

New Clinical Oncology Centre and Endoscopy Department Refurbishment



CASE STUDY



Achieving Excellence in
NHS Construction

LAING O'ROURKE

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New Clinical Oncology Centre and
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1.0 Introduction

This case study describes the procurement design and construction of two projects at Southend Hospital in Essex. The first, an extension to an existing radiotherapy department comprising two linear accelerator bunkers and associated outpatients facilities; and the second a scheme which involved the remodelling of an existing Medical Records department into an Endoscopy Suite. The collective value of both schemes was £6.2m (Oncology £4.75m; Endoscopy £1.44m). Both projects were carried out concurrently under the NHS ProCure21 framework on behalf of Southend University Hospital NHS Foundation Trust, and were completed within budget and on programme. The new Clinical Oncology Centre was officially opened on 11 October 2006.

2.0 Scheme Description

2.1 Linear Accelerators (LINAC)

The scheme comprises a two storey extension to an existing Radiotherapy Department with two new linear accelerator bunkers on the ground floor and associated outpatients facilities on the first floor. The facility is accessed via a new link corridor which connects to the existing hospital. Prior to works commencing, a demolition and enabling works project was undertaken (as ProCure21 phase 3 works) to relocate the existing EEG facility (Electroencephalography) and thus enable the LINAC project to commence. The EEG facility was relocated into a new two storey modular building of 250m².

The Radiotherapy facility comprises:

- Two linear accelerator bunkers
- Control rooms
- Main reception and waiting area
- Nurse station
- Consulting/examination rooms
- Changing facilities
- WCs
- Staff room
- Lift
- Plantrooms
- 40 car parking spaces



The new Linear accelerator building

The building has a gross internal floor area of 1017m² made up of:

- Ground floor - 635m²
- First floor - 382m²

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The building comprises:

- 130 CFA (continuous flight augured) piles
- Suspended insitu concrete ground beams
- Suspended insitu concrete ground slab incorporating a gas membrane
- Insitu concrete bunker construction with post tensioned slab to the first floor
- Structural steel frame above the first floor
- Insulated render, curtain walling and brickwork cladding externally
- Standing seam roof
- Metsec external wall lining system
- Drywall partitions internally
- Mechanical & Electrical installations

2.2 Endoscopy Suite

Remodelling of an existing mezzanine level Medical Records department into a fully functioning Endoscopy Suite. Due to occupied floors above, below and adjacent, construction access was gained through the existing elevation.

The floor area is 604m².

The Endoscopy facility comprises the following:

- Full strip out
- Full new services installation fed from existing
- Replacement of all existing windows
- An eight bed ward
- Three endoscopy treatment rooms
- Reception
- Waiting area
- Stage 1 and stage 2 recovery areas
- Examination/consulting rooms
- Endoscope cleaning rooms



The new Endoscopy Suite (remodelled from the existing Medical Records Department)

A very restricted overall floor to ceiling height of 2.4m (floor to slab), with a 2.2m suspended ceiling height left only 200mm for the ceiling and service zone.

3.0 Background to the Scheme and Client Objectives

3.1 Linear Accelerators

“Waiting for treatment of any kind is worrying and it is often painful and debilitating. Waiting for diagnosis and treatment for cancer is also potentially life threatening.

The drive to end waiting is central to the Cancer Plan.”
(NHS Cancer Plan, September 2000)

In the Cancer Plan of 2000 the Department of Health, via a number of intermediate targets, committed to reduce waiting times for cancer patients such that by December 2005 no patient would wait longer than two months from urgent GP referral to first treatment or no longer than one month from diagnosis to first treatment.

Southend Hospital’s two existing linear accelerators would not be able to deliver this commitment. In addition the age of the existing linear accelerators meant that they were also not able to provide 21st century cancer treatment. The two new linear accelerators provide state of the art cancer treatment and, with the existing facilities will achieve the Department of Health’s cancer waiting objectives as set out in the Cancer Plan.



One of the new linear accelerators

3.2 Endoscopy Suite

With the recent expansion in endoscopy services, the existing Endoscopy Suite at Southend Hospital had become inadequate for current requirements; it occupied inappropriate and rather cramped space. It was therefore proposed to provide a new modern and expanded facility in the vacated Medical Records department on the mezzanine floor of the existing block.

