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# Projet REGAIN – Interreg IVB North West Europe
# Mise en place d'une méthodologie transnationale

**État d'avancement n°1 du 19/05/09**

La première partie de la mise en œuvre d'une méthodologie transnationale correspondait à l'établissement d'une méthodologie commune, pour la conception et la construction de bâtiments semi-industriels/semi-tertiaires environnementalement efficaces, et plus particulièrement efficaces du point de vue énergétique.

Chacun des partenaires du projet REGAIN imprime à son projet sa vision des objectifs du développement durable et de leur mise en œuvre dans son contexte propre. Ce contexte « local » est également exprimé sous la forme des valeurs cibles affectées aux critères d'évaluation de la qualité environnementale des projets, via l'outil d'évaluation commun « SB-Tool », proposé par l'équipe italienne et choisi par l'ensemble des partenaires du projet comme outil de référence.

Il existe actuellement une palette d'outils d'évaluation, parmi lesquels :

- VALIDEO : mis au point, en Belgique, par le Centre Scientifique et Technique de la Construction (CSTC) et le Bureau SECO, VALIDEO est en fin de phase de certification et pourra bientôt être appliqué, dans un premier temps, aux bâtiments tertiaires uniquement.

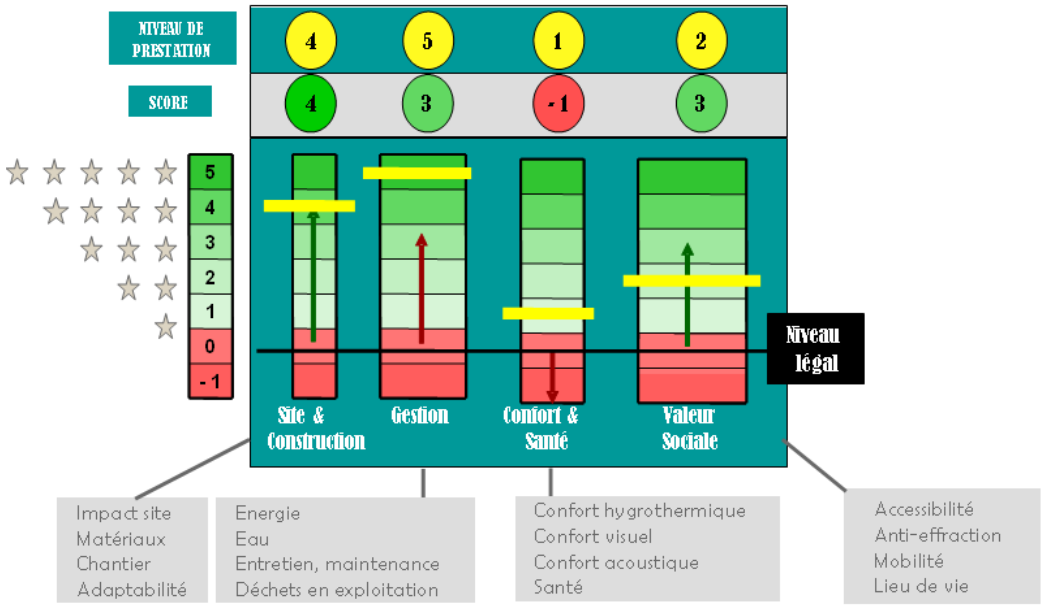


Figure 1 : Mode de cotation et critères d'évaluation de VALIDEO



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Seize critères généraux d'évaluation ont été définis dans 4 domaines (Site et Construction, Gestion, Confort et Santé, Valeur sociale) : voir Figure 1 ci-dessus. Pour chaque critère, une cotation est établie, qui est de 0 point lorsque le prescrit légal correspondant est respecté, sans plus ; ensuite de 1 à 5 points au fur et à mesure de l'accroissement de qualité du projet pour le critère concerné. La cote est négative (-1) si le projet ne rencontre pas le prescrit légal, par exemple un bâtiment existant qui ne respecte plus la législation ayant évolué. La somme des cotations obtenues conduit à un résultat global exprimé en nombre d'étoiles (1 à 5).

L'outil VALIDEO n'est encore applicable qu'aux seuls bâtiments tertiaires et demanderait une adaptation importante pour s'appliquer à un bâtiment mixte atelier-bureaux.

- BREAM (Building Research Establishment Environmental Assessment Method) : mis au point par le "CSTC anglais", le Building Research Establishment, BREEAM comporte également plusieurs chapitres de critères couvrant les sujets de la qualité environnementale et affecte une cotation pour chacun de ces critères (Figure 2).

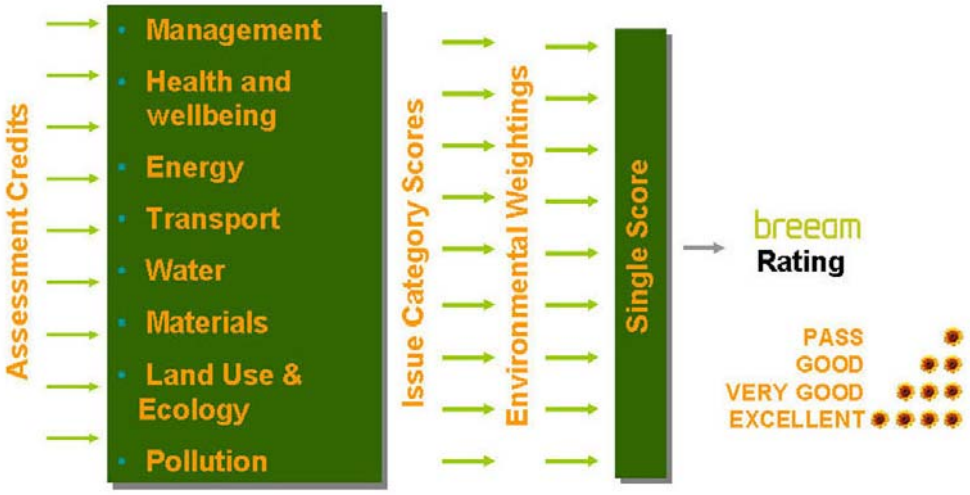



Figure 2 : Mode de cotation et critères d'évaluation de BREEAM

Pour être appliqué dans des contextes nationaux différents, BREEAM nécessiterait une adaptation particulière à chacun, comme cela est en cours par exemple pour les Pays-Bas qui souhaitent l'utiliser dans le cadre de la certification des bâtiments.

- LEED (Leadership in Energy and Environmental Design) : dans le contexte américain (USA), LEED est un label indépendant géré par l'US Green Building Council, qui poursuit l'objectif de transformer le secteur de la construction en l'amenant à mieux intégrer le bien-être de ses occupants, la performance environnementale et le rendement économique des bâtiments. D'expérience, il peut être établi que l'utilisation de LEED entraîne un surcoût de construction estimé à une moyenne d'environ 2 % du coût des travaux, mais engendre une amélioration de la productivité des travailleurs qui l'occupent : l'impact sur le coût salariat de cet accroissement de la productivité des usagers rentabilise très rapidement le surcoût de construction consenti. L'adaptation de LEED à un contexte européen serait plus importante encore que celle de BREEAM.

- HQE (Haute Qualité Environnementale) : français, cet outil d'évaluation regroupe les critères d'appréciation des bâtiments évalués en 14 cibles, elles-mêmes regroupées en 4 familles (éco-construction, éco-gestion, santé, confort) : voir Figure 3.

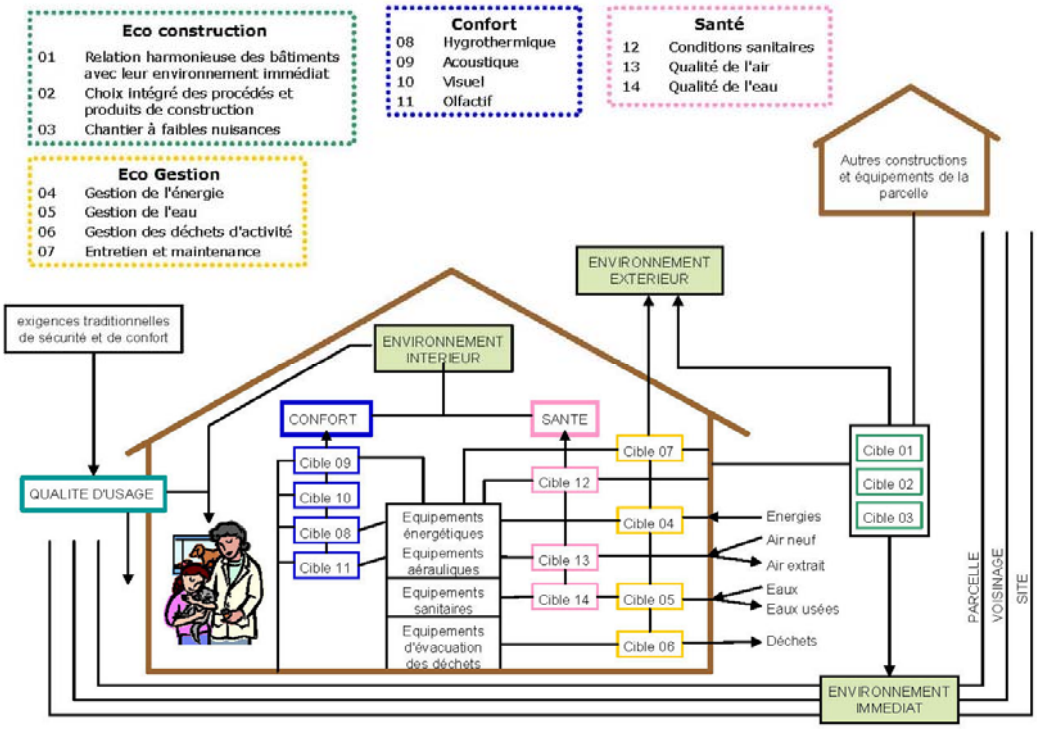



Figure 3 : Critères d'évaluation par HQE

Le label HQE ne comporte pas l'approche économique du projet qui reste pourtant un des trois piliers du développement durable (environnement, social et économie).

- MINERGIE : suisse, le label Minergie (tout comme le label PassivHaus en Allemagne et en Autriche) est essentiellement axé sur l'énergie et n'approche les autres aspects de qualité environnementale que par le biais de son extension « Minergie-ECO ». Son adaptation aux projets REGAIN serait difficile.

L'équipe italienne partenaire du projet REGAIN a proposé un outil tout à fait complet et aisément adaptable à des contextes nationaux et régionaux : SB-Tool. Développé l'Université de Thessalonique dans le cadre d'un projet de recherche européen comprenant 25 pays participants, le « Sustainable Building – Tool » évalue les bâtiments suivant plus d'une centaine de critères regroupés en 7 familles, comprend également des aspects sociaux, économiques et culturels (voir Figure 4 ci-après) et permet d'affecter les poids souhaités à chacun des critères à l'intérieur de chaque famille et entre les familles de critères elles-mêmes.

Cette faculté d'adaptation de SB-Tool aux contextes locaux a favorisé le choix de SB-Tool par de nombreux organismes dans de nombreux pays dans le monde (Australie, Espagne, France, Japon, Chine, Corée, Taïwan, Norvège, Suède, Allemagne, Pays-Bas, Autriche, Finlande, Grèce, Canada, Etats-Unis, Grande Bretagne, Chili, Argentine…) et par les parenaires du projet REGAIN pour évaluer leurs projets de bâtiments.

Lors de la réunion plénière des partenaires du projet REGAIN qui s'est tenue à Glasgow, un certain nombre de ces critères d'appréciation ont été considérés comme ne s'appliquant pas aux projets de bâtiments mixtes et d'autres encore ne s'appliquent pas au contexte du site de Créalys sur lequel s'implantera le projet du BEP. Le poids relatif affecté à chaque critère et à chacune de leurs familles a été également décidé collégialement.

| | |
|---|---|
| **A** | **Site Selection, Project Planning and Development** |
| A1 | Site Selection |
| A2 | Project Planning |
| A3 | Urban Design and Site Development |
| **B** | **Energy and Resource Consumption** |
| B1 | Total Life Cycle Non-Renewable Energy |
| B2 | Electrical peak demand for facility operations |
| B3 | Renewable Energy |
| B4 | Materials |
| B5 | Potable Water |
| **C** | **Environmental Loadings** |
| C1 | Greenhouse Gas Emissions |
| C2 | Other Atmospheric Emissions |
| C3 | Solid Wastes |
| C4 | Rainwater, Stormwater and Wastewater |
| C5 | Impacts on Site |
| C6 | Other Local and Regional Impacts |
| **D** | **Indoor Environmental Quality** |
| D1 | Indoor Air Quality |
| D2 | Ventilation |
| D3 | Air Temperature and Relative Humidity |
| D4 | Daylighting and Illumination |
| D5 | Noise and Acoustics |
| **E** | **Service Quality** |
| E1 | Safety and Security During Operations |
| E2 | Functionality and efficiency |
| E3 | Controllability |
| E4 | Flexibility and Adaptability |
| E5 | Commissioning of facility systems |
| E6 | Maintenance of Operating Performance |
| **F** | **Social and Economic aspects** |
| F1 | Social Aspects |
| F2 | Cost and Economics |
| **G** | **Cultural and Perceptual Aspects** |
| G1 | Culture & Heritage |
| G2 | Perceptual |

Figure 4 : Familles des critères d'évaluation par SB-Tool

L'adaptation au contexte belge, wallon et sur le site de Créalys est en cours de réalisation : l'Annexe comporte les critères retenus et les valeurs pivots de la cotation des critères particuliers, dont certaines restent encore à compléter.

