

BREEAM NEW CONSTRUCTION METHOD M5X01883

Assignment 2: BREEAM Case
Study – FACE South Building SA1

P152115

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Introduction

The purpose of this essay is to establish the methods which were implemented to achieve the BREEAM standard Calculation for the FACE building on the new University SA1 development. Additionally, this will involve providing suggestions to improve the evidential methodology to enable a higher scoring for the project where possible. The focus within the following information will be with the sole relation to achieving the Water category requirements. This topic was allocated and agreed within group discussions at Swansea Metropolitan University with other members of the BREEAM class.

BREEAM Case Study**Face South Building: Water**

Kubba (2016) States that the subject of water in construction is a topic which requires extensive planning and monitoring in both the design and construction phase. Additionally, claiming that post completion / handover the functionality and usability is continually tested during the buildings lifecycle.

Achieving / Improving the Water Category - points allocation

The Non-Domestic New Construction Manual (NDNC Manual)- Breeam 2014 assert, that the water category contains 4 Units with varying point allocation:

Wat 01: Water Consumption – 5 Points

Wat 02: Water Monitoring – 1 Point

Wat 03: Leak Detection – 2 Points

Wat 04: Water Efficient Equipment – 1 Point

Novak (2014) affirms this and avers that there is currently a maximum of 9 points available in total for the Water Category, this represents an overall maximum scheme weighting of 7%. Additionally, stating that this equates to 0.78 points per weighting percentage (maximum 7%) available toward the overall scoring e.g. $0.78 \times 9 = 7\%$ or for example $0.78 \times 6 = 4.68$. To meet the criteria for this category, 2 Mandatory / Minimum units must be identified and fulfilled. Brebbia et al (2016) affirms this and additionally proclaims that categories with mandatory requirements, must reach a minimum BREEAM rating of Very Good once assessed. These units are represented and justified in the project evidence documentation provided:

Wat01 Water Consumption: Minimum Requirement

Breeam (2014) states, that to achieve the maximum available credits that specific aspects of consumption and offsetting must be factored and calculated. Furthermore, that the Swansea SA1 is in a Precipitation 2 area (FIG 1.0) therefore all calculations must meet the requirements set for this level.

Wat01 must meet set requirements in 2 sections:

Part 1: Fitting Consumption

The Evidence detailed in the Face specification document (2016) states that the sanitary wares and fittings are:

- WC: 3.75 Effective Flush Volume (liters)
- WHB Taps: 3.75 Liters / Min
- Showers: 4 Liters/min
- Urinal (2 or more): 0.75 Liters/bowl/hour
- Urinal (1 only): 1 Liters/bowl/hour
- Kitchenette Tap 5 liters/min

The BREEAM NDNC manual (2014) avers, that these components listed as evidence above, have water efficiency ratings that correspond to a level 4 classification (FIG 1.1). To satisfy the minimum requirement of Wat01, it also indicates that all sanitary ware / fittings must reach a minimum of level 3 or 4 to achieve the maximum of 4 to 5 points respectively. This is proven in the evidence and indicates that it will be specified as 4 points achieved.

The components and calculations present, indicate that for WAT01 this development will achieve 4 out of the 5 points available.

Part 2: Rain Water Yield

Firstly, Kier (2016) indicate, that to achieve the correct standard for points allocation that the average water consumption per service user must be calculated. This is evident in “50 Water Consumption” (Fig 1.2) within the evidence folder. The figures indicate that the amount of water is calculated using the formula: “ Litres/Person/Day “. Utilizing this method, the calculations show a maximum permissible demand of grey water permissible components of:

WC Flushing: 7.50 l/p/d – (1 flush = 3.75)

Urinal Flushing: 4.52 l/p/d

Adeyeye (2017) Positions, that the installation of water collection tank must strictly adhere to BS8515:2009 the Rainwater Harvesting systems code of practice. The evidence

(Fig 1.3) confirms that this has been carried out at the development. Furthermore, presenting calculations based on rainfall and a water catchment area of 1995m² and a tank of 30,000 liters (FIG SCHEMATIC). This approach will produce a yield of 3.21 l/p/d to offset the non-potable components.

