Manor Longbridge Primary School
How to use lessons learnt and true collaboration sucessfully

Manor Longbridge Primary School – How to Use Lessons Learnt and True Collaboration Successfully

A Joint Submission by Neilcott Construction Limited, The London Borough of Barking and Dagenham and Playle & Partners LLP

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Introduction

The basis of the case study which we put forward last year was our experiences as a team over the 4-year framework with the London Borough of Barking and Dagenham ("the Council") and specifically the successful use of the PPC2000 form of contract to deliver a new 3 form entry primary school at Cannington Road, Barking. The case study touched upon the fact that we were going to take forward lessons learnt on this project to further challenge preconceived ideas in relation to procurement time frames and the cost/quality balance, upon another project.

This paper sets out the challenges faced by the team and how the use of the PPC2000 Form of Contract which promotes early involvement and collaboration with the Constructor and their specialist supply chain was imperative to the success of this project. An example of the timescales involved can be noted from the fact that the planning application for the new school had to be submitted within one week of Neilcott's formal appointment.

Project Overview

The project involved the design and construction of a new school on the former University of East London site, which was known as Academy Central, consisting of around 1,000 new homes. The Planning Application which covered the development included a Section 106 Agreement allowing for the construction of a new 2 form entry primary school, which was subsequently increased to a 3 form entry primary school and nursery. The Section 106 Agreement allowed for the transfer of ownership of the School site to the council. The inclusion in the Section 106 Agreement for the provision of a new school is a result of more than 450,000 places in schools in England are need by 2015, government figures show – partly as a result of the baby boom in the past decade. The problem is more acute in London - in Barking, the number of primary age children is predicted to rise from 19,000 to more than 27,000 by 2015.

Over the last three years the council has created almost 8,000 new primary places due to rapidly changing demography alongside one of the fastest rising birth rates in the country.

Procurement/Award

The project was tendered on the Council's Framework using a two-stage design and build procurement route and the PPC2000 Form of Contract.

The Employer's Requirements which were of a non-prescriptive nature contained an accommodation schedule and masterplan showing the boundaries of the new school and proposed position but did not stipulate the plan or form of the proposed building. During the first stage tender period details of site constraints were provided following results of various surveys including the existence of a culvert running across the middle of the site of the proposed school which restricted the location of the school within the overall boundaries.

The first stage tenders were assessed on a 50% quality and 50% cost basis. The qualitative responses included:

- Site Plan
- Floor Plans
- Elevations and Sections
- Axonometric or Isometric Drawings
- Artists impression to demonstrate the external elevations, spaces/play areas for the school – any scale/minimum A3 Paper size
- Other drawings/diagrams/sketches tenderers consider relevant to demonstrate their proposals

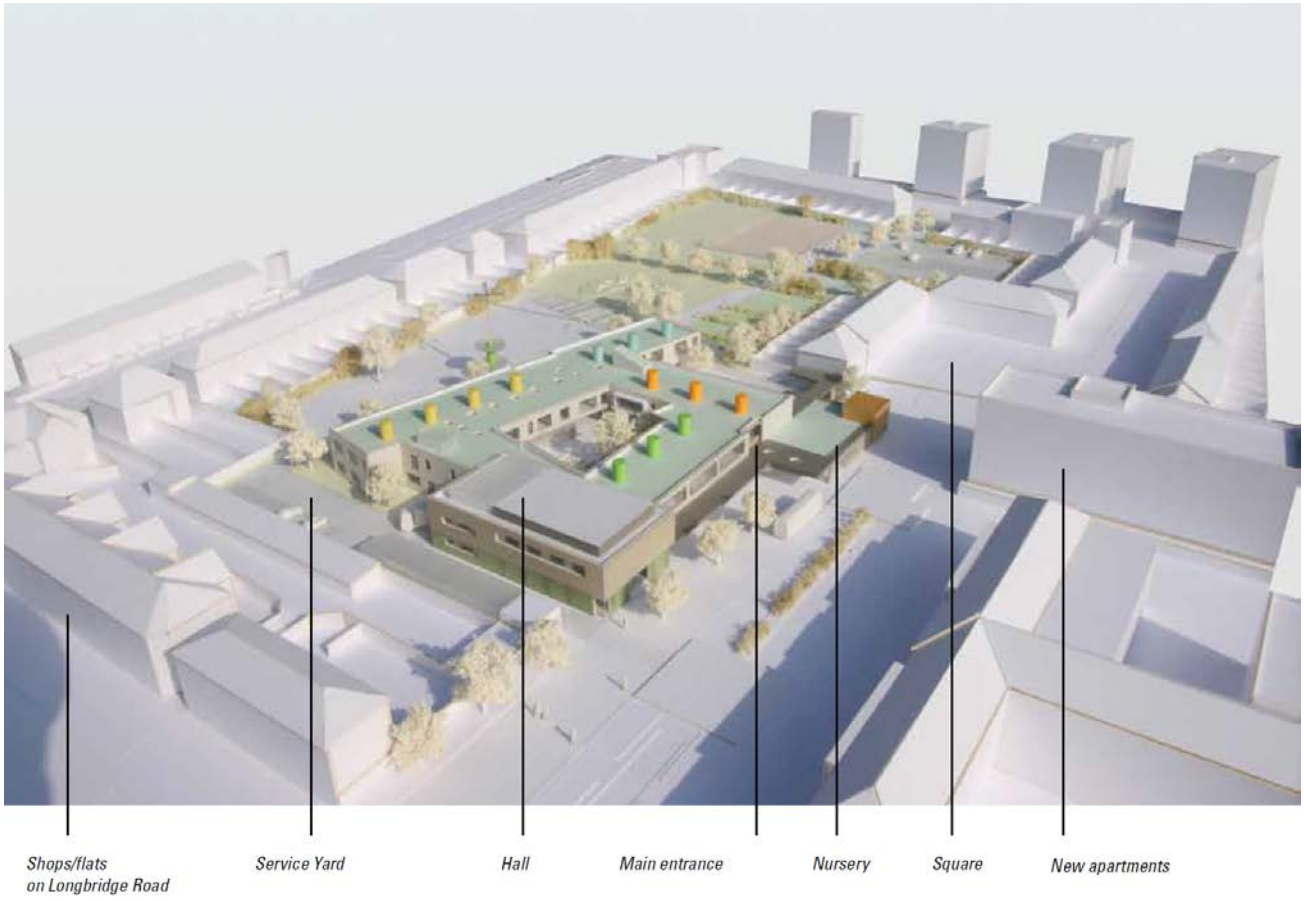
In addition a written submission was required covering the following points:

- Timetable
- Key Elements/Materials
- Comments on Employers Requirements
- 10 Design Quality Points
- BREEAM
- School Accommodation Schedule
- Partnering/Project Timetable
- Design/Site Management/Site Establishment
- Sectional Completion - how part of the project will be handed over to allow occupation in September 2011
- How will you work with the team to ensure project remains within budget

The tender appraisal of the qualitative responses included an audit of the design submissions, and the Financial Appraisals including a detailed analysis of the elemental cost plans submitted.

Formal interviews/presentations were then made by each of the tendering constructors to the Employer and their Consultants.

In order to provide a better understanding of the proposal a model of the school was made to better explain and expand upon the school layout and the proposed circulation and external spaces. *(See figure below)*



Design Philosophy/Best Practice

The new school provides:

- Educational facilities for early years and primary age pupils from the Academy Central site and from the surrounding areas.
- A large (260sqm) multi-purpose hall which will be used by the school during the day, and available to the community out of hours
- Other facilities which will be available to the community include sporting facilities and IT/Learning Resource (library) Unit
- Specialist facilities for children with behavioural and emotional issues and support services for parents.

The new school is organised over two levels, the building is planned compactly around the landscaped courtyard acting as a focal point for the design, connecting the school together into a coherent whole.

The “pin-wheel” plan arrangement provides a clearly legible layout to the school. The courtyard operates as a central reference point for navigation and functions as a social, community and performance space and clear lunchtime route with its link to the playground. The 2 staircases have designated colours for ease of reference.

Our approach to the design of the external spaces included space where children with different abilities can play and learn together, within the landscape areas are flexible spaces that are capable of evolving and with the potential for change.

Sustainability/BREEAM

The Manor Longbridge Primary School is an exemplary sustainability model, both in terms of construction and operation. The frame was from panelised cross laminated timber, the windows are highly energy efficient with low U-values and their outer frames are recycled PPC aluminium. *(PPC2000 Clause 4 Objectives and Targets 4.1(iii) innovation, improved efficiency, cost effectiveness, lean production and improved sustainability).*

The tender documentation required Neilcott to deliver a building with a “Very Good” rating; Neilcott delivered a rating of “Excellent” without compromise to the overall project budget. From the numerous design and build projects undertaken by the team collaboratively over the previous years, we were aware that BREEAM Excellent was an aspiration for the regeneration department which had rarely been realised. Through offering a commitment to achieving BREEAM Excellent, a trade off against energy savings enhancements over and above 2010 Building Regulations was realised which provided savings to the project significantly in excess of any costs involved, both capital and whole life costs.

The design focussed upon minimising energy consumption by using the following techniques:

- High performance – the building fabric in terms of U values, insulation levels and thermal bridging
- Low infiltration rates/air permeability – passive ventilation strategy wherever possible
- Variable speed fan controls – utilising high efficiency fans and demand control techniques where mechanical ventilation was necessary
- Weather compensated heating – flow temperature and local zone control
- Highly energy efficient lighting with day light thinking and presence detection
- Provision of power factor correction equipment

Main Challenges and Innovations Developed

A planning application for the scheme had to be submitted within one week of our appointment which included the following documents:

- Architectural Drawings
    - Floor layouts
    - Elevations
    - Landscaping detail
    - Site plan
- Design and Access Statement
- Noise Assessment
- Energy Implementation Plan
- Sustainability Statement
- Habitat Survey
- Flood risk assessment
- Green travel plan
- Transport statement
- Strategy for community use
- Aboricultural impact assessment

The only way that this application could be submitted within the time parameters was for Neilcott and our design consultants to work entirely at risk prior to appointment in order that the relevant surveys could be undertaken, design developed, costings prepared and pre-planning consultation and discussions held.

