Interim Report to Communities and Local Government Building Regulations Division Under the Building Operational Performance Framework

AIRTIGHTNESS OF BUILDINGS — TOWARDS HIGHER PERFORMANCE

Interim Report D2 — Developers, Sites and Protocols

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Reference Number: CI 61/6/16 (BD2429)

Milestone number: L2 D2

Interim Report D2: Developers, Sites and Protocols

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Date: February 2004	Date:	Date:

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Executive Summary

1 This report reviews the progress that has been made on identifying participating developers, suitable developments and house types and establishing the design assessment and site survey protocols.

2 Five developers from the commercial and social housing sectors have agreed to participate in the project in principal. However, identification of sites and dwelling types is proving problematic, as a number of available sites are not Part L1 2002 compliant or do not fit in with the project programme. In addition, incorporating certain dwelling types, such as apartments, into the project may prove difficult due to site programming constraints.

3 Potential sites have been identified for two of the developers and their programmes are being studied to identify specific dwelling types. For the other three developers, a number of sites have been identified and these are currently being investigated to determine their suitability. Identification of all of the sites and dwelling types will be completed by March 2004.

4 A design assessment and a site survey protocol have been devised in order to assess the design and construction phases of each dwelling type. These protocols are based upon a checklisting approach, with the data being stored in a Microsoft Access based project database. This database will incorporate graphic as well as alpha numeric data, and all of the project information will be inter-linked, creating a valuable and searchable resource bank.

5 A site access protocol has also been produced. This protocol will be common to both the C1 and L2 projects and will form part of a site and data access agreement for each site.

Introduction

6 This report is milestone D2: Developers, sites and protocols of the ODPM Project reference CI 61/6/16 (BD2429) *Airtightness of Buildings — Towards Higher Performance'*.

7 The aim of this report is to identify participating developers, suitable developments and house types and establish the design assessment and site survey protocols (tasks 2.1 and 2.2 of the project proposal).

Identification of Participating Developers, Suitable Developments and House Types

8 Five developers from the commercial and social housing sector have agreed to participate in the project in principal. Of the five, three of the developers are large volume house builders, one is an SME which is currently building some social housing and the remaining developer is part of a large privately owned property development company (see Table 1). All five developers were selected based upon their ability to participate in the project, and their involvement in developments in Yorkshire and/or Lancashire.

Developer	**Type of company**
Developer A	Large volume house builder.
Developer B	Large volume house builder.
Developer C	Large volume house builder.
Developer D	SME
Developer E	Housing arm of a large privately owned property development company.

Table 1 Participating developers.

9 In order to select suitable sites (one per developer) and house types (five per site), a set of site selection criteria were devised. These criteria are set out in Table 2 and are based upon the need for the selected dwellings to be as representative of new build as possible.

Criteria	**Commentary**
Sites must be Part L1 2002 compliant.	
Sites should reflect the principal forms of construction in England and Wales.	The intention is to select sites that are of masonry cavity and timber frame construction. However, finding suitable timber frame sites may prove difficult and will be dependent upon the participating developers.
Sites should have a sufficient number of dwellings available at an appropriate stage of construction.	First five dwellings from each site should be due for completion in May/June 2004. Second five dwellings should be due for completion in May/June 2005.
Dwelling types should reflect the main housing forms that are currently being constructed in England and Wales.	Sites will be selected to give coverage of the following built forms: Detached Semi-detached Terraced Apartments

Table 2 Site selection criteria.

10 A number of difficulties have been experienced when trying to identify suitable sites and house types for each of the developers within the allocated timescale. The reasons for these difficulties are as follows:

a) Gaining agreement, even in principal, from the five developers took longer than anticipated.

b) Early feedback from the developers indicated that there may be problems identifying appropriate sites, as a number of the currently available sites were designed to comply with Part L of the 1995 Building Regulations and not Part L1 of the 2002 Building Regulations. This has been compounded by the fact that the chosen sites are also required to fit in with the project programme.

c) Feedback from the developers has also indicated that there may be problems identifying certain dwelling types to fit in with the project programme. For instance, apartments have much longer build times than other housing forms and all of the units within a particular block tend to be completed and handed over at the same time. This means that it is very unlikely that any apartments will be ready for pressure testing in May/June 2004, and it may also be difficult to find a site where a second phase of apartments will be ready for pressure testing in May/June 2005.

