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ABSTRACT

This recommendation is complementary to recommendation 30, (CE 001 037) on professional training, and preserves the opportunities for transfer which have always been part of the British Electricity Supply Industry Board's schemes. The two together supersede the sections of Recommendation 5 that refer to the education and training of generation and transmission engineers. The distinction is not made between technician engineers and technicians in electricity supply and the term technician engineering trainee is used for all of those covered by the present recommendation. Topics covered are: (1) responsibilities of generation and transmission engineers, (2) recruitment and entry qualifications, (3) length and pattern of training, (4) educational courses, (5) types of training, (6) safety, and (7) administration. Educational courses appropriate for technician engineering training in generation and transmission are listed and discussed in the appendixes. (Author/DS)

ED 087938

Electricity Supply Industry Training Board

Recommendation 31: Technician Engineering Training in Generation and Transmission

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note on terminology

In the title and text of the recommendation the term "generation" is used to denote the operation and maintenance functions only and does not include the development and construction function.

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foreword

The Board's recommendation 5, on the training of student engineering apprenctices, issued in April 1968, made provision for the training of generation and transmission engineers through a number of alternative patterns of education and training. The education provision led in some cases to a degree or diploma, and in others to a qualification such as a Higher National Certificate. The programmes of practical training were adapted in length to the patterns of "thick" and "thin" sandwich courses and to studies by block or day release, but had a similar content, based on the best current training practices within the industry.

The Board regarded recommendation 5 as an interim statement of its policy in this sector but decided that a more fundamental and detailed consideration of the training needs of the various categories of engineers within the industry was required, based on an analysis of the duties and responsibilities of each group of engineers, and of the knowledge and skills implicit in carrying out the various elements of their work.

The present recommendation is the result of such consideration applied to generation and transmission engineers who are studying for a technician engineering qualification. Its provisions are based on an analysis of the work of these engineers in power stations or transmission districts, since it is here that early appointments are normally held. Typical programmes of training with related syllabuses have been drawn up for each of these two areas of work and are published separately.

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This recommendation is complementary to recommendation 30, on professional engineering training in generation and transmission, and preserves the opportunities for transfer which have always been part of the Board's schemes. The two together supersede the sections of recommendation 5 that refer to the education and training of generation and transmission engineers.

In some sectors of the engineering industry, distinction is made between technician engineers and technicians. This distinction is not made in electricity supply and the term "technician engineering trainee" is used for all those covered by the present recommendation irrespective of the course of further education they may follow.

recommendation on technician engineering training in generation and transmission

the responsibilities of generation and transmission engineers

1. These engineers are concerned with the generation of electricity and the transmission of bulk supplies to distribution systems and certain large customers. Various factors influence the planning of their training, amongst the most important of which are the following:

a) Reliability of supply coupled with maintaining the highest possible plant availability, particularly of modern plant having high unit replacement cost.

b) The degree to which operation and maintenance are interlinked and the necessity therefore of engineers having sound knowledge of both disciplines. Additionally an understanding of the work of other aspects of generation and transmission is essential.

c) The work will usually be of a regular pattern, but engineers must be continually alert in order to deal with unusual occurrences. Both the human and technical aspects of supervisory responsibility are involved, namely, control of staff and communication; determination of work methods and fault diagnosis.

d) The safety of staff and public.

recruitment and entry qualifications

3. Entrants will be termed "technician engineering trainees", and will be drawn mainly from the following sources:

a) *School leavers*
Young people who have reached a sufficient standard in secondary education, particularly in mathematics and a suitable science subject, to qualify them for entry to one of the courses specified in appendix I. In selecting, boards will wish to look for evidence of a reasonable standard of spoken and written English in view of the importance of effective communication.

b) *Suitably qualified craft apprentices*
Craft apprentices who during their training have made sufficient progress towards an appropriate qualification, as well as demonstrating suitable personal qualities, to merit transfer to the category of technician engineering trainee.

c) *Industrial staff*
Staff, usually between the ages of 21 and 35, selected by their electricity board, and who have reached an appropriate educational standard, as outlined in appendix II.

