6th FORM CENTRE
BARNSLEY COLLEGE

Daylighting Analysis Report

December 2013
Rev A

ZEROENERGYDESIGN

Upperbank House,
Stoneythorpe,
Leeds,
LS18 4BN
United Kingdom
W: silcockleedham.co.uk
T: +44 (0)113 393 3310

SILCOCK LEEDHAM Consulting Engineers

LOW CARBON CONSULTANTS

breeam AP

ZEROENERGYDESIGN

verisys Ltd

Amendment Record Sheet

Revision	Description	Date	Approved
A	First Issue	Dec 13	WP

1.0 Introduction

As part of the design team for the new 6th Form Centre at Barnsley College, Silcock Leedham Consulting Engineers have been appointed to undertake a daylighting analysis of the internal spaces in support of the planning application for the scheme.

In order to obtain accurate output information a thermal model has been created for the new build element of the construction using Architects general arrangement layouts and elevations.

IES-VE 2012, an industry recognised software package, has been used to generate the daylight calculations utilising the 'Radiance' calculation tool.

The following reflectances & glazing light transmittances have been input into the model:

- Ceiling 70% reflectance
- Walls 50% reflectance
- Floor 20% reflectance
- Windows (North& East) 0.77 transmittance
- Windows (South & West) 0.64 transmittance
- Rooflights 0.5 transmittance

It is accepted that the surface reflectances above can be improved upon, this analysis is intended to give a base case assessment without imposing any significant constraints on the Architectural / Client aspirations for internal colour schemes.

2.0 - Sky types used for daylighting analysis

The CIE Overcast Sky has been used in this calculation due to the requirement to produce Daylight Factors for each space.

Standard Sky Conditions

Clear sky	Intermediate sky	Overcast sky	Uniform sky

2.1 Clear sky

The luminance of the standard CIE clear sky varies over both, altitude and azimuth. It is brightest around the sun and dimmest opposite it. The brightness of the horizon lies in-between those two extremes.

2.2 Intermediate sky

The standard CIE intermediate sky is a somewhat hazy variant of the clear sky. The sun is not as bright as with the clear sky and the brightness changes are not as drastic.

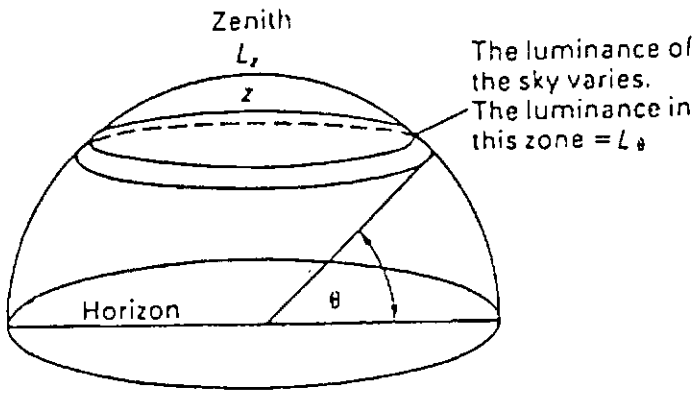
2.3 Overcast sky

The luminance of the standard CIE overcast sky changes with altitude. It is three times as bright in the zenith as it is near the horizon. The overcast sky is used when measuring daylight factors. It can be modelled under an artificial sky.

2.4 Uniform sky

The standard uniform sky is characterised by a uniform luminance that does not change with altitude or azimuth. It is a historical instrument from the days when calculations were done by hand or with tables. Today, it is hardly used at all.

2.5 *CIE Overcast Sky*



CIE Overcast Sky

The CIE Overcast sky has the following characteristics:
(a) Zenith (q = 90o) is the brightest region
(b) The luminance decreases to 1/3 of that of the zenith towards the horizon
(c) The luminance is independent of the position of the sun, and therefore the orientation of the windows has no effect on the illumination of the room.

Daylight Factor (DF) definition - Daylight Factor is the ratio of daylight illumination at a given point on a given plane, from an obstructed sky of assumed or known illuminance distribution, to the light received on a horizontal plane from an unobstructed hemisphere of this sky, expressed as a percentage. Direct sunlight is excluded for both values of illumination.

The daylight factor is the sum of the sky component, the external reflected component, and the internal reflected component. The interior plane is usually a horizontal working plane. With the CIE standard overcast condition, then the DF will remain constant regardless of absolute exterior illuminance.

The Daylight Factor gives a "feeling" as to how "bright" or how "dark" a building is – the higher the DF the "brighter" the building is perceived during daylight hours.

