N I A O

Northern Ireland Audit Office

Report by the Comptroller and Auditor General for Northern Ireland

Re-roofing of the Agriculture and Food Science Centre at Newforge

NIA 24/02

17th October 2002
Price £9.50

N I A O
Northern Ireland Audit Office

Report by the Comptroller and Auditor General
for Northern Ireland

Ordered by the Northern Ireland Assembly
to be printed 9th October 2002

Re-roofing of the Agriculture and Food Science Centre at Newforge

NIA 24/02

BELFAST: The Stationery Office

This report has been prepared under Article 8 of the Audit (Northern Ireland) Order 1987 for presentation to the Assembly in accordance with Article 11 of the Order.

J M Dowdall
Comptroller and Auditor General

Northern Ireland Audit Office
9th October 2002

The Comptroller and Auditor General is the head of the Northern Ireland Audit Office employing some 100 staff. He, and the Northern Ireland Audit Office, are totally independent of Government. He certifies the accounts of all Government departments and a wide range of other public sector bodies; and he has statutory authority to report to Parliament and the Assembly on the economy, efficiency and effectiveness with which departments and other bodies have used their resources.

For further information about the Northern Ireland Audit Office please contact:

Northern Ireland Audit Office
106 University Street
BELFAST
BT7 1EU

Tel: 028 9025 1100

email: info@niauditoffice.gov.uk

website: www.niauditoffice.gov.uk

List of Abbreviations

DARD	Department of Agriculture and Rural Development
DFP	Department of Finance and Personnel
EMD	Estate Management Division
HMT	Her Majesty's Treasury
NIAO	Northern Ireland Audit Office
SLA	Service Level Agreement

Table of Contents

DARD: RE-ROOFING OF THE AGRICULTURE AND FOOD SCIENCE CENTRE AT NEWFORGE

Introduction

In 1988, the Department of Agriculture and Rural Development undertook to replace the flat roofs on five buildings, built in 1972, at the Agriculture and Food Science Centre, Newforge. At that time, ingress of water through the flat roofs had become an increasing problem and, following a survey, the roofs were declared unsafe and in need of replacement. Construction Service was engaged to advise the Department and to manage the subsequent construction project.

The project involved the replacement of the flat roofs by free standing pitched roofs, of innovative design. In addition to the new pitched roofs, an extension and decant accommodation, for staff displaced during re-roofing, were also constructed. Overall, the total cost of the project amounted to some £12.5 million, including professional fees.

Due to operational and funding constraints, the project was undertaken in phases, with re-roofing being finally completed in 2000. The project has solved the major problem of ingress of water to the buildings and has extended the life expectancy of the Centre.

NIAO's approach to this review was to examine the handling of the project, from the identification of the need for re-roofing through to completion and evaluation of the project, against the best practice guidance available during the life of the project. We have made a number of recommendations (paragraph 63) on project appraisal, implementation, monitoring and evaluation, which will assist the Department in its handling of future capital projects. The Department is now considering how best to take these forward.

DARD: RE-ROOFING OF THE AGRICULTURE AND FOOD SCIENCE CENTRE AT NEWFORGE

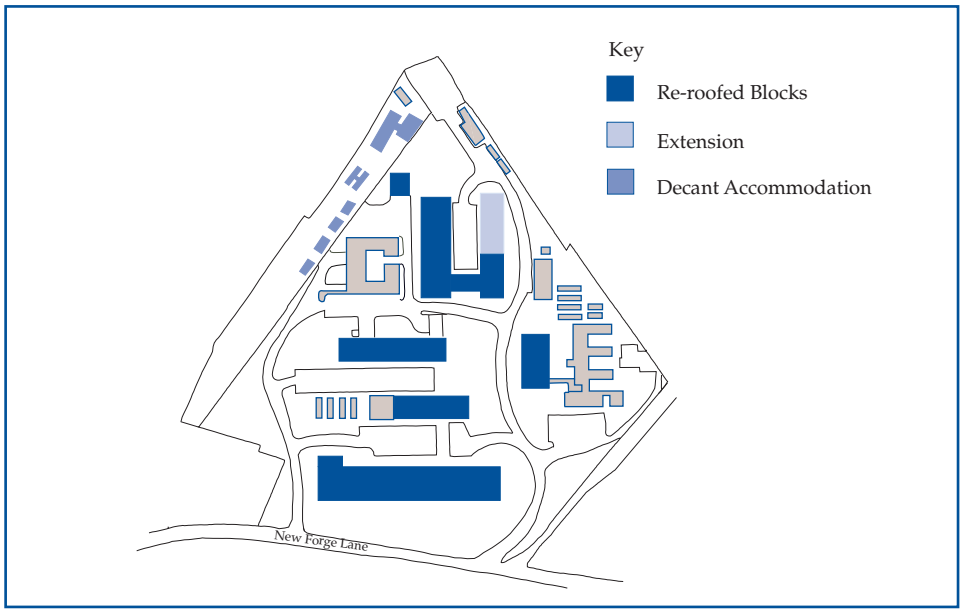
Background

1. The Agriculture and Food Science Centre at Newforge (the Centre) provides facilities for degree teaching and research for Queen's University of Belfast. This is delivered by staff from the Science Service of the Department for Agriculture and Rural Development (the Department).

2. The site at the Centre comprises a complex of buildings, including five two-storey, flat-roofed buildings (the blocks), which were constructed in 1972 and cover an area of some 9,250 square metres (Figure 1 and front cover photograph). By 1987, ingress of water through the flat roofs of these blocks was an increasing problem and the Department asked Construction Service[1] to undertake a feasibility study to assess the condition of the roofs and provide proposals for their upgrading or replacement. Consultants engaged by Construction Service reported in March 1988 that the roofs were unsafe and needed replacement.

Figure 1

Site Plan of the Agriculture and Food Science Centre.



