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Quality Assessment of Research

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Foreword

It is with great pleasure that I herewith present this report on the research in Architecture, Building and Planning. It is one of the last reports in this round of quality assessments carried out in the programme started by the Dutch universities in 1993. In this programme international committees of independent experts are assessing all university research. In 1998 the next round of assessments has started on the basis of a renewed Protocol.

The Review Committee for the Assessment of Research in Architecture, Building and Planning visited the two faculties in Eindhoven and Delft and also the OTB Institute for Policy and Technology at Delft University of Technology. The report gives a description of the research activities in relation to the state-of-the-art in the fields of Architecture, Building and Planning. It points to the intrinsic difficulties for faculties for which design is one of the major activities and for which it can be a constraint to find the balance between design and education and training in the design process on the one hand and research on the other hand. Moreover, the Committee gives a number of valuable recommendations and it is my expectation that their judgements and suggestions will be carefully taken into account by the researchers, by the OTB directors and by the faculties and universities.

As the Chairman of the Association of Universities in the Netherlands (VSNU) I would like to express my thanks to the Chairman and the Committee Members for their kind co-operation in this assessment and for their dedication with which they fulfilled this task. Furthermore, I thank those involved in this assessment within the universities.

Prof. Drs M.H. Meijerink
Chairman of the Association of Universities in the Netherlands
Preface

The Review Committee for Academic Research in Architecture, Building and Planning was assigned the task of evaluating the research of the Faculty of Architecture, Building and Planning at Eindhoven University of Technology, the Faculty of Architecture at Delft University of Technology, and of the OTB Institute for Policy and Technology at Delft. Experts from five European countries were invited to compose the Committee such that the various disciplines of the field were covered. The Committee’s secretary has prepared the visitation in a most efficient way in supplying all written material on time and by organising accommodation and transport at and between the two locations. The Committee appreciated the warm hospitality of the faculties involved, which created an open, constructive and successful atmosphere.

Architecture, building, planning and policy comprise a wide field of activities, which are partly technological, partly social, partly artistic and more. The disciplines deal with the most primary needs of mankind, i.e. housing, but also with the environment, urban settlements, energy consumption, history of architectural design. This list is exemplary rather than exhaustive. The chapters that follow show that the Faculty at Eindhoven University is different from that of Delft, but both serve needs of the Dutch society and both institutions “produce” architects and engineers that have perspectives in the building and construction world.

The Committee wants to thank all persons involved in the thorough preparation of the visitation. The reports were readily available and had a wealth of information. All sessions were well prepared. The questions posed by the Committee were answered in a frank manner such that a rather clear picture about the situation at each university appeared. The Committee tried to be objective and to avoid any subjective view, as much as possible.

The Review Committee did not only ask, dispute, analyse the situation of the two universities and OTB. It was a great experience and many implications about research at faculties of architecture, building and planning only became clear after having visited the universities in Eindhoven and Delft. There was also the possibility to mirror their own activities in the light of the Dutch academic world. Since many countries try to assess the quality of their universities in a most objective way they have to look to the Dutch system which wakes and supports the self-responsibility of the universities but which includes also international expertise. It seems that this system of assessment is very efficient and effective.

Hans-Wolf Reinhardt,
Chairman of the Committee.
I. Introduction

1.1 The Dutch System for Quality Assessments of Research

The Review of the Research in Architecture, Building and Planning is part of a programme, initiated by the Dutch Universities, to assess all university research. The outlines of this review system are laid down in general terms in the 1994 Protocol. This protocol indicates that the principal goals of the review are:

- quality maintenance and improvement through feedback to the research group and the university management;
- management on the basis of quality through the provision of quality assessments to the boards of faculties and universities.

The review is mainly based on the assessments of faculty and institute reports. These reports consist of a description of the research profile of the faculty or institute, a description of the organisational structure of the faculty (including research institute or research school), and a description of the research programmes. Every programme presents a short description of its approach, results, and future developments. A main part of the information consists of input and output figures. The input figures give an indication of the research input in full time equivalents (fte) of scientific personnel for each year of the review period; the output figures always enclose a selection of five key publications and an overview of publications. An important element of the programme description is a 'mission statement'.

Highly valued features of the assessments are the interviews, which the Review Committee conducts with the delegations of the faculty boards, the directors of the research institute and the programme directors. The interviews with the delegation of the faculty boards are especially aimed at a discussion of the faculty's or institute's research profile, being the result of their research policy.

The focus of the assessments is the scientific quality of the research programmes. Other aspects of the assessments are scientific productivity, scientific and societal relevance, and scientific long-term viability. These aspects are assessed separately. A ranking, based on an integration of these four aspects, can not be made. This type of VSNU assessments is carried out per discipline, over a period of five years, by means of peer review. Committees of predominantly international experts are composed. The Royal Academy of Arts and Sciences (KNAW) advises on the constitution of these committees. The assessments mostly are carried out in English. Every committee finishes the assessment with a report. The assessment reports are public.

1.2 The Review Committee for Architecture, Building and Planning

By decree of 16 May 1997 the Chairman of VSNU appointed the Chairman and the Members of the Review Committee for Architecture, Building and Planning. Prof. Hans-Wolf Reinhardt, University of Stuttgart, Germany, has been appointed as Chairman and Member.

Members of the Committee:
- Prof. Michael Batty, University College London, UK
- Prof. Hugo Hens, Catholic University of Leuven, Belgium
- Prof. John McKeon, University of Brighton, UK
- Prof. Peter Nijkamp, Vrije Universiteit, Amsterdam, The Netherlands
Prof. Gerhard Schmitt, ETH Zürich, Switzerland
Dr. Bas J. Blaauwboer, VSNV, has been appointed as Secretary of the Review Committee.
A short curriculum vitae of the Members is included in Appendix II.

1.3 Scope of the assessment

The Committee was asked to operate according to the earlier mentioned 1994 Protocol. For the assessment of architecture, building and planning, this protocol was elaborated in the 'Discipline Protocol for the Research Assessment of Architecture, Building and Planning 1996', established by the VSNV (see appendix III).

The participating universities in the assessment were:

Delft University of Technology
- Faculty of Architecture
- The OTB Institute for Policy and Technology

Eindhoven University of Technology
- Faculty of Architecture, Building and Planning

According to this discipline protocol, the areas to be covered in the assessment were to be as follows:
- Social and Cultural Aspects
- Architecture/Urban Design
- Town Planning
- Construction and Building Physics
- Building Technology and Planning
- Social Housing/Real Estate Management.

It will be seen from 2.2 (below) that, in the context of the participating Institutions' submissions, and while covering the specified field, the Committee has chosen to divide the field slightly differently.

The field of architecture, building and planning is not a simply demarcated, homogeneous discipline. It incorporates clearly some of the 'hard' (natural) sciences in this area, but also social sciences like social geography, urban planning, spatial informatics and policy science. A clear example of the wide coverage of various disciplines under the heading of architecture, building and planning is formed by research at OTB which might to some extent also be qualified as research in the area of social geography and/or physical planning in a broad sense. The Review Committee found it in general difficult to draw sharp boundary lines. It has accepted the choice of the universities of Delft and Eindhoven, to put the set of proposed research programmes under the review procedure for architecture, building and planning, but wishes to remark that other packages (combining other disciplines) might have been possible as well. This is particularly relevant, as only a few months ago the discipline of economic and social geography has been reviewed.

The areas covered in this assessment have some overlap with research done in other universities or faculties. The majorities of the activities of e.g. OTB could very well be covered in the area of economic or social geography. Another example is the observation made by the Committee that architectural history research is also being performed in

the history departments of other universities in The Netherlands. This also applies to landscape architecture.

1.4 Data provided to the Committee

The Review Committee has received the following documentation from the participating faculties and from OTB:
- A report 'Research Assessment 1992-1996', encompassing a profile and key data of the Faculties and the Institute, documentation for each of the 16 research programmes including input and output data of research and a list of publications made in the assessment period.
- A set of comprehensive key publications, five for each research programme.
- For the Delft Faculty the Committee also received, on its request, extra information on assignment of the input and output data for the period 1992-1993 to the programmes as they were operative in 1996.

During the visit of the Committee some additional documentation was provided e.g. about the role of architectural design in research.

1.5 Procedures followed by the Committee

The Review Committee received the complete set of documentation in June 1997. Each member was then asked to fill in a preliminary assessment form (see Appendix IV) for some of the 16 research programmes, according to their specific expertise. Notwithstanding this procedure, the final outcome of the assessment as published in the second half of this report, is the responsibility of the entire Committee.

The Committee convened in Eindhoven on 8 September 1997. The Eindhoven Faculty was visited on 8-10 September. On the first day, the preliminary judgements for all 16 programmes were discussed extensively and a first consensus was reached about the research programmes and about the further questions to be asked to faculty or institute boards or to Programme Directors. On the day of the Committee's visit, each of the six Programme Directors presented the research activities of his or her group to the Committee. The Committee was impressed by the open manner in which these conversations were conducted and by the frankness with which the Committee's many questions were answered. The Committee also spoke with Ph.D. students and learned about their motivations for doing research and about their perception of the supervision they receive. Also the research sites were visited including informal discussions with researchers.

