A Function-Based Cost Model for Early Cost Advice on New-Build Schools Projects

Mohammad Zakwan Majed Arab

Submitted for the degree of Doctor of Philosophy

Two volumes- Vol 2

Heriot Watt University

School of the Built Environment

July 2011

Appendices

Appendix A

The Interview questions

The Emails sent to the councils

Appendix B

Questionnaire 1 sent to the councils

Questionnaire 1 sent to external consultants

Questionnaire 1 tables

(6.6, 6.15.1, 6.18, 6.19, 6.20, 6.21, 6.22, 6.23, 6.24, 6.25, 6.26, 6.27, 6.28, 6.29, 6.30, 6.31, 6.32, 6.33, 6.34, 6.35, 6.36, 6.38.3, 6.39.2, 6.40.1, 6.48, 6.49, 6.50, 6.51, 6.52, 6.53, 6.54, 6.55, 6.56 and 6.57)

Appendix C

Questionnaire 2 sent to the head teachers

Questionnaire 2 sent to the councils

Questionnaire 2 table (7.5, 7.6, 7.49, 7.50, 7.51, 7.52, 7.56, 7.57, 7.58, 7.59, 7.63, 7.64, 7.65 and 7.66).

BCIS Examples

The interviewee's questions

Thank interviewee for sparing valuable time to discuss the issues

Interview purpose: Expletory study

Interviewee's name: …..

Location: The named council

Time/ Date: 11 am , Monday 19/03/2007

- The interview

- **A request to record it**

- **(time:** 1 hour**)**

- **Interview type:** The interview is open-end questions.

- **Confidentiality:**

1- All the information will be used for academic work carried out by Heriot Watt University.

2- You will receive the full transcript to be sure about the accuracy of the transcript if it is required.

3- You will share in the results of the project including research reports produced.

- The research idea: To build a cost model for early cost advice for new build school projects, depending on information available in brief documents (client requirements) as independent variables.

- **The interview aim:** Exploring polices and practical issues to evaluate how early cost advice is currently applied to school projects.

A- Theoretical policies:

To determine the regulatory environment and the availability of good practice and policy guidance relating to design and costing of school projects.

1- **What policy framework and guidelines exist on setting budgets for school projects?**

     Probe:

     • The financial relationship between Scottish Executive and Local authorities.

2- **What policy framework and guidance exists on briefing school projects?**

     Probe:

     • Scottish Executive perspective.

     • Local Authorities (Scottish councils) generally and the Named council especially.

3- **What policy framework and guidelines exist for school design?**

     Probe:

     • Technical design.

     • Scottish Executive perspective.

• Local Authorities (Scottish councils) generally and the Named council especially**.**

4- What policy framework and guidelines exist on seeking early cost advice on school projects?

B- Practical issues:

To understand the council's actual experience relating to how budgets are allocated and early cost advice achieved on school projects.

5- What are the practical/ operational approaches to budget setting/early cost advice?

    Probe:

    • Local councils generally and the Named council especially.

6- What type of cost models are used to provide early cost advice and at what stage are they applied?

    Probe:

    • The first given cost advice.

7- How accurate and reliable are these cost models?

8- Are project teams satisfied with the level of performance of these cost models?

9- Who are the parties involved in early cost advice?

> Probe:

> • In terms of those sharing in forming it and the others using it.

10- What are the strengths/ advantages and weaknesses/limitations of these models in your opinion?

> Probe:

> • How can be dealt with these weaknesses.

C- General questions:

11- What are the procurements that you used to use and using now?

> Probe:

> • Exp: Traditional, design and build, PFI,..etc.

12- The applicability of Value management and Quality Function Deployment as Quality techniques at early stage of a project.

> Probe:

> • Are they used at early stage by the Named council?

> • If not: do you have any restriction to use them.

13-How widely does the brief vary (i.e. high level client requirements) from project to project?

Probe:

• Number of pupils will vary but what about nature of project requirements. These requirements are the high level requirements (not design requirements (energy, efficiency, safety, security …etc.

14-The proposed cost model will depend on briefing information- client's needs and requirements as the main variables; what is this information/ client's requirements for school projects and how identified as part of procurement process.

15-Could I ask you about other contacts you might approach (clients, contractors or consultant)?

16-What is your opinion about the proposed cost model, the possibility and usefulness of it?

Thank you very much for your generosity and cooperation.

Dear Sir/Madam

Heriot-Watt University Doctoral Research Project: Early Cost Advice on New-Build Schools

As part of a PhD programme in the School of the Built Environment we are conducting research into how cost estimates are established and budgets set at the early stages of new-build schools projects procured in Scottish Local Authorities. This is part of a wider research project to develop a reliable model for providing cost advice at the inception stage for Schools.

I am looking for a meeting with a person, who has knowledge and an experience of early cost advice used at the inception of school projects from the client perspective, to share his/her knowledge and experience of early cost advice, and help build a picture of approaches and practices in the Orkney council. This would be confidential and for the purposes of research only, in accordance with the University's research ethics guidelines. As a participant he/she would also share in findings that emerge from this phase of the project

I would be happy to answer any queries you might have about the project and I can be contacted by email, telephone or letter to discuss this with you.

Yours sincerely

M Zakwan Arab

Address

Dear,

<u>Heriot-Watt University Doctoral Research Project: Early Cost Advice on New-Build Schools</u>

As part of a PhD programme in the School of the Built Environment we are conducting research into how cost estimates are established and budgets set at the early stages of new-build schools projects procured in Scottish Local Authorities. This is part of a wider research project to develop a reliable model for providing cost advice at the inception stage for Schools.

I am writing to ask if you would agree to a short interview of around 30-40 minutes to share your knowledge and experience of early cost advice from the client perspective, and help build a picture of approaches and practices in different councils in Scotland. This would be confidential and for the purposes of research only, in accordance with the University's research ethics guidelines. As a participant you would also share in findings that emerge from this phase of the project

I would be happy to answer any queries you might have about the project and I can be contacted by email, telephone or letter to discuss this with you and hopefully arrange a convenient time to meet.

Your participation in this research would be much appreciated and of great value to the project.

Yours sincerely

M Zakwan Arab

Address

The email sent to the various UK councils asking for suitable respondents

Dear Sir/ Madam,

I am a postgraduate student at Heriot Watt University in Edinburgh studying for a PhD in Construction Management. My PhD title is "Building a function-based cost model for new-build school projects in the Uk ".

I am looking for the contact details of the director of education department or educational counsellor (the decision makers for writing the brief and designing primary and secondary council schools) and also architectures or consultants who are working as a client's representatives or designers for primary and secondary schools projects. I would like to send them a questionnaire as a part of my research. The questionnaire is about determining and evaluating the various school clients' design needs and requirements which are determined at the briefing stage of the project life-cycle. Would you please assist me in getting their contact details so I can get in touch with them?

Your help would be so much appreciated.

Sincerely Yours
M.Zakwan Arab

The web based questionnaire sent to the various councils' respondents, the program will insert the full name of each expert after Dear

Date 25/05/2009

Dear,

Title: Building Function Based-Cost Model for Early Cost Advice on New-Build School Projects

I am pursuing a PhD research study in the school of the Built Environment at Heriot-Watt University to develop a function-based cost model for new-build school projects. I have been advised to send the questionnaire to you by Mr Peter Weavers.

It would be very helpful if you could find time to complete the web-site survey form below. The survey will not take more than 15 minutes, as we appreciate the value of your time. The main aim of the survey is evaluating the various design needs and requirements for primary and secondary schools that are considered at the briefing stage of the project. The survey's participants would be those who are involved in preparing briefs and designing primary and secondary schools (e.g. Architects, Designers, Project Managers, Planning Managers, etc.). A summary of the results of the survey can be provided if you so indicate on the form.

Please be assured that any information you provide will be treated in complete confidence and will be used for the purpose of the research only. All data collected in this survey will be held anonymously and securely. Individual results are strictly confidential to your organisation only and individuals cannot be identified in any way.

The web-site survey link: www.hw-university-research.co.uk/councils/?c=106

A Function Based-Cost Model for Early Cost Advice on New-Build School Projects

M.Zakwan Arab

Room 403 Sir William Arrol Building

School of the Built Environment

Heriot-Watt University

Edinburgh EH14 4AS

Za12@hw.ac.uk

The research aims to develop a cost model to estimate the cost of new-build school projects using information at the briefing stage. The model estimates construction cost using the proposed schools clients' design needs together.

Objectives:

This study is being conducted to achieve the following objectives:

1) Establish the various design requirements determined by clients at the briefing stage of school project.
2) Evaluate the importance of these requirements from the client perspective (Local Authorities Education Department).
3) Establish and evaluate the various clients requirements determined at the briefing stage in the designers perceptions.

Question 1: Personal Information:

1- Your name
   ……………………………………

2- Which Department are you within the council?
   ……………………………………

3- What is the position you fulfill?
   ……………………………………

4- How long have you been working on schools in the council?

   01-10 ☐   11-20 ☐   21-30 ☐   over 30 ☐

Question 2: Do you use any of these documents as a guide for determining the different design needs? Please tick as many as relevant.

Previous experience	☐
School Design :Building Our Future	☐
Assessing Secondary School Design Quality	☐
General Design Brief for Post-Primary Schools	☐
Assessing Secondary School Design Quality	☐
Briefing Framework for Primary & Secondary schools (BB98,99)	☐
Building Bulletin 95:Design for Learning Community	☐
Creating Excellent Secondary Schools	☐
Design Quality Indicators for schools	☐
Quality Indicators for Designing schools	☐
Different Post Occupancy Evaluation Methods	☐

If none of the above are used, could you specify which guides you use?
   ……………………………………………
   ……………………………………………

Question 3: at the briefing stage, several main design requirements are determined by the client for new-build schools. As client could you please specify and rank the following requirements which the design should achieve for current new-build schools in general?

Please rank in scale "Not important to Extremely important"   "Not ask" is for the requirements which clients do not ask about at the briefing stage

Accommodation requirements	Description	Not Important	Slightly Important	Important	Very important	Extremely important
The provision of internal teaching and learning spaces	eg: Large, Small, Laboratories, Learning resources, Personal	1	2	3	4	5
The provision of external learning spaces		1	2	3	4	5
The provision of internal non-teaching spaces	eg: Halls, Storage, Staff & Administration spaces.	1	2	3	4	5
The provision of external spaces for non-learning purposes	eg: Car Parking, Landscaping	1	2	3	4	5
The provision of internal physical and sport spaces		1	2	3	4	5
The provision of external physical and sport spaces		1	2	3	4	5
The provision of spaces for internal & external movement	eg: Circulation, Corridors, Stairs	1	2	3	4	5
The provision of internal & external spaces for social activities		1	2	3	4	5
The provision of ancillary spaces	eg: Toilets, Equipments Spaces	1	2	3	4	5
The provision of service facilities	eg: Health, Welfare, Chaplaincy	1	2	3	4	5
Well proportioned internal & external spaces		1	2	3	4	5
Spatial arrangements that enhance student creativity		1	2	3	4	5
Spaces for community use and out of hours use	For various activities, circulation and services	1	2	3	4	5
Attractiveness of spaces	Colours and finishes (internal design)	1	2	3	4	5
Spaces which enhance variety of learning		1	2	3	4	5
Spaces and design that fulfill the curriculum needs		1	2	3	4	5
Shared sport spaces to meet needs of the proposed school and other schools		1	2	3	4	5

Architectural design quality	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Attractive and appealing internal appearance	Building details, colour schemes and materials	0	1	2	3	4	5
Attractive and appealing external appearance	Building details, colour schemes and materials	0	1	2	3	4	5
Design which achieves diversity of use		0	1	2	3	4	5
Good neighbourhood identity (Building is a centre of community)	Design reflects the community aspiration	0	1	2	3	4	5
Design which gives a homely feeling		0	1	2	3	4	5
Internal and external planning efficiency		0	1	2	3	4	5
Design which achieves building ease of use	User-friendly building	0	1	2	3	4	5
High profile public presence		0	1	2	3	4	5
Importance of location of building on the site		0	1	2	3	4	5
Design which creates pleasurable environment for students to study		0	1	2	3	4	5
Integration of engineering services within design		0	1	2	3	4	5

External site and school grounds	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Outdoor learning environmental features	Protection from weather, gardening opportunities	0	1	2	3	4	5
Dedicated designed landscaping		0	1	2	3	4	5
Site which is large enough and designed well to meet educational needs		0	1	2	3	4	5
Exterior design indicates the interior function		0	1	2	3	4	5

Operation of Building	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Minimise maintenance cost	0	1	2	3	4	5
Minimise energy cost	0	1	2	3	4	5
Ease of building and site maintenance	0	1	2	3	4	5

Question 3: Cont'd

Design Flexibility and Adaptability	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Design of site (site layout) is adaptable	Long term changes	0	1	2	3	4	5
Flexibility of design and spaces	Short term changes	0	1	2	3	4	5

Accessibility and Inclusion of people with disabilities	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Inclusive internal & external access for all	Pupils & Staff	0	1	2	3	4	5
Design attains ease of movement through building & site for all	Staff, Pupils & people with disabilities	0	1	2	3	4	5
Entrance is welcoming and easily identified		0	1	2	3	4	5
Access for public and private transportation		0	1	2	3	4	5
The provision of way finding principles		0	1	2	3	4	5
High environmental features for people with disabilities	Light, Thermal and Air Quality	0	1	2	3	4	5
Internal & external circulation satisfy people with disabilities		0	1	2	3	4	5
Inclusion of welfare spaces to support people with disabilities	Physical & psychological support	0	1	2	3	4	5
Specific design features for people with disabilities	Colours and finishes	0	1	2	3	4	5

Sustainability	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Durable elements & components (Long life)	Materials and components	0	1	2	3	4	5
Efficient energy usage		0	1	2	3	4	5
Maximising the use of natural day light		0	1	2	3	4	5
Maximising the use of natural ventilation		0	1	2	3	4	5
Sustainable materials specified	eg: Low embodied energy materials	0	1	2	3	4	5
Adaptable to climate change	Future change	0	1	2	3	4	5
Minimising the mechanical & electrical systems		0	1	2	3	4	5

Question 3: Cont'd

Building Organisation and Planning	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Design attains a good relationship between spaces (Spatial relationship)		0	1	2	3	4	5
Well organised site	Various spaces & circulation	0	1	2	3	4	5
Patterns of use relate to the disposition of spaces and activities		0	1	2	3	4	5
Linking well between indoor and outdoor		0	1	2	3	4	5

Health and safety and security	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Design which allows for internal & external supervision of users		0	1	2	3	4	5
Safe & secured internal & external movement	Safe circulation, stairwell	0	1	2	3	4	5
Safe & secured building entrance		0	1	2	3	4	5
Clear boundaries of the site		0	1	2	3	4	5
Safe approach to the school		0	1	2	3	4	5
Well supervised personal spaces	Toilets, locker spaces	0	1	2	3	4	5
Adequate security for community use		0	1	2	3	4	5
Safe site is created		0	1	2	3	4	5

Building Performance	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Design that accommodates good ICT infrastructure	Information and communication technologies	0	1	2	3	4	5
Design which enhances learning and teaching performance		0	1	2	3	4	5
Internal & external design enhances student motivation		0	1	2	3	4	5
Internal & external design enhances social activities		0	1	2	3	4	5
Design gets the overall client's and users' satisfaction		0	1	2	3	4	5
High profile public presence		0	1	2	3	4	5
Building makes the most of site features & topography		0	1	2	3	4	5

Question 3: Cont'd

Community Involvement	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
School encourages interactive relationship with community organisations	0	1	2	3	4	5
Easy and adequate physical access for community	0	1	2	3	4	5
Internal & external design encourages community use	0	1	2	3	4	5
Design creates welcoming school	0	1	2	3	4	5

Environmental Design	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Well balanced natural and artificial lighting		0	1	2	3	4	5
Adequate lighting for all day, all year		0	1	2	3	4	5
Lighting which is easily controlled by users		0	1	2	3	4	5
Thermal comfort for all day, all year		0	1	2	3	4	5
Temperature which is easily controlled by users		0	1	2	3	4	5
Acoustic performance in the different areas	Planning & materials	0	1	2	3	4	5
Well balanced natural and mechanical ventilation		0	1	2	3	4	5
Adequate ventilation (good air quality) for all day, all year		0	1	2	3	4	5
Ventilation which is easily controlled by users		0	1	2	3	4	5
Environment which enhances pupils' motivation and achievement		0	1	2	3	4	5
Well controlled relationship between thermal and ventilation		0	1	2	3	4	5
Mechanical Systems which do not disturb the learning activities		0	1	2	3	4	5

	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Overall building Value for Money	0	1	2	3	4	5

- If you have other requirements which were not mentioned previously, could you specify and rank them in the empty spaces please?

Other Requirements	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
		0	1	2	3	4	5
		0	1	2	3	4	5

- **Do you as a council evaluate and review your existing primary and secondary schools buildings (post occupancy evaluation, post review, etc)?**

         Yes ☐   No ☐

If Yes, could you please specify the person or department within the council who are responsible for either evaluating the existing schools or recording their evaluations?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

- **Are you interested to participate in the next stage of the research for example: another questionnaire or interviews?**

         Yes ☐   No ☐

- **Are you interested in receiving the results of this research?**

         Yes ☐   No ☐

If **Yes** please give your contact details

Address:

……………………………………………………………………………………

……………………………………………………………………………………

Email:

……………………………………………………………………………………

Thank you for your valuable time in completing this survey

Code No:
…………………………

The web based questionnaire sent to the various architects' respondents, the program will insert the full name of each expert after Dear

415

Dear Sir/Madam

Title: Building Function Based-Cost Model for Early Cost Advice on New-Build School Projects

I am pursuing a PhD research study in the school of the Built Environment at Heriot- Watt University to develop a function-based cost model for new-build school projects.

It would be very helpful if you could find time to complete the web-site survey form below. The survey will not take more than 15 minutes, as we appreciate the value of your time. The main aim of the survey is evaluating the various design needs and requirements for primary and secondary schools that are considered at the briefing stage of the project. The survey's participants should be architects or designers who are involved in preparing briefs and designing primary and secondary schools. A summary of the results of the survey can be provided if you so indicate on the form.

Please be assured that any information you provide will be treated in complete confidence and will be used for the purpose of the research only.

Yours faithfully

M.Zakwan Arab

The web-site survey link: www.hw-university-research.co.uk/architects/?c=106

A Function Based-Cost Model for Early Cost Advice on New-Build School Projects

M.Zakwan Arab

Room 403 Sir William Arrol Building

School of the Built Environment

Heriot-Watt University

Edinburgh EH14 4AS

Za12@hw.ac.uk

The research aims to develop a cost model to estimate the cost of new-build school projects using information at the briefing stage. The model estimates construction cost using the proposed schools clients' design needs together.

Objectives:

This pilot study is being conducted to achieve the following objectives:

1) Establish the various design requirements determined by clients at the briefing stage of school project.
2) Evaluate the importance of these requirements from the client perspective (Local Authorities Education Department).
3) Establish and evaluate the various clients requirements determined at the briefing stage in the designers' perceptions.

Question 1: Personal Information:

1- The Architect's name

…………………………………

2- The years of experience the Architect has in the field of schools

1-10 ☐   11-20 ☐   21-30 ☐   over 30 ☐

3- Number of the primary and secondary schools projects which the architect has been involved in

☐

Question 2: Are you aware of your clients' needs using any of these documents as a guide for determining the different design needs? Please tick as many as relevant.

Previous experience	☐
School Design :Building Our Future	☐
Assessing Secondary School Design Quality	☐
General Design Brief for Post-Primary Schools	☐
Assessing Secondary School Design Quality	☐
Briefing Framework for Primary & Secondary schools (BB98,99)	☐
Building Bulletin 95:Design for Learning Community	☐
Creating Excellent Secondary Schools	☐
Design Quality Indicators for Schools	☐
Quality Indicators for Designing Schools	☐
Different Post Occupancy Evaluation Methods	☐

If none of or other than the above are used, could you specify please which guides you use?

………………………………………………

……………………………………………

……………………………………………

Question 3: at the briefing stage, several main design requirements are determined by the client for new-build schools. From your experience, to what extent are the following design requirements important for the schools clients for current new-build schools in general? Please rank in scale 1 to 5 or 0 to 5

Please rank in scale "Not important to Extremely important"   "Not ask" is for the requirements which clients do not ask about at the briefing stage

Accommodation requirements	Description	Not Important	Slightly Important	Important	Very important	Extremely important
The provision of internal teaching and learning spaces	eg: Large, small, laboratories, learning resources, personal	1	2	3	4	5
The provision of external learning spaces		1	2	3	4	5
The provision of internal non-teaching spaces	eg: Halls, storage, staff & administration spaces.	1	2	3	4	5
The provision of external spaces for non-learning purposes	eg: Car parking, landscaping	1	2	3	4	5
The provision of internal physical and sport spaces		1	2	3	4	5
The provision of external physical and sport spaces		1	2	3	4	5
The provision of spaces for internal & external movement	eg: Circulation, corridors, stairs	1	2	3	4	5
The provision of internal & external spaces for social activities		1	2	3	4	5
The provision of ancillary spaces	eg: Toilets, equipment spaces	1	2	3	4	5
The provision of service facilities	eg: Health, Welfare, Chaplaincy	1	2	3	4	5
Well proportioned internal & external spaces		1	2	3	4	5
Spatial arrangements that enhance student creativity		1	2	3	4	5
Spaces for community use and out of hours use	For various activities, circulation and services	1	2	3	4	5
Attractiveness of spaces	Colours and finishes (internal design)	1	2	3	4	5
Spaces which enhance variety of learning		1	2	3	4	5
Spaces and design that fulfill the curriculum needs		1	2	3	4	5
Shared sport spaces to meet needs of the proposed school and other schools		1	2	3	4	5

Question 3: Cont'd

Architectural design quality	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Attractive and appealing internal appearance	Building details, colour schemes and materials	0	1	2	3	4	5
Attractive and appealing external appearance	Building details, colour schemes and materials	0	1	2	3	4	5
Design which achieves diversity of use		0	1	2	3	4	5
Good neighbourhood identity (Building is a centre of community)	Design reflects the community aspiration	0	1	2	3	4	5
Design which gives a homely feeling		0	1	2	3	4	5
Internal and external planning efficiency		0	1	2	3	4	5
Design which achieves building ease of use	User-friendly building	0	1	2	3	4	5
High profile public presence		0	1	2	3	4	5
Importance of location of building on the site		0	1	2	3	4	5
Design which creates pleasurable environment for students to study		0	1	2	3	4	5
Integration of engineering services within design		0	1	2	3	4	5

External site and school grounds	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Outdoor learning environmental features	Protection from weather, gardening opportunities	0	1	2	3	4	5
Dedicated designed landscaping		0	1	2	3	4	5
Site which is large enough and design well to meet educational needs		0	1	2	3	4	5
Exterior design indicates the interior function		0	1	2	3	4	5

Operation of Building	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Minimise maintenance cost	0	1	2	3	4	5
Minimise energy cost	0	1	2	3	4	5
Ease of building and site maintenance	0	1	2	3	4	5

Question 3: Cont'd

Accessibility and Inclusion of people with disabilities	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Inclusive internal & external access for all	Pupils & staff	0	1	2	3	4	5
Design attains ease of movement through building & site for all	Staff, Pupils & people with disabilities	0	1	2	3	4	5
Entrance is welcoming and easily identified		0	1	2	3	4	5
Access for public and private transportation		0	1	2	3	4	5
The provision of way finding principles		0	1	2	3	4	5
High environmental features for people with disabilities	Light, thermal and air quality	0	1	2	3	4	5
Internal & external circulation satisfy people with disabilities		0	1	2	3	4	5
Inclusion of welfare spaces to support people with disabilities	Physical & psychological support	0	1	2	3	4	5
Specific design features for people with disabilities	Colours and finishes	0	1	2	3	4	5

Sustainability	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Durable elements & components (Long life)	Materials and components	0	1	2	3	4	5
Efficient energy usage		0	1	2	3	4	5
Maximising the use of natural day light		0	1	2	3	4	5
Maximising the use of natural ventilation		0	1	2	3	4	5
Sustainable materials specified	eg: Low embodied energy materials	0	1	2	3	4	5
Adaptable to climate change	Future change	0	1	2	3	4	5
Minimising the mechanical & electrical systems		0	1	2	3	4	5

Design Flexibility and Adaptability	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Design of Site (site layout) is adaptable	Long term changes	0	1	2	3	4	5
Flexibility of design and spaces	Short term changes	0	1	2	3	4	5

Question 3: Cont'd

Building Organisation and Planning	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Design attains a good relationship between spaces (Spatial relationship)		0	1	2	3	4	5
Well organised site	Various spaces & circulation	0	1	2	3	4	5
Patterns of use relate to the disposition of spaces and activities		0	1	2	3	4	5
Linking well between indoor and outdoor		0	1	2	3	4	5

Health and safety and security	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Design which allows for internal & external supervision of users		0	1	2	3	4	5
Safe & secured internal & external movement	Safety circulation, stairwell	0	1	2	3	4	5
Safe & secured building entrance		0	1	2	3	4	5
Clear boundaries of the site		0	1	2	3	4	5
Safe approach to the school		0	1	2	3	4	5
Well supervised personal spaces	Toilets, locker spaces	0	1	2	3	4	5
Adequate security for community use		0	1	2	3	4	5
Safe site is created		0	1	2	3	4	5

Building Performance	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Design that accommodates good ICT infrastructure	Information and communication technologies	0	1	2	3	4	5
Design which enhances learning and teaching performance		0	1	2	3	4	5
Internal & external design enhances student motivation		0	1	2	3	4	5
Internal & external design enhances social activities		0	1	2	3	4	5
Design gets the overall client's and users' satisfaction		0	1	2	3	4	5
High profile public presence		0	1	2	3	4	5
Building makes the most of site features & topography		0	1	2	3	4	5

Question 3: Cont'd

Community Involvement	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
School encourages interactive relationship with community organisations	0	1	2	3	4	5
Easy and adequate physical access for community	0	1	2	3	4	5
Internal & external design encourages community use	0	1	2	3	4	5
Design creates welcoming school	0	1	2	3	4	5

Environmental Design	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Well balanced natural and artificial lighting		0	1	2	3	4	5
Adequate lighting for all day, all year		0	1	2	3	4	5
Lighting which is easily controlled by users		0	1	2	3	4	5
Thermal comfort for all day, all year		0	1	2	3	4	5
Temperature which is easily controlled by users		0	1	2	3	4	5
Acoustic performance in the different areas	Planning & materials	0	1	2	3	4	5
Well balanced natural and mechanical ventilation		0	1	2	3	4	5
Adequate ventilation (good air quality) for all day, all year		0	1	2	3	4	5
Ventilation which is easily controlled by users		0	1	2	3	4	5
Environment which enhances pupils' motivation and achievement		0	1	2	3	4	5
Well controlled relationship between thermal and ventilation		0	1	2	3	4	5
Mechanical Systems which do not disturb the learning activities		0	1	2	3	4	5

	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
Overall building Value for Money	0	1	2	3	4	5

- If you have other requirements which were not mentioned previously, could you specify and rank them in the empty spaces please?

Other Requirements	Description	Not Ask	Not Important	Slightly Important	Important	Very important	Extremely important
		0	1	2	3	4	5
		0	1	2	3	4	5

- **Are you interested to participate in the next stage of the research for example: another questionnaire or interviews?**

  Yes ☐   **No** ☐

- **Are you interested in receiving the results of this research?**

  Yes ☐   **No** ☐

If **Yes** please give contact details of yours

Address:

……………………………………………………………………………

……………………………………………………………………………

Email:

……………………………………………………………………………

Thank you for your valuable time in completing this survey

Code No:

Corrected Item-Total Correlation	Accommodation R	Design F & A	Architectural Q	External School	Operation	Accessibility	Sustainability	Building Organisation	Health and safety and security	Building Performance	Community Involvement	Environmental Design	Total Satisfaction
The provision of internal teaching and learning spaces	.446												.478
The provision of external learning spaces	.470												.432
The provision of internal non-teaching spaces	.701												.542
The provision of external spaces for non-learning purposes	.679												.607
The provision of internal physical and sport spaces	.643												.557
The provision of external physical and sport spaces	.641												.546
The provision of spaces for internal & external movement	.514												.397
The provision of internal & external spaces for social activities	.757												.582
The provision of ancillary spaces	.518												.392
The provision of service facilities	.500												.480

Well proportioned internal & external spaces	.650												.660
Spatial arrangements that enhance student creativity	.636												.559
Spaces for community use and out of hours use	.598												.636
Attractiveness of spaces	.719												.739
Spaces which enhance variety of learning	.719												.684
Spaces and design that fulfill the curriculum needs	.577												.545
Shared sports spaces to meet needs of the proposed school and other schools	.394												.457
Design of site (site layout) is adaptable		.485											.416
Flexibility of design and spaces		.485											.526
Attractive and appealing internal appearance			.786										.730
Attractive and appealing external appearance			.812										.729
Design which achieves diversity of use			.627										.554

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13
Good neighbourhood identity (Building is a centre of community)			.719										.692
Design which gives a homely feeling			.416										.358
Internal and external planning efficiency			.638										.508
Design which achieves ease of building use			.570										.663
High profile public presence			.511										.488
Importance of location of building on the site			.601										.641
Design which creates pleasurable environment for students to study			.648										.656
Integration of engineering services within design			.552										.546
Outdoor learning environmental features				.568									.670
Dedicated designed landscaping				.523									.547
Site is large enough and designed well to meet educational needs				.507									.608
Exterior design indicates the interior function				.401									.386
Minimise maintenance cost					.746								.568

Minimise energy cost					.526									.464
Ease of building and site maintenance					.580									.535
Inclusive internal & external access for all						.665								.602
Design attains ease of movement through building & site for all						.759								.723
Entrance is welcoming and easily identified						.651								.680
Access for public and private transportation						.347								.460
The provision of design adheres to way finding principles						.605								.594
High standard of environmental features for people with disabilities						.630								.642
Internal & external circulation satisfy people with disabilities						.759								.733
Inclusion of welfare spaces to support people with disabilities						.741								.690
Specific design features for people with disabilities						.757								.712
Durable elements & components (Long life)							.496							.701
Efficient energy usage							.677							.677

Maximising the use of natural daylight						.729						.751
Maximising the use of natural ventilation						.735						.687
Sustainable materials specified						.753						.704
Adaptable to climate change						.527						.493
Minimising the mechanical & electrical systems						.517						.323
Design attains a good relationship between spaces (Spatial relationship)							.704					.662
Well organised site							.689					.736
The disposition of spaces and activities relate to patterns of use							.699					.627
Linking well between indoors and outdoors							.728					.667
Design which allows for internal & external supervision of users								.714				.604
Safe & secure internal & external movement								.779				.665
Safe & secure building entrance								.742				.641
Clear boundaries of the site								.730				.398
Safe approach to the school								.705				.464

Item													
Well supervised personal spaces									.455				.460
Adequate security for community use									.673				.548
Safe site is created									.733				.560
Design that accommodates good ICT infrastructure										.626			.701
Design enhances learning and teaching performance										.730			.642
Internal & external design enhances student motivation										.738			.649
Internal & external design enhances social activities										.725			.708
Design gets overall client and user satisfaction										.437			.542
Building makes the most of site features & topography										.553			.647
School encourages interactive relationship with community organisations											.801		.663
Easy and adequate physical access for community											.850		.646
Internal & external design encourages community use											.796		.614
Design creates welcoming school											.612		.746

Well balanced natural and artificial lighting													.727	.739
Adequate lighting for all day, all year													.788	.775
Lighting which is easily controlled by users													.646	.593
Thermal comfort for all day, all year													.756	.739
Temperature which is easily controlled by users													.610	.559
Acoustic performance in the different areas													.798	.787
Well balanced natural and mechanical ventilation													.751	.769
Adequate ventilation (good air quality) for all day, all year													.809	.772
Ventilation which is easily controlled by users													.675	.595
Environment which enhances pupils' motivation and achievement													.626	.730
Well controlled relationship between thermal comfort and ventilation													.717	.802
Mechanical systems which do not disturb the learning activities													.632	.668
Overall building value for money														.228

Table 6.6 Corrected item-total correlation among the items and the general variables

Design & Engineering Variables	Variables' codes
The provision of internal teaching and learning spaces	**ACCOM1**
The provision of external learning spaces	**ACCOM2**
The provision of internal non-teaching spaces	**ACCOM3**
The provision of external spaces for non-learning purposes	**ACCOM4**
The provision of internal physical and sport spaces	**ACCOM5**
The provision of external physical and sport spaces	**ACCOM6**
The provision of spaces for internal & external movement	**ACCOM7**
The provision of internal & external spaces for social activities	**ACCOM8**
The provision of ancillary spaces	**ACCOM9**
The provision of service facilities	**ACCOM10**
Well proportioned internal & external spaces	**ACCOM11**
Spatial arrangements that enhance student creativity	**ACCOM12**
Spaces for community use and out of hours use	**ACCOM13**
Attractiveness of spaces	**ACCOM14**
Spaces which enhance variety of learning	**ACCOM15**
Spaces and design that fulfil the curriculum needs	**ACCOM16**
Shared sport spaces to meet needs of the proposed school and other schools	**ACCOM17**
Design of site (site layout) is adaptable	**DESIGN1**
Flexibility of design and spaces	**DESIGN2**
Attractive and appealing internal appearance	**ARCHD1**
Attractive and appealing external appearance	**ARCHD2**
Design which achieves diversity of use	**ARCHD3**
Good neighbourhood identity (Building is a centre of community)	**ARCHD4**
Design which gives a homely feeling	**ARCHD5**
Internal and external planning efficiency	**ARCHD6**
Design which achieves ease of building use	**ARCHD7**
High profile public presence	**ARCHD8**
Importance of location of building on the site	**ARCHD9**
Design which creates pleasurable environment for students to study	**ARCHD10**
Integration of engineering services within design	**ARCHD11**
Outdoor learning environmental features	**EXTER1**
Dedicated designed landscaping	**EXTER2**
Site is large enough and designed well to meet educational needs	**EXTER3**
Exterior design indicates the interior function	**EXTER4**
Minimise maintenance cost	**OPER1**
Minimise energy cost	**OPER2**
Ease of building and site maintenance	**OPER3**
Inclusive internal & external access for all	**ACCESS1**
Design attains ease of movement through building & site for all	**ACCESS2**
Entrance is welcoming and easily identified	**ACCESS3**
Access for public and private transportation	**ACCESS4**
The provision of design adheres to way finding principles	**ACCESS5**
High standard of environmental features for people with disabilities	**ACCESS6**
Internal & external circulation satisfy people with disabilities	**ACCESS7**
Inclusion of welfare spaces to support people with disabilities	**ACCESS8**
Specific design features for people with disabilities	**ACCESS9**
Durable elements & components (Long life)	**SUSTAIN1**
Efficient energy usage	**SUSTAIN2**
Maximising the use of natural day light	**SUSTAIN3**
Maximising the use of natural ventilation	**SUSTAIN4**
Sustainable materials specified	**SUSTAIN5**
Adaptable to climate change	**SUSTAIN6**
Minimising the mechanical & electrical systems	**SUSTAIN7**
Design attains a good relationship between spaces (Spatial relationship)	**PLAN1**
Well organised site	**PLAN2**
The disposition of spaces and activities relate to patterns of use	**PLAN3**
Linking well between indoors and outdoors	**PLAN4**
Design which allows for internal & external supervision of users	**SAFETY1**

Safe & secure internal & external movement	**SAFETY2**
Safe & secure building entrance	**SAFETY3**
Clear boundaries of the site	**SAFETY4**
Safe approach to the school	**SAFETY5**
Well supervised personal spaces	**SAFETY6**
Adequate security for community use	**SAFETY7**
Safe site is created	**SAFETY8**
Design that accommodates good ICT infrastructure	**PERFOR1**
Design enhances learning and teaching performance	**PERFOR2**
Internal & external design enhances student motivation	**PERFOR3**
Internal & external design enhances social activities	**PERFOR4**
Design gets the overall client's and users' satisfaction	**PERFOR5**
Building makes the most of site features & topography	**PERFOR6**
School encourages interactive relationship with community organisations	**COMM1**
Easy and adequate physical access for community	**COMM2**
Internal & external design encourages community use	**COMM3**
Design creates welcoming school	**COMM4**
Well balanced natural and artificial lighting	**ENVIRO1**
Adequate lighting for all day, all year	**ENVIRO2**
Lighting which is easily controlled by users	**ENVIRO3**
Thermal comfort for all day, all year	**ENVIRO4**
Temperature which is easily controlled by users	**ENVIRO5**
Acoustic performance in the different areas	**ENVIRO6**
Well balanced natural and mechanical ventilation	**ENVIRO7**
Adequate ventilation (good air quality) for all day, all year	**ENVIRO8**
Ventilation which is easily controlled by users	**ENVIRO9**
Environment which enhances pupils' motivation and achievement	**ENVIRO10**
Well controlled relationship between thermal comfort and ventilation	**ENVIRO11**
Mechanical Systems which do not disturb the learning activities	**ENVIRO12**
Overall building Value for Money	**VFM**

Table 6.15.1 The various design & engineering variables with their codes

	ACCOM1	ACCOM5	ACCOM6	ACCOM16	DESIGN2	OPER2	ACCESS1	ACCESS2	ACCESS7	SUSTAIN2	SUSTAIN3	SUSTAIN4	SAFETY2	SAFETY3	SAFETY8	PERFOR1	PERFOR2	PERFOR5	ENVIRO4	ENVIRO8	VFM
ACCOM1		131	132	134	134	130	132	134	132	134	134	134	132	133	132	132	133	133	134	133	123
ACCOM2	134	131	132	134	134	130	132	134	132	134	134	134	132	133	132	132	133	133	134	133	123
ACCOM3	133	130	131	133	133	129	131	133	131	133	133	133	131	132	131	131	132	132	133	132	122

431

ACCOM4	ACCOM5	ACCOM6	ACCOM7	ACCOM8	ACCOM9	ACCOM10	ACCOM11	ACCOM12	ACCOM13	ACCOM14
123	120	121	122	122	122	122	121	121	122	122
133	130	131	132	132	132	131	131	131	132	131
134	131	132	133	133	133	132	132	132	133	132
133	130	131	132	132	132	131	131	131	132	131
133	131	132	133	133	133	131	130	131	132	130
134	130	131	132	132	132	132	131	131	131	131
133	131	132	133	133	133	131	130	130	131	130
133	130	131	132	132	132	131	131	131	132	131
132	129	130	131	131	131	130	130	130	131	130
132	130	131	132	132	132	130	131	132	133	132
132	131	131	131	131	131	130	130	130	131	130
133	131	132	132	132	132	131	131	131	132	131
134	131	132	133	133	133	132	132	132	133	132
134	131	132	133	133	133	132	132	132	133	132
132	130	131	131	131	131	130	131	130	131	130
134	131	132	133	133	133	132	132	132	133	132
134	131	132	133	133	133	132	132	132	133	132
130	127	128	129	129	129	128	128	128	129	128
132	129	130	131	131	131	130	130	130	131	130
134	131	132	133	133	133	132	130	131	131	130
134	131	132	133	133	133	132	132	128	129	129
134	131	132	133	133	133	132	132	132	133	132
134	131	132	133	133	133	132	132	132	133	132
131			130	130	130	129	130	130	130	129
132	131	132	131	131	131	130	131	131	131	130
134	131	132	133	133	133	132	132	132	133	132