3.3 Client Objectives

The Trust was keen to adopt the ProCure21 procurement route as it was being promoted throughout the NHS as an initiative that could deliver better value than the more traditional and adversarial NHS procurement routes. The Trust followed the standard ProCure21 selection process, following which, Laing O'Rourke was appointed by the Trust on 5 February 2004 under a ProCure21 Phase 3 contract.

In order to maintain the Trust's desired programme, the following enabling works were undertaken under the Phase 3 contract:

- Modular EEG (Electro-encephalography) building and demolition of existing unit
- Piling
- Foundations

The piling and foundations were undertaken before planning permission was granted. The Trust felt that to achieve the desired programme this was a risk worth taking, albeit a relatively low risk, as discussions regarding the scheme had already taken place with the planning authority.

4.0 Affordability and Value Engineering

Upon appointment, a thorough review of the Trust's budgets for both schemes was undertaken. Due to a delay in proceeding with the schemes following business case approval the MIPS level was found to be inadequate. In addition, the drawn area of the LINAC facility was substantially greater than that contained within the Trust's approved Business Case. In the intervening period, successive redrafting of the LINAC drawings had increased the area without a corresponding increase in the budget – the business case allowance was 1,000m², whereas the drawn area was now well in excess of this. A major value engineering exercise commenced to ensure that the project could be delivered within budget without compromising the clinical functionality or the quality of the building. The LINAC building was reduced in area without any reduction in the clinical efficiency of the facility.

To ensure no further delay, the clinical design was developed at the same time as dealing with the affordability issues. This required very close co-operation and co-ordination to ensure that no abortive work was undertaken. Major areas where savings were made were:

4.1 Roof Parapet to LINAC Building

A substantial saving was achieved by changing from the originally proposed parapet roof detail to a traditional eaves detail. Unfortunately, the local planning authority would not deal with this under delegated powers which involved a second planning application.

4.2 Roofing to LINAC Building

The standing seam roofing design was developed with Ward Roofing's technical team which produced a saving over the originally proposed Kalzip system.



*Ward Roofing's
standing seam roof
with traditional eaves
detail*

4.3 Building Services Savings

A thorough review of the building services installation was undertaken to both the LINAC Building and the Endoscopy Suite. This produced savings of £107,000, as noted below.

LINAC Building Services	
Substitution of twin headed pumps to standby plant	£5.3K
Lighting scheme redesigned	£6.4K
Linac frame structure to be used for lightning protection	£0.8K
Omit 2 year warranty on plant	£22.7K
Alternative controls contractor	£16.4K
Alternative AHU supplier	£6.7K
Alternative lift contractor	£16.4K
Endoscopy Building Services	
Lighting scheme redesign	£6.4K
Omit 2 year warranty on plant	£15.1K
Alternative controls supplier	£10.8K
Total building services value engineering savings	£107.0K

5.0 Market Testing and Guaranteed Maximum Price Production

Laing O'Rourke commenced the production of the Guaranteed Maximum Price (GMP) from day one of the project working alongside the Cost Advisor. The GMP Production took the following route:

- Conversion of Client DCAGs into an Elemental Cost Plan.
- Review of scheme design to match the budget.
- Value Engineering regularly incorporated into Cost Plan revisions.
- Conversion of Cost Plan into works packages format to match the way that the construction works would be procured.
- Preparation of bills of quantities for a proportion of the packages (some packages prepared with specifications and drawings only).
- 90% Market Testing staggered as the design was progressed, with the Cost Plan updated weekly as results were received.
- Analysis of tender returns and results with both Laing O'Rourke, the Cost Advisor and the Client.
- Rationalisation of certain elements/packages when costs came back exceeding the budget including further Value Engineering.

Through extensive market testing and Value Engineering, Laing O'Rourke successfully achieved an affordable GMP that met the Client's budget, all within seven months from appointment.

After considering the options, and primarily due to the relatively small value of the M&E element, it was decided that better value would be achieved if the building services package were to be competitively tendered using smaller more local contractors rather than the larger PSCM building services contractors. Following a tendering process Essex Electrical were appointed for the M&E services installation.