L'équipe italienne a proposé récemment un étalonnement de l'énergie grise et des émissions de $CO_2$ consécutives à la production et à la mise en œuvre des matériaux de construction dans un projet de bâtiment mixte : cet étalonnement sera utilisé afin de déterminer ces deux paramètres du projet de Créalys.

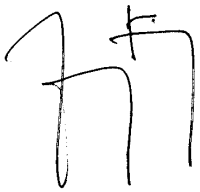
La suite de la méthodologie comportera notamment :

- la continuation de l'adaptation des valeurs pivots des critères SB-Tool ;
- la relecture attentive du cahier des charges rédigé par l'équipe de projet, dans le souci d'obtenir la meilleure qualité environnementale possible pour le budget considéré ;
- l'élaboration de fiches techniques types qui pemettront aux entreprises de proposer

et/ou de suggérer du matériel et/ou des matériaux particulièrement innovants ;

- la préparation d'une liste de personnes et organismes à tenir informés de l'avancement du projet et à inviter à des visites du futur chantier ;
- l'étalissement d'un cahier de suivi retraçant le fil rouge du projet, depuis sa conception jusqu'à la réception définitive ;
- la préparation d'un mode d'évaluation du projet par les usagers eux-mêmes, en phase d'utilisation.

Ainsi fait à Liège, le 19/05/09,



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Annexe : Liste des critères retenus par SB-Tool et adaptation, au contexte belge et au projet BEP Créalys, des valeurs associées à l'échelle de cotation des critères.

| Benchmarks A for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

# A Site Selection, Project Planning and Development

## A1 Site Selection

### A1.1 Pre-development ecological value or sensitivity of land.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To encourage the selection of sites that have low ecological value or that are ecologically stable.* | | | |
| Indicator | Ecological value and / or sensitivity of land used for construction, as determined by a competent authority or by existing documentation. | P-Dsn. | Dsn | Ops. |
| Information sources | Reference x, y and z. | | | |
| Applicable project type | Any occupancy except renovation projects | | | |
| Assessment method | Review of site analysis report by an ecologist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total project | Score |
|---|---|---|
| Negative | The site currently supports a wide range of flora and fauna. | -1 |
| Acceptable practice | The site currently supports a range of flora and fauna consistent with other sites in the area. | 0 |
| Good Practice | The site currently supports a range of flora and fauna that is less diverse than other sites in the area. | 3 |
| Best Practice | The site currently supports a very limited range of flora and fauna. | 5 |

### A1.2 Pre-development agricultural value of land.

rejected in Glasgow

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To discourage the use of land with high agricultural value.* | | | |
| Indicator | Agricultural value of land used for construction, as determined by a competent authority or by existing documentation. | P-Dsn. | Dsn | Ops. |
| Information sources | Reference x, y and z. | | | |
| Applicable project type | Any occupancy except renovation projects. | | | |
| Assessment method | Review of site analysis report by an agronomist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total project | Score |
|---|---|---|
| Negative | Land used for the project is Class A (best grade) agricultural land. | -1 |
| Acceptable practice | Land used for the project is Class B agricultural land. | 0 |
| Good Practice | Land used for the project is Class C (lowest grade) agricultural land. | 3 |
| Best Practice | Land used for the project has no agricultural value. | 5 |

| Benchmarks A for designated occupancies in BigTown, Europe | | Uses included | Small Industrial | |
|---|---|---|---|---|
| | | | Office | |
| | | | 0 | |
| New Construction | Design Phase | Generic | | . |

## A1.3 Vulnerability of land to flooding.

rejected in Glasgow

| | | | | |
|---|---|---|---|---|
| Intent | *To discourage the selection of land for building where there is a substantial risk that the site may be flooded.* | Applicable phases (Active if green) | | |
| Indicator | Height above 100-year flood plain as defined in official documentation or assessment by competent authorities. | P-Dsn. | Dsn | Ops. |
| Information sources | Reference x, y and z. | | | |
| Applicable project type | Any occupancy except renovation projects | | | |
| Assessment method | Review of site analysis report. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |
| Total project | Total project | | m | Score |
| Negative | The height of the minimum elevation of the site above the elevation of the 100-year flood plain is : | | 1.0 | -1 |
| Acceptable practice | | | 1.3 | 0 |
| Good Practice | | | 2.0 | 3 |
| Best Practice | | | 2.5 | 5 |

## A1.4 Potential for development to contaminate nearby bodies of water.

rejected in Glasgow

| | | | | |
|---|---|---|---|---|
| Intent | *To discourage the selection of land for building where the risk of polluting an adjacent water body is high.* | Applicable phases (Active if green) | | |
| Indicator | Distance of the building from water body or wetland as defined in official documentation or assessment by competent authorities. | P-Dsn. | Dsn | Ops. |
| Information sources | Reference x, y and z. | | | |
| Applicable project type | Any occupancy except renovation projects | | | |
| Assessment method | Review of site analysis report. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |
| Total project | Total project | | m | Score |
| Negative | The distance of the nearest body of water, including wetlands from the closest part of the site, is equal to or less than: | | 15 | -1 |
| Acceptable practice | | | 25 | 0 |
| Good Practice | | | 55 | 3 |
| Best Practice | | | 75 | 5 |

| Benchmarks A for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## A1.5 Pre-development contamination status of land.

JMH proposes to reject it for the context of Crealys

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To encourage the use of previously contaminated land for building.* | | | |
| Indicator | Official documentation or assessment by competent authorities. | P-Dsn. | Dsn | Ops. |
| Information sources | Brownfield lands should be preferentially developed, since this will reduce pressures to use more valuable lands for development. | | | |
| Applicable project type | Any occupancy except renovation projects | | | |
| Assessment method | Review of site analysis report by a geophysical specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| | Total project | Score |
|---|---|---|
| Total project | Total project | Score |
| Negative | The site is documented as having no sub-surface contamination. | -1 |
| Acceptable practice | The site is documented as having no sub-surface contamination. | 0 |
| Good Practice | The site is documented as having moderate sub-surface contamination. | 3 |
| Best Practice | The site is documented as having major sub-surface contamination. | 5 |

## A1.6 Proximity of site to public transportation.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To encourage the selection of sites that are within a short distance of a public transport stop.* | | | |
| Indicator | Distance in m. to public transport stop from a main building entry or exit door. | P-Dsn. | Dsn | Ops. |
| Information sources | Reference x, y and z. | | | |
| Applicable project type | Any occupancy, where public transport is available in the area. | | | |
| Assessment method | Review of site plan and existing public transit routes. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| | Total project | m | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The distance of the project from a public transport stop is equal to or less than: | 700 | -1 | 700 | 580 | Survey |
| Acceptable practice | | 300 | 0 | 300 | 500 | Survey |
| Good Practice | | 200 | 3 | 200 | 260 | Survey |
| Best Practice | | 100 | 5 | 100 | 100 | Survey |

| Benchmarks A for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## A1.7 Distance between site and centres of employment or residential occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the selection of sites that are within a reasonable distance of centers of employment.* | Applicable phases (Active if green) | | |
| Indicator | If Residential, distance to the nearest center of employment with at least 3 different firms or organizations hiring a minimum of 10 persons; if non-residential, distance to nearest major area of housing. | P-Dsn. | Dsn | Ops. |
| Information sources | Reference x, y and z. | | | |
| Applicable project type | All occupancies except for Enclosed Parking or Open Space. | | | |
| Assessment method | Review of site plan by an outside planner. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Occupancy 1 | Small Industrial | on | m | Score | Values proposed by JMH | instead of | Source |
| Negative | The distance to nearest major area of affordable housing is equal to or less than: | | 10 000 | -1 | 10 000 | 5 800 | Survey |
| Acceptable practice | | | 6 000 | 0 | 6 000 | 5 000 | Survey |
| Good Practice | | | 2 000 | 3 | 2 000 | 2 600 | Survey |
| Best Practice | | | 1 000 | 5 | 1 000 | 1 000 | Survey |
| Occupancy 2 | Office | on | m | Score | Values proposed by JMH | instead of | Source |
| Negative | The distance to nearest major area of affordable housing is equal to or less than: | | 700 | -1 | 700 | 0 | Survey |
| Acceptable practice | | | 300 | 0 | 300 | | Survey |
| Good Practice | | | 200 | 3 | 200 | 0 | Survey |
| Best Practice | | | 100 | 5 | 100 | | Survey |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B Energy and Resource Consumption

## B1 Total Life Cycle Non-Renewable Energy

### B1.1 Annualized non-renewable primary energy embodied in construction materials.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the embodied primary energy used in the building, annualized over the estimated lifespan of the building.* | Applicable phases (Active if green) | | |
| Indicator | Estimate of embodied primary energy used for structure, envelope (excl. glazing), and major interior components, as determined by a program designed to estimate embodied energy and emissions through Life Cycle Analysis; also, estimate of lifespan. | | Dsn | Ops. |
| Information sources | Note that minimization of embodied energy may not always be optimal. For example, the greater embodied energy associated with high thermal mass will, in most cases, reduce operating energy, and the total net lifecycle energy could then be reduced. | | ● | ● |
| Applicable project type | All occupancies | Assumed lifespan in years | | 50 |
| Assessment method | Use an embodied energy estimating system, based on LCA (Life Cycle Assessment). Alternatively, use the crude estimating method provided in this system. | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| | | | | | |
|---|---|---|---|---|---|
| Occupancy 1 | Small Industrial | GJ/m2 | MJ/m2 per yr. | Score | Data to be received from Italian team |
| Negative | The predicted embodied energy for materials used in the structure and building envelope as determined an acceptable LCA-based estimating method : | 8.6 | 172 | -1 | |
| Acceptable practice | | 8.0 | 160 | 0 | |
| Good Practice | | 6.2 | 124 | 3 | |
| Best Practice | | 5.0 | 100 | 5 | |
| Occupancy 2 | Office | GJ/m2 | MJ/m2 per yr. | Score | Data to be received from Italian team |
| Negative | The predicted embodied energy for materials used in the structure and building envelope as determined an acceptable LCA-based estimating method : | 12.6 | 252 | -1 | |
| Acceptable practice | | 12.0 | 240 | 0 | |
| Good Practice | | 10.2 | 204 | 3 | |
| Best Practice | | 9.0 | 180 | 5 | |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B1.2 Annual non-renewable primary energy used for facility heating

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of non-renewable energy (not including on-site renewable energy) used annually for building operations, commensurate with functional needs.* | | | |
| Indicator | MJ of delivered energy per m2 of net area, including fuel and electrical use, as predicted by means of an acceptable method or tool. | | Dsn | Ops. |
| Information sources | See IEA.org for data and case studies. | ● | ● | ● |
| Applicable project type | Any occupancy except for Open Space | | | M |
| Assessment method | During early design stages a screening tool may be used, but in later stages an hour-by-hour simulation program should be used. Benchmarks for Ops should be derived from operational data for the relevant occupancy types, after a period of occupancy of at least one year. Note that benchmarks should be set using Delivered energy data, since this is what is commonly available. SBTool applies a conversion factor to these values to convert them to primary energy for the Results. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | Elec. MJ/m2 per yr | Total MJ/m2 per yr | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 540 | 1460 | -1 | | 1 460 | |
| Acceptable practice | | 500 | 1300 | 0 | | 1 300 | |
| Good Practice | | 380 | 820 | 3 | | 820 | |
| Best Practice | | 300 | 500 | 5 | 144 MJ/m2 | 500 | IBGE 40 kWh/m2 = 144 MJ/m2 |

| Occupancy 2 | Office | Elec. MJ/m2 per yr | MJ/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 320 | 375 | -1 | | 375 | |
| Acceptable practice | | 300 | 350 | 0 | | 350 | |
| Good Practice | | 240 | 275 | 3 | | 275 | |
| Best Practice | | 200 | 225 | 5 | 54 MJ/m2 | 225 | IBGE 15 kWh/m2 = 54 MJ/m2 |

## B1.3 Annual non-renewable primary energy used for facility cooling

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of non-renewable energy (not including on-site renewable energy) used annually for building operations, commensurate with functional needs.* | | | |
| Indicator | MJ of delivered energy per m2 of net area, including fuel and electrical use, as predicted by means of an acceptable method or tool. | | Dsn | Ops. |
| Information sources | See IEA.org for data and case studies. | ● | ● | ● |
| Applicable project type | Any occupancy except for Open Space | | | |
| Assessment method | During early design stages a screening tool may be used, but in later stages an hour-by-hour simulation program should be used. Benchmarks for Ops should be derived from operational data for the relevant occupancy types, after a period of occupancy of at least one year. Note that benchmarks should be set using Delivered energy data, since this is what is commonly available. SBTool applies a conversion factor to these values to convert them to primary energy for the Results. | | | |
| Applicable Standards | a | | | |
| | b | Revise text | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | Elec. MJ/m2 per yr | Total MJ/m2 per yr | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 540 | 1460 | -1 | | 1 460 | |
| Acceptable practice | | 500 | 1300 | 0 | | 1 300 | |
| Good Practice | | 380 | 820 | 3 | | 820 | |
| Best Practice | | 300 | 500 | 5 | 152 MJ:m2 | 500 | IBGE 45 kWh/m2 = 152 MJ/m2 |

| Occupancy 2 | Office | Elec. MJ/m2 per yr | MJ/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 320 | 375 | -1 | | 375 | |
| Acceptable practice | | 300 | 350 | 0 | | 350 | |
| Good Practice | | 240 | 275 | 3 | | 275 | |
| Best Practice | | 200 | 225 | 5 | 152 MJ:m2 | 225 | IBGE 45 kWh/m2 = 152 MJ/m2 |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B1.4 Annual non-renewable primary energy used for lighting and equipment