Source: DARD

[1] Construction Service became an Agency within the Department of the Environment (NI) on 1 April 1996. The function transferred to the Department of Finance and Personnel in December 1999.

3. The subsequent re-roofing of the five blocks, together with an additional small building at the Centre, took some 12 years from inception to completion i.e. from receipt of the 1988 feasibility study to 2000 when the contractor moved off the site. Work on the main re-roofing contract did not actually commence until May 1993, having been postponed to allow for the building of a two-storey extension (the Extension) at Newforge, to accommodate Science Service staff being transferred from other locations.

4. The re-roofing project itself was constrained by the need to:

- keep the Centre functioning throughout the year and particularly during the University term, from October to June each year
- keep construction noise to a minimum during examination times
- provide decant accommodation for those staff and their equipment vacated from the top floors of the blocks during re-roofing
- contain project funding to £1 million per year.

As a result, the approach adopted was to re-roof one block at a time.

5. Overall, the cost of the re-roofing and extension projects, including decant accommodation and professional fees, amounted to £12.51 million. Within this figure, the cost of the re-roofing main contract was £9.03 million (including some additional works and cost fluctuations), some 50 per cent higher than the tender sum of £6.05 million. In May 1996, the re-roofing contract was suspended for 12 months to allow essential fire certification works[2] to be carried out, at an additional cost of £2.87 million. Details of costs are set out in Appendix 1.

Scope of NIAO Examination

6. In view of the higher than planned cost for the re-roofing project and the length of time taken to complete the work, NIAO examined the:

- assessment of the need for re-roofing
- project appraisal
- project implementation
- monitoring of the project

[2] Following the fire in Parliament Buildings at Stormont, in 1995, the Secretary of State gave an undertaking that all Northern Ireland Civil Service buildings would be fire certified by April 1997.

- project evaluation
- effectiveness of the completed work.

7. The Department's handling of the project was examined against best practice and guidance available at that time, including recommendations on procurement of capital projects set out in the 1985 HMT Efficiency Unit Review on Procurement, which covered project appraisal, monitoring and the role of the project sponsor.

Assessment of the Need for Re-roofing

8. The March 1988 roof condition report prepared by consultant architects indicated that the roofs on the five blocks at the Centre had two major defects:

- ingress of water
- inadequate insulation standards.

The consultants confirmed that the roofs were unsafe and needed replacement.

9. Subsequently, in June 1988, the consultants undertook a separate review on the condition of the external walls and the need to upgrade these to improve insulation. Although there had been some deterioration due to lack of regular maintenance, the walls were considered to be sound with no major defects. The options to improve insulation by providing additional wall cladding, were costed at between £1.0 million and £1.6 million. However, these were considered to have only marginal benefits in terms of savings in energy consumption and the Department decided not to upgrade the walls.

10. The consultants' March 1988 feasibility study provided five design options for re-roofing the blocks. Of these options, only two were considered practicable:

- a flat-roof replacement, with an estimated life span of 15-20 years, at an estimated cost of £1.7 million
- a free-standing pitched roof, involving a latticed steel structure, with an estimated life span of 30 years, at an estimated cost of £3.2 million.

The three remaining options were rejected because of structural constraints.

11. The consultants recommended the free-standing pitched roof option. This provided for external maintenance walkways and a covered roof space, offering an enclosed maintenance zone for equipment and plant which had previously been situated in the open on the flat roof. The consultants considered that remedial works on the flat roofs should commence immediately and, subject to the availability of finance, recommended that the complete re-roofing programme should be contained within a maximum 3¼ year period.

12. The consultants also recommended constructing an additional building (an extension to an existing block), at a further cost of £1.23 million, to provide decant accommodation for staff who would have to move out of the blocks during re-roofing.

Project Appraisal

Re-roofing Project Proposal

13. In November 1988, the Department informed the Department of Finance and Personnel (DFP) of its proposal to:

- undertake an investment appraisal of the two re-roofing options to determine the most cost-effective long term alternative
- construct a permanent Extension at the Centre, to serve as a short-term decant facility up to 1994 and then as permanent accommodation for relocated staff of the Department's Aquatic Science Research Division.

14. DFP expressed concerns at the high costs of the re-roofing options and the proposed Extension stating that *"it is difficult to believe that there are no cheaper alternatives"*. DFP recommended that the Department undertake investment appraisals for both the re-roofing and the Extension projects.

Investment Appraisal Documentation

15. The Departmental division which initiates a capital project is responsible for conducting the appropriate investment appraisal. In

this case, Estate Management Division (EMD) was responsible for undertaking the investment appraisal for the re-roofing project and Science Service was responsible for the investment appraisal of the Extension project. However, we found that the Department was unable to provide us with copies of the investment appraisals for the re-roofing options and the Extension.

16. We did see a 'draft' investment appraisal for the Extension, prepared by Science Service in January 1989 and revised in March 1989. No documents were found for the re-roofing project, although EMD told us that an investment appraisal had been prepared. Although the completed investment appraisals were required to be submitted to DFP, the Department could only provide an unsigned draft submission letter to DFP, prepared in March 1989 and referring to the attachment of investment appraisals in respect of re-roofing and the Extension.

17. The Department's project files did not contain any documentary evidence of DFP approval having been sought and obtained for the re-roofing project and the Extension. Best practice states that responsibility for these procedures should be centralised with one person, to ensure that all information is maintained and handled in an appropriate manner[3]. We recommend that the Department takes steps to ensure that all prime documentation, such as investment appraisals and DFP approvals, are retained and associated with the relevant project files and that responsibility for maintaining records rests with a designated officer within EMD, the division responsible for progressing capital projects.

