elect./Mech./Civil/Chem. Engineering, Textile Technology, Architecture, Commerce and Art, by the Association of Principals of Technical Institutions (India), they were taken over by A.I.C.T.E. in 1947 and renamed National Certificate and Diploma courses in 1949. The idea was originally borrowed from U. K., but the Indian and U. K. schemes have been different from the beginning. Today the two do not resemble at all. This has resulted in the virtual failure of the Indian scheme and particularly of the National Diploma Course.

8.41. The existing Indian National Certificate Course in Engineering (E.M.C) is organised as below—

*Minimum admission qualification*—Matriculation with Maths. and Science and preferably Drawing.

*Duration*—Full-time—3 years, followed by 2 years' industrial training/

Part-time—5 years for students engaged in full-time industrial training: employment.

The course is now the model for State Diploma courses in Engineering to qualify for Central Government grants and for recruitment to Subordinate Central services. The A.I.C.T.E. still holds the final N.C. (Engg.) examinations, but only for Delhi Polytechnic students. The Directorates of Technical Education of various States conduct the State Diploma Examinations.

Reference Para 8.2— Only the Calcutta Technical School and para 8.22— Central Polytechnic, Madras, now offer evening State Diploma courses, which 2 or 3 batches of students have so far completed.

8.42. *The National Diploma Courses* may be—

(1) *Full-time*—3 years followed by 1 year's industrial training.

*Admission qualifications*—I.Sc. or equivalent, with Physics, Chemistry and Mathematics.

They were offered at the Delhi Polytechnic, Delhi, for over 10 years and at the Government Engineering College, Jabalpur, for 1-2 years and at Indore for a year or so, but later replaced by equivalent Degree courses.

(2) *Part-time evening*—2 years' full-time or 3 years' part-time.

*Admission qualifications*—Pass in National Certificate or State Diploma Examination, for students in full-day industrial training, employment.

Part-time B. D. (E.M.C) courses firstly of 3 years' and now of 4 years' duration, have been offered at the Delhi Polytechnic since 1958. The first batch

of 3-year course students will take the final National Diploma Examination of the A.I.C.T.E. in December, 1961.

How satisfactory the Delhi arrangement is will not be known before another 2-3 years.

*Comments—(i)* Unlike in U.K., the National Certificate course in India may be both part-time and full-time;

*(ii)* It is not broken up as O.N.C. and H.N.C. and is lower in standard for the particular speciality than the H.N.C. of U.K.;

*(iii)* N. C. course of India includes more subjects than in U. K., but students cannot pass examinations subjectwise;

*(iv)* Indian N. C. holders gain exemption only from the 'Studentship' Examination and not even from a single subject of the Section A Examination of the Institution of Engineers (India);

*(v)* Unlike in U. K. the entire Indian N. D. (Engineering) Examination and not merely endorsement subjects have to be passed to be eligible for Graduate Membership of Institution of Engineers (India);

*(vi)* Altogether, the Indian N. C./N. D. scheme is not at all linked with Institution of Engineers (India) and other professional institutions and as in U. K. does not contribute substantially to Professional Memberships.

#### 8.5. *Correspondence Courses in Engineering*

8.50. Private Correspondence Schools, such as B. I. E. T. and I. C. S. of Bombay, have been in existence for many years. They draw lesson materials from U. K., mostly for their own courses and examinations, Instruction is given entirely through the mail. The students never meet the teachers nor do laboratory work.

8.51. *Degree level*—Besides others the B.I.E.T. offers correspondence courses also for Sections A and B of A.M.I.E. Examinations on "no pass no fee" condition. The total charge is Rs. 600 for the whole course, reduced to Rs. 450 for advance lumpsum payment. The Institute supplies well known text books, good study guides and lesson material based thereon and a grading and correction service, which could be better and more personal. The teachers, almost wholly part-time, are paid Re. 0.50—Re. 1.00 per lesson. Complaints are heard, but for the insignificant charge the service is fairly good.

The I.C.S. charges are about twice the B.I.E.T.'s. Their lessons are self-contained, *i.e.*, not based on text books. Teachers are wholly part-time and get nearly twice the B.I.E.T. rates.

8.52. *Diploma level*—As different States hold their State Diploma Examinations, there are no comprehensive correspondence courses at the Diploma level as for A.M.I.E. Examinations.

8.53. *Comments—(i)* Text books and lesson materials of correspondence schools are generally of good quality;

*(ii)* Their organisation and pioneering effort deserve praise;

*(iii)* But their technical courses cannot be fully effective without additional oral or laboratory instruction and consultation centres;

(iv) For the very small charge individual teaching (grading and correction) cannot be better;

(v) At the Diploma level there are no standard All India courses ready,

(vi) Regarding the development of short period and refresher courses for qualified engineers in new techniques and technologies they may do much in future.

#### 8.6. *Quality of students available for Engineering courses*

8.60. With the gradual introduction of the Higher Secondary course and consequently of the 3 years' B.A./B.Sc. and 5 years' integrated Degree courses, Engineering colleges/Polytechnics draw students from those, who have passed the

- (i) Higher Secondary/Multi-purpose Examination;
- (ii) Senior Cambridge or equivalent examination with Physics, Chemistry and Maths. and preferably Drawing as subjects, for Degree and Diploma courses;
- (iii) Higher Secondary Technical Examination with Physics, Chemistry and Maths. and Engineering Drawing and Workshop Practice as subjects, for Degree and Diploma courses.
- (iv) Junior Technical Examination, for Diploma courses only (not yet).
- (v) Matriculation Examination with Mathematics and Science, for Diploma courses only.
- (vi) B.Sc's. or even M.Sc's. with Physics, Chemistry and Maths., mostly for Degree courses.

8.61. Under Categories (i), (ii) and (iii) the best students in merit join (1) Technology or Engineering Degree courses, the relative popularity at present being approximately as below—

*Mechanical/Electrical/Architecture/Chemical/Civil/Textile Technology etc.*— Selection is generally made on merit either on the basis of marks secured in the last public examination or alternatively, through competitive admission tests; or (2) B.Sc. (Hons.) courses with Physics, Chemistry, Maths., Geology, Physiology, Botany etc. to qualify as scientists or to attempt Indian Administrative Services or other competitive examinations.

8.62. The next group of students in merit join B.Sc. (Pass or Hons.) classes with Physics, Chemistry, Maths. etc., because they

- (1) failed to get admission to Engineering degree courses, but would like to try again to join such courses before or after they pass B.Sc.;
- (2) like to continue their studies in pure sciences;
- (3) want to take competitive examinations for administrative and other services.

Comparatively few succeed. Out of financial necessity many take service as clerks, assistants etc. and the rest drift in the hope of a professional career.



These latter and the third group of Higher Secondary etc. students in merit, besides the comparatively few good Matriculates still available, a very large body, are the potential students of full-time and part-time and cooperative N.C. course and part-time/cooperative N.D. course.

Many I.Sc's, B.Sc's, and M.Sc's, also try to qualify as Engineers through A.M.I.E. (Ind.) courses, but very few succeed.

8-63. Category (iv) Junior Technical Schools are still experimental. If their students increase considerably in number and quality in the IV Plan period, they will probably supply much of the Polytechnic students, but in the III Plan period they need not be counted.

8-64. Unfortunately until now, the Universities, I.I.Ts. and the A.I.C.T.E. have not reduced the duration of Degree, N.D./N.C. or State Diploma courses for B.Sc.s. or M.Sc's. This deserves urgent attention to prevent much wastage of time, money and talent of a large number of potential Engineering students.

8-7. *Facilities for Practical Training or Industrial Work*—(1) Diploma or N. C. holders must be in employment or training before joining Degree, N. D. or A.M.I.E. courses at Jabalpur, Delhi etc. Some may not be employed in positions commensurate with their technical training, still not much difficulty is anticipated.

(2) Part-time Diploma students of the Calcutta Technical School, Central Polytechnic, Madras, and the Ordnance Factories, Jabalpur, are already in training/employment.

(3) Until now, industry has by and large preferred to employ already trained personnel rather than train its own potential employees. For rapid increase in the number of students undergoing part-time correspondence courses, places, of training or work in industry with appropriate salaries or maintenance stipends are still too few.

The efforts of the Regional Officers of the Ministry of Scientific Research and Cultural Affairs, Government of India so far to arrange practical training facilities for Degree/Diploma students do not touch even the fringe of this problem.

(4) Of the States, West Bengal has the longest established body, namely the Board of Apprenticeship Training, associated with the Department of Industries West Bengal Government to develop and coordinate facilities for practical training of student apprentices in the Engineering industry. Over many years, this Board has also framed syllabi etc. and conducted Final Examinations for Apprenticeship Diploma courses offered at the Calcutta Technical School.

With the creation of a separate Chief Inspectorate for Technical Education under the Education Department of the West Bengal Government, the time is probably ripe for the 2 bodies to merge.

In Madras, the State Board of Technical Education has been doing similar work for the last 10-12 years quite successfully.

In other States, it is presumed that the newly created State Directorates of Technical Education will take up this coordination work.

### 8.8. *Other important factors—*

8.81. Financial resources of the students: Private industry or charitable bodies have instituted very few stipends, scholarships and fee concessions and loans for technical students. Unless their number is increased proportionately with the increased annual intake, many students of merit may not be able to join technical courses.

The Working Group has given considerable thought to this matter (cf. pp. 63-64 of the Report), but primarily in respect of full-time students, who pursue shorter courses than part-time correspondence students.

If industry can be persuaded to grant adequate maintenance stipends to student-apprentices, as in U.S.A., U.K., Sweden and U.S.S.R., their educational costs will be met and many youths of merit will be attracted to part-time and correspondence in preference to full-time courses. But finding adequately paid apprenticeships for thousands of young students lacking means will not be easy. Until this objective is achieved, part-time and correspondence students must be given greater financial help and incentive than full-time students. The Ministry of Labour and Employment already grants a large number of stipends to attract educated youths to train as Craftsmen and ultimately as Supervisors. The Ministry of S. R. & C. A. should also devise a scheme of abundant scholarships, stipends, loans etc. for part-time and correspondence students of Engineering. Some of these should be awarded on a national scale in recognition of merit, which will give the students concerned better status and free their minds from any sense of inferiority or discrimination as compared with full-time students.

8.82. *Selection of students*—By and large admissions to degree and diploma level courses in Engineering are made on merit either on the basis of aggregate percentage marks secured in the last public examination passed or by competitive All India, Regional or Statewise admission tests. Very often, students have to take several such tests all over the country, involving not only extra financial or physical strain on themselves, but also much unnecessary work by several examining bodies. As Engineering colleges and Polytechnics are developing all over the country, even out of the way places, the time is probably ripe to make admissions not on All India but on regional basis. Students may then be admitted on the basis of Higher Secondary examination results and the elaborate procedure of admission tests may be avoided in most cases.

8.83. *Wastage*—Different regions report different percentages of wastage and even with a region some areas report proportionately greater wastage than others. Overall wastage is much more than in other countries and reduction is imperative.

### 8.9. *Summary*—(i) Cooperative Sandwich courses:

Special Class Apprenticeship course at the Railway Workshops, Jabalpur is probably the only successful example.

(ii) Part-time Evening Degree/N.D. Courses at Jadaipur Delhi are too new for correct evaluation. They are not very suitable for mature persons with Engineering background.

(iii) A. M. I. E. Examinations—Wastage is very large, due to lack of formal teaching. Defence Ministry's new courses require to be observed.

(iv) Diploma level (1) Calcutta Technical School offers the most successful part-time courses in cooperation with West Bengal Apprenticeship Training Board (2) TISCO's 'C' class apprenticeship scheme is quite effective. (3) Central Polytechnic, Madras Courses are also successful.

(v) National Certificate/Diploma courses—designed for full-time and not part-time study; they should be brought in line with similar U. K. courses.

(vi) Correspondence Courses of B. I. E. T., I.C.S. etc. without oral and laboratory instruction, for A.M.I.E. Exam. and for their own Diplomas/Certificates.

(vii) Availability of students: (1) Good B.Sc.s. and M.Sc.s. for Degrees courses. (2) Good Higher Secondary passed students for N. C. (Engg.) courses, only.

(viii) Facilities for practical training—available for immediate requirements, but not enough for rapid increase of facilities.

(ix) Financial resources of students—In spite of many scholarships etc. recently granted by Government, many students of merit find difficulty in meeting their educational costs. Large increase is imperative.

(x) Selection of students is made largely by merit. Regional instead of All India selection would be more practicable.

(xi) Wastage—still much more than in Europe or U. S. A. must be reduced for greater out-turn.

## 9. PROS AND CONS

9.0. With the anticipated intensive industrialisation of India in III and subsequent Plan periods, facilities for technical education must grow very fast. No country is able to provide 100 per cent institutional full-time courses for this purpose. Part-time and correspondence courses are therefore on the increase everywhere and should also be in India.

In paras 8.1 to 8.5, the few part-time cooperative and correspondence courses in Engineering, now available in India at Degree/Diploma level, and their advantages and disadvantages have been described. Whatever their faults, until and unless better courses can be devised they should go on and more effectively, because, to increase their number and to diversify them in the IV Plan period, much planning, execution and time will be required. The present position abroad and in India in various respects is compared in this Chapter on the basis of available information. Recommendations regarding the future have also been made.

9.1. *Nature of part-time courses, approx. class hours per week and session*

9.11. *Entirely evening*—Classes held on 3-4 evenings—10-12 hours per week.

Country	Evenings per week	Instructional weeks per session	Instructional hours		Remarks
			Per week	Per session	
1	2	3	4	5	6
U.S.A.	3-4	34-35	10-12	350-420	Extensively followed.
U.K.	3-4	33-34	7-10	200-330	Not considered suitable. Dropping gradually.
Sweden	4	34-35	16 (actual 12)	400-420	Extensively followed.
U.S.S.R.	4 (+4 weeks full-time on paid leave)	34-35	„	420 (+136)	„
<i>India</i> (Delhi Poly-technic)	} 4+ Sundays (whole days) } 4+ alternate Sundays (whole days)	37-38	16	500-600	Being given up.
		35-36	12½	430-450	Students attend fairly regularly, but often neglect industrial training.
<i>India</i> (School of Planning and Arch. Delhi).	5+2 mornings	32	14	450	Attendance not good. Very hard for students.
<i>India</i> (Jadavpur University)	6	32	18	575	Attendance reported satisfactory, but very hard for students.

*Comments and recommendations*—(i) Students cannot do shift work in industry in evening and get little time for home study;

(ii) In India climatic and transport conditions being generally unfavourable, evening classes are practicable only in a few large cities with modern transport system and not for above 12 hours per week and 32-33 weeks per annum; very limited possibility.

9.12. *Day and Evening*—Classes on one whole day (6 hours)+1 or 2 evenings—9 or 11—12 hours per week for 35 weeks and 315—420 hours per session. Many such courses in U.K.; few, if at all in Sweden, U.S.S.R. and India.

*Comments and recommendations*—(i) They suit students more than entirely evening courses;

(ii) Industry would find it difficult to release by rotation different groups of students for one day per week and place them in shift work;

(iii) Limited practicability in a few large cities, e.g., Bombay, Calcutta, Kanpur and Ahmedabad.

9.13. *Whole-day release*—Classes on 2 whole days, 12 hours per week for 35—36 weeks, i.e., 420—430 hours per session, upto 3 groups of students at the same time.

*Comments and recommendations*—(i) Many such courses in U. K., but few, if at all, in U. S. A., Sweden and U. S. S. R.

(ii) Successful at the Calcutta Technical School—2 turns per week of 6 hours each. If 1 evening of 2½ hours, week can be added, the total would increase to 500 hours per session;

(iii) Ministry of Defence's new A. M. I. E. courses in Defence factories, Laboratories and Establishments working on this plan, 2 afternoons per week of about 6 hours each for classes on 52 weeks i.e., approx. 624 hours per session, may be successful, as they are meant for disciplined Defence personnel who are released under official orders;

(iv) Very satisfactory for Indian students. But Industry would find it difficult to release by rotation employees for classes and place them on shift work. So, their success with civilian students, released by several undertakings at the same time, is problematic.

9.14. *Co-operative or Sandwich courses*—Two different groups of students attend alternate full-time periods of 1, 2, 3, 4 or 6 months in industry and school.

Country	Alternate periods	Instructional			Remarks
		Weeks per session	Hours		
			Per week	Per session	
1	2	3	4	5	6
U.S.A.	Quarter				
	Semester	22—23	30—32	650—700	Extensive and increasing— Degree and Diploma courses.
U.K.	2 months	22—23	„	„	Diploma Tech. courses rapidly increasing.
	6 months				

1	2	3	4	5	6
Sweden	..	..	..	..	..
U.S.S.R.	3 months	22—23	34—35	700—800	Extensive a Diploma level. Fewer at Techni- cum level. In- creasing in num- ber.
India	..	22—23 +22— 23	32—33 4	800—850	Jabalpur Spi. Cl. Rly. Appr. AMIE courses —very satis- factory.

*Comments and recommendations*—(i) Every country reports growing interest/reliance on these courses. If students also attend classes on one evening per week, when they work full-time in industry, the total instructional hours per session would increase to 800—850, only 20 per cent short of the full-day course;

(ii) They suit students best of all, as they may concentrate fully on study or industrial work, as the case may be, at a time. Also, they may have plenty of preparation time at home;

(iii) Industry finds no difficulty in releasing students by rotation for classes and placing them for evening/night shift work, without being short of working personnel;

(iv) Student-apprentices remuneration would naturally be less than for 12 months' industrial work per annum;

(v) Overall, two groups of students may be trained at the same time and if working on double shifts (7·30 a.m. to 2 p.m. and 2 p.m. to 8·30 p.m. with  $\frac{1}{2}$  hour recess), even 4 groups at a time using the same class rooms, labs., library etc., but different groups of teachers.