4. Selection procedure should include interview, and a review of academic performance and school record, together with selection tests where appropriate.

length and pattern of education and training

5. Before taking up his first appointment the trainee must have satisfactorily completed the practical training prescribed in the recommendation, and have reached an acceptable standard of further education in electrical, mechanical or instrument and control engineering.

6. The overall length of the education and training programme will normally be about four years. There will be some reduction of this time when entrants—for example, from sectors of the industrial staff—already have relevant experience. For approximately the first two years trainees will follow a common programme, but at that stage a decision will be made as to whether they are to be trained for work in generation or in transmission, and the remainder of their education and training will be specialised.

7. Attendance for further education will be on a day, block or sandwich release basis. The nature of appropriate education courses and the content of training are set out in the following paragraphs.

educational courses

8. The further education courses followed by those undertaking technician engineering training in generation and transmission should be designed in two stages. The initial stage, extending over the first two years, should provide broadly based knowledge of the fundamentals of both mechanical and electrical engineering. The second stage, extending over two or three further years, should provide specialised knowledge in mechanical, electrical, instrument and control engineering or in other technologies. An introduction to supervisory studies should also be included at an appropriate stage.

9. The level of course initially followed will depend on the entry qualifications of the trainee and appropriate alternatives are set out in appendix I. Those who later demonstrate ability to follow a more advanced course should be considered for transfer, which may also imply changing to professional training. Appendix I indicates the most suitable stages for transfers to be made.

10. Young engineers who have the ability and interest should be encouraged to continue to study after the education in engineering associated with their formal training has been completed. Such study may begin during the latter part of their training course and continue into the early years of appointment. Where the engineer has attained a sufficient standard, he may study for a higher engineering qualification. Where this is not appropriate, attention should rather be directed towards a broadening of knowledge and the industry's correspondence courses will frequently be suitable. Short courses are also commonly available in colleges in subjects relevant to the future work of generation and transmission engineers; for example, more specialised aspects of engineering, or techniques associated with the planning and control of engineering work. Electricity boards should advise on the most appropriate subjects to follow, and, where necessary, extend facilities for study beyond the end of the formal training scheme under their provisions for career development.

11. Throughout this recommendation reference is made to courses within the further education system as it stands at present. Changes in the structure and nomenclature of courses may follow the adoption of the reports of the Committee on Technician Courses and Examinations.

training

12. The broad objectives of engineering training in generation and transmission have been stated in paragraph 2. It is to be recognised, however, that the training of an engineer in the sense of continuing to increase his knowledge, skill and experience, extends throughout his working life and that from time to time during his career, particularly when taking up a new appointment, he should be given facilities to attend courses in new aspects of his work, or refresher courses to enable him to bring his knowledge up to date. It is recommended therefore that electricity boards ensure close integration between initial training, as covered by this recommendation, and later training provided by their career development scheme. For this reason the recommendation has kept the length of training as short as practicable, recognising that the early appointments of an engineer are necessarily under the close supervision of more experienced engineers.

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13. The training schemes can be divided into three phases. The first is general and common to both generation and transmission engineers; the second and third concentrate on either power station or transmission work. The arrangement may be shown diagrammatically as follows:

General training	Generation Training Stage I	Generation Training Stage II
	Transmission Training Stage I	Transmission Training Stage II

14. Through systematic analysis of the work of generation and transmission engineers it is possible to sub-divide these stages and to identify a number of areas in which it is essential to provide opportunity for entrants to gain knowledge and experience during training. These form the major areas of a training programme and can be summarised as follows:

general training	Induction and related knowledge
	Workshop practice
	Power plant familiarisation; an introduction to generation, including station unit operation, and to transmission
	Maintenance; power plant and transmission plant

Stage I

generation training

Operation, fossil fuel and nuclear.

Control systems and instrumentation.

Maintenance, mechanical, electrical and instrumentation and control.

Computer applications.

Job administration and supervision, including work study, work planning and effective communication.

Stage II

Directed objective training in :

a) Planning and organisation of operation and maintenance.

b) Plant operation.

c) Maintenance in *one* of the following areas :
Mechnical plant and equipment.
Electrical plant and equipment.
Instrumentation and control equipment

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Stage I

transmission training

Operation, maintenance and construction of plant and equipment.