18. We also found that DFP's files on the Newforge project had been destroyed in 1998. Consequently, we were unable to ascertain whether any investment appraisals had been submitted to DFP. Given that the project was not completed until 2000, we would have expected that these key papers would have been retained for some time after that date. We recommend that DFP reviews its procedures to ensure that its prime documentation, and that of Departments, relating to capital projects is retained during the currency of those projects and for an appropriate period - in our view, at least three years - following completion of the necessary post-project evaluations. Public Records Office guidance on records management should also be taken into account.

---

[3] CUP Guidance No.7 Project Sponsorship: Planning and Progress Monitoring, November 1988.

Identification of Options

19. The Department told us that it had considered alternative options to both re-roofing (for example, to rebuild or relocate) and decanting arrangements (for example, renting accommodation or occupying other Queen's University facilities). Construction Service documentation also indicated that the Department had been asked to investigate whether decant accommodation was available elsewhere within the University. However, we found no evidence to indicate that alternative options were actively considered by the Department.

20. Best practice[4] on appraisal stated that *"the main alternative ways of meeting the objectives … should be listed"* and a *"wide range of options"* should be considered. In our view, the Department should have ensured that the consideration of options, including decisions not to evaluate particular options, were fully recorded and the relevant documentation retained. In the absence of documentation, it is not clear to us, the extent to which consideration was given to a range of options.

Assessment of Options

Re-roofing

21. In June 1989, the Department accepted the recommended free-standing pitched roof option and instructed Construction Service to proceed to design stage with an intended construction start date in 1990.

The Extension

22. The Department's March 1989 draft submission letter for DFP (paragraph 16) indicated that its preferred option for decant accommodation to facilitate re-roofing, was the construction of a permanent Extension to one of the blocks. The Department's aim was that the Extension would initially be used for decant purposes and then become permanent accommodation for relocated Aquatic Science Research Division staff. This option was also referred to as being favoured by Construction Service and the Department's consultants. The Department noted that the alternative to this option was the construction of temporary decant accommodation, estimated to cost some £0.5 million, but with little residual value after completion of the re-roofing project.

[4] HMT Investment Appraisal in the Public Sector 1982 and DAO/DFP 3/85.

23. We found, however, that Science Service's March 1989 draft investment appraisal of the Extension did not include the option to use it as a decant facility, despite it being highlighted as the lowest cost option in the earlier, January 1989, draft appraisal. Science Service decided that this option was no longer acceptable because it considered that the Extension was urgently required for Aquatics Division staff, immediately on completion.

24. In May 1989, EMD and the Department's Resource Control Division considered that the Science Service appraisal had not adequately addressed options for the location of Aquatics Division staff. They also expressed reservations that the appraisal had too readily dismissed the option to use the Extension as decant accommodation, before locating Aquatics Division staff there, and questioned the view that Aquatics Division units needed to be urgently relocated to the Newforge site. Despite these major reservations, we found no evidence that the issues raised were subsequently addressed. Construction of the Extension began in autumn 1991 and, on its completion in June 1992, was occupied by Aquatics Division staff.

25. We found Science Service's decision surprising given that, in 1989, it had noted that re-roofing was a priority and that *"the dangerous nature of the existing roofs at Newforge must be attended to urgently and cannot be postponed…"*. The change in priorities, coupled with financial constraints which limited funding for the project to £1 million per year, meant that commencement of re-roofing was delayed until 1993. There was a continued deterioration of the roofs over the period 1989 to 1993 and an increased health and safety risk to staff and students. Indeed, in August 1992, EMD recorded that the roofs were *"in a perilous state"*.

Decant Accommodation

26. The Science Service decision to give priority to the permanent relocation of Aquatics Division staff at the Extension, rather than allowing it to be used as decant accommodation for staff from the blocks during re-roofing, led to increased costs for the re-roofing project, through the need to provide alternative decant accommodation.

Additional work required as a result of the changed priorities included:

- building temporary alternative decant accommodation comprising:
  - a purpose-built temporary decant building
  - a small temporary block, custom-built for a new marine unit within

Aquatics Division, which became vacant after staff transferred to the Extension
- four temporary classrooms

- the removal of other small out-buildings already on the site
- additional site works.

The total cost of the temporary decant accommodation associated with the re-roofing project amounted to £1 million. At April 2001, following completion of the re-roofing project, the temporary decant buildings were valued at £173,000. The buildings are currently being used for storage, but will require removal in due course. Temporary planning permission for the four classrooms ran out in November 2000. Planning permission for the remaining temporary decant buildings expires in March 2003 and it appears that the Department is unlikely to seek renewal of these permissions. EMD told us that it has considered transferring the classroom units to another DARD site, but has not proceeded because of the high cost of dismantling, transport and re-erection.

27. We noted that there was no evidence that the cost and timing implications of the Science Service decision to change the intended use for the Extension (from temporary decant accommodation to immediate permanent occupancy by Aquatics Division) were assessed. Given the £1 million cost of the alternative decant accommodation, its limited lifespan and low residual value, we would have expected the Department to have been able to provide evidence of the evaluation of its decision not to use the Extension as decant accommodation. We recommend that where a management decision is to be made which impacts significantly on the outcome of a major capital project, the cost of pursuing that particular action must be assessed and recorded before the decision is finalised.

28. Treasury guidance[5] requires that where two projects are mutually dependent, the project should be appraised and justified as a whole. However, the March 1989 draft of the investment appraisal for the Extension did not link its construction as decant accommodation with the re-roofing project. Indeed, in May 1989, Science Service informed EMD that *"the re-roofing of Newforge and decanting scenario should now be separated/disentangled from the [Extension] and this made clear to DFP"*. In our view, the investment appraisals for both projects should have been linked in this case, in line with Treasury guidance.

[5] HMT Investment Appraisal in the Public Sector 1982

Project Implementation

Project Programme

29. The timetable for the re-roofing project underwent several revisions following the decision, in 1989, to proceed. The planned and actual implementation timetables are shown at Appendix 2.