ACCOM15	ACCOM16	ACCOM17	DESIGN1	DESIGN2	ARCHD1	ARCHD2	ARCHD3	ARCHD4	ARCHD5	ARCHD6	ARCHD7
119	123	121	123	123	123	123	123	123	121	123	106
129	133	131	133	133	133	133	133	133	131	133	113
130	134	132	134	134	134	134	134	134	132	134	114
129	133	131	133	133	133	133	133	133	131	133	113
130	134	132	134	134	134	134	134	134	132	134	114
129	133	130	133	133	133	133	133	133	130	133	113
129	132	130	132	132	132	132	132	132	130	132	112
129	132	130	132	132	132	132	132	132	130	132	112
130	133	131	133	133	133	133	133	133	131	133	113
128	132	130	132	132	132	132	132	132	130	132	112
130	134	132	134	134	134	134	134	134	132	134	114
130	134	132	134	134	134	134	134	134	132	134	114
130	134	132	134	134	134	134	134	134	132	134	114
129	132	130	132	132	132	132	132	132	130	132	112
130	134	132	134	134	134	134	134	134	132	134	114
128	132	130	132	132	132	132	132	132	130	132	112
129	132	130	132	132	132	132	132	132	130	132	113
130	134	132	134	134	134	134	134	134	132	134	114
130	134	132	134	134	134	134	134	134	132	134	114
126	130	128	130	130	130	130	130	130	128	130	112
128	132	130	132		132	132	132	132	130	132	113
130	134	132	134	134	134	134	134	134	132	134	114
129		130	132	132	132	132	132	132	130	132	112
130	132	130	132	132	132	132	132	132	130	132	112
128	131	129	131	131	131	131	131	131	129	131	111
130	134	132	134	134	134	134	134	134	132	134	114

ARCHD8	ARCHD9	ARCHD10	ARCHD11	EXTER1	EXTER2	EXTER3	EXTER4	OPER1	OPER2	OPER3	ACCESS1
122	123	122	123	122	120	121	121	120	119	120	121
132	133	132	133	132	129	131	131	130	129	130	131
133	133	133	133	132	130	131	131	130	129	130	131
132	132	132	132	132	129	132	132	131	130	131	132
133	134	133	134	133	130	132	132	131	130	131	132
132	132	132	133	132	129	131	131	130	129	130	130
131	132	131	132	131	129	130	130	129	128	129	130
133	134	133	134	133	130	132	132	131	130	131	132
133	134	133	134	133	130	132	132	131	130	131	132
133	134	133	134	133	130	132	132	131	130	131	132
132	132	131	132	131	130	131	131	129	128	129	130
133	134	133	134	133	130	132	132	131	130	131	132
133	134	133	134	133	130	132	132	130	130	131	132
132	132	132	132	132	129	132	132	131	130	131	132
132	133	132	133	132	129	131	131	130	129	130	130
132	132	131	132	131	129	130	130	129	128	129	129
132	132	131	132	131	130	130	130	130	129	130	130
131	132	131	132	131	128	130	130	129		129	132
129	130	129	130	129	126	128	128	130	130		129
131	132	131	132	131	128	130	130	131	130	130	
133	134	133	134	133	130	132	132	131	130	131	132
132	132	131	132	131	129	130	130	129	128	129	130
131	131	130	131	130	128	129	129	128	127	128	129
133	134	133	134	133	130	132	132	131	130	131	132

ACCESS2	ACCESS3	ACCESS4	ACCESS5	ACCESS6	ACCESS7	ACCESS8	ACCESS9	SUSTAIN1	SUSTAIN2	SUSTAIN3	SUSTAIN4
134	133	133	131	134	132	133	134	134	134	134	134
131	130	131	129	131	130	130	131	131	131	131	131
132	131	132	130	132	131	131	132	132	132	132	132
134	133	133	131	134	132	133	134	134	134	134	134
134	133	133	131	134	132	133	134	134	134	134	134
130	129	129	127	130	128	129	130	130	130	130	130
132	131	131	129	132	130	131	132	132	132	132	132
	133	133	131	134	132	133	134	134	134	134	134
132	131	132	129	132		131	132	132	132	132	132
134	133	133	131	134	132	133	134	134		134	134
134	133	133	131	134	132	133	134	134	134		134
134	133	133	131	134	132	133	134	134	134	134	
132	131	131	129	132	130	131	132	132	132	132	132
133	132	132	130	133	131	132	133	133	133	133	133
132	131	132	129	132	131	131	132	132	132	132	132
132	131	132	129	132	131	131	132	132	132	132	132
133	132	133	130	133	132	132	133	133	133	133	133
133	132	132	130	133	131	132	133	133	133	133	133
134	133	133	131	134	132	133	134	134	134	134	134
133	132	132	130	133	131	132	133	133	133	133	133
133	132	132	130	133	131	132	133	133	133	133	133
134	133	133	131	134	132	133	134	134	134	134	134
133	130	131	129	131	130	130	131	131	131	131	131
123	123	122	120	123	122	122	123	123	123	123	123

435

SUSTAIN5	SUSTAIN6	SUSTAIN7	PLAN1	PLAN2	PLAN3	PLAN4	SAFETY1	SAFETY2	SAFETY3	SAFETY4	SAFETY5
123	122	122	123	123	122	123	122	121	122	121	122
133	132	132	133	133	132	133	133	132	133	132	133
134	133	133	134	134	133	134	133	132	133	132	133
133	132	132	133	132	132	133	132	131	132	131	132
133	133	133	133	133	132	133	132	131	132	131	132
132	132	132	133	133	132	133	132	131	132	131	132
132	132	132	132	132	131	132	132	131	132	131	132
133	133	133	133	133	132	133	133	132	133	132	133
132	131	131	132	132	131	132	132		132		132
134	133	133	134	134	133	134	133	132	133	132	133
134	133	133	134	134	133	134	133	132	133	132	133
132	132	132	132	132	131	132	131	130	131	131	133
134	133	133	134	134	133	134	133	132	133	132	133
132	132	132	132	132	131	132	131	130	131	131	133
134	133	133	134	134	133	134	133	132	133	132	133
130	129	129	130	130	129	130	129	128	129	128	129
134	133	133	134	134	133	134	133	132	133	132	133
134	133	133	134	134	133	134	133	132	133	132	133
132	132	132	132	131	131	132	131	130	131	130	131
131	131	131	131	131	130	131	130	129	130	129	130
134	133	133	134	134	133	134	133	132	133	132	133

SAFETY6	SAFETY7	SAFETY8	PERFOR1	PERFOR2	PERFOR3	PERFOR4	PERFOR5	PERFOR6	COMM1	COMM2	COMM3
122	122	121	121	122	122	122	122	123	122	122	123
133	133	132	132	132	132	132	133	133	132	132	133
133	133	132	132	133	133	133	133	134	133	133	134
132	131	131	131	132	132	132	132	133	132	133	133
132	132	132	132	133	133	133	133	133	132	132	133
132	132	132	132	133	133	133	133	133	131	131	132
132	132	131	131	131	131	131	131	132	131	131	132
132	132	132	132	133	133	133	133	133	132	132	133
133	133	132	132	133	133	133	133	134	133	133	134
133	133	132	132	133	133	133	133	134	133	133	134
133	133	132	132	133	133	133	133	134	133	133	134
131	131	131	131	131	131	131	131	132	131	131	132
132	132	132	132	132	132	132	132	132	131	131	132
132	132							133	132	132	133
132	132	132	132	132	133	133	133	133	132	132	133
132	132	132	132	132	132	132		132	132	132	132
132	132						131	132	131	131	132
133	133	132	132	132	132	132	132	133	132	132	133
132	132	131	131	131	131	131	131	132	131	131	132
132	132	132	132	133	133	133	133	134	133	133	134
133	133	132	132	133	133	133	133	134	133	133	134
133	133	132	132	133	133	133	133	132	131	131	132
131	131	130	130	131	131	131	131	132	131	131	132
129	129	128	128	129	129	129	129	130	129	129	130
133	133	132	132	133	133	133	133	133	133	133	134
133	133	132	132	133	133	133	133	134	133	133	134
131	131	131	131	132	133	133	133	134	133	133	134
130	131	131	131	132	132	132	131	132	131	131	132
133	133	132	132	133	133	133	133	134	133	133	134
130	130	130	130	131	131	131	130	131	130	130	131
133	133	132	132	133	133	133	133	134	133	133	134

437

COMM4	ENVIRO1	ENVIRO2	ENVIRO3	ENVIRO4	ENVIRO5	ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11
123	122	123	123	123	123	121	122	122	123	122	123
133	132	133	133	133	133	132	132	133	133	132	133
134	133	134	134	133	134	133	133	134	134	133	134
133	132	133	133	133	133	131	132	132	133	132	133
133	132	133	133	133	133	131	132	132	133	132	133
132	131	132	132	132	132	131	132	132	132	132	132
132	131	132	132	132	132	131	131	132	132	131	132
133	132	133	133	133	133	132	132	133	133	132	133
132	131	132	132	132	132	131	132	132	132	131	132
132	131	132	132	132	132	131	132	132	132	131	132
134	133	134	134	134	134	132	133	133	134	133	134
134	133	134	134	134	134	132	133	133	134	133	134
132	131	132	132	132	132	131	132	132	133	132	133
134	133	134	134	134	134	132	133	133	134	133	134
134	133	134	134	134	134	132	133	133	134	133	134
132	133	132	132	132	132	132	133	133	132	133	132
130	130	130	130	130	130	128	129	129	130	129	130
132	132	132	132	132	132	130	130	130	132	131	132
134	133	134	134	134	134	132	133	133	134	133	134
134	133	134	134	134	134	132	133	133	134	133	134
130	130	130	130		130	130	130		131	131	131
133	132	132	132	132	132	130	131	131	132	132	132
133	131	132	132	132	132	129	130	131	132	132	132
134	133	134	134	134	134	132	133	133	134	133	133
133	132	133	133	134	133	132	133	133	133	133	134
132	131	132	132	133	132	131	132	132	132	132	132
132	131	132	132	132	132	131	131	131	132	132	132
133	132	133	133	132	133	132	132	132	133	132	132
134	133	134	134	134	134	133	133	133	134	133	134
132	131	132	132	131	132	130	130	130	132	131	132
131	130	131	131	130	131	129	130	130	131	131	131
134	133	134	134	134	134	132	133	133	134	133	134

ENVIRO12	VFM
123	
133	122
133	122
134	123
133	122
133	122
134	123
132	121
133	122
132	121
132	121
133	122
133	122
132	121
134	123
134	123
134	123
133	122
134	123
130	119
132	121
134	123
134	123
134	123
132	121
131	120
134	123

Table 6.18 Degree of Freedom among the chosen variables and the whole variables set

	ACCOM1	ACCOM2	ACCOM3	ACCOM4	ACCOM5	ACCOM6	ACCOM7
VFM	0.000	0.000	0.000	0.000	0.002	0.000	0.000
ENVIRO8	0.000	0.000	0.000	0.000	0.682	1.000	0.000
ENVIRO4	0.000	0.047	0.000	0.000	0.041	0.141	0.001
PERFOR5	0.000	0.000	0.000	0.000	0.927	0.777	0.000
PERFOR2	0.000	0.000	0.000	0.000	0.013	0.011	0.000
PERFOR1	0.000	0.002	0.000	0.000	0.488	0.786	0.000
SAFETY8	0.000	0.013	0.000	0.000	0.155	0.275	0.001
SAFETY3	0.000	0.000	0.000	0.000	0.520	0.923	0.000
SAFETY2	0.000	0.001	0.000	0.000	0.294	0.678	0.000
SUSTAIN4	0.000	0.002	0.000	0.000	0.501	0.855	0.000
SUSTAIN3	0.000	0.000	0.000	0.000	0.916	0.558	0.000
SUSTAIN2	0.000	0.000	0.000	0.000	0.158	0.056	0.000
ACCESS7	0.000	0.024	0.000	0.000	0.045	0.117	0.001
ACCESS2	0.000	0.000	0.000	0.000	0.917	0.586	0.000
ACCESS1	0.000	0.000	0.000	0.000	0.091	0.052	0.000
OPER2	0.000	0.001	0.000	0.000	0.628	0.867	0.000
DESIGN2	0.000	0.035	0.000	0.000	0.048	0.147	0.002
ACCOM16	0.000	0.000	0.000	0.000	0.001	0.000	0.000
ACCOM6	0.000	0.000	0.000	0.000	0.495		0.000
ACCOM5	0.000	0.000	0.000	0.000		0.495	0.000
ACCOM1		0.000	0.000	0.000	0.000	0.000	0.000

ACCOM8	ACCOM9	ACCOM10	ACCOM11	ACCOM12	ACCOM13	ACCOM14	ACCOM15	ACCOM16	ACCOM17	DESIGN1
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.492	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.542	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.004	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.025	0.001	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.032	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.214	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022	0.014	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.013	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

DESIGN2	ARCHD1	ARCHD2	ARCHD3	ARCHD4	ARCHD5	ARCHD6	ARCHD7	ARCHD8	ARCHD9	ARCHD10	ARCHD11
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.195	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.016	0.000
0.931	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.000	0.000	0.457	0.000
0.079	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.006	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.282	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.044	0.000
0.740	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.000	0.000	0.235	0.000
0.188	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.048	0.000
0.403	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.083	0.000
0.217	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.022	0.000
0.061	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.002	0.000
0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.930	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.000	0.000	0.319	0.000
0.078	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000
0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.017	0.000
0.325	0.000	0.000	0.000	0.000	0.000	0.000	0.032	0.000	0.000	0.410	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.147	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.027	0.000
0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

EXTER1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EXTER2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EXTER3	0.000	0.001	0.039	0.000	0.000	0.005	0.020	0.001	0.004	0.044	0.000	0.000	0.000	0.000	0.000	0.002	0.059	0.000	0.001	0.000	0.000	0.000
EXTER4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OPER1	0.000	0.010	0.120	0.000	0.000	0.020	0.079	0.003	0.004	0.012	0.001	0.000	0.097	0.001	0.000	0.000	0.098	0.000	0.002	0.001	0.000	0.000
OPER2	0.001	1.000	0.177	0.603	0.014	0.809	0.323	0.935	0.859	0.931	0.569	0.039	0.248	0.616	0.057		0.325	0.014	0.867	0.628	0.000	0.000
OPER3	0.000	0.059	0.576	0.003	0.000	0.114	0.331	0.044	0.063	0.075	0.019	0.000	0.415	0.017	0.001	0.051	0.427	0.000	0.023	0.011	0.000	0.000
ACCESS1	0.134	0.015	0.000	0.144	0.621	0.011	0.004	0.057	0.028	0.042	0.159	0.832	0.000	0.043		0.057	0.004	0.250	0.052	0.091	0.000	0.000
ACCESS2	0.005	0.411	0.026	0.032	1.000	0.261	0.065	0.395	0.275	0.501	0.921	0.145	0.013		0.043	0.616	0.078	0.013	0.586	0.917	0.000	0.000
ACCESS3	0.000	0.131	0.925	0.054	0.000	0.235	0.727	0.181	0.335	0.156	0.013	0.000	0.851	0.012	0.000	0.137	0.879	0.000	0.167	0.068	0.000	0.000
ACCESS4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ACCESS5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

ACCESS6	ACCESS7	ACCESS8	ACCESS9	SUSTAIN1	SUSTAIN2	SUSTAIN3	SUSTAIN4	SUSTAIN5	SUSTAIN6	SUSTAIN7	PLAN1
0.000	0.000	0.000	0.000	0.000	0.044	0.011	0.001	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.070	0.032	0.460	0.924	0.000	0.000	0.000	0.002
0.000	1.000	0.004	0.012	0.719	0.000	0.017	0.113	0.000	0.000	0.000	0.131
0.000	0.000	0.000	0.000	0.032	0.460	0.159	0.931	0.000	0.000	0.000	0.002
0.000	0.029	0.000	0.000	0.006	0.118	0.857	0.611	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.455	0.047	0.008	0.000	0.000	0.000	0.020
0.000	0.922	0.004	0.005	0.488	0.002	0.069	0.280	0.000	0.000	0.000	0.075
0.000	0.275	0.000	0.000	0.144	0.023	0.355	0.863	0.000	0.000	0.000	0.010
0.000	0.000	0.000	0.000	0.000	0.021	0.921	0.501	0.000	0.000	0.000	0.000
0.000	0.148	0.000	0.000	0.091	0.013	0.013	0.307	0.000	0.000	0.000	0.005
0.000	0.342	0.000	0.001	0.132	0.034	0.443	1.000	0.000	0.000	0.000	0.020
0.000	0.183	0.000	0.000	0.079	0.102	0.307		0.000	0.000	0.000	0.008
0.000	0.027	0.000	0.000	0.009	0.000	0.102	0.783	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.145		0.021	0.000	0.000	0.000	0.100
0.000	0.013	0.000	0.000	0.020		0.027	0.148	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.589	0.001	0.832	0.042	0.000	0.000	0.000	0.000
0.000	0.930	0.012	0.028		0.039	0.569	0.931	0.000	0.000	0.000	0.120
0.000	0.248	0.001	0.001	0.637	0.214	0.061	0.217	0.000	0.000	0.000	0.018
0.000	0.000	0.000	0.000	0.046	0.056	0.032	0.008	0.000	0.000	0.000	0.000
0.000	0.117	0.000	0.000	0.000	0.158	0.558	0.855	0.000	0.000	0.000	0.004
0.000	0.045	0.000	0.000	0.044	0.001	0.916	0.501	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000

443

PLAN2	PLAN3	PLAN4	SAFETY1	SAFETY2	SAFETY3	SAFETY4	SAFETY5	SAFETY6	SAFETY7	SAFETY8	PERFOR1
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.294	0.520	0.000	0.000	0.000	0.000	0.155	0.488
0.000	0.000	0.000	0.001	0.678	0.923	0.000	0.000	0.000	0.000	0.275	0.786
0.000	0.000	0.000	0.000	0.001	0.004	0.000	0.001	0.000	0.000	0.000	0.001
0.000	0.000	0.000	0.026	0.403	0.188	0.000	0.008	0.000	0.003	0.740	0.282
0.000	0.000	0.000	0.002	0.859	0.935	0.000	0.000	0.000	0.000	0.323	0.809
0.000	0.000	0.000	0.000	0.028	0.057	0.000	0.000	0.000	0.000	0.004	0.011
0.000	0.000	0.000	0.000	0.275	0.395	0.000	0.000	0.000	0.000	0.065	0.261
0.000	0.000	0.000	0.010	0.342	0.183	0.000	0.002	0.000	0.002	0.922	0.275
0.000	0.000	0.000	0.000	0.013	0.034	0.000	0.000	0.000	0.000	0.002	0.023
0.000	0.000	0.000	0.000	0.307	0.443	0.000	0.000	0.000	0.000	0.069	0.355
0.000	0.000	0.000	0.001	0.783	1.000	0.000	0.000	0.000	0.000	0.280	0.863
0.000	0.000	0.000	0.000		0.656	0.000	0.000	0.000	0.000	0.348	0.931
0.000	0.000	0.000	0.000	0.656		0.000	0.000	0.000	0.000	0.158	0.804
0.000	0.000	0.000	0.007	0.348	0.158	0.000	0.000	0.000	0.000		0.472
0.000	0.000	0.000	0.002	0.931	0.804	0.000	0.000	0.000	0.000	0.472	
0.000	0.000	0.000	0.000	0.001	0.003	0.000	0.001	0.000	0.000	0.000	0.001
0.000	0.000	0.000	0.000	0.169	0.386	0.000	0.000	0.000	0.000	0.049	0.382
0.000	0.000	0.000	0.029	0.280	0.148	0.000	0.009	0.000	0.003	0.788	0.245
0.000	0.000	0.000	0.001	0.566	0.927	0.000	0.000	0.000	0.000	0.235	0.699
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001

PERFOR2	PERFOR3	PERFOR4	PERFOR5	PERFOR6	COMM1	COMM2	COMM3	COMM4	ENVIRO1	ENVIRO2	ENVIRO3
0.235	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.003	0.110	0.000	0.533	0.000	0.000	0.000	0.000	0.003	0.005	0.045	0.000
0.110	0.041	0.000	0.927	0.000	0.000	0.000	0.000	0.001	0.029	0.029	0.000
0.000	0.161	0.000	0.777	0.000	0.000	0.000	0.000	0.004	0.028	0.120	0.000
0.853	0.000	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.871	0.000	0.079	0.000	0.000	0.000	0.000	0.208	0.382	0.863	0.000
0.052	0.176	0.000	0.603	0.000	0.000	0.000	0.000	0.013	0.020	0.120	0.000
0.038	0.002	0.000	0.144	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.001	0.036	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.002	0.008	0.000
0.254	0.864	0.000	0.029	0.000	0.000	0.000	0.000	0.167	0.324	0.906	0.000
0.000	0.001	0.000	0.118	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.721	0.021	0.000	0.857	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000
0.000	0.138	0.000	0.611	0.000	0.000	0.000	0.000	0.012	0.010	0.088	0.000
0.158	0.355	0.000	0.169	0.000	0.000	0.000	0.000	0.014	0.070	0.319	0.000
0.003	0.158	0.000	0.386	0.000	0.000	0.000	0.000	0.009	0.028	0.170	0.000
0.355	0.721	0.000	0.049	0.000	0.000	0.000	0.000	0.141	0.319	0.797	0.000
0.001	0.254	0.000	0.382	0.000	0.000	0.000	0.000	0.008	0.040	0.181	0.000
0.138	0.000	0.000	0.052	0.000	0.000	0.000	0.000	0.171	0.294	0.905	0.000
0.008	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.013	0.041	0.000	0.927	0.000	0.000	0.000	0.000	0.001	0.005	0.029	0.000
0.011	0.161	0.000	0.777	0.000	0.000	0.000	0.000	0.004	0.028	0.120	0.000
0.542	0.000	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.871	0.000	0.079	0.000	0.000	0.000	0.000	0.208	0.382	0.863	0.000
0.014	0.176	0.000	0.603	0.000	0.000	0.000	0.000	0.013	0.020	0.120	0.000
0.621	0.002	0.000	0.144	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.032	0.036	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.002	0.008	0.000
0.000	0.864	0.000	0.029	0.000	0.000	0.000	0.000	0.167	0.324	0.906	0.000
0.455	0.001	0.000	0.118	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.047	0.021	0.000	0.857	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000

	ENVIRO4	ENVIRO5	ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12	VFM
VFM	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
ENVIRO8	0.049	0.000	0.000	0.000		0.000	0.089	0.000	0.030	0.002
ENVIRO4		0.000	0.001	0.000	0.049	0.000	0.800	0.001	0.386	0.000
PERFOR5	0.049	0.000	0.327	0.001	0.533	0.000	0.046	0.000	0.005	0.001
PERFOR2	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.235
PERFOR1	0.049	0.000	0.004	0.000	0.699	0.000	0.228	0.000	0.072	0.001
SAFETY2	0.000	0.000	0.000	0.000	0.235	0.000	0.723	0.000	0.272	0.000
SAFETY3	0.245	0.000	0.027	0.000	0.927	0.000	0.230	0.000	0.036	0.000
SAFETY8	0.788	0.000	0.195	0.008	0.566	0.000	0.472	0.000	0.075	0.000
SUSTAIN4	0.148	0.000	0.022	0.000	0.924	0.000	0.178	0.000	0.041	0.001
SUSTAIN3	0.280	0.000	0.065	0.001	0.460	0.000	0.043	0.000	0.005	0.011
SUSTAIN2	0.113	0.000	0.009	0.000	0.032	0.000	0.000	0.865	0.000	0.044
ACCESS7	0.017	0.000	0.000	0.000	0.000	0.000	0.023	0.000	0.003	0.000
ACCESS2	0.000	0.000	0.000	0.000	0.411	0.000	0.035	0.000	0.100	0.005
ACCESS1	1.000	0.000	0.186	0.007	0.015	0.000	0.000	0.000	0.000	0.001
OPER2	0.026	0.000	0.001	0.000	1.000	0.000	0.193	0.000	0.056	0.134
DESIGN2	0.000	0.000	0.000	0.000	0.195	0.000	0.816	0.003	0.410	0.000
ACCOM16	0.177	0.000	0.039	0.000	0.003	0.000	0.000	0.000	0.000	0.492
ACCOM6	0.931	0.000	0.427	0.017	1.000	0.000	0.156	0.000	0.052	0.000
ACCOM5	0.000	0.000	0.000	0.000	0.682	0.000	0.077	0.000	0.020	0.000
ACCOM1	0.141	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.002

Table 6.19 Sig (p value) among the chosen variables and the whole variables set

ACCOM1	3.63	7.591	8.774	7.639	9.241	7.913	5.628	9.188	7.837	7.08	7.416	9.385	7.078	5.623	7.18	8.891	6.896	5.652	10.3	9.311	
ACCOM2	-6.816	-3.605	-2.005	-4.099	-2.507	-3.151	-6.277	-3.442	-3.603	-4.021	-3.182	-2.277	-5.601	-5.185	-3.944	-2.129	-3.433	-6.713	-3.941	-4.293	12.58
ACCOM3	-7.24	-6.07	-4	-5.27	-4.03	-5.83	-8.26	-4.52	-5.07	-6.75	-5.27	-4.57	-7.14	-7.09	-6.4	-3.73	-4.65	-8.58	-6.11	-6.83	14.04
ACCOM4	-11.16	-9.242	-7.604	-9.944	-7.452	-9.294	-11.37	-9.11	-8.398	-9.499	-8.334	-8.645	-11.13	-10.98	-9.574	-7.938	-8.595	-13.48	-10.5	-10.38	18.412
ACCOM5	-3.193	0.411	2.068	0.091	1.429	0.695	-2.515	1.055	0.646	-0.106	0.675	2.023	-1.42	-1.704	-0.104	1.998	0.485	-3.258	0.685	9.311	
ACCOM6	-3.673	0	1.481	-0.284	1.096	0.272	-2.567	0.416	0.096	-0.587	0.183	1.578	-1.929	-1.962	-0.546	1.459	0.168	-3.667	0.685	10.299	
ACCOM7	-6.95	-5.1	-3.41	-4.45	-3.5	-4.75	-6.81	-4.13	-4.84	-5.27	-4.23	-3.51	-6.21	-5.88	-5.13	-3.13	-4.06	-7.37	5.219	5.532	11.62
ACCOM8	-8.838	-8.467	-6.435	-6.495	-5.645	-8.378	-11.12	-6.39	-6.899	-8.476	-7.272	-6.623	-9.408	-8.882	-8.442	-5.778	-6.29	-11.44	8.126	8.479	15.969
ACCOM9	-9.665	-6.599	-4.941	-6.552	-5.788	-5.9	-9.502	-6.45	-7.066	-7.161	-6.214	-5.241	-8.087	-7.684	-6.886	-5.114	-6.103	-9.194	7.639	7.787	15.47
ACCOM10	-12.35	-9.438	-7.873	-10.14	-8.352	-8.326	-12.21	-9.526	-10.02	-10.58	-9.658	-8.637	-11.2	-10.7	-9.878	-7.64	-8.484	-11.66	11.324	11.615	18.001
ACCOM11	-7.685	-6.626	-4.328	-5.25	-3.976	-5.267	-8.163	-4.714	-5.488	-6.578	-5.82	-3.917	-6.698	-6.691	-5.828	-3.739	-4.54	-7.753	5.452	5.907	11.98

ACCOM12	ACCOM13	ACCOM14	ACCOM15	ACCOM16	ACCOM17	DESIGN1	DESIGN2	ARCHD1	ARCHD2	ARCHD3
-7.095	-10.06	-8.646	-6.76	-0.69	-13.09	-8.72	-5.12	-8.346	-8.981	-9.303
-6.073	-9.562	-7.427	-3.93	3.015	-12.24	-5.5	-1.3	-6.903	-7.642	-7.684
-3.663	-8.087	-5.171	-2.32	4.218	-12.1	-4.57	0.087	-4.723	-5.297	-6.241
-4.84	-8.454	-6.989	-4.07	2.277	-11.45	-5.87	-1.77	-6.208	-7.062	-7.396
-3.689	-7.773	-5.147	-2.26	3.688	-10.79	-4.61	-0.33	-4.513	-5.411	-6.182
-4.672	-9.791	-6.288	-3.77	3.355	-11.88	-5.16	-1.08	-5.953	-6.598	-7.024
-7.673	-10.69	-9.519	-7.71	0.611	-13.86	-7.37	-3.8	-9.093	-9.184	-10.19
-4.6	-8.566	-6.543	-4.07	2.89	-10.94	-5.57	-1.32	-5.608	-6.425	-6.969
-4.094	-8.837	-6.247	-3.19	3.553	-11.16	-5.3	-0.84	-5.224	-6.085	-6.811
-5.002	-9.064	-6.94	-3.22	2.683	-12.42	-6	-1.24	-6.491	-6.877	-7.362
-5.744	-9.96	-8.032	-3.47	2.166	-13.11	-6.21	-1.89	-7.653	-8.465	-8.637
-6.652	-10.97	-9.602	-6.04	1.248	-13.77	-7.61	-3.27	-9.012	-9.244	-10.14
-3.615	-8.334	-5.223	-2.32	4.378	-11.21	-4.63	-0.09	-5.095	-5.392	-6.344
-5.071	-9.744	-7.048	-4.24	2.524	-12.26	-5.91	-1.78	-7.113	-7.198	-7.897
-6.146	-10.58	-8.095	-5.54	1.156	-12.61	-7.01	-2.96	-7.854	-8.258	-8.843
-4.381	-7.927	-6.513	-3.19	2.487	-10.29	-5.11	-0.99	-6.166	-6.494	-6.403
-3.411	-8.793	-5.304	-2.51	4.588	-10.24	-5.61		4.58	5.384	7.18
-7.708	-12.08	-9.892	-7.46		14.477	8.446	4.588	8.711	9.317	10.06
4.684	9.676	6.987	3.475	-3.667	12.306	6.133	1.459	5.696	6.535	6.981
5.107	9.969	7.14	4.219	-3.258	12.162	6.354	1.998	6.191	6.964	7.552
11.67	15.544	13.58	11.92	5.652	17.818	12.35	8.891	13.83	14.14	13.596

ARCHD4	ARCHD5	ARCHD6	ARCHD7	ARCHD8	ARCHD9	ARCHD10	ARCHD11	EXTER1	EXTER2	EXTER3	EXTER4
-9.166	-18.58	-8.342	-6.732	-15.88	-9.668	-5.636	-7.215	-9.984	-12.83	-6.427	-16.71
-8.901	-17.23	-6.962	-3.006	-14.47	-7.57	-2.438	-6.079	-8.367	-10.95	-3.443	-15.64
-6.67	-15.33	-5.384	-2.005	-14.02	-6.042	-0.746	-4.297	-6.66	-9.564	-2.083	-14.78
-8.065	-16.16	-5.708	-3.179	-14.59	-7.15	-2.033	-5.118	-7.439	-10.44	-2.85	-13.9
-9.936	-18.5	-8.779	-5.415	-16.7	-9.028	-4.53	-7.438	-10.27	-12.96	-6.26	-16.86
-7.484	-17.19	-6.276	-3.527	-13.17	-7.828	-2.772	-6.171	-8.227	-10.93	-4.098	-15.15
-7.455	-16.81	-6.274	-3.179	-13.4	-7.238	-1.745	-5.014	-7.822	-10.65	-2.944	-14.06
-7.352	-16.81	-6.868	-3.352	-13.88	-7.31	-1.992	-5.326	-7.311	-10.29	-3.499	-14.69
-6.68	-15.54	-5.568	-2.489	-12.61	-6.599	-1.194	-4.395	-6.393	-9.154	-2.356	-14.77
-8.393	-16.8	-6.973	-3.551	-14.09	-8.185	-3.151	-6.246	-9.151	-11.56	-4.368	-15.58
-7.177	-15.19	-6.2	-2.823	-13.13	-7.258	-2.309	-5.307	-8.428	-10.73	-3.624	-15.4
-9.572	-18.34	-8.471	-4.923	-15.82	-9.327	-4.772	-7.939	-10.4	-13.15	-5.349	-16.5
-6.425	-15.36	-5.163	-2.401	-13.35	-6.02	-1	-4.756	-6.781	-10.09	-2.033	-14.39
-8.194	-15.69	-6.664	-3.926	-14.18	-7.813	-3.182	-6.368	-7.897	-10.87	-3.61	-14.43
-9.143	-16.76	-7.814	-4.837	-15.32	-9.078	-4.68	-7.372	-9.277	-12.41	-4.887	-14.94
-6.601	-15.18	-5.741	-2.964	-11.99	-6.319	-2.421	-4.88	-6.879	-9.866	-3.203	-13.86
6.851	18.081	5.902	2.17	14.221	6.12	0.827	4.061	7.301	10.124	1.905	14.164
10.66	18.132	9.098	7.28	17.351	10.66	5.135	7.946	10.704	13.523	5.672	15.983
7.508	15.865	6.173	3.505	14.382	7.91	2.23	5.453	8.493	11.724	3.308	15.363
8.101	16.57	6.846	3.678	15.092	8.255	2.516	5.9	9.102	11.671	3.835	15.037
14.61	22.556	14.075	11.057	21.625	14.61	9.329	11.585	16.462	19.26	10.262	20.506

OPER1	OPER2	OPER3	ACCESS1	ACCESS2	ACCESS3	ACCESS4	ACCESS5	ACCESS6	ACCESS7	ACCESS8	ACCESS9
-6.546	-3.567	-5.453	-1.508	-2.836	-4.623	-9.617	-9.655	-6.864	-6.684	-6.684	-6.4
-2.619	0	-1.903	2.471	0.824	-1.519	-6.938	-8.205	-5.319	-4.497	-4.497	-4.301
-1.567	1.357	-0.56	3.624	2.257	-0.094	-5.792	-7.496	-4.071	0	-2.93	-2.55
-3.874	-0.521	-3.069	1.47	0	-1.941	-7.791	-7.642	-5.052	-2.21	-4.362	-4.232
-5.238	-2.485	-4.353	-0.496	-2.161	-4.166	-8.571	-10.64	-6.946	-4.26	-6.212	-5.844
-2.355	0.242	-1.59	2.579	1.13	-1.194	-6.423	-8.189	-4.77	-1.095	-3.772	-3.61
-1.768	0.993	-0.976	2.909	1.858	-0.35	-5.991	-7.146	-3.803	-0.098	-2.913	-2.888
-2.976	0.082	-2.032	1.92	0.853	-1.346	-7.393	-8.154	-4.802	-1.339	-3.819	-3.69
-2.91	0.178	-1.875	2.217	1.096	-0.968	-7.308	-8.009	-4.374	-0.954	-3.606	-3.353
-2.55	0.086	-1.796	2.049	0.675	-1.427	-6.772	-8.121	-5.025	-1.456	-4.088	-3.984
-3.388	-0.571	-2.374	1.416	-0.099	-2.512	-8.004	-8.87	-5.821	-2.236	-4.998	-5.075
-5.475	-2.087	-4.559	0.212	-1.466	-3.59	-9.16	-10.21	-6.917	-3.954	-6.096	-5.86
-1.671	1.16	-0.817	4.007	2.506	-0.188	-6.13	-7.511	-4.863		3.7	3.592
-3.314	-0.502	-2.427	2.045		2.553	7.271	9.505	6.034	2.506	4.948	5.076
-4.586	-1.92	-3.56		2.045	3.693	8.387	9.745	6.809	4.007	6.264	5.826
-3.572		1.966	-1.92	-0.502	1.497	6.755	7.391	4.525	1.16	3.344	3.364
1.666	-0.988	0.798	-2.964	-1.775	0.152	5.568	7.117	4.001	-0.088	2.56	2.218
5.537	2.487	4.697	1.156	2.524	4.127	9.485	10.637	6.837	4.378	6.263	5.964
3.136	0.168	2.305	-1.962	-0.546	1.388	8.354	8.181	4.753	1.578	4.033	3.948
3.361	0.485	2.568	-1.704	-0.104	1.842	8.097	8.79	5.221	2.023	4.471	4.336
10.497	6.896	9.786	5.623	7.18	8.386	15.19	14.039	10.535	9.385	10.866	10.212

SUSTAIN1	SUSTAIN2	SUSTAIN3	SUSTAIN4	SUSTAIN5	SUSTAIN6	SUSTAIN7	PLAN1	PLAN2	PLAN3	PLAN4	SAFETY1
-5.035	-2.037	-2.57	-3.284	-8.373	-9.258	-9.552	-5.372	-7.429	-9.886	-8.682	-7.671
-1.826	2.161	0.741	-0.095	-5.255	-7.148	-6.956	-3.18	-5.775	-8.021	-6.618	-3.501
-0.361	3.785	2.419	1.593	-3.957	-6.088	-6.13	-1.518	-4.355	-7.153	-5.222	-2.213
-2.778	1.574	0.18	-0.509	-5.894	-7.529	-7.607	-3.232	-5.388	-8.962	-7.438	-4.682
-4.387	-0.749	-2.002	-2.708	-8.108	-9.029	-9.177	-5.803	-9.231	-11.94	-8.975	-6.614
-1.77	2.145	0.769	0	-5.354	-7.103	-6.97	-2.672	-5.791	-8.371	-6.162	-4.393
-1.469	2.304	0.928	0.173	-4.482	-6.315	-6.25	-2.629	-5.682	-8.16	-5.724	-3.121
-0.695	3.123	1.836	1.085	-4.488	-6.753	-6.819	-1.796	-4.132	-7.462	-5.359	-2.722
-1.515	2.512	1.026	0.276	-5.201	-6.861	-6.966	-2.345	-4.876	-8.078	-6.702	-4.668
-1.702	2.343	1.156		6.162	7.678	8.327	2.869	5.342	8.394	6.2	3.422
-2.634	1.648		1.156	7.254	8.311	8.349	3.973	6.816	8.935	7.33	4.297
-5.338		1.648	2.343	8.747	9.348	9.208	4.832	8.081	10.693	9.032	5.894
0.542	-3.954	-2.236	-1.456	4.501	6.336	6.411	1.658	4.166	7.121	5.305	2.619
2.363	-1.466	-0.099	0.675	5.929	7.574	7.684	3.69	6.716	8.992	6.706	4.22
3.83	0.212	1.416	2.049	7.009	8.155	8.662	4.885	7.45	9.349	7.76	5.213
2.016	-2.087	-0.571	0.086	4.922	6.908	6.806	2.406	4.599	7.635	5.644	3.132
0.473	-3.269	-1.889	-1.24	3.602	6.766	6.448	1.565	3.954	7.396	5.229	2.246
4.903	1.248	2.166	2.683	7.267	8.944	8.682	5.731	8.635	10.626	9.355	6.292
2.035	-1.929	-0.587	0.183	5.216	6.88	7.014	2.934	5.481	8.429	7.029	4.135
2.372	-1.42	-0.106	0.675	5.773	7.104	7.248	3.647	6.381	9.404	6.717	3.497
10.64	7.078	7.08	7.416	12.015	12.93	12.86	10.246	13.33	15.206	14.306	11.24