Transmission plant, protection, telecommunications and measurement equipment.

Operation of transmission systems.

Distribution engineering.

Computer applications.

Job administration and supervision, including work study, work planning and effective communication.

Stage II

Directed objective training in :

a) Operation and maintenance including planning and organisation.

b) Protection including telecommunication and control aspects.

Tests, appraisals and projects will be introduced at suitable points throughout the programme.

15. The content of training for each of these components (both formal and on-job) has been analysed. The syllabus for each formal course or period of on-job training indicates the objectives and content of the aspect of training concerned, the training methods that are appropriate, the duration and the location in which it should be given. Implicit in this training is the importance of developing an understanding of human and industrial relationships.

16. The programme for any particular training scheme operated by electricity boards should be compiled by combining the syllabuses in a suitable order to fit in with the pattern of release which trainees are following, and with the loading of formal training centres. The notes of guidance which form appendix III illustrate how this could be done for generation or transmission, with particular reference to school leaver entrants, but boards may vary this order according to local circumstances. The grouping of the components listed in appendix III and summarised in paragraphs 13 and 14, and their content, have been developed from an analysis of current engineering posts. This range of duties may alter as a result of technological advance and/or organisational change and it is recognised that the training programme should reflect such developments as they occur. The programme is in fact structured in such a way that components can be regrouped to meet different engineering employment patterns should these be introduced. Whatever changes are made there must as far as possible be a logical progression through the training components.

17. For entrants other than school leavers (i.e. categories (b) and (c) of paragraph 3) modifications will be required particularly to the early stages of the programme, in order to take full account of the training and experience the entrant has already had and to avoid unnecessary duplication. Trainees will need to be considered individually and appropriate training provided for each.

formal and on-job training

18. A significant feature of the training specified is the proportion of formal training required, which is approximately 50 per cent of the training time in the first two phases. In this way it is possible to utilise the skill the young people concerned will have already developed in acquiring knowledge through formal studies, and to keep the brisk pace to their programme which is essential if their abilities are to be extended and their interest maintained. Problems of sufficient numbers to form viable groups are likely to arise within an electricity board and may be met by combination with other groups of trainees within the board, by arrangements between regions, or by arrangements on a national basis. Experimentation in ways of providing formal training other than in a conventional classroom setting should maintain the principles of planned sequence, concentration of instruction and adequate attention from a tutor.

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19. On-job training however is an essential complement to formal training. This is partly because certain equipment and processes cannot be satisfactorily simulated, but more particularly because it is essential for the trainee to get the feel of 'real' situations and to have direct contact with staff whom he may expect to supervise later in his career. It is important during such on-job training that the trainee participates in the situation as far as possible, rather than watches it, and such participation may frequently be in association with a junior supervisor. It will normally be most effectively achieved by attaching the trainee to an engineer who may allocate him to different jobs.

20. Nonetheless it is inevitable that some time will be spent in observation and this must be made as purposeful as possible. The trainee's approach should be analytical, i.e. he should find out and record such facts as what is being done and why, the job method used, the sequence of events and the time taken ; he should deduce what are the critical points for supervising engineers to check. He should be required to discuss his findings with experienced engineers and from time to time produce written reports. Individual and group projects may be introduced into the programme at appropriate points.

21. Most formal courses in technical work should include visits to power stations or other installations, and there will usually be particular merit in including locations where construction or commissioning is in progress. In addition, trainees should where possible spend at least one period of on-job training in such a location.

safety 22. Safety is a vital aspect of the work of an engineer in generation and transmission, and instruction in relevant aspects must be built into every phase of his training. The importance of the safety of the public and of craftsmen and others working under his direction, as well as of himself, must become so much part of his approach to his work as to permeate his thinking and be habitual in his actions. The bearing of physical fitness on safety, particularly for engineers closely associated with field work, should be borne in mind; in this connection trainees should be encouraged to participate in sport and similar activities.

the administration and monitoring of training

23. From the basic programmes in generation and transmission set out in this recommendation, electricity boards should develop an individual programme for each trainee. These programmes should be developed in close collaboration between senior engineers and education and training staff, and administered by a nominated person, preferably an engineer, who normally should be on the staff of the officer responsible for education and training. His duties will include :

a) Drawing up an individual programme for each trainee in advance of his needs.