6.0 Innovation/Best Practice

In order to achieve an affordable scheme which delivered the Trust's clinical requirements a number innovative solutions were developed. These comprised:

6.1 Demolition

The new linear accelerator building is located right in the heart of the existing hospital. An existing 200mm thick slab had to be removed to enable the Linac's to be constructed. To avoid the noise and vibration that mechanical breakers would have caused the concrete slab was diamond saw cut. These were then removed and broken up off site.



The saw cut existing concrete slab being removed

6.2 Muck Away

The pile arisings were separated from the general site strip/excavation to enable their disposal as inert waste.



Dedicated access route to the site

6.3 Site Access

A new vehicle barrier and road widening were provided to ensure safe access to the site by construction traffic.

6.4 Piling

A CFA (Continuous Flight Auger) piling system was used as this is a quiet and vibration free method of piling.



CFA piling rig

6.5 LINAC bunkers construction

The most economic solution for the bunkers construction was established to be insitu concrete with the primary shield walls being 2.4m thick and the secondary shield walls being 0.75m to 1.5m thick. The primary shield roof slab was 2.4m thick. Concrete was used for both the primary and secondary shielding. Limestone aggregate was employed resulting in reduced heat gain during hydration. Thermocouples were not therefore required. Bespoke reinforcement fabrication was used for the pits. Bunker walls were cast in a single pour to avoid construction joints (300m³ x 2 bunkers). The bunker roof slab was also cast in a single pour to avoid construction joints (200m³ x 2 bunkers).



LINAC walls ready for concrete pour



LINAC roof slab ready for concrete pour

6.6 Post tensioned concrete slab

The height of the new LINAC building was an issue for the local planners and by opting for a post-tensioned insitu flat concrete first floor slab this reduced the height of the building to accord with the planners requirements.

6.7 Metsec walling system

A Metsec walling system was selected for the external walls. This economic system provided an early watertight date thus enabling the internal trades to progress at the earliest opportunity.



Completed Linac walls and roof slab, with first floor steel frame in place

6.8 PSCP/Trust Communication

Whilst site works were in progress, weekly user group meetings were held at which all aspects of potential disruption were discussed and mechanisms for minimising the disruption were agreed. The importance of regular dialogue cannot be overemphasised. These meetings were paramount in the success of both schemes.

6.9 Linear Accelerators Installation

The Trust provided and installed the linear accelerators directly. Laing O'Rourke provided every assistance to ensure that the installation went smoothly, including making one of the bunkers available three months ahead of the completion date. The Trust then installed the linear accelerator whilst Laing O'Rourke completed the balance of the works.



The first linear accelerator being installed

6.10 Endoscopy - Ceiling Void

The existing building into which the new Endoscopy Department was to be installed had a very restricted ceiling height with only a 200mm service void above the new suspended ceiling. Intumescent painted ductwork was fixed directly to the soffit to reduce the service depth. Where ductwork was required to be insulated this was made up from Kingspan KoolDuct pre-insulated ductwork – which can be cut and fitted on site.



The Endoscopy Suite ceiling void

6.11 Endoscopy Suite - Noisy Work

It is impossible to undertake such a scheme without some degree of noise. Therefore, periods were agreed when noisy work could be carried out. These were primarily early morning, lunchtime and evenings, so that the adjacent departments (outpatients and pharmacy) would not be disturbed. The weekly user group meetings enabled the necessary flexibility (for Laing O'Rourke and the Trust) to be built into this arrangement.

6.12 Building Services Connection Schedule

A detailed building services connection schedule was prepared prior to site commencement for use during the construction stage. This was found to be an extremely valuable document by which to control services shutdowns and changeovers. It defined the following:

- Service
- Location
- Connection by
- Supply provided by
- Fed from
- Shut down required
- Approximate date
- Notice period
- Responsibility for commissioning
- Comments

6.13 Independent Access – Endoscopy Suite

Due to occupied floors above, below and adjacent, access was gained through the existing elevation. This comprised the removal, and subsequent reinstatement, of two precast concrete cladding panels. All plant and materials were loaded via a forklift. The panels were stored off site, and subsequently refixed.