According to the recommendations of the British Standards Institution (BS8206 pt 2) the average daylight factor within an office should be:

- Not less than 5% if electric lighting is not normally to be used during daytime

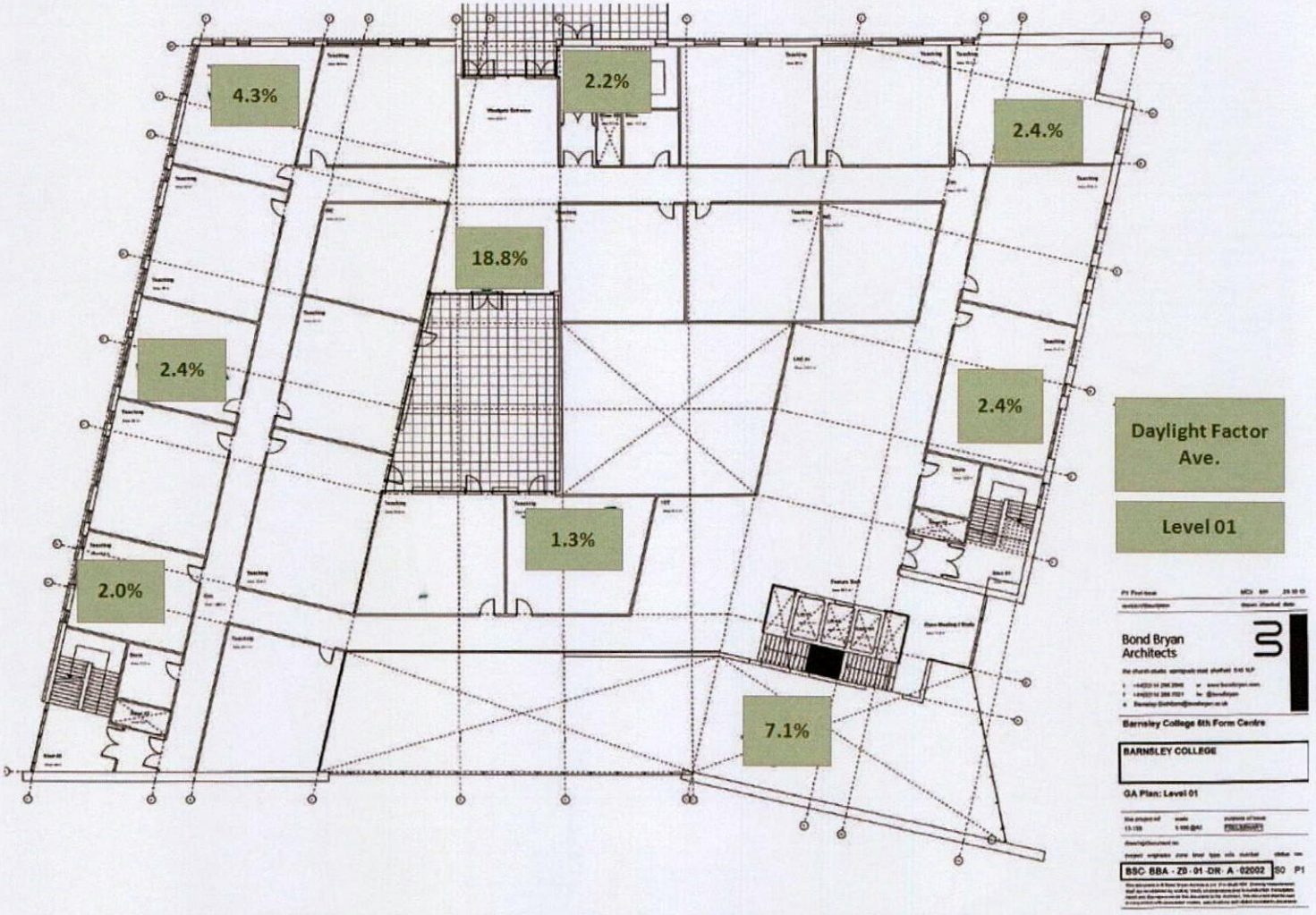
Or

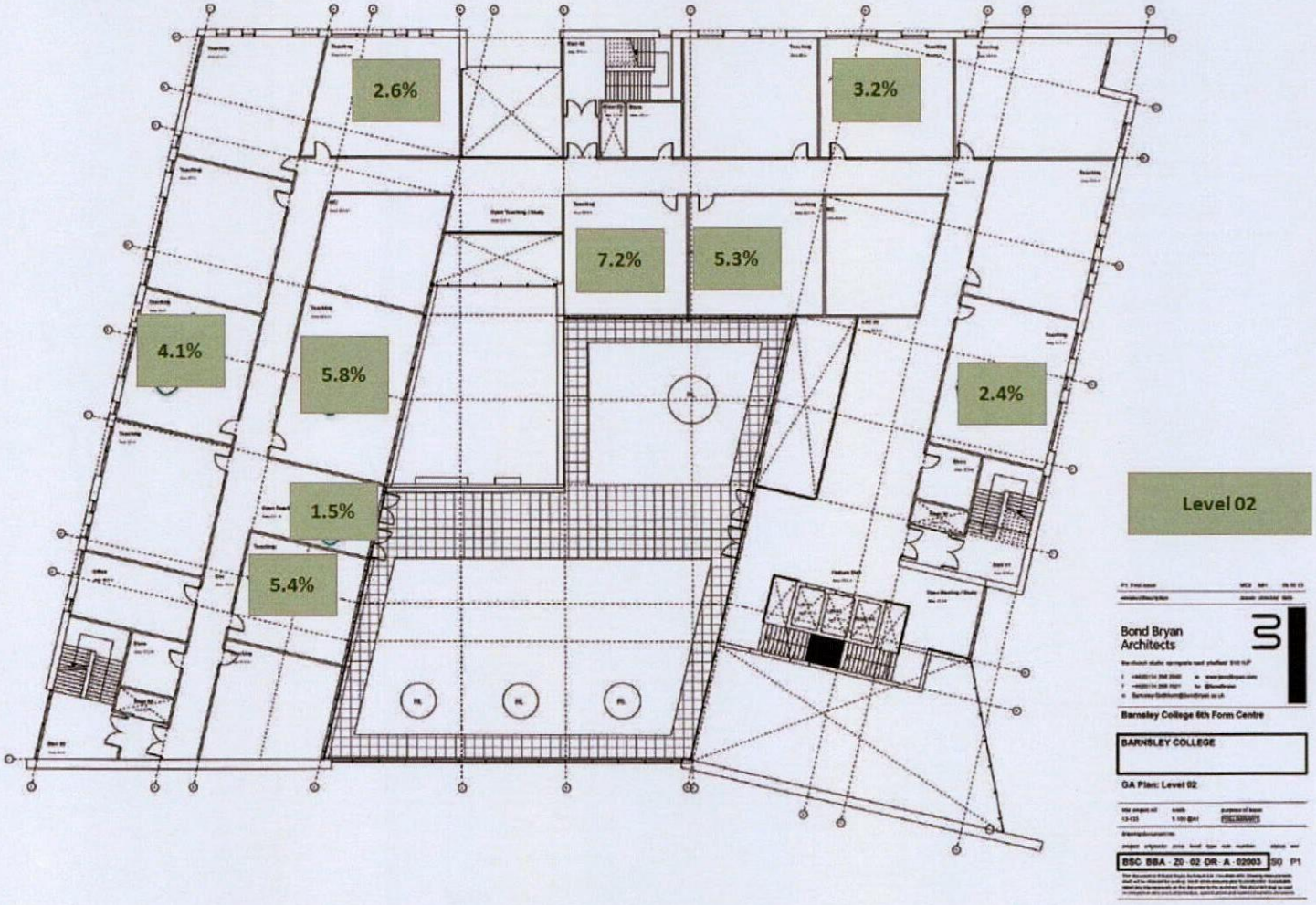
- Not less than 2% if electric lighting is to be used throughout the daytime and a predominantly daylit appearance is required.