b) In consultation with the trainee, adjusting these programmes from time to time in the light of his progress and needs, and of local variation in the experience that can be provided.

c) Keeping in close touch with the training which the trainee is currently undertaking and, at intervals of not more than three months, discussing with him the work he has been doing to check that he has a thorough understanding of it.

d) Receiving reports from the heads of the departments of the electricity board in which each of his trainees has been working, from leaders of the formal courses he has attended, and from the college at which the trainee has been undertaking his academic studies and, in consultation with them, taking any necessary action.

e) Preparing an annual written review of each trainee's progress and development, based primarily on reports from the departments in which he has been working, the engineer's observations of the trainee and quarterly discussions with him, and college reports of progress on academic studies. The review should include observations on the aims and interests relevant to his future career that the trainee has expressed.

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24. At each working unit of the electricity board, to which trainees are attached, management should nominate an engineer to take local responsibility for acting as a mentor to the trainees attached to his unit. He should be a qualified engineer and of sufficient seniority and experience to cover the whole of the unit's activities. His duties will include placing trainees with appropriate members of his unit's staff, checking that they are gaining the correct experience and preparing reports on progress. It is expected that training will be given to engineers to assist them to fulfil training duties as outlined above.

25. It is important that measures are taken to assess and record each trainee's progress through his training so that remedial action can be taken to correct any gaps in his knowledge and that a systematic feedback of information is established from which the various components of the training programmes can be evaluated.

26. Formal courses will usually include practical exercises, either written or manual, which will in themselves show how the trainee is progressing ; and if necessary these can be supplemented by more formal tests. For the on-job training some degree of feedback will be obtained from exercises and written reports from trainees, but the essential source will be reports from engineers under whom they have carried out their on-job training.

educational courses appropriate for technician engineering training in generation and transmission

appendix I

educational courses

According to their entry qualifications, trainees will normally follow one of the routes outlined below:

i) a) In England and Wales, a course leading first to the Ordinary National Certificate in engineering, but including both mechanical and electrical options; and where studies are undertaken on a day rather than a block release basis, more than one day's release will be required. To some extent the subjects taken may have to be varied in line with their availability within colleges, but they should include:

O.1 Year Mathematics, Mechanical Engineering Science, Electrical Engineering Science, Workshop Processes and Communications, Physics, General Studies.

O.2 Year Mathematics, Applied Mechanics, Electrical Engineering A, Physics II, Applied Heat *or* Workshop Technology, General Studies.

This course should be followed by further studies for a Higher National Certificate with either a mechanical or an electrical bias, the options being:

HNC in Engineering (which has a mechanical bias);

HNC in Electrical and Electronic Engineering—heavy current options;

HNC in Electrical and Electronic Engineering—light current options.

i) b) In Scotland arrangements should be made with colleges to implement the principle of covering both electrical and mechanical subjects relevant to generation and transmission during the first two years of study, and at the same time of enabling trainees to gain an Ordinary National Certificate. Trainees should study for an ONC in either :

1) Engineering (mechanical engineering options) with additional electrical subjects ; or

2) Electrical and Electronic Engineering, with additional mechanical subjects including engineering drawing in the first year.

These courses should be followed by further studies for the appropriate Higher National Certificate, i.e. :

HNC in Engineering (mechanical engineering options) ;

HNC in Electrical and Electronic Engineering—heavy current options ;

HNC in Electrical and Electronic Engineering—light current options.

In all cases courses should include an introduction to supervisory studies. Trainees who demonstrate the ability, should be allowed to study for a further period to cover additional subjects and so obtain Certificates of Supplementary Study. In some cases it will be particularly appropriate for such Supplementary Studies to be in another engineering discipline from that in which they gained their HNC.

ii) A course leading to a Mechanical Engineering Technician's Certificate (Course No. 255, formerly No. 293) or an Electrical Technician's Certificate (Course No. 280 followed by Course No. 281, both formerly No. 57) of the City and Guilds of London Institute.