SAFETY2	SAFETY3	SAFETY4	SAFETY5	SAFETY6	SAFETY7	SAFETY8	PERFOR1	PERFOR2	PERFOR3	PERFOR4	PERFOR5
-4.805	-3.592	-10.15	-7.278	-8.692	-7.084	-4.344	-3.325	-1.194	-4.803	-9.888	-3.387
-0.576	-0.092	-7.537	-3.898	-6.556	-4.494	-1.194	-0.387	3.042	-1.609	-9.025	0.625
1.085	1.456	-6.143	-2.666	-5.206	-3.063	0.27	1.167	4.258	-0.185	-7.549	1.987
-1.383	-0.869	-8.378	-5.088	-6.906	-5.305	-1.983	-0.877	1.962	-2.1	-8.51	-0.877
-3.4	-3.001	-10.86	-6.747	-9.143	-7.198	-4.205	1.962	-0.877	5.892	13.2	1.962
0.942	1.42	-8.402	-3.546	-6.098	-3.629	-0.722	-3.318	-4.205	1.146	8.6	-0.877
-0.087	0.248	-6.597	-3.764	-5.697	-4.513	1.42	-0.722	-3.318	0.358	7.261	-1.983
	-0.446	8.524	4.591	6.889	4.618	0.942	0.248	-3.001	1.42	8.059	-0.869
-0.446		9.073	4.737	6.467	4.98	1.085	-0.087	-3.4	0.928	7.629	-1.383
0.276	0	7.676	3.92	6.512	4.773	1.836	0.173	-2.708	1.492	8.664	-0.509
1.026	0.769	8.208	4.595	7.504	5.344	3.123	0.928	-2.002	2.329	9.739	0.18
2.512	2.145	9.176	5.907	8.602	6.342	-0.098	2.304	-0.749	3.558	10.7	1.574
-0.954	-1.339	6.689	3.085	5.395	3.143	1.858	-1.095	-4.26	0.172	7.941	-2.21
1.096	0.853	8.159	4.369	7.267	4.816		1.13	-2.161	2.116	9.549	0
2.217	1.92	8.954	5.335	8.072	5.863	2.909	2.579	-0.496	3.212	10.65	1.47
0.178	0.082	7.412	3.834	6.349	4.057	0.993	0.242	-2.485	1.361	7.367	-0.521
-0.838	-1.324	6.031	2.7	5.906	3.022	-0.332	-1.08	-3.798	0.163	6.931	-1.77
3.553	2.89	9.422	6.24	8.853	6.674	3.688	3.355	0.611	4.332	10.87	2.277
0.416	0.096	7.43	4.085	6.342	4.483	1.096	0.272	-2.567	1.411	7.71	-0.284
1.055	0.646	8.447	4.42	6.911	4.883	1.429	0.695	-2.515	2.066	8.458	0.091
9.188	7.837	13.965	11.278	13.226	11.948	9.241	7.913	5.628	8.487	14.57	7.639

452

PERFOR6	COMM1	COMM2	COMM3	COMM4	ENVIRO1	ENVIRO2	ENVIRO3	ENVIRO4	ENVIRO5	ENVIRO6	ENVIRO7
-9.97	-10.33	-9.89	-10.17	-5.97	-5.076	-4.4	-8.672	-4.363	-9.801	-5.197	-6.102
-7.87	-9.945	-9.279	-9.782	-3	-2.851	-2.023	-7.691	-1.991	-9.024	-3.264	-5.503
-6.537	-8.345	-7.341	-8.02	-1.377	-1.055	-0.12	-6.1		8.02	0.985	3.298
8.066	8.864	8.648	8.661	3.382	2.711	2.15	7.291	1.987	8.499	2.907	4.488
9.833	11.986	11.08	11.514	5.714	5.835	4.915	9.206	4.258	10.59	5.493	7.437
7.235	9.371	8.295	9.374	2.713	2.075	1.346	6.65	1.167	9.326	2.233	3.639
6.556	7.698	7.43	7.58	1.479	1	0.257	5.563	0.27	7.668	1.303	2.691
7.579	8.772	8.289	8.58	2.634	2.223	1.38	6.909	1.456	8.264	2.309	3.83
7.33	8.382	8.101	8.283	2.487	1.827	1	6.056	1.085	8.015	1.858	3.332
8.112	9.131	8.735	9.227	2.532	2.604	1.721	6.708	1.593	8.292	2.646	4.238
8.901	10.553	9.774	10.333	3.589	3.902	3.012	8.088	2.419	8.958	3.802	5.693
9.429	11.569	10.66	11.664	5.248	5.353	4.422	9.309	3.785	9.95	4.775	6.8
6.869	8.283	7.905	8.435	1.391	0.99	0.118	5.829	0	7.753	1.328	2.747
9.271	10.154	10.14	10.668	3.955	3.151	2.712	7.578	2.257	9.056	3.318	4.582
9.77	11.476	11.29	11.975	5.296	4.859	4.456	9.502	3.624	10.57	5.085	6.604
6.981	8.515	7.574	8.31	2.516	2.364	1.564	6.929	1.357	8.646	2.084	3.909
6.064	8.186	7.189	8.164	1.266	0.877	0.173	4.944	0.087	6.776	0.798	2.414
9.468	11.393	10.94	11.21	5.981	5.344	4.895	8.951	4.218	10.53	5.174	6.839
7.883	8.994	8.402	8.69	2.97	2.223	1.567	6.68	1.481	8.412	2.351	4.031
8.335	9.719	9.292	9.38	3.435	2.881	2.21	7.174	2.068	8.522	3.003	4.772
14.68	15.267	15.35	15.237	11.423	10.032	9.535	13.05	8.774	13.83	9.969	11.219

ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12	VFM
-3.211	-8.911	-4.347	-6.853	-5.119	
	8.769	1.713	5.252	2.199	-3.211
-1.991	7.046	0.254	3.421	0.87	-4.363
0.625	8.192	2.018	5.438	2.831	-3.387
3.042	10.24	4.215	7.748	4.906	-1.194
-0.387	7.658	1.212	4.198	1.812	-3.325
-0.095	7.387	1.353	4.807	2.067	-3.284
-0.576	7.376	0.722	4.203	1.797	-4.805
-0.092	7.709	1.207	4.679	2.116	-3.592
-1.194	7.086	0.355	3.624	1.104	-4.344
0.741	8.312	2.042	5.731	2.869	-2.57
2.161	9.489	3.645	6.915	4.452	-2.037
-4.497	3.638	-2.292	0.171	-1.655	-6.684
0.824	8.164	2.133	5.533	3.067	-2.836
2.471	9.82	3.579	6.707	4.183	-1.508
0	7.623	1.309	4.196	1.932	-3.567
-1.301	5.804	0.233	3.027	0.826	-5.119
3.015	9.751	4.694	7.07	4.649	-0.69
0	7.195	1.426	4.163	1.958	-3.673
0.411	7.731	1.784	4.866	2.354	-3.193
7.591	13.75	8.111	11.959	8.817	3.63

Table 6.20 T values among the chosen variables and the whole variables set

	ACCOM1	ACCOM2	ACCOM3	ACCOM4
VFM	0.097	0.274	0.300	0.503
ENVIRO8	0.302	0.089	0.218	0.391
ENVIRO4	0.365	0.029	0.107	0.301
PERFOR5	0.305	0.112	0.174	0.426
PERFOR2	0.192	0.229	0.340	0.493
PERFOR1	0.322	0.070	0.206	0.396
SAFETY8	0.393	0.045	0.110	0.296
SAFETY3	0.316	0.089	0.163	0.347
SAFETY2	0.390	0.082	0.135	0.386
SUSTAIN4	0.291	0.070	0.173	0.341
SUSTAIN3	0.272	0.108	0.255	0.402
SUSTAIN2	0.272	0.190	0.277	0.480
ACCESS7	0.400	0.038	0.137	0.362
ACCESS2	0.278	0.104	0.235	0.406
ACCESS1	0.193	0.169	0.277	0.477
OPER2	0.268	0.083	0.144	0.362
DESIGN2	0.371	0.033	0.094	0.320
ACCOM16	0.193	0.252	0.356	0.575
ACCOM6	0.446	0.105	0.222	0.455
ACCOM5	0.398	0.123	0.264	0.451
ACCOM1		0.541	0.597	0.717

0.078	0.001	0.032	0.000	0.046	0.004	0.015	0.003	0.009	0.003	0.000	0.015	0.031	0.000	0.022	0.002	0.030	0.075	0.004		0.398	**ACCOM5**
0.100	0.000	0.016	0.001	0.048	0.001	0.009	0.000	0.001	0.000	0.003	0.027	0.019	0.002	0.029	0.000	0.016	0.092		0.004	0.446	**ACCOM6**
0.284	0.165	0.080	0.130	0.260	0.147	0.086	0.151	0.115	0.118	0.173	0.224	0.086	0.165	0.209	0.113	0.069	0.290	0.172	0.191	0.504	ACCOM7
0.390	0.352	0.237	0.242	0.484	0.349	0.196	0.265	0.238	0.284	0.351	0.400	0.251	0.349	0.376	0.235	0.201	0.496	0.335	0.356	0.657	ACCOM8
0.434	0.248	0.155	0.245	0.406	0.210	0.204	0.274	0.241	0.225	0.278	0.330	0.173	0.263	0.311	0.224	0.164	0.389	0.308	0.318	0.643	ACCOM9
0.555	0.405	0.320	0.440	0.532	0.348	0.349	0.434	0.411	0.414	0.459	0.487	0.365	0.425	0.468	0.360	0.307	0.507	0.497	0.511	0.711	ACCOM10
0.328	0.251	0.124	0.174	0.337	0.176	0.108	0.187	0.146	0.204	0.247	0.254	0.106	0.205	0.255	0.139	0.096	0.313	0.186	0.213	0.521	ACCOM11
0.294	0.220	0.092	0.152	0.308	0.143	0.094	0.139	0.114	0.159	0.200	0.251	0.091	0.163	0.225	0.130	0.081	0.310	0.143	0.167	0.508	ACCOM12
0.453	0.409	0.330	0.351	0.464	0.423	0.316	0.357	0.373	0.382	0.427	0.475	0.346	0.417	0.461	0.328	0.368	0.523	0.417	0.433	0.645	ACCOM13
0.380	0.296	0.168	0.272	0.409	0.233	0.169	0.246	0.231	0.267	0.328	0.411	0.173	0.273	0.335	0.249	0.176	0.426	0.273	0.283	0.583	ACCOM14
0.278	0.107	0.040	0.114	0.314	0.099	0.038	0.085	0.073	0.074	0.113	0.219	0.040	0.121	0.194	0.075	0.046	0.300	0.086	0.122	0.522	ACCOM15

ACCOM16	ACCOM17	DESIGN1	DESIGN2	ARCHD1	ARCHD2	ARCHD3	ARCHD4	ARCHD5	ARCHD6	ARCHD7	ARCHD8
0.004	0.586	0.382	0.176	0.362	0.396	0.413	0.406	0.740	0.361	0.299	0.674
0.064	0.533	0.185	0.013	0.264	0.305	0.307	0.373	0.694	0.267	0.074	0.613
0.117	0.526	0.135	0.000	0.143	0.173	0.225	0.249	0.640	0.178	0.034	0.596
0.038	0.500	0.206	0.023	0.225	0.273	0.291	0.296	0.693	0.228	0.099	0.568
0.003	0.595	0.290	0.098	0.383	0.388	0.438	0.426	0.723	0.367	0.206	0.677
0.079	0.520	0.168	0.009	0.212	0.248	0.272	0.330	0.668	0.198	0.083	0.617
0.093	0.472	0.139	0.001	0.134	0.182	0.225	0.253	0.650	0.190	0.052	0.546
0.059	0.477	0.189	0.013	0.191	0.237	0.267	0.289	0.683	0.262	0.090	0.594
0.087	0.489	0.175	0.005	0.171	0.219	0.260	0.296	0.685	0.230	0.083	0.578
0.051	0.539	0.212	0.011	0.239	0.261	0.288	0.278	0.636	0.223	0.065	0.564
0.034	0.566	0.223	0.026	0.304	0.348	0.358	0.345	0.681	0.266	0.100	0.599
0.011	0.589	0.302	0.074	0.377	0.389	0.434	0.406	0.718	0.349	0.175	0.653
0.127	0.491	0.140	0.000	0.164	0.180	0.234	0.238	0.645	0.168	0.049	0.574
0.045	0.532	0.207	0.023	0.274	0.279	0.318	0.334	0.651	0.249	0.119	0.602
0.010	0.550	0.271	0.062	0.318	0.341	0.372	0.388	0.684	0.316	0.172	0.642
0.045	0.453	0.167	0.007	0.226	0.245	0.240	0.251	0.643	0.202	0.073	0.527
0.136	0.443	0.190		0.135	0.178	0.278	0.259	0.712	0.206	0.040	0.603
	0.614	0.347	0.136	0.362	0.393	0.430	0.459	0.714	0.382	0.317	0.694
0.092	0.538	0.222	0.016	0.197	0.244	0.270	0.299	0.659	0.224	0.099	0.610
0.075	0.534	0.236	0.030	0.226	0.270	0.303	0.334	0.680	0.263	0.109	0.635
0.193	0.706	0.532	0.371	0.588	0.599	0.580	0.614	0.794	0.597	0.517	0.779

ARCHD9	ARCHD10	ARCHD11	EXTER1	EXTER2	EXTER3	EXTER4	OPER1	OPER2	OPER3	ACCESS1	ACCESS2
0.432	0.207	0.297	0.450	0.578	0.254	0.698	0.263	0.097	0.199	0.018	0.061
0.301	0.043	0.217	0.347	0.481	0.083	0.651	0.050	0.000	0.027	0.045	0.005
0.214	0.004	0.121	0.250	0.413	0.032	0.623	0.018	0.014	0.002	0.090	0.037
0.315	0.055	0.223	0.339	0.481	0.114	0.637	0.103	0.002	0.068	0.016	0.000
0.380	0.135	0.294	0.444	0.564	0.230	0.685	0.174	0.046	0.127	0.002	0.034
0.279	0.031	0.166	0.297	0.458	0.059	0.598	0.041	0.000	0.019	0.049	0.010
0.248	0.011	0.128	0.238	0.394	0.041	0.627	0.024	0.008	0.007	0.061	0.025
0.287	0.029	0.176	0.288	0.451	0.085	0.622	0.064	0.000	0.031	0.027	0.005
0.284	0.023	0.160	0.318	0.470	0.063	0.603	0.062	0.000	0.027	0.036	0.009
0.282	0.039	0.174	0.348	0.470	0.090	0.643	0.047	0.000	0.024	0.031	0.003
0.333	0.069	0.225	0.386	0.507	0.126	0.648	0.081	0.003	0.041	0.015	0.000
0.394	0.146	0.320	0.449	0.571	0.178	0.674	0.186	0.032	0.137	0.000	0.016
0.215	0.008	0.146	0.260	0.439	0.031	0.612	0.021	0.010	0.005	0.110	0.045
0.313	0.071	0.232	0.319	0.476	0.090	0.612	0.077	0.002	0.043	0.031	
0.384	0.143	0.292	0.396	0.546	0.155	0.632	0.140	0.028	0.089		0.031
0.235	0.043	0.155	0.268	0.436	0.074	0.600	0.089		0.029	0.028	0.002
0.218	0.005	0.110	0.286	0.441	0.027	0.603	0.021	0.007	0.005	0.062	0.023
0.459	0.165	0.320	0.463	0.584	0.196	0.659	0.190	0.045	0.144	0.010	0.045
0.322	0.037	0.184	0.355	0.516	0.078	0.645	0.071	0.000	0.040	0.029	0.002
0.342	0.046	0.210	0.389	0.516	0.102	0.637	0.081	0.002	0.049	0.022	0.000
0.614	0.396	0.500	0.671	0.740	0.444	0.761	0.457	0.268	0.422	0.193	0.278

ACCESS3	ACCESS4	ACCESS5	ACCESS6	ACCESS7	ACCESS8	ACCESS9	SUSTAIN1	SUSTAIN2	SUSTAIN3	SUSTAIN4	SUSTAIN5
0.148	0.431	0.437	0.277	0.268	0.268	0.250	0.171	0.033	0.051	0.081	0.363
0.017	0.267	0.341	0.175	0.133	0.133	0.122	0.024	0.034	0.004	0.000	0.172
0.000	0.201	0.300	0.110	0.000	0.061	0.046	0.001	0.097	0.042	0.019	0.105
0.028	0.315	0.310	0.161	0.036	0.126	0.119	0.055	0.018	0.000	0.002	0.207
0.116	0.356	0.465	0.266	0.121	0.226	0.204	0.126	0.004	0.052	0.029	0.331
0.011	0.238	0.342	0.147	0.009	0.098	0.090	0.016	0.039	0.006	0.000	0.132
0.001	0.214	0.284	0.099	0.000	0.061	0.059	0.004	0.069	0.025	0.009	0.132
0.014	0.293	0.338	0.148	0.014	0.099	0.093	0.023	0.033	0.004	0.000	0.177
0.007	0.290	0.332	0.127	0.007	0.090	0.078	0.017	0.046	0.008	0.001	0.170
0.015	0.256	0.335	0.159	0.016	0.112	0.106	0.021	0.039	0.010		0.221
0.045	0.325	0.375	0.202	0.036	0.158	0.161	0.049	0.020		0.010	0.282
0.088	0.387	0.443	0.263	0.106	0.218	0.204	0.175		0.020	0.039	0.363
0.000	0.222	0.304	0.152		0.095	0.089	0.002	0.106	0.036	0.016	0.133
0.047	0.284	0.408	0.214	0.045	0.155	0.161	0.040	0.016	0.000	0.003	0.208
0.094	0.349	0.424	0.260	0.110	0.230	0.205	0.100	0.000	0.015	0.031	0.271
0.017	0.261	0.301	0.136	0.010	0.080	0.080	0.030	0.032	0.003	0.000	0.157
0.000	0.189	0.279	0.107	0.000	0.047	0.035	0.002	0.074	0.026	0.011	0.088
0.114	0.403	0.463	0.259	0.127	0.228	0.210	0.152	0.011	0.034	0.051	0.283
0.014	0.346	0.340	0.146	0.019	0.110	0.106	0.030	0.027	0.003	0.000	0.171
0.025	0.334	0.375	0.172	0.031	0.133	0.126	0.041	0.015	0.000	0.003	0.203
0.346	0.634	0.601	0.453	0.400	0.470	0.438	0.458	0.272	0.272	0.291	0.519

SUSTAIN6	SUSTAIN7	PLAN1	PLAN2	PLAN3	PLAN4	SAFETY1	SAFETY2	SAFETY3	SAFETY4	SAFETY5	SAFETY6
0.413	0.428	0.190	0.310	0.445	0.380	0.325	0.160	0.096	0.460	0.303	0.382
0.279	0.268	0.071	0.200	0.328	0.248	0.084	0.003	0.000	0.301	0.103	0.244
0.218	0.220	0.017	0.124	0.278	0.169	0.036	0.009	0.016	0.222	0.051	0.169
0.300	0.305	0.073	0.179	0.378	0.294	0.142	0.014	0.006	0.349	0.164	0.265
0.380	0.388	0.202	0.390	0.519	0.377	0.249	0.081	0.064	0.474	0.256	0.388
0.232	0.228	0.050	0.197	0.337	0.199	0.069	0.000	0.000	0.249	0.087	0.220
0.257	0.260	0.024	0.115	0.298	0.179	0.053	0.007	0.015	0.350	0.097	0.197
0.277	0.269	0.051	0.201	0.347	0.222	0.127	0.002		0.384	0.137	0.263
0.264	0.270	0.040	0.153	0.332	0.254	0.142		0.002	0.357	0.145	0.241
0.307	0.343	0.058	0.176	0.346	0.223	0.081	0.001	0.000	0.309	0.104	0.242
0.342	0.344	0.105	0.257	0.375	0.286	0.122	0.008	0.004	0.338	0.137	0.297
0.397	0.389	0.148	0.328	0.462	0.378	0.207	0.046	0.033	0.389	0.208	0.357
0.233	0.237	0.020	0.116	0.279	0.176	0.050	0.007	0.014	0.255	0.068	0.182
0.301	0.307	0.092	0.252	0.378	0.251	0.118	0.009	0.005	0.335	0.126	0.284
0.337	0.364	0.153	0.296	0.400	0.313	0.172	0.036	0.027	0.381	0.178	0.332
0.270	0.264	0.043	0.140	0.311	0.197	0.071	0.000	0.000	0.300	0.102	0.238
0.256	0.238	0.018	0.104	0.291	0.169	0.037	0.005	0.013	0.216	0.052	0.208
0.376	0.362	0.197	0.358	0.459	0.395	0.229	0.087	0.059	0.402	0.226	0.371
0.264	0.272	0.061	0.185	0.352	0.255	0.085	0.001	0.000	0.298	0.113	0.235
0.278	0.286	0.092	0.237	0.405	0.274	0.116	0.009	0.003	0.356	0.131	0.269
0.557	0.554	0.439	0.570	0.635	0.604	0.487	0.390	0.316	0.596	0.489	0.568

SAFETY7	SAFETY8	PERFOR1	PERFOR2	PERFOR3	PERFOR4	PERFOR5	PERFOR6	COMM1	COMM2	COMM3	COMM4
0.291	0.135	0.084	0.012	0.159	0.445	0.086	0.447	0.467	0.445	0.457	0.225
0.132	0.011	0.001	0.066	0.019	0.382	0.003	0.318	0.428	0.395	0.418	0.063
0.066	0.001	0.010	0.120	0.000	0.300	0.029	0.242	0.344	0.288	0.324	0.014
0.176	0.029	0.006	0.028	0.032	0.354		0.328	0.373	0.362	0.361	0.079
0.282	0.118	0.077		0.207	0.567	0.028	0.421	0.521	0.482	0.499	0.197
0.091	0.004		0.077	0.010	0.359	0.006	0.284	0.401	0.344	0.400	0.053
0.134	0.015	0.004	0.118	0.001	0.285	0.029	0.246	0.311	0.296	0.303	0.016
0.138	0.015	0.000	0.064	0.015	0.330	0.006	0.302	0.368	0.342	0.356	0.050
0.158	0.007	0.000	0.081	0.007	0.308	0.014	0.289	0.349	0.334	0.342	0.045
0.146	0.009	0.000	0.052	0.016	0.361	0.002	0.329	0.385	0.365	0.389	0.046
0.177	0.025	0.006	0.029	0.039	0.416	0.000	0.372	0.456	0.418	0.443	0.088
0.232	0.069	0.039	0.004	0.087	0.463	0.018	0.399	0.502	0.461	0.504	0.170
0.070	0.000	0.009	0.121	0.000	0.323	0.036	0.263	0.344	0.323	0.350	0.014
0.148	0.025	0.010	0.034	0.033	0.407	0.000	0.391	0.437	0.436	0.459	0.105
0.208	0.061	0.049	0.002	0.073	0.464	0.016	0.420	0.501	0.493	0.521	0.175
0.113	0.008	0.000	0.046	0.014	0.296	0.002	0.273	0.360	0.308	0.347	0.046
0.064	0.001	0.009	0.098	0.000	0.265	0.023	0.215	0.335	0.280	0.332	0.012
0.251	0.093	0.079	0.003	0.124	0.471	0.038	0.401	0.494	0.474	0.484	0.211
0.133	0.009	0.001	0.048	0.015	0.311	0.001	0.320	0.382	0.350	0.364	0.063
0.155	0.015	0.004	0.046	0.032	0.353	0.000	0.347	0.421	0.399	0.402	0.083
0.518	0.393	0.322	0.192	0.351	0.615	0.305	0.616	0.637	0.639	0.634	0.493

ENVIRO1	ENVIRO2	ENVIRO3	ENVIRO4	ENVIRO5	ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12
0.174	0.136	0.379	0.134	0.439	0.182	0.234	0.078	0.392	0.134	0.276	0.176
0.058	0.030	0.308	0.029	0.380	0.075	0.187		0.366	0.022	0.172	0.035
0.008	0.000	0.217		0.324	0.007	0.076	0.029	0.270	0.000	0.080	0.006
0.053	0.034	0.286	0.029	0.352	0.061	0.132	0.003	0.335	0.030	0.182	0.057
0.205	0.154	0.389	0.120	0.457	0.187	0.295	0.066	0.441	0.118	0.311	0.153
0.032	0.014	0.251	0.010	0.397	0.037	0.092	0.001	0.308	0.011	0.118	0.024
0.008	0.001	0.190	0.001	0.308	0.013	0.052	0.011	0.276	0.001	0.090	0.009
0.036	0.014	0.264	0.016	0.339	0.039	0.100	0.000	0.309	0.011	0.141	0.033
0.025	0.008	0.217	0.009	0.327	0.026	0.078	0.003	0.292	0.004	0.118	0.024
0.049	0.022	0.251	0.019	0.339	0.050	0.119	0.000	0.289	0.014	0.147	0.031
0.103	0.063	0.328	0.042	0.375	0.099	0.196	0.004	0.340	0.030	0.197	0.058
0.177	0.127	0.393	0.097	0.425	0.147	0.258	0.034	0.402	0.091	0.263	0.129
0.007	0.000	0.205	0.000	0.313	0.013	0.054	0.133	0.091	0.038	0.000	0.020
0.069	0.052	0.300	0.037	0.380	0.077	0.136	0.005	0.332	0.033	0.186	0.066
0.152	0.131	0.406	0.090	0.458	0.166	0.248	0.045	0.422	0.089	0.254	0.117
0.041	0.018	0.270	0.014	0.365	0.033	0.105	0.000	0.309	0.013	0.119	0.028
0.006	0.000	0.154	0.000	0.255	0.005	0.042	0.013	0.201	0.000	0.064	0.005
0.177	0.152	0.374	0.117	0.453	0.169	0.260	0.064	0.415	0.142	0.272	0.139
0.036	0.018	0.253	0.016	0.349	0.041	0.110	0.000	0.282	0.015	0.116	0.028
0.060	0.036	0.282	0.032	0.357	0.065	0.149	0.001	0.313	0.024	0.153	0.041
0.431	0.404	0.560	0.365	0.588	0.430	0.486	0.302	0.585	0.331	0.516	0.367

	VFM
	0.078
	0.134
	0.086
	0.012
	0.084
	0.135
	0.096
	0.160
	0.081
	0.051
	0.033
	0.268
	0.061
	0.018
	0.097
	0.176
	0.004
	0.100
	0.078
	0.097

Table 6.21 Eta Values among the chosen variables and the whole variables set

	ACCOM1	ACCOM2	ACCOM3	ACCOM4	ACCOM5	ACCOM6	ACCOM7	ACCOM8	ACCOM9
VFM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ENVIRO8	yes	yes	yes	yes	No	No	yes	yes	yes
ENVIRO4	yes	yes	yes	yes	No	No	yes	yes	yes
PERFOR5	yes	yes	yes	yes	No	No	yes	yes	yes
PERFOR2	yes	yes	yes	yes	No	No	yes	yes	yes
PERFOR1	yes	yes	yes	yes	No	No	yes	yes	yes
SAFETY8	yes	yes	yes	yes	No	No	yes	yes	yes
SAFETY3	yes	yes	yes	yes	No	No	yes	yes	yes
SAFETY2	yes	yes	yes	yes	yes	yes	yes	yes	yes
SUSTAIN4	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
SUSTAIN3	yes	yes	yes	yes	No	No	yes	yes	yes
SUSTAIN2	yes	yes	yes	yes	No	No	yes	yes	yes
ACCESS7	yes	yes	yes	yes	yes	No	yes	yes	yes
ACCESS2	yes	yes	yes	yes	No	No	yes	yes	yes
ACCESS1	yes	yes	yes	yes	No	No	yes	yes	yes
OPER2	yes	yes	yes	yes	No	No	yes	yes	yes
DESIGN2	yes	yes	yes	yes	yes	yes	yes	yes	yes
ACCOM16	yes	yes	yes	yes	yes	yes	yes	yes	yes
ACCOM6	yes	yes	yes	yes	No		yes	yes	yes
ACCOM5	yes	yes	yes	yes		No	yes	yes	yes
ACCOM1		yes	yes	yes	yes	No	yes	yes	yes

462

ACCOM10	Yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes
ACCOM11	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes
ACCOM12	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes
ACCOM13	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes
ACCOM14	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes
ACCOM15	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes
ACCOM16	No	yes	yes	yes	No	yes	yes	No	yes	Yes	yes	yes	yes	No	yes	yes	yes	yes	yes		yes	yes	yes	yes	
ACCOM17	Yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes		yes	yes	yes	yes	yes	yes	yes
DESIGN1	Yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
DESIGN2	Yes	No	No	No	No	No	yes	No	Yes	No	No	yes	No	No	No	yes	No		yes	yes	yes	No			
ARCHD1	Yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

463

Row																						
ARCHD2	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
ARCHD3	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
ARCHD4	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
ARCHD5	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
ARCHD6	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
ARCHD7	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
ARCHD8	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
ARCHD9	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
ARCHD10	Yes	yes	yes	No	yes	yes	No	yes	yes	Yes	No	yes	No	yes	yes	No	yes	yes	yes	yes	yes	yes
ARCHD11	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
EXTER1	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	
EXTER2	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	

EXTER3	Yes	yes	yes	yes	No	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes
EXTER4	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes
OPER1	Yes	yes	yes	yes	No	yes	yes	No	yes	Yes	yes	yes	No	yes	yes	No	yes	yes	yes	yes	Yes
OPER2	Yes	yes	No	No	yes	No		No	No	yes	No	No	No	yes	No	No	No	No	No	yes	No
OPER3	Yes	yes	yes	yes	No	yes	yes	No	yes	yes	No	No	yes	yes	No	No	yes	No	No	yes	No
ACCESS1	No	yes	No	No	No	yes	No		yes	yes	No	No	No	Yes	yes	No	yes	yes	No	No	No
ACCESS2	Yes	yes	No	No	No	yes	No	No	yes		yes	No	No	No	No	yes	No	No	yes	No	No
ACCESS3	Yes	yes	No	No	No	yes	No	No	yes	yes	No	yes	No	yes	No	No	No	yes	No	No	No
ACCESS4	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes
ACCESS5	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes
ACCESS6	Yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	Yes
ACCESS7	Yes	yes	No	No	No	yes	yes		yes	yes	No	No	No	Yes	yes	No	No	yes	No	yes	Yes

465

ACCESS8	ACCESS9	SUSTAIN1	SUSTAIN2	SUSTAIN3	SUSTAIN4	SUSTAIN5	SUSTAIN6	SUSTAIN7	PLAN1	PLAN2	PLAN3
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
yes	yes	No	yes	No	No	yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	No	No	No	No	yes	yes	yes	yes	yes	yes
yes	yes	yes	No	No	No	yes	yes	yes	No	yes	yes
yes	yes	No	No	No	No	yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	yes	No	No	No	yes	yes	yes	yes	yes	yes
yes	yes	No	yes	yes	yes	yes	yes	yes	No	yes	yes
yes	yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	No	Yes	Yes	No	yes	yes	yes	yes	yes	yes
yes	yes	yes	yes			yes	yes	yes	yes	yes	yes
yes	yes	No	No	No	No	yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	No	No	No	No	yes	yes	yes	No	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	No	No	yes	yes	yes	yes	yes	yes
No	No	No	No	No	No	yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	No	No	No	No	yes	yes	yes	No	yes	yes
yes	yes	yes	yes	No	No	yes	yes	yes	yes	yes	yes
No	yes	yes	yes	No	No	yes	yes	yes	yes	yes	yes
No	yes	yes	No	No	No	yes	yes	yes	No	yes	yes
yes	yes	yes	No	No	No	yes	yes	yes	yes	yes	yes
yes	yes	No	No	No	No	yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	yes	No	No	No	yes	yes	yes	yes	yes	yes
yes	yes	yes	No	No	No	yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

PLAN4	SAFETY1	SAFETY2	SAFETY3	SAFETY4	SAFETY5	SAFETY6	SAFETY7	SAFETY8	PERFOR1	PERFOR2	PERFOR3
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	No
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	yes
yes	yes	No	No	yes	yes	yes	yes	yes	yes	No	yes
yes	yes	yes	yes	yes	yes	yes	yes	No	No	yes	No
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	yes
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	No
yes	yes	No	No	yes	yes	yes	yes	yes	yes	No	No
yes	yes	yes	yes	yes	yes	yes	yes	No	No	yes	yes
Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	Yes	No
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	yes
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes	No	No	No	No
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	No
yes	yes	No	No	yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	No	No	yes	yes	yes	yes	No	No	No	No
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	yes
yes	yes	No	No	yes	yes	yes	yes	yes	yes	No	No
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	No
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	No
Yes	Yes	yes	yes	yes	yes	yes	yes	yes	yes	No	yes
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	No
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	No
yes	yes	No	No	yes	yes	yes	yes	yes	yes	No	yes
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	yes
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	No	No
yes	yes	No	No	yes	yes	yes	yes	No	No	yes	yes
yes	yes	No	No	yes	yes	yes	yes	yes	No	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

467

PERFOR4	PERFOR5	PERFOR6	COMM1	COMM2	COMM3	COMM4	ENVIRO1	ENVIRO2	ENVIRO3	ENVIRO4	ENVIRO5
Yes	yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
yes	No	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	No	yes	yes	yes	yes	yes	yes	yes	yes	No	yes
yes	yes	yes	yes	yes	yes	yes	No	No	yes	No	yes
yes	No	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	No	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	No	yes	yes	yes	yes	No	yes	No	yes	No	yes
yes	No	yes	yes	yes	yes	yes	yes	No	yes	No	yes
Yes	yes	Yes	Yes	Yes	Yes	Yes	Yes	yes	Yes	yes	Yes
yes	No	yes	yes	yes	yes	yes	No	No	yes	No	yes
yes	No	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	No	yes	yes	yes	yes	yes	yes	No	yes	No	yes
yes	No	yes	yes	yes	yes	No	yes	No	yes	No	yes
yes	No	yes	yes	yes	yes	yes	yes	No	yes	No	yes
yes	No	yes	yes	yes	yes	yes	No	No	yes	No	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	No	yes	yes	yes	yes	No	No	No	yes	No	yes
yes	No	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Yes	yes	Yes	Yes	Yes	Yes	yes	No	No	Yes	No	Yes
yes	No	yes	yes	yes	yes	yes	No	No	yes	No	yes
yes	No	yes	yes	yes	yes	No	No	No	yes	No	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	No	yes	yes	yes	yes	yes	yes	yes	yes	No	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

468

ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12	VFM
Yes	Yes	Yes	Yes	Yes	Yes	Yes	
yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	No	yes	No	yes	yes	yes
No	yes	No	yes	No	yes	No	No
yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	No	yes	No	yes	yes	No
No	yes	No	yes	No	No	No	yes
yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	No	yes	No	yes	yes	yes
Yes	Yes	yes	Yes	Yes	Yes	Yes	Yes
No	yes	yes	yes	No	yes	No	yes
yes	yes	No	yes	No	yes	yes	yes
No	yes	No	yes	No	yes	No	yes
yes	yes	No	yes	No	yes	No	yes
yes	yes	No	yes	yes	yes	yes	yes
yes	yes	No	yes	yes	yes	yes	yes
No	yes	No	yes	No	No	No	No
yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	No	yes	yes	yes	yes	yes
No	yes	No	yes	No	No	No	No
yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	No	yes	No	yes	yes	yes
yes	yes	No	yes	No	yes	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes
Yes	Yes	yes	Yes	Yes	Yes	Yes	yes

Table 6.22 Significant differences among the chosen variables and the whole variables set

	ACCOM1	ACCOM2
VFM	Moderate	Large
ENVIRO8	Large	Moderate
ENVIRO4	Large	Small
PERFOR5	Large	Moderate
PERFOR2	Large	Moderate
PERFOR1	Moderate	Moderate
SAFETY8	Large	Small
SAFETY3	Large	Moderate
SAFETY2	Large	Moderate
SUSTAIN4	Large	Moderate
SUSTAIN3	Large	Moderate
SUSTAIN2	Large	Large
ACCESS7	Large	Small
ACCESS2	Large	Moderate
ACCESS1	Large	Large
OPER2	Large	Moderate
DESIGN2	Large	Small
ACCOM16	Large	Large
ACCOM6	Large	Moderate
ACCOM5	Large	Moderate
ACCOM1		Large

ACCOM3	ACCOM4	ACCOM5	ACCOM6	ACCOM7	ACCOM8	ACCOM9	ACCOM10	ACCOM11	ACCOM12	ACCOM13
Large	Large	Moderate	Moderate	Large	Large	Large	Large	Large	Large	Large
Large	Large	None	None	Large	Large	Large	Large	Large	Large	Large
Large	Large	None	None	Large	Large	Large	Large	Moderate	Moderate	Large
Moderate	Large	Small	Small	Moderate	Large	Large	Large	Large	Large	Large
Large	Large	None	None	Moderate	Large	Large	Large	Large	Large	Large
Large	Large	Small	Small	Large	Large	Large	Large	Large	Large	Large
Large	Large	None	None	Large	Large	Large	Large	Moderate	Moderate	Large
Large	Large	None	None	Large	Large	Large	Large	Large	Moderate	Large
Moderate	Large	Small	Small	Moderate	Large	Large	Large	Large	Large	Large
Large	Large	None	None	Large	Large	Large	Large	Large	Large	Large
Large	Large	None	None	Large	Large	Large	Large	Large	Moderate	Large
Moderate	Large	Small	Small	Moderate	Large	Large	Moderate	Moderate	Moderate	Large
Large	Large	None	None	Large	Large	Large	Large	Large	Moderate	Large
Large	Large	None	None	Large	Large	Large	Large	Large	Large	Large
Large	Large	None	None	Moderate	Large	Large	Moderate	Large	Large	Large
Large	Large	None	None	Large	Large	Large	Large	Large	Moderate	Large
Large	Large	Small	Small	Moderate	Large	Large	Large	Large	Moderate	Large
Large	Large	None	None	Large	Large	Large	Large	Moderate	Large	Large
Large	Large	Small	Small	Moderate	Large	Large	Large	Moderate	Large	Large
Moderate	Large	None	None	Large	Large	Large	Large	Large	Large	Large
Large	Large	Small	Small	Moderate	Large	Large	Moderate	Large	Moderate	Large
Large	Large	Moderate	Moderate	Moderate	Large	Large	Large	Moderate	Large	Large
Large	Large	Small	None	Large	Large	Large	Large	Large	Large	Large
Large	Large	None	None	Large	Large	Large	Large	Large	Large	Large
Large	Large	None	None	Large	Large	Large	Large	Large	Large	Large
Moderate	Large	None	None	Large	Large	Large	Large	Large	Large	Large
Large	Large			Large	Large	Large	Large	Large	Large	Large
Large	Large	None	None	Large	Large	Large	Large	Large	Large	Large
Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large