For India, the order of preference would be—

- (a) Co-operative courses—approx. 800 hrs/session.
- (b) 2 whole days +1 evening/week—500 hours/session.
- (c) 2 whole days/week—425 hours/session.
- (d) 1 whole day+1 evening/week—315 hours/session.
- (e) 1 whole day+2 evenings/week—420 hours/session.
- (f) 4 evenings/week—350 hours/session.

### 9·2. Evening Degree courses offered in various countries.

9·21. U. S. A.—Only 12 E. C. P. D. accredited institutions. Admission—High School Examination; Duration—8 to 12 years; Age at leaving—27—30 years.

*U. K.* Only London University, but number of students dwindling; Admission—G. C. E.(A); Duration—over 6 years; Age at leaving—over 25 years.

*Sweden—Nil.*

*U. S. S. R.*—Many institutions offer Engineer Diploma courses (equivalent to Degrees), but students are much fewer than for day or correspondence courses. Admission: Secondary School/Technicum Examination; Duration—6 years and more; Age at leaving: 27–30 years.

*India*—Only Jadavpur University—started in 1958. Admission: State Diploma (Engineering); *but not Higher Secondary or I.Sc.*; Duration: 4 years. No exemption for passing State Diploma Examination. Much of State Diploma Course work repeated. Probably age at leaving: 25–26 years. High anticipated wastage.

*Comments and recommendations*—(i) A long evening Degree course for Higher Secondary passed or equivalent students is impracticable due to poor financial resources of Indian students and inadequate paid training/employment opportunities;

(ii) Universities' response to Government of India's recent circular to institute evening Degree courses not satisfactory. Few, if any, may agree to do so in the future;

(iii) Even if some universities start such courses, the duration will not be reduced for State Diploma holders;

(iv) The Engineering Degree course in India is basically designed as a full-time course following the Higher Secondary/I.Sc. course and not as a part-time course following the 3 years N. C. (Engineering) course; also, not specially for training maintenance/operating engineers;

(v) The Government need not yet to take vigorous steps to institute evening degree course, but may observe the results of Jadavpur University's experiment. If they are good, such courses may be started in one or two more universities in 1964, 1965 or later.

#### 9-22. *Other part-time courses at Degree level.*

*U.S.A.*—Very few, if at all. Details not known.

*Sweden—Nil.*

*U.S.S.R.*—*Nil.*

*U. K.*—Part-time day, day and/or evening courses—

*O. N. C.*—3 years for 15 year old students, followed by H. N. C. (3 years) + Endorsement (usually 2 years) courses, leading to A. M. I. C. E., A. M. I. Mech. E. etc. Age at leaving—25-26 years.

*India*—(1) *Delhi Polytechnic*—N. D. (Engg.) 4 years' evening course, after 3 years' full time N. C. (Engg.) course or equivalent; subjects and syllabii covered in N. C. (Engg.) course not repeated. Only 2 A. I. C. T. E. examinations—Parts I and II.

(2) *School of Planning and Architecture—Delhi*—7 years' N. D. (Arch.) evening and morning course after Higher Secondary. Only 2 A. I. C. T. E. examinations—Intermediate and Final.

*Comments and recommendations*—(i) N. D. (Engg.) course is designed as full-time course for Inter College Secondary School leavers and not for part-time State Diploma passed students;

(ii) Syllabii need substantial changes in line with the U. K. scheme by exclusion of much N. C. (Engg.) work to make it suitable for part-time students. Also, greater diversification is required like the hundreds of study Plans for Engineering Diploma courses in the U. S. S. R. The objective should be to train specialist maintenance/operating engineers and not merely engineering graduates;

(iii) Part-time Day industrial release (1 or 2 days/week) would be difficult to organise in India on a large scale for many years;

(iv) The present, largely evening, part-time N. D. (Engg.) course may succeed to a limited extent only in Calcutta, Bombay, Madras, Bangalore, Coimbatore, Chandigarh and Hyderabad besides Delhi.

(v) Part-time N. D. (Arch.) course of Delhi—Pass percentage low and very few pass within the minimum time. Still on the whole it has succeeded and deserves to be taken up by other Schools of Architecture in big cities like Bombay and Calcutta.

9·23. *Cooperative courses at Degree level—U. S. A.*—19 E. C. P. D. accredited institutions. Admission: High School; Duration: usually 5 years. Alternate terms in industry and college; Age at leaving—23-24 years.

*U. K.*—Dip. Tech. courses; Admission—G. C. E.(A); Duration—usually 4 years; a few 5 years—6 months p.a. in college and 6 months p.a. industry; Age at leaving—22-23 Years.

*Sweden*—Nil.

*U. S. S. R.*—6 Works Technical Colleges and several special purpose Institutes e.g., for Railways. Admission: Secondary School or Technicum; Duration—5½ years. Alternate periods of 3 months in Works and College; Age at leaving—25 years and upwards.

*India*—Indian Railways (Special Class apprentices—Jabalpur Railway Workshop); Duration—I.Sc.—4 years, and Higher Secondary—5 years. Alternate periods of 3 months at works and in Technical School. Also, evening classes for 4 to 5 hours per week while at works.

*Comments/recommendations*—(i) Britain particularly, also U. S. A. and U.S. S. R., commend Cooperative/Sandwich courses in preference to regular full-time and part-time courses for rapid out-turn of engineers well versed in Theory and Practice. For modern industry this is considered the best and quickest way of training top class engineers. Special Class Railway apprentices have also proved this to be a very successful method of training in India;

(ii) In para 8·62 it has been indicated that a large number of suitable Science graduates will be available for Engineering training at least in the III and IV Plans periods. If such courses including industrial training of 3 years'



duration can be arranged, many who would otherwise drift would be drawn and a large number of engineers may be trained through them;

(iii) Usual Degree courses are not recommended for this purpose, because they are too rigid and an individual university would not be easily able to revise its syllabii according to changing circumstances. Besides, they are not meant for older persons engaged full-time in industrial work. In U. K., the Government now vigorously support Dip. Tech. courses, which like the Specialist Diploma courses in U. S. S. R., are the most suitable for highly specialised occupations in modern industry;

There is nothing equivalent to Dip. Tech. courses in India, nor should there be multiplicity of courses. Referring to the suggestion in Para 8·9(v), when the Indian N. C./N. D. scheme is reorganised in line with the U. K. scheme certain features of the Dip. Tech. courses mainly intensification and diversification of training are incorporated, the revised N. D. syllabii would be very suitable for Cooperative courses also;

(iv) Such courses requiring alternate periods of 2 months at college and works, would be ideal at Steel centres, large Railway and Ordnance/Defence Workshops, Colliery areas, Fertilisers factories and important industrial cities like Bombay, Calcutta and Kanpur. Students may also attend classes on 1 evening/week while doing full-time factory work. Their technological instruction may be organised in regular Technical colleges in the vicinity in the mornings or evenings. Otherwise smaller institutions offering such courses may be set up for an intake of 25-50 students in each group, with inexpensive laboratory equipment. For higher laboratory work the students must use the facilities of nearby technical colleges outside normal working hours or during the vacations.

(v) If required, 4 groups of students in 2 shifts may be trained at a time at the same technical institution, permitting large scale expansion of technical education at little extra capital cost.

### 9·3. Diploma level

9·31. *Evening Diploma Courses—U.S.A.*—Admission—High School or equivalent; Duration—5 years approx. 12 hours on 3-4 evenings week; Age at leaving—23 years.

*U. K.*—Part-time day and/or evening O. N. C.—3 years approx. 200-250 hours/session and 7-8 hours week. Admission—G.C.E.(O) or equivalent education. *H. N. C.*—3 years after O.N.C. Age at leaving—O.N.C.—19 and H.N.C.—22 years upwards.

*Sweden*—(1) Fackskolelinje 3-4 years at Specialised/(State) Technical Schools. Admission—Realexamen or special test; age at leaving 20 years.

(2) Institute Engineers, at Municipal Technical Schools. Lower course—3 years. Consecutive (higher) course—2 years. Age at leaving—22 years upwards.

*U. S. S. R.*—Technicum—4½ years courses for 8th class High School boys. 2½ years for 10th class boys. Age at leaving—approx. 22 years upwards.

*India*—(1) State Diploma—5 years after Matriculation or equivalent. Age at leaving 21-22 years upwards.

(2) West Bengal Apprenticeship Board Diploma—4 years evening, after I.Sc.; Age at leaving—22 years upwards.

9·32. *Co-operative Courses at Diploma level.*

*U. S. A.*—Only 6 Diploma institutions accredited by E. C. P. D.

*U. K.*—Few, if at all. But British educationists show increasingly greater faith in them.

*Sweden*—*Nil.*

*U. S. S.R.*—Details not known.

*India*—TISCO, Jamshedpur—B courses at trade level.

9·33. *Comments/recommendations*—(i) The standard of the Indian Diploma is perceptibly lower than that of other countries.

When all schools change to the Higher Secondary pattern, the extra year's schooling may improve it considerably.

However, Indian industry being young and rudimentary, even less qualified persons may be useful.

(ii) Though co-operative courses have not yet been exclusively used abroad at Diploma level, yet in India as for Degree courses, so for Diploma courses, the Sandwich or co-operative curriculum would be the quickest way of multiplying the intake of students 3 or 4 times in small sized Polytechnics attached to very large Factories and groups of small works within a neighbourhood and if required, by working on 2 shifts.

(iii) The chief task in this connection would be to find suitable training or employment facilities for students in factories and to arrange for their periodical release to attend Polytechnics.

(iv) For quick and large out-turn of Diploma engineers, the full-time Diploma course should be of 2 years and redesigned for Higher Secondary or Junior Technical School passed students. The part-time course need not take more than 3½ years and may be offered as below—

(a) 3-3½ years part-time day and/or evening, approx. 350/420 hours per session. Admission—Higher Secondary; Leaving Age—20 years upwards;

(b) 2-2½ years' Sandwich; 750—800 hours/session. Admission—Higher Secondary or Junior Technical School. Leaving age—19 years upwards; and

(c) 1½-2 years' Sandwich; 750—800 hours/session for B. Sc. Alternate full-time periods of one month at a Polytechnic and at Works. Leaving age—21 years upwards.

Immediately, all the three ways may be tried. Later, (b) and (c) will be better. Ultimately, when there will not be surplus B.Sc's. only (b) will remain.

9·4. *Correspondence Courses*

9·41. *Degree level*

*U. S. A.*—Only 1st and 2nd year working in universities is possible, but no laboratory instruction. Completion percentage at the University of Wisconsin is approx. 70.

Generally used by students to accelerate rate of progress in studies.

However, I.C.S. and other Correspondence Institutions offer systematic correspondence courses for students preparing for the State (Engineering, Architecture etc.) License Examinations without attending any Tech. Colleges. Duration—8 to 12 years.

*U. K.*—Only for A. M. I. C. E. and A. M. I. Mech. E. examinations but not for A. M. I. E. E. examinations; private correspondence schools offer some courses. The number of students is rapidly dwindling. Further, very few attain professional membership through A. M. I. C. E./A. M. I. Mech. E. examinations.

*Sweden*—*Nil.*

*U. S. S. R.*—Approx. 50 per cent of Diploma engineers qualify through Correspondence courses according to Study Plans made by U. S. S. R. Government, which include Laboratory work also. Minimum duration—6 years. Age at leaving—27 years upwards.

*India*—Only private Correspondence institutes offer courses for A. M. I. E. (Ind.) examinations.

9.42. *Diploma level*—*U. S. A.*—Only 2 E. C. P. D. accredited institutions offer them mainly in Electronic Technology. But private correspondence schools offer a great variety of courses, some of which are very popular.

*U. K.*—Only private correspondence schools have own courses, examinations and diplomas.

*Sweden*—N. K. I. and Hermods offer well designed 5 or 4 years' courses, which include oral and laboratory instruction in technical institutes and lead to Government Diploma Examinations and awards at par with regular awards.

*U. S. S. R.*—Very large number of institutions offer them. Duration—1 year more than full-time courses. Includes periodical visits to Consultation Centres and full-time oral and Lab. instruction in regular institutions for 4 to 5 weeks per year on paid leave.

9.43. *Intermediate level*—*Short period courses*—*U. S. A.*—Many such courses at private Correspondence Schools and University Extension Departments.

*U. K.*—C. E. G. Board Power Station practice course is an admirable example.

In India, such useful courses may be developed when there is more experience with correspondence courses at lower levels. This holds good for part-time courses also.

9.44. *Comments/recommendations*—(i) Correspondence instruction is both a technique and art, which has to be developed over many years. Not every teacher can be a good correspondence teacher. Special training is required. This is particularly true for technological subjects, for which judicious use of diagrams, photographs, films etc. is essential.

(ii) Degree level—Only U. S. S. R., where the State has full powers and has directed industrial and educational authorities to grant special leave and other facilities to part-time and correspondence students, have these courses been effectively used; in U. S. A. much less.

*Diploma level*—There is a close resemblance between the successful Swedish, and U. S. S. R. practices of complete training of engineers by correspondence courses, which include a fair quantum of oral and laboratory instruction.

(iii) Indian Universities/Boards of Education (technical or otherwise) have no experience of conducting correspondence courses.

Only very recently the U. G. C. has asked the Delhi University to start a pilot scheme for correspondence courses leading to the B. A. Degree in the following subjects---

English; Modern Indian Language (Hindi, Urdu, Panjabi); History, Economics, Commerce and Maths.

(iv) Correspondence courses in many Engineering and Science subjects would require Laboratory instruction. So, they should not be started in a hurry until enough experience has been gained with subjects not requiring laboratory work.

(v) The best students would by merit qualify for full college training leaving scholastically indifferent students to take correspondence courses.

The problem is, therefore, quite complicated, but with the help of correct technique and procedure, correspondence instruction can be almost as effective as institutional courses.

(vi) Still, the time is ripe and it is quite practicable to introduce correspondence instruction in several subjects of the Engineering courses to cover 40 to 50 per cent of Degree and Diploma students on a large scale over a period of 10 years.

(vii) Subjects, such as Physics, Chemistry, Maths., Applied Mechanics, Heat Engines, Engg. materials, Economics and Accounts, Labour Relations and Languages, easily lend themselves to correspondence instruction.

(viii) Fortunately, the experiences of U. S. A., U. S. S. R. and Sweden are available and correspondence lesson material etc. at various levels in the English language will not be difficult to get fairly soon and at nominal cost from U. S. A. and U. K. But they will have to be adapted to Indian syllabii and conditions, which will require much effort.

(ix) India now has a chain of Engineering Colleges and Polytechnics even in remote areas. As a first step, several of them may be selected to enrol part-time students, and a few to give correspondence instruction in several selected subjects to such part-time students as prefer them. These courses will be given according to approved Study Plans and with the help of Centrally prepared lesson materials for N. D./N. C. or State Diploma/A. M. I. E. (India) examinations, under the overall administrative control of respective State Boards of Technical Education. As the students would visit their Alma mater 2-3 times a week frequent consultations with their teachers regarding the subjects of correspondence instruction would be practicable.

(x) If additional paid leave of 4-5 weeks a year can be arranged for them, the students will have additional oral or Lab. instruction for approx. 130 hours a year, just before their annual examinations, which will be very helpful.

(xi) If the above objectives are achieved within the III Plan period it may be possible in the IV Plan period to introduce real correspondence courses of the U. S. S. R. and Swedish pattern, and to equal the Soviet arrangement of 20 per cent of full-time oral instruction and laboratory work for correspondence

students for all subjects of the 1st and 2nd years of the 4 years' part-time N. D. Engg. courses, following N. C. (Engg.) Certificate, at the Degree level and of 2 years of the proposed 3—3½ years evening N. C. (Engg.) or State Diploma courses at the Diploma level for 25—30 per cent of students. This will relieve part-time students from attending college for the 1st 2 years to a considerable extent.

(xii) Gradually, in the V Plan period 50 per cent of Degree and Diploma students may be covered in this manner for more years of study, but it would be idle to predict too accurately.

(xiii) Correspondence courses must lead to the same National Diplomas' and State Diplomas as institutional courses.

(xiv) Correspondence Courses (at Intermediate levels—generally short period) should be attempted only after sufficient experience has been gained at Degree and Diploma levels.

#### 9.5. *Professional Institutions and their interest in technical education*

*U. S. A.*—E. C. P. D. (conference of major professional institutions approves the day/evening courses and examinations for colleges at Degree and Diploma levels, but holds no examination itself.

*U. K.*—Institutions of Civil/Elect./Mech./Chem. etc. Engineers jointly with the Ministry of Education administer N. C./N. D. courses and examinations at Degree and Diploma levels. Overwhelmingly more part-time students qualify for professional memberships through O. N. C. and H. N. C. and to some extent O. N. D. and H. N. D. examinations than through the Institutions' own Associate Membership examinations.

*Sweden and U.S. S. R.*—Professional institutions, if any, do not hold their own examinations.

*India*—Institution of Engineers (India)—

(1) holds A. M. I. E. examinations for students who take no formal course; wastage is high and few thus qualify for Membership;

(2) exempts Engineering graduates or equivalent from A. M. I. E. examinations.

Notwithstanding all its efforts at the professional level, the Institution of Engineers (Ind.) has so far taken no interest in technical education at the Diploma level.

*Comments and recommendations*—(i) Only in U. K. and India professional institutions hold their own examination, which candidates can take without attending college or doing laboratory work. Failure rate is high and few qualify for Professional Membership that way;

(ii) In U. K. professional institutions make up by cooperating with Government in holding N. C./N. D. examinations.

(iii) Until suitable arrangements are made in India, failures in the A.M.I.E. examinations must somehow be reduced to 50 per cent, in order to increase the out-turn considerably;

(iv) Majority of A. M. I. E. examinees are from Delhi, Calcutta, Bombay and Madras urban areas. If evening courses in selected subjects of A. M. I. E. Sections 'A' and 'B' examinations are provided for 9-10 months per year for State Diploma passed students, the above percentage would rise;

(v) The Defence Ministry's recently started A. M. I. E. courses may be the models for such courses, with necessary adaptations.