This was possible due to the previous collaborative working arrangements between all parties and the use of PPC2000 Form of Contract together with the trust, openness and honesty that existed. *(Clause 1.3 Roles and responsibilities "The partnering team shall work together and individually in the spirit of trust, fairness and mutual cooperation for the benefit of the project")*

Planning consent was granted on the evening of 28th February 2011 and work commenced on site on 1st March 2011, the AMP was agreed in April 2011 with section one of the building to be handed over 26th August 2011 with completion of section two 30th October 2011.

During design development five structural forms were considered:

- Traditional timber frame construction
- Panelised cross laminated timber
- SIPS
- Metsec
- Precast

The merits of each system were reviewed during design development as a team alongside all of our specialist designers and we concluded that the cross laminated timber option was the recommended structural form. *(See Appendix 1 for the appraisal undertaken).*

The benefits of the system can be summarised as:

- Speed and reliability
- Previous successful collaboration between all parties
- Previous successful use on LBBD projects
- Minimal risk of cost escalations during second stage
- Lightweight and highly engineered
- Strong sustainable credential – carbon neutral
- Flexibility in design
- Flexibility for future adaptations (including reconfiguration for alternative use e.g. secondary school)
- Minimal weather sensitivity

The cross laminated timber structure carries no on-going cost in use. *(Clause 4.1 (vi) commitment to people including staff and Users).* More importantly, of all modern methods of construction available it is the least costly to alter and adapt once constructed. Given the likelihood of changes in the way the curriculum is delivered during the expected life of the building this is a major benefit.

The overall timescales of this project appeared prima facie significantly more challenging than the previous project that we had just completed and Neilcott and our design team had to design some innovative solutions. In order to maximise the time available for internal fit out it was essential to waterproof the building as quickly as possible after completion of the CLT structure. This was achieved by applying a sacrificial waterproof membrane along the gutter area and sealing the longitudinal joints between roof panels. Suitable temporary drainage arrangements were necessary remote from permanent outlets. Services penetrations on the roof were drilled on site.

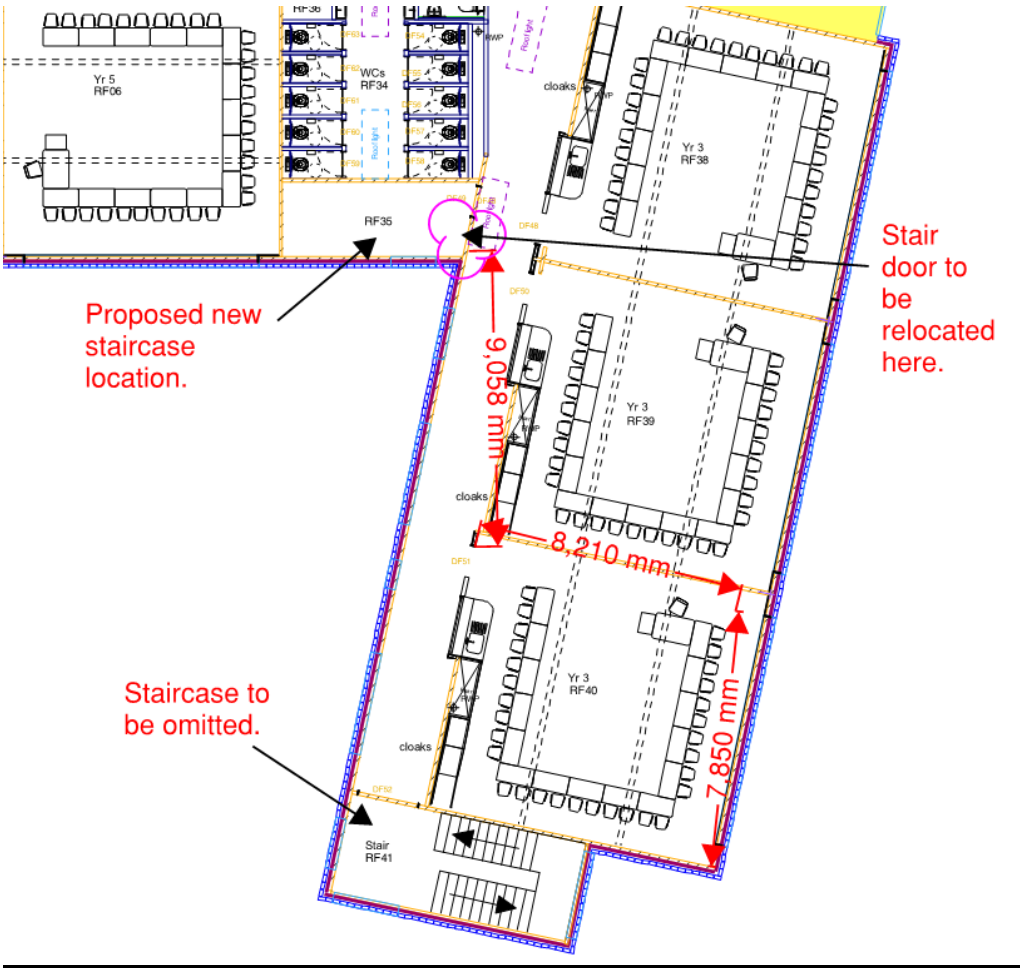
The window openings were sealed with heavy duty polythene and once the structure was complete windows and doors were installed utilising a cantilever bracketry system specially developed by Neilcott for this project. *(Pictured below)*