The first two years should essentially cover the subject matter of Part I of both the electrical and the mechanical courses, so that by the end of the T_2 year the trainee has a broad basic education in engineering, and is qualified to study for the Part II of either course. The subjects to be covered in Part I should be:

Mathematics, Engineering Science both Mechanical and Electrical, Workshop Processes, Engineering Drawing and Materials, Power Production, Technical Reports, General Studies.

Whilst there is considerable overlap between the syllabuses of Course No. 280 and Part I of Course No. 255 there are significant differences in content and emphasis, and electricity boards should make special arrangements with colleges to ensure that their trainees cover all the required ground, granting more than one day's release where necessary. The second two years should be specialised in mechanical, electrical or instrument and control engineering, and trainees should take one the of following:

Mechanical – Part II of Mechanical Technician's Course, No. 255.

Electrical – Electrical Technician's Course, No. 281.

Instrument – Electrical Technician's Course, No. 281 with instrumentation and control bias.

Trainees who on entry to the scheme are already taking the Industrial Measurement and Control Technician's Certificate (Course No. 275, formerly No. 310) of the City and Guilds of London Institute should complete that course (e.g. industrial staff trainees).

Those who demonstrate the ability should be allowed to study for a further period after the completion of Part II to cover a special technique and to gain a Full Technological Certificate. A proportion of trainees should be encouraged to take Part III studies based on instrument and control technology.

Parts II and III should include an introduction to supervisory studies.

release for further education

Sufficient release for educational requirements must be built into trainees' individual programmes. For the first stage (i.e. Ordinary National Certificate or Part I City and Guilds of London Institute Courses) which, as indicated, covers a broad basic education in engineering and includes both electrical and mechanical engineering studies, courses will typically require:

i) Fifteen weeks' release in each of the two years where block release courses are followed;

ii) Two days' per week release in each of the two years where day release courses are followed.

For the second stage (i.e. Higher National Certificate or Part II City and Guilds of London Institute Courses) courses will typically require:

i) Twelve weeks' release in each of the two years where block release courses are followed;

ii) One day per week release with the associated evening studies where day release courses are followed.

If an introduction to Supervisory Studies is to be given during this second stage, additional release on a block or day release basis will be required.

transfers between courses

Electricity boards should consider for transfer to a more demanding course trainees who have shown from their performance in their present situation that they have the capacity for more advanced work.

Such transfers will normally be:

a) From CGLI technician's courses to ONC/HNC courses;

b) From ONC (or OND) to HND or degree sandwich courses.

In case (b) the change is not only of academic courses, but implies also a change to professional training.

A transfer between courses often necessitates an extension of the length of time for which the trainee requires to study and some corresponding adjustment in the duration of his practical training programme may be implied.

educational standards appropriate to applicants for technician engineering traineeships from industrial staff

appendix II

Applicants should have reached an appropriate educational standard and have demonstrated that they have the ability successfully to complete a course leading to a Higher National Certificate, or a City and Guilds Technician's Certificate in appropriate subjects. They should therefore have attained one of the standards outlined below:

i) Possession of:

a) In England and Wales, a General Certificate of Education at the Ordinary level or its equivalent in four subjects including mathematics and one of the following: physics, physics with chemistry, mechanics, mechanical science, engineering science, science (building and engineering).

b) In Scotland, a Scottish Certificate of Education at Ordinary grade in three subjects, namely: mathematics, technical drawing, physics or applied mechanics; or equivalent qualifications.

ii) Successful completion of the General Engineering Course at appropriate level: or

iii) Successful completion of the City and Guilds Electrical Technician's Course No. 280 (formerly Part I of Course No. 57), Part I of the City and Guilds Mechanical Engineering Technician's Course No. 255 (formerly No. 293) or Part I of the City and Guilds Industrial Measurement and Control Technician's Course No. 275 (formerly 310); or

iv) Completion of a City and Guilds craft course at a high standard; or

v) Such other qualifications as may be established, e.g. the City and Guilds Principles and Operation of Power Plant Course No. 653 (formerly 464) with appropriate endorsements.

typical programmes for technician engineering trainees in generation and transmission

appendix III

1. The two sequence diagrams which follow illustrate the combination of the various syllabuses into training programmes, for trainees taking (a) the generation option, and (b) the transmission option. The items have been sequenced in a logical order which should act as a general guide to electricity boards. In practice, such considerations as the necessity of accommodating educational release requirements or of making a sufficient number of trainees available for formal courses, or the availability of vacancies for on-job training in small departments, may make some re-arrangement necessary.