11 These difficulties have meant that it has only been possible to identify potential sites for two of the developers (A and E). Details of these sites can be seen in Table 3. The programmes associated with these sites are currently being investigated to determine appropriate dwelling types. With respect to the three remaining developers, a number of potential sites have been identified, all of which are currently being investigated to determine their suitability.

	Type of development	**Type of construction**	**Dwelling types**
Developer A	Private	Masonry cavity	Mixture of apartments, terraced, detached and semi-detached properties — specific examples to be defined depending on programme.
Developer E	Social housing	Masonry cavity	Apartments

Table 3 Details of identified sites.

Impact on the Project Programme

12 The issues outlined above have meant that although it has been possible to identify developers and potential sites, it has not been possible to commit to specific sites and dwelling types within the allocated timescale. Despite this, feedback from the developers on identifying specific sites and dwelling types is encouraging and progress is being made on developing the project database (see below). It is anticipated that all of the sites and dwelling types will be identified by the end of March 2004. This is not expected to have any major impact on the overall research programme and it is envisaged that all of the remaining milestones will be unaffected. Details of the sites and the dwelling types will be included within milestone D3: Assessments of Design and Pilot Site Data, which is due at the end of May 2004.

Design Assessment and Site Survey Protocols

13 In order to be able to assess the design and the construction of each house type (five house types per developer), two protocols have been developed:

a) **Design assessment protocol**. This protocol assesses and records the information contained within the detailed design drawings.

b) **Site survey protocol.** This protocol assesses and records the construction work on site.

14 It is intended that the design assessment protocol will be completed as soon as detailed design drawings can be forwarded onto the project team. Information obtained from the literature review (see Interim Report D1 — Literature Review and Built Examples by Johnston, Wingfield and Bell,

2004) on factors such as; the main air leakage paths, the position of the air barrier, continuity of the air barrier, etc. will be used to inform the design assessment.

15 The literature review will also be used to inform the site assessment. The site assessment will be completed in three separate stages. These stages are as follows:

a) **Stage 1: During intermediate floor construction.** This will enable inspection of the method of supporting the intermediate floors and enable any potential leakage problems to be identified.

b) **Stage 2: During dry-lining/wet plaster phase.** This will enable inspection of the internal leaf of the external walls, the application of the dry-lining, inspection of window/wall junctions, inspection of service penetrations, etc.

c) **Stage 3: Completion**. This will enable identification of any potential leakage areas that have not been picked up during the 'snagging' process.

16 Both the design assessment and the site survey protocols are based upon the checklisting approach developed by the BRE (see Webb and Barton, 2001 and Webb, Barton and Scivyer, 2001). Consequently, both protocols contain a series of checklists that cover the main elements of each dwelling. These checklists are not only designed to be compatible with one another, but they are also designed to be compatible with the data input requirements of the project database.

17 The checklists that are incorporated within each protocol are as follows:

a) Dwelling details.

b) Dimensions and built form.

c) Ground floor.

d) External walls.

e) External windows and doors.

f) Intermediate flooring.

g) Ceiling junction.

18 A copy of the design assessment and the site survey protocol can be found within Appendices 1 and 2, respectively.

Site Access Protocol

19 In addition to the design assessment and site survey protocols, a site access protocol has also been produced. The protocol seeks to ensure clarity on matters of role and to enable key ethical issues, such as informed consent and the preservation of anonymity, to be dealt with and agreed between the research team and the individual developers and site staff. This protocol has been developed for both the L2 (Reference No: CI 61/6/16 BD2429) and the C1 (Reference No: CI 71/6/1 BD2414) projects (see Smith and Bell, 2004), and will be used as part of a site and data access agreement for each site. A copy of the protocol is contained within Appendix 3. Copies of this protocol have been circulated to the developers for comment and adoption.

Project database

20 The data obtained from the design assessment and site survey protocols will be stored in a project database. This database will be common to both the L2 (Reference No: CI 61/6/16 BD2429) and the C1 (Reference No: CI 71/6/1 BD2414) projects. As well as holding information obtained from the design assessment and site survey protocols, the database will also store further graphical and alpha numeric information that has been obtained from drawings, site visits and other updates. All of these data will be inter-linked to provide a valuable, searchable resource bank.