On the third day the entire Institute and the individual research programmes were once more thoroughly discussed within the Committee and the scores of the six programmes were agreed upon. Authors for draft texts accompanying these scores as well as for a general description of the Faculty were appointed. There was also time for informal contacts between the Committee members and Programme Directors and Faculty Board members and with the Chairman of the University Board, Dr. ir. H.G.J. de Wilt.

On 10 September the Committee moved to Delft, where the OTB institute was visited during the afternoon. Here too, the Committee met with PhD students, the Institute's Board and with the four Programme Directors or their representatives, who gave a detailed description of the research work being carried out. After this meeting the Committee re-discussed the programmes and the scores were agreed upon.
On 11 and 12 September the Committee visited the Delft Faculty for meetings with Programme Directors, PhD students and the Faculty Board. Here too, informal meetings with these persons and with the Chairman of the University Board, Dr. N. de Voogd, took place. In a final meeting the Committee assessed the scores and appointed authors for the accompanying texts. In the weeks that followed the Committee's secretary collected and collated these texts in a draft report, which was then circulated to the Committee Chairman and Members. The Faculties received a draft for a check on factual errors, after which the Committee decided on the final text.

1.6 Aspects and Assessment Scale

The criteria that should be covered by the assessments are stated in the 1994 Protocol of VlN3. The Review Committee was required to give judgements on four aspects: quality, productivity, relevance and viability. A five-point scale was used to give scores on the four criteria and an additional commentary was added for each research programme. These commentaries are an integral part of the assessments.

The 1994 Protocol allows the Review Committee considerable freedom to interpret the four aspects and the assessment scale in such a way that the assessments reflect what they see as important. Hereby the Committee has been taking into account the variety in the nature of the research programmes under scrutiny, which varies from fundamental scientific research to applied technology.

In the case of this assessment, the criteria were interpreted in the manner as indicated below.

Scientific Quality:

The scientific quality of a research group is based on:
- the contributions made to international scientific developments
- the standing of scientific publications and of the journals they appeared in
- the originality of approaches and ideas in tackling scientific problems
- indicators of international recognition other than publications, like positions in international scientific networks and advisory appointments based on scientific reputation

The ratings on the five-points scale for quality are defined as follows:

Excellent (5): The research group belongs to the international elite within its field of research. It works at the frontiers of international progress in its field and contributes effectively to that progress by means of a substantial number of publications in highly rated scientific journals or, for mainly technology based programmes, contributes on a regular basis to the newest developments in important fields of technology by means of conference papers, designs and international advisory positions.

Good (4): The group meets the international standards in its field of research or technology and it makes worthwhile and recognised contributions to the international research community or to the newest developmental developments.

Satisfactory (3): The group meets the international standards in its field of research or technology at an acceptable level.

Unsatisfactory (2): The group does not meet the international standards in its field, nor does it contribute significantly to its progress and development.

Poor (1): The group is far from meeting international standards of its field and has no influence upon its development.

Scientific Productivity:

The scientific productivity of a research group is based on:
- its contribution to the international scientific literature by means of publications in international refereed journals and scientific books
- the number of Ph.D. theses
- for technology based programmes: its contribution to presentations at and proceedings of international conferences
- other scientific output, such as professional publications, designs, design tools and methods, software and patents.

The Committee's assessments are based on a general impression of the production of each research group with reference to its size and resources. The result therefore is a 'peer review' about productivity, which reflects the Committee's perception of the productivity over the past five-year period.

Whether architectural design as such was also to be considered as a measure for scientific was a matter of debate, also with the Faculty Board representatives. This debate was also a result of the slight differences in the text of the draft discipline protocol and its final form (as given in Appendix III). It finally was decided to not consider the "end product" as a design research output. However, where research activities could be shown to be the basis or the support for architectural design, this was considered to belong to the scientific output.

Taking into account the size and resources of the group, the ratings used for scientific productivity are:

Excellent (5): The number and character of scientific publications in highly regarded journals is outstanding, considerable numbers of Ph.D. theses have been produced. Key-note addresses and invited reviews are made regularly at leading international conferences.

Good (4): The number and character of scientific publications are above average. Ph.D. theses are produced regularly. Clear visibility is achieved through frequent contributions at major international conferences.

Satisfactory (3): Productivity is reasonable, also compared to average amounts of contributions in the same field.

Unsatisfactory (2): There has been some scientific output but as a whole the group's performance is below the standard of other research groups in similar fields.

Poor (1): The output of the research done is far below standard.
Relevance

The Review Committee has considered the following aspects as part of its integrated assessment of relevance:
- the significance of the contribution of a research group to the development of its field with special focus on originality of ideas and approaches;
- potential impact and applications in future technologies;
- the contribution of the research group to relevant scientific and professional networks of (future) users (government, agencies, industry and others) based on its specific knowledge and expertise;
- success in obtaining funding from the second and third money source.

The ratings for relevance are:

Excellent (5): Notable and influential contributions have been made to prominent fields. Such research groups play important roles in scientific and/or industrial communities.

Good (4): Some contributions have been made to prominent fields or else notable and influential contributions have been made to less prominent fields.

Satisfactory (3): The group has performed moderately well on not very prominent but still useful sub-fields.

Unsatisfactory (2): The research does not appear to have great relevance to the actual or potential development or applications of architecture, building and planning.

Poor (1): The research appears to have no relevance for architecture, building and planning or their applications.

Viability:

The following aspects are taken into account:
- whether it is worthwhile to continue the research topics, based on the group’s ideas and plans for the future (scientific prospects);
- prospects of future funding of personnel and facilities;
- continuity of leadership for the programme;
- coherence of the programme.

The group’s mission statement and plans are judged against the feasibility of developing or sustaining their research. Guarantees for continuity of leadership at a high academic level is seen as a major aspect of the viability of a programme.

The ratings used for viability are:

Excellent (5): The group is judged to have clear and coherent plans on the international frontiers in its field. It has reached and is likely to maintain, its leading role in international networks. Continuity of funding is assured. Highly qualified staff will continue to be available in the future.

Good (4): The group is seen as competent to do the proposed research. The scientific issues being researched seem to be fruitful. The research group’s position in the field seems to be assured. There are few doubts about the future funding or the availability of the competent staff needed to maintain the programme of research.

Satisfactory (3): There are some reservations about one or more of the aspects mentioned above, but if the proper measures are taken in time, there is a good chance that the group will continue to contribute adequately to its scientific field.

Unsatisfactory (2): Based on the plans presented, the Committee has serious doubts about the continued viability of the research group, and considers that without additional measures for strengthening the group and/or continuity in leadership, it will not be able to function adequately.

Poor (1): Poor means that for one or more of a number of possible reasons, the research programme is judged to be non-viable, and should not be continued in its present form.
2. Architecture, Building and Planning

2.1. General introduction

A fundamental problem in reviewing the research performance of architecture is that there are not clear-cut criteria for research in architecture. Architecture is neither science nor technology. It contains part of technology but it is not at all science. It contains part of social sciences but it is less empirical. Architecture depends on intuition, ideas, sometimes also on ideology. Some facets of art are present. Architecture depends for a great deal on persons, on individual personalities who create new things, which cause imprints in the landscape, in the town, in neighbourhoods etc. The central product (one might say "experiment") of architecture is design, but simply design is not recognised as research. This suggests that a core activity of a faculty of architecture does not contribute to scientific quality, productivity, and relevance. There is a systemic error in assessing the performance of a faculty of architecture since a large part and a most important part cannot be assessed by the rules (which apply to scientific research). An assessment system which is tuned to rigorous scientific or empirical sociological or historical etc. activities will fail if it is applied to architecture especially when design achievements and their critical testing are not recognised as research. This also applies to other faculties who consider design as their core activity, which results in a poor representation in NWO. The Review Committee has felt that architecture is not adequately represented in NWO and that this situation should be improved.

There are parts of architecture that have tendencies to civil engineering such as structural design or building physics. As research is concerned these disciplines have to compete with disciplines which are part of other faculties such as civil engineering or applied physics. This means that the competition is strong and a good mark means a real high level of research. Other disciplines, part of architecture, are compared with economics or history. There, one can count publications, lectures or other printed products. However, these disciplines do not determine the specific feature of a faculty of architecture.

To speak in scientific terms the measuring tools do not easily fit to the quantity to be measured. The measuring devices have to be analysed and to be adjusted to the task. Architecture deals with the primary needs of people. Since the habits, customs, experiences, and roots of people are still rather local despite all signs of globalisation, telecommunication, tourism and other international co-operation, architecture is mainly local, local in the sense of regional or national. This means that the local population is subject of architectural investigation and that this population benefits mostly from new ideas in architecture and from developments that stem from a faculty of architecture. This means also that international publications are not necessarily superior to domestic publications. A result of that situation is that most publications, i. e. books, reports, papers, newspaper articles, are in Dutch and addressed to local readership. So, what has a high priority in the scientific community does not apply to architecture, at least not in such an exclusive way. Of course, there are also centrally important parts in architecture which are of global interest and they could and should be published on an international forum.

