

# COMMISSION OF THE EUROPEAN COMMUNITIES

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## MEMORANDUM

### ESTABLISHMENT OF A FIFTH E.C.S.C. PROGRAMME OF ERGONOMICS FOR THE STEEL AND COAL INDUSTRIES

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Memorandum

Establishment of a Fifth E.C.S.C. Programme

of

Ergonomics for the Steel and Coal Industries

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## I. Introduction

The "IVth E.C.S.C. Programme on Ergonomics for the Steel and Coal Industries (1980-1984)", approved by the Commission of the European Communities on 3rd September 1980 pursuant of Article 55 of the E.C.S.C. Treaty has come to its end. The 13 million ECUS made available for the programme and for the dissemination of the results have been committed.

This "Fourth Programme", building on the work of its predecessor, has had notable success in carrying through a Programme of Community Ergonomics Action in the two industries. The Action through:

- a series of studies to determine and evaluate ergonomics design parameters of various production and associated service systems, carried out by ergonomics groups within the industries with the participation of the workforce;
- the co-ordination and dissemination of the study results throughout the industries by the Community Ergonomics Action Bureau of Information and Co-ordination;

has allowed a significant ergonomics contribution to be made to many aspects of health and safety in the E.C.S.C. industries.

The programme has formally embraced the four member countries with coal industries and eight of those with steel industries.

In summary the topics dealt with in the programme have been

- automated systems
- heavy plant and equipment
- protective clothing and equipment
- underground illumination.

An example from each of these topics suggests the effectiveness of the programme.

- The main resources of the programme have gone into the new systems, based on the micro-processor, being introduced into both industries: and have been concerned with optimizing man's role in these systems as a function of his behavioural characteristics and capabilities. The most complete example in this respect has been concerned with new high technology continuous casting plant: where Community Action projects, involving the Belgian, German and Italian steel industries, have seen ergonomics requirements studied and defined; passed to design and construction; and subsequently evaluated with positive results.
- The programme has seen the completion of the work to define the ergonomics design parameters for heavy underground mining equipment. The approach here has allowed recommendations and guidelines to be drawn-up which should be applicable to the whole range of such equipment in the foreseeable future. A similar programme of work has also produced the ergonomics design parameters for an extensive range of underground personnel transport systems.
- A Dutch, Belgian and United Kingdom steel industries' co-ordinated group of projects have carried out further studies on molten-metal-splash-protective clothing which, among other things, has resulted in the specification of new material which, while lighter in weight than many used in current designs, offers increased protection.
- Work on underground illumination in mines was begun in this programme and the first fruits of joint French, German and United Kingdom studies has been the specification of ergonomics requirements for face lighting and the resultant implementation at a number of faces. The results of these studies will be brought to the notice of the various illumination standards committees.

For, whereas previous laboratory studies have directed standards towards a value of between 40-50 lux for the face the Community Ergonomics Action studies carried out on site give values as low as 5 lux as an adequate level of illumination for all tasks carried out at the face given uniform and non-glare conditions.

The complete results of this IVth Programme are currently being collated, evaluated and synthesised. They will be presented generally to the industries at a series of Information Days planned for Spring 1985. However, as is stated later in this Memorandum, an intrinsic and explicit part of the Vth Community Ergonomics Action Programme will be to establish these results in the every-day practice of the industries.

## II. The Need for the Proposed Programme

It has been possible at the end of the IVth E.C.S.C. Ergonomics Programme to terminate in success certain lines of Ergonomics Action.

An overview of the industries, nevertheless, makes it clear that the need for such Action continues in many of their operations.

The ever-changing and rapid exploitation of the potential of the micro-processor, in both the coal and the steel industries, precludes a final statement, at this point, on the ergonomics considerations of the new technology in these industries. Particularly, as the systems of software become more sophisticated, attention will need to be given to the ergonomics, in its broadest sense, of the system. It must be ensured that the conceptual/organizational framework of the system generates tasks which can be accommodated by the capabilities of the normal, trained operator. The safety hazard, and, possibly to a lesser degree, the risk to health in contrary circumstances can only be a matter of conjecture.

Further there are many operations which will remain untouched by the new technology and which in the increasing general demand for an enhanced quality of working life, and greater productivity, will require the industries to improve working conditions and environment. Continued ergonomics action will assist these efforts.

There are, specifically, several major hazards which still affect the health of the workforce and which the application of ergonomics data and principles can, in part, reduce. "Back problems" which are now the biggest single source of sickness absence is an example.