This approach allowed windows and selected doors (main points of access and egress were let until later so as to avoid damage) to be installed and sealed to the cross laminated timber structure with the EDPM membrane prior to the external cladding being erected. This removed the external cladding from the critical path thereby mitigating the risk associated with inclement weather and allowed the internal fit out to commence 11-weeks from start on site. *(This building is a substantial building two-storey with a GIFA of 4112m^2)*

In addition to this innovative solution which provided early weather tightness, early involvement of Hoare Lea as fire engineering consultants allowed consideration of the means of escape. *(Clause 10.8 Maximum specialist contributions – encourage their maximum contribution to and participation in an integrated design, supply and construction process).*

Working collaboratively with the Architect, other specialist consultants, building control and the fire officer Hoare Lea prepared an assessment taking into account all aspects of the project which allowed the removal of an additional staircase which in turn allowed the school to manage circulation around the building more efficiently. *(Diagram overleaf).*

This specialist also put a case forward to Building Control and the Fire Officer which allowed the acoustic panels in the school hall to remain untreated, reducing cost and allowing the architectural finish that all members of the team wanted. *(Clause 4 Objectives, innovation, improved efficiency, cost-effectiveness, lean production and improved Sustainability).* These two items alone provided savings of £44,000 to the overall project value.



Joint Risk Register

A joint risk register was developed early with all parties contributing (see Appendix 2) this allowed for a structured approach to the identification of risks and allowed for their impacts to be allowed for and that where possible the risks and their impacts minimised.

This risk register was developed collaboratively by all parties during the pre-constructions stages. *(Clause 2 Partnering Documents 2.6(xii) any Risk Register)*

Neilcott was allocated £502,500, the Council £185,000 with £132,000 shared 50/50 between both parties. Not only did we manage to apply control measures and an action plan to avoid spending any of the risk allocation the project was delivered under the AMP.

Value for Money

The overall cost of the building with preliminaries apportioned, excluding external works and design fees was £1725/m^2 – the previous project at Cannington Road was £1,747/m^2 – both of these costs include the provision of sprinklers with equated to circa £50/m^2. These costs are comparable with data published by the BCIS and below costs where traditional construction methods have been adopted - the cost saving per m^2 demonstrates measurable continuous improvement as required by Clause 4.1 and the value management approach adopted achieved a solution that met the client's needs whilst achieving best value.

By providing a design solution that achieved the sectional completion dates considerable savings were achieved by mitigating the requirement for temporary accommodation – provision of eight temporary classrooms together with toilet facilities and ancillary accommodation could have resulted in costs of over £500,000 which would not have been recovered.

Employment, Skills and Training

Despite the challenging programme and overcoming numerous constraints a commitment was made not only to utilise as much of the local supply chain as possible, but to engage as much of the required labour locally. The document controller engaged upon this project was from the local area and has continued with us and is now engaged upon a project at London South Bank University. The project also had two project initiated apprentices, in addition to our permanent apprentices working at various stages throughout the project. Numerous school and college events were also undertaken.

Conclusion

The use of the PPC2000 Contract on this project and the collaborative working ethos promoted, allowed the successful completion of the school in what on the face of it was an insurmountable challenge. Not only were the challenging timescales met, the cost/quality balance was in no way jeopardised as can be evidenced from the project being a finalist in the LABC Building Excellence Awards 2011 for best educational development. The overall project cost was contained within the Council's approved budget. Lessons learnt on the first project where implemented on this project to the benefit of all parties to the Contract.

The project met all of the *Objectives and Targets as detailed within Clause 4.1 and 4.2 of the PPC2000 Form of Contract a*s is evidenced from the information in this case study.


School

Appendix 1 – Review of Structural Form

Neither traditional timber nor metsec were considered suitable due to the difficult loading paths required in various areas of the building which would require significant steel structures to be introduction which would negate speed, impose significant design constraints and dramatically reduce flexibility. Perhaps more significantly neither system is considered sufficiently robust to meet the building's design life requirements without considerable maintenance. Whilst SIPS panels can overcome some of these concerns the need to place an order very early in the procurement process would lead to considerable financial exposure during the second stage.