21 Microsoft Access will be used to create the database, with hyperlinks set up to allow for the viewing of photographs, Microsoft Excel analysis spreadsheets, Autodesk AutoCAD drawing files, and any additional information (e.g. word documents, adobe acrobat files, etc.).

22 The opening screen will be a switchboard containing various command buttons. These buttons will allow access to custom made forms, with lists of records generated by predetermined sorts, filters and queries. Examples of these are contained within Appendix 4. To ensure confidentiality developers will only be referred to by reference numbers and site locations will only be listed as a

region; details of both will be available to group members through either intranet permissions or internet passwords.

23 The database will initially be held on a PC within the Centre for the Built Environment (CeBE). Full administrative privileges will only be available to members of the group who need to input data, run filters and queries, and alter designs; read-only access will be available to other group members through intranet links and file sharing permissions. This will develop, allowing web access, with confidential information accessible only by the use of registered user names and passwords.

24 The user will be able to search a list of sites and view details, which may include links to photographs, drawings (with appropriate permission if required), and site analysis. Various automated searches, queries and filters will be available – e.g. search by project, search by construction type, filter by date, etc. the results of which will be presented on screen in either form or report format, whichever is most suitable.

25 Group members will be able to access the developer details and additional site details (address and contact details) to utilise the database further.

Conclusions

26 This report reviews the progress that has been made on identifying participating developers, suitable developments and house types, and establishing the design assessment and site survey protocols.

27 Five developers have agreed to participate in the project in principal. Three of the developers are large volume house builders; one is an SME and the other is the housing arm of a large privately owned property development company.

28 Criteria have been devised to aid the selection of sites and dwelling types from each developer. However, identification of appropriate sites is proving problematic. The reasons for this appear to be three-fold. First of all, gaining agreement, even in principal, from the developers took longer than expected. Secondly, a number of potential sites are either not Part L1 2002 compliant or do not fit in with the project programme. Finally, utilising certain dwelling types, for instance apartments, may prove difficult due to programming constraints.

29 Potential sites have been identified for two of the developers and their programmes are currently being investigated in order to identify specific dwelling types. Various sites have been identified for the other three developers, and these are currently being investigated to determine their suitability. It is anticipated that all of the sites and dwelling types will be identified by the end of March 2004 and this will not have any adverse impact on the overall project programme.

30 A design assessment and a site survey protocol have been produced. These protocols compliment one another and consist of a series of checklists that cover the main elements of each dwelling. The data obtained from these checklists will be stored in a Microsoft Access based project database, which will also incorporate graphical and alpha numeric information that has been obtained from drawings, site visits and the pressurisation tests. The adoption of such a platform will enable all of the project information to be inter-linked, creating a valuable and searchable resource bank.

31 A site access protocol has also been produced. This protocol will be common to both the C1 and L2 projects and will form part of a site and data access agreement for each site.

References

JOHNSTON, D. WINGFIELD, J. and BELL, M (2004) Airtightness of Buildings — Towards Higher Performance. *Interim Report D1— Literature Review and Built Examples.* A Report to Communities and Local Government Building Regulations Division Under the Building Operational Performance Framework. Project Reference Number CI 61/6/16 (BD2429), Leeds Metropolitan University, Leeds.

SMITH, M. and BELL, M. (2004) *Condensation Risk – Impact of Improvements to Part L and Robust Details on Part C. Interim Report Number 1 — Initial Workshop and Site Selection Criteria.* A Report to the ODPM Building Regulations Division Under the Building Operational Performance Framework. Project Reference Number CI 71/6/16 (BD2414), Leeds Metropolitan University, Leeds.

WEBB, B. and BARTON, R. (2001) Estimation of actual airtightness based on design and workmanship assessment – Methodology of assessing design drawings. Project Report Number 202559, Undertaken for AEA Technology by the Building Research Establishment, Garston, Watford.

WEBB, B. BARTON, R. and SCIVYER, C. (2001) Estimation of actual airtightness based on design and workmanship assessment — Development of site checklist on workmanship. Project Report Number 202561, Undertaken for AEA Technology by the Building Research Establishment., Garston, Watford.