470

ACCOM14	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
ACCOM15	Large	Moderate	Small	Moderate	Moderate	None	Moderate	Large	Small	Moderate	Large	Small	Moderate	Large	Moderate	Small	Moderate	Moderate	Moderate	Moderate	Small	Large	Moderate	Moderate	Large	Large	Moderate	Large
ACCOM16	Large	Moderate	Moderate	Moderate	Small	Small	Moderate	Small	Small	Moderate	Small	Moderate	None	Small	Moderate	Small	Small	Moderate	Moderate	Moderate	Small	Small	Moderate	Moderate	Moderate	Moderate	Moderate	Large
ACCOM17	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
DESIGN1	Large	Large	Large	Large	Large	Moderate	Large	Large	Large	Large	Large	Moderate	Large	Large	Large	Large	Large	Large	Large	Large	Moderate	Large	Large	Large	Large	Large	Large	Large
DESIGN2	Large	Small	Small	Moderate		None	Moderate	Small	None	Moderate	Small	Small	None	Small	None	None	Moderate	None	Small	Small	Moderate	Small	None	Moderate	Moderate	Small	Small	Large
ARCHD1	Large	Large	Large	Large	Moderate	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Moderate	Large	Large	Large	Large	Large	Large	Large
ARCHD2	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
ARCHD3	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
ARCHD4	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
ARCHD5	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
ARCHD6	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ARCHD7	Large	Moderate	Small	Moderate	Large	Moderate	Moderate	Small	Moderate	Large	Moderate	Moderate	Moderate	Moderate	Small	Large	Moderate	Moderate	Large	Moderate	Large	Small	Moderate	Large	Moderate	Moderate	Large	Small	Moderate	Large
ARCHD8	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
ARCHD9	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
ARCHD10	Large	Small	Small	Large	None	Small	Large	Moderate	None	Large	Moderate	Small	Small	Small	Small	Small	Moderate	Small	None	Small	Small	Small	Small	Moderate	Small	Small	Large	Small	Small	Large
ARCHD11	Large	Large	Large	Moderate	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Moderate	Large	Large	Large	Moderate	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
EXTER1	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
EXTER2	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
EXTER3	Large	Moderate	Moderate	Large	Small	Moderate	Large	Moderate	Moderate	Small	Small	Large	Moderate	Moderate	Moderate	Moderate	Small	Large	Moderate	Moderate	Moderate	Moderate	Small	Large	Moderate	Moderate	Large	Moderate	Moderate	Large
EXTER4	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
OPER1	Large	Moderate	Moderate	Large	Small	Moderate	Large	Moderate	Small	Moderate	Moderate	Large	Moderate	Small	Small	Small	Large	Moderate	Moderate	Large	Small	Moderate	Moderate	Moderate	Small	Small	Large	Moderate	Moderate	Large
OPER2	Large	None	None	Small	None	Small	Small	None	None	Small	Small	None	None	None	Small	None	None	Small	Moderate	None	None	None	None	None	None	Small	Large	None	None	Moderate
OPER3	Large	Small	Small	Large	None	None	Small	Moderate	Small	Moderate	Small	Small	Small	Small	None	Small	Small	Small	Moderate	Small	Small	None	Small	Small	None	Small	Large	Small	Small	Large

ACCESS1	ACCESS2	ACCESS3	ACCESS4	ACCESS5	ACCESS6	ACCESS7	ACCESS8	ACCESS9	SUSTAIN1	SUSTAIN2	SUSTAIN3
Small	Moderate	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
Small	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	None
Moderate	None	Small	Large	Large	Large	Small	Moderate	Moderate	Small	Small	None
Small	None	Small	Large	Large	Large	Small	Moderate	Moderate	Small	Small	Small
None	Small	Moderate	Large	Large	Moderate	Moderate	Large	Large	Large	Small	Small
Small	Small	None	Large	Large	Moderate	None	Small	Small	None	Moderate	Small
Small	None	Small	Large	Large	Large	Small	Moderate	Moderate	Small	None	None
Small	Small	Moderate	Large	Large	Large	Moderate	Large	Large	Moderate	Small	Small
Small	Small	Small	Large	Large	Large	Moderate	Large	Large	Small	Moderate	None
Moderate	None	None	Large	Large	Large	Small	Moderate	Moderate	None	Small	Small
Small	None	Small	Large	Large	Large	None	Moderate	Moderate	Large	Small	None
None	None	None	Large	Large	Moderate	None	Moderate	Moderate	Small	Small	None
Small	None	Small	Large	Large	Large	None	Moderate	Small	Small	Small	None
Small	None	None	Large	Large	Moderate	Moderate	Large	Moderate	Small	Moderate	Small
Small	Small	Small	Large	Large	Large	Small	Moderate	Large	None	Small	Small
Small	Small	Moderate	Large	Large	Large	None	Moderate	Moderate	Small	None	None
Moderate	None	Small	Large	Large	Moderate	None	Moderate	Moderate	Small	Small	None
Small	Small	Moderate	Large	Large	Moderate	Moderate	Moderate	Moderate	Small	Small	None
Small	Small	None	Large	Large	Large	Small	Moderate	Moderate	Small	Small	None
Small	Small	Small	Large	Large	Large	Small	Moderate	Moderate	None	Moderate	None
Small	Small	Small	Large	Large	Large	Moderate	Large	Large	Moderate	None	None
Small	None	Small	Large	Large	Large	Large	Moderate	Moderate	Small	Small	None
Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large

SUSTAIN4	SUSTAIN5	SUSTAIN6	SUSTAIN7	PLAN1	PLAN2	PLAN3	PLAN4	SAFETY1	SAFETY2	SAFETY3	SAFETY4
Moderate	Large	Large	Large	Large	Large	Large	Large	Large	Moderate	Moderate	Large
Large	Large	Large	Large	Large	Large	Large	Large	Moderate	None	None	Large
None	Large	Large	Large	Moderate	Large	Large	Large	None	None	Small	Large
Small	Moderate	Large	Large	Small	Moderate	Large	Large	Small	Small	None	Large
None	Large	Large	Large	Moderate	Large	Large	Large	Moderate	None	Moderate	Large
Small	Large	Large	Large	Large	Large	Large	Large	Large	Moderate	None	Large
None	Moderate	Large	Large	Large	Large	Large	Large	Large	None	None	Large
None	Moderate	Large	Large	Moderate	Moderate	Large	Large	Small	None	Small	Large
Small	Large	Large	Large	Large	Large	Large	Large	Moderate	Small	Small	Large
None	Large	Large	Large	Moderate	Large	Large	Large	Large	None	None	Large
None	Large	Large	Large	Small	Large	Large	Large	Large	None	None	Large
None	Large	Large	Large	Small	Large	Large	Large	Moderate	None	None	Large
None	Moderate	Large	Large	Small	Moderate	Large	Large	Moderate	None	None	Large
None	Moderate	Large	Large	Large	Large	Large	Large		None	None	Large
None	Large	Large	Large	Moderate	Large	Large	Large	Large	None	None	Large
	Large	Large	Large	Small	Large	Large	Large	Moderate	None	Small	Large
None	Large	Large	Large	Small	Large	Large	Large	Small	Small	Small	Large
None	Large	Large	Large	Small	Large	Large	Large	Moderate	None	None	Large
None	Large	Large	Large	Small	Moderate	Large	Large	Large	None	None	Large
Small	Large	Large	Large	Large	Large	Large	Large	Large	Moderate	Small	Large
None	Large	Large	Large	Small	Large	Large	Large	Moderate	None	None	Large
None	Large	Large	Large	Moderate	Moderate	Large	Large	Moderate	None	None	Large
Small	Moderate	Large	Large	Small	Moderate	Large	Large	Large	Small	Small	Large
Small	Large	Large	Large	Small	Large	Large	Large	Small	Small	Small	Large
None	Large	Large	Large	Large	Large	Large	Large	Moderate	None	None	Large
Small	Large	Large	Large	Small	Large	Large	Large	Large	Moderate	Small	Large
None	Large	Large	Large	Small	Large	Large	Large	Moderate	None	None	Large
Small	Moderate	Large	Large	Moderate	Moderate	Large	Large	Moderate	None	Small	Large
None	Large	Large	Large	Large	Moderate	Large	Large	Large	None	None	Large
None	Large	Large	Large	Moderate	Large	Large	Large	Moderate	None	None	Large
Small	Large	Large	Large	Moderate	Large	Large	Large	Moderate	None	Small	Large
Small	Large	Large	Large	Small	Large	Large	Large	Large	None	Small	Large
None	Moderate	Large	Large	Small	Large	Large	Large	Large	Moderate	None	Large
None	Large	Large	Large	Large	Large	Large	Large	Moderate	None	None	Large
None	Large	Large	Large	Moderate	Large	Large	Large	Moderate	None	None	Large
Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large

SAFETY5	SAFETY6	SAFETY7	SAFETY8	PERFOR1	PERFOR2	PERFOR3	PERFOR4	PERFOR5	PERFOR6	COMM1	COMM2
Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
Moderate	Large	Large	Small	None	Small	Small	Large	None	Large	Large	Large
Moderate	Large	Moderate	None	None	Small	Small	Large	None	Large	Large	Large
Large	Large	Large	Moderate	Moderate	None	Moderate	Large	Small	Large	Large	Large
Small	Large	Moderate	None	None	Small	None	Large	None	Large	Large	Large
Moderate	Large	Moderate	Moderate	Small	Moderate	Moderate	Large	Small	Large	Large	Large
Moderate	Large	Large	None	None	None	None	Large	None	Large	Large	Large
Large	Large	Large	None	None	Small	Small	Large	Small	Large	Large	Large
Moderate	Large	Moderate	None	None	Moderate	None	Large	None	Large	Large	Large
Moderate	Large	Moderate	Small	Small	None	Small	Large	Small	Large	Large	Large
Large	Large	Large	None	None	Small	Small	Large	None	Large	Large	Large
Moderate	Large	Large	None	None	Small	None	Large	None	Large	Large	Large
Moderate	Large	Large	None	None	Moderate	Moderate	Large	Small	Large	Large	Large
Moderate	Large	Moderate	Small	Small	Moderate	Small	Large	Small	Large	Large	Large
Large	Large	Large	Moderate	Small	Moderate	Moderate	Large	None	Large	Large	Large
Moderate	Large	Moderate	None	None	Moderate	None	Large	Small	Large	Large	Large
Large	Large	Large	Moderate	None	Moderate	None	Large	Small	Large	Large	Large
Moderate	Large	Moderate	None	None	Moderate	None	Large	None	Large	Large	Large
Large	Large	Large	None	None	Moderate	Small	Large	Small	Large	Large	Large
Small	Large	Moderate	Small	Small	Small	Small	Large	Small	Large	Large	Large
Moderate	Large	Moderate	Moderate	Moderate	Small	Moderate	Large	None	Large	Large	Large
Large	Large	Large	None	None	None	None	Large	None	Large	Large	Large
Moderate	Large	Moderate	None	None	Small	Small	Large	Small	Large	Large	Large
Large	Large	Large	Moderate	Moderate	Moderate	Moderate	Large	Small	Large	Large	Large
Moderate	Large	Moderate	Small	None	None	None	Large	None	Large	Large	Large
Moderate	Large	Moderate	None	None	Small	Small	Large	None	Large	Large	Large
Large	Large	Large	Moderate	Moderate	Moderate	Moderate	Large	Small	Large	Large	Large
Large	Large	Moderate	None	None	None	None	Large	None	Large	Large	Large
Moderate	Large	Moderate	Moderate	Moderate	Small	Small	Large	None	Large	Large	Large
Moderate	Large	Large	Small	None	Small	Small	Large	None	Large	Large	Large
Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large

COMM3	COMM4	ENVIRO1	ENVIRO2	ENVIRO3	**ENVIRO4**	ENVIRO5	ENVIRO6	ENVIRO7	**ENVIRO8**	ENVIRO9	ENVIRO10
Large	Large	Moderate	Large	Large	Moderate	Large	Large	Moderate	Moderate	Large	Moderate
Large	Moderate	Small	Small	Large	Small	Large	Moderate	Large	Small	Large	Small
Large	Moderate	Small	Small	Large	Small	Large	None	Moderate	None	Moderate	None
Large	Large	Large	Large	Large	Moderate	Large	Moderate	None	Moderate	Large	Small
Large	Small	Moderate	Moderate	Large	None	Large	Large	Large	None	Large	Small
Large	Small	None	None	Large	Small	Large	Small	Moderate	Small	Large	Moderate
Large	Large	Large	Moderate	Large	Moderate	Large	Small	Moderate	None	Large	Small
Large	Moderate	Moderate	Moderate	Large	Small	Large	Small	Small	Moderate	Large	Small
Large	Small	None	Small	Large	None	Large	Large	Moderate	None	Large	Small
Large	Large	Large	Large	Large	Moderate	Large	Small	Moderate	None	Moderate	Small
Large	Moderate	Moderate	Moderate	Large	Small	Large	Small	Moderate	None	Large	Moderate
Large	Small	Small	Small	Large	Small	Large	Moderate	Large	Small	Large	Small
Large	Small	Small	None	Large	None	Large	Small	Small	None	Large	None
Large	Small	Small	Small	Large	Small	Large	Small	Moderate	None	Large	Small
Large	Small	Small	None	Large	None	Large	Large	Moderate	Small	Large	Small
Large	Large	Small	Small	Large	Small	Large	Small	Small	Small	Large	Small
Large	Moderate	Large	Large	Large	Moderate	Large	Large	Large	None	Large	Small
Large	Small	Small	Small	Large	Small	Large	None	Moderate	Moderate	Large	Moderate
Large	Small	None	None	Large	None	Large	Small	Large	None	Large	Large
Large	Small	Small	Small	Large	Small	Large	Large	Large	None	Large	Large
Large	Small	Small	None	Large	Small	Large	Small	None	Small	Large	None
Large	Small	None	None	Large	None	Large	Moderate	Moderate	None	Large	Small
Large	Large	Large	Large	Large	Small	Large	Large	Moderate	Moderate	Large	Moderate
Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Small
Large	Small	Small	Small	Large	Small	Large	Small	Small	Small	Large	Small
Large	Small	Small	Small	Large	Small	Large	Moderate	Large	Small	Large	Small
Large	Small	Moderate	Small	Large	Moderate	Large	Small	Moderate	Moderate	Large	Small
Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large	Large
Large	Moderate	Small	Small	Large	Small	Large	Moderate	None	None	Small	Small
Large	Moderate	Moderate	Small	Large	Large	Large	Large	Large	None	Large	Large

ENVIRO11	ENVIRO12	VFM
Large	Large	Moderate
Large	Small	Moderate
Moderate	Small	Moderate
Large	Moderate	None
Moderate	None	Large
Moderate	Small	Moderate
Large	Moderate	Small
Large	Moderate	Moderate
None	Small	Large
Large	Moderate	Small
Large	Small	Small
Large	Small	Moderate
Moderate	Small	Large
Large	Small	Moderate
Moderate	None	Moderate
Moderate	Small	Moderate
Large	Large	Small
Large	Small	Moderate
Moderate	None	Moderate
Large	Small	Moderate
Large	Large	

Table 6.23 Practical difference among the chosen variables and the whole variables set

Variable Name	Code	Mean	Std.Deviation
The provision of internal teaching and learning spaces	ACCOM1	4.72	0.555
Spaces and design that fulfil the curriculum needs	ACCOM16	4.37	0.789
The provision of internal physical and sport spaces	ACCOM5	4.16	0.77
The provision of external physical and sport spaces	ACCOM6	4.13	0.722
The provision of external learning spaces	ACCOM2	3.81	0.868
Spaces which enhance variety of learning	ACCOM15	3.81	0.904
Spatial arrangements that enhance student creativity	ACCOM12	3.73	0.938
The provision of spaces for internal & external movement	ACCOM7	3.72	0.906
Well proportioned internal & external spaces	ACCOM11	3.68	0.972
The provision of internal non-teaching spaces	ACCOM3	3.66	0.935
The provision of ancillary spaces	ACCOM9	3.56	0.872
Attractiveness of spaces	ACCOM14	3.56	0.972
The provision of internal & external spaces for social activities	ACCOM8	3.51	0.94
The provision of service facilities	ACCOM10	3.29	0.901
Spaces for community use and out of hours use	ACCOM13	3.28	1.051

The provision of external spaces for non-learning purposes	ACCOM4	3.27	0.918
Shared sport spaces to meet needs of the proposed school and other schools	ACCOM17	2.83	1.188
Flexibility of design and spaces	DESIGN2	4.01	0.824044
Design of Site (site layout) is adaptable	DESIGN1	3.56	0.997509
Design which creates pleasurable environment for students to study	ARCHD10	3.93	0.955
Design which achieves ease of building use	ARCHD7	3.64	0.91
Attractive and appealing internal appearance	ARCHD1	3.62	0.929
Integration of engineering services within design	ARCHD11	3.59	1.088
Attractive and appealing external appearance	ARCHD2	3.56	0.967
Internal and external planning efficiency	ARCHD6	3.55	0.928
Design which achieves diversity of use	ARCHD3	3.44	1.012
Good neighbourhood identity (Building is a centre of community)	ARCHD4	3.4	1.094
Importance of location of building on the site	ARCHD9	3.4	1.094
High profile public presence	ARCHD8	2.76	1.035
Design which gives a homely feeling	ARCHD5	2.24	1.143
Site is large enough and designed well to meet educational needs	EXTER3	3.84	0.976
Outdoor learning environmental features	EXTER1	3.46	0.89
Dedicated designed landscaping	EXTER2	3.13	0.94
Exterior design indicates the interior function	EXTER4	2.42	1.214
Minimise energy cost	OPER2	4.12	0.912
Ease of building and site maintenance	OPER3	3.95	0.841
Minimise maintenance cost	OPER1	3.86	0.845
Inclusive internal & external access for all	ACCESS1	4.29	0.868
Design attains ease of movement through building & site for all	ACCESS2	4.17	0.927
Internal & external circulation satisfy people with disabilities	ACCESS7	4.02	0.826

Entrance is welcoming and easily identified	ACCESS3	3.99	0.992
Specific design features for people with disabilities	ACCESS9	3.78	1.07
Inclusion of welfare spaces to support people with disabilities	ACCESS8	3.76	1.027
High standard of environmental features for people with disabilities	ACCESS6	3.61	1.133
Access for public and private transportation	ACCESS4	3.44	0.946
The provision of design adheres to way finding principles	ACCESS5	3.31	1.113
Efficient energy usage	SUSTAIN2	4.27	0.727
Maximising the use of natural daylight	SUSTAIN3	4.18	0.905
Maximising the use of natural ventilation	SUSTAIN4	4.12	0.962
Durable elements & components (Long life)	SUSTAIN1	3.97	0.837
Sustainable materials specified	SUSTAIN5	3.7	0.925
Minimising the mechanical & electrical systems	SUSTAIN7	3.31	1.192
Adaptable to climate change	SUSTAIN6	3.3	1.239
Design attains a good relationship between spaces (Spatial relationship)	PLAN1	3.87	1.006
Well organised site	PLAN2	3.67	0.97
Linking well between indoor and outdoor	PLAN4	3.55	0.975
The disposition of spaces and activities relate to patterns of use	PLAN3	3.26	1.15
Safe & secure building entrance	SAFETY3	4.11	0.873
Safe & secure internal & external movement	SAFETY2	4.08	0.826
Safe site is created	SAFETY8	4.03	0.879
Design which allows for internal & external supervision of users	SAFETY1	3.81	0.946
Safe approach to the school	SAFETY5	3.75	0.979
Adequate security for community use	SAFETY7	3.72	0.953
Well supervised personal spaces	SAFETY6	3.48	1.017
Clear boundaries of the site	SAFETY4	3.38	1.042

Design enhances learning and teaching performance	PERFOR2	4.33	0.856
Design gets the overall client and user satisfaction	PERFOR5	4.16	0.806
Design that accommodates good ICT infrastructure	PERFOR1	4.1	1.007
Internal & external design enhances student motivation	PERFOR3	3.99	1
Building makes the most of site features & topography	PERFOR6	3.39	1.08
Internal & external design enhances social activities	PERFOR4	3.37	1.044
Design creates welcoming school	COMM4	3.9	0.933
Easy and adequate physical access for community	COMM2	3.34	1.069
Internal & external design encourages community use	COMM3	3.25	1.098
School encourages interactive relationship with community organisations	COMM1	3.21	1.177
Adequate ventilation (good air quality) for all day, all year	ENVIRO8	4.12	0.91
Thermal comfort for all day, all year	ENVIRO4	4	0.898
Adequate lighting for all day, all year	ENVIRO2	3.99	0.894
Environment which enhances pupils' motivation and achievement	ENVIRO10	3.99	1.033
Well balanced natural and artificial lighting	ENVIRO1	3.93	0.919
Acoustic performance in the different areas	ENVIRO6	3.93	0.906
Mechanical systems which do not disturb the learning activities	ENVIRO12	3.93	1.034
Well balanced natural and mechanical ventilation	ENVIRO7	3.79	0.935
Well controlled relationship between thermal and ventilation	ENVIRO11	3.74	0.946
Lighting which is easily controlled by users	ENVIRO3	3.5	0.984
Ventilation which is easily controlled by users	ENVIRO9	3.41	1.039
Temperature which is easily controlled by users	ENVIRO5	3.25	1.183
Overall building value for money	VFM	4.42	0.734

Table 6.24 Means & SD of the relative importance of the variables under each categorical variable

Category	Comparison	ACCOM1	ACCOM2	ACCOM3	ACCOM4	ACCOM5	ACCOM6	ACCOM7	ACCOM8	ACCOM9
Practical difference	ACCOM1		Large	Large	Large	Large	Large	Large	Large	Large
	ACCOM5	Large	Moderate	Large	Large		None	Large	Large	Large
	ACCOM6	Large	Moderate	Large	Large	None		Large	Large	Large
	ACCOM16	Large	Large	Large	Large	Moderate	Moderate	Large	Large	Large
Significant differences	ACCOM1		yes	yes	yes	yes	yes	yes	yes	yes
	ACCOM5	yes	yes	yes	yes		No	yes	yes	yes
	ACCOM6	yes	yes	yes	yes	No		yes	yes	yes
	ACCOM16	yes	yes	yes	yes	yes	yes	yes	yes	yes
Eta Values	ACCOM1		0.541	0.597	0.717	0.398	0.446	0.504	0.657	0.643
	ACCOM5	0.398	0.123	0.264	0.451		0.004	0.191	0.356	0.318
	ACCOM6	0.446	0.105	0.222	0.455	0.004		0.172	0.335	0.308
	ACCOM16	0.193	0.252	0.356	0.575	0.075	0.092	0.290	0.496	0.389
T values	ACCOM1		12.58	14.04	18.412	9.311	10.299	11.62	15.969	15.47
	ACCOM5	9.311	-4.293	-6.83	-10.38		0.685	5.532	8.479	7.787
	ACCOM6	10.3	-3.941	-6.11	-10.5	0.685		5.219	8.126	7.639
	ACCOM16	5.652	-6.713	-8.58	-13.48	-3.258	-3.667	-7.37	-11.44	-9.194
Sig (p value)	ACCOM1		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	ACCOM5	0.000	0.000	0.000	0.000		0.495	0.000	0.000	0.000
	ACCOM6	0.000	0.000	0.000	0.000	0.495		0.000	0.000	0.000
	ACCOM16	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000

Table 6.25 The different t-test values for ACCOM variables

Variable	Practical difference	Significant differences	Eta Values	T values	Sig (p value)
ACCOM10	Large, Large, Large, Large, Large, Large	yes, yes, yes, yes	0.507, 0.497, 0.511, 0.711	-11.66, 11.324, 11.615, 18.001	0.000, 0.000, 0.000, 0.000, 0.000
ACCOM11	Large, Large, Large, Large, Large, Large	yes, yes, yes, yes	0.313, 0.186, 0.213, 0.521	-7.753, 5.452, 5.907, 11.98	0.000, 0.000, 0.000, 0.000, 0.000
ACCOM12	Large, Large, Large, Large, Large, Large	yes, yes, yes, yes	0.310, 0.143, 0.167, 0.508	-7.708, 4.684, 5.107, 11.67	0.000, 0.000, 0.000, 0.000, 0.000
ACCOM13	Large, Large, Large, Large, Large, Large	yes, yes, yes, yes	0.523, 0.417, 0.433, 0.645	-12.08, 9.676, 9.969, 15.544	0.000, 0.000, 0.000, 0.000, 0.000
ACCOM14	Large, Large, Large, Large, Large, Large	yes, yes, yes, yes	0.426, 0.273, 0.283, 0.583	-9.892, 6.987, 7.14, 13.58	0.000, 0.000, 0.000, 0.000, 0.000
ACCOM15	Large, Moderate, Moderate, Large, Large	yes, yes, yes, yes	0.300, 0.086, 0.122, 0.522	-7.46, 3.475, 4.219, 11.92	0.000, 0.001, 0.000, 0.000, 0.000
ACCOM16	Large, Moderate, Moderate, Large	yes, yes, yes, yes	0.193, 0.075, 0.092	5.652, -3.258, -3.667	0.000, 0.001, 0.000, 0.000, 0.000
ACCOM17	Large, Large, Large, Large, Large, Large	yes, yes, yes, yes	0.614, 0.538, 0.534, 0.706	14.477, 12.306, 12.162, 17.818	0.000, 0.000, 0.000, 0.000, 0.000

	DESIGN2 Practical difference	DESIGN2 Significant differences	DESIGN2 Eta Values	DESIGN2 T values	DESIGN2 Sig (p value)
DESIGN1	Large	yes	0.190	-5.61	0.000

Table 6.26 The different t-test values for DESIGN variables

	Sig (p value)		T values		Eta Values		Significant differences		Practical difference	
	ARCHD7	ARCHD10	ARCHD7	ARCHD10	ARCHD7	ARCHD10	ARCHD7	ARCHD10	ARCHD7	ARCHD10
ARCHD1	0.032	0.000	-2.166	-4.439	0.040	0.129	Yes	yes	Small	Moderate
ARCHD2	0.001	0.000	-3.362	-4.992	0.090	0.158	Yes	yes	Moderate	Large
ARCHD3	0.009	0.000	-2.669	-5.307	0.059	0.175	Yes	yes	Small	Large
ARCHD4	0.000	0.000	-3.827	-5.719	0.114	0.197	Yes	yes	Moderate	Large
ARCHD5	0.000	0.000	-12.13	-14.82	0.566	0.625	Yes	yes	Large	Large
ARCHD6	0.006	0.000	-2.809	-4.204	0.065	0.117	Yes	yes	Moderate	Moderate
ARCHD7		0.261		-1.13		0.011		No		Small
ARCHD8	0.000	0.000	9.68	-11.36	0.453	0.494	Yes	yes	Large	Large
ARCHD9	0.000	0.000	4.699	-5.95	0.162	0.210	Yes	yes	Large	Large

483

	ARCHD10	ARCHD11
	0.261	0.018
		0.000
	-1.13	2.39
		3.898
	0.011	0.048
		0.103
	No	Yes
		yes
	Small	Small
		Moderate

Table 6.27 The different t-test values for ARCHD variables

	EXTER3 Sig (p value)	EXTER3 T values	EXTER3 Eta Values	EXTER3 Significant differences	EXTER3 Practical difference
EXTER1	0.000	-4.333	0.125	yes	Moderate
EXTER2	0.000	-7.449	0.299	yes	Large
EXTER4	0.000	13.105	0.565	yes	Large

Table 6.28 The different t-test values for EXTER variables

	Sig (p value) OPER2	Sig (p value) OPER3	T values OPER2	T values OPER3	Eta Values OPER2	Eta Values OPER3	Significant differences OPER2	Significant differences OPER3	Practical difference OPER2	Practical difference OPER3
OPER1	0.000	0.0167	-3.572	-2.691	0.089	0.015	Yes	yes	Moderate	Small
OPER2		0.051		1.966		0.029		No		Small

OPER3								
0.051		1.966		0.029		No		Small

Table 6.29 The different t-test values for OPER variables

	Sig (p value)				T values				Eta Values				Significant differences				Practical difference			
	ACCESS1	ACCESS2	ACCESS3	ACCESS7	ACCESS1	ACCESS2	ACCESS3	ACCESS7	ACCESS1	ACCESS2	ACCESS3	ACCESS7	ACCESS1	ACCESS2	ACCESS3	ACCESS7	ACCESS1	ACCESS2	ACCESS3	ACCESS7
ACCESS1		0.043	0.000	0.000		2.045	3.693	4.007		0.031	0.094	0.110		yes	yes	yes		Small	Moderate	Moderate
ACCESS2	0.043		0.012	0.013	2.045		2.553	2.506	0.031		0.047	0.045	yes		yes	yes	Small		Small	Small
ACCESS3	0.000	0.012		0.851	3.693	2.553		-0.188	0.094	0.047		0.045	yes	yes		No	Moderate	Small		None
ACCESS4	0.000	0.000	0.000	0.000	8.387	7.271	5.733	-6.13	0.222	0.199	0.284	0.349	yes	yes	yes	yes	Large	Large	Large	Large
ACCESS5	0.000	0.000	0.000	0.000	9.745	9.505	7.837	-7.511	0.304	0.321	0.408	0.424	yes	yes	yes	yes	Large	Large	Large	Large
ACCESS6	0.000	0.000	0.001	0.000	6.809	6.034	3.51	-4.863	0.152	0.085	0.214	0.260	yes	yes	yes	yes	Large	Moderate	Large	Large
ACCESS7	0.000	0.013	0.851		4.007	2.506	-0.188		0.110	0.045	0.045		yes	yes	No		Moderate	Small	None	
ACCESS8	0.000	0.011	0.000	0.000	6.264	4.948	2.594	3.7	0.230	0.155	0.049	0.095	yes	yes	yes	yes	Large	Large	Small	Moderate

	Sig (p value)				T values				Eta Values				Significant differences				Practical difference			
ACCESS 9	0.000	0.000	0.017	0.000	5.826	5.076	2.418	3.592	0.205	0.161	0.042	0.089	yes	yes	yes	yes	Large	Large	Small	Moderate

Table 6.30 The different t-test values for ACCESS variables

	Sig (p value)				T values				Eta Values				Significant differences				Practical difference			
	SUSTAIN1	SUSTAIN2	SUSTAIN3	SUSTAIN4	SUSTAIN1	SUSTAIN2	SUSTAIN3	SUSTAIN4	SUSTAIN1	SUSTAIN2	SUSTAIN3	SUSTAIN4	SUSTAIN1	SUSTAIN2	SUSTAIN3	SUSTAIN4	SUSTAIN1	SUSTAIN2	SUSTAIN3	SUSTAIN4
SUSTAIN1		0.000	0.009	0.091		-5.338	-2.634	-1.702		0.175	0.049	0.021		yes	yes	No		Large	Small	Small
SUSTAIN2	0.000		0.102	0.021	-5.338		1.648	2.343	0.175		0.020	0.039	yes		No	yes	Large		Small	Small
SUSTAIN3	0.009	0.102		0.250	-2.634	1.648		1.156	0.049	0.020		0.010	yes	No		No	Small	Small		None
SUSTAIN4	0.091	0.021	0.250		-1.702	2.343	1.156		0.021	0.039	0.010		No	yes	No		Small	Small	None	
SUSTAIN5	0.001	0.000	0.000	0.000	3.566	8.747	7.254	6.162	0.087	0.363	0.282	0.221	yes	yes	yes	yes	Moderate	Large	Large	Large
SUSTAIN6	0.000	0.000	0.000	0.000	5.997	9.348	8.311	7.678	0.213	0.397	0.342	0.307	yes	yes	yes	yes	Large	Large	Large	Large
SUSTAIN7	0.000	0.000	0.000	0.000	5.753	9.208	8.349	8.327	0.199	0.389	0.344	0.343	yes	yes	yes	yes	Large	Large	Large	Large

Table 6.31 The different t-test values for SUSTAIN variables

	Sig (p value)			T values			Eta Values			Significant differences			Practical difference		
	SAFETY2	SAFETY3	SAFETY8	SAFETY2	SAFETY3	SAFETY8	SAFETY2	SAFETY3	SAFETY8	SAFETY2	SAFETY3	SAFETY8	SAFETY2	SAFETY3	SAFETY8
SAFETY1	0.000	0.000	0.007	-4.668	-4.393	-2.722	0.142	0.127	0.053	yes	yes	yes	Large	Moderate	Small
SAFETY2		0.656	0.348		-0.446	0.942		0.002	0.007		No	No		None	None
SAFETY3	0.656		0.158	-0.446		1.42	0.002		0.015	No		No	None		Small
SAFETY4	0.000	0.000	0.000	8.524	9.073	-8.402	0.357	0.384	0.350	yes	yes	yes	Large	Large	Large
SAFETY5	0.000	0.000	0.000	4.737	4.591	-3.764	0.145	0.137	0.097	yes	yes	yes	Moderate	Moderate	Large
SAFETY6	0.000	0.000	0.000	6.467	6.889	-5.697	0.241	0.263	0.197	yes	yes	yes	Large	Large	Large
SAFETY7	0.000	0.000	0.000	4.98	4.618	-4.513	0.158	0.138	0.134	yes	yes	yes	Large	Moderate	Moderate
SAFETY8	0.348	0.158		0.942	1.42		0.007	0.015		No	No		None	Small	

Table 6.32 The different t-test values for SAFETY variables

	PLAN1	PLAN1	PLAN1	PLAN1	PLAN1

	Sig (p value)	T values	Eta Values	Significant differences	Practical difference
PLAN2	0.005	2.842	0.057	yes	Small
PLAN3	0.000	7.023	0.271	yes	Large
PLAN4	0.000	4.061	0.110	yes	Moderate

Table 6.33 The different t-test values for PLAN variables

	Sig (p value)				T values				Eta Values				Significant differences				Practical difference			
	PERFOR1	PERFOR2	PERFOR3	PERFOR5	PERFOR1	PERFOR2	PERFOR3	PERFOR5	PERFOR1	PERFOR2	PERFOR3	PERFOR5	PERFOR1	PERFOR2	PERFOR3	PERFOR5	PERFOR1	PERFOR2	PERFOR3	PERFOR5
PERFOR1		0.001	0.254	0.382		-3.318	1.146	-0.877		0.077	0.010	0.006		yes	No	No		Moderate	None	None
PERFOR2	0.001		0.000	0.052	-3.318		5.892	1.962	0.077		0.207	0.028	yes		yes	No	Moderate		Large	Small
PERFOR3	0.254	0.000		0.038	1.146	5.892		-2.1	0.010	0.207		0.032	No	yes		yes	None	Large		Small
PERFOR4	0.000	0.000	0.000	0.000	8.6	13.2	8.662	-8.51	0.359	0.567	0.361	0.354	yes	yes	yes	yes	Large	Large	Large	Large
PERFOR5	0.382	0.052	0.038		-0.877	1.962	-2.1		0.006	0.028	0.032		No	No	yes		None	Small	Small	
PERFOR6	0.000	0.000	0.000	0.000	7.235	9.833	6.219	8.066	0.284	0.421	0.225	0.328	yes	yes	yes	yes	Large	Large	Large	Large

Table 6.34 The different t-test values for PERFOR variables

	COMM4 Sig (p value)	COMM4 T values	COMM4 Eta Values	COMM4 Significant differences	COMM4 Practical difference
COMM1	0.000	-8.013	0.326	yes	Large
COMM2	0.000	-7.091	0.274	yes	Large
COMM3	0.000	-7.462	0.294	yes	Large

Table 6.35 The different t-test values for COMM variables

	T values							Sig (p value)							Degree of Freedom						
	ENVIRO1	ENVIRO2	ENVIRO4	ENVIRO6	ENVIRO8	ENVIRO10	ENVIRO12	ENVIRO1	ENVIRO2	ENVIRO4	ENVIRO6	ENVIRO8	ENVIRO10	ENVIRO12	ENVIRO1	ENVIRO2	ENVIRO4	ENVIRO6	ENVIRO8	ENVIRO10	ENVIRO12
ENVIRO1		-1.289	-1.055	0	-2.851	-0.601	0		0.200	0.294	1.000	0.005	0.549	1.000		133	133	131	132	132	133
ENVIRO2	-1.289		-0.12	1.1	-2.023	0.188	0.798	0.200		0.905	0.273	0.045	0.851	0.427	133		134	133	132	134	133
ENVIRO3	5.084	6.277	-6.1	-5.216	-7.691	-4.814	-4.11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	134	134	134	133	132	134	133
ENVIRO4	-1.055	-0.12		0.985	-1.991	0.254	0.87	0.294	0.905		0.327	0.049	0.800	0.386	134	134		133	132	134	133
ENVIRO5	6.556	7.598	8.02	-7.246	-9.024	-6.682	-6.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000	134	134	134	133	132	134	133

Pairwise comparison table (t-values, p-values and N per comparison column), with summary columns for Practical difference, Significant differences and Eta Values.

t-values

	ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12
ENVIRO12	-0.286	-1.598	2.199	-5.186	0.717	-2.778	
ENVIRO10	-0.735	-2.247	1.713	-5.826		3.151	0.717
ENVIRO8	-3.264	-5.503		8.769	1.713	5.252	2.199
ENVIRO6		2.227	-3.264	7.046	-0.735	2.811	-0.286
ENVIRO4	0.985	3.298	-1.991	6.593	0.254	3.421	0.87
ENVIRO2	1.1	3.379	-2.023	5.623	0.188	3.467	0.798
ENVIRO1	0	2.36	-2.851		-0.601	2.486	0

p-values

	ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12
ENVIRO12	0.775	0.112	0.030	0.000	0.475	0.006	
ENVIRO10	0.464	0.026	0.089	0.000		0.002	0.475
ENVIRO8	0.001	0.000		0.000	0.089	0.000	0.030
ENVIRO6		0.028	0.001	0.000	0.464	0.006	0.775
ENVIRO4	0.327	0.001	0.049	0.000	0.800	0.001	0.386
ENVIRO2	0.273	0.001	0.045	0.000	0.851	0.000	0.427
ENVIRO1	1.000	0.020	0.005		0.549	0.014	1.000

N

	ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12
ENVIRO12	131	133	132	133	132	133	
ENVIRO10	132	133	133	133		134	133
ENVIRO8	132	133		132	133	133	133
ENVIRO6		131	132	134	131	132	132
ENVIRO4	132	132	133	134	133	134	134
ENVIRO2	131	132	133	133	133	134	134
ENVIRO1	132	133	132		132	133	133

Summary

	Practical difference		Significant differences		Eta Values	
	ENVIRO1	ENVIRO2	ENVIRO1	ENVIRO2	ENVIRO1	ENVIRO2
ENVIRO12	None	None	No	No	0.000	0.005
ENVIRO10	None	None	No	No	0.003	0.000
ENVIRO8	Small	Small	No	No	0.058	0.030
ENVIRO6	None	None	yes	yes	0.000	0.000
ENVIRO4	None	None	No	No	0.008	0.009
ENVIRO2	Small		No		0.012	0.000
ENVIRO1		Small		No		0.012

Table 6.36 — t-test values for ENVIRO variables. (Rotated table; reconstructed below as three aligned blocks — Difference Located, Differences, and t-test value — with columns ENVIRO3–ENVIRO12.)