At the present time, the building and construction industry is strong and absorbs most students (afstudeerders) directly after their last exam. There are not many talented young architects who prefer staying at the university as a "researcher" on the basis of an A10 salary. Many members of staff at Delft and Eindhoven saw their best workers walk
away, which makes planning and performing of continuous projects rather difficult. Research output depends on a certain minimum stay in a group and if this stay is too short the output will be poor or none. This current situation has to be born in mind when assessing productivity and quality of research.

2.2 Major areas, sub-fields or disciplines

2.2.1 Housing

Housing is a multi-faceted research field comprising not only technical aspects of the housing stock, but also (and more in particular) the regulatory aspects of the housing markets, the behaviour of various actors on this market (at both the supply and demand side), and the policy analysis of interventions on the housing market. Furthermore, the field comprises also indirect aspects of the housing market, such as spatial mobility (commuting e.g.), financing institutions and planning procedures. The recent regulatory changes in the Dutch housing market policy make this field a research area.

2.2.2 Construction and property management

Construction and property management cover two different but complementary activities. In general, one may say that looking at the life of a building from initial construction to final demolition - from the cradle to the grave so to speak - construction management involves the process of building from the start of design to the completion of all construction. Property management on the other hand involves the process of maintaining and managing buildings during their useful life from the time that initial construction is finished. Both construction and property management involve questions of land management, which deal with tenure, valuation and land use. Construction management concerns the way that the overall building process is organised and executed to completion. Typical topics involve: cost-quality criteria, cost prediction and control, modular co-ordination and prefabrication, site organisation, planning techniques, building performance and its consequences for the building process, man-machine implications during construction and so on. Construction management is thus a key topic from the contractors' point of view and as such, involves linking economic, engineering and logistical issues, which must be an integral part of building education.

Property management concentrates on processes and policies for the efficient management of building use and maintenance. It involves issues which institutional and individual bodies in both the private and public sectors should adopt and follow in managing offices, housing and other distinct types of building stock. These processes are distinctly economic in orientation in that they relate maintenance and use costs to the value and income which building yield and are thus intimately involved with investment portfolios. Increasingly these issues are being reflected in construction management in that they relate to site value, potential land use yield, ownership, related planning constraints, as well as technical issues such as traffic generation and land use mix.

Both these aspects of management build on the traditional concerns of land and quantity surveying but set within a wider concern for economic organisation, logistical issues involving the process of construction, and the use of information technologies to manage the interaction of many distinct and materially different processes.

2.2.3 Building Technology

Building technology is a discipline at the cross-road between architecture and engineering. In the subfield, the steps from design to buildability are analysed. This includes as well the materialisation of the building construction, i.e. foundations floors, facades, roofs, walls, windows, etc. in relation to specific performance objectives (for example: low pollution buildings), as the way the overall construction process should be organised. In doing so, the engineering disciplines structural design, building physics and material science are of prime importance. Also behavioural disciplines such as organisation science, economy and anthropometry and disciplines linked to architecture, i.e. form and aesthetics, intervene. In that sense, building technology is a common concern for architects and building engineers. As far as research is concerned, both of course may put other accents. Architects normally are more interested in the impact of building technology on design and vice versa. Engineers on the contrary more focus on performances, the construction process and new technologies.

Although the discipline is a key-element in engineering and architecture, it never succeeded in creating its own research image. This is not a problem in the Netherlands only, but a world-wide reality. At least one of the reasons is that the building sector lacks a scientific mood. Building technology was seen as a problem of experience and good sense, rather than a result of scientific input. The statement 'the art of construction' still reflects that reality. As a consequence, most researchers, who could be active in the field, mitigated to other disciplines, building technology is based on, see TUE 3 and TUD 2. Only, may have their orientation could change. A performance based approach and concerns such as a sustainable development may form the tracks to turn building technology into an applied science, rather than a 'state of the art'-activity.

2.2.4 Structural Engineering and Building Physics

Structural engineering and building physics are typical engineering disciplines. Both are based on physics -mechanics, elasticity and plasticity for structural engineering, thermodynamics, heat and mass transfer, wave theory and light for building physics - and apply the knowledge gained there to building construction. Their originality lies in the application, i.e. the way they use physics to upgrade building quality and attain specific performance requirements such as structural safety, energy efficiency, comfort, etc. The two fields are a common concern of architecture and building at one side and civil engineering at the other. Because of the imbedding in engineering, research in both fields is quite different from architectural research. The quality levels one should meet are by definition related to the engineering research tradition. Also the evaluation must be done in confrontation with the standards used in engineering research. This of course does not mean both fields cannot have their own accents in architecture and building. The relation with building design for example will be stronger than in civil engineering. Also the research topics can differ.

The Netherlands in general and the Dutch technical universities in particular have a long-lasting tradition of creative and fundamental work in both fields. Already in the sixties, they ranked high as well in building physics as in structural engineering. However, from the beginning there has been a marked difference between the Faculty for Building, Architecture and Planning in Eindhoven and the Faculty of Architecture and Civil Engineering in Delft. In Eindhoven, both fields were seen as strongholds, see TUE 1 and TUE 2. Research was a promoted actively and a big share of means invested in it. In Delft, on the contrary, active research in both fields has never been a priority. They served the design objectives, the faculty was caring about, see TUD 2. The question is as if such a
position is not counter-productive for creative research in structural engineering and building physics on an academic level.

2.2.5 Information Technology in Architecture, Building and Planning

Information technology is a relatively new and rapidly evolving field in architecture, building and planning. While fundamental theoretical work started in the United Kingdom more than two decades ago, the United States dominated the advancement of the field in the last decade. The 1980s are characterised by a decentralised development in a large number of centres worldwide. The maturing of the World Wide Web has occurred while the exchange of research and teaching results. Unlike other areas in architecture that have strong contextual, regional and national elements, information technology is by nature more international and universal.

The Dutch Universities have been very active in the advancement of the field. In the 1980s Eindhoven organised several international conferences that demonstrated its vision in theoretical and practical terms. Spin-off firms with graduates from the school produced world-wide successful simulation software. Industry supported the effort of building an advanced virtual reality centre. Delft followed a practice-oriented line with strong links to building technology and a theoretical line, which became internationally known through conferences and publications. Delft and Eindhoven are known internationally today for the quality of their research in information technology. Their research agendas complement each other.

Both universities take advantage of international experts in the field through part-time visiting teaching and research positions. This has the advantage of flexibility while guaranteeing the internationally recognised quality and stature of the field. The work is of relevance for industry and for architectural education. As in most other architecture schools, information technology must find its appropriate place in the curriculum to transfer research results to teaching.

2.2.6 Urban Planning, Urban Design and Development

Planning, often referred to as town, urban and regional, spatial or even environmental planning, is organised in Western Europe into at least three distinct subfields. The main area is now called urban and regional planning and it deals with the strategic allocation of land use in towns and cities, and in the countryside, with environmental impacts, with implications for transport, and with the statutory legal procedures for formulating and implementing plans in practice. This field originally developed from a concern for the physical environment at a much finer spatial scale where architectural considerations were paramount but in the last thirty years it has become more strongly informed by social science disciplines. The second, much smaller activity, is still strongly tied to physical design and architecture and this is called urban design, which is usually taken to embrace or at least link to the subject of landscape design. Urban and regional planning requires quite strong disciplinary inputs from mainstream urban geography and economics, sociology and political science and these areas are often coordinated under the title of the third distinct subfield urban studies or urban development. This area is also linked to transport planning which is usually part of civil engineering, while the growing concern for infrastructure within urban planning is generating much stronger links to the environmental and construction sciences and to property development and surveying.

In the Netherlands, planning is divided between the geographical sciences and architecture. In faculties of geographical and environmental sciences, which were evaluated in 1994, the emphasis on urban planning is more at the strategic scale. However, there is considerable overlap between the disciplinary pursuits of the urban and regional planning and urban design programmes evaluated here as part of architecture and those in the geographical sciences. Strong programmes in urban and regional planning exist at Amsterdam, Utrecht, Groningen and Nijmegen where the emphasis is on the strategic scale of planning, planning processes, urban geography, and demographic analysis.

At Eindhoven and Delft, there is more emphasis on the urban design scale of planning which represents the traditional interface with architects and urban designers, the historical heartland of the subject. In Delft, there is an important emphasis on research in urban development which is in favour with the planning and construction practice in the city, and in the OTB (Institute for Policy and Technology) which has recently become the Research Institute for Housing, Urban and Mobility Studies. The OTB in fact is a spin off from the Faculty of Architecture's planning programme. In the wider context it is worth noting that engineering disciplines such as traffic engineering and photogrammetry play an important role in supporting research in architecture, planning and construction particularly at Delft. Finally, the relationship of urban and regional planning to housing markets, spatial economics, and regional science, which are present in various programmes evaluated under Economics in December 1995, must be noted.