The success of the IVth Programme in itself generates a need for further Action. If the programme is to have been truly economically viable, then its results, which are not ephemeral, must be integrated into the infrastructure of the industries for medium and long term use.

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With these considerations in mind, a "Fifth Programme of Ergonomics" is proposed which will have the following objectives:

- (i) ensuring that ergonomics makes its full contribution to safety in the development and installation of new high technology systems in the E.C.S.C. industries;
- (ii) contribution to the alleviation of a major health problem in the E.C.S.C. industries;
- (iii) continued improvement of the general working and environmental conditions; and assisting the E.C.S.C. industries to meet the demands for a better quality of working life;
- (iv) undertaking Action which will exploit the results of the previous programme to the benefit of the foregoing aims in the long term.

### III. The Programme

#### 1. Community Ergonomics Action

The Community Ergonomics Action programme is planned to cover three main activities with the following objectives:

- assuring that the ergonomics questions relevant to safety which arise with the technological development taking place in the E.C.S.C. industries receive the necessary and appropriate consideration;
- continuation of an ergonomics contribution to health and safety in the many areas of the E.C.S.C. industries which will remain relatively untouched by the new technologies;
- establishing the data built-up from previous E.C.S.C. ergonomics programmes in the every-day practice of the various health, safety and procurement functions of the industries and that of the designers and manufacturers of the industries' equipment

The work will be carried out through a series of projects undertaken by the ergonomics groups and services established in the industries during the previous programmes; with the participation of the workforce; and in conjunction with the Community Ergonomics Action Bureau of Information and Co-ordination. Harnessing their collective expertise in a joint effort will be encouraged by giving priority to proposals calling for co-operative projects at the industry and Community level.

Specific aspects of the programme are as follows.

##### 1.1. Ergonomics and Technological Development

The use of the "new technology" in the restructuring and the continuing development of steel production and coal winning is rapidly increasing the number of tasks in the E.C.S.C. industries where factors in design, construction, operation and maintenance of the system, and its auxiliary operations such as communications and transport, can give a predisposition to "human-machine incompatibility" which in turn gives rise to major questions for the safety of personnel.



While it is recognized that "human-machine incompatibility" may occur for a number of reasons, a critical factor in the frequency of its appearance in these new systems will be the flow of information to the operator, his means to evaluate this information, and the means available to him for necessary corrective action. All of which must be compatible with his normal abilities to conceptualize a real physical situation, from a remote position, based on numerical, symbolic or pictorial displays. Abilities which themselves are subject to variation as information load, operating period, physical environment and job organization vary.

To reduce the risks to safety inherent in "human-machine incompatibility" it is necessary to give ergonomics consideration during the four phases, design, construction, operation and maintenance, to

- the design of hardware and software systems to take account of
  - \* human information processing and cognitive abilities,
  - \* the principles of man computer interaction,
  - \* operational decision aids;
- the influence of the physical work environment;
- the influence of work organization;
- the planning and evaluation of operator training.

The present programme will therefore support the study, development and evaluation of the above ergonomics requirements, singly and interactively, for E.C.S.C. production and auxiliary systems: thereby reducing the potential for a source of accident causation.

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## 1.2. Production Plant and Equipment

Despite the major reconstruction programmes which are introducing the microprocessor-based equipment into the steel and coal industries, in the medium term, many tasks in both industries will continue to be related to systems based on traditionally engineered plant and equipment. For example:

- charging of electric arc furnaces;
- equipping and salvaging faces;
- pushing coke ovens;
- surface mobile plant;
- manual surface treatment;
- loading and unloading ships.

In such operations, levels of vibration, noise, thermal stress and illumination, postural constraints and physiological load singly and interactively can potentially militate against an acceptable working environment, and in extreme cases can pose health and safety hazards.

The present programme will therefore support the study and evaluation of the ergonomics requirements of such operations with a view to ameliorating the associated working conditions.

## 1.3. Specific Topics

Within the general framework of ergonomics considerations of plant and equipment, three specific areas have been noted as of special importance with regard to improving health and safety in the E.C.S.C. industries. They are as follows.

### 1.3.1. Biomechanical Damage Risks

Lumbar and general muscular accidents and injury continue to be a significant cause of sickness absence in the E.C.S.C. industries.