Difference Located

	ENVIRO3	ENVIRO4	ENVIRO5	ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12
1	Large	None	Large	None	Small	Small	Large	None	Small	None
2	Large	None	Large	None	Moderate	Small	Large	None	Moderate	None
3	Large	None	Large	None	Moderate	Small	Large	None	Moderate	None
4	Large	Small	Large	Moderate	Small	Moderate	Large	None	Small	None
5	Large	None	Large	None	Small	Small	Large	None	Large	Small
6	Large	None	Large	None	Small	Small	Large	None	Moderate	None
7	Moderate	None	Large	None	Small		Large	None	Small	None

Differences

	ENVIRO3	ENVIRO4	ENVIRO5	ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12
1	yes	No	yes	No	yes	yes	yes	No	yes	No
2	yes	No	yes	No	yes	yes	yes	No	yes	No
3	yes	No	Yes	yes	Yes	Yes	Yes	No	Yes	No
4	Yes	yes	yes	No	yes	yes	yes	No	yes	No
5	yes	No	yes	No	yes	yes	yes	No	yes	yes
6	yes	No	yes	No	yes	yes	yes	No	yes	No
7	yes	No	yes	No	No	No	yes	No	No	No

t-test value

	ENVIRO3	ENVIRO4	ENVIRO5	ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12
1	0.112	0.006	0.214	0.001	0.019	0.035	0.167	0.004	0.054	0.004
2	0.148	0.000	0.251	0.004	0.037	0.022	0.203		0.069	0.004
3	0.308	0.029	0.380	0.075	0.187		0.366	0.022	0.172	0.035
4	0.171	0.007	0.285		0.036	0.075	0.233	0.004	0.056	0.001
5	0.217		0.324	0.007	0.076	0.029	0.270	0.000	0.080	0.006
6	0.227	0.000	0.301	0.009	0.079	0.030	0.245	0.000	0.082	0.005
7	0.163	0.008	0.244	0.000	0.040	0.058	0.192	0.003	0.044	0.000

Table 6.36 The different t-test values for ENVIRO variables

Code	Differences	Difference Located
ACCOM1	No	
ACCOM16	Yes	S&C-E&C

ACCOM5	Yes	All
ACCOM6	Yes	S&C
ACCOM15	Yes	S&C
ACCOM2	No	
ACCOM12	Yes	E&C
ACCOM11	Yes	S&C-E&C
ACCOM3	No	
ACCOM14	Yes	S&C
ACCOM7	No	
ACCOM8	Yes	S&C
ACCOM9	No	
ACCOM13	Yes	S&C-E&C
ACCOM4	Yes	S&C
ACCOM10	No	
ACCOM17	No	
DESIGN2	No	
DESIGN1	Yes	E&C
ARCHD10	Yes	E&C
ARCHD7	Yes	E&C
ARCHD1	Yes	E&C
ARCHD11	No	
ARCHD2	No	
ARCHD4	Yes	S&C-E&C
ARCHD3	Yes	E&C
ARCHD6	No	
ARCHD9	No	
ARCHD8	Yes	S&C-E&C
ARCHD5	No	
EXTER3	No	
EXTER1	Yes	E&C
EXTER2	No	
EXTER4	No	
OPER2	No	
OPER3	No	
OPER1	No	
ACCESS1	Yes	S&C-E&C
ACCESS2	Yes	S&C-E&C
ACCESS7	Yes	S&C-E&C
ACCESS3	No	
ACCESS9	Yes	S&C-E&C
ACCESS8	Yes	S&C-E&C
ACCESS6	Yes	S&C
ACCESS5	No	
ACCESS4	Yes	S&E
SUSTAIN2	Yes	E&C
SUSTAIN3	No	
SUSTAIN4	Yes	S&C-E&C
SUSTAIN1	No	
SUSTAIN5	No	
SUSTAIN6	No	
SUSTAIN7	No	
PLAN1	Yes	E&C
PLAN2	Yes	E&C
PLAN4	No	
PLAN3	No	
SAFETY8	No	
SAFETY2	No	
SAFETY3	No	
SAFETY7	Yes	S&C-E&C
SAFETY1	No	

SAFETY5	Yes	E&C
SAFETY6	No	
SAFETY4	No	
PERFOR2	Yes	S&C-E&C
PERFOR1	Yes	S&C-E&C
PERFOR5	No	
PERFOR3	Yes	S&C-E&C
PERFOR4	Yes	S&C-E&C
PERFOR6	No	
COMM4	Yes	S&C-E&C
COMM1	Yes	E&C
COMM2	Yes	S&C-E&C
COMM3	Yes	S&C-E&C
ENVIRO8	Yes	S&C-E&C
ENVIRO10	Yes	S&C-E&C
ENVIRO2	Yes	S&C-E&C
ENVIRO1	Yes	S&C-E&C
ENVIRO6	Yes	S&C
ENVIRO12	Yes	S&C
ENVIRO4	Yes	S&E-S&C
ENVIRO7	Yes	S&C-E&C
ENVIRO11	Yes	S&C-E&C
ENVIRO3	No	
ENVIRO9	No	
ENVIRO5	No	
VFM	No	

Table 6.38.3 ANOVA results for the whole set of design & engineering variables

Variables' Code	Chi-Square	Df	Asymp.Sig	Difference
ACCOM1	4.545	2	0.103	No
ACCOM16	23.217	2	0.000	Yes
ACCOM5	19.979	2	0.000	Yes
ACCOM6	10.668	2	0.005	Yes
ACCOM15	7.008	2	0.030	Yes
ACCOM2	1.093	2	0.579	No
ACCOM12	6.687	2	0.035	Yes
ACCOM11	8.558	2	0.014	Yes
ACCOM3	5.331	2	0.070	No
ACCOM14	8.074	2	0.018	Yes
ACCOM7	3.062	2	0.216	No
ACCOM8	6.052	2	0.050	No
ACCOM9	0.912	2	0.634	No
ACCOM13	8.720	2	0.013	Yes
ACCOM4	6.994	2	0.030	Yes
ACCOM10	2.319	2	0.314	No
ACCOM17	5.022	2	0.081	No
DESIGN2	6.904	2	0.032	Yes
DESIGN1	11.198	2	0.004	Yes
ARCHD10	16.852	2	0.000	Yes
ARCHD7	13.379	2	0.001	Yes
ARCHD1	5.498	2	0.064	No
ARCHD11	7.341	2	0.026	Yes
ARCHD2	2.435	2	0.296	No
ARCHD4	13.554	2	0.001	Yes
ARCHD3	10.337	2	0.006	Yes
ARCHD6	2.759	2	0.252	No
ARCHD9	5.807	2	0.055	No
ARCHD8	9.850	2	0.007	Yes

ARCHD5	6.990	2	0.030	Yes
EXTER3	4.638	2	0.098	No
EXTER1	7.358	2	0.025	Yes
EXTER2	1.263	2	0.532	No
EXTER4	4.755	2	0.093	No
OPER2	2.559	2	0.279	No
OPER3	1.804	2	0.406	No
OPER1	2.941	2	0.230	No
ACCESS1	21.746	2	0.000	Yes
ACCESS2	17.476	2	0.000	Yes
ACCESS7	15.802	2	0.000	Yes
ACCESS3	7.491	2	0.024	Yes
ACCESS9	12.594	2	0.002	Yes
ACCESS8	16.360	2	0.000	Yes
ACCESS6	12.733	2	0.002	Yes
ACCESS5	6.314	2	0.043	Yes
ACCESS4	5.373	2	0.068	No
SUSTAIN2	7.240	2	0.027	Yes
SUSTAIN3	3.310	2	0.191	No
SUSTAIN4	10.118	2	0.006	Yes
SUSTAIN1	3.961	2	0.138	No
SUSTAIN5	3.366	2	0.186	No
SUSTAIN6	2.413	2	0.299	No
SUSTAIN7	1.669	2	0.434	No
PLAN1	6.377	2	0.041	Yes
PLAN2	5.480	2	0.065	No
PLAN4	1.305	2	0.521	No
PLAN3	2.672	2	0.263	No
SAFETY8	4.176	2	0.124	No
SAFETY2	3.463	2	0.177	No
SAFETY3	3.288	2	0.193	No
SAFETY7	7.948	2	0.019	Yes
SAFETY1	4.580	2	0.101	No
SAFETY5	6.971	2	0.031	Yes
SAFETY6	5.679	2	0.059	No
SAFETY4	3.088	2	0.214	No
PERFOR2	9.679	2	0.008	Yes
PERFOR1	14.314	2	0.001	Yes
PERFOR5	0.843	2	0.656	No
PERFOR3	11.113	2	0.004	Yes
PERFOR4	11.511	2	0.003	Yes
PERFOR6	4.201	2	0.122	No
COMM4	10.432	2	0.005	Yes
COMM1	15.902	2	0.000	Yes
COMM2	18.824	2	0.000	Yes
COMM3	17.445	2	0.000	Yes
ENVIRO8	10.675	2	0.005	Yes
ENVIRO10	16.384	2	0.000	Yes
ENVIRO2	7.711	2	0.021	Yes
ENVIRO1	7.757	2	0.020	Yes
ENVIRO6	8.926	2	0.011	Yes
ENVIRO12	12.309	2	0.002	Yes
ENVIRO4	13.783	2	0.001	Yes
ENVIRO7	15.515	2	0.000	Yes
ENVIRO11	9.512	2	0.009	Yes
ENVIRO3	2.769	2	0.250	No
ENVIRO9	1.568	2	0.457	No
ENVIRO5	2.711	2	0.258	No
VFM	2.179	2	0.336	No

Table 6.39.2 Kruskal-Wallis one-way ANOVA partial results

	ACCOM1	ACCOM2	ACCOM3	ACCOM4	ACCOM5	ACCOM6	ACCOM7	ACCOM8	ACCOM9	ACCOM10
ARCHD3	131	387	266	229	233	171	154	410	151	175
ARCHD2	307	315	429	365	367	327	232	481	332	201
ARCHD1	313	298	456	350	346	283	264	479	308	213
DESIGN2	135	169	201	244	276	152	186	338	260	200
DESIGN1	96	271	151	256	231	226	160	231	190	244
ACCOM17	149	133	289	317	222	282	133	381	128	62
ACCOM16	478	312	394	395	497	429	282	506	257	214
ACCOM15	361	440	414	426	433	333	346	622	432	298
ACCOM14	263	273	523	439	437	456	349	598	387	278
ACCOM13	225	174	489	472	422	400	404	540	235	274
ACCOM12	216	261	386	458	287	288	359	540	270	248
ACCOM11	251	215	452	430	400	426	337	541	271	300
ACCOM10	283	485	380	351	447	471	359	320	547	1
ACCOM9	329	535	431	416	403	458	250	348	1	547
ACCOM8	406	346	602	540	433	471	523	1	348	320
ACCOM7	137	180	497	432	271	325	1	523	250	359
ACCOM6	461	338	477	377	770	1	325	471	458	471
ACCOM5	472	361	501	354	1	770	271	433	403	447
ACCOM4	314	432	690	1	354	377	432	540	416	351
ACCOM3	404	318	1	690	501	477	497	602	431	380
ACCOM2	367	1	318	432	361	338	180	346	535	485
ACCOM1	1	367	404	314	472	461	137	406	329	283

ACCOM11	ACCOM12	ACCOM13	ACCOM14	ACCOM15	ACCOM16	ACCOM17	DESIGN1	DESIGN2	ARCHD1	ARCHD2
351	434	517	479	539	315	291	264	524	545	539
578	487	408	686	561	344	373	219	416	850	1
559	522	451	713	576	335	297	228	384	1	850
363	404	502	436	488	351	150	485	1	384	416
331	332	338	324	253	230	321	1	485	228	219
348	399	384	439	509	1	275	321	150	297	373
390	376	298	360	289	275	1	230	351	335	344
490	581	447	634	1	509	289	253	488	576	561
687	601	547	1	634	439	360	324	436	713	686
481	424	1	547	447	384	298	338	502	451	408
602	1	424	601	581	399	376	332	404	522	487
1	602	481	687	490	348	390	331	363	559	578
300	248	274	278	298	214	62	244	200	213	201
271	270	235	387	432	257	128	190	260	308	332
541	540	540	598	622	506	381	231	338	479	481
337	359	404	349	346	282	133	160	186	264	232
426	288	400	456	333	429	282	226	152	283	327
400	287	422	437	433	497	222	231	276	346	367
430	458	472	439	426	395	317	256	244	350	365
452	386	489	523	414	394	289	151	201	456	429
215	261	174	273	440	312	133	271	169	298	315
251	216	225	263	361	478	149	96	135	313	307

496

ARCHD3	ARCHD4	ARCHD5	ARCHD6	ARCHD7	ARCHD8	ARCHD9	ARCHD10	ARCHD11	EXTER1	EXTER2	EXTER3
1	606	395	422	311	270	415	398	315	501	385	408
539	635	343	515	421	477	522	571	458	520	506	539
545	590	335	519	449	452	421	617	445	567	541	507
524	452	385	473	213	424	303	314	253	496	380	394
291	397	138	155	320	327	330	298	156	318	286	189
264	315	36	362	211	224	246	302	134	391	286	315
315	406	62	261	455	330	406	364	299	319	272	281
479	517	207	449	395	361	466	548	423	574	470	465
539	519	309	355	341	407	370	514	363	489	418	337
351	438	240	342	441	235	432	456	305	532	351	461
434	430	271	387	332	289	299	503	267	559	309	426
517	528	201	402	331	414	483	387	366	481	464	337
175	223	49	180	183	191	292	223	250	393	341	295
151	260	117	268	231	195	206	184	170	349	345	348
410	445	88	188	367	337	307	351	241	465	449	267
154	190	119	97	228	196	246	240	278	245	190	198
171	332	30	165	237	264	399	298	259	367	346	341
233	396	-83	300	237	342	416	294	339	435	319	390
229	269	90	243	359	259	329	330	247	402	408	340
266	363	50	280	363	173	380	347	203	420	341	380
387	325	237	225	158	207	207	262	185	427	402	373
131	334	14	229	288	237	334	243	179	327	288	278

EXTER4	OPER1	OPER2	OPER3	ACCESS1	ACCESS2	ACCESS3	ACCESS4	ACCESS5	ACCESS6	ACCESS7	ACCESS8
320	203	244	223	334	396	272	78	400	443	388	462
441	293	407	323	379	451	551	233	449	319	413	429
467	296	441	350	407	535	557	222	464	392	517	485
245	198	107	284	183	262	229	121	370	355	298	294
242	144	78	62	165	209	273	119	245	125	270	267
177	105	78	250	182	212	140	79	167	257	254	248
66	247	324	247	381	436	388	132	487	358	352	397
388	199	74	222	406	433	300	150	296	144	338	265
323	336	421	371	350	464	438	267	386	307	448	320
206	281	258	242	362	428	397	306	463	284	419	379
366	210	337	186	244	262	274	193	300	235	421	318
392	186	277	214	312	324	385	263	281	261	383	328
128	257	252	332	233	248	231	457	256	337	345	408
152	343	318	325	150	203	237	267	363	234	249	240
258	152	243	163	338	407	310	226	395	375	447	406
139	156	173	172	155	211	308	404	268	171	224	244
206	229	194	325	305	360	263	371	273	135	354	335
153	244	167	296	420	534	445	310	361	252	403	409
184	327	207	262	294	304	315	334	353	174	332	309
137	179	177	134	297	366	357	379	290	216	395	380
218	281	270	306	243	292	233	241	404	432	266	410
89	174	189	226	330	369	268	232	161	87	255	288

ACCESS9	SUSTAIN1	SUSTAIN2	SUSTAIN3	SUSTAIN4	SUSTAIN5	SUSTAIN6	SUSTAIN7	PLAN1	PLAN2	PLAN3	PLAN4
423	377	442	475	420	448	391	264	542	456	393	356
466	555	461	586	514	507	343	246	637	613	333	498
576	504	508	577	559	534	422	282	648	646	477	560
214	401	258	268	328	346	365	280	361	386	348	366
242	181	221	254	382	306	410	388	164	193	212	268
178	209	223	265	287	296	253	222	295	348	209	385
257	322	303	262	237	217	115	27	373	436	274	345
376	391	416	382	363	457	341	257	445	591	484	515
408	537	523	560	546	490	305	219	497	572	387	549
400	418	341	418	417	399	177	191	453	435	361	450
322	315	345	377	411	433	257	183	312	382	303	419
348	346	294	458	490	279	151	126	458	503	311	490
409	264	208	307	326	393	157	43	265	256	306	303
278	290	162	222	213	276	75	55	221	265	276	322
352	391	359	386	355	343	125	103	373	450	230	388
275	246	168	210	126	174	43	48	206	267	167	237
360	355	306	426	401	341	-59	-77	364	403	281	349
419	359	343	525	476	428	102	120	476	495	386	339
245	322	211	264	216	275	33	11	307	338	201	415
330	351	265	395	282	263	56	-39	408	429	183	316
363	321	273	272	233	326	263	-102	287	216	297	328
258	367	377	338	328	181	153	86	347	379	316	328

SAFETY1	SAFETY2	SAFETY3	SAFETY4	SAFETY5	SAFETY6	SAFETY7	SAFETY8	PERFOR1	PERFOR2	PERFOR3	PERFOR4
379	333	309	278	227	370	375	323	423	429	388	499
468	367	380	276	289	359	310	361	510	431	438	459
401	353	367	289	313	391	287	345	554	503	529	542
365	341	333	219	279	393	296	249	363	326	336	362
198	195	74	31	118	49	258	178	323	187	207	357
247	209	205	181	142	82	269	179	246	161	214	299
306	298	256	170	169	192	194	201	485	472	374	343
404	407	383	241	312	319	310	311	583	637	631	544
425	409	410	303	342	376	325	330	501	499	454	493
307	358	306	226	212	311	424	326	546	313	317	425
285	308	208	190	189	148	299	241	445	357	417	416
343	316	300	224	269	227	341	227	489	395	393	452
329	394	312	263	396	124	223	227	264	259	297	291
339	359	292	287	357	188	219	252	268	282	305	262
314	300	233	115	197	175	131	146	582	428	372	450
166	227	233	71	149	127	37	22	379	117	198	97
308	403	361	219	278	137	-300	305	421	284	210	218
393	448	506	367	331	255	365	385	540	517	426	341
319	317	159	251	243	119	308	148	435	275	329	402
304	244	171	211	197	167	176	135	525	322	242	336
372	389	326	374	301	118	358	245	315	378	395	368
309	396	282	163	253	148	276	341	439	396	280	201

PERFOR5	PERFOR6	COMM1	COMM2	COMM3	COMM4	ENVIRO1	ENVIRO2	ENVIRO3	ENVIRO4	ENVIRO5	ENVIRO6
258	269	506	463	590	429	395	490	350	419	317	369
373	497	504	508	486	553	599	575	480	456	477	566
324	521	546	514	518	566	593	617	487	483	488	595
212	257	408	371	402	331	229	335	152	343	205	362
120	288	246	205	171	175	188	256	85	292	102	232
118	189	272	215	232	348	253	310	172	365	248	229
176	205	337	342	279	438	355	438	210	274	267	350
276	362	409	397	438	496	501	508	320	403	402	442
364	453	534	501	461	567	501	550	454	479	398	524
188	351	572	604	621	498	337	463	326	445	412	503
299	202	292	317	329	378	376	440	279	369	344	406
324	397	430	423	355	524	440	490	368	450	369	482
341	375	83	184	140	266	314	356	231	206	141	295
190	332	174	172	167	265	242	186	125	151	191	256
127	336	395	355	394	479	441	477	251	408	332	430
104	114	133	130	102	298	168	221	304	231	276	300
274	359	339	335	253	465	339	338	207	255	263	372
262	397	428	449	354	505	441	463	276	384	264	506
274	275	295	366	264	452	262	312	234	254	293	293
186	299	373	371	334	429	353	422	304	235	303	368
301	384	238	240	263	307	350	335	176	201	106	231
289	310	284	296	215	462	329	327	98	210	143	291

ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12	VFM		ACCOM1	ACCOM2	ACCOM3	ACCOM4
410	439	277	457	371	317	74	ACCESS7	255	266	395	332
511	564	430	458	501	437	75	ACCESS6	87	432	216	174
548	586	488	610	550	514	1	ACCESS5	161	404	290	353
257	250	205	299	338	255	-215	ACCESS4	232	241	379	334
198	192	42	190	264	98	79	ACCESS3	268	233	357	315
363	268	152	192	234	197	12	ACCESS2	369	292	366	304
332	388	248	475	299	281	-75	ACCESS1	330	243	297	294
470	482	364	532	500	518	107	OPER3	226	306	134	262
486	569	416	497	505	422	7	OPER2	189	270	177	207
365	429	340	355	372	350	6	OPER1	174	281	179	327
447	511	316	434	321	297	62	EXTER4	89	218	137	184
517	547	320	409	400	270	94	EXTER3	278	373	380	340
333	263	212	232	387	256	206	EXTER2	288	402	341	408
227	218	198	230	267	261	170	EXTER1	327	427	420	402
372	474	284	430	318	355	2	ARCHD11	179	185	203	247
243	308	276	182	177	282	-16	ARCHD10	243	262	347	330
332	368	171	175	245	183	180	ARCHD9	334	207	380	329
478	493	268	260	405	325	173	ARCHD8	237	207	173	259
260	320	365	368	297	250	12	ARCHD7	288	158	363	359
326	406	372	348	266	232	74	ARCHD6	229	225	280	243
293	325	180	297	339	275	-88	ARCHD5	14	237	50	90
261	305	152	228	286	249	59	ARCHD4	334	325	363	269

ACCOM5	ACCOM6	ACCOM7	ACCOM8	ACCOM9	ACCOM10	ACCOM11	ACCOM12	ACCOM13	ACCOM14	ACCOM15	ACCOM16
403	354	224	447	249	345	383	421	419	448	352	338
252	135	171	375	234	337	261	235	284	307	358	144
361	273	268	395	363	256	281	300	463	386	487	296
310	371	404	226	267	457	263	193	306	267	132	150
445	263	308	310	237	231	385	274	397	438	388	300
534	360	211	407	203	248	324	262	428	464	436	433
420	305	155	338	150	233	312	244	362	350	381	406
296	325	172	163	325	332	214	186	242	371	247	222
167	194	173	243	318	252	277	337	258	421	324	74
244	229	156	152	343	257	186	210	281	336	247	199
153	206	139	258	152	128	392	366	206	388	323	66
390	341	198	267	348	295	461	426	337	470	465	281
319	346	190	449	345	341	351	309	464	470	418	272
435	367	245	465	349	393	532	559	481	574	489	319
339	259	278	241	170	250	305	267	366	423	363	299
294	298	240	351	184	223	456	503	387	548	514	364
416	399	246	307	206	292	432	299	483	466	370	406
342	264	196	337	195	191	289	289	414	361	407	330
237	237	228	367	231	183	441	332	331	395	341	455
300	165	97	188	268	180	342	387	402	449	355	261
83	30	119	88	117	49	240	271	201	207	309	62
396	-332	190	445	260	223	438	430	528	517	519	406

ACCOM17	DESIGN1	DESIGN2	ARCHD1	ARCHD2	ARCHD3	ARCHD4	ARCHD5	ARCHD6	ARCHD7	ARCHD8	ARCHD9
270	254	298	517	413	388	393	136	303	317	340	293
125	257	355	392	319	443	390	308	224	170	299	125
245	167	370	464	449	400	406	276	277	236	334	297
119	79	121	222	233	78	201	154	191	254	200	342
273	140	229	557	551	272	451	136	379	354	460	451
209	212	262	535	451	396	425	85	316	347	316	367
165	182	183	407	379	334	373	63	257	319	293	352
62	250	284	350	323	223	261	69	298	242	265	237
78	78	107	441	407	244	269	68	218	216	134	193
144	105	198	296	293	203	232	73	218	271	190	199
242	177	245	467	441	320	298	360	312	210	391	262
189	315	394	507	539	408	418	138	485	259	313	440
318	391	496	541	506	385	362	189	363	338	377	426
272	286	380	445	458	315	370	252	437	237	292	414
156	134	253	567	571	398	437	231	350	408	262	480
298	302	314	617	571	398	437	231	350	408	262	480
330	246	303	421	522	270	520	138	459	421	403	1
327	224	424	452	477	415	517	287	395	203	1	403
320	211	213	449	421	311	309	163	392	1	203	421
155	362	473	519	515	422	481	239	1	392	395	459
138	36	385	335	343	395	335	1	239	163	287	138
397	315	452	590	635	606	1	335	481	309	517	520

ARCHD10	ARCHD11	EXTER1	EXTER2	EXTER3	EXTER4	OPER1	OPER2	OPER3	ACCESS1	ACCESS2	ACCESS3
527	442	432	362	417	251	297	260	341	558	665	497
312	356	417	332	305	196	253	264	288	393	475	311
230	345	446	430	373	166	478	306	469	360	499	540
177	300	187	261	247	160	360	255	334	189	230	356
411	351	344	269	397	257	430	389	353	540	645	1
573	462	348	313	388	169	336	353	359	772	1	645
502	397	327	291	300	71	278	364	236	1	772	540
248	414	386	280	388	238	667	377	1	236	359	353
449	278	255	216	417	162	578	1	377	364	353	389
200	302	263	201	316	126	1	578	667	278	336	430
317	314	290	295	364	1	126	162	238	71	169	257
466	456	443	365	1	364	316	417	388	300	388	397
398	320	563	1	365	295	201	216	280	291	313	269
447	251	1	563	443	290	263	255	386	327	348	344
503	1	251	320	456	314	302	278	414	397	462	351
1	503	447	398	466	317	200	449	248	502	573	411
480	414	377	426	440	262	199	193	237	352	367	451
262	292	326	377	313	391	190	134	265	293	316	460
408	237	289	338	259	210	271	216	242	319	347	354
350	437	347	363	485	312	218	218	298	257	316	379
231	252	393	189	138	360	73	68	69	63	85	136
437	370	496	362	418	298	232	269	261	373	425	451

ACCESS4	ACCESS5	ACCESS6	ACCESS7	ACCESS8	ACCESS9	SUSTAIN1	SUSTAIN	SUSTAIN3	SUSTAIN4	SUSTAIN5	SUSTAIN6
272	417	577	1	689	727	338	481	469	509	587	261
199	510	1	577	620	631	295	356	409	391	465	466
333	1	510	417	456	465	458	386	386	395	465	303
1	333	199	272	321	298	272	225	336	263	249	60
356	540	311	497	478	499	424	470	594	448	495	204
230	499	475	665	537	603	382	528	551	555	496	268
189	360	393	558	513	487	343	478	459	435	409	151
334	469	288	341	301	322	490	504	309	371	436	232
360	478	253	297	302	300	525	450	344	278	421	143
255	306	264	260	240	323	453	534	480	416	438	166
160	166	196	251	236	306	220	174	263	327	308	294
247	373	305	417	392	422	399	412	527	558	533	314
261	446	417	432	468	455	391	398	492	530	514	384
187	261	332	362	354	404	351	290	354	375	435	365
300	345	356	442	410	415	446	453	415	374	403	147
177	230	312	527	412	489	362	536	526	523	483	342
342	297	125	293	366	325	437	340	403	380	438	182
200	334	299	340	370	337	303	247	286	285	378	203
254	236	170	317	117	263	319	239	231	219	252	268
191	277	224	303	286	244	396	295	345	361	430	267
154	276	308	136	206	281	196	109	178	98	213	288
201	406	390	393	511	434	453	377	433	366	423	235

SUSTAIN7	PLAN1	PLAN2	PLAN3	PLAN4	SAFETY1	SAFETY2	SAFETY3	SAFETY4	SAFETY5	SAFETY6	SAFETY7
279	428	466	308	410	489	485	415	316	399	221	305
428	466	276	269	213	301	274	324	220	257	295	242
222	275	347	290	380	409	412	395	297	369	433	295
83	359	281	290	279	303	354	327	258	399	216	192
70	259	597	417	476	481	423	469	362	372	402	334
-205	547	579	388	358	399	413	484	349	273	338	319
277	513	454	256	265	312	294	314	243	193	245	252
213	447	244	255	274	318	369	391	234	367	291	233
182	224	255	228	224	239	349	288	279	274	282	250
107	215	244	255	274	318	369	391	234	367	291	233
35	209	301	301	327	404	453	440	326	444	291	349
242	373	342	333	336	186	143	203	312	217	44	240
265	423	453	334	345	481	413	475	421	329	247	422
207	460	437	383	467	290	309	240	225	296	226	266
258	450	485	354	477	391	420	293	256	305	358	405
186	441	429	345	374	243	290	348	146	169	144	201
337	402	539	311	429	265	314	290	180	226	179	296
121	503	506	294	443	421	364	331	244	309	196	304
238	423	504	319	295	292	264	307	141	162	239	201
118	388	431	281	389	274	260	155	98	148	157	194
182	463	528	426	408	367	362	416	387	274	275	389
186	239	170	253	231	201	184	183	79	141	308	185
102	557	535	388	429	428	395	339	284	323	284	391

SAFETY8	PERFOR1	PERFOR2	PERFOR3	PERFOR4	PERFOR5	PERFOR6	COMM1	COMM2	COMM3	COMM4	ENVIRO1
459	553	452	402	519	429	440	430	479	452	510	489
276	434	322	374	536	208	399	251	279	433	252	415
312	477	386	465	496	175	397	343	416	474	381	424
238	279	117	107	178	269	342	155	213	152	227	186
441	552	498	545	460	304	492	464	503	435	614	519
464	618	561	486	515	295	537	484	557	522	625	515
273	561	477	333	464	280	423	474	515	499	555	519
342	303	308	323	236	495	255	241	225	177	339	318
300	361	376	351	251	317	291	300	305	296	363	402
342	336	292	320	268	401	223	248	245	231	306	308
294	204	225	323	357	187	362	220	196	187	242	307
465	410	515	480	458	430	344	343	446	381	421	486
236	399	296	364	448	231	443	442	366	432	420	448
311	460	394	443	462	324	358	484	391	466	447	415
320	401	322	286	337	360	379	297	398	305	421	467
380	495	379	432	404	359	391	423	417	382	579	508
371	409	282	311	284	317	447	371	467	350	465	377
274	465	352	383	408	136	360	377	373	390	457	317
164	384	257	244	328	123	303	391	384	352	405	366
367	322	346	279	332	140	357	403	464	376	394	386
133	220	184	300	280	154	256	309	256	309	152	168
394	538	415	379	511	264	416	529	501	506	516	466

ENVIRO2	ENVIRO3	ENVIRO4	ENVIRO5	ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12	VFM
632	416	537	404	649	495	609	448	558	525	503	157
506	309	433	234	480	457	451	308	475	540	434	17
458	288	461	310	479	381	416	297	403	439	466	-91
222	218	243	191	352	229	249	246	130	276	218	126
549	433	530	397	655	519	541	417	396	501	576	216
650	538	538	396	578	441	579	406	472	536	558	113
604	454	470	420	555	507	536	410	459	442	466	229
340	323	429	294	384	276	267	283	269	409	325	92
326	342	352	414	379	398	404	373	244	370	330	204
374	390	416	360	346	309	256	370	257	351	360	276
263	252	332	192	350	297	327	172	284	395	292	55
552	399	475	387	510	499	506	368	258	486	369	158
432	264	320	251	406	319	365	340	363	480	359	11
485	321	436	272	459	457	476	292	437	460	323	-52
511	458	397	330	491	477	504	355	361	506	404	22
508	462	366	394	473	479	504	446	478	484	426	180
469	304	342	256	437	390	382	293	284	404	336	164
365	311	437	379	450	355	376	281	278	351	389	107
336	193	274	278	308	292	279	260	409	326	265	111
446	365	430	308	410	393	438	350	313	333	237	3
180	170	187	137	224	276	239	141	316	298	298	-70
507	387	463	469	558	508	555	365	449	433	350	59

	ACCOM1	ACCOM2	ACCOM3	ACCOM4	ACCOM5	ACCOM6	ACCOM7	ACCOM8	ACCOM9	ACCOM10	ACCOM11
PERFOR1	439	315	525	435	540	421	379	582	268	264	489
SAFETY8	341	245	135	148	385	305	22	146	252	227	227
SAFETY7	276	358	176	308	365	300	37	131	219	223	341
SAFETY6	148	118	167	119	255	137	-127	175	188	124	227
SAFETY5	253	301	197	243	331	278	149	197	357	396	269
SAFETY4	163	374	211	251	367	219	71	115	287	263	224
SAFETY3	282	326	171	159	506	361	233	233	292	312	300
SAFETY2	396	389	244	317	448	403	227	300	359	394	316
SAFETY1	309	372	304	319	393	308	166	314	339	329	343
PLAN4	328	328	316	415	339	349	237	388	322	303	490
PLAN3	316	297	183	201	386	281	167	230	276	306	311
PLAN2	379	216	429	338	495	403	267	450	265	256	503
PLAN1	347	287	408	307	476	364	206	373	221	265	458
SUSTAIN7	86	102	39	11	120	77	48	103	55	43	126
SUSTAIN6	153	263	-56	-33	102	59	-43	125	75	157	151
SUSTAIN5	181	326	263	275	428	341	-174	343	276	393	279
SUSTAIN4	328	233	282	216	476	401	126	355	213	326	490
SUSTAIN3	338	272	395	264	525	426	210	386	222	307	458
SUSTAIN2	377	273	265	211	343	306	168	359	162	208	294
SUSTAIN1	367	321	351	322	359	355	246	391	290	264	346
ACCESS9	258	363	330	245	419	360	275	352	278	409	348
ACCESS8	288	410	380	309	409	335	244	406	240	408	328

ACCOM12	ACCOM13	ACCOM14	ACCOM15	ACCOM16	ACCOM17	DESIGN1	DESIGN2	ARCHD1	ARCHD2	ARCHD3	ARCHD4
445	546	501	583	485	323	246	363	554	510	423	538
241	326	330	311	201	178	179	249	345	361	323	394
299	424	325	310	194	258	269	296	287	310	375	391
148	311	376	319	192	49	82	393	391	359	370	284
189	212	342	312	169	118	142	279	313	289	227	323
190	226	303	241	170	31	181	219	289	276	278	284
208	306	410	383	256	74	205	333	367	380	309	339
308	358	409	407	298	195	209	341	353	367	333	395
285	307	425	404	306	198	247	365	401	468	379	428
419	450	549	515	345	385	268	366	560	498	356	429
303	361	387	484	274	209	212	348	477	333	393	388
382	435	572	591	436	348	193	386	646	613	456	535
312	453	497	445	373	295	164	361	648	637	542	557
183	191	219	257	27	222	388	280	282	246	264	102
257	177	305	341	115	253	410	365	422	343	391	235
433	399	490	457	217	296	306	346	534	507	448	423
411	417	546	363	237	287	382	328	559	514	420	366
377	418	560	382	262	265	254	268	577	586	475	433
345	341	523	416	303	223	221	258	508	461	442	377
315	418	537	391	322	209	181	401	504	555	377	453
322	400	408	376	257	178	242	214	576	466	423	434
318	379	320	397	265	267	248	294	485	429	462	511

ARCHD5	ARCHD6	ARCHD7	ARCHD8	ARCHD9	ARCHD10	ARCHD11	EXTER1	EXTER2	EXTER3	EXTER4	OPER1
220	322	384	465	409	495	401	460	399	410	204	336
133	367	164	274	371	380	320	311	236	465	294	342
185	389	194	201	304	296	201	405	266	422	240	349
308	275	157	239	196	179	144	358	226	247	44	291
141	274	148	162	309	226	169	305	296	329	217	444
79	387	98	141	244	180	146	256	225	421	312	326
183	416	155	307	331	290	348	293	240	475	203	440
184	362	260	264	364	314	290	420	309	413	143	453
201	367	274	292	421	265	243	391	290	481	186	404
231	408	389	295	443	429	374	477	467	345	336	327
253	426	281	319	294	311	345	354	383	334	333	301
170	528	431	504	506	539	429	485	437	453	342	301
239	463	388	423	503	402	441	450	460	423	373	209
186	182	118	238	121	337	186	258	207	265	242	35
288	267	268	203	182	342	147	384	365	314	294	143
213	430	252	378	438	483	403	514	435	533	308	421
98	361	219	285	380	523	374	530	375	558	327	278
178	345	231	286	403	526	415	492	354	527	263	344
109	295	239	247	340	536	453	398	290	412	174	450
196	396	319	303	437	362	446	391	351	399	220	525
281	244	263	337	325	489	415	455	404	422	306	300
206	286	117	370	366	412	410	468	354	392	236	302

OPER2	OPER3	ACCESS1	ACCESS2	ACCESS3	ACCESS4	ACCESS5	ACCESS6	ACCESS7	ACCESS8	ACCESS9	SUSTAIN1
361	303	561	618	552	279	477	434	553	525	482	423
300	342	273	464	441	238	312	276	459	442	432	328
250	233	252	319	334	192	295	242	305	358	334	346
282	291	245	338	402	216	433	295	221	271	309	307
279	234	243	349	362	258	297	220	316	358	331	306
274	367	193	273	372	399	369	257	399	449	352	338
349	369	294	413	423	354	412	274	485	433	395	471
288	391	314	484	469	327	395	324	415	430	397	415
239	318	312	399	481	303	409	301	489	456	392	494
224	274	265	358	476	279	380	213	410	379	411	523
228	255	256	388	417	180	290	269	308	334	451	349
244	348	454	579	597	281	347	276	466	513	424	429
224	215	447	513	547	259	359	275	428	505	472	500
182	107	213	277	205	70	83	222	279	171	337	190
166	232	151	268	204	-60	303	261	261	327	458	269
438	436	409	496	495	249	465	465	587	540	565	490
416	371	435	555	448	263	395	391	509	484	526	375
480	309	459	551	594	336	386	409	469	505	581	450
534	504	478	528	470	225	386	356	481	437	453	651
453	490	343	382	424	272	458	295	338	331	293	1
323	322	487	603	499	298	465	631	727	699	1	293
240	301	513	537	478	321	456	620	689	1	699	331

SUSTAIN	SUSTAIN3	SUSTAIN4	SUSTAIN5	SUSTAIN6	SUSTAIN7	PLAN1	PLAN2	PLAN3	PLAN4	SAFETY1	SAFETY2
497	526	485	420	135	132	517	626	421	397	416	417
364	495	547	539	311	337	430	435	368	402	488	622
305	455	516	465	295	292	370	283	377	463	524	585
277	383	351	331	303	144	338	319	207	209	386	339
288	354	380	502	184	74	287	362	335	477	580	602
213	341	389	460	161	92	395	286	279	268	571	485
388	424	452	535	196	187	419	419	368	511	609	762
400	488	449	497	205	181	400	548	369	358	762	1
416	433	411	609	251	178	407	429	315	433	1	724
368	351	385	412	346	329	581	542	1	676	315	368
428	438	391	501	328	269	577	589	676	1	433	511
501	570	482	461	257	187	658	1	542	589	429	419
397	551	464	389	231	229	1	658	581	577	407	419
280	372	477	475	502	1	229	187	329	269	178	187
332	380	391	492	1	502	231	257	346	328	251	196
591	645	645	1	391	477	464	482	385	391	411	452
614	798	1	645	391	475	389	461	412	501	609	535
674	1	798	645	380	372	551	570	351	438	433	424
1	674	614	591	332	280	397	501	368	428	416	388
651	450	375	490	269	190	500	429	349	523	494	471
453	581	526	565	458	337	472	424	451	411	392	395
437	505	484	540	327	171	505	513	334	379	456	433