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of non-renewable energy (not including on-site renewable energy) used annually for building operations, commensurate with functional needs.* | Applicable phases (Active if green) | | |
| Indicator | MJ of delivered energy per m2 of net area, including fuel and electrical use, as predicted by means of an acceptable method or tool. | | Dsn | Ops. |
| Information sources | See IEA.org for data and case studies. | ● | ● | ● |
| Applicable project type | Any occupancy except for Open Space | | | M |
| Assessment method | During early design stages a screening tool may be used, but in later stages an hour-by-hour simulation program should be used. Benchmarks for Ops should be derived from operational data for the relevant occupancy types, after a period of occupancy of at least one year. Note that benchmarks should be set using Delivered energy data, since this is what is commonly available. SBTool applies a conversion factor to these values to convert them to primary energy for the Results. | | | |
| Applicable Standards | a | | | |
| | b | Revise text | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | Elec. MJ/m2 per yr | Total MJ/m2 per yr | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 540 | 1460 | -1 | | 1 460 | |
| Acceptable practice | | 500 | 1300 | 0 | | 1 300 | |
| Good Practice | | 380 | 820 | 3 | | 820 | |
| Best Practice | | 300 | 500 | 5 | | 500 | IBGE 2 W/m2*1600h/an*3.6/1000=11.5 MJ/m2 |

| Occupancy 2 | Office | Elec. MJ/m2 per yr | MJ/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 320 | 375 | -1 | | 375 | |
| Acceptable practice | | 300 | 350 | 0 | | 350 | |
| Good Practice | | 240 | 275 | 3 | | 275 | |
| Best Practice | | 200 | 225 | 5 | | 225 | IBGE 2 W/m2*1600h/an*3.6/1000=11.5 MJ/m2 |

## B2 Electrical peak demand for facility operations

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the peak monthly electrical demand for building operations, especially where the grid is near peak capacity.* | Applicable phases (Active if green) | | |
| Indicator | Average of peak monthly electrical demand for one year, W/m2, as predicted by means of an acceptable method or tool. | | Dsn | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | Any occupancy except open space | | | |
| Assessment method | Review of contract documentation and sample equipment specifications by an ouside electrical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | on | W/m2 | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The peak monthly electrical demand for the occupancy, as predicted by means of an acceptable method or tool. | | 6 | -1 | 6 | 6 | o.k. with proposal |
| Acceptable practice | | | 5 | 0 | 5 | 5 | o.k. with proposal |
| Good Practice | | | 3 | 3 | 3 | 3 | o.k. with proposal |
| Best Practice | | | 2 | 5 | 2 | 2 | o.k. with proposal |

| Occupancy 2 | Office | on | W/m2 | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The peak monthly electrical demand for the occupancy, as predicted by means of an acceptable method or tool. | | 0 | -1 | | 0 | BEP : ? |
| Acceptable practice | | | | 0 | | | BEP : ? |
| Good Practice | | | 0 | 3 | | 0 | BEP : ? |
| Best Practice | | | | 5 | | | BEP : ? |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B3 Renewable Energy

### B3.1 Use of off-site energy that is generated from renewable sources.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To encourage the use of sources that generate power by renewable energy means, e.g. 'green power'.* | | | |
| Indicator | Percent of annual purchased electricity consumption for the Total Building that is planned to be obtained from sources that generate power by means of renewable energy. | | Dsn | Ops. |
| Information sources | NABERS (Australian system) defines Acceptable Practice as 20% and Best Practice as 100%, whereas HK-BEAM equivalents are 4% and 20% and BREEAM specifies a threshold of 10%. | Available from grid, per Emission worksheet | | 0.0% |
| Applicable project type | Any occupancy where renewable sources are available. | | | |
| Assessment method | Review of contract documentation and sample equipment specifications by an ouside electrical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Total project | Total project | Percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The percent of annual purchased electricity consumption planned to be obtained from sources that generate power by means of renewable energy : | 0% | -1 | 0% | 0% | o.k. with proposal |
| Acceptable practice | | 0% | 0 | 0% | 0% | o.k. with proposal |
| Good Practice | | 30% | 3 | 30% | 30% | o.k. with proposal |
| Best Practice | | 50% | 5 | 50% | 50% | o.k. with proposal |

### B3.2 Provision of on-site renewable energy systems.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To encourage the use of on-site renewable energy systems.* | | | |
| Indicator | The amount of energy intended to be contributed by renewable energy systems, in MJ/m2 per year, not including daylighting or Ground Source Heat Pumps (GSHP). | | Dsn | Ops. |
| Information sources | We suggest a higher level for Residential and Schools than for Office, because of possibility of using renewable sources for pre-heating Hot Water. E-Benchmark suggests a minimum of 10% and LEED ranges from 5% to 20%. | | ● | ● |
| Applicable project type | Any occupancy except Enclosed Parking and Open Space. | | | |
| Assessment method | Review of contract documentation and sample equipment specifications by an ouside electrical engineer with renewables expertise. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Occupancy 1 | Total project | M | MJ/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The predicted annual contribution of on-site renewable energy planned for operations, as per drawings and specifications : | | 40 | -1 | 40 | 40 | o.k. with proposal |
| Acceptable practice | | | 50 | 0 | 50 | 50 | o.k. with proposal |
| Good Practice | | | 80 | 3 | 80 | 80 | o.k. with proposal |
| Best Practice | | | 100 | 5 | 100 | 100 | o.k. with proposal |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B4 Materials

### B4.1 Re-use of suitable existing structure(s).

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the re-use of any sound structures that exist on the site, as part of the new project.* | Applicable phases (Active if green) | | |
| Indicator | The development of an inventory and the percent, by area, of an existing structure that is re-used or recycled, where the structures are in usable condition. | Dsn | C&C. | Ops. |
| Information sources | 0 | | | |
| Applicable project type | Any occupancy, where an existing structure in usable condition is located on the site. | | | |
| #REF! | If there is an existing structure on the site, the basis of assessment should be a report that provides a structural, functiona and economic assessment of the existing structure, carried out by a team of qualified professionals. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| | | | | |
|---|---|---|---|---|
| Total project | Total project | Percent by area | Score | Not applicable in the context of Cralys |
| Negative | The percentage (by area) of existing sound structures that is planned to be re-used as part of the project : | 13% | -1 | |
| Acceptable practice | | 25% | 0 | |
| Good Practice | | 61% | 3 | |
| Best Practice | | 85% | 5 | |

### B4.2 Use of recycled materials from off-site sources.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the use of recycled materials from off-site sources as part of the new facility, where they are suitable.* | Applicable phases (Active if green) | | |
| Indicator | The percentage, by cost, of the materials, products, and furnishings in the project are recycled from off-site sources. | Dsn | C&C. | Ops. |
| Information sources | LEED ranges from 25% to 50%. | | | |
| Applicable project type | Total building. | | | |
| #REF! | Review of contract documentation by an outside materials specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| | | | | |
|---|---|---|---|---|
| Total project | Total Project | % by cost | Score | Data to be received from Italian team |
| Negative | The percentage (by cost) of the materials, products, and furnishings in the project that are made from materials that recycled from off-site post-consumer sources : | 7% | -1 | |
| Acceptable practice | | 10% | 0 | |
| Good Practice | | 19% | 3 | |
| Best Practice | | 25% | 5 | |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B4.3 Use of bio-based products obtained from sustainable sources.

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To encourage the use of bio-based products that are certified by a recognized certification agency as coming from renewable sources, or the equivalent.* | Applicable phases (Active if green) | | | |
| Indicator | The percentage, by cost, of bio-based products used in the building, including wood and agricultural products, that are certified by a recognized certification agency. | Dsn | C&C. | Ops. | |
| Information sources | 0 | | | | |
| Applicable project type | Total building, all sizes. | | | | |
| Assessment method | Review of contract documentation by an outside materials specialist. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| Information Submittals | d | | | | |
| | e | | | | |
| | f | | | | |
| Total project | Total Project | Percent by cost | Score | Data to be received from Italian team | |
| Negative | The percentage (by cost) of the wood-based products in the building certified by a recognized certification agency as coming from renewable sources : | 9% | -1 | | |
| Acceptable practice | | 10% | 0 | | |
| Good Practice | | 13% | 3 | | |
| Best Practice | | 15% | 5 | | |

## B4.4 Use of cement supplementing materials in concrete.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Intent | *To encourage the use of cement supplementing materials in concrete, such as flyash, steel slag or rice ash, in order to reduce GHG emissions from the use of cement.* | Applicable phases (Active if green) | | | | | |
| Indicator | The percentage, by volume, of cement substitute used in concrete. | Dsn | C&C. | Ops. | | | |
| Information sources | Note that up to 50% of CSM has been used, but curing time increases with volume used. Typical industry utilisation ranges from 15% to 25%. | | | | | | |
| Applicable project type | 0 | | | | | | |
| Assessment method | Review of contract documentation by an outside concrete specialist. | | | | | | |
| Applicable Standards | a | | | | | | |
| | b | | | | | | |
| | c | | | | | | |
| Information Submittals | d | | | | | | |
| | e | | | | | | |
| | f | | | | | | |
| Total project | Total Project | % by vol. | Score | Values proposed by JMH | instead of | Source | |
| Negative | The percentage, by volume, of an acceptable cement supplementing material used in concrete : | 2% | -1 | 0% | 2% | | |
| Acceptable practice | | 10% | 0 | 0% | 10% | No law constraint | |
| Good Practice | | 34% | 3 | 10% | 34% | | |
| Best Practice | | 50% | 5 | 25% | 50% | | |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B4.5 Use of materials that are locally produced.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the procurement of high-weight materials such as aggregate, sand, concrete, masonry, steel and glass,from sources within the greater urban region.* | Applicable phases (Active if green) | | |
| Indicator | The percentage, by weight, of the aggregate, sand, concrete, masonry, steel and glass used in the project produced within the greater urban region, if local sources of acceptable quality are available. | Dsn | C&C. | Ops. |
| Information sources | LEED specifies specific distances, but we consider that this is not applicable to all areas. | | | |
| Applicable project type | Total building, all sizes. | | | |
| Assessment method | Review of contract documentation by an outside materials specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| | Total project | % by weight | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The percentage, by weight, of the aggregate, sand, concrete, masonry, steel and glass used in the project produced within the greater urban region : | 42% | -1 | | 42% | |
| Acceptable practice | | 50% | 0 | | 50% | No law constraint |
| Good Practice | | 74% | 3 | | 74% | |
| Best Practice | | 90% | 5 | | 90% | |

## B4.6 Design for disassembly, re-use or recycling.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage a building design that will facilitate the easy dis-assembly of components so that they can be re-used or recycled at the end of the service life of the components.* | Applicable phases (Active if green) | | |
| Indicator | Measures taken to facilitate future disassembly and re-use or recycling. | Dsn | C&C. | Ops. |
| Information sources | 0 | | | |
| Applicable project type | Total building | | | |
| Assessment method | Review of contract documentation by an outside deconstruction specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| | Total project | Score |
|---|---|---|
| Negative | No measures have been taken to facilitate future disassembly, re-use or recycling. | -1 |
| Acceptable practice | Limited measures have been taken to facilitate future disassembly, re-use or recycling, such as the use of modular interior partitions and other interior components. | 0 |
| Good Practice | Measures have been taken to facilitate future disassembly, re-use or recycling, such as the use of modular interior components and the use of bolted structural or building envelope components. | 3 |
| Best Practice | Extensive measures have been taken to facilitate future disassembly, re-use or recycling, such as the use of modular interior components, the use of bolted structural or building envelope components, and the non-use of composite or bonded materials. | 5 |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B5 Potable Water

### B5.1 Use of potable water for site irrigation.

| | | | | |
|---|---|---|---|---|
| Intent | *To discourage the use of potable water for irrigation; and to ensure that any potable water used for irrigation purposes during dry seasons is minimal.* | Applicable phases (Active if green) | | |
| Indicator | The development of a credible irrigation management plan for areas landscaped with non native species (excluding stored rainwater or greywater used for this purpose). | Dsn | C&C. | Ops. |
| Information sources | 0 | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review pf landscaping plans by an outside landscape architect. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Total project | Total Project | $M^3 / m^2$ | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The predicted net annual potable water volume used for irrigation of areas landscaped with non-native species (excluding stored rainwater or greywater used for this purpose) : | 4.8 | -1 | 5% | 4.8 | o.k. with proposal |
| Acceptable practice | | 4.0 | 0 | 4% | 4.0 | o.k. with proposal |
| Good Practice | | 1.6 | 3 | 2% | 1.6 | o.k. with proposal |
| Best Practice | | 0.0 | 5 | 0% | 0.0 | o.k. with proposal |

### B5.2 Use of potable water for building and occupancy needs.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of potable water imported to the site and used for occupancy needs, excluding building system uses or irrigation of exterior areas.* | Applicable phases (Active if green) | | |
| Indicator | Prediction of total potable water use, in L per person per day, based on a credible water management plan for occupancy fixtures and use. Note that the benchmarks are expressed as L / m2 per year in order to allow uses such as indoor parking to be compared to other uses such as office or residential. | Dsn | C&C. | Ops. |
| Information sources | See File C for fixtures and water consumption data for the specific project. | ● | | |
| Applicable project type | By separate occupancies, excluding irrigation water for outdoor areas. | | | |
| Assessment method | Review of contract documentation by a specialist in water use. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | on | L / m2 per year | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | Based on a credible water management plan, the volume of potable water predicted to be used for occupancy needs : | | 1600 | -1 | | 1 600 | BEP : ? |
| Acceptable practice | | | 1500 | 0 | | 1 500 | BEP : ? |
| Good Practice | | | 1200 | 3 | | 1 200 | BEP : ? |
| Best Practice | | | 1000 | 5 | | 1 000 | BEP : ? |

| Occupancy 2 | Office | on | L / m2 per year | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | Based on a credible water management plan, the volume of potable water predicted to be used for occupancy needs : | | 215 | -1 | | 215 | BEP : ? |
| Acceptable practice | | | 200 | 0 | | 200 | BEP : ? |
| Good Practice | | | 155 | 3 | | 155 | BEP : ? |
| Best Practice | | | 125 | 5 | | 125 | BEP : ? |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C Environmental Loadings