The water obtained by means of the collection system (3.21) will attribute to 57.065% of the total required by the WC and Urinals.

Calculations

WC: 7.5 l/p/d – 3.21 = 42.8% of requirement

Urinals: 4.52 l/p/d – 3.21 = 71.33%

Average Yield above baseline: 57.065%

Bream (2014) state that this percentage range would place the water development firmly in the 4 points range as it 50% above baseline but less than the 75% required to be awarded for 5 points (Fig 1.1).

Points Awarded

The evidence shows that the development will attain 4 marks for Wat 01.

WA01 Recommended Improvements

To achieve the maximum points available for WAT01 it would be recommended to change the sanitary ware to level 5 components. This would not only place the fittings into the 5 point range, it would also raise the percentage of rain water meeting the demand required to 5 points or 75%:

WC 6.00 l/p/d (1 Flush = 3.0) – 3.21l/p/d = 53.5%

Urinals 0.00 l/p/d (Waterless) – 3.21l/p/d = 100%

Average = $100 + 53.5 / 2$

= 76.75% (above baseline)

Innovation

Breeam (2014) List Wat01 as an innovation category and will award further points to developments which are constructed to an exemplary level. Galiano-Garrigos (2016) claims that, to achieve this classification, the application of BREEAM level 5 components will be obligatory. Secondly, this project shows evidence of rain water harvesting only. Malina (2014) proffers that incorporating a grey water recovery system to recycle waste water e.g. sinks and kitchen drainage, water consumption will be lowered considerably. Furthermore, insisting that the yield of harvested water

will easily achieve 100% of the demand above baseline if correctly executed and approved by the Breeam Assessor. Although, this would be highly dependant on site conditions such as space, topography or previous use e.g. brownfield sites present in the SA1 Area.

Wat02 Water Monitoring: Minimum Requirement

Breeam (2014) aver, that Wat02 is a Mandatory / Minimum requirement to allow a project to achieve the lowest certification necessary for the Water category.

Furthermore, that only a single point is available for this section and is achieved through the implementation of a water meters . This will allow the post operational use of the development to be monitored the usage of individual sections of the building and help to achieve points in the management category (see page 10: associated categories). Kier (2016) state that, they will comply with 4 specific requirements set out in the Breeam Technical Manual (2014) (Fig 1.4). The document “Proposed Domestic Water Schematic (FACE Tech)” (Fig 1.5) illustrates that each requirement has been met in the buildings planned design and methodology for each element:

1. An incorporated main water meter to the main feed to the Face building is illustrated in the design.
2. Each unit which operates at more than 10% of the overall water consumption has been fitted with an individual meter.
3. Each Meter Unit is Marked with a Building Management System Mark “BMS”. This indicates that each unit is capable of both water metering and pulse output to a BMS Platform to allow leak detection.
4. The Meters are linked to Current BMS systems in the Main Building (FIG 1.6).

Points Awarded

The evidence shows that the development will attain 1 marks for Wat 02.

Wat 03 Leak Detection

The Bream Technical Manual (2014) reveals that Wat 03 has 2 achievable points, that each point involves satisfying specific prerequisites for each assessment criteria (Fig 1.7):

Part 1: 1 point

Dual Water Metering and Pulsating BMS enabled devices previously mentioned in Wat 02 (Fig 1.5) also enable this point to be achieved without further adaption or cost to the design schematic. Each Meter employs a pulse output which is connected to the detection system which alerts the BMS.

Part 2: 1 Point

Flow control devices and valves are present on the schematic for the face south building (Fig 1.5). The operational valves allow for the BMS to control and regulate the flow / output for areas of the building which are not in constant use. This will allow the BMS to calculate the operational use and adjust the water flow to elements within the area e.g. Flushing Sequence of urinals.