Roles and Responsibilities

30. EMD is responsible for the maintenance of the Department's non-office accommodation, including the specialised science buildings of the Centre. Construction Service, acting on instructions from EMD, maintains the Department's specialised buildings. It also undertakes refurbishment and new build projects and advises EMD on construction related matters. Since 1997, the relationship between EMD and Construction Service has been formalised under the terms of a Service Level Agreement.

Project Sponsor and Project Manager

31. A project sponsor for each capital project is appointed within EMD to represent the Department's interests through all the project stages. Within Construction Service, an experienced construction professional is appointed as project manager, to manage the design and construction of the project on a day-to-day basis and act as the main contact between the Department, contractor and consultants. With a large number of groups/individuals involved in the design and construction stages of the project, the roles of project manager and project sponsor were key to ensuring the successful completion of the re-roofing project to time, cost and quality.

32. Construction Service, which was appointed as the Department's agent, nominated one of its professional staff as 'client adviser', to liaise with the project sponsor and provide advice on project design prior to the appointment of a project manager. On the re-roofing and Extension projects, the client adviser was subsequently appointed as the project manager. However, best practice suggests that although it is possible that the client adviser may be re-engaged as the project manager, this should be avoided in order to protect the independence of the role of client adviser[6].

---

[6] CUP No.33: Project Sponsorship 1992 and The Financial Management and Audit of Contracts; A Practical Guide, 1999 (CIPFA).

33. The Department told us that professional staff in Construction Service, who have experience of working with the DARD estate, provide both advice and project management services to EMD. In the Department's view, separate appointments of client adviser and project manager are unnecessary and combining the roles is a more effective and efficient use of resources. While we note the Department's view, we believe that there are benefits in keeping the roles separate – the availability of a professional adviser to provide advice, *independent* of the main project team, if required, to the project sponsor during the later stages of the project and the opportunity to obtain independent and informed comment on the completed project. For these reasons, we recommend that the Department considers the separation of the client adviser and project manager roles in future projects.

Staff Continuity

34. Best practice[7] also recommends that there should be continuity of staff in key positions. We noted that three persons held the post of project sponsor during the life of the project, although we saw no evidence that the project suffered as a consequence. We recognise that there are circumstances where staff changes are unavoidable, particularly where projects extend over a long period of years. However, we would urge that the Department takes all reasonable steps to ensure that changes in key personnel are minimised in order to maintain the smooth running of projects.

Staff Training

35. The role of the project sponsor is extensive and requires understanding and competence in a wide range of management and construction skills. Although project sponsors need not be expert in construction matters and procedures, they ought to:

- have a clear understanding of the requirements of project management
- recognise the statutory obligations that must be met, for example Health and Safety legislation and procurement regulations
- be knowledgeable of the roles of other members of the construction team
- be aware of best practice guidance within the construction field.

[7] CUP No.33: Project Sponsorship 1992.

36. In discussions with the final project sponsor, who had been in post from January 1997, we found that he had not attended training in these areas for a number of years and was not aware of current Treasury guidance on contract procurement. This guidance stated that it *"should be read by investment decision makers, project owners, project sponsors and project managers ... in departments involved in works projects"* and should be applied to existing projects.

37. The Department said that, as it relied on professional advisers from Construction Service for the procurement role, there was no deficiency in expertise. It accepted, however, that some updating of knowledge in relevant areas is required by project sponsors, although it felt that it would not be practical or cost-effective to train project sponsors to the extent that they could dispense with the services of a professional adviser.

38. NIAO agrees with this approach. It is important, however, that the Department ensures that its project sponsors are properly equipped to fulfil their role and to ensure compliance with best practice. We recommend that an assessment of training needs be undertaken and relevant guidance brought to the attention of all staff involved in capital projects.

The Re-roofing Project

Tendering

39. In September 1992, the re-roofing contract was advertised as a single tender in the European Union Journal under an accelerated tendering procedure. The accelerated procedure is used when there is insufficient time for the normal tendering process to be followed. Construction Service justified the use of the accelerated tendering procedure in this case on the grounds that the construction phase had been *"postponed due to previous financial restrictions with consequential increased deterioration of the existing roofs which results in tight programming now that finances have been made available"*. Planning permission for the preferred pitched roof option was due to expire on 15 March 1993 and, by July 1992, the Department was concerned that planning permission would not be renewed. It considered it desirable, therefore, that the re-roofing contract was in place before planning permission expired. In the event the main contractor was unable to start on site until April 1993 and so, to ensure that work

commenced before planning permission expired, Construction Service engaged a contractor to commence site works.

40. Seven tenders for the main contract were received. These ranged from £5.85 million to £6.25 million and were evaluated against cost and quality criteria. The lowest tender was not accepted by Construction Service because the tendering contractor wanted to use its own sub-contractors and not those Construction Service had nominated. The second lowest tender was rejected because it included an alternative roof cladding material, which although giving a saving of some £0.2 million, was not considered comparable to the specification requirements. Therefore, the contract was let, in April 1993, for £6.05 million to the third lowest tenderer.

41. The period of the contract, at 5½ years, was longer than the 3¼ years originally anticipated by the Department's consultants, because of the constraints on the project (paragraph 4). As the contract period exceeded two years, it was let on a full-fluctuations[8] basis, in line with Government policy.

42. The cost estimate of £5.3 million, prepared in March 1991, was used 18 months later as the re-roofing contract estimate at tender stage, in September 1992. Because of the lapse of time since the estimate was prepared, the likely costs of this contract were not, therefore, fully assessed before tendering stage. Guidance on project appraisal stated that *"before firm commitment [to proceed with a project is made], the approving authority should receive an updated appraisal of the project"*.[9] This guidance required approving authorities to have conditions in place under which capital projects must be re-appraised and re-submitted for approval - for example, where a specified time elapses before commencement of the next stage of a project or estimated capital costs rise by more than a given amount. In light of this guidance and the delay in commencing the re-roofing project, we consider that it would have been appropriate for the Department to have updated the cost estimates in the re-roofing project appraisal. The Department accepted this point but added that had the tenders been 'unacceptably high' it would not have been committed to implementing the work as planned.