During the IVth Ergonomics Programme, research was initiated to obtain data on human biomechanical capabilities with regard to posture, age etc. on the one hand, and the aspects of tasks in the industries which create lumbar, muscular or limb damage on the other. These data will be to hand for the Vth Programme and will allow an ergonomics contribution to alleviating physical load and the reduction of biomechanical damage risk through ergonomics considerations in the design of, for example,

- aids for physically arduous lifting and handling tasks;
- tools and equipment for work in restricted or unconventional workplaces;
- tools for maintenance.

The present programme will therefore support the study, development and evaluation of the ergonomics requirements in the design of these and other equipment and tools as necessary with a view to reducing biomechanical damage risk.

#### 1.3.2. Hearing Conservation and Auditory Communication

The ergonomics aspects of hearing loss as a result of prolonged exposure to high noise levels, and the requirements for hearing conservation are now well established. Protection and conservation now lie ultimately in technical intervention to reduce noise at the source. As such, the solutions lie outside the scope of an ergonomics programme. However, it must be recognized that the results of such interventions will be seen in the medium rather than the short term.

In the interim a significant degree of hearing conservation can be achieved through integrated programmes which

- aim to reduce noise exposure by
  - \* secondary noise reduction design, e.g. acoustic tiling, screening, etc.,
  - \* personal protection, e.g. ear defenders, noise havens, etc.,
  - \* job organization;
- carry through routine and frequent auditory screening and monitoring of the personnel's hearing acuity.

It must further be recognized that personal protection raises problems of communication and hence safety - particularly in mining.

The ergonomics aspects of these approaches have been considered in the IVth E.C.S.C. Programme with significant success and further work should allow the development of systems which will give hearing protection in noisy environment without hindrance to speech comprehension and auditory warning signals.

The present programme will therefore support the further study, development and evaluation of the ergonomics requirements in the design of hearing conservation and allied communication systems.

### 1.3.3. Underground Illumination in Mining

At Community level the illumination of underground work posts is still marked by its absence. It is, however, generally assumed that increasing illumination in mines is a desirable feature both with respect to safety and the general amelioration of working conditions.

This is currently being demonstrated in the increase of machine mounted lighting, the development of new designs of personal cap lamps and the installation of illumination at transfer/junction points and face-ends. It is important that such developments go ahead with the benefit of ergonomics considerations, and in the IVth Programme a successful start was made with respect to face illumination.

The present programme will therefore continue this line of work and will support studies directed at defining the requirements of ergonomics standards for the design of underground lighting in mines.

#### 1.4. The Developments of Results

Community Ergonomics Action and Research in the IIIrd and IVth Programmes have built up a considerable body of knowledge concerning the ergonomics requirements of

- coal winning machinery
- underground transport systems for mining
- underground illumination in mines
- human thermal environment regulatory equipment
- control stations in steel production
- continuous casting as an integrated system
- socio-technical aspects of the "new technology" systems
- the automization of various processes in steel manufacture
- protective clothing for both the steel and coal industries
- methodologies for carrying out ergonomics action.

To complete this Action effectively it is now necessary to

- evaluate and synthesise this information and data;
- make the syntheses available to the social partners in the industries at Community, industry and plant level;
- elaborate an effective means of communication with the appropriate manufacturers to ensure the application of ergonomics data in their products;
- develop standards, codes of practice and guidelines wherever possible from the data.

The present programme will therefore, through the medium of the Community Ergonomics Action Bureau of Information and Co-ordination, support the necessary activities to ensure the dissemination, at all levels, of relevant ergonomics data from previous programmes and the general ergonomics literature: and further, carrying out the necessary transmutation of its form, to ensure its utilization in design, manufacture, standards, codes of practice and guidelines.

## 2. Ergonomics Research

The purpose of this section of the programme will be to sustain the data needs of the Community Ergonomics Action Programme where basic knowledge on human performance or behaviour is required but is currently not available within the general pool of ergonomics data.

As it is required that this research programme provides a quick and pertinent response to current project development needs, and as previous experience has shown that a pre-structured programme of basic research does not adequately meet these needs, it is not thought viable to define precise topics other than that they will be contained within areas directly related to the Community Ergonomics Action given above.

Rather it is proposed that research topics be formulated by the industries through the Programme Committee of Experts, on the basis of priority needs for the data and common interest, as each Sub-programme of Community Ergonomics Action projects is established.

3. Selective Studies into Special Aspects of the Ergonomics Contribution to Safety and Health in the Steel and Coal Industries

Relatively small, but often important and interesting, problems in ergonomics or its application are raised in the course of the work of industrial medical officers, safety officers, training officers and others associated with ergonomics action. Where the solutions of such problems are of interest to furthering the aims of ergonomics action or research, the programme will support and, if necessary, initiate small selective studies.