It is considered therefore that only cross laminated timber and pre-cast are the only realistic options.

Pre-Cast

Whilst in theory pre-cast offers a possible solution this option has been discarded for the following reasons:

1. LBBD are not familiar with pre-cast concrete as an end product
2. Lead-in for the pre-cast concrete if longer than for cross laminated timber therefore a commitment to a supplier will be required much earlier in the process. This has several drawbacks, principally:
    a. Reduced time to finalise layouts with the stakeholders
    b. Exposure to increased costs as design modifications are called for later within the project
    c. High cost of late incorporation of BWIC for services which will put unacceptable programme pressure on the preparation of the M&E Design and may demand unacceptable early appointment of the M&E sub-contractors
    d. Reduced flexibility for future modifications without substantial additional cost
    e. Loss of sustainable credentials or additional costs to use recycled aggregates. Significantly increased number of vehicle movements due to weight restrictions

Cross Laminated Timber

Cross laminated timber addresses most if not all of the potential shortcomings of the pre-cast system.

(i) *Tried and trusted system*

Cross laminated timber structures are an increasingly common form of construction and their characteristics are well known by designers, planners and building control. Neilcott has particular experience of cross laminated timber structures having recently completed the Cannington Road School for LBBD together with the Lauriston Primary School (for L.B. Hackney) and Northbury Primary school also for LBBD both of which were multi-storey structures. For a project with both tight programme and cost constraints it is by far the least risk option.

(ii) *Successful collaboration*

Neilcott's principal designers, Greenhill Jenner Associates (architects), MLM (structural engineers) and Con Serv (M&E consultants) have all worked successfully with this form of construction previously. In addition the specialist timber engineering company engaged upon the above projects, KLH, have shown themselves to be equally committed to collaborative working and in particular have not sought to impose cost escalation post appointment.

(iii) *Highly Engineered*

The product is highly engineered with outstanding dimensional control which enables other components such as windows and screens to go into manufacture early knowing that the as constructed structure will be dimensionally reliable.

(iv) *Lightweight*

The relative lightweight of the structure reduces foundation loads which minimises costs generally and equally importantly allows more innovative foundation solutions to be adopted.

(v) *Flexible*

The product is structurally flexible. In this respect whilst late design changes are not allocated the system can tolerate a considerable amount of in situ modification. This does allow a degree of flexibility to accommodate change without punitive cost during construction. Equally it is well suited to future adaptations to accommodate the ever changing needs of the teaching and learning environment.

(vi) *Weather Sensitive*

The material is not sensitive to weather conditions during construction. Most importantly the erection process is not unduly weather sensitive, it being possible to erect structures during wet periods (provided that wind conditions do not preclude the use of cranes). Given the tight timescale involved and the likely erection period during April this is a substantial benefit.

(vii) *Environmental Credentials*

The product itself has strong environmental credentials.

In addition the number of vehicle movements required is significantly lower than traditional solutions. It is expected that the entire cross laminated structure will be delivered on just a few vehicles.

The erection process is also highly predictable with few if any unforeseen temporary conditions arising and as a consequence the management of health and safety during erection is greatly simplified.

viii) *Design*

The product imposes few constraints upon the designer, allowing interesting and variable spaces to be constructed ensuring that the end product does not have the appearance of a factory produced building.

The only significant benefit which precast may have over cross laminated timber is the possible avoidance of sprinklers. This is not wholly certain however. In particular connection details can require particular fire treatment and the greater prospect of potential progressive collapse introduces a new consideration for insurers. As a consequence it is considered that the benefits of the cross laminated timber structure options are such as to make it the preferred solution for the New School Primary project.

RISK REGISTER

Project: **NEW SCHOOL PRIMARY, FORMER UEL SITE**
Client: LONDON BOROUGH BARKING & DAGENHAM
Issue Date: 12 April 2011
Version: 5