Wat 04 Water Efficient Equipment: 1 Point

Breeam (2014) states, that in order to achieve the point in this category, the design must implement a strategy to control all unregulated water consumption (Fig 1.8) and enable a design which utilises a self contained water supply. The evidence in “50 Water Consumption” avers that the use of natural precipitation will be used to meet the demand of external landscaping and planting in all seasons of the year.

Total Points allocation

Wat01: 4pts

Wat02: 1pt

Wat03: 2pts

Wat04 1pt

Total: 8 points (9 available)

Weighting 6.24% (7% total)

Breeam Rating: Very Good

Associated Categories

BREEAM (2014) “Project Brief and design” (Man 01) states that all concept / feasibility related calculations to the design will be overseen by an appointed sustainability champion during this stage of the development. Furthermore, that during the construction phase, a nominated sustainability champion will be appointed but it does not indicate if this will be the same nominee as at the design / conception phase. If an alternative candidate is appointed, the views of these two persons may conflict with regards to acceptability of materials or methods during the projects lifecycle even though it may still achieve the criteria for points scoring in the respective categories. In this case study, the evidence given states that Jamie Best is the appointed nominee for all stages as shown in the sustainability champion compliance letter (Fig 1.9)

Kier (2016) proffer, in the BREEAM Specification Data document, that water must be precisely controlled to achieve positive gains in alternative categories. This includes all categories that are outside the fundamental Water Criteria where the minimum specification is presented (WAT01 – 04):

Management

Kier (2016) initially state the importance of careful monitoring and reporting of water usage on and off site in the Man 02 category. While this does not directly affect the points available in categories directly involved with water usage, it is important to obtain all available points in the management category. The Brief (Kier, 2016) avers that this is the responsibility of the appointed individual/s, this will most likely be the previously mentioned “sustainability champion” for the management phase. Francis et al (2014) suggests, that to achieve the points required, it is essential to adhere at

least to the minimum specifications present in the Considerate Constructors Scheme (2014 now 2017) (Fig 2.0). Water is additionally referenced in the management category and states that monitoring systems (present in Wat 02 and 03) are required to be implemented before the full points allocation of Man 04 can be achieved in the hand over phase e.g. commissioning and testing schedules of the building.

Energy

ENE 04 states, that surface water cooling will be utilized to promote low carbon technologies. This will not have a direct effect on water consumption as it is obtained through rainfall and can still be utilized through greywater collection.

Conclusion

It is apparent that the 08 Water Category in the BREEAM Non-Domestic manual 2014 has the smallest weighting percentage of all categories. However, it does appear that achieving the overall percentage requirement is very expensive and must be designed and vigorously calculated before construction. The Calculations in this essay show that the Face South Building achieved a weighting of 6.24% (of 7%) The water rating for the category as an individual, can only be classed as “ Very Good” and not Excellent or Exemplary. This is due to the underachievement in Man 01 by selecting level 4 components which only produce 55% above base rate. Although, an excellent rating can easily be achieved by upgrading the components to Level 5. This could further be improved to gain an 85% Exemplary by installing a grey water system instead of just using rainwater tank harvesting.

References

Adeyeye, K (2017). *Water Efficiency in Buildings: Theory and Practice*. London: John Wiley & Sons. 186-226.

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BS8515:2009 the Rainwater Harvesting systems code of practice

Francis et al (2014). *European Building Construction Illustrated*. London: John Wiley & Sons. 23-36.

Galiano-Garrigos (2016). *Urban Sustainability*. Oxford: Routledge. 176-184.

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KIER (2016). *BREEAM New Construction 2014 Specification* . Gardner, A: Kier. 1-36.

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Kubba, S (2016). *Handbook of Green Building Design and Construction: LEED, BREEAM, and Green Globes*. Oxford: Butterworth-Heinemann. 119-124.