Appendix 1

Design assessment protocol

Design assessment protocol

Name of assessor: Date of assessment:

Dwelling details		
Site reference		
Plot No.		
Location		
Address		
Developer		
Development type	Private	Social housing
Development size	(total number of units)	
Programme start date		
Programme end date		
Other details		

Dimensions & Build Form					
Ground floor area	m^2				
Total envelope surface area	m^2				
Volume	m^3				
No. of storeys					
Type of dwelling	Detached	Semi-detached	Mid-terrace	End-terrace	Apartment
Construction type	Masonry cavity full fill	Masonry cavity partial fill	Timber frame		
Position of air barrier					
Other details					

Ground Floor				
Construction type	Concrete slab on ground	Concrete suspended	Timber T&G	Timber butted
Is air barrier continuous between ground floor & ext. walls?	Yes		No	
If Yes, give details				
Are service penetrations sealed?	Yes		No	
If Yes, give details				
Other details				

External Walls			
Construction type	Masonry cavity full fill	Masonry cavity partial fill	Timber frame
Internal finish	Dry-lining		Wet plaster
If dry-lining, are continuous ribbons of plaster used?	Yes		No
Are service penetrations sealed?	Yes		No
If Yes, give details			
Other details			

External Windows and Doors		
Are windows/doors draughtstripped?	Yes	No
Are window/door frames sealed to external wall internally?	Yes	No
If Yes, give details		
Are window/door frames sealed to external wall externally?	Yes	No
If Yes, give details		
Are window/door sills/thresholds sealed to external wall internally?	Yes	No
If Yes, give details		
Are window/door sills/thresholds sealed to external wall externally?	Yes	No
If Yes, give details		
Do windows contain trickle vents?	Yes	No
Other details		

Intermediate Flooring			
Construction type	Timber joist	Timber I-beam	Concrete
External wall junction/method of support	Built-In	Joist hangers	
Is external wall/intermediate floor junction sealed?	Yes	No	
If Yes, give details			
Are service penetrations sealed?	Yes	No	
If Yes, give details			
Other details			

Ceiling Junction		
Is air barrier continuous between ceiling and external walls?	Yes	No
If Yes, give details		
Is ceiling continuous above partition walls?	Yes	No
Are service penetrations sealed?	Yes	No
If Yes, give details		
Is loft hatch draughtstripped?	Yes	No
If Yes, give details		
Is loft hatch sealed to ceiling?	Yes	No
If Yes, give details		
Other details		

Appendix 2

Site survey protocol

Site survey protocol

Name of assessor: Date of visit:

Dwelling details		
Site reference		
Plot No.		
Location		
Address		
Developer		
Development type	Private	Social housing
Development size	(total number of units)	
Programme start date		
Programme end date		
Other details		

Dimensions and Build Form					
Ground floor area	m^2				
Total envelope surface area	m^2				
Volume	m^3				
No. of storeys					
Type of dwelling	Detached	Semi-detached	Mid-terrace	End-terrace	Apartment
Construction type	Masonry cavity full fill	Masonry cavity partial fill	Timber frame		
Position of air barrier					
Other details					

Ground Floor				
Construction type	Concrete slab on ground	Concrete suspended	Timber T&G	Timber butted
Is air barrier continuous between ground floor & ext. walls?	Yes		No	
If Yes, give details				
Are service penetrations sealed?	Yes		No	
If Yes, give details				
If No, give details				
Are there any additional service penetrations?	Yes		No	
If Yes, give details				
Other details				

External Walls			
Construction type	Masonry cavity full fill	Masonry cavity partial fill	Timber frame
Internal finish	Dry-lining		Wet plaster
If dry-lining, are continuous ribbons of plaster used?	Yes		No
If No, give details			
Are perpends fully filled?	Yes		No
Are there any obvious cracks or gaps in the external walls?	Yes		No
If Yes, give details			
Are there any areas of unfinished plaster/dry-lining?	Yes		No
If Yes, give details			
Are service penetrations sealed?	Yes		No
If Yes, give details			
If No, give details			
Other details			

External Windows and Doors		
Are windows/doors draughtstripped?	Yes	No
Does draughtstripping compress when windows/doors are closed?	Yes	No
If No, give details		
Are window/door frames sealed to external wall internally?	Yes	No
If Yes, give details		
Are window/door frames sealed to external wall externally?	Yes	No
If Yes, give details		
Are window sills/door thresholds sealed to external wall internally?	Yes	No
If Yes, give details		
Are window sills/door thresholds sealed to external wall externally?	Yes	No
If Yes, give details		
Do windows/doors fit and close correctly?	Yes	No
If No, give details		
Do windows contain trickle vents?	Yes	No
If Yes, do trickle vents close completely?	Yes	No
If No, give details		
Other details		