### C1 Greenhouse Gas Emissions

#### C1.1 Annualized GHG emissions embodied in construction materials.

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To minimize the amount of CO2-equivalent emissions from primary non-renewable energy used in the extraction, fabrication and transportation of materials and components in the building.* | Applicable phases (Active if green) | | | |
| Indicator | CO2-equivalent emissions per Kg. per m2 of gross area, as determined by calculations based on design documents and fuel emission values plus process-related emissions related to the region of production, and annualized according to the predicted lifespan of the building. | Dsn | | Ops. | Lifespan = 35 years (Glasgow meeting) |
| Information sources | Benchmarks for GJ/m2 are the same as those selected for Benchmark B1.1. Values in BREEAM range from about 1000 to 300 kgCO2/m2 for Residential, and 100 to 500 kgCO2/m2f or offices (not annualized). | Assumed lifespan in years, from Basic worksheet | | 50 | |
| Applicable project type | All occupancies | kg eCO2 per embodied GJ | | 55 | |
| Assessment method | We recommend that this analysis be carried out only with new projects, since there are likely to be insurmountable difficulties in obtaining emsission data for materials that are located in an existing building. | | | | |
| | a | | | | |
| Applicable Standards | b | | | | |
| | c | | | | |
| | d | | | | |
| Information Submittals | e | | | | |
| | f | | | | |
| Occupancy 1 | Small Industrial | GJ/m2 | kg/m2 * year | Score | Data to be received from Italian team |
| Negative | The annualized amount of CO2-equivalent emissions from primary non-renewable energy used in materials and components for structure and building envelope, based on design documents : | 8.6 | 9.5 | -1 | |
| Acceptable practice | | 8.0 | 8.8 | 0 | |
| Good Practice | | 6.2 | 6.8 | 3 | |
| Best Practice | | 5.0 | 5.5 | 5 | |
| Occupancy 2 | Office | GJ/m2 | kg/m2 * year | Score | Data to be received from Italian team |
| Negative | The annualized amount of CO2-equivalent emissions from primary non-renewable energy used in materials and components for structure and building envelope, based on design documents : | 12.6 | 13.9 | -1 | |
| Acceptable practice | | 12.0 | 13.2 | 0 | |
| Good Practice | | 10.2 | 11.2 | 3 | |
| Best Practice | | 9.0 | 9.9 | 5 | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C1.2 Annual GHG emissions from all energy used for facility heating.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *To minimize the amount of CO2-equivalent emissions from all energy used for annual building operations.* | | Applicable phases (Active if green) | | | | | |
| Indicator | Annual CO2-equivalent emissions per Kg. per m2 of net area, as determined by an hour-by-hour simulation program and calculations based on regional fuel emission values. | | Dsn | | Ops. | | | |
| | Values in the UK BREEAM system range from 167 to 30 kgCO2/m2 for Residential, 250 to 20 kgCO2/m2 for Office and about 48 to 17 kgCO2/m2 for Schools. | | | | | | | |
| Information sources | Emissions for Residential taken from average Canadian building stock values for 1999 (NRCan data). | | Est. kg CO2 per GJ, Small Industrial | | 55.0 | | | |
| | Emissions for Commercial taken from average Canadian building stock values for 1999 (NRCan data). | | Est. kg CO2 per GJ, Office | | 55.0 | | | |
| | 0 | | Est. kg CO2 per GJ, 0 | | 55.0 | | | |
| Applicable project type | All occupancies except open space | | Values below are based on B1.2 in BmkB | | | | | |
| Assessment method | The use of an hour-by-hour simulation tool, as required for B1.2, will produce annual energy consumption results. These data are combined by SBTool with emission data (see Emissions worksheet) to produce estimates of operating emissions. | | | | | | | |
| | a | | | | | | | |
| Applicable Standards | b | | | | | | | |
| | c | | | | | | | |
| | d | | | | | | | |
| Information Submittals | e | | | | | | | |
| | f | | | | | | | |
| Occupancy 1 | Small Industrial | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source | |
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 80 | -1 | | 80 | | |
| Acceptable practice | | | 72 | 0 | | 72 | | |
| Good Practice | | | 45 | 3 | | 45 | | |
| Best Practice | | | 28 | 5 | | 28 | | |
| Occupancy 2 | Office | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source | |
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 21 | -1 | | 21 | | |
| Acceptable practice | | | 19 | 0 | | 19 | | |
| Good Practice | | | 15 | 3 | | 15 | | |
| Best Practice | | | 12 | 5 | | 12 | | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C1.3 Annual GHG emissions from all energy used for facility cooling.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of CO2-equivalent emissions from all energy used for annual building operations.* | Applicable phases (Active if green) | | |
| Indicator | Annual CO2-equivalent emissions per Kg. per m2 of net area, as determined by an hour-by-hour simulation program and calculations based on regional fuel emission values. | Dsn | | Ops. |
| | Values in the UK BREEAM system range from 167 to 30 kgCO2/m2 for Residential, 250 to 20 kgCO2/m2 for Office and about 48 to 17 kgCO2/m2 for Schools. | | | |
| Information sources | Emissions for Residential taken from average Canadian building stock values for 1999 (NRCan data). | Est. kg CO2 per GJ, Small Industrial | | 55.0 |
| | Emissions for Commercial taken from average Canadian building stock values for 1999 (NRCan data). | Est. kg CO2 per GJ, kg/m2 per yr. | | 55.0 |
| | 0 | Est. kg CO2 per GJ, 0 | | 55.0 |
| Applicable project type | All occupancies except open space | Values below are based on B1.2 in BmkB | | |
| Assessment method | The use of an hour-by-hour simulation tool, as required for B1.2, will produce annual energy consumption results. These data are combined by SBTool with emission data (see Emissions worksheet) to produce estimates of operating emissions. | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

Text to be revised

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Occupancy 1 | Small Industrial | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 80 | -1 | | 80 | |
| Acceptable practice | | | 72 | 0 | | 72 | |
| Good Practice | | | 45 | 3 | | 45 | |
| Best Practice | | | 28 | 5 | | 28 | |
| Occupancy 2 | Office | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 21 | -1 | | 21 | |
| Acceptable practice | | | 19 | 0 | | 19 | |
| Good Practice | | | 15 | 3 | | 15 | |
| Best Practice | | | 12 | 5 | | 12 | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C1.4 Annual GHG emissions from all energy used for lighting and equipment.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of CO2-equivalent emissions from all energy used for annual building operations.* | Applicable phases (Active if green) | | |
| Indicator | Annual CO2-equivalent emissions per Kg. per m2 of net area, as determined by an hour-by-hour simulation program and calculations based on regional fuel emission values. | Dsn | | Ops. |
| | Values in the UK BREEAM system range from 167 to 30 kgCO2/m2 for Residential, 250 to 20 kgCO2/m2 for Office and about 48 to 17 kgCO2/m2 for Schools. | | | |
| Information sources | Emissions for Residential taken from average Canadian building stock values for 1999 (NRCan data). | Est. kg CO2 per GJ, Small Industrial | | 55.0 |
| | Emissions for Commercial taken from average Canadian building stock values for 1999 (NRCan data). | Est. kg CO2 per GJ, kg/m2 per yr. | | 55.0 |
| | 0 | Est. kg CO2 per GJ, 20.625 | | 55.0 |
| Applicable project type | All occupancies except open space | Values below are based on B1.2 in BmkB | | |
| Assessment method | The use of an hour-by-hour simulation tool, as required for B1.2, will produce annual energy consumption results. These data are combined by SBTool with emission data (see Emissions worksheet) to produce estimates of operating emissions. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

Text to be revised

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Occupancy 1 | Small Industrial | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 80 | -1 | | 80 | |
| Acceptable practice | | | 72 | 0 | | 72 | |
| Good Practice | | | 45 | 3 | | 45 | |
| Best Practice | | | 28 | 5 | | 28 | |
| Occupancy 2 | Office | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 21 | -1 | | 21 | |
| Acceptable practice | | | 19 | 0 | | 19 | |
| Good Practice | | | 15 | 3 | | 15 | |
| Best Practice | | | 12 | 5 | | 12 | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C2 Other Atmospheric Emissions

### C2.1 Emissions of acidifying emissions during facility operations.

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To minimize the production of atmospheric emissions from building operations that may result in acidification.* | Applicable phases (Active if green) | | | SO2 (not emitted anymore) replaced by NOx |
| Indicator | SO2 Equiv. per year in kg. per unit net area | Dsn | | Ops. | |
| Information sources | References x, y and z | | | M | |
| Applicable project type | Total project | | | | |
| #REF! | Review of contract documents and equipment specifications. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| Information Submittals | d | | | | |
| | e | | | | |
| | f | | | | |

| Total project | Total Project | Kg. / m2 per yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The predicted emission of SO2 equivalent per year in kg. per unit area net, based on the results of an acceptable hour-by-hour simulation program and taking into account the characteristics of available fuels : | 0.45 | -1 | | 0.45 | |
| Acceptable practice | | 0.40 | 0 | | 0.40 | |
| Good Practice | | 0.25 | 3 | | 0.25 | |
| Best Practice | | 0.15 | 5 | | 0.15 | |

### C2.2 Emissions leading to photo-oxidants during facility operations.

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To minimize the production of atmospheric emissions from building operations that may result in photo-oxidants.* | Applicable phases (Active if green) | | | |
| Indicator | Ethene equiv. per year in gm per net unit area | Dsn | | Ops. | |
| Information sources | References x, y and z | | | | |
| Applicable project type | Total project | | | | |
| Assessment method | Review of contract documents and equipment specifications. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| Information Submittals | d | | | | |
| | e | | | | |
| | f | | | | |

| Total project | Total Project | gm./m2 per yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The predicted emission of Ethene equivalent per year in gm. per net unit area, based on the results of an acceptable hour-by-hour simulation program, and taking into account the characteristics of available fuels : | 0.278 | -1 | | 0.278 | |
| Acceptable practice | | 0.250 | 0 | | 0.250 | |
| Good Practice | | 0.166 | 3 | | 0.166 | |
| Best Practice | | 0.110 | 5 | | 0.110 | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C3 Solid Wastes

### C3.1 Solid waste resulting from the construction and demolition process.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of waste off the site by encouraging the development and implementation of a construction waste management program, with sorting, re-use and recycling measures.* | Applicable phases (Active if green) | | |
| Indicator | The development of a credible construction waste management plan and the percentage, by weight, of construction waste to be re-used (on or off the site) or re-cycled, as predicted in the plan. | Dsn | C&C. | Ops. |
| Information sources | It is assumed that a construction waste management plan is developed, and construction waste is sorted, with specific amounts recorded. | | | |
| Applicable project type | Total Project | | | |
| Assessment method | Review of construction management plan by an outside party with construction and solid waste management expertise. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | Percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The percentage, by weight, of construction waste to be re-used (on or off the site) or re-cycled, as predicted in the construction waste management plan : | -7% | -1 | | -7% | |
| Acceptable practice | | 10% | 0 | | 10% | |
| Good Practice | | 61% | 3 | | 61% | |
| Best Practice | | 95% | 5 | | 95% | |

### C3.2 Solid waste resulting from facility operations.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the provision of facilities for storage of waste on each floor or each major work area, and space for the central sorting and storage of waste, with access to a truck loading area.* | Applicable phases (Active if green) | | |
| Indicator | Facilities provided in the design for the storage and sorting of solid wastes in both dispersed and central locations. | Dsn | | Ops. |
| Information sources | We specify storage areas per dwelling and per work group, and assume that the central storage area will be sized to suit. | | | |
| Applicable project type | Separate criteria for residential and non-residential; NA for parking or open space | | | |
| Assessment method | Review of construction documents by an outside party with solid waste management expertise. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | on | percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | A central sorting and storage area is located close to a truck loading area, and storage has been provided sufficient for all wastes that may accumulate over a period of one week. It is estimated that the percentage of total waste that can be sorted and | | 70% | -1 | | 70% | |
| Acceptable practice | | | 75% | 0 | | 75% | |
| Good Practice | | | 89% | 3 | | 89% | |
| Best Practice | | | 98% | 5 | | 98% | |

| Occupancy 2 | Office | on | percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | A central sorting and storage area is located close to a truck loading area, and storage has been provided sufficient for all wastes that may accumulate over a period of one week. It is estimated that the percentage of total waste that can be sorted and | | 70% | -1 | | 70% | |
| Acceptable practice | | | 75% | 0 | | 75% | |
| Good Practice | | | 90% | 3 | | 90% | |
| Best Practice | | | 100% | 5 | | 100% | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial<br>Office<br>0 |
|---|---|---|---|
| New Construction | Design Phase | Generic | . |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C4 Rainwater, Stormwater and Wastewater