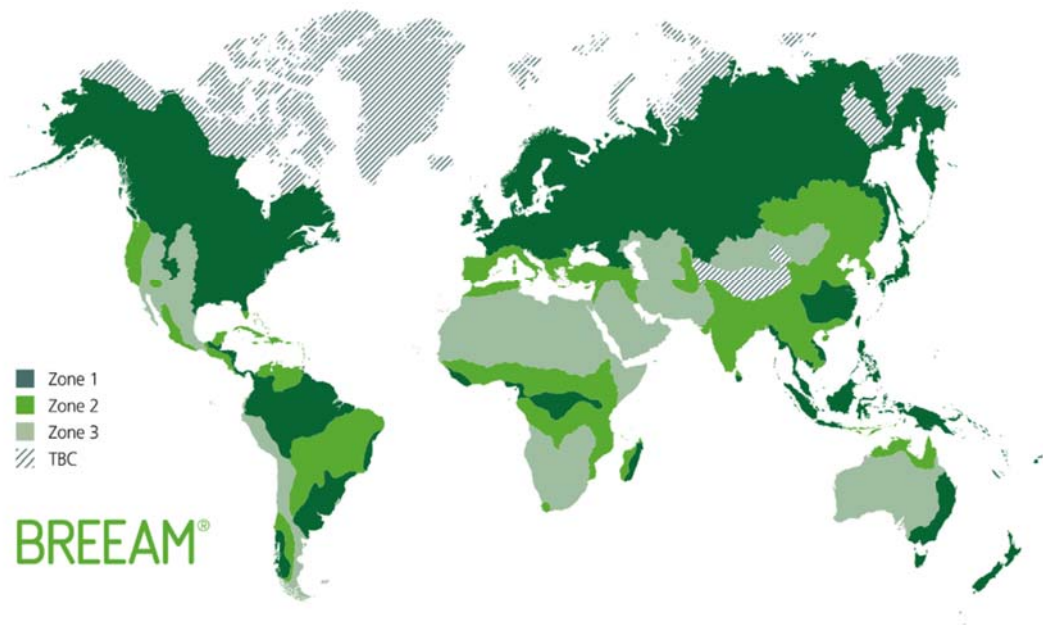
Malina, M (2014). *Delivering Sustainable Buildings: An Industry Insider's View*.

London: John Wiley & Sons. 4-9.

Appendix

(Fig 1.0)

World map of BREEAM precipitation zones



BRE (2014). [image] Available at: http://www.breeam.com/BREEAMIntNDR2016SchemeDocument/content/03_scoring_rating_all/env_weighting_all.htm [Accessed 24 Apr. 2018].

(FIG 1.1)

Table - 17: Water efficient consumption levels by component type

Component	Performance Levels						Unit
	Base	1	2	3	4	5	
WC	6	5	4.5	4	3.75	3	Effective flush volume (litres)
Wash hand basin taps	12	9	7.50	4.50	3.75	3	litres/min
Showers	14	10	8	6	4	3.50	litres/min
Baths	200	180	160	140	120	100	litres
Urinal (2 or more urinals)	7.50	6	3	1.50	0.75	0	litres/bowl/hour
Urinal (1 urinal only)	10	8	4	2	1	0	litres/bowl/hour
Greywater/rainwater system	0%	0%	0%	25%	50%	75%	% of WC/urinal flushing demand met using recycled non-potable water
Kitchen tap: kitchenette	12	10	7.50	5	5	5	litres/min
Kitchen taps: restaurant (pre-rinse nozzles only)	10.30	9	8.30	7.30	6.30	6	litres/min
Domestic sized dishwashers	17	13	13	12	11	10	litres/cycle
Domestic sized washing machines	90	60	50	40	35	30	litres/use
Waste disposal unit	17	17	0	0	0	0	litres/min
Commercial sized dishwashers	8	7	6	5	4	3	litres/rack
Commercial/Industrial sized washing machines	14	12	10	7.50	5	4.50	litres/kg

Bre (2018). *Check Lists and Tables*. [image] Available at: https://tools.breeam.com/nondom_mobile/Advanced/content/08_water/wat01.htm [Accessed 24 Apr. 2018].