#### IV. Co-ordination of the Work

The Commission will be advised on the scientific/technical aspects of the promotion of all individual projects by a "Vth E.C.S.C. Ergonomics Programme Committee of Scientific Experts" which will incorporate representatives of all the national ergonomics teams of the steel and coal industries which themselves draw on the expertise of both the social partners and appropriate specialists. Subsequently it will be advised on the views of the social partners concerning these projects by the Committee of Producers and Workers for Industrial Safety and Medicine, primarily through the Sub-Committee of this group. For the Research Programme the Commission will be further advised on individual projects by a Committee of Government Experts whose members are suitably qualified.

Giving due regard to the fact that the relevance of projects within the Action Programme is generally limited to the E.C.S.C. industries and the need for a rapid implementation of projects in the Action Programme, this pattern of consultative procedures has been found to be the most effective in previous programmes.

During the IVth Ergonomics Programme, the national ergonomics teams, established throughout the member-countries in the two industries, consolidated and developed their activities: among them being co-ordination of the Community Ergonomics Action projects within their national industry; and, with the assistance of a central Bureau for Co-ordination and Information Dissimination, co-ordination and liaison with other national teams and the Programme Committee of Scientific Experts at the Community level.

Through this network, the Committee of Scientific Experts have successfully co-ordinated the promotion and development of Community Ergonomics Action projects within the IVth Programme. It is proposed that a similar network be available for the Vth Programme.



The Vth E.C.S.C. Ergonomics Programme Committee of Scientific Experts will also undertake the co-ordination of the Research Programme through working parties on the themes of the programme, on the basis of information available from the semestrial technical reports submitted to the Commission as a condition of contract, and from direct contact with the researchers at meetings convened in Luxembourg or at the Research Centres as necessary.

## V. Programme Results

The network of ergonomics teams, The Community Ergonomics Action Bureau of Information and Co-ordination and the Programme Committee of Scientific Experts mentioned in Section IV has proved an efficacious channel for quickly disseminating important findings and current progress and developments in the Action and Research Programmes to the appropriate sectors of the industries, by means of a semestrial Information Bulletin, special reports and information meetings for team representatives. It is envisaged that the same information flow system would be used in the current programme.

Outline final reports of the projects and, where necessary, synthesis of groups of projects will be drawn up and disseminated to the relevant sectors of the industries and the Commission.

For a wider public, information on the initiation and final results of projects will be presented in "Euro-Abstracts".

The complete final reports will be available on request from the Commission to interested organizations and individuals.

In a significant number of cases information on the results will be available in the open scientific/technical literature.

At the conclusion of the programme the results will be presented to the steel and coal industries during a series of Information Days.

## VI. Financial Aspects and Duration of the Programme

The Fourth Ergonomics Programme ran for five years. This has proved sufficient for positive results to be drawn from the projects. It is proposed that this Fifth Programme will therefore also run for five years.

The funds to be allocated for the programme include not only the financial aid for the projects but also the related costs of implementing the programme and disseminating the results, as well as the costs of publication, translation, typing, distribution media, etc.

In assessing the funds required, account has been taken of the cost of previous projects, average cost increases, the annual budget for social research in the coal and steel sector, and the equipment required by institutions and individuals for the satisfactory organization of the programme.

In view of the above and the fact that Community financial aid does not usually exceed 60% of the direct costs of the projects, the remainder being met by the beneficiary, it is felt that to implement a satisfactory programme which will make an effective ergonomics contribution towards improving industrial safety and health in the E.C.S.C. industries, it is necessary to allocate funds amounting to 15 million ECUS, spread over 5 years from 1985: these being required as follows:

Community Ergonomics Action	11	million ECUS
Ergonomics Research	3	million ECUS
Selective Ergonomics Studies	.5	million ECUS
Operating Costs	.5	million ECUS

VII. Conclusions

The Commission of the European Communities

- considering the need to encourage ergonomics action in the E.C.S.C. industries, and to promote ergonomics research appropriate to this action, for the improvement of health and safety in these industries;
- taking into account the favourable opinions and agreement expressed by expert, industrial and government consultative committees;
- having regard to Article 55 of the Treaty establishing the European Coal and Steel Industry;

proposes to launch "A Fifth Programme on Ergonomics for the Steel and Coal Industries" for which the total cost is estimated at 15 millions ECUS over a period of 5 years beginning in 1985.