### C4.1 Liquid effluents from facility operations sent off the site.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the volume of waste water, including effluent, sent off the site to be treated.* | Applicable phases (Active if green) | | |
| Indicator | The volume of liquid waste per person per day that is sent off the site for treatment. | Dsn | | Ops. |
| Information sources | The default (0) volume is assumed to be 95% of the potable water consumption with no on-site treatment, as per BmkA 5.2 (see cells at right) | 1425 | 190 | 0 |
| Applicable project type | By separate occupancies. | | | |
| Assessment method | Review of contract documents. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | on | L / m2 * yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The predicted volume of liquid waste per m2 per year to be sent off the site for treatment | | 1520 | -1 | | 1 520 | |
| Acceptable practice | | | 1425 | 0 | | 1 425 | |
| Good Practice | | | 1140 | 3 | | 1 140 | |
| Best Practice | | | 950 | 5 | | 950 | |

| Occupancy 2 | Office | on | L / m2 * yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The predicted volume of liquid waste per m2 per year to be sent off the site for treatment | | 204 | -1 | | 204 | |
| Acceptable practice | | | 190 | 0 | | 190 | |
| Good Practice | | | 147 | 3 | | 147 | |
| Best Practice | | | 119 | 5 | | 119 | |

### C4.2 Retention of rainwater for later re-use.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the retention of rainwater on the site for later re-use.* | Applicable phases (Active if green) | | |
| Indicator | The percent of annual rainwater falling on the site that is planned to be retained on the site for future use on the site or in the building in holding ponds or tanks. | Dsn | | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of contract documents and landscaping plans by a person with experience in this field. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | Percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The percent of annual rainwater falling on the site that is predicted to be retained on the site for future use on the site or in the building in holding ponds or tanks. | 0% | -1 | | 0% | |
| Acceptable practice | | 0% | 0 | | 0% | |
| Good Practice | | 45% | 3 | | 45% | |
| Best Practice | | 75% | 5 | | 75% | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C4.3 Untreated stormwater retained on the site.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the volume of stormwater sent off the site.* | Applicable phases (Active if green) | | |
| Indicator | Percent of stormwater that is retained on the site. | Dsn | | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | By separate occupancies. | | | |
| Assessment method | Review of contract documents and landscaping plans by a person with experience in this field. | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Total project | Total Project | Percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The percent of stormwater retained on the site, on an annualized basis: | 10% | -1 | | 10% | |
| Acceptable practice | | 25% | 0 | | 25% | |
| Good Practice | | 70% | 3 | | 70% | |
| Best Practice | | 100% | 5 | | 100% | |

**N.A.** N.A. ● ●

### N.A. N.A.

| | | | | |
|---|---|---|---|---|
| N.A. | N.A. | Applicable phases (Active if green) | | |
| N.A. | N.A. | Dsn | C&C. | Ops. |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | Score |
| N.A. | N.A. | | | -1 |
| N.A. | N.A. | | | 0 |
| N.A. | N.A. | | | 3 |
| N.A. | N.A. | | | 5 |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial | |
|---|---|---|---|---|
| | | | Office | |
| | | | 0 | |
| New Construction | Design Phase | Generic | . | |

| N.A. N.A. | | | | |
|---|---|---|---|---|
| N.A. | N.A. | Applicable phases (Active if green) | | |
| N.A. | N.A. | Dsn | C&C. | Ops. |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | Score |
| N.A. | N.A. | | | -1 |
| N.A. | N.A. | | | 0 |
| N.A. | N.A. | | | 3 |
| N.A. | N.A. | | | 5 |

| N.A. N.A. | | | | |
|---|---|---|---|---|
| N.A. | N.A. | Applicable phases (Active if green) | | |
| N.A. | N.A. | Dsn | C&C. | Ops. |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | Score |
| N.A. | N.A. | | | -1 |
| N.A. | N.A. | | | 0 |
| N.A. | N.A. | | | 3 |
| N.A. | N.A. | | | 5 |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

N.A. N.A.

| | | | | |
|---|---|---|---|---|
| N.A. | N.A. | Applicable phases (Active if green) | | |
| N.A. | N.A. | Dsn | | Ops. |
| N.A. | N.A. | ● | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | Score |
| N.A. | N.A. | | | -1 |
| N.A. | N.A. | | | 0 |
| N.A. | N.A. | | | 3 |
| N.A. | N.A. | | | 5 |

| **C6 Other Local and Regional Impacts** | ● | ● | Not applicable (decided in Glasgow) |
|---|---|---|---|

C6.1 Cumulative thermal changes to lake water or sub-surface aquifers.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that building operations involving ground-source or ground-water heat pumps do not change the average annual temperature of sub-surface aquifers, nor affect the water quality of such aquifers.* | Applicable phases (Active if green) | | |
| Indicator | Predictions of changes in the average annual temperature of sub-surface aquifers, determined by simulation studies. | Dsn | | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | For Total Project if a water-source or ground-source heat pumps (GSHP) is being used. | | | |
| #REF! | Review of mechanical drawings, specifications and equipment by geophysical engineer. | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Total project | Total Project | | Deg. C | Score |
| Negative | Studies predict that operations of ground-source or ground-water heat pumps may change the average annual temperature of sub-surface aquifers by : | | 1.8 | -1 |
| Acceptable practice | | | 1.5 | 0 |
| Good Practice | | | 0.6 | 3 |
| Best Practice | | | 0.0 | 5 |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C6.2 Heat Island Effect - landscaping and paved areas.

Not applicable to Crealys context

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that open areas of the site are either landscaped, or are paved with reflective materials, to minimize infrared re-radiation to the atmosphere that would increase the urban heat island effect.* | Applicable phases (Active if green) | | |
| Indicator | Reflectance and area of paved and landscaped areas, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | Total Project | | | |
| Assessment method | Review of landscaping plans and design team analysis. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Total project | Total Project | | Percent | Score |
| Negative | Drawings and specifications indicate that the area of landscaped open area plus paved areas with a surface reflectance of 60% or greater, as a percentage of total open area (site area minus building footprint) is : | | 40% | -1 |
| Acceptable practice | | | 50% | 0 |
| Good Practice | | | 80% | 3 |
| Best Practice | | | 100% | 5 |

## C6.3 Heat Island Effect - roofing.

Not applicable to Crealys context

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the use of roofing systems with high reflectance or a landscaped or green roof, or a combination of these, so that reflected infrared radiation to the atmosphere is minimized.* | Applicable phases (Active if green) | | |
| Indicator | Reflectance and area of roofing material; or the use of a green roof, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | Total Project | | | |
| Assessment method | Review of roofing specifications. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Total project | Total Project | | Percent | Score |
| Negative | According to drawings and specifications, the percentage of total roof area provided with a Green roof or a roofing system with a surface reflectance of 60%, or a combination of these, is : | | 0% | -1 |
| Acceptable practice | | | 0% | 0 |
| Good Practice | | | 60% | 3 |
| Best Practice | | | 100% | 5 |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C6.4 Atmospheric light pollution.

Not applicable to Crealys context

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the spillage of light into the atmosphere from ground-level sources.* | Applicable phases (Active if green) | | |
| Indicator | Percentage of total exterior light output that lies outside a vertical 120 degree cone, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | 0 | ● | | |
| Applicable project type | Total Project | | | |
| Assessment method | Review of building and site illumination plans and design team analysis. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | Percent | Score |
|---|---|---|---|
| Negative | The percentage of total exterior light output that lies outside a vertical 120 degree cone, as indicated by drawings and specifications is : | 90% | -1 |
| Acceptable practice | | 75% | 0 |
| Good Practice | | 30% | 3 |
| Best Practice | | 0% | 5 |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D Indoor Environmental Quality

### D1 Indoor Air Quality

#### D1.1 Pollutant migration between occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *Ensure that areas that contain equipment or activities generating chemical pollutants, are separately ventilated and isolated from other occupied spaces. Examples include copier rooms, waste storage areas and janitorial rooms.* | Applicable phases (active if green) | | |
| Indicator | Measures taken to isolate areas or rooms where pollutants may be generated, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | 0 | ● | | |
| Applicable project type | Separate by occupancy type. | | | |
| #REF! | Review of contract documents and mechanical system by an oustide mechanical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | on | | Score |
| Negative | Drawings and specifications indicate that some rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants are not separately ventilated. | | | -1 |
| Acceptable practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated. | | | 0 |
| Good Practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated and there is little possibility of migration to or from other occupied spaces. | | | 3 |
| Best Practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated and there is NO possibility of migration to or from other occupied spaces. | | | 5 |
| Occupancy 2 | Office | on | | Score |
| Negative | Drawings and specifications indicate that some rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants are not separately ventilated. | | | -1 |
| Acceptable practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated. | | | 0 |
| Good Practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated and there is little possibility of migration to or from other occupied spaces. | | | 3 |
| Best Practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated and there is NO possibility of migration to or from other occupied spaces. | | | 5 |

#### D1.2 CO2 concentrations in indoor air.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *To ensure that carbon dioxide concentrations stay below acceptable levels in typical primary occupancy areas.* | Applicable phases (active if green) | | | | | | |
| Indicator | Designs for HVAC systems that conform to ASHRAE, CIBSE or other acceptable protocol. | Dsn | | Ops. | | | | |
| Information sources | Reference x, y and z | | | | | | | |
| Applicable project type | Non-residential Occupancies, except for Open Space. | | | | | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | | | | | |
| Applicable Standards | a | | | | | | | |
| | b | | | | | | | |
| | c | | | | | | | |
| | d | | | | | | | |
| Information Submittals | e | | | | | | | |
| | f | | | | | | | |
| Occupancy 1 | Small Industrial | on | ppm | Score | Values proposed by JMH | instead of | Source: EN 13 779 | |
| Negative | Designs for HVAC systems, carried out in accordance with ASHRAE, CIBSE or other acceptable standards, predict concentrations of CO2 during operating conditions equal to or less than : | | 1160 | -1 | 1 000 | 1 000 | 1 200 | |
| Acceptable practice | | | 1050 | 0 | 800 | 800 | 800 | |
| Good Practice | | | 720 | 3 | 700 | 700 | 500 | |
| Best Practice | | | 500 | 5 | 600 | 600 | 350 | |
| Occupancy 2 | Office | on | ppm | Score | Values proposed by JMH | instead of | Source: EN 13 779 | |
| Negative | Designs for HVAC systems, carried out in accordance with ASHRAE, CIBSE or other acceptable standards, predict concentrations of CO2 during operating conditions equal to or less than : | | 640 | -1 | 1 000 | 1 000 | 1 200 | |
| Acceptable practice | | | 600 | 0 | 800 | 800 | 800 | |
| Good Practice | | | 480 | 3 | 500 | 700 | 500 | |
| Best Practice | | | 400 | 5 | 350 | 600 | 350 | |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D1.3 IAQ monitoring during project operations.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure long-term indoor air quality in non-residential occupancies by installing a permanent carbon dioxide monitoring system to provide objective data on indoor air quality, with monitoring points located in typical primary occupancy areas.* | Applicable phases (active if green) | | |
| Indicator | Measures anticipated to ensure adequate monitoring of IAQ quality. | Dsn | | Ops. |
| Information sources | Reference A, B and C. | | | |
| Applicable project type | By separate occupancies except outdoor space. | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | on | | Score |
| Negative | No specific measures are anticipated to ensure adequate and on-going monitoring of IAQ quality in public areas. | | | -1 |
| Acceptable practice | Annual monitoring is anticipated to assess IAQ quality in public areas. | | | 0 |
| Good Practice | Quarterly monitoring is anticipated to assess IAQ quality in public areas. | | | 3 |
| Best Practice | Daily monitoring is anticipated to assess IAQ quality in public areas. | | | 5 |
| Occupancy 2 | Office | on | | Score |
| Negative | No specific measures are anticipated to ensure adequate and on-going monitoring of IAQ quality in public areas. | | | -1 |
| Acceptable practice | Annual monitoring is anticipated to assess IAQ quality in public areas. | | | 0 |
| Good Practice | Quarterly monitoring is anticipated to assess IAQ quality in public areas. | | | 3 |
| Best Practice | Daily monitoring is anticipated to assess IAQ quality in public areas. | | | 5 |

# D2 Ventilation

## D2.1 Effectiveness of ventilation in naturally ventilated occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that the number, placement and type of windows or other openings in a naturally-ventilated building are capable of providing a high level of air quality and ventilation.* | Applicable phases (active if green) | | |
| Indicator | Area and location of windows that provide natural ventilation. | Dsn | | Ops. |
| Information sources | Cross-ventilation is defined as spaces where openable windows are located on at least two separate walls. | ● | | |
| Applicable project type | By separate occupancies for buildings under a defined height limit. | Height limit, floors | | 16 |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer with specific knowledge of natural ventilation issues. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | M | | Score |
| Negative | The aggregate area of openings from primary occupancy areas to the exterior is less than 5% of the aggregate primary floor area, and less than 50% of all primary spaces have cross-ventilation. | | | -1 |
| Acceptable practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 5% of the aggregate primary floor area, and more than 50% of all primary spaces have cross-ventilation. | | | 0 |
| Good Practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 5% of the aggregate primary floor area, and at more than 75% of all primary spaces have cross-ventilation. | | | 3 |
| Best Practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 10% of the aggregate primary floor area, and more than 90% of all primary spaces have cross-ventilation. | | | 5 |
| Occupancy 2 | Office | M | | Score |
| Negative | The aggregate area of openings from primary occupancy areas to the exterior is less than 5% of the aggregate primary floor area, and less than 50% of all primary spaces have cross-ventilation. | | | -1 |
| Acceptable practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 5% of the aggregate primary floor area, and more than 50% of all primary spaces have cross-ventilation. | | | 0 |
| Good Practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 5% of the aggregate primary floor area, and at more than 75% of all primary spaces have cross-ventilation. | | | 3 |
| Best Practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 10% of the aggregate primary floor area, and more than 90% of all primary spaces have cross-ventilation. | | | 5 |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D2.2 Air quality and ventilation in mechanically ventilated occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that mechanical ventilation and cooling systems are designed in a manner that will ensure a satisfactory level of air quality and ventilation.* | Applicable phases (active if green) | | |
| Indicator | Conformance of the design to the requirements of a recognized relevant standard, such as ASHRAE or CIBSE. | Dsn | | Ops. |
| Information sources | Reference x, y and z | | | |
| Applicable project type | Any occupancy except Outdoor Area | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | | M | Score |
| Negative | Mechanical ventilation in some primary occupancy areas does not fully satisfy the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | -1 |
| Acceptable practice | Mechanical ventilation in some primary occupancy areas meets the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 0 |
| Good Practice | Mechanical ventilation in more than 50% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 3 |
| Best Practice | Mechanical ventilation in 100% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 5 |
| Occupancy 2 | Office | | M | Score |
| Negative | Mechanical ventilation in some primary occupancy areas does not fully satisfy the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | -1 |
| Acceptable practice | Mechanical ventilation in some primary occupancy areas meets the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 0 |
| Good Practice | Mechanical ventilation in more than 50% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 3 |
| Best Practice | Mechanical ventilation in 100% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 5 |