SAFETY3	SAFETY4	SAFETY5	SAFETY6	SAFETY7	SAFETY8	PERFOR1	PERFOR2	PERFOR3	PERFOR4	PERFOR5	PERFOR6
382	236	332	337	287	348	1	601	517	547	287	435
645	583	562	322	650	1	348	518	473	416	453	376
435	591	497	370	1	650	287	416	481	493	386	340
371	412	312	1	370	322	337	340	362	343	194	264
509	653	1	312	497	562	332	390	384	423	418	287
530	1	653	412	591	583	236	419	417	433	305	332
1	530	509	371	435	645	382	519	457	380	423	390
762	485	602	339	585	622	417	446	464	353	490	377
609	571	580	386	524	488	416	478	509	496	441	464
358	268	477	209	463	402	397	410	534	514	429	496
369	279	335	207	377	368	421	507	558	497	324	419
548	286	362	319	283	435	626	599	515	526	282	468
400	395	287	338	370	430	517	521	505	496	323	502
181	92	74	144	292	337	132	252	381	276	220	352
205	161	184	303	295	311	135	247	390	415	221	320
497	460	502	331	465	539	420	487	532	566	440	434
449	389	380	351	516	547	485	525	499	500	351	486
488	341	354	383	455	495	526	523	531	517	381	478
400	213	288	277	305	364	497	491	466	429	500	328
415	306	338	307	346	328	423	379	385	372	518	426
397	331	352	309	334	432	482	375	517	543	390	548
430	410	449	271	358	442	525	410	421	555	339	464

COMM1	COMM2	COMM3	COMM4	ENVIRO1	ENVIRO2	ENVIRO3	ENVIRO4	ENVIRO5	ENVIRO6	ENVIRO7	ENVIRO8
523	495	522	658	577	668	467	565	542	605	512	563
297	378	312	462	320	345	322	410	369	450	386	439
426	533	461	332	376	317	204	368	267	381	394	403
520	455	509	286	224	280	202	271	232	363	229	312
182	238	172	260	268	291	264	315	255	407	307	313
365	402	330	483	450	432	397	497	336	440	417	447
339	412	317	509	405	387	272	487	333	412	365	458
382	415	380	412	497	470	282	397	204	399	331	377
460	490	365	498	418	450	309	426	332	486	497	449
370	388	358	389	337	374	235	350	322	404	452	317
554	471	458	688	572	634	443	549	451	541	536	546
548	562	517	598	525	563	332	430	399	560	514	565
289	365	369	142	271	281	126	236	179	300	274	186
270	207	341	122	267	352	170	234	26	301	306	221
431	483	488	387	567	630	481	521	357	568	552	480
420	468	445	421	577	582	401	570	374	647	529	532
491	485	473	508	654	685	477	551	362	674	613	594
459	414	436	515	589	600	400	480	292	496	506	493
502	491	463	493	495	489	390	397	294	464	435	418
393	457	474	418	473	592	426	482	363	613	539	552
358	385	371	427	469	594	446	528	357	600	552	569

	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12	VFM		ACCOM1	ACCOM2	ACCOM3	ACCOM4	ACCOM5	ACCOM6
VFM	507	516	508	469	145	VFM	59	88	74	12	173	180
PERFOR2	480	191	507	441	253	PERFOR2	249	275	-232	250	325	183
PERFOR3	389	227	393	308	137	PERFOR3	286	339	266	297	405	245
PERFOR4	349	297	379	316	83	PERFOR4	228	297	348	368	260	175
PERFOR5	392	221	381	427	328	PERFOR5	152	180	372	365	268	171
PERFOR6	402	185	362	328	232	PERFOR6	305	325	406	320	493	368
COMM1	419	185	489	481	255	COMM1	261	293	326	260	478	332
COMM2	414	263	460	482	360	COMM2	291	231	368	293	506	372
COMM3	296	329	429	446	357	COMM3	143	106	303	293	264	263
COMM4	378	477	463	485	104	COMM4	210	201	235	254	384	255
ENVIRO1	292	419	443	484	69	ENVIRO1	98	176	304	234	276	207
ENVIRO2	464	429	458	459	108	ENVIRO2	327	335	422	312	463	338
ENVIRO3	410	467	504	464	89	ENVIRO3	329	350	353	262	441	339
ENVIRO4	93	163	357	372	68	ENVIRO4	462	307	429	452	505	465
ENVIRO5	118	315	442	345	30	ENVIRO5	215	263	334	264	354	253
ENVIRO6	404	379	549	570	228	ENVIRO6	296	240	371	366	449	335
ENVIRO7	391	341	542	414	80	ENVIRO7	284	238	373	295	428	339
ENVIRO8	405	363	542	453	89	ENVIRO8	310	384	299	275	397	359
ENVIRO9	332	494	451	514	204	ENVIRO9	289	301	186	274	262	274
ENVIRO10	417	398	405	437	199	ENVIRO10	201	368	336	402	341	218
ENVIRO11	352	573	628	612	100	ENVIRO11	280	395	242	329	426	210
ENVIRO12	460	470	477	433	151	ENVIRO12	396	378	322	275	517	284

ACCOM7	ACCOM8	ACCOM9	ACCOM10	ACCOM11	ACCOM12	ACCOM13	ACCOM14	ACCOM15	ACCOM16	ACCOM17
16	2	170	206	94	62	6	7	107	75	12
282	-355	261	256	270	297	350	422	518	281	-197
177	318	267	387	400	321	372	505	500	299	234
182	430	230	232	409	434	355	497	532	475	192
276	284	198	212	320	316	340	416	364	248	152
308	474	218	263	547	511	429	569	482	388	268
243	372	227	333	517	447	365	486	470	332	363
300	430	256	295	482	406	503	524	442	350	229
276	332	191	141	369	344	412	398	402	267	248
231	408	151	206	450	369	445	479	403	274	365
304	251	125	231	368	279	326	454	320	210	172
221	477	186	356	490	440	463	550	508	438	310
168	441	242	314	440	376	337	501	501	355	253
298	479	265	266	524	378	498	567	496	438	348
102	394	167	140	355	329	621	461	438	279	232
130	355	172	184	423	317	604	501	397	342	215
133	395	174	83	430	292	572	534	409	337	272
114	336	332	375	397	202	351	453	362	205	189
104	127	190	341	324	299	188	364	276	176	118
97	450	262	291	452	416	425	493	544	343	357
198	372	305	297	393	417	317	454	631	374	207
117	428	282	259	395	357	313	499	637	472	187

DESIGN1	DESIGN2	ARCHD1	ARCHD2	ARCHD3	ARCHD4	ARCHD5	ARCHD6	ARCHD7	ARCHD8	ARCHD9	ARCHD10
79	215	1	75	74	59	70	3	111	107	164	180
98	255	-514	437	317	350	298	-237	265	389	336	426
264	338	550	501	371	433	298	333	326	351	404	484
190	299	610	458	457	449	316	313	409	278	284	478
42	205	488	430	277	365	141	350	260	281	293	446
192	250	586	564	439	555	239	438	279	376	382	504
198	257	548	511	410	508	276	393	292	355	390	479
232	362	595	566	369	558	224	410	308	450	437	473
102	205	488	477	317	469	137	308	278	379	256	394
292	343	483	456	419	463	187	430	274	437	342	366
85	152	487	480	350	387	170	365	193	311	304	462
256	335	617	575	490	507	180	446	336	365	469	508
188	229	593	599	395	466	168	386	366	317	377	508
175	331	566	553	429	516	152	394	405	457	465	579
171	402	518	486	590	506	309	376	352	390	350	382
205	371	514	508	463	501	256	464	384	373	467	417
246	408	546	504	506	529	309	403	391	377	371	423
288	257	521	497	269	416	256	357	303	360	447	391
120	212	324	373	258	264	154	140	123	136	317	359
299	362	542	459	499	511	280	332	328	408	284	404
214	336	529	438	388	379	300	279	244	383	311	432
161	326	503	431	429	415	184	346	257	352	282	379

ARCHD11	EXTER1	EXTER2	EXTER3	EXTER4	OPER1	OPER2	OPER3	ACCESS1	ACCESS2	ACCESS3	ACCESS4
22	52	11	158	55	276	204	229	92	113	216	126
404	323	-359	369	292	360	330	325	466	558	576	218
506	460	480	486	395	351	370	409	442	536	501	276
361	437	363	258	284	257	244	269	459	472	396	130
355	292	340	368	172	370	373	283	410	406	417	246
504	476	365	506	327	256	404	267	536	579	541	249
477	457	319	499	297	309	398	276	507	441	519	229
491	459	406	510	350	346	379	384	555	578	655	352
330	272	251	387	192	360	414	294	420	396	397	191
397	436	320	475	332	416	352	429	470	538	530	243
458	321	264	399	252	342	390	323	454	429	433	218
511	485	432	552	263	326	374	340	604	650	549	222
467	415	448	486	307	308	402	318	519	515	519	186
421	447	420	421	242	306	363	339	555	625	614	227
305	466	432	381	187	231	296	177	499	522	435	152
398	391	366	446	196	245	305	225	515	557	503	213
297	484	442	343	220	248	300	241	474	484	464	155
379	358	443	344	362	223	291	255	423	537	492	342
360	324	231	430	187	401	317	495	280	295	304	269
337	462	448	458	357	268	251	236	464	515	460	178
286	443	364	480	323	320	351	323	333	486	545	107
322	394	296	515	225	292	376	308	477	561	498	117

520

ACCESS5	ACCESS6	ACCESS7	ACCESS8	ACCESS9	SUSTAIN1	SUSTAIN	SUSTAIN3	SUSTAIN4	SUSTAIN5	SUSTAIN6
91	17	157	151	100	199	204	89	80	228	30
466	-434	503	433	612	437	514	453	414	570	345
439	540	525	477	628	405	451	542	542	549	442
403	475	558	470	573	398	494	363	341	379	315
297	308	448	460	352	417	332	405	391	404	118
416	451	609	569	552	418	493	594	532	480	221
381	457	495	552	539	435	506	613	529	552	306
479	480	649	600	613	464	496	674	647	568	301
310	234	404	357	363	294	292	362	374	357	26
461	433	537	528	482	397	480	551	570	521	234
288	309	416	446	426	390	400	477	401	481	170
458	506	632	594	592	489	600	685	582	630	352
424	415	489	469	473	495	589	654	577	567	267
381	252	510	427	418	493	515	508	421	387	122
474	433	452	371	474	463	436	473	445	488	341
416	279	479	385	457	491	414	485	468	483	207
343	251	430	358	393	502	459	491	420	431	270
397	399	440	464	548	426	328	478	486	434	320
175	208	429	339	390	518	500	381	351	440	221
496	536	519	555	543	372	429	517	500	566	415
465	374	402	421	517	385	466	531	499	532	390
386	322	452	410	375	379	491	523	525	487	247

SUSTAIN7	PLAN1	PLAN2	PLAN3	PLAN4	SAFETY1	SAFETY2	SAFETY3	SAFETY4	SAFETY5	SAFETY6	SAFETY7
68	89	108	69	104	357	360	255	232	328	83	137
372	464	459	484	485	446	482	481	328	427	316	308
357	504	458	443	463	429	460	489	362	381	379	393
163	467	429	419	477	329	263	185	185	221	297	227
93	410	464	292	378	296	414	419	402	392	349	389
186	565	546	317	449	377	458	447	341	313	312	403
274	514	536	452	497	331	365	417	247	307	229	394
300	560	541	404	486	399	412	440	333	407	363	381
179	399	451	322	332	204	333	336	264	255	232	267
236	430	549	350	426	397	487	497	278	315	271	368
126	332	443	235	309	282	272	397	285	264	202	204
281	563	634	374	450	470	387	432	279	291	280	317
271	525	572	337	418	497	405	450	313	268	224	376
142	598	688	389	498	412	509	483	221	260	286	332
369	517	458	358	365	380	317	330	263	172	509	461
365	562	471	388	490	415	412	402	320	238	455	533
289	548	554	370	460	382	339	365	293	182	520	426
352	502	468	419	496	464	377	390	332	287	264	340
220	323	282	324	429	441	490	423	305	418	194	386
276	496	526	497	514	496	353	380	433	423	343	493
381	505	515	558	534	509	464	457	417	384	362	481
252	521	599	507	410	478	446	519	419	390	340	416

SAFETY8	PERFOR1	PERFOR2	PERFOR3	PERFOR4	PERFOR5	PERFOR6	COMM1	COMM2	COMM3	COMM4	ENVIRO1
253	145	145	244	64	338	151	54	57	30	259	56
441	469	510	644	511	421	494	334	384	-391	433	468
507	508	538	624	625	451	619	466	472	444	460	566
191	516	515	589	556	339	422	443	422	439	480	467
480	507	426	392	431	357	286	371	381	359	468	421
439	563	581	537	512	361	440	517	530	495	588	648
386	512	556	555	523	396	431	504	498	454	544	719
450	605	526	551	568	378	519	557	543	501	509	612
369	542	364	287	357	234	255	313	397	393	477	374
410	565	503	517	492	312	416	468	445	424	544	591
322	467	379	293	387	321	360	382	410	386	456	485
345	668	607	545	562	357	498	522	528	565	590	775
320	577	599	589	571	350	517	534	528	529	517	1
462	658	537	473	390	413	448	580	592	521	1	517
312	522	413	404	559	215	432	736	815	1	521	529
378	495	445	418	535	348	536	775	1	815	592	528
297	523	481	410	510	260	461	1	775	736	580	534
376	435	377	433	536	347	1	461	536	432	448	517
453	287	380	414	331	1	347	260	348	215	413	350
416	547	621	665	1	331	536	510	535	559	390	571
473	517	758	1	665	414	433	410	418	404	473	589
518	601	1	758	621	380	377	481	445	413	537	599

ENVIRO2	ENVIRO3	ENVIRO4	ENVIRO5	ENVIRO6	ENVIRO7	ENVIRO8	ENVIRO9	ENVIRO10	ENVIRO11	ENVIRO12	VFM
44	41	123	85	107	53	9	90	86	91	184	1
500	301	482	320	534	458	494	390	567	697	1	184
580	422	545	372	628	558	593	437	609	1	697	91
552	354	444	340	531	481	561	410	1	609	567	86
453	655	512	728	558	468	557	1	410	437	390	90
709	519	706	751	751	712	1	557	561	593	494	9
691	482	654	407	672	1	712	468	481	558	458	53
687	485	693	493	1	672	751	558	531	628	534	107
433	634	485	1	493	407	453	728	340	372	320	85
679	498	1	485	485	482	519	655	354	422	301	41
539	1	498	634	693	654	706	512	444	545	482	123
1	539	679	433	687	691	709	453	552	580	500	44
775	485	591	374	612	719	648	421	467	566	468	56
590	456	544	477	509	544	588	468	480	460	433	259
565	386	424	393	501	454	495	359	439	444	391	30
528	410	445	397	543	498	530	381	422	472	384	-57
522	382	468	313	557	504	517	371	443	466	334	54
498	360	416	255	519	431	440	286	422	619	494	151
357	321	312	234	378	396	361	357	339	451	421	338
562	387	492	357	568	523	512	431	556	625	511	64
545	293	517	287	551	555	537	392	589	624	644	244
607	379	503	364	526	556	581	426	515	538	510	145

Table 6.40.1 The correlation matrix for the design & engineering variables

Accommodation Requirements Variables Varmix			
Factor1	**Loading**	**Factor2**	**Loading**
Spatial arrangements that enhance student creativity	0.854	The provision of ancillary spaces	0.765
Attractiveness of spaces	0.851	The provision of external learning spaces	0.764
Well proportioned internal & external spaces	0.824	The provision of service facilities	0.761
The provision of internal & external spaces for social activities	0.741	The provision of external physical and sport spaces	0.674
Spaces for community use and out of hours use	0.737	The provision of internal physical and sport spaces	0.668
Spaces which enhance variety of learning	0.681	The provision of internal teaching and learning spaces	0.64
The provision of spaces for internal & external movement	0.548		
Spaces and design that fulfil the curriculum needs	0.451		

Table 6.48 The resulted factors for the accommodation requirements category

Environmental Design Variables Varmix			
Factor1	**Loading**	**Factor2**	**Loading**
Well controlled relationship between thermal comfort and ventilation	0.795	Temperature which is easily controlled by users	0.868
Adequate lighting for all day, all year	0.777	Ventilation which is easily controlled by users	0.834
Well balanced natural and artificial lighting	0.755	Lighting which is easily controlled by users	0.799
Mechanical systems which do not disturb the learning activities	0.751		
Adequate ventilation (good air quality) for all day, all year	0.748		
Well balanced natural and mechanical ventilation	0.743		
Acoustic performance in the different areas	0.74		
Environment which enhances pupils' motivation and achievement	0.719		
Thermal comfort for all day, all year	0.671		

Table 6.49 The resulted factors for the environmental design category

Sustainability Variables Varmix			
Factor1	**Loading**	**Factor2**	**Loading**
Efficient energy usage	0.886	Minimising the mechanical & electrical systems	0.866
Durable elements & components (Long life)	0.811	Adaptable to climate change	0.784
Maximising the use of natural daylight	0.769		
Maximising the use of natural ventilation	0.672		

Table 6.50 The resulted factors for sustainability category

Accessibility and Inclusion of People with Disabilities Variables Varmix			
Factor1	**Loading**	**Factor2**	**Loading**
High standard of environmental features for people with disabilities	0.866	Inclusive internal & external access for all	0.847
Specific design features for people with disabilities	0.79	Design attains ease of movement through building & site for all	0.841
Inclusion of welfare spaces to support people with disabilities	0.782	Entrance is welcoming and easily identified	0.755
Internal & external circulation satisfy people with disabilities	0.72		

Table 6.51 The resulted factors for accessibility and inclusion of people with disabilities category

Community Involvement variables varmix	
Factor1	**Loading**
Easy and adequate physical access for community	0.924
School encourages interactive relationship with community organisations	0.895
Internal & external design encourages community use	0.893
Design creates welcoming school	0.757

Table 6.52 The resulted factors for the community involvement category

Building Organisation and Planning Variables Varmix	
Factor1	**Loading**
Linking well between indoors and outdoors	0.85
Design attains a good relationship between spaces (Spatial relationship)	0.839
Patterns of use relate to the disposition of spaces and activities	0.836
Well organised site	0.83

Table 6.53 The resulted factors for the building organisation and planning category

Architectural Design Quality Variables Varmix	
Factor1	**Loading**
Attractive and appealing internal appearance	0.895
Attractive and appealing external appearance	0.895
Good neighbourhood identity (Building is a centre of community)	0.8
Design which achieves diversity of use	0.747
Design which creates pleasurable environment for students to study	0.736

Table 6.54 The resulted factors for architectural design quality category

External Site and School Grounds Variables varmix	
Factor1	Loading
Outdoor learning environmental features	0.853
Dedicated designed landscaping	0.814
Site is large enough and designed well to meet educational needs	0.733

Table 6.55 The resulted factors for external site and school grounds category

Health and safety and security Variables Varmix	
Factor1	Loading
Safe & secure internal & external movement	0.869
Safe site is created	0.811
Safe & secure building entrance	0.804
Design which allows for internal & external supervision of users	0.804
Safe approach to the school	0.79
Clear boundaries of the site	0.788
Adequate security for community use	0.757

Table 6.56 The resulted factors for the Health and safety and security category

Building Performance Variables Varmix	
Factor1	Loading
Design enhances learning and teaching performance	0.878
Internal & external design enhances student motivation	0.874
Internal & external design enhances social activities	0.821
Design that accommodates good ICT infrastructure	0.76
Design gets the overall client and user satisfaction	0.565

Table 6.57 The resulted factors for the building performance category

Appendix C

School of the Built Environment
Research Questionnaire

HERIOT WATT
UNIVERSITY

Date 10/02/2010

Dear Sir/Madam, (The council representative)

Dear Sir/Madam,

Research to improve the accuracy of cost estimates for new school buildings at the briefing stage

Research is being conducted in the School of the Built Environment at Heriot- Watt University to develop a function based cost estimating model for new school buildings which could be used at the briefing stage.

It would be very helpful to the success of this research if you could find time to complete the web-site survey form below. We appreciate your time is valuable, so the survey has been designed to take no more than 1 minute for each. The main aim of the survey is to find out basic information about a number of the council's schools. This will help in the development of a cost estimating model that can be applied at the briefing stage of new school building projects.

Please be assured that any information you provide will be treated in complete confidence and will be used for academic research purposes only.

Yours faithfully,

M.Zakwan Arab

A Function Based-Cost Model for Early Cost Advice on New-Build School Projects

M.Zakwan Arab

Room 403 Sir William Arrol Building

School of the Built Environment

Heriot-Watt University

Edinburgh EH14 4AS

Za12@hw.ac.uk

The research aims to develop a cost estimating model that can be applied at the briefing stage of new school building projects. The model estimates construction cost using the proposed requirements defined by the client.

Objectives:

This part of the study is being conducted to achieve the following objective

Requiring basic information about the specified school.

Part 1: Personal Information:

The first section is about you and your experience. This information will be treated as anonymous and confidential and will not be passed on to third parties.

1- Your name (optional)

....

2- What is the position you fulfill?

....

Part 2: School Information

3- Type of school:

Secondary ☐   **Primary** ☐   **Primary & Nursery** ☐

4- Total school area: ☐ **m2**

5- Number of stories of school: ☐

6- How old is the school (when first built)?

☐ **Years**

7- The school final construction cost at the time of occupation (initial completion) if known. (Total cost or cost per square metre)?

£ ☐ **or £/m2** ☐

8- Has there been any major refurbishment carried out since the school was first built? This does not include normal repair and maintenance activities.

Yes ☐   **No** ☐

If yes, could you give a few details please?

....

....

School of the Built Environment
Research Questionnaire

HERIOT WATT UNIVERSITY

Date 10/02/2010

Research to improve the accuracy of cost estimates for new school buildings at the briefing stage

Research is being conducted in the School of the Built Environment at Heriot- Watt University to develop a cost estimating method for new school buildings which could be used at the briefing stage. The estimating method depends mainly on your evaluation of your school

It would be very helpful to the success of this research if you could find time to complete the survey. We appreciate your time is valuable, so the survey has been designed to take no more than 10 minutes. The main aims of the survey are to find out, from your point of view, firstly how important the various stated design and engineering criteria for new school buildings are and secondly how well you believe your school meets these various criteria. This will help in the development of a cost estimating method that can be applied at the briefing stage of new school building projects. A summary of the results of the survey can be provided if you so indicate on the form.

P.S.

1- Please notice that there is a hard copy sent to your school. If you respond to this web-based survey ignore the hard copy please.
2- It would be very helpful and appreciated the presence of the business manager or purser.

Please be assured that any information you provide will be treated in complete confidence and will be used for academic research purposes only.

Yours faithfully,

M.Zakwan Arab

A Function Based-Cost Model for Early Cost Advice on New-Build School Projects

M.Zakwan Arab

Room 403 Sir William Arrol Building

School of the Built Environment

Heriot-Watt University

Edinburgh EH14 4AS

Za12@hw.ac.uk

The research aims to develop a cost estimating model that can be applied at the briefing stage of new school building projects. The model estimates construction cost using the proposed requirements defined by the client.

Objectives:

This part of the study is being conducted to achieve the following objectives:

1) Confirm the importance of the list of identified design and engineering requirements determined from design guidance and previous study conducted as part of this research.

2) Evaluate the extent to which you believe your school achieves these requirements.

Part 1: Personal Information:

The first section is about you and your experience. This information will be treated as anonymous and confidential and will not be passed on to third parties.

5- Your name (optional)
···

6- What is the position you fulfill?
···

7- How long have you been involved with this school?

01-10 Years ☐   11-20 Years ☐   21-30 Years ☐

over 30 Years ☐

Part 2: School Information

1- Type of school:

Secondary ☐   **Primary** ☐   **Primary & Nursery** ☐

2- Number of School Stories or levels: (Ground floor is counted, E.g. ground and first floors =2) ☐ **floors**

3- Range of pupils age (E.g. 3 to 5 years): ☐ **Years**

4- Is there a basement?   **Yes** ☐   **No** ☐

5- How old is the school in years (when first built, opened), or what year was your school opened? ☐

6- The school final construction cost at the time of occupation (initial completion) if known (Total cost or cost per square metre)?

£ ☐ **Or**   **£/m2** ☐

7- Has there been any major refurbishment or Additions to your building (E.g. New heating system, Rooms, Links) carried out since the school was first built? This does not include normal repair, snagging and maintenance activities.

Yes ☐   **No** ☐

If yes, could you give a few details please?

···

···

Appendix C

Part 3: at the briefing stage of the design, several main design and engineering requirements are determined by clients and users for new-build schools. From your experience, could you please firstly <u>rank the importance of the following requirements which the design should achieve for current new-build schools in general</u> and secondly *rate the extent to which you believe your school achieves these requirements?*

Please rank the importance in scale "Not important to Extremely important (1-5)"

Please rate the satisfaction in scale "Not Satisfactory at all to Very Satisfactory (1-5)"

Internal & External Accommodation Requirements	Examples	How Important In your opinion					How Satisfied (with your school)				
		Not Important	Slightly Important	Important	Very important	Extremely important	Un-satisfactory	Not Very Satisfactory	Quite Satisfactory	Satisfactory	Very Satisfactory
The provision of adequate internal teaching and learning spaces	E.g. Appropriate sized classes, Laboratories, Learning resources, Personal	1	2	3	4	5	1	2	3	4	5
The provision of an adequate internal physical and sport spaces	E.g. Sport halls, Gym space	1	2	3	4	5	1	2	3	4	5
The provision of adequate external physical and sport spaces	E.g. Sport halls, Gym space	1	2	3	4	5	1	2	3	4	5
Spaces and design that fulfill the curriculum needs		1	2	3	4	5	1	2	3	4	5
School grounds which are large enough and designed well to meet educational needs	E.g. Outdoor classrooms	1	2	3	4	5	1	2	3	4	5
The overall Internal & External Accommodation Requirements	Teaching, Non teaching, movement and services area						1	2	3	4	5

Sustainability	Description	How Important In your opinion					How Satisfied (with your school)				
		Not Important	Slightly Important	Important	Very important	Extremely important	Un-satisfactory	Not Very Satisfactory	Quite Satisfactory	Satisfactory	Very Satisfactory
Durable elements & components (Long life)	Materials and components	1	2	3	4	5	1	2	3	4	5
Efficient energy usage		1	2	3	4	5	1	2	3	4	5
Maximising the use of natural day light		1	2	3	4	5	1	2	3	4	5
Maximising the use of natural ventilation		1	2	3	4	5	1	2	3	4	5
The overall Sustainability							1	2	3	4	5

Appendix C

Environmental Design	Description	How Important In your opinion					How Satisfied (with your school)				
		Not Important	Slightly Important	Important	Very important	Extremely important	Un-satisfactory	Not Very Satisfactory	Quite Satisfactory	Satisfactory	Very Satisfactory
Well balanced natural and artificial lighting		1	2	3	4	5	1	2	3	4	5
Adequate lighting for all day, all year		1	2	3	4	5	1	2	3	4	5
Thermal comfort for all day, all year	Temperature comfort	1	2	3	4	5	1	2	3	4	5
Acoustic performance in the different areas	Planning & Materials	1	2	3	4	5	1	2	3	4	5
Adequate ventilation (good air quality) for all day, all year		1	2	3	4	5	1	2	3	4	5
Environment which enhances pupils motivation and achievement	Temperature, Lighting, Ventilation	1	2	3	4	5	1	2	3	4	5
Mechanical Systems which do not disturb the learning activities	E.g. Boiler, Computers, Conditioner	1	2	3	4	5	1	2	3	4	5
The overall Environmental Design							1	2	3	4	5

Design & Planning Features	Description	How Important In your opinion					How Satisfied (with your school)				
		Not Important	Slightly Important	Important	Very important	Extremely important	Un-satisfactory	Not Very Satisfactory	Quite Satisfactory	Satisfactory	Very Satisfactory
Flexibility of design and spaces	Short term changes	1	2	3	4	5	1	2	3	4	5
Design which creates pleasurable environment for students to study	E.g. Finishes, Layouts	1	2	3	4	5	1	2	3	4	5
Design attains a good relationship between the spaces (Spatial relationship)		1	2	3	4	5	1	2	3	4	5
Design that accommodates good ICT infrastructure	Information and communication technologies	1	2	3	4	5	1	2	3	4	5
Design which enhances learning and teaching performance		1	2	3	4	5	1	2	3	4	5
Internal & external design enhances & promotes student motivation		1	2	3	4	5	1	2	3	4	5
Design that achieves the overall client's and users' satisfaction		1	2	3	4	5	1	2	3	4	5
Design that creates a welcoming school		1	2	3	4	5	1	2	3	4	5
The overall Design & Planning Features							1	2	3	4	5

Accessibility and Inclusion of people with disabilities	Description	How Important In your opinion					How Satisfied (with your school)				
		Not Important	Slightly Important	Important	Very important	Extremely important	Un-satisfactory	Not Very Satisfactory	Quite Satisfactory	Satisfactory	Very Satisfactory
Inclusive internal & external access for all	Pupils, Staff , Parent & people with disabilities	1	2	3	4	5	1	2	3	4	5
Design attains ease of movement through building & site for all	Staff, Pupils & people with disabilities	1	2	3	4	5	1	2	3	4	5
Entrance is welcoming and easily identified		1	2	3	4	5	1	2	3	4	5
Internal & external circulation satisfy people with disabilities		1	2	3	4	5	1	2	3	4	5
The overall Accessibility and Inclusion of people with disabilities							1	2	3	4	5

Safety, Health and Security	Description	How Important In your opinion					How Satisfied (with your school)				
		Not Important	Slightly Important	Important	Very important	Extremely important	Un-satisfactory	Not Very Satisfactory	Quite Satisfactory	Satisfactory	Very Satisfactory
Safe & secured internal movement	Safety circulation, stairwell	1	2	3	4	5	1	2	3	4	5
Safe & secured external movement	Safety circulation, playing areas	1	2	3	4	5	1	2	3	4	5
Safe & secured building entrance		1	2	3	4	5	1	2	3	4	5
Safe site is created		1	2	3	4	5	1	2	3	4	5
The overall Safety, Health and Security							1	2	3	4	5

Operation at consideration of Building	Description	How Important In your opinion					How Satisfied (with your school)				
		Not Important	Slightly Important	Important	Very important	Extremely important	Un-satisfactory	Not Very Satisfactory	Quite Satisfactory	Satisfactory	Very Satisfactory
Minimise energy cost		1	2	3	4	5	1	2	3	4	5
Ease of building and site maintenance		1	2	3	4	5	1	2	3	4	5
The overall Operation at consideration of Building							1	2	3	4	5

General Requirements	Description	How Important In your opinion					How Satisfied (with your school)				
		Not Important	Slightly Important	Important	Very important	Extremely important	Un-satisfactory	Not Very Satisfactory	Quite Satisfactory	Satisfactory	Very Satisfactory
The Overall building Value for Money	Building's functions & quality	1	2	3	4	5	1	2	3	4	5
The Overall Quality of The Building's Design	E.g. Level of finishing, Luxury	1	2	3	4	5	1	2	3	4	5
Your Overall Satisfaction							1	2	3	4	5

- **Are you interested in receiving the results of this research?**

Yes ☐ **No** ☐

If **Yes** please give contact details of yours

Address: ....

....

Email: ....

Thank you very much for
your valuable time in completing this survey

Code No:

535

Corrected Item-Total Correlation	Accommodation requirements	Sustainability	Environmental design	Accessibility requirements	Health and safety, and security	Design & planning features	Operational consideration of building	Total design variables scale for importance
The provision of adequate internal teaching and learning spaces	.393							.224
The provision of adequate internal physical and sport spaces	.721							.598
The provision of adequate external physical and sport spaces	.769							.502
Spaces and design that fulfill the curriculum needs	.679							.616
School grounds which are large enough and designed well to meet educational needs	.694							.572
Durable elements & components. (Long life)		.729						.644
Efficient energy usage		.810						.701
Maximising the use of natural day light		.830						.777
Maximising the use of natural ventilation		.840						.719
Well balanced natural and artificial lighting			.859					.797
Adequate lighting for all day, all year			.821					.748

Thermal comfort for all day, all year			.715					.698
Acoustic performance in the different areas			.635					.623
Adequate ventilation (good air quality) for all day, all year			.771					.765
Environment which enhances pupils motivation and achievement			.553					.677
Mechanical systems which do not disturb the learning activities			.673					.722
Flexibility of design and spaces				.587				.481
Design which creates pleasurable environment for students to study				.759				.683
Design attains a good relationship between the spaces. (Spatial relationship)				.787				.779
Design that accommodates good ICT infrastructure				.617				.681
Design which enhances learning and teaching performance				.713				.650
Internal & external design enhances & promotes student motivation				.627				.632
Design that achieves the overall client and user satisfaction				.744				.674

Design that creates a welcoming school				.568				.514
Inclusive internal & external access for all					.806			.690
Design attains ease of movement through building & site for all					.803			.652
Entrance is welcoming and easily identified					.692			.759
Internal & external circulation satisfy people with disabilities					.804			.720
Safe & secured internal movement						.718		.597
Safe & secured external movement						.867		.597
Safe & secured building entrance						.719		.530
Safe site is created						.581		.550
Minimise energy cost							.724	.635
Ease of building and site maintenance							.724	.758
Overall building value for money								.724

Appendix C

Overall Quality of the building's Design								.711

Corrected Item-Total Correlation	Accommodation Requirements	Sustainability	Environmental Design	Accessibility Requirements	Safety, Health and Security	Design & Planning features	Operational consideration of building	Total design variables scale for importance
The provision of adequate internal teaching and learning spaces	.718							.718
The provision of adequate internal physical and sport spaces	.660							.626
The provision of adequate external physical and sport spaces	.662							.538
Spaces and design that fulfill the curriculum needs	.712							.757
School grounds which are large enough and designed well to meet educational needs	.687							.561
Durable elements & components. (Long life)		.609						.619
Efficient energy usage		.653						.639
Maximising the use of natural day light		.750						.793
Maximising the use of natural ventilation		.778						.769
Well balanced natural and artificial lighting			.731					.798

Adequate lighting for all day, all year			.797					.798
Thermal comfort for all day, all year			.687					.635
Acoustic performance in the different areas			.748					.773
Adequate ventilation (good air quality) for all day, all year			.780					.758
Environment which enhances pupils motivation and achievement			.765					.787
Mechanical systems which do not disturb the learning activities			.642					.626
Flexibility of design and spaces				.744				.672
Design which creates pleasurable environment for students to study				.782				.728
Design attains a good relationship between the spaces. (Spatial relationship)				.885				.805
Design that accommodates good ICT infrastructure				.595				.668
Design which enhances learning and teaching performance				.863				.781
Internal & external design enhances & promotes student motivation				.878				.806

Design that achieves the overall client's and users' satisfaction				.848			.766
Design that creates a welcoming school				.689			.707
Inclusive internal & external access for all					.774		.663
Design attains ease of movement through building & site for all					.786		.665
Entrance is welcoming and easily identified					.641		.601
Internal & external circulation satisfy people with disabilities					.810		.706
Safe & secured internal movement						.730	.698
Safe & secured external movement						.685	.635
Safe & secured building entrance						.768	.624
Safe site is created						.809	.697
Minimise energy cost							.668	.639
Ease of building and site maintenance							.668	.751

Overall building Value for Money								.674
Overall quality of the building's design								.718

Table 7.5 Corrected Item-Total Correlation among the items and their scales

ariable Name	Variable code
The provision of adequate internal teaching and learning spaces	**ACCOM1**
The provision of adequate internal physical and sport spaces	**ACCOM2**
The provision of adequate external physical and sport spaces	**ACCOM3**
Spaces and design that fulfill the curriculum needs	**ACCOM4**
School grounds which are large enough and designed well to meet educational needs	**ACCOM5**
Durable elements & components. (Long life)	**SUSTAIN1**
Efficient energy usage	**SUSTAIN2**
Maximising the use of natural day light	**SUSTAIN3**
Maximising the use of natural ventilation	**SUSTAIN4**
Well balanced natural and artificial lighting	**ENVIRO1**
Adequate lighting for all day, all year	**ENVIRO2**
Thermal comfort for all day, all year	**ENVIRO3**
Acoustic performance in the different areas	**ENVIRO4**
Adequate ventilation (good air quality) for all day, all year	**ENVIRO5**
Environment which enhances pupils motivation and achievement	**ENVIRO6**
Mechanical systems which do not disturb the learning activities	**ENVIRO7**
Flexibility of design and spaces	**DES&PLN1**
Design which creates a pleasurable environment for students to study	**DES&PLN2**
Design attains a good relationship between the spaces. (Spatial relationship)	**DES&PLN3**
Design that accommodates good ICT infrastructure	**DES&PLN4**
Design which enhances learning and teaching performance	**DES&PLN5**
Internal & external design enhances & promotes student motivation	**DES&PLN6**
Design that achieves the overall client's and users' satisfaction	**DES&PLN7**
Design that creates a welcoming school	**DES&PLN8**
Inclusive internal & external access for all	**ACCESS1**
Design attains ease of movement through building & site for all	**ACCESS2**

Entrance is welcoming and easily identified	ACCESS3
Internal & external circulation satisfy people with disabilities	ACCESS4
Safe & secured internal movement	SAFTEY1
Safe & secured external movement	SAFTEY2
Safe & secured building entrance	SAFTEY3
Safe site is created	SAFTEY4
Minimise energy cost	OPER1
Ease of building and site maintenance	OPER2
The Overall building Value for Money	VFM

Table 7.6 The design & engineering variables with their codes

The relationship between the total accomodation requirments category and school age
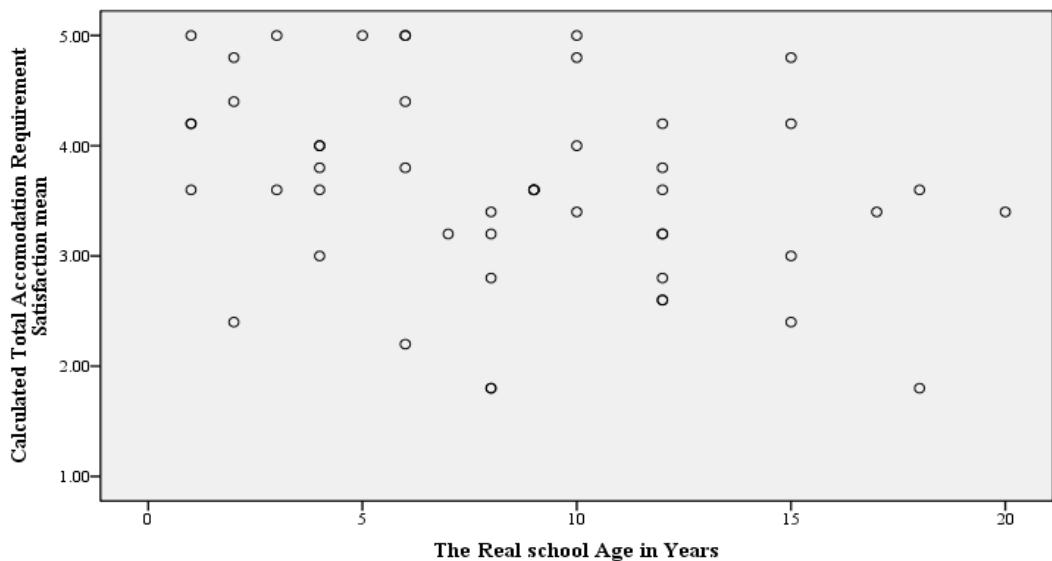
The relationship between the total accomodation requirments category and school age
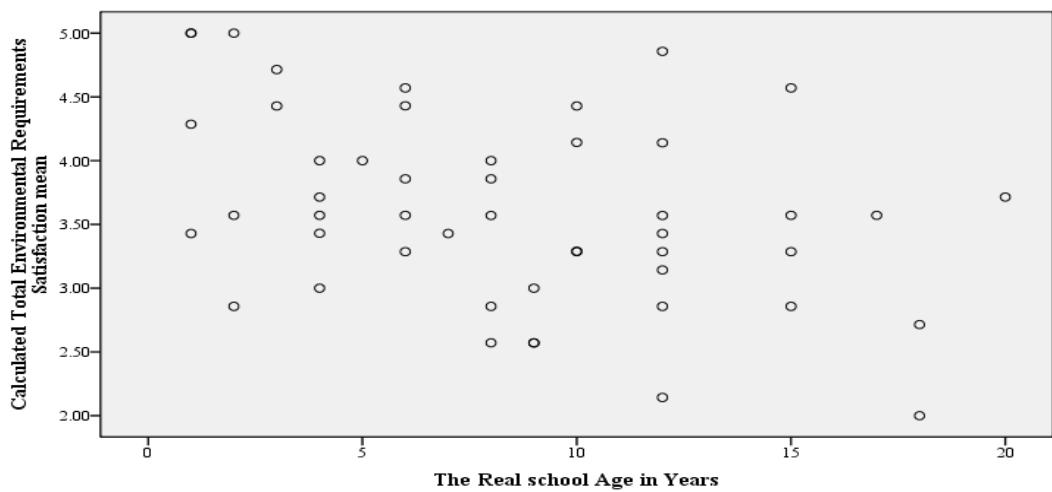
Appendix C