Urban Planning and Management and Real Estate Management (TUE5) at Eindhoven, and Urban Planning and Design (TUD5), and Social Housing and Urban Renewal (TUD5) fall directly within this subfield/discipline. However, there are several other programmes at Eindhoven and Delft which are developing important research in urban planning, particularly Design and Decision Support Systems (TUE7) at Eindhoven and the entire research programme of the OTB at Delft. The particular emphasis and orientation of Eindhoven and Delft with their strong links to design and architecture make the programmes in this subfield more varied than their potential counterparts which fall under the Geographical Sciences. There is more emphasis on links to professional practice and on designs as outputs from these programmes and consequently less emphasis on publications through mainstream professional journals. Urban Planning (TUE5) is quite valuable in that it is small and somewhat parochial in emphasis. Urban Design and Planning (TUD5) at Delft covers a very broad remit taking in urban and landscape design as well as mainstream urban and regional development. Social Housing and Urban Renewal (TUD5) is quite small but appears to have potential and in fact originally spawned the OTB which is indicative of its emphasis on housing.

In this general evaluation, it is hard not to draw the conclusion that the programmes constituting this subfield should be reinvigorated by new developments that are taking place in other programmes in their faculties, which involve information technologies, new styles of urban policy, and new thinking about the way design and planning should function in contemporary societies. There is an almost complete absence of NWO funding in these programmes (TUE5, TUD5) and emphasis which should be addressed in future research plans.

2.2.7 Architecture design and theory

Research in architectural design and theory, while fundamental to the academic health of a university faculty of architecture, is notoriously difficult to define and concise. Even the difficult translation of Bouwkunde (TUD calls it a Faculty of Architecture; TUE is a Faculty of Architecture, Building, Planning) begins to show the problem.
Inevitably the area overlaps with those more easily delimited: whether in physical science (e.g. structural design or energy studies), humanities (e.g. critical theory or aesthetics), social science (e.g. environmental psychology or urban economics), history (architectural or design history), management studies (e.g. construction processes or facilities management) and education (e.g. cognitive processes of designing).

Within a faculty centered on education for designers, there is therefore a high likelihood of research efforts named 'architectural design' (1) appearing to have a certain haphazardness and displaying difficulty in forming a coherent research endeavour; and (2) in the focus and criteria for research work (which might appear suitable to be embedded in another discipline) to specifically relate to design practice. (This was clear to the Committee, for example, in some architectural historical research.) Where such a position is taken, its base in pedagogic theory should be explicit.

That list would still leave out both theories of architecture - theoretical structures of the built environment, its production and education - and, centrally, the critical production of designs themselves, whether architectural, urban or landscape.

First, a university faculty of architecture must interpret "building knowledge" (bouwkunde) widely. It is the study not just of how the environment is (or might better be) formed; but is also a study of the knowledge embedded within built form. Here there is a cultural focus, which is historical/social as much as technical; architecture becomes a medium for cultural discourse as much as one within which management, design and information technology skills can be refined.

Second, this "critical design practice" which might be central to university architectural research is still only becoming formed within the international academic community. Clearly outcomes can be designs (as indicated in the VSNU Discipline Protocol); equally clearly they must be open to critical view and peer scrutiny, as straightforwardly although not identically - as papers for a scientific publication.

The peer review for "designs" as research outcomes might include:
(a) placing in an open design competition,
(b) publication of the project in a recognised (national/international) professional journal,
(c) publication of the completed work in a recognised (international/national) professional journal,
(d) the published project gaining an award or other recognition,
(e) the completed work gaining an award or similar recognition.

The critical scrutiny for 'designs' as research outcomes offer wider possibilities; it might include:
(a) study in a scientific journal of its performance against stated criteria;
(b) assessment by social research of adaptability to changing user needs
(c) critical scientific audit of the energy embodied in the building.

These random examples each themselves involving research in architectural design and theory might greatly enrich the strength of a university department of architectural/landscape/interior design wherein the original design solution was generated. Such a framework should support and encourage research directors/professors to present their designs collaboratively, both as research material and as the material for their colleagues' research; this 'laboratory' in which the 'experiment' is the constructed design could offer enriched research outcomes.

Conversely design solutions which do not stand up to such scrutiny, where goals are not explicitly articulated and testable fail to join the critical domain of the developing discipline and cannot be considered in themselves adequate research production.

Neither of the Faculties of Bouwkunde in the Netherlands seems yet clear in its stance regarding the position of 'designs' in architectural research. Each, in its documentation, was shy of articulating a position; the Committee therefore invited each faculty in the light of the Discipline Protocol's specific reference to designs to respond with a written statement during the visit.

2.3 General impression of research in the area of Architecture, Building and Planning in the Netherlands

The overall general impression of the Committee on the research in the area is certainly not overwhelmingly positive. Several groups have a performance, which is below average. The bottleneck is not the capacity in a strict sense, but there is insufficient scientific innovation. Much research is more of the same, which may be caused by the many part-time staff members. Clearly, there are some good examples of highly productive research teams with an outstanding international status, but the total impression of Architecture, Building and Planning needs improvement. Faculties and universities might join hands to develop a strategy plan, which would bring Dutch Architecture, Building and Planning research back to the international forefront.
3. Assessment per Faculty or Institute and per Programme

3.1 Eindhoven University of Technology
Faculty of Architecture, Building and Planning

3.1.1 General observations

The Faculty of Architecture, Building and Planning at the Eindhoven University of Technology (TUE) was founded in the late 1960s. The faculty consists of four departments: Structural design, Physical Aspects of the Built Environment, Building Production and Construction Techniques, and Architecture and Urban Planning. The founders of the faculty had the intention to set up an academic teaching programme which combines architecture and structural engineering and which leads to architects and planners with a strong technical background and/or building engineers with a considerable basis of planning and design. The teaching programme has proven to be very successful which makes the students from Eindhoven University of Technology very valuable for the building practice.

In conjunction to teaching, a research activity developed which covers the following programmes: Structural design, Building physics, Design and decision support systems in architecture and urban planning, Building technology, Urban planning and management: housing and real estate management, and Architectural design. These programmes will be assessed in the following chapters. The research of the faculty is both basic and applied with a relevance of either category depending on the field, the tradition and relation with practice. It will be obvious that the groups differ considerably. Eindhoven University of Technology has continuously developed and increased the research facilities. There is a laboratory for structural and materials research (Pieter van Musschenbroek Laboratory), a laboratory for building physics, and a field site for full-scale buildings. Computers and multimedia equipment are available for software development, simulations and virtual reality.

The faculty has stated its mission as "to provide an environment that supports:
- an integration of education and research,
- innovation, multidisciplinarity, design-oriented research, that is
- both academically sound and rigorous, and
- relevant to its stakeholders."

The Faculty Board has provided additional arguments to define the meaning of "design-oriented research". The faculty stated that "the output of our research efforts should predominantly consist of knowledge and tests (...) that support the design process (either in terms of designing the design process or in terms of providing information for design decisions) at the various stages of a design process. The (architectural) designs themselves are not considered to be output from research activities, except in those cases where prototypes are designed or built, to test or explore particular guidelines or models."

The Review Committee accepted the mission as defined and amended by the faculty as basis of the assessment of research, i.e. the members of the Committee tried to judge the research in the light of the mission. Criteria were the innovative character, the
multidisciplinarity, the rigour of data treatment, the use of models, either mathematical, physical, forecasting or numerical, and the objective discussion of results.

The intention of the faculty founders to merge structural engineering, architecture and planning had also a direct impact on research. There are programmes that are rather science oriented and which have to be assessed as an activity in applied science. To this category belong the experimental and analytical research efforts in Structural design and Building physics. Some of this work could take place in a faculty of Civil Engineering as well; however, an extra quality is achieved due to the continuous reflection on its value for design. Problems are formulated from the view of design and results are analysed and structured such that they enrich the design possibility. This means that the design-orientation determines the choice of research topics in the area of Structural design and Building physics.

The name Building Technology created the expectation of the Review Committee that the programme would also belong to the more science-oriented part of the research programme. It turned out, however, that the title was not covering most of the activities and that the research group is in a state of strong transition. The main activity is related to production and construction management and has strong ties with the construction industry.

Three programmes are devoted to design, planning and management. As defined by the Faculty design as such does not mean research unless certain criteria are met. Although there are famous young architects of the Eindhoven School this does not mean that they performed research to be assessed by the Committee. A large part of the architectural design activities belong to teaching and support teaching with books and models. On the other hand, if a historical comparative study is performed analysing an architectural development and very rigorous methods are used this is judged as research. A similar situation is encountered in urban planning where the invention of new tools and methods is research but the application of known methods to solve a current problem would not meet the definition of research. In this context, a field that develops new means of visualisation in planning and management has an advantage in the assessment procedure.

There are two concerns that were expressed by the Committee: the large number of part-time professors and the low NWO funding in some areas. Research is most stimulated when it is the main commitment of the group leader and when he or she closely supervises a project. A small part-time appointment seems not sufficient since other activities will prevail and research will have a low priority. The Committee suggests to check carefully all new appointments and to strengthen the research involvement of the chairs.

There are only two groups that succeeded in receiving NWO funding. The reasons for this situation are manifold; they are partly due to a systematic problem in NWO-funding and partly caused by individual experiences of the researchers. The Committee was told several times that applications were often rejected and that new applications were not tried because of lack of time. Maybe that a part-time appointment does not allow writing thorough proposals. The systematic problem is that design and planning fall often between the disciplines of social sciences, technical sciences and art. NWO uses the review committees as they exist and there is obviously no committee that is competent in architecture and planning. The Committee suggests that the University takes the initiative of negotiations with NWO to solve this systematic issue.