*Construction access to the
Endoscopy Suite*

7.0 User Groups and Sign off

The design concept was developed closely with the Trust and reviewed fortnightly at user group meetings attended by:

- The Trust's Capital Project Manager
- Laing O'Rourke's Design Manager
- The Trust's Services Managers
- Departmental Consultant Heads of Oncology and Endoscopy
- Clinicians
- Senior Nurses
- The Architect

This varied attendance allowed the design to be reviewed from all angles with all views being taken into account. The design was signed off at both 1:200 and 1:50/Room Data Sheets within the parameters set in the pre-construction programme.

8.0 Risk Management

Laing O'Rourke, the Trust and the Trust Cost Advisor managed risk in the following manner:

- A whole project Risk Review was undertaken with all foreseeable risks identified.
- All risks were inputted into a risk matrix.
- The risk owner was identified and allocated the risk.
- Each risk was then assessed for probability of occurrence and a strategy for avoidance or mitigation was developed.
- A financial sum was then allocated to the risk if appropriate.

Traditionally, Clients prefer to pass as much risk to the Contractor as possible, but with the ProCure21 philosophy prevalent in all parties' thinking, it was decided that the risk would be owned by the party most suited to manage the risk.

The risk register worked well with the LINAC building being completed on budget, and the Endoscopy Suite being completed £160,000 under budget. The Trust reinvested their £80,000 gain share into new Endoscopy equipment.

... the Endoscopy Suite was completed £160,000 under budget

9.0 Benchmarking

9.1 AEDET (Achieving Excellence in Design Evaluation Toolkit)

Both schemes scored highly at both the design stage as well as the Post Project Evaluation (PPE) stage. In addition, it can be seen that the completed buildings achieved higher scores than those anticipated at the design stage - clearly indicating that the ProCure 21 process had exceeded the expectations of the users. Marks are out of 6.

AEDET - Endoscopy

		2004 (Design)	2006 (PPE)	Difference
1	Uses	5	5	0
2	Access	4	5	+1
3	Spaces	4	5	+1
4	Character/ Innovation	3	5	+2
5	Citizen Satisfaction	4	5	+1
6	Internal Environment	3	5	+2
7	Urban/Social Integration	N/A	N/A	N/A
8	Performance	4	5	+1
9	Engineering	4	5	+1
10	Construction	4	6	+2

AEDET - LINAC

		2004 (Design)	2006 (PPE)	Difference
1	Uses	4	5	+1
2	Access	3	4	+1
3	Spaces	4	5	+1
4	Character/ Innovation	4	5	+1
5	Citizen Satisfaction	4	5	+1
6	Internal Environment	3	5	+2
7	Urban/Social Integration	4	5	+1
8	Performance	4	4	0
9	Engineering	4	5	+1
10	Construction	4	5	+1

9.2 NEAT (NHS Environmental Toolkit)

The NEAT score for both schemes at the design stage was 'Good' (53% for the LINAC Building and 53% for the Endoscopy Suite). A Post Project Evaluation (PPE) for NEAT has yet to be completed.

9.3 Client Satisfaction

Client satisfaction scores were extremely high with 10 out of 10 being scored in some categories. The summary client satisfaction figures were (all out of 10):

	Client Satisfaction (Product)	Client Satisfaction (Service)
LINAC	8.25	9
Endoscopy	8	9

10.0 Health & Safety

Laing O'Rourke made Health and Safety their number one priority on the project with the Trust client equally committed to achieving an incident free project. Unfortunately there was one RIDDOR reportable accident across the two projects.

11.0 Future Schemes

The Trust have a number of potential future projects, and although none of these are firm at present it is hoped that Laing O'Rourke and the Trust will be able to continue their relationship under the ProCure21 banner as has been so successfully demonstrated by the Oncology and Endoscopy schemes at Southend Hospital.

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12.0 Client and Public Endorsement

“I would like to pass on the messages of congratulations I have received from various sections of the Facilities Team over the way last week’s big concrete pour was managed. The increased traffic movements to your compound had the potential to cause major disruption to the Hospital’s operation. Your cooperation with the Facilities Team and Car Park management team in particular is appreciated.”