9.6. *Authorities making academic awards to co-operative, part-time and correspondence students in Engineering*

*U. S. A.*—Degree level: Universities and colleges approved by E. C. P. D. and other accrediting bodies.

*Diploma level*—Colleges, institutes accredited by E. C. P. D. (only a few such) and other accrediting bodies. Federal/State Governments are not directly concerned.

*U. K.*—Degree level :

*Degree courses*: Universities—Dip. Tech. courses—of National Council for Technological Awards—a Government Body/A. M. I. C. E./A. M. I. Mech. A. M. I. E. E. etc. examinations of relative professional institutions.

*Degree/Diploma levels*: O. N. C./H. N. C., O. N. D. H. N. D. courses. [see Joint committees of relative professional institutions, Ministry of Education.]

*Sweden*—*Degree level*: Colleges of Technology—Government financed, but autonomously administered.

*Diploma level* National Board of Vocational Education—Government body.

*U. S. S. R.*—Degree/Diploma levels: U. S. S. R. Government draw Study Plans in consultation with the Republic Governments and educational authorities and issue general orders regarding grant of facilities for such students. Republic Governments execute those plans through their Technical colleges/Technicums—Entirely Government controlled.

*India*—Degree level—

*Degree courses*—Universities and Indian Institutes of Technology/Science.

*N. D. (Engg.)*—All India Boards of A. I. C. T. E.

*A. M. I. E. (Ind.) Examinations*—Institution of Engineers (I).

*Diploma level*—*N. C. (Engg.)* A. I. C. T. E.

All India Boards of University Diplomas:

Diplomas of State Boards of Vocational Education.

*Comments and recommendations (i)* In each country, Government's control on Technical education appears to be parallel to its control on industry, e.g.

*U. S. A.*—Free private enterprise both in industry and education. No direct Government control, except through grants to universities/colleges and research and development centres.

*U. K.*—Government and professional institutions/bodies share in the control of education/industry.

*Sweden*—More or less as in U. K.

*U.S.S.R.*—Both industry and Technical education are entire'y State controlled.

By analogy, in India with its mixed economy Technical education may be under the joint control of Government and professional institutions.

(ii) Historically, the Indian system of Technical Education is based on and resembles to some extent the U. K. system and it will be pointless to make a sudden break with the past. It has already been suggested that part-time N. C./N. D. courses, modified to the U. K. pattern, will suit India well.

(iii) Formal correspondence study in Engineering, as in U. S. S. R. and Sweden, resembles part-time study to a great extent. Correspondence courses should therefore also lead to award of N. C./N. D. in Engineering rather than to other kinds of qualifications. As in U. K. most Indian students also would try for Professional membership through them.

(iv) Like U. K. in Indian professional institutions and Government (A. I. C. T. E.) should jointly administer N. C./N. D. schemes. In that case, A. M. I. E. and similar professional examinations with their low passing rates may be stopped altogether. Institution of Engineers may not be averse to this suggestion.

(v) In U. K., the Ministry of Education has to deal separately with different professional institutes, but she is a small country with a long Engineering tradition and many common members and *reasonable* co-operation between different professional bodies already exist.

In U. S. A., coordination was achieved by several important professional institutions joining together on the E. C. P. D. 29 years ago.

(vi) In India, the Institution of Engineers (India) is 26 years old. Other professional bodies, though much younger and less established, will grow with the country's industrial development. It will be difficult for the A. I. C. T. E. to deal separately with each professional body and evolve a common policy regarding technical education acceptable to all. So, some co-ordinating body like the E. C. P. D. should be organised in India also. It is understood that the Government of India already have this in view, which, if true, is reassuring.

#### 9.7. Administration of co-operative, part-time and correspondence studies

9.7.1. In para 9.6 N. C./N. D. courses/examinations under the overall academic control of the A. I. C. T. E. and the Coordinating Professional Body (like E. C. P. D. of U. S. A.) have already been recommended for this purpose because they are flexible and may permit experimenting to suit changing industrial requirements. However, to deal with the day to day problems of part-time and correspondence institutions, a separate Board of part-time and correspondence Education (as in U. S. S. R.) should be constituted under the A. I. C. T. E., to be operated by the Ministry of Scientific Research and Cultural Affairs along with other A. I. C. T. E. work. It is strongly recommended that the Ministry's control should be very indirect in such academic matters. This Board's functions would be—

(i) Formulation of Policy;

- (i) Preparation and/or procurement of lesson materials for N. C./N. D. courses, in consultation with the appropriate All India Boards of Technical Studies;
- (ii) Conduct of N. D. Engineering examinations and award of N. D. on a national scale at least for 8—10 years.
- (iv) Legislative measures regarding facilities for training/employment of student-apprentices.
- (v) Coordination with State Boards of Technical Education and industry regarding the operation and standard progress of N.C./N.D. courses.

The courses would, however, be offered in selected colleges/polytechnic mostly under the State Governments all over the country.

9-72. The State Boards of Technical Education already administer full-time State Diploma courses modelled on N. C. (Engg.) courses of the A. I. C. T. E through the Polytechnics under their charge and examine and award State Diplomas to students. As part-time (including correspondence and cooperative instruction (in some subjects) students of N. D./N. C. courses would mostly be enrolled at the regular Engineering Colleges/Polytechnics respectively in the States, naturally the State Boards would be ultimately responsible for their administration also. Each State Board, therefore, should have a Division of part-time and correspondence instruction, with an associated Committee drawing members from education, industry and also Civil bodies. This Division's functions would be :

- (i) To select an Engineering College/Polytechnic for offering part-time, correspondence and/or cooperative courses. In doing so, the considerations will be :
  - (a) that the institution concerned is in a position to do this work effectively and part-time/correspondence students will be academically equal to full-time students;
  - (b) the presence of big industry or a group of small industries nearby;
  - (c) the possibility of employing/training a large body of technical personnel at Degree/Diploma level locally;
  - (d) the availability of obtaining experts from industry as part-time teachers;
  - (e) the possibility of housing the students without building costly hostels.
  - (f) quick public transport;
  - (g) the payment of adequate stipends/remunerations and grant of extra leave to students.

Additional considerations for selecting institutions for part-time instruction are whether—

- (1) correspondence courses may be given in certain subjects; if so, to what extent;
- (2) whole day or day and evening or entirely evening courses are to be offered. The nature of industrial training or employment facilities in the particular locality would decide this.

(i) To organise in cooperation with industry, in the State apprenticeship and employment for a large body of students. Indian industry is not yet ready directly to sponsor students on a large scale unless industrial growth is much faster than hitherto. So colleges must sponsor part-time and correspondence



students on their own initiative and place them in industry for training or employment, for some years. It will save much duplication of effort, if the Division of part-time and correspondence instruction undertakes this work on behalf of all Colleges/Polytechnics in an area. The authority of the State also would be more effective than that of a single College/Polytechnic.

(iii) To select students: The Division itself may do this work on the basis of academic merit and aptitude for hard work and place students into industrial concerns for training/employment and also in the selected Polytechnics/Colleges near their homes.

In large steel works, fertiliser factories, damsite works, the State Board in cooperation with those industrial units may develop works, Technical Colleges and Polytechnics as in U. S. S. R. In the first stage, they would offer parts and ultimately, the whole of the N. D./N. C. courses, if required.

9-73. After the students are posted to a Polytechnic/College, it will be for its Principal to arrange their instruction according to N. D./State Diploma syllabi, mostly with his own staff and partly with part-time specialist teachers.

9-74. Certain students who find it difficult to attend the College/Polytechnic on too many occasions and prefer to study certain subjects through correspondence courses, may be permitted to do so. The institution concerned would send them study guides/lessons prepared by the Board of Part-time and Correspondence Instruction of the A. I. C. T. E., with local adaptations, if necessary. They would return their assignments to the institution for grading and correction. If required, controlled periodical tests at their own places may also be arranged in those subjects for them. At the end of the session, however, all students whether part-time or cooperative, would take the annual examination at the college and successful students promoted to the higher class.

9-8. *Breakup*—Assuming the approximate percentages under each category of Engineering/Technology on Table XIV on page 40 of the Working Group's Report, the breakup of the A. I. C. T. E. target of annual intake of 1,000 students for Degree and 5,000 students for Diploma, part-time and correspondence courses in the III Plan period is tabulated below—

Branch	Degree			Diploma		
	Intake		Out-turn at 60% wastage	Intake		Out-turn at 60% wastage
	% of total	Number		% of total	Number	
Civil .. .. .	25	250	100	50	2,500	1,000
Mechanical .. .. .	25	250	100	20	1,000	400
Electrical .. .. .	25	250	100	18	900	360
Tele-Comm. .. .. .	5	50	20	2	100	40
Chemical .. .. .	5	50	20	3	150	60
Metallurgy .. .. .	5	50	20	2	100	40
Mining .. .. .	5	50	20	1	50	20
Others .. .. .	5	50	20	4	200	80
<b>Total .. .. .</b>	<b>100</b>	<b>1,000</b>	<b>400</b>	<b>100</b>	<b>5,000</b>	<b>2,000</b>

*Comments and recommendations*—(1) Degree level—C/M/E Engineering—annual intake of 250 seats each may be easily supplied by the large out-turn of full-time State Diploma passed Engineers, but in other categories it is doubtful whether that out-turn will be enough to keep the part-time courses running. Anyway, for the comparatively small intake suggested in them part-time and correspondence courses need not be started. If necessary, cooperative courses, with an annual intake of 50 State Diploma passed students (2 groups of 25 each) alternatively attending Works and College in each of the relative categories, may be tried in the regular institutions in the morning at one or two industrial centres. Otherwise, the annual intake for C/M/E Engineering may be increased to 350, 350 and 300 respectively in the III Plan period.

(2) Diploma level/C/M/E Engineering requirements are 2,500/1,000/900 respectively. Others are very small. Facilities for full-time Diploma course, in other categories, which are still insufficient, may first be developed in the III Plan period. If pilot scale experiment is desired, 2½ years' cooperative courses for Higher Secondary passed students or equivalent, alternatively short period courses of 1½ to 2 years for B. Sc.s at the Degree level, may be started in a few places. If the latter courses are not started, the annual intake for C/M/E Engg. may be increased to 2,800/1,200/1,000, respectively, in the III Plan period.

9.9. *Estimate of approximate costs*—The comparative costs of training full-time, part-time and correspondence students are known only for U. S. S. R. [Para 7.4(iv)].

The ratios are full-time/part-time/correspondence

$$3 \quad : \quad 1\frac{1}{2} \quad : \quad 1$$

In U. S. A., it is reckoned that correspondence training costs = 1/5 of full-time college training.

The approximate cost of training a full-time Engg. student in India may be taken as:

	Rs. p.a.
Degree .. .. .	1,200
Diploma .. .. .	700

For a rough calculation, if the U. S. S. R. ratios are adopted, the relative cost per student would be—

Course	Per student	
	Per Degree student	Per Diploma student
	Rs.	Rs.
Full-time .. .. .	1,200.00	700.00
Part-time .. .. .	600.00	350.00
Correspondence .. .. .	400.00	233.00

During the III Plan period, correspondence courses only in certain subjects have been recommended to be started for some part-time students. The initial costs of organising correspondence courses will be considerable. To cover this expenditure it would be wiser to assume that all would be part-time students.

If the annual intake of students for part-time and correspondence students from 1962 onwards is :

Degree level	..	..	..	..	1,000 students
Diploma level	..	..	..	..	5,000 students

The total number of students every year from 1962 to 1966 and the approximate cost of training them would be as below--

Year	Degree	Diploma
1962-63	1,000	5,000
1963-64	2,000	10,000
1964-65	3,000	15,000
1965-66	4,000	20,000
<b>Total (as in April/May, 1966)</b>	<b>10,000</b>	<b>50,000</b>
	@ Rs. 600.00	@ Rs. 350.00
	p.a.	p.a.
	= 60,00,000	= 1,75,00,000
<b>Total</b>	<b>Rs. 2,35,00,000</b>	

On account of reduction of students due to failure and drop-out etc. the total amount may reduce to Rs. 2,00,00,000.

Rs. 2 crores for the III Plan period is 4 times the sanctioned amount of Rs. 50 lakhs set aside by A. I. C. T. E. for part-time and correspondence students. Clearly, the financial allocation has to be increased considerably if effective action is to be taken.

## 10. SUMMARY OF RECOMMENDATIONS

### 10.1. For III Plan period

10.11. Degree level—(1) Evening Degree courses—Observe Jadavpur University's experiment before starting elsewhere—intake—100 students.

(2) Evening N. D. courses (present syllabi) and

(3) A.M.I.E. (Sections A & B) coaching courses offer them as below—

12 hrs/week day and/or evening, as locally convenient in 10/12 large cities drawing students from several small and medium sized industrial concerns rather than from 1/2 big ones. Total 750 seats.

Probable places are—

**Delhi**—(College of Engineering and Technology or Delhi Polytechnic—existing);

**Calcutta**—Jadavpur University—(existing) and B. E. College, Sibpur—classes to be held at a central place, and Calcutta Technical School—(existing).

**Bombay**—(I.I.T. Powai and V.J.T.I.).

**Madras**—(Guindy Engg. College and I.T.I.).

**Bangalore**—(Govt. Engg. College and B.M.S. Engg. College).

**Hyderabad**—(Osmania University Engg. College and Technical College).

**Coimbatore**—(Govt. Engg. College and P.S.G. College of Technology).

**Chandigarh**—(Punjab Engg. College).

**Patiala**—(Thapar College for Engg. & Technology).

**Kanpur**—(I.I.T.).

**Trivandrum**—(University College of Engineering).

(3) *Cooperative Diploma Courses*—Very strongly recommended. Starting them on 4 or 5 cities drawing students from 1 or 2 or more industrial concerns—34 hrs/week, for 22/23 weeks session or more—seats 250 per annum.

Probable places—

Jamshedpur—(TISCO; TELCO; Indian Tubes Ltd.; Indian Wire & Steel Products etc.), Durgapur/Asansol—(Hindustan Steel; Bengal Government Industries; I.I.S.Co. Burnpur and D.V.C. etc.), Rourkela—(Hindustan Steels); Mahanadi Scheme; Sindri—(Fertilisers; Coal Companies etc.), Nangal—(Nangal Fertilisers), Bhakra—(Power and Irrigation Schemes), Bangalore—(Hindustan Aircraft; Hindustan Machine Tools; Indian Telephones; Bharat Electronics etc.), Ranchi—(Heavy Engineering Ltd. and collieries), Bhopal—(Heavy Electricals) Vishakapatnam—Hindustan Shipyards etc.)—Total 1100 students p.a.

10·12. *Diploma level*—(1) Arrange Part-time day and/or evening courses 12 hrs/week in 20-25 places and 30-40 institutions drawing students from small and medium sized industrial concerns. The exact duration and routine of instruction will depend on local conditions—4,000 seats p.a.

Probable places are—

Delhi (2); Calcutta (3); Bombay (3); Madras (2); Hyderabad (2); Nagpur (1); Jabalpur (2); Bangalore (1); Poona (1); Ahmedabad (2); Kanpur (2); Chandigarh (1); Patiala (1); Amritsar (1); Jullundur (1); Ludhiana (1); Patna (1); Cuttack (1); Coimbatore (1); Trichinopoly (1); Kerala (convenient place) (1); Lucknow (1); Baroda (1); Bhopal (1).

(NOTE—Figures within brackets indicate the suggested number of institutes.)

(2) *Cooperative Diploma courses*—Organise these courses (34 hours per week for 22/23 weeks session) in 10/12 places, drawing students from large industries—1,000 seats p.a.

Probable places are—

(1) Durgapur, (2) Asansol, (3) Jamshedpur, (4) Bhilai, (5) Rourkela (6) Bhopal, (7) Ranchi, (8) Sindri, (9) Nangal.—Total 5,000 seats p.a.

## NOTE—

(a) The above lists are only suggestive. Without visiting these places and the institutions and industries in each area and without knowing the local conditions it is not possible to make firm recommendations. In selecting places and institutions for part-time and correspondence education, as far as possible regional interests must be kept in view.

(b) In selected Colleges/Polytechnics courses in Mathematics, Mechanics, Physics, Humanities etc. should also be offered by correspondence, if students prefer them.

10.2. *Administrative Measures*—(1) Create Central Board of part-time and correspondence education under the A.I.C.T.E. This unit could be located at the Delhi Polytechnic, Delhi. Facilities of the proposed Printing Technology Department of that institution will be available for producing lesson materials, as also its experience of part-time day and/or evening classes. Besides, coordination with the Ministries of S.R. & C.A., Education and Commerce and Industry as well as Directorate General of Employment and Training of the Ministry of Labour and Employment will be easy;

(2) Create Divisions of part-time and correspondence education under the State Boards of Technical Education;

(3) Create a Central body like the E.C.D.P.D. of U.S.A. for co-ordinating Professional activities of the Institution of Engineers, (India, Institution of Chemical Engineers, Institution of Telecommunication Engineers, Indian Institute of Architects, Aeronautical Society of India etc.

(4) Introduce partial correspondence instruction in certain subjects, for N.D./N.C. Engg. courses in regular institutions;

(5) Arrange a large number of apprenticeships in industry for part-time/correspondence students;

(6) Institute merit-cum-means scholarships for 25 per cent of part-time and correspondence students at Rs. 100 p.m. per student both at Degree and Diploma levels. Their continuance year by year will depend on an individual's performance;

(7) Arrange special paid leave facilities for such students;

(8) As an interim measure, Institution of Engineers should undertake the following reforms—

(i) Abolition of 'Studentship' Examinations and automatic admission of passed students to 'Studentship'.

(ii) Granting of exemption to State Diploma holders from several subjects of Section A Examination, provided they have secured not less than 60 per cent in them in the State Diploma Examination.