Intermediate Flooring			
Construction type	Timber joist	Timber I-beam	Concrete
External wall junction/method of support	Built-In	Joist hangers	
If built-in, method of sealing joists to external walls			
Is external wall/intermediate floor junction sealed?	Yes	No	
If Yes, give details			
If No, give details			
Are service penetrations sealed?	Yes	No	
If Yes, give details			
If No, give details			
Are there any additional service penetrations?	Yes	No	
If Yes, give details			
Other details			

Ceiling Junction		
Is air barrier continuous between ceiling and external walls?	Yes	No
If Yes, give details		
If No, give details		
Is ceiling continuous above partition walls?	Yes	No
Are service penetrations sealed?	Yes	No
If Yes, give details		
Are there any additional service penetrations?	Yes	No
If Yes, give details		
Is loft hatch draughtstripped?	Yes	No
If Yes, give details		
Is loft hatch sealed to ceiling?	Yes	No
If Yes, give details		
Other details		

Appendix 3

Site access protocol

Standard Protocol on the Access to Development Sites for the Purposes of Data Collection

Information to developers

Prior to researchers undertaking site observations the developer will be provided with a summary of the research project which will include an outline of the purposes of the site data collection.

Health and safety

It is acknowledged that construction sites are potentially dangerous places and that every one has a responsibility for their own health, safety and wellbeing and that of those around them. In gaining access to any site, each researcher will wear appropriate personal protective equipment. In all cases this will consist of a safety helmet, safety boots and a high visibility vest or coat. Additional equipment will be used as appropriate depending on the requirements of a particular site. On their first visit to a site each researcher will expect to receive a safety briefing given by a designated member of the site management team. On every visit researchers will inform site management of their presence and of the areas they expect to work. When they leave a site, researchers will inform site management. A site visit risk assessment will be carried out by the research team and lodged in the university.

Insurance

The university will maintain all necessary indemnity insurance cover for its staff working on the developer's site.

Site data collection

The role of the researcher is to collect data on the design and construction works taking place on the site in question. This may be done by way of personal observation involving sketching, note taking and the taking of photographs or video material. In specified circumstances and with the agreement of the site manager and site personnel concerned, data may also be collected by way of interview (either individually or in groups) which may be recorded using photographs or audio/video tape or in written notes. Any tape recording will only be done with the express permission of the person being interviewed and will be subject to the general safeguards on photographs and video and audio tape recording set out below.

Observations relating to construction and design quality

As part of the research project observations will often involve items that could be classed as defects in either design and/or construction. Such observations will normally be part of the project and will be referred to in project reports, subject to the general assurances on reporting outlined below. In general, researchers will be under no obligation to report specific instances to the developer, or any other person outside the research team unless the defect observed is thought likely to have an adverse impact on health and safety. In such cases the researcher will bring the instance to the attention of the person in charge of the site. It will then be the responsibility of the site management to take the appropriate action.

Professional responsibility of researchers

The responsibility of researchers extends to the recording and interpretation of data for the purposes of the research project only. Researchers will be under strict instructions not to interfere with construction processes or give advice to site staff or operatives. Nothing that is done or not done by researchers in the course of their work should be interpreted as providing a professional service to the developer or his consultants, contractors or subcontractors. Researchers are instructed not to give advice, irrespective of their professional qualifications, and any comments they may make or questions they ask should not be interpreted as providing a professional service or professional advice.

Photographs

In general photographs of sites, buildings and building details will seek to avoid the inclusion of people and items that could identify the site. Where this is unavoidable and individuals are likely to be recognisable or where it is desirable to include people, the verbal permission of the individuals in question will be sought at the time of taking the photograph. In seeking permission it will be made clear that the picture could appear in project publications. Where it is not possible to avoid signs or site boards that could identify a particular site, either permission to use the picture in research publications will be sought from the developers or any published version of the photograph will have identification signs obscured or removed.