3.0 – Analysis Results

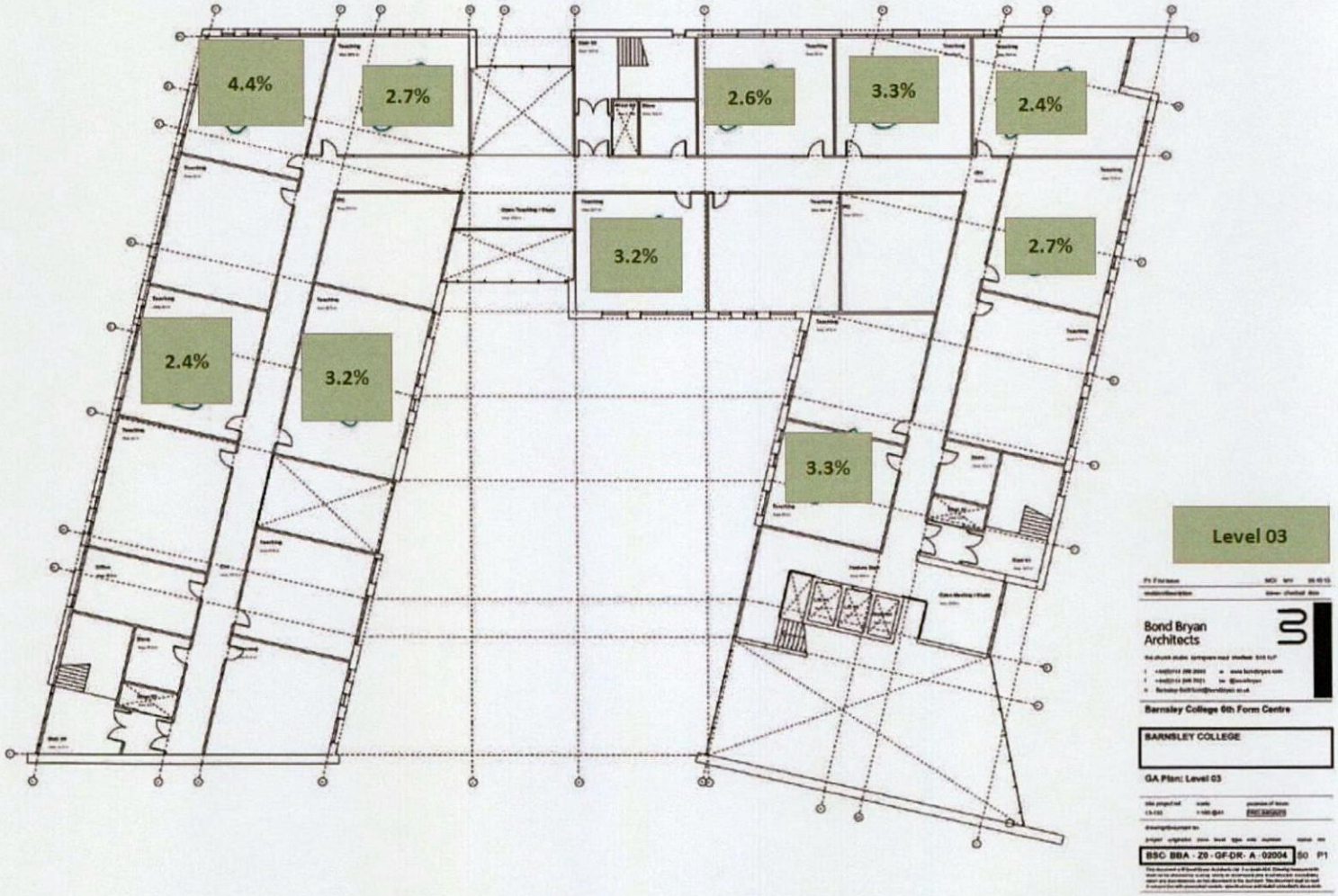
ROOM NAME	AVERAGE DF%	COMMENTS
01 - Tutorials	2.4	Passes BREEAM criteria >2%
01 - ICT	4.3	Passes BREEAM criteria >2%
01 - Stair 02	2.2	Transient area
01 - Accounts & Business	2.4	Passes BREEAM criteria >2%
01 - Art/Graphics	1.3	Borrowed light from Atrium not considered in calculation
02 - ICT English (Open)	2.6	Passes BREEAM criteria >2%
02 - Open Study	5.4	Passes BREEAM criteria >2%
02 - Teaching	5.8	Passes BREEAM criteria >2%
02 - English	4.1	Passes BREEAM criteria >2%
02 - Circ	1.5	Transient area
02 - Sociology	7.2	Passes BREEAM criteria >2%
02 - Sociology	5.3	Passes BREEAM criteria >2%
02 - Psychology	3.2	Passes BREEAM criteria >2%
02 - Staff Base	2.4	Passes BREEAM criteria >2%
03 - Lab Chemistry	4.4	Passes BREEAM criteria >2%
03 - ICT Science (Open)	2.7	Passes BREEAM criteria >2%
03 - Lab Physics	3.2	Passes BREEAM criteria >2%
03 - Lab Chemistry	2.4	Passes BREEAM criteria >2%
03 - Lab	3.2	Passes BREEAM criteria >2%
03 - Maths	2.6	Passes BREEAM criteria >2%
03 - Maths	3.3	Passes BREEAM criteria >2%
03 - Maths ICT	2.4	Passes BREEAM criteria >2%
03 - Humanities	2.7	Passes BREEAM criteria >2%
03 - Humanities	3.3	Passes BREEAM criteria >2%
01 - Open Teaching/Study	18.8	Passes BREEAM criteria >2%
00 - Main Entrance Stairs Void	7.1	Transient area

Zero Energy Design
W: zed-uk.com
T: +44 (0)113 393 3310


4.3%
2.2%
2.4%
18.8%
2.4%
2.4%
1.3%
2.0%
7.1%
Daylight Factor Ave.
Level 01
Bond Bryan Architects
Barnsley College 6th Form Centre
BARNSLEY COLLEGE
GA Plan: Level 01
BSC-BBA-Z0-01-DR-A-02002
S0
P1



Zero Energy Design
W: zed-uk.com
T: +44 (0)113 393 3310


4.4%
2.7%
2.6%
3.3%
2.4%
3.2%
2.7%
2.4%
3.2%
3.3%
Level 03
Bond Bryan Architects
Barnsley College 6th Form Centre
BARNSLEY COLLEGE
GA Plan: Level 03
BSC-BBA-Z0-GF-DR-A-02004
S0
P1