2. The diagram should be interpreted as follows:

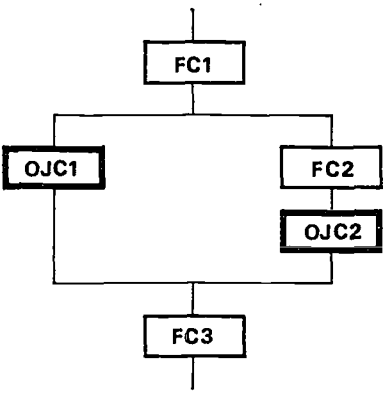
a) The sequence of training assignments flows from top to bottom.

b) Trainees are required to take all components. Where parallel paths are shown, these indicate alternatives of sequence and not of content.

c) All input components must be completed before the next component is begun.

d) A thin line box indicates a formal (or off-job) component.

e) A heavy line box indicates an on-job component.



For example:

The sequence of training components shown above indicates that:

i) Components FC1, FC2 and FC3 are formal components, while OJC1 and OJC2 are on-job components.

ii) FC1 must be completed before OJC1 or FC2 can be started.

iii) After completion of FC2, OJC2 can be started. If FC2 is taken before OJC1 it can be followed by either OJC1 or OJC2.

iv) Both OJC1 and OJC2 must be completed before FC3 can be started.

3. It is envisaged that further education will usually be covered by block release. Where arrangements are made for equivalent day release, corresponding adjustments will have to be made in the number of weeks allocated for each item of training.

4. The programme has been drawn up according to the following principles and these must be taken into account in making modifications.

i) The trainee must be sufficiently advanced in his theoretical studies to gain full benefit from a training assignment, and due account should be taken of the consultation which takes place between industry and college.

ii) Formal training in a topic should precede on-job training, apart occasionally from short introductory periods on site.

iii) Whilst syllabuses for formal courses in discrete subjects have been developed, in some circumstances there may be advantage in grouping and integration.

iv) Tests, appraisals and projects should be interspersed at suitable stages throughout the programme.

v) Where it is necessary to reduce the overall length of the training programme. the formal elements should normally be retained and the reduction made to appropriate items of on-job training.

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5. In addition to the formal instruction in safety and accident prevention included in the Induction course and the course on Safety, emphasis should be placed on the relevant safety and health precautions during each stage of on-job training. In connection with formal training in safety the requirements of the Training Board's recommendation 20, on the electrical training of apprentices to meet Factories Act requirements, must be fully met.

6. In view of the change-over to metric units which, in common with British industry as a whole, will be taking place in electricity supply between the present time and 1975, electricity boards should ensure that all trainees covered by this recommendation are given training in the aspects of S.I. units, metric threads and fastenings, and the consequential changes in specifications and standards of materials and components, that are applicable to their future work. Electricity boards should bear in mind that for many years to come equipment manufactured to both Imperial and metric specifications will be in use, and that trainees must therefore be familiar with both systems and with appropriate methods of conversion.

7. The duration of each element of training is the best estimate that can be made of the time required by engineering trainees of normal ability but with no previous industrial experience. The times given should be regarded as flexible and some revision may prove necessary as electricity boards gain experience in operation. In the case of trainees recruited from the industrial staff, individual programmes should be drawn up taking full account of previous experience. It is to be anticipated that their overall period as engineering trainees will not normally exceed two and a half years.

8. Lists of the components of directed objective training are also included. The directed objective training of generation trainees should consist of three off-job components and one group of formal courses selected from the generation list.

A typical combination of off-job components might be:

i) Operations (choice of one from two)

ii) Work Planning and Organisation

iii) Maintenance (choice of one from six)

Matching operations and maintenance components should be selected, i.e. Operations (Nuclear) with one of three Maintenance (Nuclear) components.

9. The relevant group of formal courses should be selected. In the case of the nuclear option this comprises courses in Principles of Nuclear Generation and Magnox Operations. It is anticipated that at a later stage it will be necessary to develop a course to meet the needs of trainees likely to be employed in Advanced Gas Cooled Reactor (AGR) stations.