[8] Full-fluctuations allows for variations in market price of materials over time and is usually applied to contracts of longer than two years in duration. On this project, costs of the two main materials - steel and roof-cladding - were frequently changing.

[9] DAO/DFP 7/1987 and DAO/DFP 9/1991.

Post-tender Alterations

43. In December 1992, after the main contract was advertised but before it was let, the Premises Officer at Newforge highlighted the need for refurbishment of the upper floor rooms of the blocks and the desirability of this to be undertaken in the wake of re-roofing of each block. At that time, the Department decided not to include the refurbishment in the re-roofing contract, as the contract had already been put out to tender. However, in late 1993, a maintenance programme was introduced which required adjustments to the re-roofing contract, for example, to upgrade wiring to meet future IT requirements and improve the public address systems. In the Department's view, this had no significant impact on the re-roofing programme.

44. In October 1993, six months after the re-roofing contract was let, the project manager noted that there were *"major omissions"* from the contract and, in April 1994, it was also noted that *"urgent and critical instructions"* to vary the contract were needed. The main concern related to the replacement and refurbishment of fume cupboards at the Centre. This required significant ventilation and installation works and the associated mechanical and electrical additions were incorporated into the re-roofing contract in 1994. A programme to upgrade the fume cupboards began in 1995 and ran in parallel with re-roofing.

45. The Department told us that the fume cupboards which had to be replaced or upgraded had not been incorporated into the original contract at design stage because the 'Control of Substances Hazardous to Health' regulations did not come into force in Northern Ireland until 1995 (1994 in Great Britain). In its view, these regulations introduced requirements which were not in force at the design stage of the contract. However, we noted that when the Department made the decision in 1989 to exclude the fume cupboards from the re-roofing contract, they were aware that these did not meet the safety standards at that time.

46. We were also told that when the buildings were originally surveyed in 1989, an estimate was made for mechanical and ventilation plant likely to be replaced during the period of the re-roofing contract, which was then anticipated to be completed by 1994. Some plant and associated works were excluded from the re-roofing project at that time as it was considered likely that the plant would

not need to be replaced until after re-roofing had been completed. However, because of the delay in undertaking the re-roofing project, some of the plant which had been excluded did require replacement when the blocks were being re-roofed.

47. The Department also told us that when the re-roofing contract commenced, the condition of services could be more fully assessed and it was evident that further deterioration had occurred. It decided, therefore, to undertake additional work under the re-roofing contract and avoid the disruption and additional cost of further deferring this work.

48. The Department said that projects involving refurbishment of existing buildings have more risk attached to them than new build projects and the full extent of repairs can seldom be determined from a condition survey of the building, which involves limited 'opening-up'. It also commented that anticipating changes in legislation, in this case on health and safety, is seldom possible. In its view, there could not have been significant improvements in project planning and definition at tender stage. Good practice requires that project definition should be as fully developed and co-ordinated as possible before construction contracts are committed. The additions to the contract - fume cupboards with associated ventilation work and replacement plant - and the introduction of the maintenance programme, while not affecting the overall re-roofing project timetable, suggest to us that there could have been better project planning and definition at main contract tender stage. In our view, had the earlier decisions taken in 1989 been reviewed before tender stage, this would have contributed to improved project definition.

49. Best practice[10] advises that minimising changes to design after construction has started is a key factor in successful cost control during the construction stage and that it is important for the project sponsor to fix a date after which no significant changes to requirements or design will be introduced. While some subsequent changes may be unavoidable, or in some situations desirable, changes proposed after the construction contract has been let should be avoided if at all possible and the need for changes minimised by ensuring that the project brief is as comprehensive as possible and designs fully developed. We recommend that the Department ensures that the end-user is aware of the potential increased costs arising from variations and additions to capital contracts which are

[10] CUP Guidance No.33: Project Sponsorship 1992 and CUP Guidance No.36 Contract Strategy Selection for Major Projects 1992

brought about by changing user specifications and that such variations and additions are minimised in line with best practice.

Project Costs

50. The total cost of the re-roofing contract to December 2001 was £9.03 million plus fees, an increase of £2.98 million (some 50 per cent) on the contract sum of £6.05 million. Analysis of the increase shows that while inflation accounted for £1 million, variations to the contract amounting to £1.63 million accounted for the bulk of the increased costs, with £1.31 million of this sum being in respect of mechanical and electrical engineering additions (Figure 2).

Figure 2

Re-roofing Project - Analysis of Cost Increases

	£ million	£ million
Contract sum		**6.05**
Areas of increased costs:		
Inflation	1.00	
Variations:		
Structural	0.32	
Mechanical and Electrical	1.31	
Re-measurement[11]	0.12	
Fire certification	0.23	
Total increased costs		**2.98**
Total cost of re-roofing project (excluding fees)		**9.03**

Source: Construction Service

51. We found that details of the cumulative cost for the re-roofing project were not regularly maintained by EMD. However, when requested, these were prepared for us by EMD from its records. An analysis of the sources of increased costs, including inflation and additions, was obtained from Construction Service. In our view, it is important that the Department ensures that it too maintains such information on project costs, to enable progress to be effectively monitored throughout the period of the contract and to assist in project evaluation.

[11] A re-measurement basis of payment is used when it is not possible to specify with any degree of confidence, at tender stage, the volume of work required. Contractors quote rates to be applied.