### 3.1.2 Assessment per programme

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<tr>
<td>Programme</td>
<td>Structural Design</td>
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<td>Programme Director</td>
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<td>Assessment</td>
<td>Quality 3  productivity 2  relevance 4  viability 3</td>
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The programme consists of three subprogrammes that seem to be rather independent, i.e.

- Structural behaviour of materials,
- Applied mechanics,
- Integrated design.

The subprogrammes are further split into several teams of rather small size. The programme covers a wide area, but the available staff allows only research on several small selected topics. The impression is that the programme is rather scattered and the coherence of the topics is weak. Nevertheless, there are single projects and experimental devices that meet a high international standard.

The productivity is rated unsatisfactory because of the low number of doctoral theses and international publications. Opposite to other departments the research topics of this programme are well suited for PhD work and there is also a large international forum of reviewed scientific journals. Contributions to symposia are not sufficient for international recognition.

The Committee recommends a concentration on a smaller number of research projects and to develop these to cores of continuous research.
Under this programme four research items are described:
- outdoor environment
- building parts
- indoor environment
- building services engineering

The research is aimed at a basic understanding of physical phenomena in the build environment and the improvement of the physical quality of buildings. The research results are on the average quite impressive. Especially the work related to wind, heat and moisture, building acoustics and LCA is of an excellent scientific level. Scientific productivity is good, although future policy should focus more on publication in peer reviewed international journals and international conference proceedings. Long term viability of the group is no problem, at least if one succeeds in focusing the research to a limited set of well balanced topics.

The Review Committee however also formulated some concerns. The work in some sense is so specialised that it could be performed at other faculties too, such as mechanical engineering and physics. This is no objection as long as the links with design and construction are kept up. The actual scope of the research is very broad. More focus and integration in international networks may be better. The programme directors explained that in the future, the research will be tougher structured, starting from a clear mission statement with the emphasis on sustainability, knowledge transfer, ICT/design tools and synergy between research and education, and a general strategy. Perhaps also the objectives of the building services research should be stated in a clearer way. Finally, a majority of the professors are part time. What is their role in research? Management only or the inspiring force behind the researchers?

Although the Design and Decision Support Systems in Architecture and Urban Planning (DDSS) group has undergone radical changes in recent years, it maintains a high profile and relevance of research. The present leadership is quite active and operating at an international level of competence and recognition. Results have proven to be attractive for industry as well as for theoretical discourse.

The group was able to attract foreign experts as Chairs who gave important scientific and practical input. There is a recognisable coherence of goals between the diverse research areas, an awareness of international developments, and a high integration in international organisations. The virtual reality and CAD aspects seem to have a lower priority now than in the past. Decisions are necessary in this area because of the fast moving nature of this field.

The perceived dependence of the group on presently one leader and one methodology, while very successful, raised some concern for future flexibility. The filling of the recently merged and now vacant positions in design methods and building informatics seems therefore of high importance. The publication policy of the group is very effective, the productivity is high, both in professional and scientific terms. The name DDSS is recognised as a synonym for innovation in design theory, database design, user interfaces, and modelling.
The approach taken in this programme emphasizes three related subfields: the study of cities in terms of their urban form and pattern, research into the spatial organization of residential environments with respect to their management, and studies of the strategic planning process with respect to the politics of decision making. The perspective taken partly originates from planning as urban design while the emphasis on local case studies makes the group’s publications somewhat parochial. Almost all the publications are in Dutch or German and this makes them inaccessible to an international audience. The overall programme clearly suffers from lack of reference to mainstream urban morphology, and the planning process, and all three subfields involve the director who has a part time position. Much of the work is carried out in practice with case studies being drawn from the Netherlands, Germany and Scandinavia, and this work has successfully involved wider forums for discussion and innovation. But the work is narrowly focused, detached from the mainstream planning research in the Netherlands, hence somewhat idiosyncratic. The group is very small with many part time staff and therefore vulnerable in terms of resources as well as intellectual position. With respect to research funding, this is from the university and third party sources in the ratio 2:1, but there is no funding from NWO. The narrow focus, size, and orientation of the programme suggest that the Faculty should decide to strengthen it massively or to merge it with another programme. However, as the group is the only one dealing with the mainstream planning at Eindhoven, this issue should be central to any decisions on its future.

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Under this programme three research items are described:
- human-machine technology
- information and communication technology
- building techniques

The research looks to the building as a sum of technological processes, a crossing of four inflows -information, materials, human labour and machines- and two outflows -the building and waste. Not only the programme but also the research results, however, give a very scattered impression. Poor coherence, no clear working strategy, no outlined publication strategy. The Review Committee was informed that some of the members of the programme are leaving for other research groups within the faculty. The presentation of the programme also focused on one of the items: human machine technology. The feeling was that in the future this part might develop along interesting lines. Long term viability and relevance could even be guaranteed on condition that the name of the programme is changed to reflect the real work going on. A concern expressed by the Review Committee nevertheless was that in that case the group should not restrict its activities to a kind of service centre for contractors. This seems more a task for other institutions.

Anyhow, the faculty should review the programme in depth. How to shift at least part of the work to building technology again? How to enhance the co-operation within the group? How to fill in the empty chairs? How to increase the second and third funding possibilities? In fact, building technology should be a key activity within a faculty of architecture and building, a bridge between the engineering and architecture oriented programmes.
3.2 OTB Institute for Policy and Technology

3.2.1 General observations

The institute is an interfaculty institute within Delft University of Technology. The institute has now existed for 12 years, it has a scientific director and a director, and a board. It recently has changed its name into OTB Research Institute for Housing, Urban and Mobility Studies.

OTB has developed into a respected research institute with a sufficient critical mass to ensure continuity. Most of the financing is stemming from extra-university sources (both the public and the private sector). As a consequence, most of the research is practically oriented. The profile of fundamental research is less visible that the OTB’s high profile in Dutch housing, urban and mobility issues. This specific financing model of OTB is certainly a great success and the creative management of this institute has contributed to a high visibility of the research in the Dutch applied context. At the same time, it ought to be recognised that the local/regional and policy-relevant orientation of OTB makes it difficult to obtain a high international profile in basic research. Some research work is only standard and not innovative or at the forefront. There is indeed a challenge to develop a methodology for positioning this type of research in an advanced and fundamental international research setting. So far this has not yet materialised, although the institute is aware of this. A main impediment is that there is not yet sufficient theoretical research capacity in the application-oriented environment of the institute. Clearly, the institute is widening its geographical coverage to other countries, but this does not necessarily mean a deepening of the research, so that a more solid scientific heritage based on a proper methodological framework is built. The leader of the institute is certainly an inspiring scientist, but such a large research team would need a broader intellectual leadership. In this context, the synergy between OTB and TUD could be more fully exploited. This applies to both the housing research programmes and the newly established transportation programme. Nevertheless, OTB has managed to come up with an impressive publication record.

OTB actually participates in two recognised research schools, viz. NETHUR (more focused on the spatial sciences) and TRAIL (focused on transportation research). This double participation is also reflected in the Institute’s recent name change. Furthermore, OTB has taken the decision to participate in a call for tender for the new Dutch science policy plans to create so-called top-schools. It does so, in cooperation with other research schools and groups from various universities, in the Spatial Investment Dynamics (SPIDY) initiative.
2.2 Assessment per programme

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<th>University</th>
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<td>Programme</td>
<td>Housing policy and building market</td>
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<td>Priemus, Beelhouwer, Conijn</td>
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The programme on Housing Policy and Building Market covers a broad field and is extremely relevant in the Dutch situation. A clear focus of this programme is however lacking, with the result that there is also a significant overlap with the second programme on Housing Stock Management and Housing Market Research, and to a lesser extent with the third programme on Building Organisation and Real Estate Management. Thus the profile of this programme is not clearly demarcated. Also the position of this research in the overall framework of TUD is not entirely clear.

Another feature of this programme is the high share of the third money flow (approx. 60%). There is a steady flow of dissertations, often of an applied nature (which once more illustrates the low profile of fundamental or theoretical research in the institute).

In the light of the variety of applied research projects, it is difficult to pinpoint the institute's most pronounced and significant contribution to innovative research in the past five years. There is a vast amount of publications, but the number of publications in internationally recognised and strictly refereed publication channels is rather low. Thus a high pace of basic research does not accompany the extremely high research productivity. The institute would have to consider the possibility to spend more time on building up a coherent and advanced methodological framework for the research undertaken. This seems to be a necessary task, as otherwise the institute will not be able to keep pace with the large stream of mainly American housing market studies. Thus, rather than ad hoc choices more attention would have to be devoted to a more structural foundation of the institute's research. Against this background, co-operation with other university groups in the same field may be desirable.
OTB 3

University
Delft University of Technology,
Research Institute for Policy and Technology

Programme
Building organisation and real estate management

Programme Directors
Priemus, Meijer

Assessment
Quality 3
Productivity 5
Relevance 3
Viability 4

OTB's third research programme, on Building Organisation and Real Estate Management, has more or less the same features as the two previous ones. Here there is however an almost absence of a clear mission where the relevance is set out, and there is not sufficient scope for a promising academic profile. Even real estate management as a concept appears to have a wide and sometimes diffuse interpretation, witness the various publication brought under this heading. One would expect here more cooperation with other university groups inside or outside the Netherlands. The group has an open eye for future issues (such as ecobuild), but the actual achievements - in terms of identifiable research progress - are difficult to assess. Clearly, this programme is closer to architecture than the previous ones, but the links with management science are feeble and unclear. But also here, the group has been very active in publishing its results, mainly in national publication channels.