10.3. *For the IV Plan period*, take only preparatory steps as below—

(1) Revise N.C./N.D. (Engg.) courses/examination of the A.I.C.T.E., in consultation with the Central co-ordinating body for professional education, to

introduce 'end-on' courses from the craftsman to Professional level as U.K. and also to incorporate some of the features of Dip. Tech. course (U.K.) to make them suitable for operative courses;

(2) In consultation with the universities, A.I.C.T.E., coordinating body for professional education etc., prepare diversified engg. courses to train specialists through part-time and correspondence courses for growing industries;

(3) Introduce correspondence instruction including oral and laboratory instruction in most subjects upto—Degree level—I & II years part-time N.D. and Diploma level—I and II years part-time N.C. Courses;

(4) Introduce legislation re: paid training of employment leave and other facilities, if industries cannot be persuaded to provide them voluntarily;

(5) Work out schemes for extending the scope of part-time and correspondence courses for the requirements of the IV Plan period.

ANNEXURE I

*Detailed Itinerary of the Tour of Mr. S. C. Sen, Principal, Delhi Polytechnic, Delhi, from 23-2-61 to 24-4-61*

Date/ Time 1	Place 2	Institution/ Courses 3	Persons met 4	Remarks Accredited by 5
23-2-61 3-00 p.m.	Calcutta	.. ..	..	Dep. by air.
24-2-61 11-00 a.m.	Tokyo (Japan)	.. ..	..	Arr. by air.
25-2-61 3-00 p.m.	"	Tokyo Inst. of Technology	..	..
26-2-61 11-59 p.m.	"	..	..	Dep. by air.
26-2-61 9-00 p.m.	U.S.A. San Francisco Cal.	.. ..	..	Arr. by air.
27-2-61 10-00 a.m.	"	Indian Consulate	.. Consul General— Consul—Mr. K. L. Panjabi.	

1	2	3	4	5
		Unty. of California, Berkley—		
3-00 p.m.	San Francisco	(a) Corr. Courses Divn. . .	Dir:—Mrs. Alice Rowbotham	N.U.E.A.
		(b) Engg. Extn. Divn. P.T. courses.	Dir:—Admiral C.T. Singleton.	State Deptt. of Edn. & U.C. E.C.P.D.
		(c) F.T. & Coop. courses—	Coordinator, Dir. or Instruc- tion.	
		City Coll. of San Francisco—		
<u>23-2-61</u> 10-00 a.m.	"			
		(a) Junior Coll. I & II yr. or Deg. courses.	Dr. L. D. Luckmann	St. Deptt. of Edn. & U.C. E.C.P.D.
		(b) Tech. Institute Terminal Day courses, equivalent to Diploma courses of India.		
9-00 p.m.	"	..	..	Dep. by air.
10-05 p.m.	Los Angeles	..	..	Arr. by air.
<u>1-3-61</u> 9-30 a.m.	"	National Technical Schools—		
		(a) F.T. & P.T. courses	Vice-President, Mr. Alvin O. Mark.	..
		(b) Corr. courses ..	Dir. of Edn. ..	N.H.S.C.
			Dr. Louis Mandelbaum.	
12-30 p.m.	"	Trade Tech. Coliege.		



		(a) F.T. Associate in Arts Deg. courses.	President, F. Parker Wilber	St. Deptt. of Edn.
		(b) Tech. Institute Day & Evening courses.	Dean of Studies, Dr. Dwight Adams.	
4-00 p.m.	"	L.A. State College, F.T.& Even. Deg. & Post-Deg. courses.		Western Colleges Association.
<u>2-3-61</u>	"	..	..	Dep. by air.
<u>12-45 p.m.</u>				
<u>2-3-61</u>	Chicago, Ill.	..	..	Arr. by air.
<u>6-00 a.m.</u>				
12-00 noon	"	Devry Tech. Inst--		
		(a) F.T. & P T. courses	Mr. Joseph Gerstion ..	E.C.P.D. Etc.
		(b) Corr. courses	Mr. O. I. Thompson ..	N.H.S.C.
<u>3-3-61</u>	"	Wilbur Wright Junior Col- lege, Chicago Public Schools.	Research Officer, T.V. Col- lege, Dr. H.M. Chausow.	Chicago City.
<u>3-00 p.m.</u>		Educational T.V. Projects.		
<u>3-3-61</u>	"	La Salle Etn. Unty. Corr. courses, including Deg. in Law).	President Mr. E. J. Kendall. Secy. & Edn. Dir.—Mr. Lowell B. Doak, Mr. Charles Bethke, Chairman Accred- iting Commission H.S.C.	N.H.S.C.
<u>10-00 a.m.</u>				

1	2	3	4	5
3·00 p.m.	Chicago, Ill.	Ill. Inst. of Tech. F.T., Coop. & Even. Deg. & Post-Deg. courses.	Dean J.C. Boyce Administrative Vice-President Dean W.W. Colvert, Evening Deptt.	E.C.P.D.
4·30 p.m.	"	Chicago Unty. Home Study Deptt. (no Engg. courses).	Dir:—Dr. Leonard Stein	N.U.E.A.
<u>4-3-61</u>				
10·00 a.m.	"	Science & Industry Museum.		
7·15 p.m.	"	..	..	Dep. by train.
10·15 p.m.	Madison, Wis.	..	..	Arr. by train.
<u>5-3-61</u>				
Sunday				
<u>6-3-61</u>	"	Unity. of Wisconsin. Extn. Divn.	Dir. of Corr. Study Mr. Charles A. Wedmeyer.	
10·00 a.m.				
2·00 p.m.	"	Engg. Extn. P.T. & Corr. courses.	Chairman—Prof. Paul J. Grogan. Dean of Engg. Prof. Kurt Wendt.	W.U./N.U.E.A.
<u>7-3-61</u>	"	U.S. Armed Forces Institute Corr. courses.	Dy. Dir : Dr. Wilbur L. Brothers. Chief of Methods and Training—Mr. Donal F. M. Gibson.	
10·00 a.m.				

5-00 p.m.	"	..	..	Dep. by air.
11-50 p.m.	Washington D.C.	..	..	Arr. by air.
<u>8-3-61</u>				
10-00 a.m.	"	Indian Embassy Chancery	Ambassador Mr. M.C. Chagla. Edn. Counsellor Mr. L. R. Setni Edn. Attache— Mr. G. N. Vaswani, etc.	
1-00 p.m.	"	Luncheon	.. Dr. Robert Allen, Exec. Dir., N.H.L. Council Mr. G. N. Vaswani.	
3-00 p.m.	"	Indian Embassy Chancery		
<u>9-3-61</u>	"			
10-00 a.m.		National Radio Institute. Corr. Courses.	President J. Morrison Smith N.H.S.C.	
1-00 p.m.	"	National Home Study Council.	Exec. Dir— Dr. Robert Allen.	
4-00 p.m.	"	U.S. Office of Edn.	.. Mr. J. B. Doon, (Jr.)	
<u>10-3-61</u>	University of Maryland			
10-00 a.m.	College Park Md.	Coll. of Engg. Unty. Coll. Far East & European Divns.	Dean F.T. Mavis .. Dean Ray W. Ehrensberger	E.C.P.D.
<u>11-3-61</u>	Mt. Vernon Va.	..	..	.. Visit
Saturday				

1	2	3	4	5
<u>12-3-61</u>				
Sunday 6:00 p.m. 7:00 p.m.	Washington D.C. ..	..	..	Dep. by air.
<u>13-3-61</u>				
10:00 a.m.	Philadelphia ..	..	..	Arr. by air.
	..	Unty. of Pennsylvania Engg. Schools.	Vice-President for Engg. Affairs— Dr. C.C. Chambers. Asstt. Vice-President for Graduate (Engg.) Studies—Dr. Sidney B. Shore.	E.C.P.D.
3:00 p.m.	..	School of Education. Vocational Schools Divn. Drexel Inst. of Technology, F.T. & Even, courses.	Prseident— Dr. James Creese. Dean Engg.—Dr. L.A. Brothers. Asstt. —Dean Engg.— Prof. S. H. Raynes. Asstt. —Dir. Industrial Co-ordination—Mr. S. B. Collins.	E.C.P.D.
6:00 p.m.	..	..	..	Dep. by bus.
7:30 p.m.	Trenton N. J. ..	..	..	Arr. by bus.

<u>14-3-61</u>					
10:00 a.m.	"	N. J. State Deptt. of Voc. Edn.	Supervisor—Mr. J. Segear		
11:00 a.m.	Princeton N.J.	Educational Testing Service.	Dr. Anna Dragositz Mrs. Rosenthal.	Arr. by car.	
4:00 p.m.	"	Princeton Unty.	..	Short visit.	
5:00 p.m.	"	..	..	Dep. by car.	
6:00 p.m.	Boundbrook N.J.	..	..	Arr. by car.	
<u>15-3-61</u>					
8:00 a.m.	..	..	..	Dep. by bus.	
12:00 noon	Scranton, Pa.	..	..	Arr. by bus.	
12:30 p.m.	"	International Corr. Schools. (USA) I.C.S. (International)	President—Mr. John Villame. Dir. Mr. W. Richards. President—Mr. W. Conneell	N.H.S.C.	
	"	..	..	Dep. by bus.	
<u>15-3-61</u>					
7:00 p.m.					
11:00 p.m.	New York NY.	..	..	Arr. by bus.	
<u>16-3-61</u>					
10:00 a.m.	"	New York City Coll. F. T. & Even. courses (Deg. & post-Deg. level).	Dean of Engg— Mr. William Allan. Asstt Dean—Dr. Seymour C. Hyman	E.C.P.D.	

1	2	3	4	5
3·00 p.m.	New York NY.	Brooklyn Poly. Inst. Deg. & Post-Deg. courses.	Administrative Dean— Dr. Warren L. McCab.	E.C.P.D.
6·00 p.m.	„	Indian Consulate General	Reception.	
17-3-61				
10·00 a.m.	„	American Foundation for Overseas Blind.	Mr. Paul J. Langan, Counselor for the Far East.	
11·30 a.m.	„	Columbia Unty. School of Engg. F.T.—Deg & post Deg. Evening—Master's Deg. courses.	Assoc. Dean— Mr. W.J. Hennessy Asstt. Dean— Mr. W.C.R. Corey.	E.C.P.D.
18-3-61	„	..	..	Dep. by air.
9·00 p.m.				
19-3-61	London, U.K.	..	..	Arr. by air.
9·00 a.m.				
20-2-61	London, U. K.	..	High Commission for India	Dr. N. S. Junankar, Ednl. Adviser. Edn. Officer— Mr. S. Vedantam.
9·00 a.m.				
2·30 p.m.	„	King Edward VII Nautical Coll.—F.T., P.T. & Corr. courses.	Principal— Capt. H. F. Chase, O.B.E.	Nautical Engg. & Navigation

<u>21-3-61</u>				
11.00 a.m.	"	Northampton Coll. of Adv. Technology.		
		(1) Dip. Tech. courses	Vice-Principal—	
		(2) B.Sc. Engg. Lond. (p.t.)	Mr. C.W. Trow.	
		(3) Other courses.		
<u>22-3-61</u>				
10.00 a.m.	"	Brunel Coll. of Technology.	Principal—	
		Dip. Tech. & N.D. courses.	Dr. J. Topping.	
3.00 p.m.	"	Hendon Tech. Coll. N. D., N.C., Sandwich, F.T./P.T. & Even. courses.	Principal— Dr. E. Williams.	
<u>23-3-61</u>				
8.00 a.m.	"			Dep. by train.
10.30 a.m.	Birmingham			Arr. by train.
11.00 a.m.	"	Birmingham Coll. of Adv. Technology. Dip. Tech. courses.	Vice-Principal— Mr. K. L. Stretch.	
5.00 p.m.	"			Dep. by train.
5.30 p.m.	Wolverhampton			Arr. by train.
<u>24-3-61</u>				
10.00 a.m.	"	Wolverhampton & Staffordshire Coll. of Technology. F.T. & P.T. courses.	Principal— Mr. Robert Scott.	
		(1) B.Sc.		
		(2) N.D./N.C.		
11.30 p.m.	"			Dep. by train.
<u>25-3-61</u>				
7.00 a.m.	Glasgow Balloch			Arr. by train.

1	2	3	4	5	
<u>26-3-61</u> Sunday	Loch Lomond	..	..	..	Visit
<u>27-3-61</u> 10 00a.m.	Glasgow	..	Inspector of Tech. Institutions.	Mr. Pendleton.	
11 00 a.m.	"	..	Coatbridge Tech. Coll.	Principal— Mr. R.H.Garner.	
3 00 p.m.	"	..	N.D./N.C. courses F.T., P.T. & Even. School of Engg. Burnbank—	Principal— Mr. J. A. Ryder.	
<u>28-3-61</u> 9 00 a.m.	"	..	N.C. F.T./P.T. & Even. courses.		Dep. by air.
10 00 a.m.	Manchester	..			Arr. by air.
11 30 a.m.	"	..	A.E.I.Ltd.	.. Manager Edn. Deptt.— Mr. R. F. Marshall. Asstt. Manager— Mr. B. Dawkins.	
6 00 p.m.	"	..			Dept. by train.
10 00 p.m.	London	..			Arr. by train.
<u>29-3-61</u> 10.00 a.m.	"	..	International Corr. Schools	Secretary— .. Mr. Magone.	



Principal—(Engg. Deptt.)  
Mr. E.R. Andrew.

<u>29-3-61</u> 3.00 p.m.	London	.. C.E.G. Board, Edn. & Training Branch, Holborn.	Asstt.—Edn. & Trng. Officer—Mr. Nobes.	Corres. courses for Boiler/Turbine Operators and Supervisory Engineers.
<u>30-3-61</u> 10.30 a. .	..	Inst. of Civil Engineers ..	Asstt. Secretary—Mr. Constant.	A.M.I.C.E. Exams. & courses
12.15 p.m.	..	High Com. for India, Consulate Divn. (Visa Sec.)		
2.15 p.m.	..	Ministry of Edn. ..	Inspector of Tech. Edn. Mr. H.W. French.	
31-1-61	..	Good Friday—Public Holiday.		
<u>1-4-61</u> 11.00 a.m.	..	..	..	Dep. by air
2.00 p.m.	Copenhagen (Denmark)	..	..	Arr. by air
<u>2/3-4-61</u>	..	Easter Sunday and Easter Monday	Public Holidays	
<u>4-4-61</u> 10.00 a.m.	..	..	..	Dep. by air
10.15 a.m.	Malmo (Sweden)	..	..	Arr. by air

1	2	3	4	5
11:00 a.m.	Malmo (Sweden)	Hermods Corr. School (Non-profit)	Rector—Mr. Gunnar Gadden Ednl. Dir—Mr. B. Holmberg	Laroverksingen jorer Dipl. courses
6:00 p.m.	"	"	"	Dep. by air
8:00 p.m.	Stockholm	"	"	Arr. by air
5-4-61				
10:00 a.m.	"	Indian Embassy	Ambassador— Mr. Kewal Singh. 1st Secy.— Mr. A.S. Dhawan	
1:00 p.m.	"	N. K. I. Skolan Corr. School.	Rector—Mr. Sko'd	Laroverksingen jorer Dipl. Courses.
6-4-61				
10:00 a.m.	"	National Board of Voc. Edu.	Bureau Dir—Mr. Hessler	
2:00 p.m.	"	Aftonskolan—State Even- ing School for Tech. Edu- cation	Rector—Mr. N.O. Elfman	Fackskolelinje courses.
7-4-6				
10:00 a.m.	"	Royal Inst. of Technology	Bureau Director— Mr. Hagstrom.	
1:00 p.m.	"	Indian Embassy		
4:00 p.m.	"	"	"	Dep. by air
6:00 p.m.	Helsinki (Finland)	"	"	Arr. by air
8-4-61				
11:00 a.m.	"	Indian Embassy	Charge de'affairs— Mr. M. M. Khurana.	
				Dep. by air

7-00 p.m. 9-4-61	Leningrad (U.S.S.R.) ..	Sunday ..	.. ..	.. ..	Arr. by air
<u>10-4-61</u> 12-30 p.m.	..	Leningrad Poly. Institute	Vice-Dir. & Docent in Chair of Physics— Mr. A. A. Babanov Asstt. Mr. V. Mikhachev	F.T. & Even. Specialist Dipl. courses	
<u>11-4-61</u> 10-00 a.m.	..	North Western Poly. Inst. by Correspondence.	Dir. : Mr. A. S. Zaryalov Docent—Mr. Sharov Asstt. Dir.—Mr. A.V. Lukin	Specialist Diploma corr. courses.	
<u>11-4-61</u> 3-00 p.m.	Leningrad (U.S.S.R.)	Secondary School No. 100	Dir. : Mr. P.N. Nicholaev	Upto 8th class.	
<u>12-4-61</u> morning	..	..	..	..	Sightseeing
4-00 p.m.	..	..	..	..	Dep. by air
5-00 p.m.	Moscow	..	..	..	Arr. by air
<u>13-4-61</u> 11-00 a.m.	..	All Union Corr. Poly. Insti- tute.	Dir. : Mr. S. K. Kantenik Dy. Dir. (Studies)— Mr. G. P. Lyzo Office—Mr. V. G. Barisenko Foreign Languages— Mrs. E.V. Ludvigova (Interpreter)	Specialist Dipl. Corr. courses.	