Video and audio recording

In every case where a researcher wishes to record an interview or group discussion, the permission of the interviewee or group will be sought. As a minimum, this will be done verbally immediately prior to the recording. All recorded material will be kept secure and used only for reference purposes by the research team. Following the production of the final report on a project the tapes will be erased and will not be included in the project data archive. In some cases transcripts of recordings may be produced and these will be returned to the interviewee for comment prior to the production of a final version. Checked transcripts and notes compiled with the aid of the recorded material may be retained, in anonymous form, as part of the data archive. Short illustrative extracts of recordings may be used in project reports but anonymity will be preserved unless agreed by the interviewee before the extract is attributed. Agreement to the taping of an interview will be on this basis.

Anonymity

As a general principle the anonymity of developers and their staff will be preserved where ever possible. However, it is expected that developers will wish to be acknowledged as a partner in the research. The appropriate and feasible level of anonymity will be discussed with each developer prior to their confirmation of involvement in the research project and reviewed during the course of the project. If a high degree of anonymity is important to a developer the company must be aware of the risks before agreeing to take part. However, the anonymity of individuals is more straightforward unless the project involves a high profile individual.

Project reports

Descriptions of sites and organisations will be in accordance with the level of anonymity agreed with each developer and/or individuals involved. The use and attribution of photographs, drawings and interview material collected by researchers, together with any material provided by the developer or their consultants or contractors, will adhere to the appropriate level of anonymity agreed prior to publication.

Provision of reports to developers

Wherever feasible and subject to the research needs of the project, developers will be provided with a report on the data collected from their site. This report will identify the developer's site or sites and will, normally be a confidential report. An anonymous version of the report will be retained in the data archive and the data and other material will be used in project reports, as indicated above. Subject to the terms of the Building Regulations framework agreement the project report will also be made available to the developer so that they can judge the findings from their sites against the general findings of the project as a whole.

Copyright

All material produced by the research team, including site sketches, notes and photographs will rest with the research team and be subject to the terms of the framework contract. Material provided by third parties (principally drawings provided by developers and their designers and contractors) will be subject to copyright. It should be made clear to the owners of the copyright that in supplying the material they agree to its use for illustration and review purposes in project publications with suitable attribution commensurate with an agreed level of anonymity.

Confidentiality

The data collected from the developer during the normal course of the research project will not be considered to be confidential but it will be subject to an agreed level of anonymity as indicated above. However, during the course of the project researchers may have access to sensitive information. Where researchers are provided with material that is not part of the normal data collection required for the conduct of the project, they will be expected to confirm its confidentiality status with the developer. Where the developer requires it, the material will be treated as confidential and not disclosed outside the research team. Where such material comes into the hands of researchers inadvertently, that material will be treated as confidential, the developer informed and the material in question returned as soon as possible.

Malcolm Bell and Melanie Smith

Leeds Metropolitan University

20 January 2004

Signed……. Dated……..

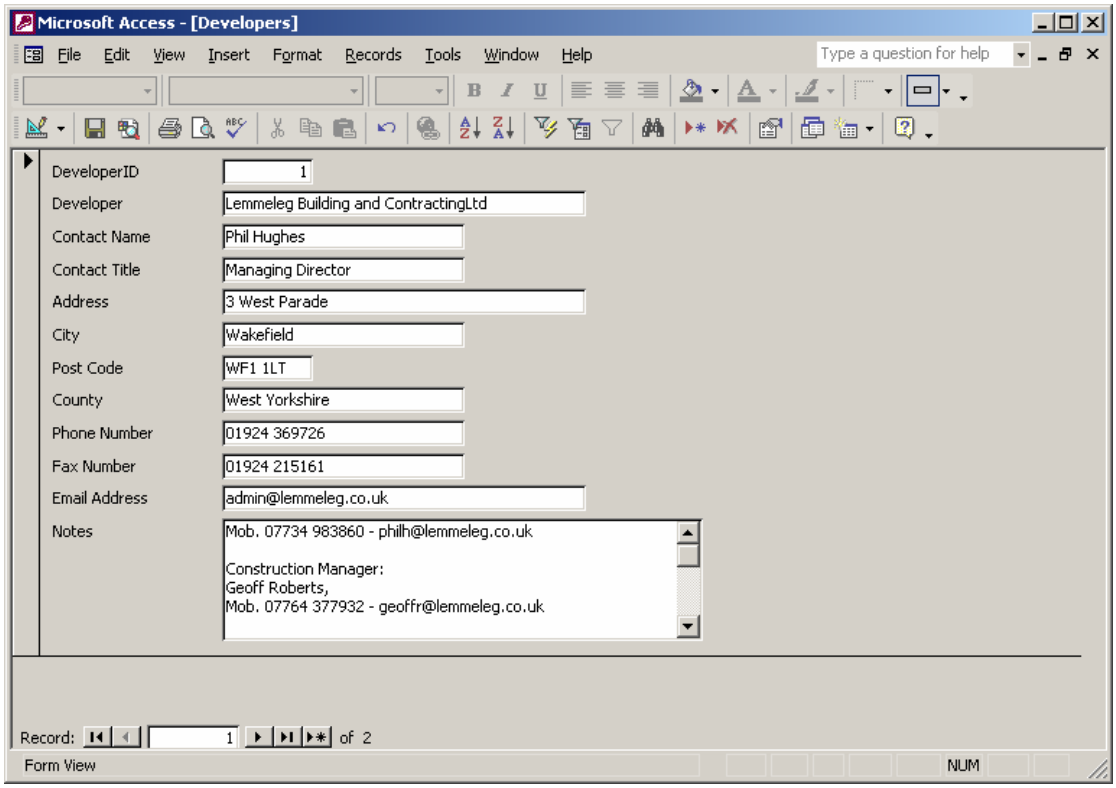
For and on behalf of Leeds Met University