(FIG 1.2)

Component	Greywater and/or rainwater utilised for component	Proportion of components using greywater and/or rainwater yield (%)	Maximum permissible demand (L/person/day)
WC flushing	Yes	100%	7.50
Urinal flushing	Yes	100%	4.52
Total			Demand met by yield (L/person/day)
			3.21
Other permissible components			
Are there other permissible components present which demand greywater and/or rainwater yield?			No
			Maximum permissible demand (L/day)
			0
Proportion of maximum permissible demand utilised by other permissible components (%)			Demand met by yield (L/person/day)
Total			0.00
Total			Greywater and/or rainwater demand met by yield (L/person/day)
			3.21

KIER Construction. (2016). *50 water consumption*. [image] Available at: <http://N/A> [Accessed 24 Apr. 2018].

FIG 1.3

BREEAM 2014 Wat 01 Water consumption: Water efficiency calculator for new non domestic education buildings		BREEAM [®] UK
Non potable water yield - rainwater system		
Has, or will, the rainwater system be specified and installed in compliance with BS8515:2009 Rainwater Harvesting Systems - Code of practice		Yes

Fig 1.4

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. The specification of a water meter on the mains water supply to each building; this includes instances where water is supplied via a borehole or other private source.
2. Water-consuming plant or building areas, consuming 10% or more of the building's total water demand, are either fitted with sub meters or have water monitoring equipment integral to the plant or area (see Compliance notes).
3. Each meter (main and sub) has a pulsed output to enable connection to a Building Management System (BMS) for the monitoring of water consumption.
4. If the site on which the building is located has an existing BMS, managed by the same occupier/owner (as the new building), the pulsed water meter(s) for the new building must be connected to the existing BMS.

BRE GLOBAL (2018). *WAT04*. [image] Available at: https://www.breeam.com/BREEAMUK2014SchemeDocument/#08_water/wat04.htm%3FTocPath%3D8.0%2520Water%7C_____4 [Accessed 17 Apr. 2018].

[illegible]

Fig 1.6**Interface Units**

Specific fire alarm interfaces shall be provided to the following systems / equipment to enable operation or shut down equipment as required under the main fire strategy:

- **Building management systems (BMS)**

Evidence Folder "56 ELECTRICAL SCOPE OF WORKS" Page 91.

Fig 1.7

You are here: [8.0 Water](#) > Wat 03 Leak detection

Wat 03 Water leak detection and prevention

Number of credits available	Minimum standards
2	No

Aim

To reduce the impact of water leaks that may otherwise go undetected.

Assessment Criteria

The following is required to demonstrate compliance for:

One credit

1. A leak detection system which is capable of detecting a major water leak on the mains water supply within the building and between the building and the utilities water meter.
2. The leak detection system is:
 - a. Audible when activated
 - b. Activated when the flow of water passing through the water meter/data logger is at a flow rate above a pre-set maximum for a pre-set period of time
 - c. Able to identify different flow and therefore leakage rates, e.g. continuous, high and/or low level, over set time periods
 - d. Programmable to suit the owner/occupiers' water consumption criteria
 - e. Where applicable, designed to avoid false alarms caused by normal operation of large water-consuming plant such as chillers.

One credit

3. One of the following types of flow control device is fitted to each WC area/facility to ensure water is supplied only when needed (and therefore prevent minor water leaks):
 - a. A time controller i.e. an automatic time switch device to switch off the water supply after a predetermined interval
 - b. A programmed time controller i.e. an automatic time switch device to switch water on and/or off at predetermined times.
 - c. A volume controller i.e. an automatic control device to turn off the water supply once the maximum preset volume is reached.
 - d. A presence detector and controller i.e. an automatic device detecting occupancy or movement in an area to switch water on and turn it off when the presence is removed.
 - e. A central control unit i.e. a dedicated computer-based control unit for an overall managed water control system, utilising some or all of the types of control elements listed above.