1	2	3	4	5
3-30 p.m.	Moscow	Embassy of India	.. Mr. A. Gonsalves— First Secretary.	
14-4-61	..	Public reception to Maj. Y. Gagarin, Astronaut	visit Agricultural & Industrial Exhibition.	
Public Holiday				
15-4-61				
11-00 a.m.	..	Energetic Inst. & Associated Corr. Institute.		
3-00 p.m.	..	Welding Technicum	.. ..	
16-4-61	..	Sunday	.. ..	Sightseeing
17-4-61				
1-00 p.m.	..	Luncheon with Mr. K. P. S. Menon, Ambassador for India.		
18-4-61				
10-30 a.m.	..	Friendship University & Luncheon.	Pro. Rector— Mr. P.D. Erzin.	
2-30 p.m.	..	Moscow Lomonosoff University		
19-4-61				
1-00 p.m.	..	Ministry of Higher and Professional Education, U.S.S.R.	Minister—Mr. V. Eleutin Officials: Mr. P. I. Palukhin Mr. V. A. Makhluiev (dealing with India)	
20-4-61				
10-30 a.m.	..	Moscow Dynamo-Electrical Machinery Works.	Dy. Dir., Mr. Barisov	

1-30 p.m.	"	Luncheon at All Union Corr. Poly. Institute.		
4-00 p.m.	"	Indian Embassy	..	
<u>21-4-61</u>	"			
1-15 a.m.	Tashkent, Uzbekistan	..	..	Dep. by air
8-00 a.m.		..	..	Arr. by air
12-00 Noon.	"	Ministry of Education, Uzbekistan.	Minister-- Mr. S. J. Alievich Dy. Minister -- Mr. Segoff Dy. Dir.--C.A. Poly. Inst. Prof. Rahamov. Officials--M s. J. Gullov and Azizov	
<u>21-4-61</u>				
1-30 p.m.	Tashkent Uzbekistan	Central Asian Poly. Insti- tute & Luncheon	Director Dy. Dir.-- Prof. G. Rahamov Dean Energetic Faculty-- Docent Badruddin.	
<u>22-4-61</u>				
9-30 a.m.	"	Textile Mills	.. ..	
11-30 a.m.	"	Central Asian Textile Inst.	Dir.--Madam H. Azamova	
<u>23-4-61</u>	"	Sunday	.. ..	Sightseeing
<u>24-4-61</u>	"			
5-30 a.m.	"	..	..	Dep. by air
8-50 a.m.	New Delhi (Palam)	..	..	Arr. by air

*Explanations to abbreviations used*

- Adv.=Advanced.  
 Arr.=Arrival.  
 Assoc.=Associate.  
 Asstt.=Assistant.  
 Cal.=California.  
 Com.=Commission.  
 Coll.=College.  
 Coop.=Cooperative.  
 Corr.=Correspondence.  
 Dep.=Departure.  
 Deptt.=Department.  
 Deg.=Degree.  
 Dipl.=Diploma.  
 Dir.=Director.  
 Divn.=Division.  
 Dy.=Deputy.  
 Edn.=Education.  
 Ednl.=Educational.  
 Engg.=Engineering.  
 Even.=Evening.  
 Exam.=Examination.  
 Exec.=Executive.  
 Extn.=Extension.  
 F.T. or f.t.=full-time.  
 Inst.=Institute.  
 Jr.=Junior.  
 N.C.=National Certificate.  
 N.D.=National Diploma.  
 P.T. or p.t.=Part-time.  
 Prof.=Professor.  
 Poly.=Polytechnic.  
 Sec.=Section.  
 Secy.=Secretary.  
 Tech.=Technical.  
 Trng.=Training.  
 T.V.=Television.  
 Unty.=University.  
 U.C.=University of California.  
 Vocl.=Vocational,

ANNEXURE II  
*The Institution of Engineers (India)*  
*A.M.I.E. Examinations*

Year	Examinations	Appeared	Passed
August, 1928	Section A	4	1
	Section B		
April, 1929	Section A	8	3
	Section B	6	2
Nov., 1956	Studentship	81	19
	Section A	1,781	162
	Section B	552	139
May, 1957	Studentship	115	10
	Section A	1,933	145
	Section B	646	135
Nov., 1957	Studentship	162	30
	Section A	2,144	207
	Section B	565	150
May, 1958	Studentship	181	29
	Section A	2,198	175
	Section B	475	107
Nov., 1958	Studentship	217	41
	Section A	2,775	235
	Section B	532	159
May, 1959	Studentship	247	38
	Section A	2,988	264
	Section B	489	151
Nov., 1959	Studentship	240	38
	Section A	3,393	269
	Section B	551	87
May, 1960	Studentship	444	38
	Section A	3,989	331
	Section B	749	133
Nov., 1960	Studentship	456	63
	Section A	4,495	692
	Section B	804	130

The number of passes, in the case of the Institution examinations, should not be strictly related to the number appearing, as candidates are allowed to appear, if they choose, even at one paper a time. If the required exemption marks are secured, a candidate is not required to appear in this paper again. Accordingly, the number of passes indicate the number of students who have successfully completed the examinations at that particular appearance.

**SCHEME FOR THE ESTABLISHMENT OF NATIONAL INSTITUTE  
OF FOUNDRY AND FORGE TECHNOLOGY**

*National Institute of Foundry and Forge Technology*

1. *Outlines of the Scheme*—During the First and Second Plan periods, Technical Education has expanded on a large scale. As compared to 1947, the present position is that facilities for degree and diploma courses have increased four-five fold. This expansion of facilities is, however, quantitative and restricted in the main to the basic branches viz. Civil Engineering, Mechanical Engineering, Electrical Engineering, Chemical Engineering, Mining and Metallurgy. The industrial development of the country, however, requires not only larger numbers of general engineers and technicians but personnel trained in various specialised fields. Qualitative improvement of training facilities and particularly, diversification of the fields of training is, therefore, necessary. A stage has now reached at which for the various engineering projects to be undertaken during the third and subsequent Plan periods, the necessary technical personnel trained in specialised fields should be made available as quickly as possible. For this purpose, institutes for the training of specialist personnel should be established in a planned manner.

2. Foundry Engineering and Forging are among specialised fields in which training facilities should be organised at a centre chosen specifically for the purpose. The centre should provide facilities for in-plant training, design training and other aspects of work on an industrial scale. It should also provide facilities in the form of part-time services of industrial experts, in the conduct of the training programme.

3. The Government of India are establishing a heavy machine building plant and a large foundry and forge plant at Ranchi. Ranchi is, therefore, eminently suited to the establishment of an institute for training in foundry and forge technology since the institute could work in close association with the heavy machinery plant and foundry and forge plant there.

4. There are only two institutions in the country viz. the Indian Institute of Science, Bangalore and the Indian Institute of Technology, Kharagpur, where foundry engineering is taught at post-graduate level. The courses, however, are essentially academic in content, designed to prepare candidates for Master's degree in this field. The development of the industry, however, required training facilities of a different kind that could be closely related to industrial needs. The training programme should be formulated so as to include a minimum period of practical training in industry. Further, the specialists required in this field consist not only of engineers but supervisory personnel to fill a large number of positions at the middle level.

5. The proposal, therefore, is to establish a National Institute of Foundry and Forge Technology at Ranchi that could work in close collaboration with



the heavy machinery and foundry project there. The function of the institute will be to train engineer-specialists in Foundry and Forge Technology as also supervisory technicians. The courses of training conducted at the institute will be self-contained, emphasis being on practical experience in industry which will be secured by devoting approximately one-third of the course time to practical work in industry.

6. *Description of the Scheme*—The industrial development of the country depends in large measure on the capacity of its foundries. Although India has produced metal castings, progress has been unsatisfactory from all points of view. That is primarily due to a lack of engineering advance as also due to lack of facilities for the training of technical personnel.

7. The position, however, is fast changing as expansion of engineering industry on a large scale is being undertaken under the Five Year Plans both in the public and private sectors. The foundry industry as the main basis of engineering industry is assuming increasing importance and, therefore, it has to be built up and developed along modern lines to meet the increasing demands of engineering industry. The primary requirement of this development is an adequate supply of engineer-specialists and supervisory technicians in foundry engineering.

8. The Indian Institute of Foundrymen in cooperation with the Ministry of Commerce and Industry, the Armour Research Foundation and the Indian Institute of Technology, Kharagpur, conducted some time back at the Kharagpur Institute a series of short-term courses in modern foundry practice for persons working in the industry. These courses demonstrated that there was a pressing need for an organised and long-term training programme at an institute specially set up for the purpose. This should be in addition to post-graduate courses in Foundry Engineering started at the Kharagpur Institute and the Indian Institute of Science, Bangalore which are orientated towards the academic aspects of this branch.

9. A large foundry and forging plant and a heavy machinery plant are in the course of erection at Ranchi. Elsewhere many small and medium-sized foundries are being established and the existing units are being expanded. Other public undertakings as for instance, the Hindustan Machine Tools, Railways, Defence Establishments, etc., are planning new foundry units and expanding the capacity of the existing ones. All these have established the urgent need to train engineer-specialists and supervisory technicians to man the various projects. Purely as an indication of the order of demand for technical personnel, the Ranchi project alone requires the following—

- (a) *Graduate-engineers specially trained in foundry and forging*—400 initially and 600 when the project has been expanded. Annual replacement—60.
- (b) *Skilled workers*—3,000 initially and 4,500 when the expansion of the project has taken place. Annual replacement—150.

A substantial part of the skilled workers that may be estimated at about 1/6th of the total force will be required to fill supervisory positions. It is understood that an equally large project is being planned to be established elsewhere in the public sector.

10. In view of these considerations, it is necessary to establish a National Institute Foundry and Forge Technology at Ranchi generally on the same lines as the National Foundry College, U.K., Giesserei Institute, Germany, Ecole Superieure de Fonderie, France and similar institutions elsewhere in the world, to train technical personnel for the industry in an organised manner.

11. Ranchi has been chosen for the location of the institute since it can work in close association with the foundry and forge plant and Heavy machinery plant there and also secure the necessary practical training facilities for the candidates. These industrial units will also assist the institute in the training programme in respect of design, production, testing and research.

12. The institute will concern itself primarily with the training of engineer specialists and supervisory technicians for the foundry and forge industry. It will also conduct short-term and refresher courses for persons working in industry in the latest methods and techniques of production, design and development.

13. For the engineer specialists, the institute will conduct a full-fledged course of 18 months duration on a sandwich basis. The sandwich course will consist of two alternate periods of training in the institute and in the industry of six months and three months, respectively. The course will be open to graduates in mechanical engineering or in metallurgy.

14. The course for the training of supervisory technicians will also be of 18 months duration on a sandwich basis. The sandwich arrangement will be the same as that for engineer-specialists. The course will be open to candidates who possess a recognised diploma or equivalent qualification in mechanical engineering or in metallurgy.

15. The refresher courses for persons working in industry will normally be of three months' duration which will include at least six weeks of theoretical instruction at the institute.

16. *Courses of Training*—An outline of the courses proposed to be conducted at the institute is given at Annexure I. The admission requirements, the duration, etc. are as given below—

Course	Duration	Admission requirements
1. Post graduate diploma Course for Engineer specialists.	18 months on sandwich basis.	Degree requirements in Mechanical Engineering or in Metallurgy.
2. Certificate Course for Supervisory Technicians.	18 months on sandwich basis.	Diploma in Mechanical Engineering or in Metallurgy.
3. Refresher or short-term courses	Upto three months	Persons working in industry and sponsored by their organisations will be admitted.

17. The above is indicative of the nature and scope of work of the institute. The Board of Governors of the Institute will however, decide from time to time the other courses to be conducted, their duration, admission requirements etc. They will also decide any changes in the above programme of work.

18. *Size and Location*—The institute will be located at Ranchi and will be within easy reach of the foundry and forge plant and heavy machinery plant there.

19. It is not possible at this stage to make a precise estimate of the requirements for engineer-specialists and supervisory technicians required for foundry and forge industry. Nevertheless, the information collected from various sources reveals that on a long range basis, the industry would require at least 100 engineer-specialists and 150 supervisory technicians trained every year. This demand will go up as the industry is further expanded during the fourth and subsequent plan periods. Only a part of this demand can be met by the existing centres of training or by the arrangements made by the industry itself to train graduate-engineers and diploma-holders. The rest have to be trained in the proposed Foundry Institute. Therefore, in the first phase of establishment and development of the Institute, provision should be made for the admission of at least 35 graduate engineers and 100 diploma-holders. In the second phase, the capacity should be increased to 50 candidates for the Diploma Course and to 150 candidates for the Certificate course, depending upon the additional demand felt for technical personnel.

20. After the Institute has been established and sufficient experience has been gained in conducting the courses, a full-fledged National Certificate course in Foundry and Forge Technology should be planned that may be of four years' duration with Matriculation or Higher Secondary as the minimum admission qualification. This course also should be conducted on a sandwich basis.

21. For the establishment and development of the Institute a site of approximately 50 acres should be required at Ranchi. This area should meet the requirements of the main buildings, hostels, staff quarters and other amenities. The Heavy Engineering Corporation has suggested a suitable site at Ranchi for the Institute which is very close to the foundry and forge plant there and which would facilitate close collaboration between the two organisations. This site should be secured from the State Government.

22. *Buildings*—The buildings for the Institute will be designed in harmony with the layout of the foundry and forge plant and heavy machinery plant at Ranchi. The total built-up area will be approximately 65,000 sq. ft. as per details given in Annexure II. The main features of the Institute building are; three lecture rooms large enough to accommodate 200 students, 100 students and 50 students; three drawing halls each capable of accommodating 30 students, laboratories for Chemistry, Metallurgy, Metal Testing, X-ray, Sand-Testing, Combustion and Refractories, High Temperature Work, Core Materials and for research, accommodation for administration, staff rooms, students' common room and board room. The workshops will include pattern shop, foundry, forge shop etc.

23. When the institute is functioning at full capacity there will be about 270 candidates, in residence undergoing regular courses. In addition, at least

30 candidates will be attending refresher short-term and other courses. Provision has, therefore, to be made to accommodate about 300 candidates in the hostels. The hostels should have at least 100 single-seat rooms for graduate-engineer trainees and 200 double-seated rooms for diploma-holder trainees. Adequate provision should also be made for the club room, reading room and other amenities for the trainees. The details of the hostels together with the estimates of cost are given at Annexure III. In addition, provision has also to be made for a small guest room to accommodate 10 persons at a time.

24. In view of its location and other factors the Institute should provide housing for staff that may include residences for the Director and instructional staff, foreign experts and for as many members of the administrative staff as possible. The schedule of residences together with estimates of cost are given in Annexure IV.

25. *Equipment*—The in-plant training facilities will be provided in the foundry and forge plant at Ranchi. The equipment requirements of the Institute would therefore, relate mainly to experimental Foundry, Metallurgical Laboratories, Metal Testing, X-ray, Combustion and Refractories Laboratories, High Temperature Laboratory, Core Materials and related works. The workshops also have to be equipped in relation to the nature and scope of the services rendered by the various shops.

26. A list of major items of equipment required for the laboratories, workshops etc. is given at Annexure V. The list is only indicative of the equipment requirements for purposes of making estimates of cost of the project. The final list together with detailed specifications etc. for each item should be prepared by the Director and the staff of the Institute. The estimated cost is of the order of Rs. 36-40 lakhs including library, furniture etc..

27. The Institute should also have a staff car and a 30 seater bus to facilitate continuous traffic between the Institute and the foundry and forge plant where the trainees have to undergo in-plant training. The staff car, is necessary for the normal official work of the Director and the instructional staff.

28. *Staff*—For the permanent instructional staff of the Institute, men of high calibre will be needed who combine first-rate technical qualifications in the various fields with industrial experience and teaching ability. Persons possessing the requisite qualifications and experience can only be attracted to the Institute by offering them terms comparable to those offered by industry and also by creating conditions in which they would remain contented and carry out their work efficiently.

29. The instructional staff required will consist of 16 persons who will be recruited in a phased manner over a three-year period during which the Institute is developed to full capacity. It is expected that some junior members of the instructional staff will be recruited from among the most able of the early trainees of the Institute.

30. In order to assure that the training at the Institute is of the highest standard and quality possible, select members of the instructional staff should be sent abroad for advanced training for periods ranging from one to two years. For this purpose, about 10 training fellowships should be secured. Each member of the instructional staff who is sent abroad for training will

first spend at least one year at the Institute working along with experts or senior staff members, developing the courses and sharing the instruction in the first session so that he is thoroughly familiar with the problems before going abroad.

31. A complete schedule of instructional, administrative and other categories of staff required is given in Annexure VI.

32. In the formative stages of the Institute which may extend over a period of three years it would be desirable to secure the services of about five foreign experts to assist in the organisation and development of the courses of training along correct lines, research and related aspects of work. The foreign experts should be chosen with a heavy bias towards industrial experience and training of engineer-specialists and technicians. It would be the special responsibility of the experts to train the junior instructional staff in order to supplement the advanced training to be given to them abroad. Since developmental research will be one of the functions of the Institute, the foreign experts would also be in a position to assist in developing this activity in the various departments.

33. *Organization and Administration*—The Institute will function as an autonomous organisation registered under the Societies Registration Act of 1860. The administration and management of the affairs and finances of the Institute will be vested in a Board of Governors consisting of 15 persons as shown below:

- 1—Chairman—to be appointed by the Central Government.
- 2,3,4—Three nominees of the Central Government to represent its Ministries of Finance, Scientific Research & Cultural Affairs and Commerce and Industry.
- 5—One representative of the All India Council for Technical Education.
- 6, 7, 8, 9 & 10—Five representatives of industry including public enterprise nominated by the Central Government.
- 11 & 12—Two members to represent other interests such as engineering profession, technical institutions etc. nominated by the Central Government.
- 13, 14—Two persons to be co-opted by the Board as a whole.
- 15—The Director of Institute (Ex-officio member—Secretary).

34. A draft Memorandum of Association and Rules for the registration of the Society is given at Annexure VII.

35. *Estimates of Cost*—The total estimates of cost of the project are as shown below—

#### *A. Capital Expenditure*

- |  |                 |
|--|-----------------|
| 1. Land (about 50 acres)   | Free of cost.   |
| 2. Development of land & provision of water supply, electricity, sewage, roads & other services. | Rs. 5.0 lacs.   |
| 3. Institute Buildings   | Rs. 12.12 lacs. |

4. Hostels inclusive of furniture and equipment for hostels.	Rs. 16.0 lacs.
5. Residential Houses & Guest House .. .. .	Rs. 16.0 lacs.
6. Equipment & Library, Furniture & Vehicles ..	Rs. 36.40 lacs.
Total ..	Rs. 85.52 lacs.