## D2.3 Air movement in mechanically ventilated occupancies.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *To ensure that air movement in mechanically ventilated occupancies is sufficient to satisfy requirements for human comfort.* | | #REF! | | | | | |
| Indicator | Predicted air speed in m/s, as indicated by an analysis of proposed HVAC system characteristics or by post-occupancy monitoring. | Dsn | | Ops. | | | | |
| Information sources | Reference x, y and z | | | | | | | |
| Applicable project type | Total project | | | | | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | | | | | |
| Applicable Standards | a | | | | | | | |
| | b | | | | | | | |
| | c | | | | | | | |
| | d | | | | | | | |
| Information Submittals | e | | | | | | | |
| | f | | | | | | | |
| Occupancy 1 | Small Industrial | on | m/s | Score | Values proposed by JMH | instead of | Source | |
| Negative | An analysis of proposed HVAC system characteristics indicates that air speed at working level during typical operating conditions is likely to be : | | 0.0 | -1 | | 0.0 | | |
| Acceptable practice | | | 0.0 | 0 | | 0.0 | | |
| Good Practice | | | 0.0 | 3 | | 0.0 | | |
| Best Practice | | | 0.0 | 5 | | 0.0 | | |
| Occupancy 2 | Office | on | m/s | Score | Values proposed by JMH | instead of | Source | |
| Negative | An analysis of proposed HVAC system characteristics indicates that air speed at working level during typical operating conditions is likely to be : | | 1.2 | -1 | | 1.2 | | |
| Acceptable practice | | | 1.5 | 0 | | 1.5 | | |
| Good Practice | | | 2.4 | 3 | | 2.4 | | |
| Best Practice | | | 3.0 | 5 | | 3.0 | | |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D2.3 Air movement in mechanically ventilated occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that mechanical ventilation and cooling systems are designed in a manner that will ensure a satisfactory level of air quality and ventilation.* | Applicable phases (active if green) | | |
| Indicator | Conformance of the design to the requirements of a recognized relevant standard, such as ASHRAE or CIBSE. | Dsn | | Ops. |
| Information sources | Reference x, y and z | | | |
| Applicable project type | Any occupancy except Outdoor Area | | | |
| #REF! | Review of contract documents and mechanical system by an outside mechanical engineer. | | | |
| Applicable Standards | a | | | |
| | b | text to be revised | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | M | | Score |
| Negative | Mechanical ventilation in some primary occupancy areas does not fully satisfy the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | -1 |
| Acceptable practice | Mechanical ventilation in some primary occupancy areas meets the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 0 |
| Good Practice | Mechanical ventilation in more than 50% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 3 |
| Best Practice | Mechanical ventilation in 100% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 5 |
| Occupancy 2 | Office | M | | Score |
| Negative | Mechanical ventilation in some primary occupancy areas does not fully satisfy the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | -1 |
| Acceptable practice | Mechanical ventilation in some primary occupancy areas meets the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 0 |
| Good Practice | Mechanical ventilation in more than 50% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 3 |
| Best Practice | Mechanical ventilation in 100% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 5 |

## D2.4 Effectiveness of ventilation in mechanically ventilated occupancies.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *Ensure, through the use of appropriate simulation programs, that the ventilation system in mechanically-ventilated non-residential occupancies will bring ventilation air to where it is needed, i.e. to seating areas or workers or visitors.* | Applicable phases (active if green) | | | | | | |
| Indicator | Percent of ventilation air reaching work surfaces, as indicated by an analysis of proposed HVAC system and room characteristics. | Dsn | | Ops. | | | | |
| Information sources | Reference x, y and z | | | | | | | |
| Applicable project type | Non-residential Occupancies. | | | | | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | | | | | |
| Applicable Standards | a | | | | | | | |
| | b | | | | | | | |
| | c | | | | | | | |
| | d | | | | | | | |
| Information Submittals | e | | | | | | | |
| | f | | | | | | | |
| Occupancy 1 | Small Industrial | on | Eac | Score | Values proposed by JMH | instead of | Source | |
| Negative | An analysis of proposed HVAC system and room characteristics in mechanically ventilated areas of the occupancy indicates that the air change effectiveness (Eac), as determined by ASHRAE 129 –1997 or equivalent CIBSE or other standard, of : | | 80% | -1 | 80% | 80% | o.k. with proposal | |
| Acceptable practice | | | 80% | 0 | 80% | 80% | o.k. with proposal | |
| Good Practice | | | 89% | 3 | 89% | 89% | o.k. with proposal | |
| Best Practice | | | 95% | 5 | 95% | 95% | o.k. with proposal | |
| Occupancy 2 | Office | on | Eac | Score | Values proposed by JMH | instead of | Source | |
| Negative | An analysis of proposed HVAC system and room characteristics in mechanically ventilated areas of the occupancy indicates that the air change effectiveness (Eac), as determined by ASHRAE 129 –1997 or equivalent CIBSE or other standard, of : | | 80% | -1 | 80% | 80% | o.k. with proposal | |
| Acceptable practice | | | 80% | 0 | 80% | 80% | o.k. with proposal | |
| Good Practice | | | 89% | 3 | 89% | 89% | o.k. with proposal | |
| Best Practice | | | 95% | 5 | 95% | 95% | o.k. with proposal | |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D3 Air Temperature and Relative Humidity

### D3.1 Air temperature and relative humidity in mechanically heated occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure acceptable temperature and humidity control within established ranges per climate zone, and to provide on-going monitoring of thermal comfort performance and the effectiveness of humidification and/or dehumidification system.* | Applicable phases (active if green) | | |
| Indicator | Compliance of mechanical ventilation systems with recognized design standards such as ASHRAE or CIBSE. | Dsn | | Ops. |
| Information sources | Reference x, y and z | | | |
| Applicable project type | All mechanically ventilated occupancies. | . | | |
| #REF! | Review of contract documents and mechanical system by an outside mechanical engineer. | | | |
| Applicable Standards | a<br>b<br>c | text to be revised | | |
| Information Submittals | d<br>e<br>f | | | |

| Occupancy 1 | Small Industrial | on | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The mechanical system design does not comply with ASHRAE 55-1992, or other similar standard such as CIBSE, or the variation from setpoints exceeds 5 deg. C: | | -1 | ≥ 19°C | < 5°C | |
| Acceptable practice | The mechanical system design complies with ASHRAE 55-1992, or complies with other similar standard such as CIBSE. Temperature variation from setpoints does not exceed 3 deg. C. | | 0 | ≥ 21°C | < 3°C | RGPT |
| Good Practice | The mechanical system design complies with ASHRAE 55-1992, or complies with other similar standard such as CIBSE. Temperature variation from setpoints does not exceed 2 deg. C. | | 3 | ≥ 23°C | < 2°C | intermediate value between neighboor ones |
| Best Practice | The mechanical system design complies with ASHRAE 55-1992, or complies with other similar standard such as CIBSE. A permanent monitoring system provides feedback on temperature and humidity conditions. Temperature variation from setpoints does not exceed 1 deg. C. | | 5 | ≤ 25°C | < 1°C | smallest PPD as possible |

### D3.2 Air temperature and relative humidity in mechanically cooled occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure acceptable temperature within established ranges per climate zone in naturally ventilated occupancies.* | Applicable phases (active if green) | | |
| Indicator | Predicted ability of natural ventilation systems to maintain temperatures within an acceptable range, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | ASHRAE 55-1992, Addenda 1995 or equivalent CIBSE or other recognized standard. | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer with specific knowledge of natural ventilation issues. | | | |
| Applicable Standards | a<br>b<br>c | text to be revised | | |
| Information Submittals | d<br>e<br>f | | | |

| Total project | Total Project | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|
| Negative | According to recognized predictive techniques, the temperature in primary occupancy areas can NOT be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 6 deg. C. | -1 | ≤ 28°C | 90% in range of 6°C | ASHRAE |
| Acceptable practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 4 deg. C. | 0 | ≤ 24°C | 90% in range of 4°C | RGPT |
| Good Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 3 deg. C. | 3 | ≤ 22°C | 90% in range of 3°C | intermediate value between neighboor ones |
| Best Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 2 deg. C. | 5 | ≤ 20°C | 90% in range of 2°C | smallest PPD as possible |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D3.3 Time lag and decrement factor

| | | Applicable phases (active if green) | | |
|---|---|---|---|---|
| Intent | *To ensure acceptable temperature within established ranges per climate zone in naturally ventilated occupancies.* | | | |
| Indicator | Predicted ability of natural ventilation systems to maintain temperatures within an acceptable range, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | ASHRAE 55-1992, Addenda 1995 or equivalent CIBSE or other recognized standard. | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer with specific knowledge of natural ventilation issues. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

text to be revised

| Total project | Total Project | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|
| Negative | According to recognized predictive techniques, the temperature in primary occupancy areas can NOT be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 6 deg. C. | -1 | 6°C | 90% in range of 6°C | o.k. with proposal and confirmed other values |
| Acceptable practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 4 deg. C. | 0 | 4°C | 90% in range of 4°C | RGPT : 20 to 24°C |
| Good Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 3 deg. C. | 3 | 3°C | 90% in range of 3°C | intermediate value between neighboor ones |
| Best Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 2 deg. C. | 5 | 2°C | 90% in range of 2°C | NEN 13 779 |

## D3.4 Air temperature in naturally ventilated occupancies.

| | | Applicable phases (active if green) | | |
|---|---|---|---|---|
| Intent | *To ensure acceptable temperature within established ranges per climate zone in naturally ventilated occupancies.* | | | |
| Indicator | Predicted ability of natural ventilation systems to maintain temperatures within an acceptable range, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | ASHRAE 55-1992, Addenda 1995 or equivalent CIBSE or other recognized standard. | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer with specific knowledge of natural ventilation issues. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Total project | Total Project | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|
| Negative | According to recognized predictive techniques, the temperature in primary occupancy areas can NOT be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 6 deg. C. | -1 | 6°C | 90% in range of 6°C | o.k. with proposal and confirmed other values |
| Acceptable practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 4 deg. C. | 0 | 4°C | 90% in range of 4°C | RGPT : 20 to 24°C |
| Good Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 3 deg. C. | 3 | 3°C | 90% in range of 3°C | intermediate value between neighboor ones |
| Best Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 2 deg. C. | 5 | 2°C | 90% in range of 2°C | NEN 13 779 |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D4 Daylighting and Illumination

### D4.1 Daylighting in primary occupancy areas.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Intent | *To ensure an adequate level of daylighting in all primary occupied spaces.* | Applicable phases (active if green) | | | | | |
| Indicator | The predicted Daylight Factor in a typical occupancy area located on the ground floor of the building, as indicated by drawings and specifications. | Dsn | | Ops. | | | |
| Information sources | x | | | | | | |
| Applicable project type | By separate occupancies | | | | | | |
| Assessment method | Review of contract documents by an illumination specialist. | | | | | | |
| Applicable Standards | a | | | | | | |
| | b | | | | | | |
| | c | | | | | | |
| Information Submittals | d | | | | | | |
| | e | | | | | | |
| | f | | | | | | |
| Occupancy 1 | Small Industrial | M | DF | Score | Values proposed by JMH | instead of | Source: littérature |
| Negative | The predicted Daylight Factor in a typical workspace located on the ground floor of the occupancy, as indicated by drawings and specifications. | | 1.8% | -1 | 1.0% | 1.6% | circulation areas |
| Acceptable practice | | | 2.0% | 0 | 2.0% | 2.0% | standard workshop |
| Good Practice | | | 2.6% | 3 | 3.0% | 2.4% | (intermediate value) |
| Best Practice | | | 3.0% | 5 | 5.0% | 3.0% | for precise tasks |
| Occupancy 2 | Office | on | DF | Score | Values proposed by JMH | instead of | |
| Negative | The predicted Daylight Factor in a typical workspace located on the ground floor of the occupancy, as indicated by drawings and specifications. | | 0.0% | -1 | 1.0% | 0.0% | circulation areas |
| Acceptable practice | | | | 0 | 2.0% | | standard office |
| Good Practice | | | 0.0% | 3 | 3.0% | 0.0% | (intermediate value) |
| Best Practice | | | | 5 | 5.0% | | drawing office |

### D4.2 Glare in non-residential occupancies.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Intent | *To ensure that glare conditions are minimized in main occupancy areas during periods of maximum exterior brightness, through the use of exterior or interior shading.* | #REF! | | | | | |
| Indicator | The predicted maximum ratio of contrast in illuminance between windows and adjacent wall areas in a typical occupancy area, as indicated by design characteristics. | Dsn | | Ops. | | | |
| Information sources | Glare shall be measured by the contrast between window areas and adjacent wall areas, as seen from the interior. | | | | | | |
| Applicable project type | Non-residential occupancies | | | | | | |
| Assessment method | Review of contract documents by an illumination specialist. | | | | | | |
| Applicable Standards | a | | | | | | |
| | b | | | | | | |
| | c | | | | | | |
| Information Submittals | d | | | | | | |
| | e | | | | | | |
| | f | | | | | | |
| Occupancy 1 | Small Industrial | on | Ratio | Score | Values proposed by JMH | instead of | Source |
| Negative | The predicted maximum ratio of contrast in illuminance between windows and adjacent wall areas in a typical occupancy area, as indicated by design characteristics is : | | 59 | -1 | 40 | 59 | "Médecine et risque du travail" (Ed. Elsevier, 2003) |
| Acceptable practice | | | 50 | 0 | 20 | 50 | |
| Good Practice | | | 23 | 3 | 10 | 23 | |
| Best Practice | | | 5 | 5 | 3 | 5 | |
| Occupancy 2 | Office | on | Ratio | Score | Values proposed by JMH | instead of | Source |
| Negative | The predicted maximum ratio of contrast in illuminance between windows and adjacent wall areas in a typical occupancy area, as indicated by design characteristics is : | | 59 | -1 | 40 | 59 | "Médecine et risque du travail" (Ed. Elsevier, 2003) |
| Acceptable practice | | | 50 | 0 | 20 | 50 | |
| Good Practice | | | 23 | 3 | 10 | 23 | |
| Best Practice | | | 5 | 5 | 3 | 5 | |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D4.3 Illumination levels and quality of lighting.