10. The directed objective training of transmission trainees should consist of the two off-job components and the formal course shown in the transmission list.

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	Time (weeks)		Syllabus Code
	Formal	On-job	
1 Induction, related knowledge and safety	1		GEF 1
2 Workshop practice	24		GEF 2
3 Power station plant I	2		GEF 3
4 Power station unit operation I		5	GEOJ 1
5 Power station plant II	2		GEF 3
6 Electrical plant and transmission systems I	3		GEF 4
7 Safety	2		GEF 5
8 Power plant maintenance I		12	GEOJ 2
9 Transmission plant operation and maintenance I		5	GEOJ 3
Totals	34	22	

stage I training (generation)

	Time (weeks)		Syllabus Code
	Formal	On-job	
1 Introduction to work study	2		GEF 6
2 Power plant maintenance II		6	GEOJ 2
3 Power plant operation	2		GEF 7
4 Power plant unit operation II		6	GEOJ 1
5 Power station control systems and instrumentation		8	GEF 8
6 Computer applications	1		GEF 9
7 Work planning, costing and control	2		GEF 10
8 Power station maintenance		9	GEOJ 5
9 Nuclear power station operation and maintenance		5	GEOJ 4
10 Power station operation		5	GEOJ 6
11 Introduction to supervision	3		GEF 11
Totals	18	31	

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stage II training (generation)

	Time (weeks)		Syllabus Code
	Formal	On-job	
1 Operation (fossil fuel)		13	GEDOT 1
2 Operation (nuclear)		13	GEDOT 2
3 Work planning and organisation		10	GEDOT 3
4 Mechanical maintenance (fossil fuel)		14	GEDOT 4
5 Mechanical maintenance (nuclear)		14	GEDOT 5
6 Electrical maintenance (fossil fuel)		14	GEDOT 6
7 Electrical maintenance (nuclear)		14	GEDOT 7
8 Instrumentation and control maintenance (fossil fuel)		14	GEDOT 8
9 Instrumentation and control maintenance (nuclear)		14	GEDOT 9
10 Fossil fuel generation	3		GEF 12
11 Principles of nuclear generation	6		GEF 13
12 Nuclear generation (magnox)	6		GEF 14

Totals 3 or 12 37
see paragraphs 8 & 9 of appendix III

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stage I training (transmission)

	Time (weeks)		Syllabus Code
	Formal	On-job	
1 Introduction to work study	2		GEF 6
2 Computer applications	1		GEF 9
3 Work planning, costing and control	2		GEF 10
4 Electrical plant and transmission systems II	1		GEF 4
5 Transmission plant operation and maintenance II		9	GEOJ 3
6 System operation		4	GEOJ 7
7 Electrical protection systems	2		GEF 15
8 Electrical protection		6	GEOJ 8
9 Telecommunications systems	1		GEF 16
10 Telecommunications		6	GEOJ 9
11 Measurements equipment	1		GEF 17
12 Measurements		6	GEOJ 10
13 Distribution Engineering	2		GEF 18
14 Transmission construction		6	GEOJ 11
15 Introduction to supervision	3		GEF 11
Totals	15	37	

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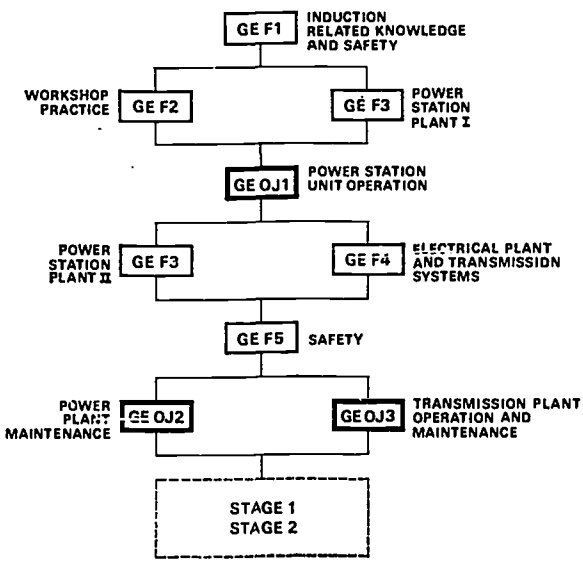
stage II training (transmission)