OTB 4

University
Delft University of Technology,
Research Institute for Policy and Technology

Programme
Infrastructure and urban development

Programme Director
Priemus

Assessment
Quality 3
Productivity 4
Relevance 3
Viability 4

The final research programme of OTB concerns Infrastructure and Urban Development. This is a recent research activity and not yet fully developed. There are already many publications on this topic, but the profile is rather broad and vague, as almost all topics related to transport appear to fall under this heading. Seen from this perspective, the link between this research programme and the profile of TRAIL Research School is not very straightforward. Although there is some co-operation, one would have expected a clearer description of OTB's profile in this case.

Furthermore, if infrastructure is the focal point of the research (and not transport in a broader sense), why is there so little attention for the international dimension? Infrastructure planning is a well-established part of international transportation research, and one may wonder whether the group goes for a high research profile in the international research community. The same applies to urban development and its links with infrastructure.

From reading the documentation and research results one gets the impression that this programme is mainly market driven and based on pragmatic choices. This has turned out to be a successful formula, but the link with the institute's profile is not always very clear. Thus there would be a need to invest more in strategic and fundamental thinking.
3.3 Delft University of Technology, Faculty of Architecture.

3.3.1 General observations

The research period to be assessed covers the five years 1993 to 1996. During this period the research organisation and management has changed from the traditionally funded research (voorwaardelijke financiering) projects to the research programmes of the faculty. The research programmes are tied to the six departments within the Faculty of Architecture. The six programmes contain a total of 20 sub-programmes each with a certain number of research projects. The title of the programmes are Architecture, Planning Technology, Building design and planning, Real estate and project management, Social housing and urban renewal, and History, theory and information technology. The size of the programmes varies between 9.1 to 18.3 fte per year. Whereas five programmes are closely related to the classical field of architecture the programme of Real estate and project management is a new specialisation which deals with the quality control of the building process and the facility management in the non-residential sector. This research project and the OTB research institute have close links with each other.

The Faculty of Architecture of Delft University of Technology has a long tradition as a famous institute for educating architects and planners. When entering the building of the faculty the Review Committee was impressed by the many activities which were going on and which were presumably part of the special teaching method called Problem Based Learning (PBL). This method has reduced the lectures in the large theatre in favour of working in small groups of 15 students. The groups are being supervised by a staff member who introduces the problem and assists the student in getting acquainted with independent learning, i.e. using books, references, visual aids, theories etc. To this end, researchers have developed teaching aids. The faculty called this activity “education-related research”. However, the Review Committee did not share this opinion and did not consider this as research in the genuine fields of architecture. It has certainly a high pedagogical value but it does not increase the current knowledge in architecture.

Obviously, the Faculty of Architecture has developed a great skill in presentation. All printed material meets high editing and publishing standards. The books, some of which are doctoral theses, were excellent in layout and printing and impressed the Committee members. To judge which books belong to research and which to teaching was sometimes difficult and not unanimously possible. When a book was a compilation of known methods, structures, buildings etc. it was considered as a teaching aid. When a problem of or for instance a type of urban development was analysed in a comparative way leading to new insight and verifiable conclusions it was seen as research output. This division means of course that a great number of books were not assumed as part of research, although they were very informative and valuable to the reader.

Within the research programmes there are some sub-programmes, such as Constructional design, Baring Structures and Mechanics, and Building physics, which belong in the field of technical sciences. The result of these research activities have to be judged in the light of the scientific community and the Committee felt several times that the results were gained more for teaching reasons than in the intention of increased knowledge. The laboratories in these fields are rather small and serve also educational purposes. The members of the Committee asked themselves whether a co-operation with research laboratories outside the faculty, either in other faculties of Delft University of Technology or outside the university, would not be preferable. Such laboratories would not only have advanced devices but also experienced staff, which could assist in experiments. The present laboratories should of course be kept for educational purposes and for preparatory work.

The discussion whether design can be regarded as research started several years ago between the faculty and the university board. The faculty would have great advantage if design would be considered as research. Until now the viewpoint of the faculty has not been accepted by the university board. Furthermore, there seems to be an inconsistency in the wording of the Discipline Protocol of November 1996 and the letter to the faculty since the first document defined “Designs” as a possible form of scientific output while the second did not. As a consequence, the faculty did not provide information on designs. The Committee could follow the view-point as stated by Leen van Duin et al: “For a design to be recognised as a PhD it needs to be accompanied by a written analysis with notes on the various steps in the design process. The design must point to a solution for a class of problems and generate new knowledge or show how existing knowledge can be applied to new design variants. A doctorate should have a scientific format.” If such a piece of work had been presented to the Committee it was judged as research output.

There is a complete lack of NWO funding. The reason for that is a structural one and an individual one. Architecture has no own department in NWO which means that applications are either handled by Social science, Technical science or Art which are competent in parts of architecture but may not cover the core. This situation led to the rejection of applications and no tradition in NWO research proposals could develop. On the other hand, contract research was successful which provided extra research funds. Probably, the staff members abandoned writing proposals to NWO and favoured more the links with industry. However, the Committee recommends that efforts should be increased to receive NWO funding since NWO projects cover longer time spans than contract research projects usually do and longer projects are necessary for a continuous and recognised research output.

In the opinion of the Committee there are too many part-time research leaders. They have a high esteem in their profession but they cannot devote the necessary time in supervising and leading research. The Committee recommends to reduce the number of part-time appointments and to strengthen research by appointing full-time or almost full-time when vacant positions are available.

Due to the reasons that were stated above and after having discussed the current research output the result was mainly judged as satisfactory. There are exceptions in both directions. The Committee is of the opinion that the faculty of Architecture possesses a great potential in human resources, basic funding and accommodation which makes it very probable that the scientific quality and productivity will increase in the future.

Until 1993 the faculty had its research organised in seven so-called VF (voorwaardelijke financiering; conditionally financed) programmes. From 1994 six departments (vakgroepen) were the basis of the research activities. In 1996 information technology is taken out of other groups, and made a seventh department. From mid 1997 the "department" structure is abandoned (according to the faculty board in response to new legislation) and 16 research themes will be the framework for research. A more top-down control, rather than the bottom-up approach - which was the basis of the old law - is now envisaged.

*The Architecture Annual 1995-1996, Delft University of Technology, p 153*
### 3.3.2 Assessment per programme

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<th>Programme</th>
<th>Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme Director</td>
<td>van Duin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assessment</th>
<th>quality</th>
<th>productivity</th>
<th>relevance</th>
<th>viability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>3</td>
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</tbody>
</table>

The architecture research programme is seen as central at the Faculty. The fact that the faculty structure is at a point of considerable change can be considered as both encouraging and disquieting. With so much regrouping since the documentation was prepared, and already with two complete reorganisations of research programmes since 1991, it has been difficult in this programme area to separate out actual achievements to date, concrete plans and hopes.

Anomalies in the structure presented are exemplified in one key publication which might have been expected to appear in the History sub-programme (TUD6), while a key publication in that programme could have been more at home here. Other research work would also fit with building physics (e.g. zero energy housing), while there are some sub-programmes (e.g. interior design) whose research output is quite invisible.

Comment on the faculty organisation is presumably already outdated; yet much of the Committee’s concern is with the clarity of the major research themes in architecture: there is a perceived scattering of effort rather than a directed focus of activity. Centrally, the role of design in research remains problematic.

The positive assertion by the faculty: “it seen itself as a design faculty. The architectural design process can be described as research process” is not yet fully explored and its implications not yet developed rigorously. In response to the Committee’s searching for design as scientific outcome, the faculty declared that research through design activity would receive a major impulse in the future. This issue is being debated within the faculty (e.g. by hosting the 1996 conference “Doctorates in Design and Architecture”).

### University

<table>
<thead>
<tr>
<th>TUD 2</th>
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</thead>
<tbody>
<tr>
<td>Delft University of Technology, Faculty of Architecture</td>
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</table>

<table>
<thead>
<tr>
<th>Programme</th>
<th>Building technology</th>
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</thead>
<tbody>
<tr>
<td>Programme Director</td>
<td>Eekhout</td>
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<td></td>
<td>2</td>
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</tr>
</tbody>
</table>

Under this programme three subprograms are classified:

- constructional design
- bearing construction and mechanics
- building physics, installation technology, technical design and information technology, technical environmental design

Each subprogramme in turn is an amalgam of different research topics, too many to mention. The overall impression of the programme is one of confusion. A lack of focus, the output in terms of peer reviewed publications in periodicals and congress proceedings disappointing, mixing up consultancy with research, etc. Much of the work is confined to describing the art of construction rather than to producing advances in the scientific fields covered. Many of the monographs published anyhow are of a high quality and reflect a real culture in caring for that type of publications. The motivation expressed by the programme leader is that the first objective of the group should be to compile and redress existing knowledge for use in architectural design. This of course is a valuable point of view. It however turns research in technology to a pendant of the teaching and studio work where architectural education is based upon.