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To ensure that lighting systems provide adequate illumination and quality levels in public and work areas; and that there is a capability to support the provision of suitable task lighting in work areas.* | Applicable phases (active if green) | | | |
| Indicator | Appropriateness of illumination levels and lighting quality to planned tasks, in Lux, as indicated by design characteristics. | Dsn | | Ops. | |
| Information sources | Acceptable values range from 30 to 500 Lux for normal tasks, and up to 10,000 Lux for demanding tasks. | ● | ● | ● | 20 to 500, up to 2 000 lux |
| Applicable project type | Non-residential Occupancies, all sizes. | | | | |
| Assessment method | Review of contract documents, especially lighting plans and specs, by an illumination specialist. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| | d | | | | |
| Information Submittals | e | | | | |
| | f | | | | |

| Occupancy 2 | Office | on | Score |
|---|---|---|---|
| Negative | The design indicates that illumination levels and quality of lighting will not be appropriate to planned tasks in the occupancy, and no provision is made for task lighting. | | -1 |
| Acceptable practice | The design indicates that ambient illumination systems will provide illumination levels appropriate to tasks in the occupancy, and provision is made for task lighting. | | 0 |
| Good Practice | The design indicates that ambient illumination systems will provide illumination levels appropriate to tasks in the occupancy, dimmable ballasts are provided, and provision is made for task lighting in each 15 m2 work zone. | | 3 |
| Best Practice | The design indicates that ambient illumination systems will provide illumination levels appropriate to tasks in the occupancy, dimmable ballasts are provided, and provision is made for task lighting in each 10 m2 work zone. | | 5 |

# D5 Noise and Acoustics ● ●

## D5.1 Noise attenuation through the exterior envelope.

| | | | | | |
|---|---|---|---|---|---|
| Intent | *Ensure that noise attenuation through the wall facing the noisiest site boundary is adequate to provide interior noise levels that will not interfere with normal tasks.* | Applicable phases (active if green) | | | |
| Indicator | The predicted noise attenuation performance of the exterior wall most exposed to potential sources of noise, as indicated by design characteristics. | Dsn | | Ops. | |
| Information sources | http://greenbuildings.santa-monica.org/envelope/envventilation.html | | | | |
| Applicable project type | Total Project | | | | |
| Assessment method | Review of design team analysis by a noise specialist. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| | d | | | | |
| Information Submittals | e | | | | |
| | f | | | | |

| Total project | Total Project | STC | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | Design documents indicate that windows in the exterior wall of the Design exposed to the most significant sources of external noise will have a Sound Transmission Class, or equivalent, of : | 29.7 | -1 | 26.0 | 29.7 | |
| Acceptable practice | | 27.5 | 0 | 29.0 | 27.5 | standard value of STC |
| Good Practice | | 34.1 | 3 | 34.0 | 34.1 | acoustic glass |
| Best Practice | | 38.5 | 5 | 41.0 | 38.5 | 2 glasses + 10 cm space between them |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D5.2 Transmission of facility equipment noise to primary occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that HVAC systems and equipment rooms are designed to minimize noise transmission to primary occupancies.* | Applicable phases (Active if green) | | |
| Indicator | Noise Reduction Criteria ratings of mechanical equipment and equipment rooms, as indicated by design characteristics. | Dsn | | Ops. |
| Information sources | Reference x, y and z." | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | NRC | Score | Values proposed by JMH | instead of | Source: Belgian acoustic standard |
|---|---|---|---|---|---|---|
| Negative | Design documents indicate that HVAC systems and equipment rooms are designed for a Noise Reduction Criteria (NRC) of : | 37.0 | -1 | 37.0 | 37.0 | |
| Acceptable practice | | 35.0 | 0 | 29.0 | 35.0 | normal acoustic comfort |
| Good Practice | | 29.0 | 3 | 34.0 | 29.0 | intermediate value |
| Best Practice | | 25.0 | 5 | 41.0 | 25.0 | superior acoustic comfort |

## D5.3 Noise attenuation between primary occupancy areas.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that measures have been taken to reduce noise impacts between all tenancies and occupancy types.* | Applicable phases (active if green) | | |
| Indicator | Minimum Sound Transmission Class of partitions between primary occupancy areas, as indicated by design characteristics. | Dsn | | Ops. |
| Information sources | Reference x, y and z." | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of design team analysis. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | STC | Score | Values proposed by JMH | instead of | Source: Belgian acoustic standard |
|---|---|---|---|---|---|---|
| Negative | Design documents indicate that the Minimum Sound Transmission Class of partitions between primary occupancy areas will be : | 23.0 | -1 | 50.0 | 23.0 | |
| Acceptable practice | | 25.0 | 0 | 54.0 | 25.0 | standard: normal comfort |
| Good Practice | | 31.0 | 3 | 59.0 | 31.0 | |
| Best Practice | | 35.0 | 5 | 62.0 | 35.0 | standard: superior comfort |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D5.4 Acoustic performance within primary occupancy areas.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that primary occupancies are designed to ensure a satisfactory level of acoustic performance.* | Applicable phases (active if green) | | |
| Indicator | Predicted reverberation time in seconds, as indicated by design characteristics. | Dsn | | Ops. |
| Information sources | Although acoustics is a complex science, only reverbation time is dealt with here. | | | |
| Applicable project type | Non-residential occupancies, all sizes | | | |
| Assessment method | Where needed, review of design team analysis by an acoustic specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | on | | Score |
| Negative | Design documents indicate that reverberation time in primary occupancy areas will be more than 3.5 seconds or less than 0.5 second. | | | -1 |
| Acceptable practice | Design documents indicate that reverberation time in primary occupancy areas will be between 3.5 seconds and 0.5 second. | | | 0 |
| Good Practice | Design documents indicate that reverberation time in primary occupancy areas will be between 3 seconds and 1 second. | | | 3 |
| Best Practice | Design documents indicate that reverberation time in primary occupancy areas will be between 2.5 seconds and 1.5 second. | | | 5 |
| Occupancy 2 | Office | on | | Score |
| Negative | Design documents indicate that reverberation time in primary occupancy areas will be more than 3.5 seconds or less than 0.5 second. | | | -1 |
| Acceptable practice | Design documents indicate that reverberation time in primary occupancy areas will be between 3.5 seconds and 0.5 second. | | | 0 |
| Good Practice | Design documents indicate that reverberation time in primary occupancy areas will be between 3 seconds and 1 second. | | | 3 |
| Best Practice | Design documents indicate that reverberation time in primary occupancy areas will be between 2.5 seconds and 1.5 second. | | | 5 |

## D6 Control of electromagnetic emissions

"magnetic" instead of "electromagnetic"

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that electro-magnetic emissions are kept to a level that does not harm human health.* | Applicable phases (Active if green) | | |
| Indicator | | Dsn | | Ops. |
| Information sources | The report shown below states that there is no certain standard for EMF. | | | |
| | Environmental Health Perspectives | | | |
| Applicable project type | Total Building, all sizes. | | | |
| Assessment method | 0 | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Total project | Total Project | | | Score |
| Negative | XXXa. | | | -1 |
| Acceptable practice | XXXs | | | 0 |
| Good Practice | XXXd. | | | 3 |
| Best Practice | XXXg. | | | 5 |

text to be revised

| Benchmarks E for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |
| **E Service Quality** | | | ● |

| Benchmarks E for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## E1 Automation of building systems to maximize operational efficiency

| | | | | | |
|---|---|---|---|---|---|
| #REF! | *To encourage the commissioning of building systems with critical functions.* | Applicable phases (Active if green) | | | |
| #REF! | The development of a commissioning plan and the range of systems to be commissioned. | Dsn | C&C. | Ops. | |
| #REF! | It is strongly recommended that the architects and engineers should be involved in the commissioning process, to ensure that the design intent is respected. Costs are estimated as ranging from 0.5% to 1.5%, with specialized facilities much higher. | ● | ● | | |
| Applicable project type | Total building where total net area is more than threshold area. | Threshold area, m2 | | 10 000 | Not applicable to Crealys context |
| #REF! | Review of commissioning management plan. | | | | |
| Applicable Standards | a | Revise text | | | |
| | b | | | | |
| | c | | | | |
| Information Submittals | d | | | | |
| | e | | | | |
| | f | | | | |
| #REF! | Total project | | | Score | |
| Negative | No commissioning plan has been developed and no commissioning activities are planned. | | | -1 | |
| Acceptable practice | A commissioning plan has been developed and some building systems with critical functions are to be commissioned, including life safety systems, central HVAC systems and electrical systems. | | | 0 | |
| Good Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control and electrical systems. | | | 3 | |
| Best Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control, electrical systems and the building envelope. | | | 5 | |

| Benchmarks E for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## E2 Ability to modify facility technical systems.

| | | | | |
|---|---|---|---|---|
| #REF! | *To encourage the commissioning of building systems with critical functions.* | Applicable phases (Active if green) | | |
| #REF! | The development of a commissioning plan and the range of systems to be commissioned. | Dsn | C&C. | Ops. |
| #REF! | It is strongly recommended that the architects and engineers should be involved in the commissioning process, to ensure that the design intent is respected. Costs are estimated as ranging from 0.5% to 1.5%, with specialized facilities much higher. | ● | ● | |
| Applicable project type | Total building where total net area is more than threshold area. | Threshold area, m2 | | 0 |
| #REF! | Review of commissioning management plan. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

Revise text

| #REF! | Total project | Score |
|---|---|---|
| Negative | No commissioning plan has been developed and no commissioning activities are planned. | -1 |
| Acceptable practice | A commissioning plan has been developed and some building systems with critical functions are to be commissioned, including life safety systems, central HVAC systems and electrical systems. | 0 |
| Good Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control and electrical systems. | 3 |
| Best Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control, electrical systems and the building envelope. | 5 |

| Benchmarks E for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## E3 Commissioning of facility systems

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To encourage the commissioning of building systems with critical functions.* | Applicable phases (Active if green) | | | |
| Indicator | The development of a commissioning plan and the range of systems to be commissioned. | Dsn | C&C. | Ops. | |
| Information sources | It is strongly recommended that the architects and engineers should be involved in the commissioning process, to ensure that the design intent is respected. Costs are estimated as ranging from 0.5% to 1.5%, with specialized facilities much higher. | ● | ● | | |
| Applicable project type | Total building where total net area is more than threshold area. | Threshold area, m2 | | 10 000 | Not applicable to Crealys context |
| #REF! | Review of commissioning management plan. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| | d | | | | |
| Information Submittals | e | | | | |
| | f | | | | |
| #REF! | Total project | | | Score | |
| Negative | No commissioning plan has been developed and no commissioning activities are planned. | | | -1 | |
| Acceptable practice | A commissioning plan has been developed and some building systems with critical functions are to be commissioned, including life safety systems, central HVAC systems and electrical systems. | | | 0 | |
| Good Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control and electrical systems. | | | 3 | |
| Best Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control, electrical systems and the building envelope. | | | 5 | |

| Benchmarks E for designated occupancies in BigTown, Europe | Uses included | Small Industrial |
|---|---|---|
| | | Office |
| | | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## E4 Maintenance of Operating Performance

### E4.1 Maintenance of building envelope performance.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that detailed design minimizes the risk of moisture accumulating in the building envelope, where it is likely to shortn the lifespan of building elements, especially if constructed of wood in areas where temperatures can fall to below 0 deg.C.* | Applicable phases (Active if green) | | |
| Indicator | In areas where applicable, the existence of a report that describes and details the measures taken to ensure long-term integrity of the building envelope. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | Any occupancy type where winter design temperatures fall below 0 deg. C. | | | |
| Assessment method | Review of contract documents and engineering analysis of performance during winter conditions. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| #REF! | Total Project | Score |
|---|---|---|
| Negative | Envelope detailing and construction does not follow industry good practice. | -1 |
| Acceptable practice | Envelope detailing and construction follows industry good practice. | 0 |
| Good Practice | Envelope detailing and construction follows best practices, and at least one air-depressurization test is carried out. | 3 |
| Best Practice | Envelope detailing and construction follows best practices, and air-depressurization tests are carried out before and after interior finishes are applied. | 5 |

| Benchmarks E for designated occupancies in BigTown, Europe | | Uses included | Small Industrial<br>Office<br>0 | |
|---|---|---|---|---|
| New Construction | Design Phase | Generic | . | |