BREEAM (2014). *WAT03 Water leak detection and prevention*. [image] Available at: https://tools.breeam.com/nondom_mobile/Advanced/content/08_water/wat03.htm [Accessed 24 Apr. 2018].

FIG 1.8

Wat 04 Water efficient equipment

Number of credits available	Minimum standards
1	No

Aim

To reduce unregulated water consumption by encouraging specification of water efficient equipment.

Assessment criteria

The following is required to demonstrate compliance:

One credit

1. The design team has identified all unregulated water demands that could be realistically mitigated or reduced.
2. System(s) or processes have been identified to reduce the unregulated water demand, and demonstrate, through either good practice design or specification, a meaningful reduction in the total water demand of the building.

BRE GLOBAL (2018). WAT04. [image] Available at:
https://www.breeam.com/BREEAMUK2014SchemeDocument/#08_water/wat04.htm%3FTocPath%3D8.0%2520Water%7C_____4 [Accessed 17 Apr. 2018].

FIG 1.9



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Jamie Best
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19/09/2016

RE: UWTSO, Swansea Waterfront Innovation Quarter Phase 1

Dear, Jamie Best

I can confirm that we have appointed Jamie Best of Melin Consultants as Sustainability Champion for the Construction Stage of the Swansea Waterfront Innovation project. They will be responsible for monitoring the project to ensure continuing compliance with the sustainability process and performance criteria, and thus ensure compliance with the BREEAM targets, through the Construction, Handover and Close-Out stages of the development. Please do not hesitate to contact me should you require any further information.

Yours sincerely

A handwritten signature in dark ink, appearing to read "A Gardner", written in a cursive style.

Name: Andrew Gardner
Design Manager
Kier Construction Western & Wales

Fig 2.0



Considerate Constructors Scheme Code of Considerate Practice

Considerate constructors seek to improve the image of the construction industry by striving to promote and achieve best practice under this Code. They will:

Care about **Appearance**

Constructors should ensure sites appear professional and well managed

- Ensuring that the external appearance of sites enhances the image of the industry.
- Being organised, clean and tidy.
- Enhancing the appearance of facilities, stored materials, vehicles and plant.
- Raising the image of the workforce by their appearance.

Secure everyone's **Safety**

Constructors should attain the highest levels of safety performance

- Having systems that care for the safety of the public, visitors and the workforce.
- Minimising security risks to neighbours.
- Having initiatives for continuous safety improvement.
- Embedding attitudes and behaviours that enhance safety performance.

Respect the **Community**

Constructors should give utmost consideration to their impact on neighbours and the public

- Informing, respecting and showing courtesy to those affected by the work.
- Minimising the impact of deliveries, parking and work on the public highway.
- Contributing to and supporting the local community and economy.
- Working to create a positive and enduring impression, and promoting the Code.

Value their **Workforce**

Constructors should provide a supportive and caring working environment

- Providing a workplace where everyone is respected, treated fairly, encouraged and supported.
- Identifying personal development needs and promoting training.
- Caring for the health and wellbeing of the workforce.
- Providing and maintaining high standards of welfare.

Protect the **Environment**

Constructors should protect and enhance the environment

- Identifying, managing and promoting environmental issues.
- Seeking sustainable solutions, and minimising waste, the carbon footprint and resources.
- Minimising the impact of vibration, and air, light and noise pollution.
- Protecting the ecology, the landscape, wildlife, vegetation and water courses.

The Code of Considerate Practice outlines the Scheme's expectations of all registered sites, companies and suppliers, describing those areas that are considered fundamental by the Scheme in helping improve the image of construction.

For more information, call **0800 783 1423** or visit www.ccscheme.org.uk

Improving the image of construction

Considerate Constructors Scheme (CCS) (2017)