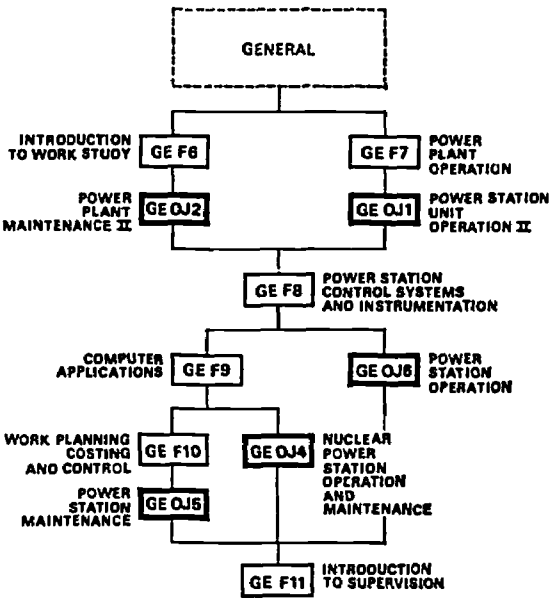
	Time (weeks)		Syllabus Code
	Formal	On-job	
1 Transmission operation and maintenance		20	GEDOT 10
2 Electrical protection		20	GEDOT 11
3 Protection and telecommunications applications	3		GEF 19
Totals	3	40	

sequence of training components generation

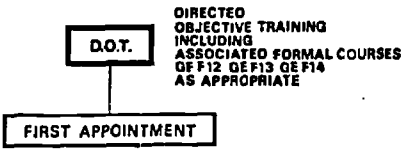
general



stage I

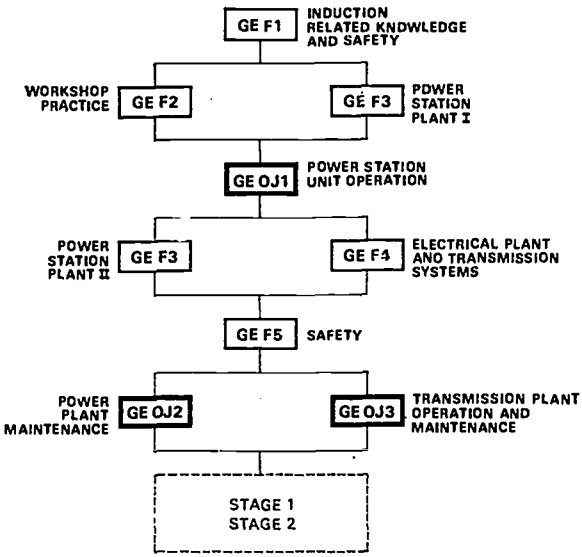


stage II

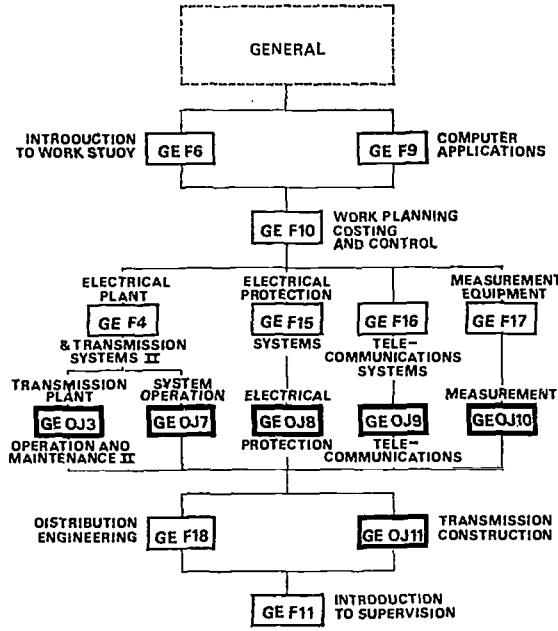


sequence of training components transmission

general



stage I



stage II