#### B. Revenue Expenditure

1. Staff salaries, allowances, Provident Fund, T.A. for Board of Governors etc. plus Rupee expenditure on Foreign Experts etc.	Rs. 5.50 lacs.
2. Running Expenses including Water & Electricity charges, postage, stationery, consumable materials, library, estate maintenances, Scholarships* etc. . . .	Rs. 5.0 lacs.
Total ..	Rs. 10.50 lacs/ year.

36. *Foreign Assistance*—It is necessary that foreign assistance should be secured in the establishment and development of the Institute especially for equipment to be imported from abroad. services of experts and facilities for the training of the staff abroad. The quantum of foreign assistance required may be estimated as shown below: —

1. *Equipment & Library*—Rs. 20.0 lakhs or \$ 400,000.
2. *Foreign Experts*—Five Experts for periods upto three years; or 15 man-years. cost: \$ 200,000.
3. *Training of Indian Staff*—For 10 members for periods upto two years: Cost : \$ 60,000.

*Total estimated cost of foreign assistance required*—\$ 660,000.

37. The question of whether the above assistance should be secured from the U.N. Technical Assistance Programme or UNESCO Programme or T.C.M. or any other programme may be decided by the Central Government. The Central Government may also consider whether this assistance should not be sought from an individual country as for instance, Czechoslovakia which is collaborating in the establishment of the foundry and heavy machinery building projects at Ranchi, on a bi-lateral agreement basis.

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\*For 50% of the Candidates at Rs. 200/- p.m. for graduates and Rs. 100/- p.m. for diploma holders.

## ANNEXURE I

*Post-Graduate Diploma Course in Foundry and Forge Technology*

## Curriculum of Studies

*First Term*—Six months duration. Common to both foundry & Forge.

	Hrs/Weeks.		Exam Marks	
	L. L.	D. F.	Paper	Sessional
2001 Applied Maths .. .. .	2	3	100	100
2002 Chemistry of Sands, clays, oils etc.	2	6	100	100
2003 Physical Metallurgy .. .. .	2	6	100	100
2004 Combustion Engineering and Refractories .. .. .	2	3	100	100
2005 Strength of Materials .. .. .	1	3	100	100
2006 Seminar .. .. .	..	3	..	..
	9	24	500	500

Examination in all subjects after term.

*Second Term*—Three months Training in Factory*Third Term* - Six months.*Foundry Stream*

	L.	L.D.F.	Paper	Sessional
2007 Heat Treatment and Furnace Design.	2	3	100	100
2008 Foundry Metallurgy .. .. .	2	3	100	100
2009 Foundry Technology .. .. .	2	6	100	100
2010 Foundry M/C & Equipments .. .. .	1	6	100	100
2011 Industrial Engg. & Managements	2	3	100	100
2006 Seminar .. .. .	..	3	..	..
	9	24	500	500

*Forge Stream*

2007 Heat Treatment & Furnace Design	2	3	100	100
2012 Metallurgy of Plastic working ..	2	3	100	100
2013 Technology of Plastic working ..	2	6	100	100
2014 Forging machines and Equipments	2	3	100	100
2011 Industrial Engg. & Management ..	2	3	100	100
2006 Seminar .. .. .	..	3	..	..
Examination in all subjects .. .. .	10	21	500	500

*Fourth Term*—3 months duration. Project and Thesis Final Examination Viva Voce.

*Certificate Course in Foundry and Forge Technology*

## Curriculum of Studies

*First Term—Six months duration*

	Hrs./Week		Exam. marks	
	L.	LDF	Paper	Sessionals
1001 Engineering Maths .. ..	2	3	100	50
1002 Chemistry .. ..	2	3	100	50
1003 Strength of Materials .. ..	2	3	100	50
1001 Workshop Theory .. ..	4	6	200	150
1005 Machine Drawing .. ..	..	6	..	200
1006 Seminar .. ..	..	3	..	..
	10	21	500	500

Examination in all subjects.

*Second Term—3 months duration. Training in factory.**Third Term—6 months duration.*

1007 Foundry Technology .. ..	2	6	200	100
1008 Plastic Working of metals .. ..	2	6	200	200
1009 Jigs, fixtures .. ..	..	3	..	50
1010 Metallurgy & Heat Treatment .. ..	2	3	100	100
1011 Industrial Engineering .. ..	2	3	100	50
1006 Seminar .. ..	..	3	..	..
	8	24	600	400

Examination in all subjects.

*Fourth Term—3 months duration. Training in factory.*

Final Examination Viva-Voce.

## ANNEXURE II

*Accommodation Requirements**A. Main Building—*

			sft.
Head of the Institute and Meeting Room .. ..	..	..	500
Other Staff members .. ..	..	..	1,000
Administration. Stores etc. .. ..	..	..	2,000
Staff Common room .. ..	..	..	600
Students Common room .. ..	..	..	800
Library & Reading Room .. ..	..	..	1,500
Lecture Theatres to seat 200 students .. ..	..	..	3,000
100 students .. ..	..	..	1,500
50 students .. ..	..	..	750
Model room .. ..	..	..	1,500
3 Drawing Halls to seat 30 students each .. ..	..	..	3,000
Chemistry Laboratory .. ..	..	..	2,000



	s ft.
Metallurgy Laboratory .. .. .	2,000
Metal Testing Laboratory .. .. .	1,000
X-ray and Dark Room .. .. .	1,000
Sand Testing Laboratory .. .. .	1,000
Combustion & Refractories Lab. High Temperature Laboratories	4,000
Core Materials Laboratories .. .. .	500
Research & Other Special Laboratories .. .. .	5,000
	32,650
Add 15% for walls, corridors, Lavatories etc. .. .. .	14,700
Total .. .. .	47,350

*B. Workshops—*

	s ft.
Patternshop .. .. .	1,500
N.F. Foundry .. .. .	1,500
Steel Foundry .. .. .	3,200
C.I. Foundry .. .. .	3,200
Stores .. .. .	1,500
Forgeshop .. .. .	3,200
	14,100
Add 25% for walls, corridors etc. .. .. .	3,525
Total .. .. .	17,625
Grand Total .. .. .	64,975
Or say .. .. .	65,000

*Estimates of cost*

A. Main Buildings: 47,350 sq. ft. @ Rs. 20 per sq. ft. inclusive of services.	9,47,000
B. Workshop: 17,625 sq. ft. @ Rs. 15 per sq. ft. inclusive of services.	2,64,375
	12,11,375
Or say .. .. .	12.12 lakhs

### ANNEXURE III

#### *Hostels*

When the Institute is functioning at full capacity there will be about 270 candidates undergoing regular courses in residence at a time. In addition, at least 30 candidates will be attending refresher, short-term and other courses. Provision should therefore be made to accommodate about 300 candidates in the hostels.

The hostels should have atleast 100 single-seated rooms for graduate-engineer-trainees and 200 double-seated rooms for Diploma-holder-trainees. Adequate provision should also be made for club room, reading room and other amenities for the trainees.

The hostels will be built in two blocks—one of 100-single seated rooms and another of 200-double seated rooms. The net living space in the single-seated rooms is about 100 sq. ft. and that in a double-seated room 85 sq. ft./candidate. Assuming a factor of three times living space for plinth (inclusive of dining hall, lounge, library, circulation, thickness of walls toilets etc.), the gross area per capita comes to 300 sq. ft. in the single-seated hostel and 255 sq. ft. in the double-seated hostel.

In addition to above, provision has to be made in the hostels for sick lay, guest rooms, dispensary and other amenities.

The total cost of the hostels including furniture, utensils, crockery, cutlery etc. and services may be estimated at Rs. 16·0 lacs.

#### ANNEXURE IV

##### *Residences for Staff*

Category of staff.	Total plinth area per Unit Quarter.	
Director (1)	2300 sq. ft. plus 656 sq. ft. for garage and servant quarter.	
Principal Training Officer & Training Officers. (6)	*2000 sq. ft. plus 250 sq. ft. for garage and servants quarter	
Instructors (Senior Scale) (6)	sq. ft. 1600	} If constructed as flats, 100 sq. ft. extra for each may be provided for staircase and circulation.
Instructor (junior scale) and equivalent staff.(8)	1400	

##### *Administrative, clerical, technical and other staff—*

	Rs.	sq. ft.	
(i) For salary range .. 300—700		1200	} The number of quarters to be built in each of these categories should be decided by the Board of Governors from time to time.
(ii) For salary range Rs. 150—300		600	
(iii) For salary range below 100		350	

The total cost of the residences at Ranchi inclusive of furniture to be provided in the houses to be occupied by foreign experts is about Rs. 15 lakhs. In addition, a guest house to accommodate about 10 persons is necessary and may be estimated to cost about Rs. 1·0 lakh inclusive of furniture, fixtures, crockery and cutlery etc.

\* If after providing for the necessary servants' quarter for each house, not enough area is left out of 250 sq. ft. for a separate garage for each house, then garage for two or three quarters have to be constructed.

## ANNEXURE V

*Equipment and Furniture**Laboratories & Workshops*

	Rs. in lacs.	
Chemistry Laboratory .. .. .	} 29.00	
Metallurgy Laboratory .. .. .		
Metal Testing Laboratory .. .. .		
X-Ray and Dark Room .. .. .		
Sand Testing Laboratory .. .. .		
Combustion and Refractories Lab. .. .. .		
High Temperature Laboratory .. .. .		
Core-material Laboratory .. .. .		
Patternshop .. .. .		
Foundries .. .. .		
Forgeshop .. .. .	} 29.00	
Research & Developmental .. .. .		
Laboratory .. .. .		
Add 10% for freight, installation and other charges .. .. .		2.9
Total .. .. .		31.9
Library including Audiovisual Aids .. .. .		1.5
Staff Car & Bus .. .. .		0.5
Office Equipment & other items .. .. .		1.0
Furniture—Laboratory, Class rooms, Library, Auditorium etc. .. .. .		1.5
Total .. .. .		36.4

*List of Equipment*(1) *Pattern Shop*

(a) Wood-turning lathe .. .. .	1 No.
(b) Wood-Planning machine .. .. .	1 No.
(c) Band Saw .. .. .	1 No.
(d) Drilling machine .. .. .	1 No.
(e) Disc Sander .. .. .	1 No.
(f) Cross Cut saw machine .. .. .	1 No.
(g) Universal Milling Machine .. .. .	1 No.

(2) *Melting Furnaces*

(a) Oil fired SKlenar type reverboratory furnace for non-ferrous alloys capacity 200 lbs. .. .. .	1 No.
(b) Morgan type tilting crucible furnace -Oil fired—suitable for melting ferrous and non-ferrous metals (Capacity 200 lbs. brass) .. .. .	1 No.
(c) Stationary type bale out furnace oil fired with automatic temperature control—100 lbs. Al. capacity .. .. .	1 No.

- (d) One ton hot blast coupola with preheating arrangement for the last and volume control for air and blower of suitable capacity and other instruments for research and development work . . . . . 1 No.
- (e) Electric induction crucible type melting furnace of units to be operated from a common power control unit 800 kg. suggested (For malleable iron and special irons to be superheated to 1450 °C from cold stage) . . . . . 1 No.
- (f) Birlec type Direct Arc furnaces of 100 Kg. batch capacity - suitable for melting steel . . . . . 1 No.

### 3. Moulding and Core Blowing Equipment

- (a) Hand operated moulding machine with Squeeze head suitable for snap Clark moulding . . . . . 1 No.
- (b) Jolt-Squeeze pneumatic pinlift moulding machine . . . . . 1 No.
- (c) Jolt-Squeeze pneumatic turn-over moulding machine . . . . . 1 No.
- (d) Junior Stationary Sand Slinger with one pattern strip down draw type machine and necessary accessories . . . . . 1 No.
- (e) One bench type core blower . . . . . 1 No.
- (f) Bench type core shooter . . . . . 1 No.

### 4. Sand Conditioning Equipment

- (a) One batch type sand muller 2 cft. batch capacity with an aerator . . . . . 1 No.
- (b) Junior complete batch type sand conditioning plant with vibratory shake out magnetic separator bucket elevator, san muller and aerator . . . . . 1 No.
- (c) Junior Sand Royar for preparing the baking sand . . . . . 1 No.
- (d) 30 Kg. Fondath type core sand miner . . . . . 1 No.
- (e) Oil fired core baking oven drawer type with temperature control (automatic) . . . . . 1 No.

### 5. Special Equipment

- (a) Junior Shell moulding equipment complete with necessary accessories . . . . . 1 No.
- (b) Centrifugal casting machine with arrangement for changing the angle of rotation from horizontal to vertical . . . . . 1 No.
- (c) Junior Pressure die casting machine for Al/Zn base alloys with necessary accessories . . . . . 1 No.

### 6. Fettleing Equipment

- (a) Junior rotoblast (airless) shot blasting unit for small and medium castings . . . . . 1 No.

- (b) Tumbling barrel (Junior) .. .. . 1 No.
- (c) 6" pneumatic rotary grinder .. .. . 1 No.
- (d) 12" Double ended pedestal grinder operated with a motor .. .. . 1 No.
- (e) Electric flexible shaft grinder with attachment for wheels of different sizes .. .. . 1 No.
- (f) Gas cutting unit for cuttings off gates .. .. . 1 No.
- (g) Do—All type machine for cutting non-ferrous matels and alloys .. .. . 1 No.
- (h) Pneumatic Chipping Hammer .. .. . 1 No.

#### 7. *Equipment for Inspection of Castings*

- (a) X-Ray Equipment—250 kva. .. .. . 1 No.
- (b) Gamma-Ray Radiographic equipment, including container and source .. .. . 1 No.
- (c) Dark-room accessories .. .. . 1 No.
- (d) Magnetic Crack Detector .. .. . 1 No.
- (e) Ultra-Violet unit for crack detection .. .. . 1 No.
- (f) Ultra-sonic crack detector .. .. . 1 No.

#### 8. *Heat Treatment and Annealing Furnaces*

- (a) Junior Bell type gaseous annealing electrically operated anneal furnace suitable for malleablising ..
- (b) One low and one high temperature Birlect type controlled atmosphere heat treatment furnace with programme controller for heat treatment of alloy and special steels effective chamber size 2' depth 18" width 12" high .. .. . 1 No.
- (c) Junior tempering furnace Bell type suitable for Aluminium and its alloys .. .. . 1 No.

#### 9. *Forging Equipment*

- (a) Steam Hammer .. .. . 1 No.
- (b) Electric Hammer .. .. . 1 No.
- (c) Pneumatic Hammer .. .. . 1 No.
- (d) Reverberatory furnace .. .. . 1 No.
- (e) Drop Forge Equipment .. .. . 1 No.
- (f) Controlled atmospheric furnace .. .. . 1 No.
- (g) Sheaving T and Trimming Equipment .. .. . 1 No.

#### 10. *Miscellaneous Accessories*

- (a) Air Compressor of 200 c. ft. of air min at 100 lb'sq" pressure with suitable receiver .. .. . 1 No.
- (b) One electrical hand operated hoist of 1 ton capacity to be operated on mono rail .. .. . 1 No.
- (c) Junior Fork Lift Truck Diesel operated .. .. . 1 No.
- (d) One Bull ladle Drum typ 5 Cwts. capacity hand shanks .. .. . 1 No.

## LABORATORY

*Sand Testing—*

(a) Sympson type Laboratory Sand mixer .. ..	1 No.
(b) Laboratory Balance .. ..	1 No.
(c) Sand Rammer .. ..	1 No.
(d) Moisture 'Speedy' Teller .. ..	1 No.
(e) Compression (Green sand) testing Machine ..	1 No.
(f) Compression (Dry sand) testing machine (Higher ranges) .. ..	1 No.
(g) Rapid sand washer .. ..	1 No.
(h) Drawing air oven (150°C) Electric—automatic temperature control .. ..	1 No.
(i) Laboratory Core baking oven with Circulator and temperature control .. ..	1 No.
(j) Permmeter .. ..	1 No.
(k) Universal sand testing machine with all accessories .. ..	1 No.
(l) Set of sieves .. ..	2 Nos.
(m) Sieve Shaker .. ..	1 No.
(n) Green hardness tester .. ..	1 No.
(o) Dry hardness tester (for cores) .. ..	1 No.
(p) Fluidity test pattern .. ..	1 No.
(q) Sinter meter .. ..	1 No.

*Analytical Laboratory—*

(a) Carbon & Sulphur determinator .. ..	1 No.
(b) Specker chemical analyser .. ..	1 No.
(c) Complete chemicals and glassware for analysis of metals and alloys including foundry sands ..	1 No.
(d) Analytical Balance .. ..	1 No.
(e) Working Benches & Fume Cupboards .. ..	1 No.

*Equipment for Mechanical Testing—*

(a) Vicker Hardness testing machine .. ..	1 No.
(b) Brinell Hardness tester .. ..	1 No.
(c) Universal testing machine (50 tons with all accessories) .. ..	1 No.
(d) Lathe for making test pieces .. ..	1 No.
(e) Drilling machine .. ..	1 No.
(f) IZOD impact machine .. ..	1 No.

*Equipment for Measuring Temperatures—*

(a) Thermocouple platinum-platinum Rhodium ..	1 No.
(b) Thermocouple Chromel-Alumel .. ..	1 No.

- (c) Indicating meter pyrometer .. .. . 1 No.  
 (d) Pyrometer optical .. .. . 1 No.  
 (e) Potentiometer, electric, automatic indicating, single dial .. .. . 1 No.  
 (f) Potentiometer, automatic, electronic automatically recording multipoint .. .. . 1 No.  
 (g) Oscillograph 8 loops, universal .. .. . 1 No.  
 (h) Profile millivoltmeter .. .. . 1 No.  
 (i) Millivoltmeter 40 mv .. .. . 1 No.  
 (j) Galvanometer .. .. . 1 No.