Steve Pye - Project Manager, Southend University Hospital NHS Foundation Trust

This comment followed the substantial single concrete pour of the LINAC walls

“Restricted site conditions could have created far more difficulties but the whole has been managed well by the entire team, without impacting too much on the surrounding areas. Regular updates and close contact with the Hospital has helped to overcome any problems. A well presented site.”

George Humfrey – Considerate Constructors Scheme Monitor

Comment from the Considerate Constructors Scheme Monitor

The trust held a very well supported open day for Foundation Trust members on 1 October 2006, which Laing O’Rourke were very proud to be the primary sponsor of. Many local dignitaries were there including the Mayor as well Steve Davies, former world champion snooker player. The new Clinical Oncology Centre was one of the highlights of the various tours which were organised by the Trust.

The official opening of the new Clinical Oncology Centre took place on 11 October 2006



The Mayor and Mayoress with Steve Davies at the Hospital Open Day on 1 October 2006.



The official opening of the new Clinical Oncology Centre took place on 11 October 2006 by the Trust’s Chief Executive, David Brackenbury; seen here with the first patient through the new facility, Brian Gibson.

13.0 Financial Facts

13.1 Linear Accelerators Building

- Gross Internal Floor Area 1017m²
- Location Factor 108
- MIPS Level 453
- Cost per m² £4,677/m²

13.2 Endoscopy Suite

- Gross Internal Floor Area 604m²
- Location Factor 108
- MIPS Level 453
- Cost per m² £2,382/m²

14.0 Conclusions

The new Centre for Clinical Oncology and the Endoscopy refurbishment schemes under the ProCure21 process were a complete success in every respect with the main ingredient of success being collaboration working and an excellent working relationship between all parties involved.

Areas where better value was obtained were in the reduced preliminaries costs of running the two separate schemes concurrently.

A number of minor items of additional works were instructed in various locations around the hospital. Although not part of the original ProCure 21 project they could economically be undertaken by the LINAC/Endoscopy site team.

In summary, the following conclusions can be taken from the scheme:

- ProCure21 Process is a complete success
- Process allows collaborative working principles – one team
- Process allows PSCP to concentrate on product not profit, as profit is agreed from the start
- Improved client involvement in all aspects of the end product
- Process is faster with more cost control
- Process provides better value for money with cost certainty
- Risk is correctly placed and managed/controlled efficiently
- The ECC contract is set up to succeed
- Process requires continuous improvement through benchmarking
- There is an increased health and safety performance through the buy in of all parties

The following items are crucial to make a Procure21 project a success:

- Early agreement of design and frozen 1:200 and 1:50 layouts
- Detailed involvement in design of Clinicians and End Users
- Early involvement and appointment of the supply chain including key subcontractors
- Early market testing
- Key staff involved at an early stage – dedicated design, project and commercial manager during the GMP stage to ensure the process is driven.
- Agreement of GMP programme by all parties including designers, the Client and the PSCP.
- Sensible allocation of risk in order to avoid unnecessarily high risk pricing within the PSCP's price.

15.0 Project Details

15.1 New Clinical Oncology Centre

- Client: Southend University Hospital
NHS Foundation Trust
- Architect: Tangram
- Structural Engineer: WSP
- Building Services Consultant: WSP
- Cost Consultant (Trust): Holbrow Brookes
- Cost Consultant (LOR): Summers Inman
- Trust Project Director: David Walsh
- Trust Capital Programme Manager: Tom Dines
- Trust Project Manager: Peter Carson
- Construction Value: £4.757m
- Commencement: 14 February 2005
- Completion: 25 May 2006
- PSCP: Laing O'Rourke

15.2 Endoscopy Suite

- Client: Southend University Hospital
NHS Foundation Trust
- Architect: Tangram
- Structural Engineer: WSP
- Building Services Consultant: WSP
- Cost Consultant (Trust): Holbrow Brookes
- Cost Consultant (LOR): Summers Inman
- Trust Project Director: David Walsh
- Trust Capital Programme Manager: Tom Dines
- Trust Project Manager: Peter Carson
- Construction Value: £1.439m
- Commencement: 31 January 2005
- Completion: 19 September 2005
- PSCP: Laing O'Rourke