Signed……. Dated……..

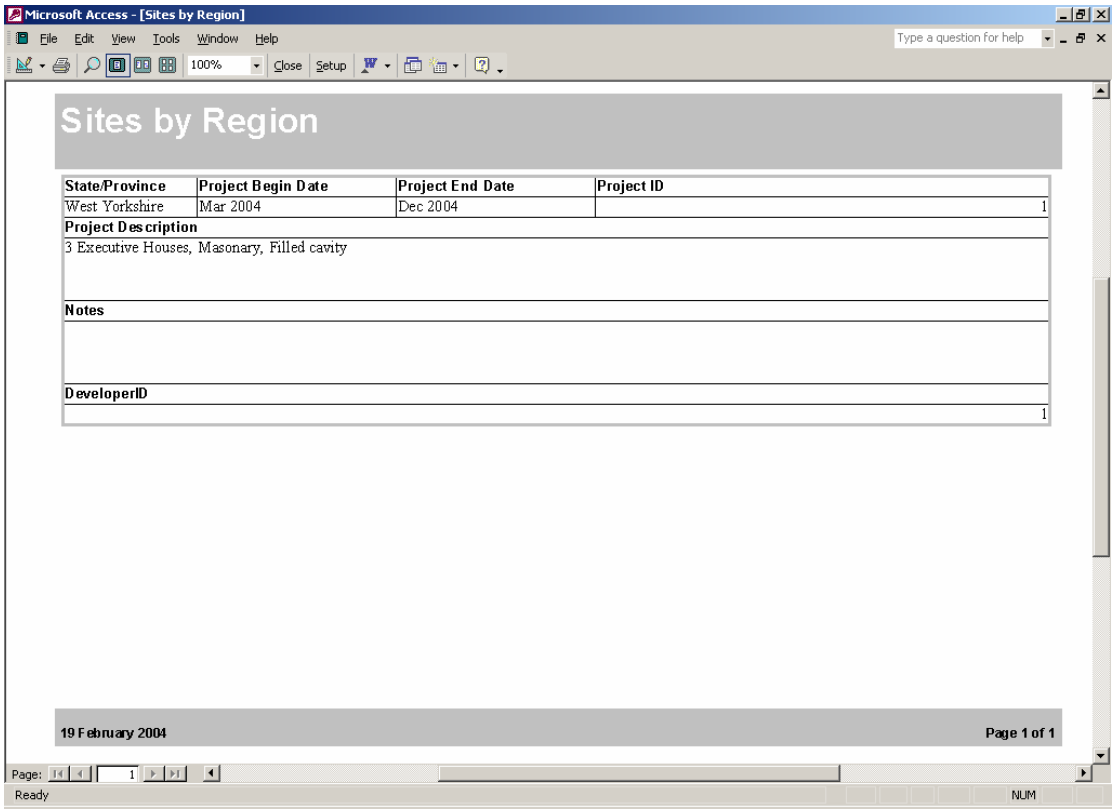
For and on behalf of XXXXXXX (Partner)

Appendix 4

Project database



Example of a form from the project database.



Example of a report from the project database.