*Metallographic Equipment—*

- (a) Vickers Protection Metallographic Microscope with all accessories including micro hardness testers .. .. . 1 No.  
 (b) Bench type metallographic microscope (Baush & Lomb) .. .. . 4 Nos.  
 (c) Complete set of polishing equipment from a cut off wheel to fine polishing including a grinder .. 1 No.  
 (d) One Dark-room with enlarging Camera and accessories for printing and developing .. .. 1 No.  
 (e) One Photographic Camera with close-up lenses and necessary accessories for photographic examination of casting defects etc. .. .. . 1 No.

ANNEXURE VI

*Staff Requirements*

Post	Numbers	Scale
Director .. .. .	1	Rs. 1,800—100—2,000—125—2,250 or alternatively Rs. 2,000—100—2,500 in special cases.
Principal Training Officer (Foundry, Metallurgy and Production Processes)	2	Rs. 1,300—60—1,600—100—1,800
Training Officers Foundry & Forge; Chemical Engineering; Industrial Engg.	4	Rs. 1,000—50—1,300—60—1,600
Instructors—Senior Scale—Foundry & Forge; Metallurgy; Mechanical Engineering Applied Mathematics.	5	Rs. 700—40—1,100—50/2—1,250
Instructors—Junior Scale—Mathematics; Chemistry; Engineering	4	Rs. 400—40—450—30—600—35—670—EE—35—950
Workshop Superintendent .. .. .	1	Rs. 700—40—1,000—50/2—1,250
Laboratory Assistants .. .. .	6	Rs. 250—10—290—15—350
Foremen Instructors .. .. .	4	Rs. 250—10—290—15—350
Draughtsmen .. .. .	2	Rs. 130—5—160—8—280

*Staff Requirements—contd.*

Post	Numbers	Scale
Subordinate Technical staff Mechanics, Operators etc.	29	Rs. 110—3—131—4—143—EB —4—155
Administrative Staff—		
Administrative Officer .. ..	1	Rs. 375—25—500—30—590—30 —900
Office Superintendent .. ..		Rs. 210—10—290—15—320—15 —425
Accountant .. ..	1	Rs. 210—10—290—15—320—15 425
Upper Division Clerks .. ..	6	Rs. 130—5—160—8—200—8— 256—8—280
Lower Division Clerks .. ..	8	Rs. 110—3—131—4—155—4 175—5—180
Stenographers .. ..	4	Rs. 210—10—290—15—320—15 —530
Steno Typists .. ..	2	Rs. 130—5—160—8—200—8— 256—8—280
Librarian .. ..	1	Rs. 325—25—575
Storekeeper .. ..	1	Rs. 210—10—290—15—320—15 —425
Security in-charge .. ..	1	Rs. 130—5—160—8—200—8— 256—8—280
Staff Car drivers .. ..	2	Rs. 110—3—131—4—155
Peons, Sweepers, Watch and Ward Staff etc.	15	Rs. 70—1—80—85
Hostel Staff—		
Hostel Manager .. ..	1	Rs. 210—10—290—15—320—15 —380
Hostel Clerk .. ..	1	Rs. 110—3—131—4—155—4— 175—5—180
Non-dining Hall Class IV Staff	10	Rs. 70—1—80—1—85
Cooks .. ..	4	Rs. 100—5—150
Bearers .. ..	8	Rs. 60—2—80
Estate Staff—		
Assistant Engineer .. ..	1	Rs. 325—25—575
Overseers .. ..	2	Rs. 210—10—290—15—320—15 —380
Mistries .. ..	4	Rs. 110—3—131—4—143—4— 155
Class IV Staff including Malis	8	Rs. 70—1—80—1—85

Average annual expenditure on salaries and allowances, Provident Fund etc. Rs. 5.0 lakhs.



## ANNEXURE VII

*Memorandum of Association and the Rules relating to Establishment of the National Institute of Foundry and Forge Technology*

In the matter of Act XXI of 1960 for the Registration of literary, scientific and charitable societies, and

In the matter of National Institute of Foundry and Forge Technology Society herein after referred to as the Society.

*Memorandum of Association*

1. (i) The name of the Society is the National Institute of Foundry and Forge Technology Society.

(ii) The registered office of the Society shall be situated at Ranchi.

2. In this memorandum and the Rules made there unless the content otherwise requires

a) "Institute" shall mean the National Institute of Foundry and Forge Technology.

b) "Society" shall mean the National Institute of Foundry and Forge Technology Society.

(c) "Central Government" shall mean the Government of India.

3. The objects for which the Society is established are—

(i) to establish and to carry on the administration and management of the National Institute of Foundry and Forge Technology. The functions of the Society shall be—

(a) to provide national facilities for forge education and research in the form of full-time courses, vacation courses and the like,

(b) to provide facilities for training of senior executive personnel for foundry industry.

(c) to train suitably qualified personnel for industry in the latest production technique and methods, design and development etc.

(d) to award appropriate diplomas and certificates on the basis of the standards laid down for the courses.

(e) to guide and conduct applied research in the field of foundry and forge technology and to devise techniques called for Indian conditions.

(f) to institute and award fellowships, scholarships, prizes and medals in accordance with the Rules and Bye-laws;

(g) to confer honorary awards and other distinctions;

(h) to fix and demand such fees and other charges as may be laid down in the Bye-laws made under the Rules of the Society.

(i) to establish, maintain and manage halls and hostels for the residence of students;

(j) to create administrative, technical and ministerial and other posts under the Society other than the post of Director of the Institute and to make appointments thereto provided that the posts so

created are in the cadre and scales of pay as approved by the Government of India from time to time. The appointment to the post of Director shall be made by the Government of India on such terms and conditions as may be decided by the Central Government,

- (k) to cooperate with educational or other institutions in any part of the world having objects wholly or partly similar to those of the Society by exchange of teachers, scholars and generally in such manner as may be conducive to their common objects; and
- (l) to create patronship, affiliations and other classes of professional or honorary or technical memberships or office as the Society may consider necessary;
- (ii) to make rules and Bye-laws for the conduct of the affairs of the Society and to add to, amend, vary or rescind them from time to time, with the approval of the Central Government;
- (iii) to acquire and hold property, provided that prior approval of the Central Government is obtained for the acquisition of immovable property;
- (iv) to deal with any property belonging to or vested in the Society in such manner as the Society may deem fit for advancing its objects, provided that prior approval of the Central Government is obtained for transfer of any immovable property;
- (v) to maintain a Fund to which shall be credited—
  - (a) all moneys provided by the Central Government;
  - (b) all fees and other charges received by the Society;
  - (c) all moneys received by the Society by way of grants, gifts, donations, benefactions, bequests or transfers; and
  - (d) all moneys received by the Society in any other manner or from any other sources.
- (vi) to deposit all moneys credited to the Fund in such Banks or to invest them in such manner as the Society may, with the approval of the Central Government, decide.
- (vii) to meet the expenses of the Society including expenses incurred in the exercise of its powers and discharge of its functions out of the Fund.
- (viii) to prepare and maintain accounts and other relevant records and to prepare an annual statement of accounts including the balance sheet of the Society in such form as may be prescribed by the Central Government in consultation with the Accountant General, Bihar.
- (ix) to forward annually to the Central Government the accounts of the Society as certified by the Auditor General of India or any other authority as may be decided by the Central Government.
- (x) to do all such things as may be necessary incidental or conducive to the attainment of all or any of the objects of the Society;
- (xi) to constitute such Committee or Committees as it may deem fit for the disposal of any business of the Institute or for tendering advice in any matter pertaining to the Institute;

(vii) to delegate any of its powers to the Board of Governors of the Institute or any of the Committee or Committees constituted by it.

4. (i) The Institute shall be open to persons of either sex, and of whatever race, creed, caste or class, and no test or condition shall be imposed as to religious belief or profession in admitting students or appointing members, teachers, and other staff of the Institute;

(ii) No benefaction shall be accepted by the Society which, in its opinion, involves condition or obligations opposed to the spirit and object of this paragraph.

5. The Central Government may at any time appoint one or more persons to review the work and progress of the Society or the Institute and to hold any enquiry into the affairs thereof and to report thereon, in such manner as the Central Government may stipulate. Upon receipt of any such report, the Central Government may take such action and issue such directions as it may consider necessary in respect of any of the matter dealt with in the report regarding the society or the Institute, as the case may be and the society shall be bound to comply with such directions.

6. In case the Central Government is satisfied that the Society or the Institute is not functioning properly, the Central Government shall have the power to take over the administration and assets of the Institute.

7. If, on winding up or dissolution of the Society, there shall remain, after satisfaction of all its debts and liabilities, any assets and property whatsoever, the same shall not be paid to or distributed among the members of the society or any of them but shall be dealt with in such manner as the Central Government may determine.

8. The names, addresses and occupations of the first members of the Governing Body of the Society to which by the Rules and by the Bye-laws of the Society, the management of its affairs is entrusted, are—

Name & address—

*Chairman—*

1. The Chairman appointed by the Central Government.

*Members—*

2. Nominee of the Central Government to represent its Ministry of Finance.

3. Nominee of the Central Government to represent its Ministry of Scientific Research and Cultural Affairs.

4. Nominee of the Central Government to represent the Ministry of Commerce and Industry.

5. Representative of the All India Council for Technical Education.

6, 7, 8, 9 & 10. Five representatives of industry including public enterprises nominated by the Central Government.

11 & 12. Two members representing other interests such as engineering profession, technical institutions etc. nominated by the Central Government.

*Ex-officio member and Secretary—*

13. The Director of Institute.

A copy of the Rules of the Society, certified to be a correct copy by Members of the Society is filled along with this Memorandum of Association.

We, the several persons whose names and addresses are given below, having associated ourselves for the purpose described in this Memorandum of Association do hereby subscribe our names to this Memorandum of Association and set our several and respective hands hereunto and form ourselves into a Society under Act XXI of 1860 this \_\_\_\_\_ day of \_\_\_\_\_ 196 .

S. No.	Name, address and occupations of members	Signature of Member.	Name, addresses and occupations of witnesses	Signature of witnesses

*National Institute of Foundry and Forge Technology*

**RULES—**

1. The Registered Office of the Society shall be situated at Ranchi.
2. The Society shall for the time being consist of the following members—
  1. *Chairman*—To be appointed by the Central Government.
  - 2, 3 & 4. Three nominees of the Central Government representing its Ministries of Finance, Scientific Research and Cultural Affairs and Commerce and Industry.
  5. One representative of the All India Council for Technical Education.
  - 6, 7, 8, 9 & 10. Five representatives of industry including public enterprises nominated by the Central Government.
  11. & 12. Two members to represent other interests such as engineering profession, technical institutions etc. nominated by the Central Government.
  13. The Director of Institute (Ex-officio Member Secretary).
  - 14 & 15. Two persons co-opted by the Board of Governors.
3. If a member of the Society shall change his address, he may notify to the Secretary his new address but if he fails to notify such new address, his address as recorded on the rolls of the members shall be deemed to be his address.
4. The general superintendence, direction and control of the affairs of the Society and its income and property shall be vested in the Governing Body of the Society, which shall be called the Board of Governors National Institute of Foundry and Forge Technology here-in-after referred to as "The Board".
5. The Board shall be composed of the following members—
  1. *Chairman*—To be appointed by the Central Government.
  - 2, 3 & 4. Three nominees of the Central Government representing its Ministries of Finance, Scientific Research and Cultural Affairs and Commerce and Industry.

5. One representative of the All India Council for Technical Education.
- 6, 7, 8, 9 & 10. Five representatives of industry including public enterprises nominated by the Central Government.
- 11 & 12. Two members representing other interests such as engineering profession, technical institutions etc. nominated by the Central Government.
- 13 & 14. Two members co-opted by the Board as a whole.
15. The Director of the Institute (ex-officio Member—Secretary).

6. (i) Where a member of the Society or the Board becomes such member by reason of the office he holds, his membership shall terminate when he ceases to hold that office.

(ii) A member of the Society or the Board representing the Central Government shall continue to be such member during the pleasure of the Central Government.

(iii) Every other member of the Society or the Board including the Chairman shall cease to be such member on the expiry of four years from the date of his appointment or nomination but shall be eligible for reappointment or renomination, as the case may be.

(iv) Should any member representing the Central Government be prevented from attending a meeting of the Society or the Board, he shall be at liberty to appoint and authorise a representative to take his place at that meeting of the Society or the Board and such representative shall have all the rights and privileges of a member of the Society or the Board for that meeting.

7. A member of the Society or the Board shall cease to be such member if he (a) dies or (b) resigns his membership or (c) becomes of unsound mind or (d) becomes insolvent or (e) is convicted of a criminal offence involving moral turpitude or (f) if he is removed by the Central Government from the membership of Society or (g) if, except in the case of Director of the Institute, he accepts a full-time appointment in the institute or (h) if he fails to attend three consecutive meetings of the Society or the Board without the leave of the Chairman.

8. (i) The Chairman of the Society or the Board may resign his office by a letter addressed to the Central Government and his resignation shall take effect from the date it is accepted by the Central Government.

(ii) A member of the Society or the Board (other than an ex-officio member or a member representing the Central Government) may resign office by a letter addressed to the Chairman and such resignation shall take effect from the date it is accepted by the Chairman.

9. Any casual vacancy in the Society or the Board shall be filled by the appointment or nomination of a member by the appropriate authority entitled to make such appointment or nomination and the member appointed or nominated to fill such casual vacancy shall hold office for the remainder of the term, if any, of the member in whose place he has been appointed or nominated.

10. The Society or the Board shall function notwithstanding any vacancy therein and notwithstanding any defect in the appointment or nomination of any of its members; and no act or proceeding of the Society or the Board shall be called in question merely by reason of the existence of any vacancy thereon or of any defect in the appointment or nomination of any of its members.

11. (i) The Society shall meet whenever the Chairman thinks fit, provided that the Chairman shall call a meeting of the Society upon written requisition of not less than four members.

(ii) For every meeting of the Society fifteen days notice shall be given to the members.

(iii) Five members including the Chairman, shall constitute a quorum at any meeting of the Society.

(iv) In case of difference of opinion amongst the members the opinion of the majority shall prevail.

(v) Each member of the Society, including the Chairman, shall have one vote and if there be an equality of votes on any question to be determined by the Society, the Chairman shall in addition have and exercise a casting vote.

(vi) Every meeting of the Society, shall be presided over by the Chairman and, in his absence from any meeting, by a member chosen from amongst themselves by the members present at the meeting.

(vii) Any resolution except such as may be placed before the meetings of the Society may be adopted by circulation among all its members and any resolution so circulated and adopted by a majority of the members who have signified their approval or disapproval of such resolution shall be as effectual and binding as if such resolution had been adopted at a meeting of the Society provided that in every such case at least four members of the Society shall have recorded their approval of the resolution.

12. *Powers and Functions of the Board*—Subject to the provision of the Memorandum, the Board shall have the powers—

(i) to prepare and execute detailed plans and programmes for the establishment of the Institute and to carry on its administration and management after such establishment;

(ii) to receive grants and contributions and to have custody of the funds of the Institute;

(iii) to prepare the budget estimates of the Society for each year, and to sanction the expenditure within the limits of the budget as approved by the Central Government;

(iv) to prescribe and conduct courses of study training and research in Industrial Engineering and allied subjects;

(v) to prescribe rules and regulations for the admission of students to the various courses of study in conformity with the policy approved in this behalf by the Central Government;

(vi) to lay down standard of proficiency to be demonstrated before the award of certificates of competence in respect of the courses offered by the Institute;

(vii) to institute and award fellowships, scholarships, prizes and medals;

(viii) to provide for and supervise the residence, health, discipline and the well-being of the students of the Institute;

(ix) to create teaching, administrative, technical, ministerial and other posts under the Institute other than the post of Director and to make appointments thereto provided that the posts so created are in the cadre and scales of pay as approved by the Government of India from time to time. The appointment to the post of Director shall be made by the Government of India on such terms and conditions as may be decided by the Central Government.

(x) to co-operate with any other organisation in the matter of education and training in Industrial Engineering and allied subjects;

(xi) to enter into arrangements for and on behalf of the Institute;

(xii) to sue and defend all legal proceedings on behalf of the Institute;

(xiii) to appoint Committees for the disposal of any business of the Institute or for tendering advice in any matter pertaining to the Institute;

(xiv) to delegate to such extent as it may deem necessary, any of its powers to any office or Committee of the Board;

(xv) to consider and pass such resolutions on the annual report, the annual accounts and the financial estimates of the Society or the Institute as it thinks fit, such annual report, annual accounts and financial estimates along with the resolutions passed thereon by the Board being submitted to the Central Government;

(xvi) to make, adopt, amend, vary or rescind from time to time with the prior approval of the Central Government Bye-laws for the regulations of, and for any purposes connected with the management and administration of the affairs of the Institute and for the furtherance of its objects;

(xvii) to make, adopt, amend, vary or rescind from time to time Bye-laws (a) for the conduct of the business of the Board and the Committees to be appointed by it, (b) for delegation of its powers or (c) for fixing the quorum, and

(xviii) to perform such additional functions and to carry out such duties as may from time to time be assigned to it by the Central Government.

13. (i) The Board shall ordinarily meet once in every three months provided that the Chairman may, whenever he thinks fit on a written requisition of not less than four members call for a special meeting. Not less than fifteen days notice shall be given for every meeting of the Board and a copy of the proceedings of every meeting shall be furnished to the Central Government as soon as practicable after the meeting.

(ii) five members of the Board including the Chairman, shall constitute a quorum for any meeting of the Board.

(iii) In case of difference of opinion amongst the members the opinion of the majority shall prevail.

(iv) Each member of the Board including the Chairman shall have one vote and if there shall be an equality of votes on any question to be determined by the Board, the Chairman shall in addition have and exercise a Casting Vote.