Monitoring

52. Guidance issued in 1989[12] , provided advice to project sponsors for the monitoring of project quality. The guidance indicated that quality assessment should be built into the project plan. The project sponsor was expected to ensure that quality assurance requirements were adequately set out in the design and construction specifications of the project and that the project manager regularly monitored quality.

53. Guidance on project planning and monitoring indicates the importance of effective reporting mechanisms over the life of a project[13] :

"For a project to be successful, its progress must be closely monitored and adjustments made to its staffing, its organisation and its plan as circumstances dictate. This means a regular and close scrutiny of the project during all its phases.

The project sponsor should establish a regular reporting sequence that is appropriate for the project and the client department's needs. Usually this will involve a hierarchy of reports – for example, internal reports to the project manager, from the project manager to the sponsor and from the sponsor to the department management.

It is important that monitoring and reporting is regular, consistent and covers all phases of the project."

We noted that a number of monitoring mechanisms were in place during the project. These included reports to the project manager and project team by a Clerk of Works; inspection of works by the design team to ensure that standards were met by the contractor; monthly progress meetings on site to review the programme and quality; monthly co-ordination meetings involving the project manager and project sponsor to discuss the programme and costs; and certification of each block by the consultant architect prior to handover to the client. However, we found no evidence that, within the Department, there had been a formal mechanism for monitoring and regular reporting to senior management during the life of the project. EMD told us that it operated on an 'exception' reporting basis. However, we would have expected to see regular reporting on the project at key project milestones, by the project sponsor, to inform senior management of EMD and Resource Control Division on project progress against time and budget, based on stage reports submitted by the project manager.

---

[12] CUP Guidance No.17 on Quality Assurance in Building and Construction, April 1989.

[13] CUP Guidance No.8 Project Sponsorship: Role of Project Sponsor, November 1988

54. We recommend that the Department introduces procedures that ensure progress of capital projects is reported regularly for review by senior management in the Department, during the life of the project. The number, timing and content of monitoring reports should be agreed in advance with Construction Service before the project commences and should reflect the scale, value and complexity of individual projects. In our view, this monitoring should include:

- spend against planned profile
- an assessment of cost variations, omissions and additions
- expected completion date
- problems arising
- progress on defects
- qualitative assessment of Construction Service performance.

These reports would also provide a ready and informed basis for post-project evaluation (see paragraph 57). In addition, more recent guidance[14], issued in 1998, recommends that procedures should be in place to ensure that value for money is achieved and confirmed independently of those managing the project.

Service Level Agreement

55. EMD's Service Level Agreement (SLA) with Construction Service for the period 1 January 1997 to 31 December 2000, provided target activity and satisfaction levels of performance. However, there was no requirement for Construction Service to provide reports to the project sponsor.

56. We note that EMD's current SLA for the period 1 April 2001 to 31 March 2004 sets out revised performance targets, including the requirement for Construction Service to *"provide quarterly project reports and expenditure profiles for capital projects and maintenance work"*. The SLA also sets out details of the service to be provided and the responsibilities of both the Department and Construction Service. We welcome this improvement in the Department's monitoring process.

Post-project Evaluations

57. Post-project evaluation examines a project's appraisal, design, management and implementation processes with the objective of learning lessons for application in future projects[15] . The evaluation of

[14] Treasury Procurement Guidance No.2 Value for Money in Construction Procurement 1998

[15] CUP Guidance No.43 Project Evaluation, November 1993

the construction phase of a project should be carried out "a*s soon as possible after completion*". Where a project relates to a building, an 'occupancy review' should also be carried out within two years of the building being occupied, to assess whether the building meets the requirements of the user and to identify any further work required. We noted, however, that, at December 2001:

- the Department had not undertaken a post-project evaluation of the Extension, which had been completed in 1992
- no post-project evaluation had been undertaken on the re-roofing project, which had been completed in early 2000 (the absence of an investment appraisal for the re-roofing project limited the scope for assessing the success of the project against planned objectives)
- an occupancy review of the Extension, which would have been due by mid-1994, had not been carried out.

58. We noted that difficulties have been encountered with the quality of the Extension:

- there were considerable delays in completing works to rectify defects
- an additional minor works contract (costing £70,000) was required to rectify certain defects and undertake further works to meet user requirements.

Aquatics Division has indicated to us that, as end-user, it considers that it was not involved early enough in the design stage for the Extension. It has also highlighted that there is inadequate noise insulation between offices and that mechanical and electrical inadequacies continue to affect the Extension - for example, poor building temperature control.

59. It is important that post-project evaluations are completed in such cases in order to measure the success of the project against objectives and to identify and record all relevant lessons to improve performance on subsequent projects. We recommend that the Department clarifies and disseminates its procedures to all relevant staff to ensure that post-project evaluations and occupancy reviews are completed on a timely basis. In order to ensure objectivity of the post-project evaluation, the review should be undertaken independently of those directly involved in the planning and implementation of the project.

Effectiveness of the Re-roofing and Extension Projects

60. The Department told us that it no longer maintains a record book for roof leaks at the site and that no maintenance has been carried out on the roofs to date. The re-roofing has, therefore, succeeded in preventing the ingress of water. The new roof structure has also permitted the enclosure of roof maintenance equipment and centralisation of chimneys from fume cupboards.

Flat roofed block at the Centre before re-roofing

Re-roofed blocks at the Centre

61. The problem of insulation standards (paragraph 9) has only been partly addressed. While energy loss through the roofs has been reduced and the overhanging roof design structure provides added protection, the wall fabric remains largely unchanged. We sought to establish whether improved re-roofing insulation had resulted in any significant fall in energy costs. Using energy consumption data for the site provided by the Department, Construction Service has estimated a saving in energy costs of 15.5 per cent per year. However, the estimate is not based on consistent and complete data. Given that the re-roofing project aimed, inter alia, to reduce energy costs, we would have expected the Department to have arranged for the gathering of relevant data.