Risk Category
HIGH
MEDIUM
LOW

RISK MATRIX

5	10	15	20	25
4	8	12	16	20
3	6	9	12	15
2	4	6	8	10
1	2	3	4	5

Risk Status	
A	Active
M	Managed
E/R	Eliminated / Reduced
I	Insured

Risk Nr.	Subject	Risk Description	Consequence	Probability	Impact	Risk Category & Score	Risk Status	Time Implications (*in weeks)	Risk Owner - Cost allocation 100% NCL	Risk Owner - Cost allocation 100% LBBD	Risk Owner 50/50% Cost allocation	Risk Manager	Action Plan/Control Measures	Date Action to be Completed	Comments
1.00	**General Employer Risks**														
1.01	**Project Creep**	The scope of the Project creeps as the design is developed	Cost and time	3	3	9	A			£25,000		DC/SB			
1.02		Inadequate or unclear brief	Cost and time	1	3	3	A			£10,000		DC/SB	Design Freeze to be set		
1.03		Delay in response or decision from Client	Cost and time	2	3	6	A			£5,000		DC/SB			
1.04		Client instruction resulting in design change	Cost and time	2	3	6	A					DC/SB	Design Freeze to be set		
1.05		Client comment resulting in design change	Cost and time	1	2	2	A					DC/SB	Design Freeze to be set		
1.06		Cummulative affect of minor employer comments and or instructions	Cost and time	1	3	3	A					DC/SB	Design Freeze to be set		
1.07		Inablity of client to instruct due to awaiting authority	Cost and time	2	4	8	A			£25,000		DC/SB	Agree AMP and obtain DA		
1.08		Availability of funds	Cost	1	5	5	A					DC/SB	Agree AMP and obtain DA		
1.09		Inablity to agree/sign the Contract	Cost and time	1	2	2	A/M				£10,000	NCL/LBBD	Target agreement of AMP by	30/04/2011	
1.10		Inability to authorise Pre Commencement Agreements as required.	Cost and time	2	5	10	A			£10,000		DC/SB	Agree AMP and obtain DA		

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2.00	**PLANNING/BUILDING REGS**														
2.01	**Planning Approval**	Delay in achieving stakeholder design freeze to layouts and elevations on time.	Time	5	3	15	A			£20,000		DC/SB	Design Freeze to be set		
2.02		Delay in concluding supplementary documentation for planning application on time.	Time	2	3	6	E/R					NCL			
2.03		Delay in obtaining planning consent delays project commencement / completion	Time	2	5	10	M				£20,000	NCL/LBBD	site works commenced 2 weeks late, cost to be confimed by NCL		
2.04		Onerous planning conditions imposed	Cost and time	3	4	12	A/M			£5,000		LBBD	JR of NCL working through process of discharging condions	01/05/2011	
2.05		Inability to discharge Planning Consent dated 28/2/11 Planing Conditions	Cost and time	2	4	8	A/M					LBBD	JR of NCL working through process of discharging condions	01/05/2011	
2.06		Requirement for formal discharge of pre commencement conditions prior to commencing construction on site in the planning permissions and Section 106 Agreement	Time	2	5	10	A/M					LBBD	JR of NCL providing partial submisison of above ground conditions	25/03/2011	
2.07		Unexpected consequences derived from 2010 Building Regulations.	Cost	2	4	8	A/M		£10,000			NCL	JR revewing latest B Reg requirements	30/04/2011	
2.08		Imposition of energy targets greater than 2010 Building Regulations	Cost	3	3	9	A			£5,000		DC			
2.09		Inability of CHP provision not meeting renewables requirements	Cost and time	3	4	12	A					DC			
2.10		Imposition of sprinklers					E/R					DC	Sprinklers included in scheme and cost plan	28/03/2011	LBBD to decide if sprinklers reqd to reception/nursery canopy area
2.11		Insistance by Planning for a Green roof					E					DC	not a Planning condition requirement		

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3.00	**DESIGN**														
3.01	**Design Risks**	Unclear design team responsibilities					E/R					NCL	all designers signed up to clear design responsibilities		
3.02		Unrealistic design programme	Cost and time	3	3	9	A/M		£5,000			NCL	weekly design team meetings plus workshops and detailed IRS linked to procuremnt	strategies in place	
3.03		Ineffective quality control procedures	Cost and time	2	3	6	A/M		£10,000			NCL	selection of tested sc's and hign number of site supervion	strategies in place	
3.04		Inadequate Site Investigation	Cost and time	2	3	6	A/M		£20,000			NCL	subject to LBBD assigning reports to NCL	o/s	awaited from LBBD
3.05		Planning Constraints/requirements	Cost and time	1	4	4	R					LBBD	Consent obtained and conditions known and being factored into design	14/04/2011	
3.06		Soundness of design data	Cost and time	2	3	6	A		£5,000			NCL			
3.07		Appropriateness of design (constructionability)	Cost and time	2	3	6	A/M		£10,000			NCL	Design revewed by construction team prior to finalsation	strategy in place	
3.08		Degree of novelty					E/R					NCL/LBBD	novelty assesed and removed		
3.09		Ineffective design coordination	Cost and time	2	3	6	A/M		£10,000			NCL	weekly design team meetings and design cord workshops	strategy in place	
3.10		Non compliance with Area Schedule	Cost and time	1	4	4	A/M		£5,000			NCL	LBBC to sign off amended area schedule	28/03/2011	
3.11		Reliability of estimating data					E						no reliance on original estimating data		
3.12		Use of Provisional Sums					E						no proviosnal sums used		