There are exceptions worthwhile mentioning. The daylight research for example is of high quality. There, confrontation with the front end in that specific field is not turned around and the research is tackled as a scientific challenge first. The Review Committee has the feeling that the faculty should first come in terms with its technological research branch. A design-oriented policy may be a correct start but is only one side of the coin. If the faculty aims to reach a high level in technology too, than the proper rationale of research in structural engineering, building physics and material science should be adopted. This includes that, apart from strengthening the intermediate between technology and design, also the front end work, the ‘hard science’, must be supported. Confrontation with the international community is an important point there. This is only possible through an active policy of peer reviewed publications. More full time professors are also needed to ensure the long-term viability. Perhaps a well-organised co-operation between the faculty of architecture and the faculty of civil engineering may help in realising these objectives.
This group links three major areas which cover urban design, metropolitan planning and landscape design. By far the strongest area is metropolitan planning which is a coherent area with research focused on spatial cohesion and the metropolitan district. Urban design however is divided into urban transformation which deals with overspill housing, port planning and transport issues while metropolitan formation deals with infrastructure in the Randstad. Landscape Architecture and Environmental design is fragmented into four subthemes: foundations and history of the discipline, design techniques, sustainable building, and ecological issues. These two main design areas are rather poorly focused with subthemes that seem to overlap and lack any coherence in terms of design and planning in its wider context. The area of metropolitan studies is more focused in that it involves the impact of new developments in telematics, mobility, and demographic aging. Most research publications however are largely in Dutch, and do not address international issues in significant ways. The quality of research appears very variable with some high profile international work but most work being parochial and local. There are strong links to practice but the design programmes are fragmented and have not generated enough critical mass to enable each other. Productivity of research publications is low although strong links to design and planning practice support research. The group is quite large at present and to achieve much more focused research, it would appear useful to rationalize and concentrate on a lesser number of subthemes so that critical mass and reputation might be built up. The links with the group (TUDs: Social Housing and Urban Renewal) were less than might be expected. The university finances most of the research in this programme with some coming from the third parties but with none from the NWO. For the programme to develop much greater funding should be sought from NWO and this suggests that the research programme should be better focused. This might involve some consideration that design in this programme be linked to other areas of design in the Faculty.

The research programme on Real Estate and Project Management is not a large group and does not have strong links with research in architecture. Consultation of all documents supplied give the impression that the group is not striving for a strong international research profile and that signs of success are insufficiently present. The relevance of the research in an academic research environment is certainly present and the quality and viability of the group is sufficient. However, the profile with respect to OTB is not clearly present. There might be some scope for a more vigorous and basic economic underpinning of the work. The relatively small group gives a coherent impression with a sufficiently strong leadership, but the scientific output (e.g. book, articles in refereed journals) is far below what would have been desirable. This makes the group vulnerable and therefore an active publication plan, with sufficient attention for international publications in high quality channels, would be necessary. The small size of the group would not warrant a subdivision of the programme into two parts. A further theoretical deepening and a better position in international developments would have to be a first priority.
This programme is strongly focused on housing in the broad context of renewal and housing markets. It is divided into three subprogrammes: housing between market and government, urban renewal and transformation which in turn is split into transformation processes and policy strategies, design resources and tools, new information technologies, and international comparative research, and finally housing stock and housing quality. The OTB is strongly linked to this programme in that Professor Priemus, the Director of OTB still belongs to this group, and much of the work on housing is clearly related to the ongoing research programme of the OTB. It is difficult to see the lines between much of OTB’s research and this group although research into housing market models, owner occupation, rental markets, and housing stock seem to be significant. It is hard to see any real distinctions between the first and third subprogrammes concerning housing markets and stock while the second subprogramme dealing with urban renewal and transformation does not have much coherence in that urban form and design, and mainstream urban planning topics all fall under this area. A substantial number of research publications are in Dutch that makes them inaccessible and the research funding for most of the areas in this programme come from university with a small proportion from third parties. There is no funding from NWO. Many of the topics being pursued in this programme are highly relevant to Dutch planning and urban policy and the area has considerable potential. Publications and outlook, however, must be much more international if the programme is to realise this potential.
## Appendix I

### Programmes

**Eindhoven University of Technology, Faculty of Architecture, Building and Planning**

<table>
<thead>
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<th>Code</th>
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<td>TUE1</td>
<td>Structural design</td>
<td>Hoenderkamp</td>
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<td>TUE2</td>
<td>Building physics</td>
<td>Wisse</td>
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<tr>
<td>TUE3</td>
<td>Design and decision support systems in architecture and urban planning</td>
<td>Timmermans</td>
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<td>TUE4</td>
<td>Building technology</td>
<td>Maas</td>
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<tr>
<td>TUE5</td>
<td>Urban planning and management and real estate management</td>
<td>Fassbinder</td>
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<tr>
<td>TUE6</td>
<td>Architectural design</td>
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**Delft University of Technology, Research Institute for Policy and Technology**

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<td>Housing policy and building market</td>
<td>Priemus, Boelhouwer, Conijn</td>
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<td>Housing stock management and housing market research</td>
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<td>Building organisation and real estate management</td>
<td>Priemus, Meijer</td>
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<td>OTB4</td>
<td>Infrastructure and urban development</td>
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**Delft University of Technology, Faculty of Architecture**

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<td>TUD2</td>
<td>Building technology (3 sub-programmes)</td>
<td>Drewe</td>
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<tr>
<td>TUD3</td>
<td>Urban design and planning (3 sub-programmes)</td>
<td>de Jonge</td>
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<td>TUD4</td>
<td>Real estate and project management (2 sub-programmes)</td>
<td>Rosemann</td>
</tr>
<tr>
<td>TUD5</td>
<td>Real estate and project management (3 sub-programmes)</td>
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<tr>
<td>TUD6</td>
<td>History, theory and information technology (4 sub-programmes)</td>
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Summary of scores, input/output data:

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<td>5 5 5 5</td>
<td>5 5 5 5</td>
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NB: these data are for 1992-1996.
(TUB has given 1993-1996 in their tables, 1991 has therefore been omitted)

Appendix II

Curricula Vitae Members Review Committee Assessment of Research in Architecture, Building and Planning

Prof. Hans-Wolf Reindhardt (chairman; 1995) graduated in 1969 as a Civil Engineer (structural engineering) from the University of Stuttgart, Germany, where he also received his PhD in Civil Engineering in 1968. After spending a postdoctoral year at the Illinois Institute of Technology, Chicago, USA, he returned to Stuttgart to become a senior teacher and research engineer at the University of Stuttgart. In 1978 he was appointed professor of concrete structures and head of the Olden Laboratory (concrete sections) at Delft University of Technology. In 1986 he moved to Darmstadt University of Technology (Germany) where he became professor of construction materials and building physics. Since 1993 he is back at the University of Stuttgart to become professor of concrete structures and the managing director of the Materials Research and Testing Establishment of Baden-Württemberg (Otto Graf Institute). In 1992-1994 he was the dean of the faculty of Civil Engineering. Professor Reindhardt has been a member of VSNU review committees for academic education for civil engineering and geodesy and for architecture. He is a co-editor of the journal Advanced Cement Based Materials and an editorial board member for Materials and Structures.

Prof. Michael Batty (1943) was from 1969 to 1979 a research assistant, lecturer, then reader in Geography in the University of Reading, England. From 1979 until 1990, he was professor of City and Regional Planning in the University of Wales at Cardiff where he acted as dean of the School of Environmental Design (1983-1986) and head of department (1985-1989). From 1990 to 1995 he was director of the National Centre for Geographic Information and Analysis (NCIGA) in the State University of New York at Buffalo, USA, where he was also professor of Geography. Currently he is professor of Spatial Analysis and Planning, and director of the Centre for Advanced Spatial Analysis (CASCA) at University College London (UK). Professor Batty has been a visiting professor in the universities of Waterloo, Melbourne, Illinois at Urbana-Champaign, Hong-Kong and Bristol. He acted as a member of the Computer Board for British Universities and Research Councils, as vice-chairman of the Economic and Social Research Council (ESRC) Environment and Planning Committee and as a member of the Science and Engineering Research Council (SERC) Transport Committee. From 1986 to 1990 he was a co-director of the Wales and South West Regional Research Laboratory (WSSWR). He is an editor of Environmental and Planning B: Planning and Design and sits on seven editorial boards of journals concerned with urban studies and planning. He is the author of two books and has co-edited six books on the use of computers in urban studies and planning.

Prof. Hugo Hess (1941) studied Engineering (Building Technology) at the University of Leuven, Belgium, where he graduated in 1968. After four years of employment as a structural engineer at an architectural office, he worked as a researcher at the Physics Department in Leuven and received a PhD in 1975. In 1976 he became assistant-professor and in 1981 professor in Building Physics at Leuven, where he is also the head of the Laboratory of Building Physics. He has been a member and chairman of the Committee for Civil Engineering of the Flanders Fund for Scientific Research and he is an Operating Agent of the International Energy Agency for energy conversation in buildings and community systems. He is also a consultant for the study of the Thermal Insulation and Building Envelopes and the International Journal on HVAC&R Research.