The relationship between the total accomodation requirments category and school age
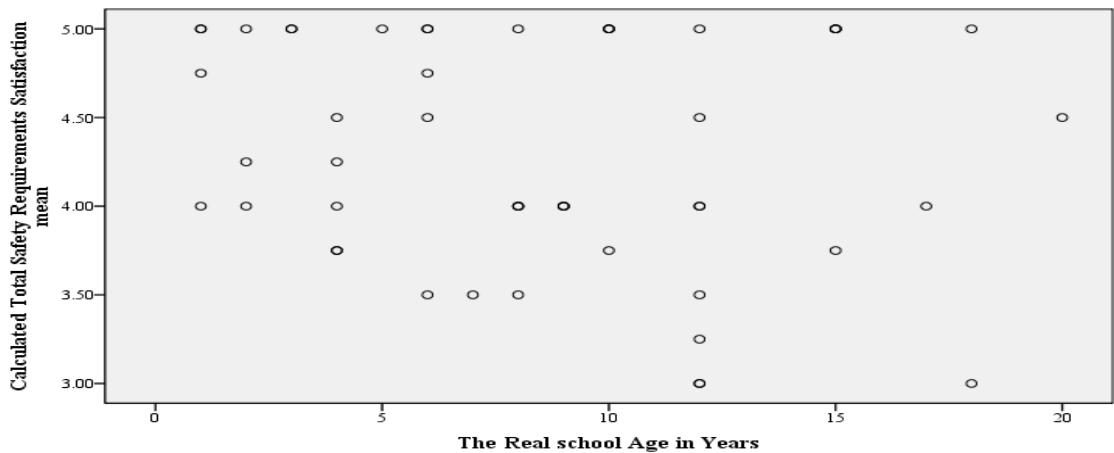
The relationship between the total accomodation requirments category and school age

The relationship between the total accomodation requirments category and school age

The relationship between the total accomodation requirments category and school age

The relationship between the total accomodation requirments category and school age

The relationship between the total accomodation requirments category and school age

Appendix C
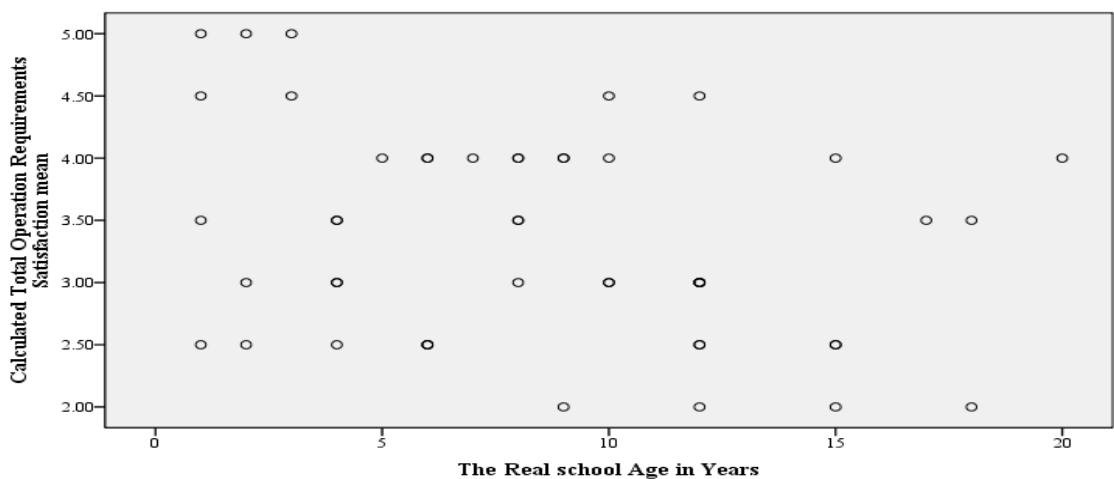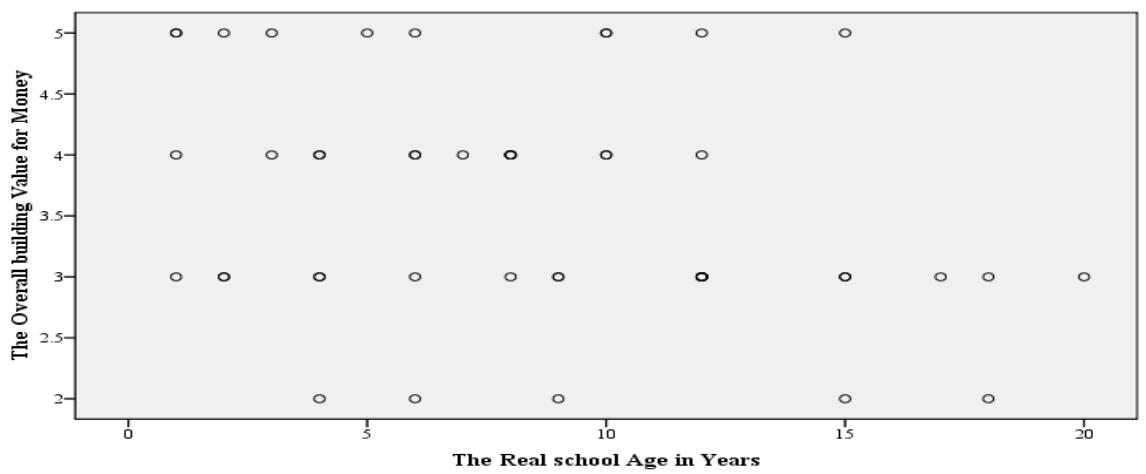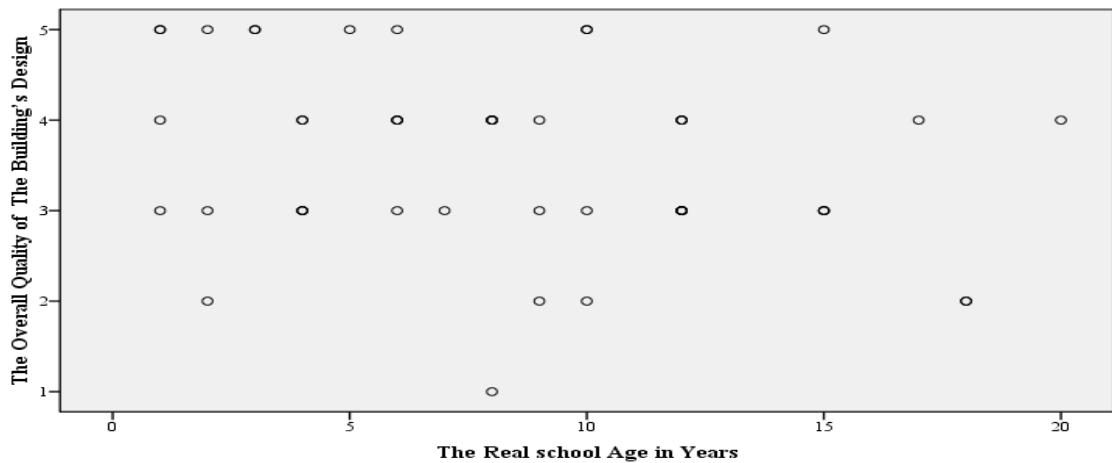
Figure (7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10, 7.11 and 7.12): Scatter plot graphs for the relationships between the studied variables

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	892.8	1256.51	40.74	59.26
2	1151.4	1281.854	11.33	88.67
3	970.8	1158.298	19.31	80.69
4	1498.4	1333.811	10.98	89.02
5	2337.5	1271.205	45.62	54.38
6	1615.3	1306.328	19.13	80.87
7	1545.8	1345.84	12.94	87.06
8	1473.4	1162.484	21.10	78.90
9	1359.5	1290.665	5.06	94.94
10	984.0	1273.413	29.41	70.59
11	971.6	1276.886	31.42	68.58
12	1148.8	1342.275	16.84	83.16
13	1328.5	1281.095	3.57	96.43
14	1295.1	1323.783	2.22	97.78
15	1097.3	1157.587	5.50	94.50
16	959.2	1075.178	12.10	87.90
17	927.6	1085.957	17.07	82.93
18	1125.4	1300.967	15.60	84.40
19	1194.8	1373.486	14.96	85.04
20	1194.8	1373.486	14.96	85.04
21	830.1	1254.392	51.12	48.88
22	1405.6	1317.314	6.28	93.72
23	1260.7	1341.792	6.43	93.57
24	1468.6	1293.377	11.93	88.07
25	1410.0	1294.736	8.17	91.83
26	1208.4	1328.613	9.94	90.06
27	1202.9	1169.892	2.74	97.26
28	1032.6	1266.95	22.69	77.31
29	1424.4	1321.784	7.21	92.79
30	1046.0	854.943	18.26	81.74
31	1663.2	1307.568	21.38	78.62

32	1335.9	1166.44	12.68	87.32
33	1360.1	1361.664	0.11	99.89
34	1280.6	1260.165	1.60	98.40
35	1104.1	1282.82	16.19	83.81
36	761.5	867.34	13.89	86.11
37	1395.6	1263.661	9.45	90.55
38	1313.0	1344.483	2.40	97.60
39	1443.1	1330.361	7.81	92.19
40	1172.3	1251.379	6.74	93.26
		Number of projects	**40**	**40**
		Mean	**14.67**	**85.33**
		Standard Deviation	**11.61**	**11.61**

Table 7.49 Adjusted and predicted total cost excluding external costs of the training projects

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	1615.3	1249.861	22.63	77.37
2	1213.1	1315.526	8.45	91.55
3	1089.0	1070.936	1.66	98.34
4	1110.6	1304.787	17.48	82.52
5	1060.8	1277.53	20.43	79.57
6	1096.9	1387.976	26.54	73.46
7	1236.4	1181.829	4.42	95.58
8	1349.6	1155.078	14.41	85.59
9	1729.4	1329.05	23.15	76.85
		Mean	**15.46**	**84.54**
		Standard Deviation	**8.84**	

Table 7.50 Construction cost excluding external costs model testing results

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	1074.37	1493.179	38.98	61.02
2	1515.98	1622.194	7.01	92.99
3	1199.95	1465.308	22.11	77.89
4	2148.06	1690.816	21.29	78.71
5	2838.40	1614.878	43.11	56.89
6	1977.99	1556.329	21.32	78.68
7	1854.09	1706.178	7.98	92.02
8	1695.05	1469.494	13.31	86.69
9	1543.73	1540.666	0.20	99.80
10	1290.22	1613.753	25.08	74.92
11	1321.25	1617.226	22.40	77.60
12	1412.89	1702.613	20.51	79.49
13	1531.50	1624.768	6.09	93.91
14	1613.39	1674.122	3.76	96.24
15	1222.91	1370.925	12.10	87.90
16	1146.01	1265.185	10.40	89.60
17	992.03	1342.308	35.31	64.69
18	1390.31	1647.973	18.53	81.47
19	1532.74	1740.49	13.55	86.45
20	1532.74	1740.49	13.55	86.45
21	1000.78	1591.399	59.02	40.98
22	1744.88	1636.992	6.18	93.82
23	1738.12	1695.464	2.45	97.55
24	1800.16	1640.383	8.88	91.12
25	1595.57	1534.738	3.81	96.19
26	1478.16	1685.618	14.03	85.97

27	1534.60	1386.563	9.65	90.35
28	1400.80	1607.29	14.74	85.26
29	1862.51	1581.784	15.07	84.93
30	1588.20	1158.304	27.07	72.93
31	1920.77	1657.907	13.69	86.31
32	1714.29	1473.45	14.05	85.95
33	1797.10	1728.668	3.81	96.19
34	1808.78	1600.505	11.51	88.49
35	1446.13	1626.493	12.47	87.53
36	1011.62	1210.697	19.68	80.32
37	1587.08	1600.668	0.86	99.14
38	1682.19	1701.488	1.15	98.85
39	1845.93	1687.366	8.59	91.41
40	1468.29	1585.053	7.95	92.05
		Number of projects	**40**	**40**
		Mean	**15.28**	**84.72**
		Standard Deviation	**12.24**	**12.24**

Table 7.51 Adjusted and predicted total contract cost of the training projects

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	1971.54	1586.868	19.51	80.49
2	1549.26	1669.198	7.74	92.26
3	1333.53	1424.292	6.81	93.19
4	1393.61	1554.788	11.57	88.43
5	1236.42	1617.87	30.85	69.15
6	1359.64	1744.981	28.34	71.66
7	1469.93	1405.166	4.41	95.59
8	1562.08	1462.088	6.40	93.60
9	1961.02	1676.056	14.53	85.47
		Mean	**14.46**	**85.54**
		Standard Deviation	**9.78**	

Table 7.52 construction cost model testing results

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	892.8	989.07	10.78	89.22
2	1151.4	1005.03	12.71	87.29
3	970.8	953.71	1.76	98.24
4	1498.4	1237.00	17.45	82.55
5	2337.5	1566.56	32.98	67.02
6	1615.3	1381.36	14.48	85.52
7	1545.8	1442.09	6.71	93.29
8	1473.4	1260.39	14.46	85.54
9	1359.5	1287.95	5.26	94.74
10	984.0	1320.44	34.19	65.81
11	971.6	1135.88	16.91	83.09
12	1148.8	1112.72	3.14	96.86
13	1328.5	1474.39	10.98	89.02
14	1295.1	1298.07	0.23	99.77
15	1097.3	1160.37	5.75	94.25
16	959.2	990.08	3.22	96.78
17	927.6	981.22	5.78	94.22
18	1125.4	1073.50	4.61	95.39
19	1194.8	1150.30	3.72	96.28

20	1194.8	1275.33	6.74	93.26
21	830.1	1330.95	60.34	39.66
22	1405.6	1424.03	1.31	98.69
23	1260.7	1368.12	8.52	91.48
24	1468.6	1281.52	12.74	87.26
25	1410.0	1362.26	3.38	96.62
26	1208.4	1323.98	9.56	90.44
27	1202.9	1334.52	10.95	89.05
28	1032.6	1270.86	23.07	76.93
29	1424.4	1397.78	1.87	98.13
30	1046.0	947.87	9.38	90.62
31	1663.2	1435.38	13.70	86.30
32	1335.9	1332.06	0.29	99.71
33	1360.1	1420.92	4.47	95.53
34	1280.6	1351.59	5.54	94.46
35	1104.1	1432.48	29.75	70.25
36	761.5	799.15	4.94	95.06
37	1395.6	1253.59	10.18	89.82
38	1313.0	1573.47	19.84	80.16
39	1443.1	1357.57	5.93	94.07
40	1172.3	1059.59	9.62	90.38
		Number of projects	**40**	**40**
		Mean	**11.43**	**88.57**
		Standard Deviation	**11.52**	**11.52**

Table 7.56 Adjusted and predicted total cost excluding external costs of the training projects

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	1615.3	1318.93	18.35	81.65
2	1213.1	1539.50	26.91	73.09
3	1089.0	1191.52	9.41	90.59
4	1110.6	1367.42	23.12	76.88
5	1060.8	915.17	13.73	86.27
6	1096.9	1271.47	15.92	84.08
7	1236.4	1215.76	1.67	98.33
8	1349.6	948.39	29.73	70.27
9	1729.4	1254.08	27.48	72.52
		Mean	**18.48**	**81.52**
		Standard Deviation	**9.31**	

Table 7.57 Construction cost excluding external costs model testing results

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	1074.37	1248.21	16.18	83.82
2	1515.98	1270.62	16.18	83.82
3	1199.95	1247.93	4.00	96.00
4	2148.06	1619.77	24.59	75.41
5	2838.40	1971.87	30.53	69.47
6	1977.99	1639.33	17.12	82.88
7	1854.09	1801.62	2.83	97.17
8	1695.05	1509.26	10.96	89.04
9	1543.73	1537.66	0.39	99.61
10	1290.22	1671.37	29.54	70.46
11	1321.25	1454.38	10.08	89.92

12	1412.89	1375.44	2.65	97.35
13	1531.50	1800.33	17.55	82.45
14	1613.39	1641.59	1.75	98.25
15	1222.91	1364.76	11.60	88.40
16	1146.01	1174.08	2.45	97.55
17	992.03	1138.06	14.72	85.28
18	1390.31	1301.24	6.41	93.59
19	1532.74	1465.07	4.41	95.59
20	1532.74	1644.48	7.29	92.71
21	1000.78	1507.42	50.62	49.38
22	1744.88	1751.39	0.37	99.63
23	1738.12	1742.53	0.25	99.75
24	1800.16	1565.01	13.06	86.94
25	1595.57	1568.40	1.70	98.30
26	1478.16	1763.00	19.27	80.73
27	1534.60	1568.49	2.21	97.79
28	1400.80	1572.17	12.23	87.77
29	1862.51	1691.60	9.18	90.82
30	1588.20	1345.39	15.29	84.71
31	1920.77	1664.76	13.33	86.67
32	1714.29	1707.72	0.38	99.62
33	1797.10	1857.45	3.36	96.64
34	1808.78	1898.24	4.95	95.05
35	1446.13	1861.79	28.74	71.26
36	1011.62	1091.36	7.88	92.12
37	1587.08	1515.18	4.53	95.47
38	1682.19	2033.98	20.91	79.09
39	1845.93	1800.21	2.48	97.52
40	1468.29	1403.33	4.42	95.58
		Number of projects	**40**	**40**
		Mean	**11.16**	**88.84**
		Standard Deviation	**10.68**	**10.68**

Table 7.58 Adjusted and predicted total contract cost of the training projects

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	1971.54	1683.92	14.59	85.41
2	1549.26	2020.40	30.41	69.59
3	1333.53	1638.99	22.91	77.09
4	1393.61	1623.58	16.50	83.50
5	1236.42	1308.83	5.86	94.14
6	1359.64	1544.82	13.62	86.38
7	1469.93	1437.21	2.23	97.77
8	1562.08	1274.41	18.42	81.58
9	1961.02	1613.80	17.71	82.29
		Mean	**15.80**	**84.20**
		Standard Deviation	**8.40**	

Table 7.59 construction cost model testing results

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	892.8	942.63	5.58	94.42
2	1151.4	1019.33	11.47	88.53
3	970.8	1078.48	11.09	88.91
4	1498.4	1143.29	23.70	76.30
5	2337.5	1566.36	32.99	67.01
6	1615.3	1361.81	15.69	84.31
7	1545.8	1452.57	6.03	93.97

8	1473.4	1337.60	9.22	90.78
9	1359.5	1204.08	11.43	88.57
10	984.0	1327.48	34.91	65.09
11	971.6	1130.19	16.32	83.68
12	1148.8	989.33	13.88	86.12
13	1328.5	1389.68	4.61	95.39
14	1295.1	1294.40	0.05	99.95
15	1097.3	1311.37	19.51	80.49
16	959.2	1054.96	9.99	90.01
17	927.6	966.43	4.18	95.82
18	1125.4	1106.87	1.65	98.35
19	1194.8	1109.75	7.12	92.88
20	1194.8	1204.89	0.85	99.15
21	830.1	1382.79	66.58	33.42
22	1405.6	1210.83	13.86	86.14
23	1260.7	1350.79	7.15	92.85
24	1468.6	1364.76	7.07	92.93
25	1410.0	1370.75	2.78	97.22
26	1208.4	1367.37	13.15	86.85
27	1202.9	1402.64	16.61	83.39
28	1032.6	1313.81	27.23	72.77
29	1424.4	1402.27	1.56	98.44
30	1046.0	1112.28	6.34	93.66
31	1663.2	1368.41	17.73	82.27
32	1335.9	1318.38	1.31	98.69
33	1360.1	1336.76	1.72	98.28
34	1280.6	1353.10	5.66	94.34
35	1104.1	1357.76	22.98	77.02
36	761.5	851.28	11.79	88.21
37	1395.6	1281.28	8.19	91.81
38	1313.0	1575.98	20.03	79.97
39	1443.1	1322.00	8.39	91.61
40	1172.3	1087.05	7.28	92.72
		Number of projects	**40**	**40**
		Mean	**12.69**	**87.31**
		Standard Deviation	**12.21**	**12.21**

Table 7.63 Adjusted and predicted total cost excluding external costs of the training projects

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	1615.3	1379.16	14.62	85.38
2	1213.1	1503.62	23.95	76.05
3	1089.0	1181.66	8.51	91.49
4	1110.6	1351.14	21.66	78.34
5	1060.8	1014.37	4.38	95.62
6	1096.9	1167.14	6.40	93.60
7	1236.4	1260.91	1.98	98.02
8	1349.6	999.61	25.93	74.07
9	1729.4	1197.29	30.77	69.23
		Mean	**15.36**	**84.64**
		Standard Deviation	**10.55**	

Table 7.64 Construction cost excluding external costs model testing results

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	1074.37	1246.80	16.05	83.95
2	1515.98	1267.45	16.39	83.61
3	1199.95	1433.73	19.48	80.52

4	2148.06	1484.53	30.89	69.11
5	2838.40	1980.94	30.21	69.79
6	1977.99	1667.73	15.69	84.31
7	1854.09	1753.87	5.41	94.59
8	1695.05	1603.13	5.42	94.58
9	1543.73	1483.16	3.92	96.08
10	1290.22	1639.07	27.04	72.96
11	1321.25	1463.79	10.79	89.21
12	1412.89	1229.66	12.97	87.03
13	1531.50	1686.31	10.11	89.89
14	1613.39	1598.01	0.95	99.05
15	1222.91	1610.39	31.69	68.31
16	1146.01	1276.11	11.35	88.65
17	992.03	1243.29	25.33	74.67
18	1390.31	1311.80	5.65	94.35
19	1532.74	1451.69	5.29	94.71
20	1532.74	1532.02	0.05	99.95
21	1000.78	1600.63	59.94	40.06
22	1744.88	1523.44	12.69	87.31
23	1738.12	1678.88	3.41	96.59
24	1800.16	1719.00	4.51	95.49
25	1595.57	1658.41	3.94	96.06
26	1478.16	1760.48	19.10	80.90
27	1534.60	1738.52	13.29	86.71
28	1400.80	1616.77	15.42	84.58
29	1862.51	1685.33	9.51	90.49
30	1588.20	1527.10	3.85	96.15
31	1920.77	1582.38	17.62	82.38
32	1714.29	1701.05	0.77	99.23
33	1797.10	1681.03	6.46	93.54
34	1808.78	1873.46	3.58	96.42
35	1446.13	1803.42	24.71	75.29
36	1011.62	1042.90	3.09	96.91
37	1587.08	1563.82	1.47	98.53
38	1682.19	1990.82	18.35	81.65
39	1845.93	1735.02	6.01	93.99
40	1468.29	1352.69	7.87	92.13
		Number of projects	**40**	**40**
		Mean	**13.01**	**86.99**
		Standard Deviation	**11.75**	**11.75**

Table 7.65 Adjusted and predicted total contract cost of the training projects

Project No	Adjusted Cost (£/m2)	Predicted Cost (£/m2)	Prediction Error %	Prediction Accuracy %
1	1971.54	1716.16	12.95	87.05
2	1549.26	1893.89	22.25	77.75
3	1333.53	1585.95	18.93	81.07
4	1393.61	1672.44	20.01	79.99
5	1236.42	1377.19	11.39	88.61
6	1359.64	1439.22	5.85	94.15
7	1469.93	1525.72	3.80	96.20
8	1562.08	1252.22	19.84	80.16
9	1961.02	1574.14	19.73	80.27
		Mean	**14.97**	**85.03**
		Standard Deviation	**6.76**	

Table 7.66 Construction cost model testing results

Detailed Elemental Analysis
BCIS *Online* analysis number: 15391

New build

BCIS code: C - 1 - 1,559

Job title:	Flint Cornist Primary School
Location:	Flint, Clwyd
Client:	Clwyd County Council
Dates:	Receipt: 24-Apr-1995 Base: 14-Apr-1995 Acceptance: 1-May-1995 Possession: 3-Jun-1995

Project details: Single storey County primary school for 325 pupils together with external works including precast concrete and macadam paving, brick walls, landscaping, services, drainage, lighting and minor buildings

Site conditions: Steeply sloping green field site with good ground conditions. Excavation above water table. Unrestricted working space and access.

Market conditions: Very competitive.
Project tender price index was 122 on a base of 1985 BCIS Index Base
Indices used to adjust costs to base price level: TPI for 2Q95 129; location factor 0.89

Tender documents:	Bill of Quantities	**Contract:**	JCT local authority contract 1980 edition
Procurement:	Selected competition	**Cost fluctuations:**	Firm
Number of tenders:	Issued: 8 Received: 8	**Contract period:**	Stipulated: 18 Offered: Agreed: 18

PC/Provisional Sums revised

Contract breakdown	Contract £	Analysis £	Competitive tender list	Tender £	% above lowest
Measured work	824,926	824,926	1	1,467,476	-
Provisional sums	33,350	33,350	2	1,472,807	0.4
PC sums	468,800	468,800	3	1,498,102	2.1
Preliminaries	28,200	28,200	4	1,534,141	4.5
Contingencies	14,724	14,724	5	1,616,908	10.2
Contract sum	1,370,000	1,370,000	Highest	1,725,353	17.6

Accommodation and design features: Single storey, 325 place primary school. Concrete foundations and ground slab. Facing brick/block walls. Pitched softwood/steel roof, natural slates; aluminium rooflights. Aluminium windows; steel roller shutter door. Brick internal walls, block and proprietary partitions; aluminium internal curtain walling. Flush and softwood sliding doors. Plaster and tiles to walls; asphalt, carpet, vinyl and tiles to floors; plasterboard and sw boarded ceilings. Fittings. PC sums for heating, ventilation and electrics. Sanitaryware. Fire and intruder alarms. Lifting platform.

Storeys as a % of gross floor area			Average Storey Heights		Functional unit	Rate
single	99%		Below ground floor	-	325 - No places	£3,221
2	1%		At ground floor	4.75		
			Above ground floor	2.70		

Areas				
Basement floors	- m2			
Ground floor	1,550 m2			
Upper floor	9 m2			
Gross floor area	1,559 m2			

		£/m2 incl Preliminaries	
Element	Percentage	Total cost of element £	£ per m2	Tender prices	1995 constant prices
Substructure	7%	91,404	58.63	59.88	67.80
Superstructure	35%	479,272	307.42	313.96	355.49
Internal finishes	8%	112,598	72.22	73.76	83.52
Fittings	2%	28,650	18.38	18.77	21.25
Services	23%	313,074	200.82	205.08	232.22
Building sub-total	75%	1,024,998	657.47	671.44	760.28
External works	22%	302,078	193.76	197.88	224.06
Preliminaries	2%	28,200	18.09	-	-
Contingencies	1%	14,724	9.44	9.44	10.69
Total		1,370,000	878.77	878.77	995.04

Areas (continued):

Usable area	1,011 m2
Circulation area	275 m2
Ancillary area	195 m2
Internal Divisions	78 m2
Gross floor area	1,559 m2
Area not enclosed	- m2
External wall area	817 m2
Wall to floor ratio	0.52
Internal cube	- m3

Submitted by: Clwyd County Council

Appendix C

CI/SfB - 712.
Primary schools - 21
■■■■ BCIS ■■■■

Element		Preliminaries shown separately				Preliminaries spread	
		Total cost	Cost per m2	Element unit quantity	Element unit rate	Total cost	Cost per m2
1	Substructure	91,404	58.63	1,550 m2	58.97	93,346	59.88
2A	Frame	9,700	6.22			9,906	6.35
2B	Upper floors	710	0.46	9 m2	78.89	725	0.47
2C	Roof	264,015	169.35	1,840 m2	143.49	269,625	172.95
2D	Stairs	6,521	4.18	1 No	6,521.00	6,660	4.27
2E	External walls	52,490	33.67	667 m2	78.70	53,605	34.38
2F	Windows and external doors	44,240	28.38	150 m2	294.93	45,180	28.98
2G	Internal walls and partitions	54,005	34.64	1,713 m2	31.53	55,153	35.38
2H	Internal doors	47,591	30.53	68 No	699.87	48,602	31.18
2	Superstructure	479,272	307.42			489,456	313.96
3A	Wall finishes	46,335	29.72	3,110 m2	14.90	47,320	30.35
3B	Floor finishes	44,290	28.41	1,559 m2	28.41	45,231	29.01
3C	Ceiling finishes	21,973	14.09	1,559 m2	14.09	22,440	14.39
3	Internal finishes	112,598	72.22			114,991	73.76
4	Fittings	28,650	18.38			29,259	18.77
5A	Sanitary appliances	8,700	5.58	65 No	133.85	8,885	5.70
5B	Services equipment	-					
5C	Disposal installations	1,500	0.96			1,532	0.98
5D	Water installations	included in	5F				
5E	Heat source	included in	5F				
5F	Space heating and air treatment	147,300	94.48			150,430	96.49
5G	Ventilating systems	included in	5F				
5H	Electrical installations	141,000	90.44			143,996	92.36
5I	Gas installations	-					
5J	Lift and conveyor installations	7,500	4.81			7,659	4.91
5K	Protective installations	-					
5L	Communications installations	included in	5H				
5M	Special installations	-					
5N	Builder's work in connection	7,074	4.54			7,224	4.63
5O	Builder's profit and attendance	-					
5	Services	313,074	200.82			319,726	205.08
	Building sub-total	1,024,998	657.47			1,046,778	671.44
6A	Site works	214,853	137.81			219,419	140.74
6B	Drainage	62,066	39.81			63,385	40.66
6C	External services	25,159	16.14			25,694	16.48
6D	Minor building works	-					
6	External works	302,078	193.76			308,498	197.88
7	Preliminaries	28,200	18.09			-	
	Total (less Contingencies)	1,355,276	869.32			1,355,276	869.32
8	Contingencies	14,724	9.44			14,724	9.44
	Contract sum	1,370,000	878.77			1,370,000	878.77

554

Appendix C

Element		Specification
1	Substructure	Plain C25 concrete foundations, RC C35 foundations and bed; A193 fabric reinforcement. Wood float finish tobed, Lithurin surface hardener. Ducts for services.
2A	Frame	Isolated steel members, beams to roof, framing to atrium.
2B	Upper floors	Suspended softwood/plywood floor (9m2).
2C	Roof	Wrot softwood trussed rafters, 20 degree pitch, Penrhyn Heather Blue slates and Gypglass insulation. Plywood and wrot softwood tongued and grooved boarding. Roof ventilators (256m). Caradon Terrain 2300 rainwater woods. Aluminium rooflight.
2D	Stairs	Plain C25 concrete steps. PC decking 100mm thick.
2E	External walls	Loadbearing cavity walls with Milton Cream Rustic facings outer skin by Butterley Bricks Ltd and 100mm Boral Edenhall Evalast common block 7N/mm2 inner skin.
2F	Windows and external doors	PC sum for aluminium windows, doors and screens. Steel roller shutter door.
2G	Internal walls and partitions	100 and 190mm Edenhall Evalast common block 7N/mm2; facing bricks (51m2); 215mm facing bricks (73m2); Crosby Sarek Ltd standard WC cubicles; aluminium internal curtain walling; 15No wrot softwood sliding doors; screens, borrowed lights.
2H	Internal doors	Flush, half hour fire doors, koto veneered with lacquer finish.
3A	Wall finishes	Lightweight Gypsum plaster (3110m2); Pilkingtons Architectural Plain Colour ceramic tiles (383m2).
3B	Floor finishes .	PC sum for hardwood flooring (£6500). Mastic asphalt (1317m2); Daniel Platt Ferrolite ceramic tiles (43m2);PC sum for vinyl, safety flooring and carpets (£17000). Softwood skirting, 702m.
3C	Ceiling finishes	Plasterboard on framing, 942m2; wrot softwood tongued and grooved boarding, 328m2; Supalux 9mm, 21m2; plasterboard and skim, 99m2. PC sum for suspended ceiling (£3300).
4	Fittings	Lundia 2 system shelving, cloakroom fittings, furniture, pinboards, kitchen fittings.
5A	Sanitary appliances	Vitreous china WC suites, wash basins, bowl urinals, stainless steel sinks; disabled WC facilities.
5C	Disposal installations	MuPVC soil and waste pipes.
5F	Space heating and air treatment	PC sum for heating, ventilation, gas and hot and cold water services.
5H	Electrical installations	PC sum for electric light and power, external lighting, fire and intruder alarms and class change bell.
5J	Lift and conveyor installations	PC sum for Melody range lifting platform, 225kg rating.
5N	Builder's work in connection	Holes, chases, covers and supports.
6A	Site works	Macadam access roads, 895m2; precast concrete slab paths, 350m2; facing brick retaining walls, 449m2; coated macadam to play courts, 1562m2; wire mesh fencing, 365m; steel gates; planting and seeding, 2046m2.
6B	Drainage	100 and 150mm Hepworth Supersleve pipes and accessories; 34No manholes; 4No PC soakaways.
6C	External services	Electricity, gas, water and telephone mains.
7	Preliminaries	2.12% of remainder of Contract Sum (excluding Contingencies).
8	Contingencies	1.11% of remainder of Contract Sum (excluding Preliminaries).