Overall Conclusions

62. The Department has solved the major problem of ingress of water at Newforge and has succeeded in re-roofing the blocks while maintaining the functioning of the Centre during construction operations. It has also managed to progress the project within the predetermined annual budget of £1 million. However, although the actual re-roofing contract was completed within its planned 5½ year timetable, with final completion some 12 years after confirmation that the roofs were unsafe and needed replaced, the project took considerably longer than originally envisaged.

63. Our review has highlighted a number of aspects in the Department's handling of the project where it did not follow best practice on appraisal, project planning, monitoring and post-project evaluation. In our view, there are a number of important areas where the Department could strengthen its procedures. We recommend that:

- the Department takes steps to ensure that investment appraisals are retained and associated with the relevant project files and that responsibility for maintaining all prime records rests with a designated officer within EMD, the division responsible for progressing capital projects (paragraph 17)

- the Department ensures that DFP approval is obtained as required for all major projects and that approvals are retained on project files (paragraph 17)

- DFP ensures that its prime documentation, and that of Departments, relating to capital projects is retained during the currency of those projects and for an appropriate period following completion of the necessary post-project evaluations (paragraph 18)

- the Department ensures that its consideration of options, including decisions not to evaluate particular options, are fully recorded and the relevant documentation retained (paragraph 20)

- where a management decision is to be made which impacts significantly on the outcome of a major capital project, the cost of pursuing that particular action must be assessed and recorded before the decision is finalised (paragraph 27)

- projects which are mutually dependent (in this case, the re-roofing and Extension projects) should be appraised and justified as a whole, in line with Treasury guidance (paragraph 28)

- the Department, in line with best practice, considers the separation of the roles of client adviser and project manager in future projects (paragraph 33)

- the Department takes all reasonable steps to ensure that changes in key personnel are minimised in order to maintain the smooth running of projects (paragraph 34)

- the Department undertakes an assessment of training needs and ensures that relevant guidance is brought to the attention of all staff involved in capital projects (paragraph 38)

- the Department, as part of its appraisal of a project, specifies the conditions under which the project should be updated, prior to tender (paragraph 42)

- the Department ensures that the end-user is aware of the potential increased costs arising from variations and additions to capital contracts which are brought about by changing user specifications and that such variations and additions are minimised in line with best practice (paragraph 49)

- the Department ensures that it maintains comprehensive information on cumulative project costs and the reasons for cost

increases, to enable progress to be effectively monitored throughout the period of the contract and to assist in project evaluation (paragraph 51)

- the Department introduces procedures that ensure progress of capital projects is reported regularly for review by senior management in the Department, during the life of the project (paragraph 54)

- the Department clarifies and disseminates its procedures to all relevant staff to ensure that post-project evaluations and occupancy reviews are completed on a timely basis. In order to ensure objectivity of the post-project evaluation, the review should be undertaken independently of those directly involved in the planning and implementation of the project (paragraph 59)

- the Department ensures that all relevant information is available to enable the effectiveness of projects to be evaluated (paragraph 61).

Appendices

APPENDIX 1
(Paragraph 5)

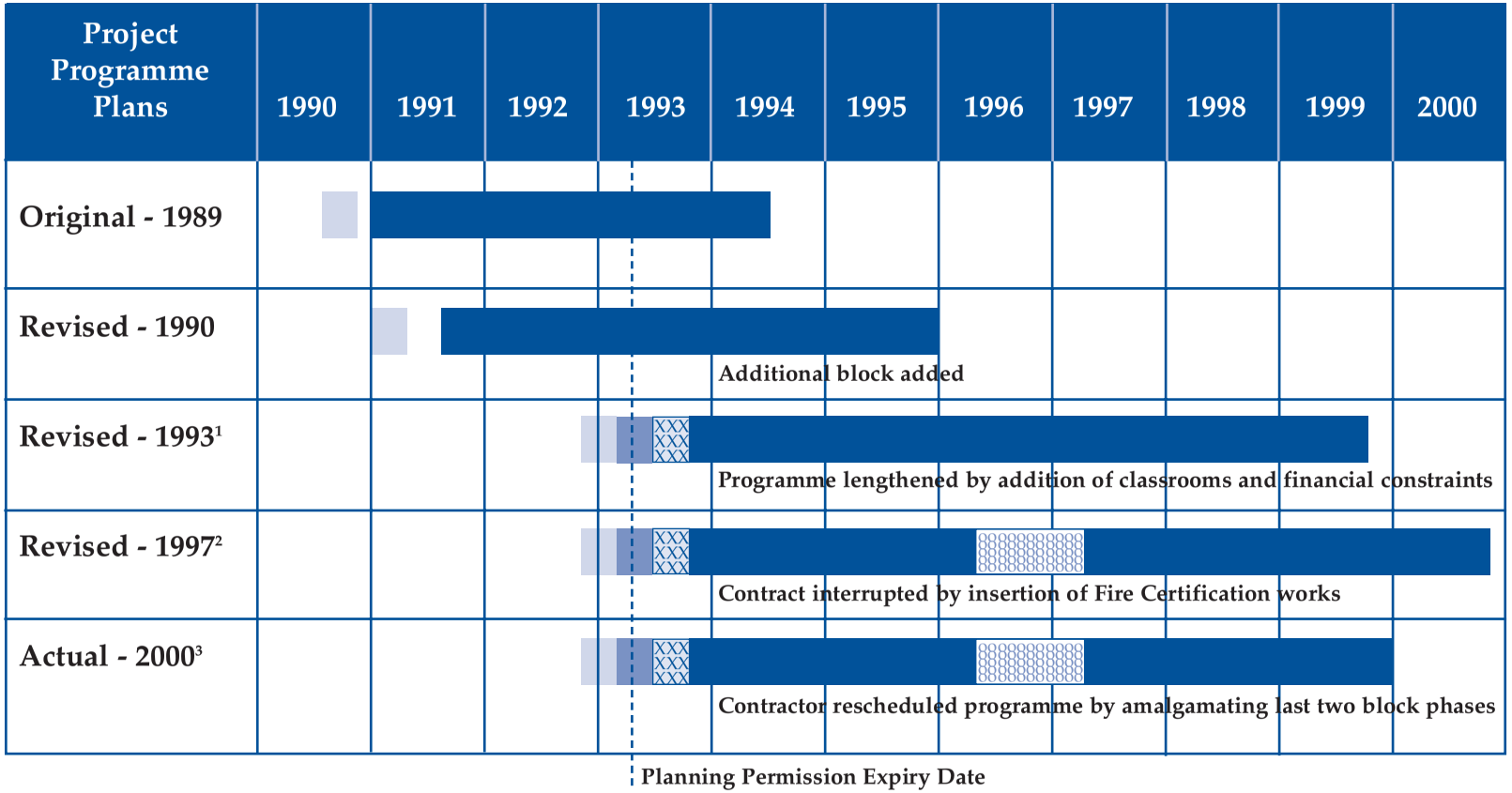
Total Costs of the Re-roofing Project, the Extension and Fire Certification Work