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4.00	**SITE CONDITIONS/ISSUES**														
4.01	**Contamination**	Ground Remediation Required	Cost	1	3	3	R		£20,000			NCL	additional soil testing completed		
4.02	**Existing Buried Services**	Finding unidentfied Buried Services	Cost and time	1	5	5	R				£25,000	NCL/LBBD	site CAT scanned and foundation works complete		
4.03	**Site Boundaries**	Identification of ownership	Cost and time	2	3	6	A/R			£5,000		LBBD	set out drg confirmed by LBBD to NCL		land trespass by Taylor Wimpey to be resolved by LBBD
4.04	**Ecological Issues**	Identification of reptiles , etc	Cost and time	1	2	2	R					NCL/LBBD	no additional ecological issues found post starting on site		
4.05	**UXB Survey**	Unexploded bomb located	Cost and time	1	5	5	A/R				£5,000	NCL/LBBD	site toolbox talk to be carried out by specialist prior to ext works	14/04/2011	
4.06	**Imposition of further logistical constraints by Taylor Wimpey/Western Homes**	Logistical restraints imposted by Taylor Wimpey create unforseen difficulties	Cost	1	3	3	M		£5,000			NCL	altrenative site access loaction agreed with TW	comp	
4.07	**Impact of existing swimming pool base**	Interference with substructures	Cost				E		£10,000			NCL	pile probing caried out , costs TBC	comp	
4.08	**Impact of existing culvert**	Interference with substructures or onerous conditions imposed relating to the culvert	Cost	1	3	3	R		£5,000			NCL	additional site surveying of culvert completed and taking into account in design		
4.10	**Site related issues**	Archaeological remains	time	1	3	3	A/R				£2,000	NCL/LBBD	archelogical investigation signed off by Planning		
4.11		Underground obstructions	Time and cost	2	3	6	A/M		£5,000			NCL	probing to bldg foorprint complete, but external works drainage may encounter obs	01/05/2011	
4.13		Adjacent Structures	Time and cost	1	2	2	R		£5,000			NCL	vibro completed		
4.14		Geotechnical problems	Time and cost	2	3	6	A/M		£5,000			NCL	further CBR testing to be carried out	14/04/2011	
4.15		Ground water	Time and cost	1	3	3	A/M		£5,000			NCL	additional site hardstadnings to keep site cleaner	14/04/2011	

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Risk Nr.	Subject	Risk Description	Consequence	Probability	Impact	Risk Category & Score	Risk Status	Time Implications (*in weeks)	Risk Owner - Cost allocation 100% NCL	Risk Owner - Cost allocation 100% LBBD	Risk Owner 50/50% Cost allocation	Risk Manager	Action Plan/Control Measures	Date Action to be Completed	Comments
4.16		Asbestos and other hazardous materials	Time and cost	1	2	2	M/R		£10,000			NCL	additional si testing carried out	comp	
4.17		Invasive plant growth	Time and cost	1	2	2	A/M		£2,000			NCL	site inspection carried out and ongoing awareness	1/15/11	
4.18		Tree preservation orders	Time and cost	3	1	3	M/R		£500			NCL	no onerous additional protection measures reqd by Planning conditons		
4.20		Environmental impact	Time and cost	2	2	4	A/R		£5,000			NCL	no onerous additional measures reqd by Planning conditons		
4.21		Physical access to site	Time and cost	1	3	3	A/M/R		£5,000			NCL	alternaitive site access loaction agreed with TW, cost of new access TBC	stratergy in place	
4.22		Existing occupancies/users	Time and cost	2	3	6	A/M/R					NCL	news letter isued and open day planned for 28/3/11	stratergy in place	
4.23		Restricted working hours/routines	Time and cost	2	4	8	A		£20,000			NCL	extent of our of hours working to be reveiwed	01/05/2011	
4.24		Maintaining access	Time and cost	1	3	3	A/M/R					NCL	alternaitive site access loaction agreed with TW, cost of new access TBC	stratergy in place	
4.25		Maintaining existing services	Time and cost	1	3	3	A/M/R		£1,000			NCL	site CAT scanned, and extg services located and marked	stratergy in place	
4.28		Location of existing services	Time and cost	1	3	3	A/M/R		£4,000			NCL	site CAT scanned, and extg services located and marked	stratergy in place	
4.29		Relocation of existing services	Time and cost	1	4	4	A/M/R					NCL/LBBD	site CAT scanned, and extg services located and marked	stratergy in place	
4.30		Cost of additional works to Academy Way access strip	Time and cost	5	4	20	A					LBBD/P&P	cost plan to be adjusted to incorporate	30//3/11	Cost included in AMP
5.00	**SITE SERVICES**														
5.01	**Provision of New Services**	Failure to deliver CHP mains supplies on time.	Time	4	5	20	A			£5,000		LBBD	Provision of gas		
5.02		Late delivery of spec and location for any site pipework to be installed across site by NCL for CHP heat supply	Cost and time	3	5	15	A				£10,000	NCL/LBBD	NCL to define latest date and advise TW	30/03/2011	
5.03	**Statutory Undertakers**	Inadequate supplies provided from CHP system	Cost	4	4	16	A			£5,000		LBBD			TW section 106 Agrteement