CI/SfB - 712.
Primary schools - 21
■■■ BCIS ■

Credits

Submitted by:	Clwyd County Council
Client:	Clwyd County Council
Architect/qs:	Clwyd County Council Department of Architecture, Planning and Estates
Engineers:	Structural - Nixon Davis Chester
Engineers:	Mech & Elec - WS Atkins Colwyn Bay
General contractor:	C Wynne & Sons Ltd
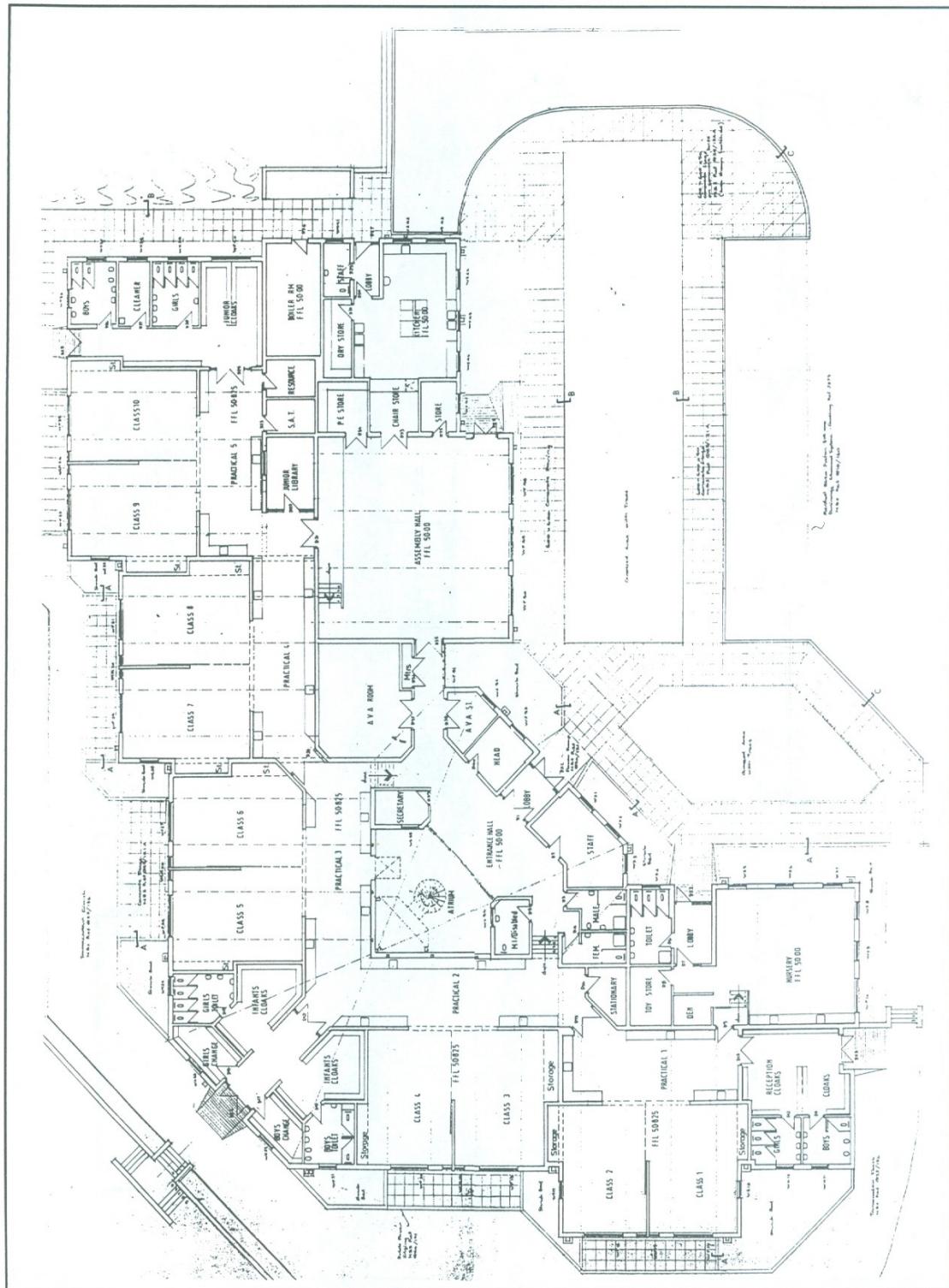
556

Appendix C

© The Royal Institution of Chartered Surveyors - December 1995

557

Appendix C

South-East Elevation

South-West Elevation

North-East Elevation

North-West Elevation

Appendix C
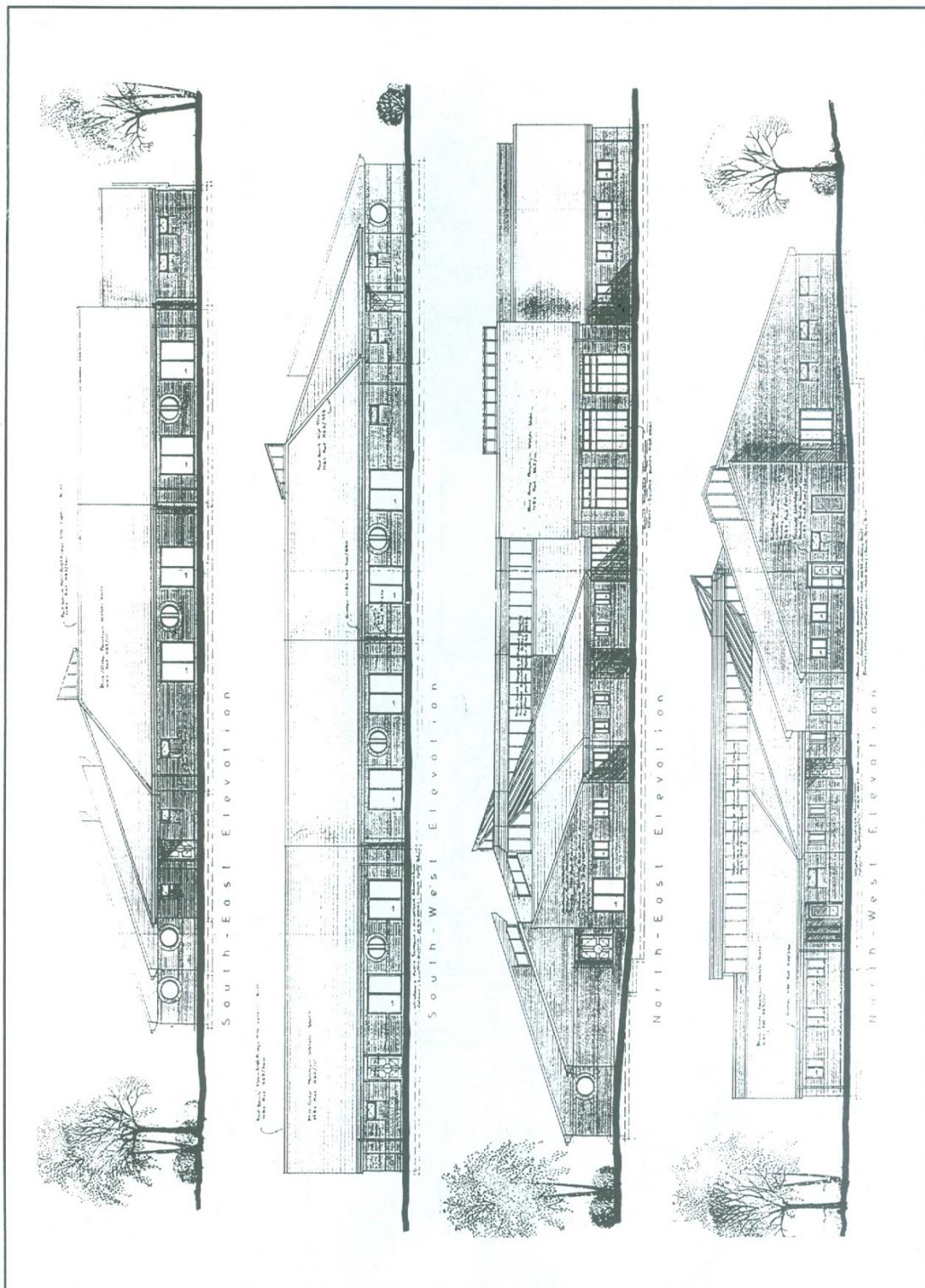
Detailed Elemental Analysis

BCIS *Online* analysis number: 15156

New build

BCIS code: C - 1 - 2,054

Job title:	Emerson Valley Middle School, Milton Keynes
Location:	Milton Keynes, Buckinghamshire
Client:	Buckinghamshire County Council
Dates:	Receipt: 30-Jan-1995 Base: Dec-1994 Acceptance: 20-Feb-1995 Possession: 27-Mar-1995

Project details:	Single storey, 480 place middle school together with external works including precast concrete, brick and macadam paving, brick walls, services, drainage and seating.
Site conditions:	Steeply sloping green field site with good ground conditions. Excavation above water table. Unrestricted working space and access.
Market conditions:	Competitive. Project tender price index was 118 on a base of 1985 BCIS Index Base. Indices used to adjust costs to base price level: TPI for 4Q94 126; location factor 1.04

Tender documents:	Bill of Quantities	Contract:	JCT local authority contract 1980 edition
Procurement:	Selected competition	Cost fluctuations:	Formula
Number of tenders:	Issued: 8 Received: 8	Contract period:	Stipulated: 15 Offered: 15 Agreed: 15

Contract breakdown			Competitive tender list		
	Contract £	Analysis £		Tender £	% above lowest
Measured work	928,497	928,497	1	1,749,641	-
Provisional sums	91,250	91,250	2	1,777,663	1.6
PC sums	550,000	550,000	3	1,801,716	3.0
Preliminaries	129,334	129,334	4	1,820,011	4.0
Contingencies	50,560	50,560	5	1,849,000	5.7
Contract sum	1,749,641	1,749,641	Highest	1,894,360	8.3

Accommodation and design features: Single storey middle school. Concrete trench fill foundations, suspended PCC ground slab with fine concrete topping. Loadbearing brick/block cavity walls. Pitched timber roof with Marley tiles. Double glazed timber windows. Block internal walls. Flush doors. Plaster and tiles to walls; vinyl, carpet and Junckers beech flooring; plasterboard and skim ceilings. PC sums for gas hot water central heating, underfloor ventilation, electrics and intruder alarm. Sanitaryware. Window cleaning walkway. External works with paving, walls, services, drainage and seating.

Storeys as a % of gross floor area			Average Storey Heights		Functional unit	Rate
single	100%		Below ground floor	-	480 - No places	£2,695
			At ground floor	2.40		
			Above ground floor	-		

Areas						£/m2 incl Preliminaries	
		Element	Percentage	Total cost of element £	£ per m2	Tender prices	1995 constant prices
Basement floors	- m2						
Ground floor	2,054 m2						
Upper floor	- m2						
Gross floor area	2,054 m2						
		Substructure	9%	160,326	78.06	84.49	83.82
Usable area	1,223 m2	Superstructure	26%	454,394	221.22	239.45	237.55
Circulation area	347 m2	Internal finishes	8%	130,652	63.61	68.85	68.30
Ancillary area	353 m2	Fittings	4%	73,239	35.66	38.59	38.29
Internal Divisions	131 m2	Services	22%	376,309	183.21	198.30	196.73
Gross floor area	2,054 m2						
		Building sub-total	69%	1,194,920	581.75	629.68	624.69
Area not enclosed	- m2	External works	21%	374,827	182.49	197.52	195.95
External wall area	916 m2	Preliminaries	7%	129,334	62.97	-	-
Wall to floor ratio	0.45	Contingencies	3%	50,560	24.62	24.62	24.42
Internal cube	5382 m3						
		Total		1,749,641	851.82	851.82	845.06

Submitted by: Buckinghamshire County Council

© The Royal Institution of Chartered Surveyors - December 1995

CI/SfB - 712.
Primary schools - 23
■ BCIS ■

Concise Elemental Analysis
BCIS *Online* analysis number: 15133

Horizontal extension
BCIS code: C - 1 - 485

Job title:	Extension to Wargrave CE Primary School, St Helens
Location:	St Helens, Merseyside
Client:	St Helens Metropolitan Borough Council
Dates:	Receipt: 9-Nov-1994 Base: 9-Nov-1994 Acceptance: 8-Dec-1994 Possession: 12-Dec-1994

Project details: Single storey classroom extension and alterations to existing entrance area and office accommodation within existing school. External works including precast concrete paving, landscaping, services and drainage.

Site conditions: Gently sloping green field site with moderate ground conditions. Excavation above water table. Restricted working space but unrestricted access.

Market conditions: Competitive.
Project tender price index was 128 on a base of 1985 BCIS Index Base
Indices used to adjust costs to base price level: TPI for 4Q94 126; location factor 1.01

Tender documents:	Bill of Quantities		**Contract:**	JCT Intermediate form of contract	
Procurement:	Selected competition		**Cost fluctuations:**	Firm	
Number of tenders:	Issued: 4 Received: 4		**Contract period:**	Stipulated: 7 Offered: 7 Agreed: 7	

Contract breakdown	Contract £	Analysis £	Competitive tender list	Tender £	% above lowest
Measured work	184,315	184,315	1	345,169	-
Provisional sums	33,800	33,800	2	350,550	1.6
PC sums	75,082	75,082	3	402,813	16.7
Preliminaries	21,572	21,572	4	405,762	17.6
Contingencies	30,400	30,400			
Contract sum	345,169	345,169			

Accommodation and design features: Single storey classroom extension and alterations to entrance and office accommodation within existing school. Concrete strip foundations and ground slab. Brick/block cavity external walls. Pitched timber roof, concrete tiled. UPVC windows. Block partitions. Flush doors. Plaster and tiles to walls; vinyl sheet, carpet and tiles to floors; suspended ceilings. Fittings. Gas hot water central heating. Sanitary, local ventilation and electrical installations. Fire alarms. External works with PCC paving, landscaping, services extended from existing and drainage.

Storeys as a % of gross floor area	Average Storey Heights		Functional unit	Rate
	Below ground floor	-		
	At ground floor	-		
	Above ground floor	-		

Areas			Element	Percentage	Total cost of element £	£ per m2	Tender prices	1995 constant prices
							£/m2 incl Preliminaries	
Basement floors	- m2							
Ground floor	- m2							
Upper floor	- m2							
Gross floor area	485 m2							
			Substructure	8%	26,980	55.63	59.72	61.01
Usable area	- m2		Superstructure	31%	108,110	222.91	239.31	244.46
Circulation area	- m2		Internal finishes	9%	31,559	65.07	69.86	71.36
Ancillary area	- m2		Fittings	3%	10,077	20.78	22.31	22.79
Internal Divisions	- m2		Services	24%	82,145	169.37	181.83	185.75
Gross floor area	485 m2		Building sub-total	75%	258,871	533.75	573.02	585.36
			External works	10%	34,326	70.78	75.98	77.62
Area not enclosed	- m2		Preliminaries	6%	21,572	44.48	-	-
External wall area	- m2		Contingencies	9%	30,400	62.68	62.68	64.03
Wall to floor ratio	-							
Internal cube	- m3		Total		345,169	711.69	711.69	727.01

Submitted by: St Helens Metropolitan Borough Council

© The Royal Institution of Chartered Surveyors - December 1995

Detailed Elemental Analysis

BCIS *Online* analysis number: 15675

New build

BCIS code: C - 1 - 603

Job title:	Primary School, Dromore
Location:	Dromore, Co Tyrone, N. Ireland
Client:	Western Education & Library Board
Dates:	Receipt: 30-Jun-1995 Base: 20-Jun-1995 Acceptance: Possession:

Project details: Single storey primary school with 3 classrooms, resource area, multi-purpose hall, ancillary areas and kitchen. External works include precast concrete and macadam paving, brick and concrete walls, steel and timber fences, landscaping, services, drainage and demolition of existing school and temporary accommodation.

Site conditions: Demolition site with good ground conditions. Part of site remains in use by school during contract period. No particular difficulties with site.

Market conditions: Extremely keen and competitive due to general recession/shortage of work in construction industry. Adjustment of PC sums, arithmetic corrections and reductions to accepted tender. Lowest tender withdrawn.
Project tender price index was 86 on a base of 1985 BCIS Index Base
Indices used to adjust costs to base price level: TPI for 2Q95 129; location factor 0.76

Tender documents:	Bill of Quantities	Contract:	JCT contract	
Procurement:	Selected competition	Cost fluctuations:	Firm	
Number of tenders:	Issued: 6 Received: 6	Contract period:	Stipulated: 10 Offered: 10 Agreed: 10	

Lowest tender not accepted, see MC text

Contract breakdown	Contract £	Analysis £	Competitive tender list	Tender £	% above lowest
Measured work	256,213	256,213	1	326,651	-
Provisional sums	200	200	2	381,593	16.8
PC sums	126,200	126,200	3	382,852	17.2
Preliminaries	700	700	4	398,702	22.1
Contingencies	7,666	7,666	5	406,900	24.6
Contract sum	390,979	390,979	6	415,284	27.1

Accommodation and design features: Single storey replacement primary school with 3 classrooms, resource and ancillary areas, multi-purpose hall and kitchen. Strip/pad foundations, RC ground slab. Steel frame to hall. Facing brick/block walls. Pitched steel and timber roof with tiles. Double glazed aluminium windows. Block partitions. Flush and hardwood doors. Plaster and paper to walls; vinyl, carpet, maple strip and tiles to floors; suspended ceilings. Fittings. Oil fired LPHW central heating. Sanitaryware, ventilation and electric light and power. Fire and intruder alarms, computer. Demolitions.

Storeys as a % of gross floor area	Average Storey Heights		Functional unit	Rate
single 100%	Below ground floor	-	85 - No places	£3,778
	At ground floor	2.70		
	Above ground floor	-		

Areas					£/m2 incl Preliminaries	
		Element	Percentage	Total cost of element £	£ per m2	Tender prices	1995 constant prices
Basement floors	- m2						
Ground floor	603 m2						
Upper floor	- m2						
Gross floor area	603 m2	Substructure	7%	28,555	47.35	47.44	62.91
Usable area	328 m2	Superstructure	31%	119,854	198.76	199.13	264.04
Circulation area	35 m2	Internal finishes	11%	42,157	69.91	70.04	92.87
Ancillary area	191 m2	Fittings	4%	14,789	24.53	24.57	32.58
Internal Divisions	49 m2	Services	29%	115,191	191.03	191.38	253.77
Gross floor area	603 m2	Building sub-total	82%	320,546	531.59	532.56	706.17
		External works	16%	62,067	102.93	103.12	136.73
Area not enclosed	- m2	Preliminaries		700	1.16	-	-
External wall area	494 m2	Contingencies	2%	7,666	12.71	12.71	16.86
Wall to floor ratio	0.82						
Internal cube	1799 m3	Total		390,979	648.39	648.39	859.76

Submitted by: Moore MacDonald & Partners

CI/SfB - 713.
Secondary schools (high schools) - 110
BCIS

Detailed Elemental Analysis
BCIS *Online* analysis number: 22867

New build
BCIS code: A - 3(2) - 11,150

Job title:	2nd Phase, Le Rocquier School
Location:	St Clement, Jersey, Channel Islands
Client:	States of Jersey Education, Sports and Culture
Dates:	Receipt: Dec-2003 Base: Dec-2003 Acceptance: Jan-2004 Possession: 2-Feb-2004

Project details:	3 and 2 storey secondary school block together with external works including macadam and other pavings, block walls, landscaping, services and drainage.
Site conditions:	Gently sloping site with bad ground conditions. Excavation above water table. Restricted working space and access.
Market conditions:	Competitive. Indices used to adjust costs to base price level: TPI for 4Q2003 196; location factor 1.40
Tender documents: **Procurement:** **Number of tenders:**	Employers requirements (for design and build) **Contract:** JCT with Contractor's Design 1981 Design and build - negotiated **Cost fluctuations:** Firm Issued: 4 Received: 4 **Contract period:** Stipulated: Offered: 21 Agreed: 21

Contract breakdown	Contract £	Analysis £		Competitive tender list Tender £	% above lowest
Measured work	12,445,111	12,445,111	1	14,275,250	-
Provisional sums	532,000	532,000			
PC sums	-	-			
Preliminaries	1,048,139	1,048,139			
Contingencies	250,000	250,000			
Contract sum	14,275,250	14,275,250			

Accommodation and design features: 3 and 2 storey secondary school. Piling. Concrete strip foundations, bed and upper floors; PCC and steel stairs. Steel frame and flat roof with metal cladding and Sarnafil. Masonry walls, render and cedar cladding. Windows, Brise Soleil. Proprietary and glass block partitions. Flush doors. Tiles and paint to walls; undefined flooring and ceilings. Fittings. Sanitaryware. Mechanical and electrical services. Lift. Fire alarm, CCTV, sound and lighting to hall, data cabling. External works with paving, walls, landscaping, services and drainage.

Storeys as a % of gross floor area	Average Storey Heights		Functional unit	Rate
	Below ground floor	-	910 - No places	£14,312
	At ground floor	-		
	Above ground floor	-		

Areas							£/m2 incl Preliminaries	
				Element	**Percentage**	**Total cost of element £**	**£ per m2**	**Tender prices** / **1995 constant prices**
Basement floors	- m2							
Ground floor	- m2							
Upper floor	- m2							
Gross floor area	11,150 m2			Substructure	9%	1,235,943	110.85	119.80 / 56.76
				Superstructure	37%	5,240,457	470.00	507.96 / 240.65
Usable area	- m2			Internal finishes	9%	1,355,925	121.61	131.43 / 62.27
Circulation area	- m2			Fittings	3%	426,000	38.21	41.29 / 19.56
Ancillary area	- m2			Services	27%	3,792,113	340.10	367.57 / 174.14
Internal Divisions	- m2							
Gross floor area	11,150 m2			Building sub-total	85%	12,050,438	1,080.76	1,168.05 / 553.38
				External works	6%	926,673	83.11	89.82 / 42.55
Area not enclosed	- m2			Preliminaries	7%	1,048,139	94.00	- /
External wall area	- m2			Contingencies	2%	250,000	22.42	22.42 / 10.62
Wall to floor ratio	-							
Internal cube	- m3			Total		14,275,250	1,280.29	1,280.29 / 606.55

Submitted by: Colin Smith Partnership

CI/SfB - 713.
Secondary schools (high schools) - 110
■■■ BCIS ■■■

Element		Preliminaries shown separately				Preliminaries spread	
		Total cost	Cost per m2	Element unit quantity	Element unit rate	Total cost	Cost per m2
1	Substructure	1,235,943	110.85			1,335,768	119.80
2A	Frame	913,450	81.92			987,228	88.54
2B	Upper floors	392,436	35.20			424,132	38.04
2C	Roof	726,628	65.17			785,316	70.43
2D	Stairs	269,045	24.13			290,775	26.08
2E	External walls	928,255	83.25			1,003,229	89.98
2F	Windows and external doors	614,491	55.11			664,122	59.56
2G	Internal walls and partitions	837,600	75.12			905,252	81.19
2H	Internal doors	558,552	50.09			603,665	54.14
2	Superstructure	5,240,457	470.00			5,663,719	507.96
3A	Wall finishes	150,513	13.50			162,670	14.59
3B	Floor finishes	703,201	63.07			759,997	68.16
3C	Ceiling finishes	502,211	45.04			542,774	48.68
3	Internal finishes	1,355,925	121.61			1,465,441	131.43
4	Fittings	426,000	38.21			460,407	41.29
5A	Sanitary appliances	81,441	7.30			88,019	7.89
5B	Services equipment						
5C	Disposal installations	included in	5F				
5D	Water installations						
5E	Heat source						
5F	Space heating and air treatment	1,840,516	165.07			1,989,171	178.40
5G	Ventilating systems						
5H	Electrical installations	1,762,742	158.09			1,905,116	170.86
5I	Gas installations						
5J	Lift and conveyor installations	67,660	6.07			73,125	6.56
5K	Protective installations						
5L	Communications installations	754	0.07			815	0.07
5M	Special installations	39,000	3.50			42,150	3.78
5N	Builder's work in connection						
5O	Builder's profit and attendance						
5	Services	3,792,113	340.10			4,098,396	367.57
	Building sub-total	12,050,438	1,080.76			13,023,731	1,168.05
6A	Site works	559,411	50.17			604,594	54.22
6B	Drainage	265,642	23.82			287,097	25.75
6C	External services	101,620	9.11			109,828	9.85
6D	Minor building works						
6	External works	926,673	83.11			1,001,519	89.82
7	Preliminaries	1,048,139	94.00				
	Total (less Contingencies)	14,025,250	1,257.87			14,025,250	1,257.87
8	Contingencies	250,000	22.42			250,000	22.42
	Contract sum	14,275,250	1,280.29			14,275,250	1,280.29

Appendix C

Element		Specification
1	Substructure	Piling. Concrete strip foundations and bed.
2A	Frame	Steel frame.
2B	Upper floors	Concrete upper floors.
2C	Roof	Steel flat roof with metal cladding and Sarnafil.
2D	Stairs	PCC straight and steel spiral stairs.
2E	External walls	Masonry walls with render and cedar cladding.
2F	Windows and external doors	Undefined windows. Brise Soleil.
2G	Internal walls and partitions	Aztec partitions.
2H	Internal doors	Undefined doors. Glass blocks.
3A	Wall finishes	Tiles and paint only.
3B	Floor finishes	Undefined.
3C	Ceiling finishes	Undefined.
4	Fittings	Provisional sum £426,000.
5A	Sanitary appliances	IPS panel system. Sanitaryware included in 5F.
5C	Disposal installations	In 5F.
5F	Space heating and air treatment	Mechanical services.
5H	Electrical installations	Electrical services.
5J	Lift and conveyor installations	Lift.
5L	Communications installations	Fire alarm, CCTV - costs in 5H.
5M	Special installations	Hall lighting and sound systems; data cabling.
5N	Builder's work in connection	Builder's work in connection with services.
6A	Site works	Site preparation. Macadam and other pavings, block walls, landscaping.
6B	Drainage	Drainage.
6C	External services	External services.
7	Preliminaries	8.08% of remainder of Contract Sum (excluding Contingencies).
8	Contingencies	1.93% of remainder of Contract Sum (excluding Preliminaries).

Credits

Submitted by:	Colin Smith Partnership
Client:	States of Jersey Education, Sport and Culture
Architect:	Nigel Biggar and Partners
Quantity surveyor:	Colin Smith Partnership

Appendix C
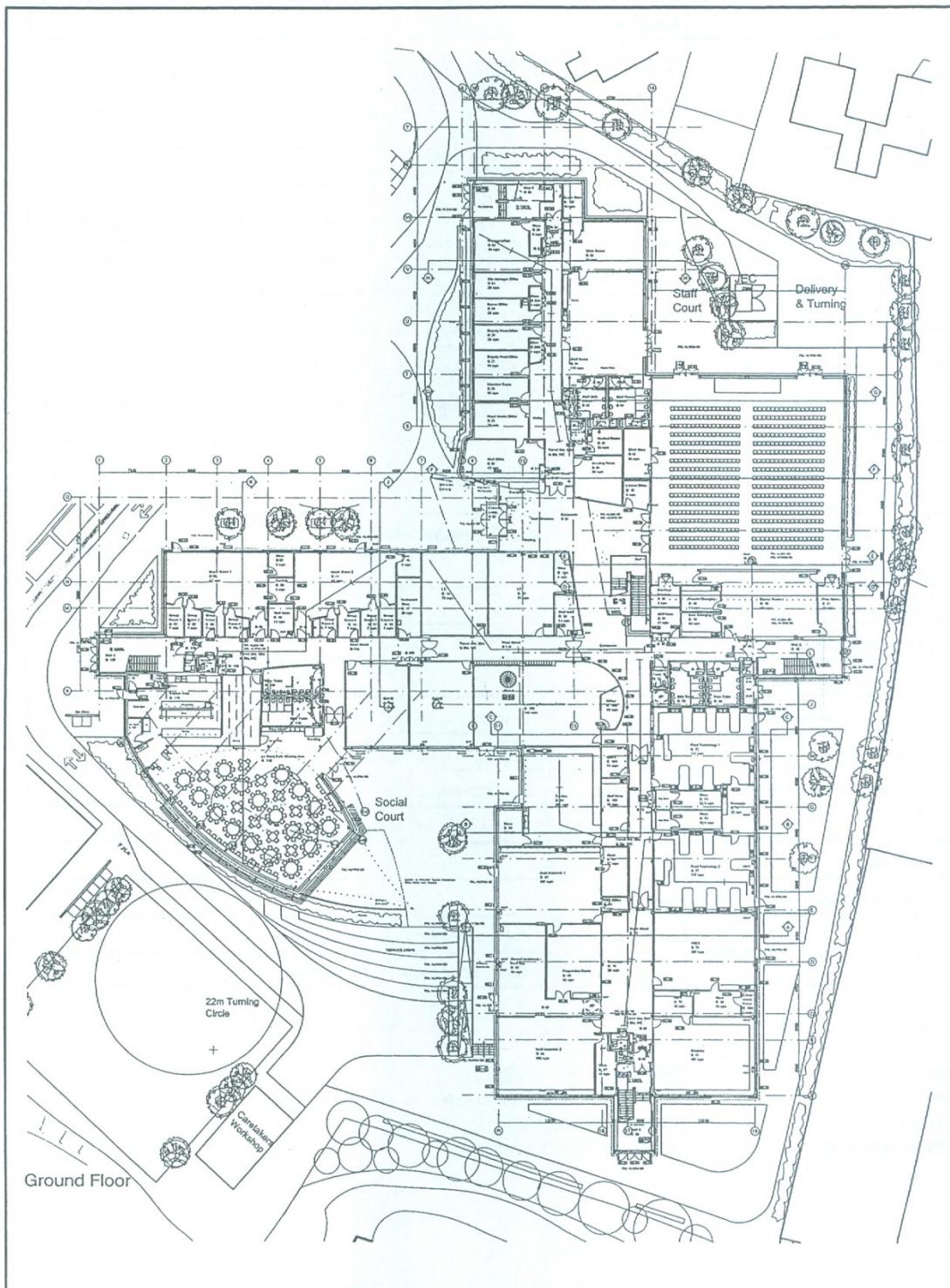
Social Court

22m Turning Circle

Caretakers Workshop

Ground Floor

Staff Court

Delivery & Turning

Architect: Nigel Biggar and Partners

© The Royal Institution of Chartered Surveyors - September 2005

565

Appendix C

Architect: Nigel Biggar and Partners

© The Royal Institution of Chartered Surveyors - September 2005
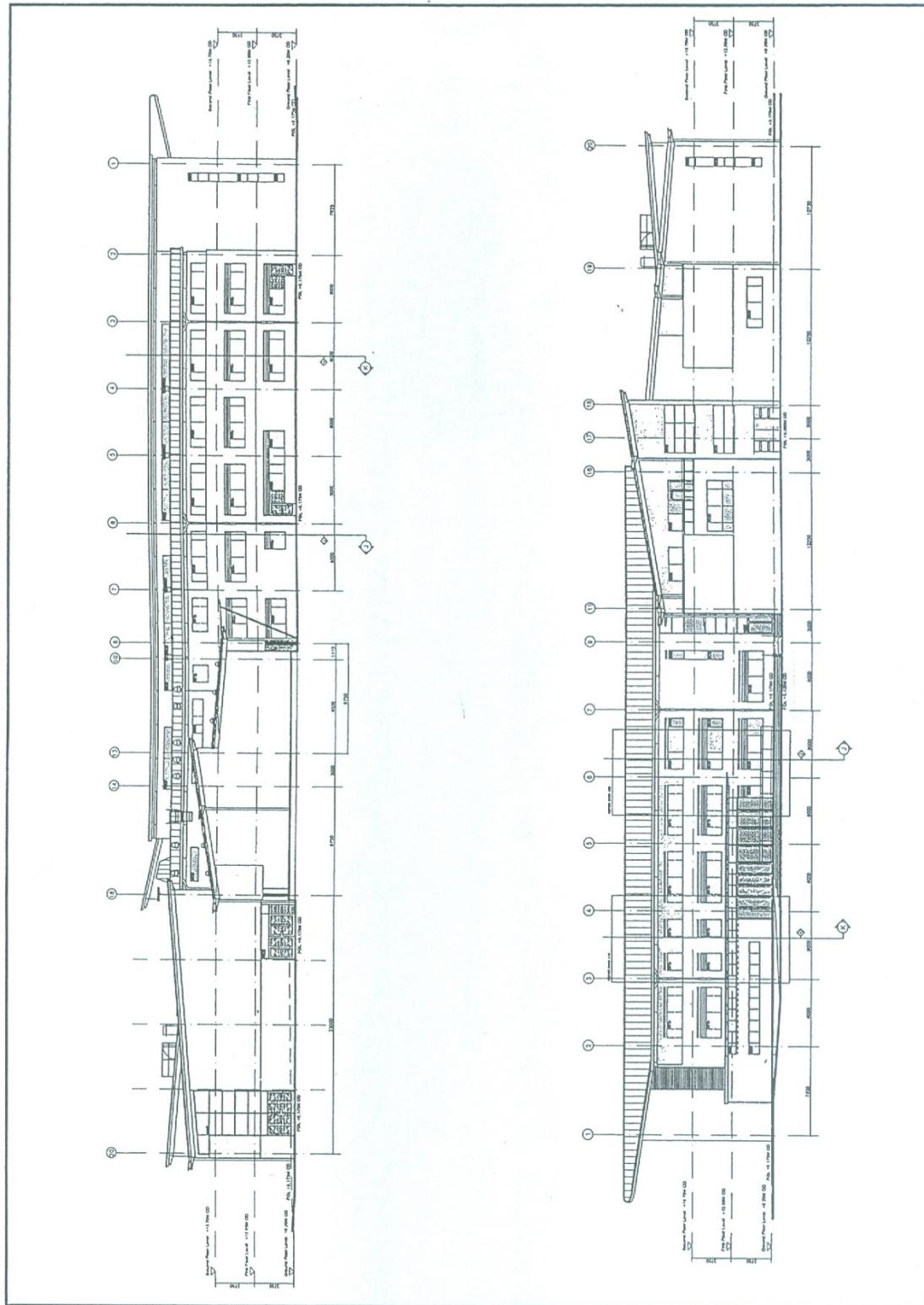
CI/SfB - 713.

Secondary schools (high schools) - 111

■ BCIS ■

Concise Elemental Analysis

BCIS *Online* analysis number: 22539

New build

BCIS code: A - 2 - 3,408

Job title:	Manchester Mesivta Secondary School, Charlton Avenue
Location:	Prestwich, Greater Manchester
Client:	Trustees of Manchester Jewish Grammar School
Dates:	Receipt: 4-May-2004 Base: 4-May-2004 Acceptance: 29-Jun-2004 Possession: 2-Aug-2004

Project details:	2 storey secondary school with 6th form block together with external works including precast concrete, block and macadam paving, metal fencing, landscaping, services, drainage and site lighting.
Site conditions:	Gently sloping demolition site surrounded by trees. Good ground conditions with excavation generally above water table. Restricted working space and access.
Market conditions:	Steelwork and brickwork elements very expensive and fluctuating. Project tender price index was 187 on a base of 1985 BCIS Index Base Indices used to adjust costs to base price level: TPI for 2Q2004 215; location factor 0.98

Tender documents:	Bill of quantities	**Contract:**	JCT private contract 1998 edition
Procurement:	Selected competition	**Cost fluctuations:**	Fixed
Number of tenders:	Issued: 6 Received: 6	**Contract period:**	Stipulated: 12 Offered: 12 Agreed: 12

Altered by negotiation

Contract breakdown			Competitive tender list		
	Contract £	Analysis £		Tender £	% above lowest
Measured work	3,488,132	3,488,132	1	4,526,483	-
Provisional sums	325,500	325,500	2	4,661,160	3.0
PC sums	-	-	3	4,804,984	6.2
Preliminaries	606,182	606,182	4	4,967,164	9.7
Contingencies	129,250	129,250	5	4,976,014	9.9
Contract sum	4,549,064	4,549,064	6	5,224,435	15.4

Accommodation and design features: 2 storey secondary school providing drama block, teaching block, sports hall/changing rooms and 6th form block. Concrete pad and strip foundations, RC ground and upper floors and stairs. Steel frame and Ruberoid covered Kingspan clad roof. Facing brick/block walls. Double glazed aluminium/timber windows. Block and cubicle partitions. Flush doors. Plaster to walls; vinyl, carpet, tile and hardwood flooring; suspended ceilings. Fittings. Sanitaryware. Gas LPHW central heating, cooling, ventilation, electrics. Lift. Alarms, CCTV, PA, door access.

Storeys as a % of gross floor area			Average Storey Heights		Functional unit		Rate
			Below ground floor	-			
			At ground floor	-			
			Above ground floor	-			

Areas					£/m2 incl Preliminaries	
		Element	**Percentage**	**Total cost of element £**	**£ per m2**	**Tender prices**	**1995 constant prices**

Areas		Element	Percentage	Total cost of element £	£ per m2	Tender prices	1995 constant prices
Basement floors	- m2						
Ground floor	- m2	Substructure	3%	158,328	46.46	53.84	33.22
Upper floor	- m2	Superstructure	27%	1,233,843	362.04	419.59	258.88
Gross floor area	3,408 m2	Internal finishes	11%	481,611	141.32	163.78	101.05
		Fittings	7%	303,235	88.98	103.12	63.62
Usable area	- m2	Services	23%	1,044,712	306.55	355.27	219.20
Circulation area	- m2						
Ancillary area	- m2	Building sub-total	71%	3,221,729	945.34	1,095.61	675.98
Internal Divisions	- m2	External works	13%	591,903	173.68	201.29	124.19
Gross floor area	3,408 m2	Preliminaries	13%	606,182	177.87		
		Contingencies	3%	129,250	37.93	37.93	23.40
Area not enclosed	- m2						
External wall area	- m2						
Wall to floor ratio	-	Total		4,549,064	1,334.82	1,334.82	823.57
Internal cube	- m3						

Submitted by: Stephen Davies Associates (Further details on BCIS *Online* service)

® The Royal Institution of Chartered Surveyors - September 2005

CI/SfB - 713.
Secondary schools (high schools) - 112
BCIS

Concise Elemental Analysis
BCIS *Online* analysis number: 22390

Rehabilitation/Conversion
BCIS code: - 4 - 1,600

Job title:	Refurbishment, The Temple, Brighton and Hove High School
Location:	Brighton, East Sussex
Client:	The Girls' Day School Trust
Dates:	Receipt: 3-Mar-2004 Base: 22-Feb-2004 Acceptance: 11-Mar-2004 Possession: 1-Apr-2004

Project details:	Refurbishment of 4 storey high school classroom block.
Site conditions:	Restricted access. Phased work during school holidays.
Market conditions:	Competitive. Project tender price index was 204 on a base of 1985 BCIS Index Base. Indices used to adjust costs to base price level: TPI for 1Q2004 200; location factor 1.10
Tender documents: Procurement: Number of tenders:	Selected competition. Issued: 5 Received: 5
Contract: Cost fluctuations: Contract period:	JCT Intermediate form of contract 1998. Firm. Stipulated: 3 Offered: 3 Agreed: 3

Contract breakdown	Contract £	Analysis £	Competitive tender list	Tender £	% above lowest
Measured work	154,450	154,450	1	378,230	-
Provisional sums	19,750	19,750	2	419,734	11.0
PC sums	131,687	131,687	3	434,198	14.8
Preliminaries	41,743	41,743	4	446,075	17.9
Contingencies	30,600	30,600	5	470,643	24.4
Contract sum	378,230	378,230			

Accommodation and design features: Refurbishment of 4 storey high school classroom block. Stripping out sanitaryware, finishes and fittings. Easing and adjusting windows. Block, timber stud and cubicle partitions. Flush internal doors. Plaster and plasterboard to walls; vinyl and carpet on hardboard on latex flooring; plasterboard suspended ceilings. Mechanical and electrical sub-contracts to include alterations to existing. Mechanical ventilation to basement.

Storeys as a % of gross floor area			Average Storey Heights		Functional unit		Rate	
			Below ground floor	-				
			At ground floor	-				
			Above ground floor	-				

Areas				£/m2 incl Preliminaries			
		Element	Percentage	Total cost of element £	£ per m2	Tender prices	1995 constant prices
Basement floors	- m2						
Ground floor	- m2						
Upper floor	- m2						
Gross floor area	1,600 m2						
		Substructure	0%	0	0.00	0.00	0.00
Usable area	- m2	Superstructure	18%	68,536	42.84	48.68	28.77
Circulation area	- m2	Internal finishes	23%	86,276	53.92	61.28	36.21
Ancillary area	- m2	Fittings	1%	4,304	2.69	3.06	1.81
Internal Divisions	- m2	Services	39%	146,771	91.73	104.25	61.60
Gross floor area	1,600 m2						
		Building sub-total	81%	305,887	191.18	217.27	128.39
Area not enclosed	- m2	External works	0%	0	0.00	0.00	0.00
External wall area	- m2	Preliminaries	11%	41,743	26.09	-	-
Wall to floor ratio	-	Contingencies	8%	30,600	19.13	19.13	11.30
Internal cube	- m3						
		Total		378,230	236.39	236.39	139.68

Submitted by: A E Thornton-Firkin & Partners

Appendix C

Detailed Elemental Analysis
BCIS *Online* analysis number: 20237

Horizontal extension
BCIS code: A - 2 - 88

Job title:	Classroom Extension, King James School
Location:	Knaresborough, North Yorkshire
Client:	The Governors, King James School
Dates:	Receipt: 26-Jun-2000 Base: 26-Jun-2000 Acceptance: 12-Jul-2000 Possession: 22-Jul-2000

Project details:	2 storey classroom extension with new entrance and staircase. External works include precast concrete and macadam paving and drainage.
Site conditions:	Level demolition site with good ground conditions. Excavation above water table. Restricted working space and access.
Market conditions:	Tight tendering climate. Indices used to adjust costs to base price level: TPI for 2Q2000 157; location factor 0.91

Tender documents: Schedule of works	**Contract:**	JCT private contract 1998 edition
Procurement: Selected competition	**Cost fluctuations:**	Fixed
Number of tenders: Issued: 5 Received: 5	**Contract period:**	Stipulated: 3 Offered: 3 Agreed: 3

Altered by negotiation

Contract breakdown	Contract £	Analysis £		Competitive tender list – Tender £	% above lowest
Measured work	102,017	102,017	1	136,742	-
Provisional sums	-	-	2	137,718	0.7
PC sums	-	-	3	142,437	4.2
Preliminaries	19,770	19,770	4	145,388	6.3
Contingencies	4,375	4,375	5	148,123	8.3
Contract sum	126,162	126,162			

Accommodation and design features: 2 storey classroom extension with entrance and stairs. Concrete pad and strip foundations, bed and upper floor on metal deck. Steel frame, stairs and pitched and flat roof with metal cladding. Brick/block walls. Double glazed aluminium windows. Block partitions. Fire rated glazed double doors, single doors; fire rated hardwood door. Plaster and plasterboard to walls; vinyl and carpet flooring; suspended ceilings. Fittings. Heating, electric light and power. External works with PCC and macadam paving, drainage and demolitions.

Storeys as a % of gross floor area			Average Storey Heights		Functional unit	Rate
			Below ground floor	-		
			At ground floor	-		
			Above ground floor	-		

Areas		Element	Percentage	Total cost of element £	£ per m2	Tender prices	1995 constant prices
						£/m2 incl Preliminaries	
Basement floors	- m2						
Ground floor	- m2						
Upper floor	- m2						
Gross floor area	88 m2						
		Substructure	6%	7,912	89.91	107.33	97.66
Usable area	- m2	Superstructure	45%	56,963	647.31	772.75	703.14
Circulation area	- m2	Internal finishes	16%	19,926	226.43	270.31	245.96
Ancillary area	- m2	Fittings	1%	1,170	13.30	15.88	14.44
Internal Divisions	- m2	Services	6%	7,750	88.07	105.14	95.67
Gross floor area	88 m2	Building sub-total	74%	93,721	1,065.01	1,271.40	1,156.87
Area not enclosed	- m2	External works	7%	8,296	94.27	112.55	102.41
External wall area	- m2	Preliminaries	16%	19,770	224.66	-	-
Wall to floor ratio	-	Contingencies	3%	4,375	49.72	49.72	45.24
Internal cube	- m3						
		Total		126,162	1,433.66	1,433.66	1,304.51

Submitted by: Franklin & Andrews