Professor John McKeen (1941) graduated as architect (1968, Strathclyde University, Scotland) followed by postgraduate studies in History and Theory of Architecture (1971, University of Essex, England). He practiced as an architect and has taught architectural design in Europe, Sri Lanka and England where he led courses at various UK universities, and he now is professor of
architecture at the University of Brighton. As an architectural historian, he ran the History of Architecture Unit at the University of North London (1982-87), taught history of design at Middlesex University and lectures and publishes widely, including several co-authored and five complete books, of which two have won American Institute of Architects' International Book Awards.

He is currently Reader at Brighton, in charge of the research in the area of Built Environment, ranging from architectural history to construction management and sustainable building. He has been on the visiting professorship at Giancarlo De Carlo's International Laboratory of Architectural and Urban Design, Italy since 1979 and teaches on a PhD programme in Oslo, Norway. He is on the editorial board of the EAAE journal STOA, and has served on the different English Higher Education Funding Council quality assessment boards for Architecture, The History of Architecture, Art & Design, and Art & Design.

Professor Peter Nijkamp (1946) graduated in 1970 in Econometrics and Regional Economics at the Erasmus University (Rotterdam, The Netherlands), where he received his PhD in 1972. In 1973 he became a lecturer in Economics at the Erasmus University as well as at the Free University of Amsterdam. From 1977 he is professor in Regional, Urban and Environmental Economics and Economic Geography at the Free University of Amsterdam and also the chairman of the Department of Regional Economics. Professor Nijkamp is a Fellow of the Royal Netherlands Academy of Arts and Sciences (KNAW) and a Fellow of the World Academy of Arts and Sciences. He has been the president of the Regional Science Association International and presently the chairman of the Network on European Communications and Transport (NECTAR). He held visiting professorships at universities in Gothenburg, Osaka, Boston, Athens, Jerusalem, Naples, Beijing, Padua, Turin, Hesinki and Catania. He is an advisor to the Dutch Government, the European Commission, the OECD, the World Bank, the Academia Sinica, the Asian Development Bank and the European Roundtable of Industrialists. He is a member of the editorial board of 28 some Scientific Journals. In 1996 professor Nijkamp received the NWO Spinoza price.

Professor Gerhard Schmitt (1955) received the degree of Diplom-Ingenieur in 1979 and the degree of Doktor-Ingenieur in 1981 from the Technical University of Munich (Germany). In 1981 he graduated as a master of Architecture at the University of California, Berkeley, USA. He held assistant and associate professorships at the University of Manitoba (Winnipeg) and at Carnegie Mellon University (Pittsburgh). In 1988 he became professor for Computer Aided Architectural Design (CAAD) at ETH Zurich, Switzerland. He held visiting professorships at the Catholic University (Leuven), the Technical University of Denmark (Copenhagen) and Harvard University (Boston). From 1994-1996 he was the Dean of the Faculty and the Department of Architecture at ETH Zurich. He is the founder of the Architectural Space Laboratory at ETH and the author and editor of several books on Computer Aided Architectural Design.

Dr Bas Blaauboer (1949) is an associate professor of toxicology at Utrecht University. In 1997 he was seconded to the VSNU as programme manager for the VSNU quality assessment. In this capacity he also served as the secretary for the review committee for research in Architecture, Building and Planning.

Appendix III

Discipline Protocol for the Assessment of Research in Architecture, Building and Planning

November 1996

This protocol specifies the terms of reference for the Review Committee and is seen as an Addendum to the 1994 General Protocol.

Participants

Delft University of Technology
* Faculty of Architecture
* The OTB Institute for Policy and Technology

Eindhoven University of Technology
* Faculty of Architecture, Building and Planning

Information

Each Faculty and the OTB will describe their present research programs and their profile in a Self-study report, according to the guidelines of the general protocol.

In addition, information will be provided about:
- the professorial chairs, including present and future vacancies
- for part-time professors: their (main) occupation outside the university
- the Delft Faculty will provide a short description of the relevant research schools in which Delft and/or EUT participate.

Information about the age profile of the senior staff will be provided on request.

An overview of the scientific output over the period 1992-1996, to be split up in:
- Dissertations (according to the general protocol)
- Scientific Publications
  - international
  - national
- Professional Publications
- Designs

Composition of the Committee:

The Committee should cover the following items:
- Social and Cultural Aspects
- Architecture/Urban Design (architectuur/straatbeleid)
- Town Planning (stedenbouwkunde)
- Construction and Building Physics (constructie/bouwphysica)
- Building Technology and Planning (bouwtechnologie en uitvoeringstechniek)
- Social Housing/Real Estate Management (woningen/nuisijnpiek)

At least one Member, besides the Chairman, should have access to publications in Dutch.

Site Visits

Site visits will be planned for TUE (one day), TUD (one day) and OTB (a half day).
## Appendix IV

### PRELIMINARY ASSESSMENT FORM

**REVIEW COMMITTEE ARCHITECTURE, BUILDING AND PLANNING**

(return before 15 August 1997 to the secretary of the committee)

Programme title: ......................................................... (code: )
Reviewer: .............................................................

Please give your ratings on a 5-point scale, in which:

<table>
<thead>
<tr>
<th>5</th>
<th>&quot;excellent&quot;</th>
<th>4</th>
<th>&quot;good&quot;</th>
<th>3</th>
<th>&quot;standard&quot;</th>
<th>2</th>
<th>&quot;below standard&quot;</th>
<th>1</th>
<th>&quot;poor&quot;</th>
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</table>

**Note:** Start from the assumption that all university research should normally conform to a certain standard. Consider if each aspect of this programme is above/ on/ below that standard. The committee report will have to specify where and why deviation of the standard is perceived. Your preliminary assessment is only for use in the committee meetings and will not be published in the committee report.

### A. QUALITY

How do you evaluate the quality of the programme with respect to:

1. originality of the approach and ideas
2. integration of the research into the international state of the art
3. coherence of the programme
4. prominence of the programme director
5. prominence of other members of the research group
6. distribution of published output over the team members
7. scientific level of the output: scientific publications
   - professional publications
   - design and software

Overall assessment of the quality:

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### B. PRODUCTIVITY

Considering the number of staff, how do you evaluate the productivity of the programme with respect to:

1. number of PhD-thesis
2. number of scientific publications
3. other products, like designs, software and patents

Overall assessment of productivity:

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</table>
### C. RELEVANCE

Considering the stated mission of this programme, how do you evaluate the relevance of the research with respect to:

1. relevance for the advancement of knowledge or expertise
2. impact and applications in future technologies
3. position in relevant networks

Overall assessment of relevance:

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### D. LONG TERM-VIABILITY

Considering its personnel and facilities, how do you evaluate the long-term viability of the programme considering long term needs of industry and society and of other users of scientific and technological knowledge:

1. with regard to what has been achieved so far
2. with regard to plans and ideas for the future

Overall assessment of long-term viability:

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2. Points of attention/remarks

3. Questions (to the programme director, the Faculty Board, the Institute director or others)

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### Publications in this series:

#### Quality Assessment of Research:

- **Protocol 1993.**
- **Mechanical Engineering, including Marine Technology, 1994.**
- **Netherlands Biology in the Nineties (Part One and Part Two), 1994.**
- **Psychological Research in The Netherlands: Past Performance and Future Perspectives, 1994.**
- **Archaeological and Historical Research in Dutch Universities 1988-1992, 1994.**
- **Onderzoekbeoordelingen 1993: Evaluatie van de proefronde.**
  (Code: PU/130309)
- **Protocol 1994**
- **Civil Engineering and Geodetic Engineering, 1995.**
- **Philosophical Research in the Netherlands, 1995.**
- **Electrical Engineering, 1995.**
- **Theological Research in Dutch Universities, 1995.**
- **Geographical and Environmental Sciences including Social Geography, Physical Geography, Cartography, Development Studies, Urban and Regional Planning, Demography, and Environmental Science and Technology, 1995.**
- **Economics, 1995.**
  (Code: PU/130316), ISBN 90-5588-017-5.
- **Pedagogical and Educational Sciences in the Netherlands: Past performance and Future perspectives, 1995.**
- **Rechtsgeleerdheid, 1996.**
- **Political Science, Public Administration and Communication Science, 1996**
- **Sociology and Anthropology at universities in the Netherlands, 1996.**
  (Code: PU/130320), ISBN 90-5588-028-0.
- **Earth Sciences in the Netherlands, 1996**
- **Chemistry, past performance and future perspective, 1996**
- **Physics, an Analysis of Physics in the Dutch Universities in the Nineties, 1996.**
- **Astronomy in the Netherlands, ASTRON Evaluation Committee (AFEC II) 1996.**
  (Code: PU/130315), ISBN 90-5588-441
- Evaluation Pharmaceutical Research at University of Groningen and Utrecht University, 1997.
- Management Science and Business Administration, 1997
  (Code: PU/130127), ISBN 90-5588-053-1
- The Interfaculty Reactor Institute Delft University of Technology, 1997.