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RISK MATRIX

5	10	15	20	25
4	8	12	16	20
3	6	9	12	15
2	4	6	8	10
1	2	3	4	5

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5.04		Insufficent capacity on network	Cost and time	4	5	20	A					LBBD			TW section 106 Agrteement
5.05		No power for Client upon partial possession and inability to prove systems	Cost and time	3	4	12	A/M/R			£10,000		LBBD	confirmation of installation date from TW awaited		further detail of action plan reqd
5.06		No water for Client upon partial possession and inability to prove systems	Cost and time	3	5	15	A/M			£5,000		LBBD	confirmation of water order recd form TW, installation date TBC from TW	30/03/2011	further detail of action plan reqd
5.07		No gas for Client upon partial possession and inability to prove systems	Cost and time	3	5	15	A/M		£5,000			NCL	NCl chasing Gas provider for quotation	30/03/2011	further detail of action plan reqd

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6.00	**CONSTRUCTION ISSUES**														
6.01	**On Site Delays**	Delay to overall programme	Time	2	5	10	A/M		£40,000			NCL	details of action plan to minmisepotential dalys to be published		extent of critical areas for handover redq for September term to be determined and agreed
6.02	**Sub Constructors Failure**	Failure due to market conditions	Time and cost	1	3	3	A/M		£40,000			NCL	carefull selection of tried & tested sc's	statergy in place	
6.03	**Other construction risks**	Uncertainty over the source and availability of materials	Time and cost	2	4	8	A/M		£5,000			NCL	selection of available materails and close supervioson of off site ongoing availbility	statergy in place	
6.04		Appropriateness of specifications	Time and cost	2	4	8	A/M					NCL	carefull reveiw of the specfied materials by the design team	statergy in place	
6.05		Incomplete design	Time and cost	2	4	8	A/M		£10,000			NCL	IRS produced and regular review of acheivement at weekly DTM's	statergy in place	
6.06		Weather and seasonal implications	Time and cost	3	4	12	A/M				£40,000	NCL/LBBD	factoring in to site programme temporary weathering	statergy in place	
6.07		Industrial relations	Time and cost	1	3	3	A/M					NCL	use of sc's with good industrial relations history	statergy in place	
6.09		Competence of contractor and sub contractors	Time and cost	2	4	8	A/M		Nil			NCL	carefull selection of tried & tested sc's	statergy in place	
6.10		Health & Safety	Time and cost	2	4	8	A/M		£5,000			NCL	carefull selection of tried & tested sc's	statergy in place	
6.11		Ineffective quality management procedures	Time and cost	2	4	8	A/M		£10,000			NCL	carefull selection of tried & tested sc's and high level of NCl site supervisison	statergy in place	
6.12		Phasing requirements	Time and cost	2	4	8	A/M		£5,000			NCL	details of action plan to minmisepotential dalys to be published		extent of critical areas for handover redq for September term to be determined and agreed
6.13		Ineffective handover procedures	Time and cost	2	4	8	A				£10,000	NCL/LBBD	action plan to be agreed with LBBD QI's re inspection process	28/04/2011	
6.14		Disputes and claims	Time and cost	1	4	4	A/M				£5,000	NCL/LBBD	regular meetings to review and resolve issues as they occur with expedent involvement from core group if nec	14/04/2011	
6.15		Effect of changes/variations on construction programme	Time and cost	3	4	12	A				£5,000	NCL/LBBD			
6.16		Cumulative effect of numerous changes/variations on construction programme	Time and cost	3	5	15	A			£20,000		LBBD	LBBD to avoid any changes		
6.17		Defects	Time and cost	3	4	12	A		£10,000			NCL	use of qualaity sc's and LBBD and NCl joint snagging process to be agreed to minimise defects		proceess TBC
6.18		Failure to achieve BREEAM	Time and cost	2	5	10	A/M			£20,000		LBBD	ongoing BREEAM review and chaisng of input reqd		LBBD info o/s

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6.19		Accidents/Injury	Time and cost	1	5	5	A/R/M		£5,000			NCL	use of quality safe sc's and use of NCL safety procedures and inspections		
6.20		Insistence on use of local work people	Time and cost	2	4	8	A					NCL/LBBD			
6.21		Requirement to work overtime to achieve completion	Time and cost	4	4	16	A		£30,000			NCL	action plan reqd TBC		
7.00	**COST PLANNING**														
7.01	**Incompatability of stakeholder aspirations with budget**		Cost	2	5	10	A					NCL/LBBD	scope confirmed	comp	
7.02	**Measurement Errors (BofQ)**		Cost	2	5	10	A/M		£30,000			NCL	double check of take offs		
7.03	**Failure to Realise Target Buying**	Labour and Materials increases	Cost	2	5	10	A/M		£25,000			NCL	use of competative sc'c		
7.04	**Unforseen Design Development**		Cost	2	5	10	A/M		£100,000			NCL	to be monitored and costed during designn developement process		
7.05	**Imposition of late changes during completion phase**		Time and cost	3	5	15	A			£10,000		LBBD	LBBD not to request any changes		
								Subtotal	£502,500	£185,000	£132,000				
								Shared Risk	£66,000	£66,000	50/50				
								Totals	**£568,500**	**£251,000**					