Project Phase	Cost Estimate £ million	Cost Outturn £ million	Fees £ million	Total £ million
Re-roofing:				
Condition Survey of Roofs	**-**	**-**	**0.02**	**0.02**
Decant Accommodation:				
Temporary Building for Aquatics Science Division staff	0.08	0.09	0.03	0.12
Temporary Decant Building and site works	0.04	0.62	0.06	0.68
Total Decant Accommodation	**0.12**	**0.71**	**0.09**	**0.80**[1]
Main Contract	**6.05**	**9.03**[2]	**0.98**	**10.01**
Total Re-roofing Project	**6.17**	**9.74**	**1.09**	**10.83**
The Extension Project	**1.38**	**1.52**	**0.16**	**1.68**
Fire Certification	**2.35**	**2.54**	**0.33**	**2.87**
Overall Totals	**9.90**	**13.80**	**1.58**	**15.38**

[1] Excludes £0.19 million for classrooms, which was included on the main re-roofing contract.

[2] Cost outturn to date. Approximately £90,000 was still due at 1st January 2002.

Project Plan and Implementation Timetable



[1] Programme lengthened to 5 ½ years to include provision of classrooms at front end of contract and to meet financial constraints

[2] Contract interrrupted for one year to undertake Fire Certification work.

[3] Actual implementation timetable: Contractor rescheduled works by amalgamating last two re-roofing phases.

APPENDIX 2
(Paragraph 29)

List of NIAO Reports

Title	NIA No.	Date Published
2001		
National Agricultural Support: Fraud	NIA 29/00	9 January 2001
A Review of Pathology Laboratories in NI	NIA 31/00	8 February 2001
Road Openings by Utilities	NIA 35/00	22 February 2001
Water Service: Leakage Management and Water Efficiency	NIA 49/00	5 April 2001
The Management of Social Security Debt Collection	NIA 71/00	28 June 2001
Belfast Action Teams: Investigations into Suspected Fraud within the Former Suffolk Action Team	NIA 72/00	2 July 2001
Building Maintenance in the Education and Library Boards		
Brucellosis Outbreak at the Agricultural Research Institute	NIA 02/01	27 September 2001
2002		
Northern Ireland Tourist Board Accounts 2000/01		
Travelling People: Monagh Wood Scheme	NIA 45/01	26 February 2002
Indicators of Educational Performance and Provision	NIA 48/01	21 February 2002
NIHE: Housing the Homeless	NIA 55/01	21 March 2002
Repayment of Community Regeneration Loans	NIA 59/01	28 March 2002
Investing in Partnership: Government Grants to Voluntary and Community Bodies	NIA 78/01	16 May 2002
Northern Ireland Tourist Board: Grant to the Malone Lodge Hotel	NIA 83/01	20 May 2002
LEDU: The Export Start Scheme	NIA 105/01	2 July 2002
Compensation for Clinical Negligence	NIA 112/02	5 July 2002

Published by The Stationery Office Limited
and available from:

The Stationery Office
(Mail, telephone and fax orders only)
PO Box 29, Norwich NR3 1GN
General enquiries 0870 600 5522
Order through the Parliamentary Hotline *Lo-Call* 0845 7 023474
Fax orders 0870 600 5533
Email book.orders@theso.co.uk
Internet http://www.ukstate.com

The Stationery Office Bookshops
123 Kingsway, London WC2B 6PQ
020 7242 6393 Fax 020 7242 6394
68-69 Bull Street, Birmingham B4 6AD
0121 236 9696 Fax 0121 236 9699
33 Wine Street, Bristol BS1 2BQ
0117 9264306 Fax 0117 9294515
9-21 Princess Street, Manchester M60 8AS
0161 834 7201 Fax 0161 833 0634
16 Arthur Street, Belfast BT1 4GD
028 9023 8451 Fax 028 9023 5401
The Stationery Office Oriel Bookshop
18-19 High Street, Cardiff CF1 2BX
029 2039 5548 Fax 029 2038 4347
71 Lothian Road, Edinburgh EH3 9AZ
0870 606 5566 Fax 0870 606 5588

The Parliamentary Bookshop
12 Bridge Street, Parliament Square
London SW1A 2JX
Telephone orders 020 7219 3890
General enquiries 020 7219 3890
Fax orders 020 7219 3866

Accredited Agents
(See Yellow Pages)

and through good booksellers

£9.50

TSO

www.tso.co.uk

ISBN 0-339-40118-4

9 780339 401181