(v) Every meeting of the Board shall be presided over by the Chairman and, in his absence from any meeting, by member chosen from amongst themselves by the members present at the meeting.

(vi) Any resolution except such as may be placed before the meeting of the Board, may be adopted by circulation among all its members and any resolution so circulated and adopted by a majority of the members who have signified their approval or disapproval of such resolution shall be as effective and binding as if such resolution had been passed at a meeting of the Board, provided that in every such case at least four members of the Board shall have recorded their approval of the resolution.

14. The Board shall by resolution delegate to the Chairman, Director-Cum-Secretary and other officers and staff of the Board such of its powers for the conduct of the affairs of the Board as it may consider necessary or desirable.

15. Subject to the Rules and Regulations and to any orders of the Board, Director shall be responsible for the proper administration of the Institute and for the conduct of the subordinate staff under the direction and guidance of the Board.

16. The members of the Society, Board or of any Committee appointed by the Society or the Board shall not be entitled to any remuneration from the Society or the Board: but non-official members of the Society or the Board or any Committee appointed by either of them shall be paid by the Society such travelling and daily allowance as may be provided for in the Bye-laws to be made in this behalf in respect of any journeys undertaken by them for attending the meetings of the Society, the Board or the Committee or in connection with any other business of the Society, the Board or the Committee as the case may be. Official members who are employees of the Central Government shall initially receive T.A. and D.A. from the same source from which they draw their salaries at rates admissible to them according to their Government rules, but the whole expenditure shall be re-imbursable from the Institute to the Central Government.

17. The Chairman shall have the power to invite any person or persons, not being members of the Board, to attend the meeting of the Board, but such invitees shall not be entitled to vote at the meeting.

18. The Accounts of the Board shall be audited by the Auditor General of India or any other authority as may be decided by the Central Government and any expense incurred in connection therewith shall be payable by the Board.

19. (i) Within six months after the close of every financial year, the society shall submit to the Central Government a report on the working of the Institute in the previous year together with an audited statement of accounts showing the income and expenditure for the previous year.

(ii) The Society shall submit to the Central Government the budget estimates for every financial year by such date as may be fixed by the Central Government in this behalf.

20. For the purpose of section 6 of the Registration of Society Act, the person in whose name the society may sue or be sued shall be the Secretary of the Society.



ANNEXURE X  
(Item II of Agenda)

**MINISTRY OF HOME AFFAIRS**  
(DIRECTORATE OF MANPOWER)

SUBJECT—*Establishment of an Institute of Applied Manpower Research.*

Suggestions have been made from time to time that in view of the crucial importance of manpower for economic development and the need for bringing together governmental, corporate, and concerned non official agencies in the consideration of manpower problems, the Government of India might establish a more or less autonomous institute for carrying on systematic research into manpower problems. This question came up for consideration at an informal meeting presided over by the Deputy Chairman, Planning Commission, in December last, and it was decided that the Ministry of Home Affairs (Directorate of Manpower) should formulate necessary proposals at an early date. The Home Minister has considered the matter since and approved of the suggestions generally.

2. It is widely recognised now that manpower research is of as great, if not of greater importance, as research in physical resources. Studies made both in the U.S.A. and the U.S.S.R. in recent years have brought out that improvement in the quality and utilisation of the labour force have been major factors in accelerating economic growth. In a country like India where the State has assumed the main responsibility for promoting economic growth, and where education and training are largely financed from public revenues, manpower research has a special value, in that it can provide a firm basis for Government policies and programmes. Manpower Research has value also, in any democratic set-up, for educating public opinion, and influencing the minds of the vast number of individuals and organisations (such as Universities, Industrial establishments) whose decisions determine in many ways the educational and economic activities of the country.

3. A good deal of valuable research into manpower problems has been and is being done by Government agencies, such as the Perspective Planning Division in the Planning Commission, the Directorate General of Employment and Training, and others. This is, however, a vast (and very complex) field. And, apart from the need of attention to immediate problems, such as the estimation of requirements and resources of trained personnel of different categories for our plan programmes and improvement of the utilisation of employed manpower, there is need for studying and spelling out in fairly concrete terms the wide manpower implications of the transition from a predominantly agricultural to a well diversified economy, the problem of utilisation of the large number of persons who are likely to enter the labour force in the coming years, and the impact of the rapid growth of education that is taking place. While Governmental agencies which are engaged on research into different aspects of the manpower problem must continue the work, and there

may be need for further strengthening these organisations for the efficient discharge of the specific responsibilities entrusted to them, there are inherent difficulties in establishing an adequate organisation for manpower research in all its aspects within the governmental structure. To begin with, the pressure of day to day problems tends to upset research programmes within Government; and the urgency of immediate needs and the influence of current policies often deflect the course of investigation and influence its results. Further manpower problems have too wide ramifications to permit of an entirely satisfactory coordination of the research programmes of different Ministries as well as of the corporate sector and private agencies by a Government Department. A semi-autonomous institution functioning outside but in close link with Government can deal with the whole manpower field in an integrated way, and also somewhat more effectively than may be feasible through a purely governmental set-up. It is accordingly proposed to establish an Institute of Applied Manpower Research.

4. The objectives and scope of the Institute may be defined in broad terms as follows—

- (i) to advance knowledge about the nature, characteristics and utilisation of human resources in India;
- (ii) to provide a broad perspective of requirements of trained manpower for economic development in different fields with due regard to the probable impact of technological changes on the pattern of employment;
- (iii) to develop improved methods and techniques for dealing with
  - (a) training and development of the existing work-force;
  - (b) educational preparation for employment;
  - (c) vocational guidance;
  - (d) identifying and developing highly talented persons;
  - (e) forecasting demand and supply of manpower and connected matters;
- (iv) to provide manpower research services to Government departments, public corporations and private establishments;
- (v) to stimulate interest in manpower problems generally, and to cooperate with and assist manpower research by other agencies and institutions or professional associations;
- (vi) to cooperate with international agencies engaged in manpower research and arrange for interchange of materials and data;
- (vii) to provide advanced training in professional techniques for manpower planning and administration.

5. *Constitution*—The Institute of Applied Manpower Research shall be a corporate body registered under the Societies Registration Act, 1860 (No. XXI of 1860). The headquarters of the Institute shall be at New Delhi.

- (i) The Institute shall have—
  - (a) a President;
  - (b) two or more vice-Presidents; and

(c) a Director

who will be appointed by the Government of India.

(ii) There shall be a *General Council* consisting of—

- (a) The President and others mentioned at (i) above;
- (b) Two representatives of the Planning Commission, and one representative each of the Ministries of Home Affairs, Labour and Employment, Education, Scientific Research and Cultural Affairs, Commerce and Industry, Irrigation and Power, Food and Agriculture, Health, Finance (Expenditure), Railways, Defence, Steel, Mines and Fuel, Transport and Communications and the Central Statistical Organisation (16);
- (c) One representative each of the Council of Scientific and Industrial Research, University Grants Commission, the All India Council of Technical Education, the All India Council of Agricultural Education, the All India Medical Council, National Council for Training in Vocational Trades, Institute of Engineers, Institute of Chemical Engineers, Institute of Tele-Communication Engineers and the National Productivity Council (10);
- (d) One representative each of the Federation of Indian Chambers of Commerce and Industry, the All India Management Association, Employers' Federation of India, the All India Manufacturers' Organisation and the All India Organisation of Industrial Employers (5);
- (e) Two representatives of public sector enterprises;
- (f) One representative of each State Government (15).

NOTE—The General Council may coopt, from time to time, the representatives of other organisations or institutions which may be concerned with the work of programme of this Institute.

(iii) The Institute shall have an *Executive Council* consisting of—

- (a) A Chairman;
- (b) The Director (ex-officio);
- (c) One representative each of the Planning Commission, Ministry of Home Affairs (Directorate of Manpower), Ministry of Scientific Research and Cultural Affairs, Ministry of Commerce and Industry, Ministry of Finance (Expenditure) and Ministry of Labour and Employment (Directorate General of Employment and Training);
- (d) Three members from the representatives of the Employers' Federation of India, the All India Manufacturers' Organisation, the All India Organisation of Employees, the All India Management Association, and the National Productivity Council; and
- (e) not more than four other members of the General Council.

The Chairman and members (excepting only the ex-officio members) shall be nominated by the President.

6. A meeting of the General Council shall be held at least once a year to consider the annual report and accounts of the Institute, and the programme of work for the coming year. The president may convene a special meeting of the General Council whenever he thinks fit.

7. Subject to such limitations as the Government of India may impose from time to time, the Executive Council shall have powers in respect of all matters concerning the Institute including the preparation and sanction of budget estimates, sanctioning of expenditure, making and execution of contracts, investment of the funds of the Institute, and appointment of staff. It may, by Resolution, appoint Committees or Sub-Committees for such purposes and with such powers as it may think proper. The President may nominate one member of the Executive Council to act as Treasurer and he will be in charge of all payments made by and to the Institute.

8. It is proposed to locate Institute of Applied Manpower Research in the campus of the existing Indian Institute of Public Administration. This will result in certain economies in the cost of buildings, library and other common facilities and will also help to avoid delay in starting the Institute.

9. *Estimates of Cost*—Two statements giving details of the recurring and non-recurring cost have been annexed. The non-recurring cost has been estimated as approximately Rs. 3.5 lakhs including Rs. 1.75 lakhs for construction of additional building accommodation. The Ford Foundation has indicated its willingness to meet the cost of equipment such as Staff Car, Motor-Cycle, Gestetner Duplicator, Typewriters, Thermofax copying machine, Calculating machines and Rotaprint machine and books. The recurring cost has been estimated as Rs. 5 lakhs annually. Mr. Leo R. Werts, Manpower Consultant had recommended the constitution of six separate sections each having a Chief, an associate Officer and Junior Research staff. Having regard to considerations of economy, it is proposed to have only two Sections or Divisions, one dealing chiefly with Manpower statistics, studies of requirements and resources of manpower, and methods and techniques of manpower research, etc., and the other with problems relating to institutional preparation and training for employment, vocational guidance and improvement and utilisation of the existing work force (including managerial personnel). Each Division will have besides a Chief or Head, two Research Officers and two Junior Research Officers. Provision has been made also for one Statistician and four Research-cum-Statistical Assistants, besides a small office staff, operators and messengers etc. The total cost of staff works out to about Rs. 2.17 lakhs. A lump sum provision of Rs. 1 lakh has been made for financing of special research programmes including field surveys that may be undertaken directly by the Institute. There is also a provision of Rs. 60,000 for grants to other organisations for approved research schemes entrusted to them. The Ford Foundation has indicated its willingness to meet 50% of the recurring expenditure for a period of five years initially, and to arrange at its own expense for experts and consultants whose services may be needed by the Institute in the initial stages.

**STATEMENT I**

*Estimate of cost for the Institute of Applied Manpower Research*

Non-Recurring				Recurring					
Items				Rs.	Items				Rs.
1. Additional building accommodation (15,000 Sq. ft.)				1,75,000	1. Library .. .. .				15,000
2. Furniture .. .. .				25,000	2. Stationery .. .. .				10,000
3. Staff car .. .. .				15,000	3. Printing and Publications .. .. .				30,000
4. One motor-cycle and 3 bi-cycles for messengers				4,500	4. *Pay and Allowances for staff .. .. .				2,17,000
5. Equipment—					5. (a) Field surveys and investigations .. .. .				1,00,000
(i) One Gestetner Duplicator .. .. .				2,000	(b) Grants to other organisations for approved research schemes .. .. .				60,000
(ii) 15 Typewriters (English) .. .. .				15,000	6. Travelling and Daily Allowances .. .. .				40,000
(iii) One Thermofax copying machine or Photo Duplicator .. .. .				3,500	7. Misc. and Contingencies .. .. .				28,000
(iv) Four Calculating Machines (2 electric and 2 hand) .. .. .				12,000					
(v) One Rotaprint Machine .. .. .				10,000	Total .. .. .				5,00,000
6. Telephones .. .. .				20,000					
7. Library .. .. .				50,000					
				Total .. .. .					
				3,32,000					
				or say .. .. .					
				3,50,000					

\*For details—see Statement II.

## STATEMENT II

<i>Staff</i>	Rs.
1 Director of Research (Rs. 2,500)	30,000
2 Heads of Divisions (Rs. 1,100—1600)	26,400
1 Statistician (Rs. 600—1,150)	7,200
1 Administrative Officer (Rs. 600—1,000)	7,200
4 Research Officers (Rs. 700—10—1,100)	33,600
4 Junior Research Officers (Rs. 350—650)	16,800
4 Research-cum-Statistical Assistants (Rs. 275—455)	13,200
2 Assistants (Rs. 210—530)	5,040
1 Accountant-Cashier (Rs. 210—425)	2,520
8 Stenographers (Rs. 210—530)	20,160
8 Clerks/Typists (Rs. 110—180)	10,560
1 Rotaprint Machine Operator (Rs. 130—256)	1,560
1 Staff Car Driver (Rs. 110—139)	1,320
1 Motor Cycle Messenger (Rs. 100—130)	1,200
1 Gestetner Operator (Rs. 80—110)	960
1 Daftry (Rs. 75—95)	780
3 Messengers (Rs. 70—85)	2,520
1 Farash (Rs. 70—85)	840
2 Sweepers (Rs. 70—85)	1,680
Allowances, etc.	33,000
Total	2,16,540
	<i>or say</i>
	2,17,000

*The Institute of Applied Manpower Research Rules*

1. *Title*—These rules may be called the Institute of Applied Manpower Research Rules.

2. *Definitions*—In these Rules, unless there is anything repugnant in the subject or context—

- (a) “the Institute” means the Institute of Applied Manpower Research;
- (b) “President” means the President of the Institute;
- (c) “Vice-President” means the Vice-President of the Institute;
- (d) “the General Council” means the General Council of the Institute;
- (e) “the Executive Council” means the Executive Council of the Institute;
- (f) “Chairman” means the Chairman of the Executive Council; and
- (g) “Director” means the Director of the Institute.

3. *General Council*—The General Council of the Institute shall consist of the following—

- (a) the President;
  - (b) two or more Vice-Presidents;
  - (c) the Director;
  - (d) two representatives of the Planning Commission;
- } to be appointed by the Government of India.

(e) One representative each of—

Ministry of Home Affairs;  
 Ministry of Labour and Employment;  
 Ministry of Education;  
 Ministry of Scientific Research and Cultural Affairs;  
 Ministry of Commerce and Industry;  
 Ministry of Irrigation and Power;  
 Ministry of Food and Agriculture;  
 Ministry of Health;  
 Ministry of Finance (Expenditure);  
 Ministry of Railways;  
 Ministry of Defence;  
 Ministry of Steel, Mines and Fuel;  
 Ministry of Transport and Communications;  
 Central Statistical Organisation;  
 Council of Scientific and Industrial Research;  
 University Grants Commission;  
 All India Council for Technical Education;  
 All India Council of Agricultural Education;  
 All India Medical Council;  
 National Council for Training in Vocational Trades;  
 Institute of Engineers;  
 Institute of Chemical Engineers;  
 Institute of Tele-Communication Engineers;  
 National Productivity Council;

(f) one representative of each State Government;

(g) one representative each of—

the Federation of Indian Chambers of Commerce and Industry;  
 Employers' Federation of India;  
 the All India Manufacturers' Organisation and  
 the All India Organisation of Industrial Employees;

(h) four representatives of labour nominated by the Government;

(i) one representative of the All India Management Association.

NOTE.—The General Council may coopt, from time to time, representatives of other organisations or institutions which may be concerned with the work of programme of the Institute.

4. *Meeting of the General Council*—The General Council shall meet at least once a year to consider the annual report and accounts of the Institute and consider and approve the programme of work generally for the ensuing year. The President may convene a special meeting of the General Council whenever he thinks it necessary to do so.

5. *Executive Council*—The Institute shall have an Executive Council consisting of—

(a) Chairman;

(b) Director (ex-officio);

(c) one representative each of—

Planning Commission;

Ministry of Home Affairs (Directorate of Manpower);

Ministry of Scientific Research and Cultural Affairs;  
 Ministry of Commerce and Industry;  
 Ministry of Finance (Expenditure); and  
 Ministry of Labour and Employment (Directorate General of Employment and Training);

- (d) Three members from amongst the representatives of—  
 Employers' Federation of India ;  
 All India Manufacturers' Organisation ;  
 All India Organisation of Employees;  
 All India Management Association;  
 National Productivity Council; and  
 All India Organisation of Labour;

(e) not more than four other members of the General Council.

The Chairman and members (excepting the ex-officio members) shall be nominated by the President.

6. *Meeting of the Executive Council*—The Executive Council of the Institute shall meet as often as necessary and at least twice each year. The meeting of the Executive Council may be convened by the Chairman of the Council or by any other Member of the Council who may be authorised in this behalf by the Chairman of the Council.

7. *Powers and Functions of the Executive Council*—(1) Subject to the general control and direction and subject to such limitations as the Government of India may impose from time to time, the Executive Council shall have powers in respect of all matters connected with the Institute including

- (i) the preparation and sanction of budget estimates,
- (ii) sanctioning of expenditure,
- (iii) entering into and execution of contracts on behalf of the Institute,
- (iv) recruitment of staff, and
- (v) investment of the funds of the Institute.

(2) The Executive Council may, by resolution, appoint one or more committee or committees, sub-committee or sub-committees for such purposes as may be specified by it.

(3) The Executive Council of the Institute may, by resolution, delegate to the Chairman or the Director or to both, such of its powers as it may deem fit for the conduct of business.

8. *Treasurer*—The President shall nominate a member of the Executive Council as Treasurer of the Institute and he shall be responsible for all moneys received and payments made by the Institute.

9. *Bye-Laws*—The General Council of the Institute may frame bye-laws for the proper conduct of business of the Institute for which no specific provision has been made in these rules. Such bye-laws shall be passed by the General Council by a majority of the total membership of the Council and by a majority of not less than 3/5 of the members present.