## E4.2 Development and implementation of a maintenance management plan.

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To ensure the availability and implementation of a plan for the long-term maintenance and efficient operation of the facility.* | Applicable phases (Active if green) | | | |
| Indicator | The availability of a comprehensive and long-term plan at the end of Design phase, and evidence of its implementation during Operations phase. | Dsn | | Ops. | |
| Information sources | 0 | | | | |
| Applicable project type | Total project, where gross area exceeds threshold area. | Threshold area, m2 | | 10 000 | Not applicable to Crealys context |
| #REF! | Review of operations and maintenance management plan. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| Information Submittals | d | | | | |
| | e | | | | |
| | f | | | | |

| #REF! | Total Project | Score |
|---|---|---|
| Negative | No explicit plan exists for future maintenance and efficient operation of the facility. | -1 |
| Acceptable practice | An explicit plan exists for future maintenance and efficient operation of the facility, but it is not comprehensive and is not long term. | 0 |
| Good Practice | An explicit plan exists for future maintenance and efficient operation of the facility, covering main technical systems, and providing performance targets, system maintenance and replacement guidance over at least a 10-year period. | 3 |
| Best Practice | An explicit plan exists for future maintenance and efficient operation of the facility, covering all technical systems, and providing performance targets, system maintenance and replacement guidance over a 25-year period. | 5 |

| Benchmarks E for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## E4.3 On-going monitoring and verification of performance.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure the ongoing optimization of building energy and water consumption performance over time.* | Applicable phases (Active if green) | | |
| Indicator | The provision of energy sub-metering systems and water consumption monitoring systems, according to design documentation. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | 0 | | | |
| Assessment method | Review of contract documentation, with special emphasis on the capability of the computerized building management system to manage the gathering and analysis of data from many dispersed locations. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |
| #REF! | Total Project | | | Score |
| Negative | According to design documentation, no sub-metering of energy use will be provided for major occupancies. | | | -1 |
| Acceptable practice | According to design documentation, an energy submetering system is provided for a few major occupancies. | | | 0 |
| Good Practice | According to design documentation, an energy and water submetering system will be provided for the occupancy, occasional air quality tests will be carried out, and a reporting system will be provided. | | | 3 |
| Best Practice | According to design documentation an energy and water submetering system linked to a building management system will be provided for the occupancy, regular air quality tests will be carried out, and a reporting system will be provided. | | | 5 |

| Benchmarks E for designated occupancies in BigTown, Europe | Uses included | Small Industrial |
|---|---|---|
| | | Office |
| | | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## E4.4 Retention of as-built drawings and documentation.

| | | | | |
|---|---|---|---|---|
| Intent | *Ensure that as-built architectural, mechanical and electrical drawings, and equipment manuals are available to operating staff and owners, so that they will be able to operate the building efficiently.* | Applicable phases (Active if green) | | |
| Indicator | The scope and quality of design documentation retained for use by building operators, according to design documentation. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | 0 | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| #REF! | Total Project | | | Score |
| Negative | Operations and maintenance manuals have not been provided, or are deficient. Plans for operation do not provide for recording, reporting and documentation protocol for maintenance, or it will be inconsistent with the size and complexity of the building. | | | -1 |
| Acceptable practice | A full set of systems manuals and complete as-built drawings will be been provided. There will be a partial recording, reporting and documentation protocol for maintenance, but somewhat inconsistent with the size and complexity of the building. | | | 0 |
| Good Practice | A full set of operations and maintenance documentation, including a full set of systems manuals, complete as-built drawings and an operations and maintenance guide will be provided. | | | 3 |
| Best Practice | A full set of operations and maintenance documentation, including a full set of systems manuals, complete as-built drawings and an operations and maintenance guide will be provided in both hard-copy and electronic forms. | | | 5 |

| Benchmarks E for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## E4.5 Provision and maintenance of a building log.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *Assess whether operating events, such as significant events, occupancy density, operating schedule, energy and water consumption, renovations and equipment changes, etc., are all recorded in a building log for future analysis and reference.* | | | |
| Indicator | The maintenance of a building log, of varying degrees of comprehensiveness. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | 0 | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| #REF! | Total Project | | | Score |
| Negative | A building log is not maintained, or it is only sporadically maintained. | | | -1 |
| Acceptable practice | A building log is continuously maintained, but only a few key parameters are covered, such as energy and water consumption. | | | 0 |
| Good Practice | A building log is continuously maintained, and contents include all key operating parameters, as well as most relevant supporting data. | | | 3 |
| Best Practice | A building log is continuously maintained, and contents include all key operating parameters, as well as most relevant supporting data. The log is maintained in a software form that collects operating data from the BMS system. | | | 5 |

| Benchmarks E for designated occupancies in BigTown, Europe | Uses included | Small Industrial |
|---|---|---|
| | | Office |
| | | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## E4.6 Skills and knowledge of operating staff.

| | | | | |
|---|---|---|---|---|
| Intent | *To increase the probability that tenants and occupants will operate building systems under their control in an efficient manner. This probability will be increased if incentives are built into sales or lease agreements.* | Applicable phases (Active if green) | | |
| Indicator | The presence of sales agreements or leases that will incent owners or tenants to operate the facilities efficiently. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | All occupancies | | | |
| Assessment method | Review of proposed lease agreements to ascertain incentives and disincentives for efficient day-to-day management. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| #REF! | Total Project | Score |
|---|---|---|
| Negative | Sales agreements or leases will contain no information relating to efficient building operations and heating, cooling and power costs are paid by the building owner. | -1 |
| Acceptable practice | Planned leases will require tenants to pay directly for heating, cooling and electric power usage. | 0 |
| Good Practice | Planned leases will require tenants to pay directly for heating, cooling and electric power usage and information is provided about performance requirements and recommended practices. | 3 |
| Best Practice | Planned leases will require tenants to pay directly for heating, cooling and electric power usage, information is provided about performance requirements and recommended practices and performance incentives are provided. | 5 |

| Benchmarks F for designated occupancies in BigTown, Europe | | Uses included | Small Industrial<br>Office<br>0 | |
|---|---|---|---|---|
| New Construction | Design Phase | Generic | | . |

## F Social and Economic aspects

### F1 Social Aspects

rejected in Glasgow, because considered as mandatory

#### F1.1 Minimization of construction accidents.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize accidents causing injury or death to construction workers.* | Applicable phases (Active if green) | | |
| Indicator | Target rate for accidents on the jobsite requiring hospitalization per 100,000 hours worked. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | 0 | | | |
| Assessment method | Review of construction management plans by specialist in construction safety. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | Rate | Score |
|---|---|---|---|
| Negative | Target rate for accidents on the jobsite requiring hospitalization per 100,000 hours worked is : | 0.60 | -1 |
| Acceptable practice | | 0.50 | 0 |
| Good Practice | | 0.20 | 3 |
| Best Practice | | 0.00 | 5 |

| Benchmarks F for designated occupancies in BigTown, Europe | | Uses included | Small Industrial<br>Office<br>0 | |
|---|---|---|---|---|
| New Construction | Design Phase | Generic | | . |

## F1.2 Access for physically handicapped persons.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To assess the relative ease of access and use of facilities for persons with physical handicaps.* | | | |
| Indicator | The scope and quality of design measures planned to facilitate access and use of building facilities by handicapped persons. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | By separate occupancies | | | |
| Assessment method | Review of construction documents by a specialist in universal access design. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | On | Score |
|---|---|---|---|
| Negative | Design documentation indicates that not all key facilities in the occupancy, including entry points, washrooms and vertical circulation systems, are accessible to wheelchair users and visually impaired persons. | | -1 |
| Acceptable practice | Design documentation indicates that all key facilities in the occupancy, including entry points, washrooms and vertical circulation systems, are accessible to wheelchair users and visually impaired persons. | | 0 |
| Good Practice | Design documentation indicates that all key facilities in the occupancy, including entry points, washrooms, vertical circulation systems and support facilities, are accessible to wheelchair users and visually impaired persons. | | 3 |
| Best Practice | Same as Good Practice. | | 5 |

| Occupancy 2 | Office | on | Score |
|---|---|---|---|
| Negative | Design documentation indicates that not all key facilities in the occupancy, including entry points, washrooms and vertical circulation systems, are accessible to wheelchair users and visually impaired persons. | | -1 |
| Acceptable practice | Design documentation indicates that all key facilities in the occupancy, including entry points, washrooms and vertical circulation systems, are accessible to wheelchair users and visually impaired persons. | | 0 |
| Good Practice | Design documentation indicates that all key facilities in the occupancy, including entry points, washrooms, vertical circulation systems and support facilities, are accessible to wheelchair users and visually impaired persons. | | 3 |
| Best Practice | Same as Good Practice. | | 5 |

| Benchmarks F for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## F1.3 Access to views from work areas.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *To assess the extent to which the distance from a workstation to the exterior and the interior organization of the space does not limit visual access to exterior views.* | Applicable phases (Active if green) | | | | | | |
| Indicator | Distance of the most remote workstation in a typical primary occupancy from exterior windows; and the extent to which interior organization provides exterior views. | Dsn | | Ops. | | | | |
| Information sources | 0 | | | | | | | |
| Applicable project type | For non-residential occupancies, all sizes. | | | | | | | |
| #REF! | Review of analysis prepared by the design team. | | | | | | | |
| Applicable Standards | a | | | | | | | |
| | b | | | | | | | |
| | c | | | | | | | |
| | d | | | | | | | |
| Information Submittals | e | | | | | | | |
| | f | | | | | | | |
| Occupancy 1 | Small Industrial | on | m. | Score | Values proposed by JMH | instead of | Source | |
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 11 | -1 | | 11 | | |
| Acceptable practice | | | 10 | 0 | | 10 | | |
| Good Practice | | | 6 | 3 | | 6 | | |
| Best Practice | | | 4 | 5 | | 4 | | |
| Occupancy 2 | Office | On | m. | Score | Values proposed by JMH | instead of | Source | |
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 11 | -1 | | 11 | | |
| Acceptable practice | | | 10 | 0 | | 10 | | |
| Good Practice | | | 6 | 3 | | 6 | | |
| Best Practice | | | 4 | 5 | | 4 | | |

## F1.4 Social utility of primary building function

rejected in Glasgow

| | | | | |
|---|---|---|---|---|
| Intent | *To assess the extent to which the primary occupancy function of the project satisfies basic societal needs.* | Applicable phases (Active if green) | | |
| Indicator | The degree of social relevance of the primary occupancy. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | All occupancies | | | |
| Assessment method | Review of planned primary occupancy type by expert panel that includes a sociologist and an economist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Total project | Total Project | | | Score |
| Negative | The planned primary occupancy serves a function that will work against regional social values or stability. | | | -1 |
| Acceptable practice | The planned primary occupancy serves a function that is not likely to have either a negative or positive impact on regional social values or stability. | | | 0 |
| Good Practice | The planned primary occupancy serves a function that is likely to have a positive impact on regional social values or stability. | | | 3 |
| Best Practice | The planned primary occupancy serves a function that is likely to have a very positive impact on regional social values or stability. | | | 5 |

| Benchmarks F for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## F2 Cost and Economics

### F2.1 Minimization of life-cycle cost.

| | | | Applicable phases (Active if green) | | |
|---|---|---|---|---|---|
| Intent | *To assess the level of total Life Cycle Cost of the project* | | | | |
| Indicator | Predicted Life Cycle Cost over a 25-year period, with calculations carried out in accordance with recognized procedures. | | Dsn | | Ops. |
| Information sources | 0 | | | | |
| Applicable project type | 0 | | | | |
| Assessment method | Review of LCC analysis by a qualified cost consultant. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| Information Submittals | d | | | | |
| | e | | | | |
| | f | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Occupancy 1 | Small Industrial | on | EUR per m2 | Score | Values proposed by JMH | instead of | Source |
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 9 880 | -1 | | 9 880 | |
| Acceptable practice | | | 9 500 | 0 | | 9 500 | |
| Good Practice | | | 8 360 | 3 | | 8 360 | |
| Best Practice | | | 7 600 | 5 | | 7 600 | |
| Occupancy 2 | Office | on | EUR per m2 | Score | Values proposed by JMH | instead of | Source |
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 12 840 | -1 | | 12 840 | |
| Acceptable practice | | | 12 000 | 0 | | 12 000 | |
| Good Practice | | | 9 480 | 3 | | 9 480 | |
| Best Practice | | | 7 800 | 5 | | 7 800 | |

### F2.2 Minimization of construction cost.

| | | | Applicable phases (Active if green) | | |
|---|---|---|---|---|---|
| Intent | *To assess the difference between the capital cost of the Design with that of a reference building designed according to standards of Acceptable Practice.* | | | | |
| Indicator | Predicted construction cost per unit area, according to design documentation. | | Dsn | | Ops. |
| Information sources | 0 | | | | |
| Applicable project type | For individual occupancies, all sizes | | | | |
| Assessment method | Review of cost analysis by a qualified cost consultant. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| Information Submittals | d | | | | |
| | e | | | | |
| | f | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Occupancy 1 | Small Industrial | on | EUR/m2 | Score | Values proposed by JMH | instead of | Source |
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 2 100 | -1 | | 2 100 | BEP : ? |
| Acceptable practice | | | 2 000 | 0 | | 2 000 | BEP : ? |
| Good Practice | | | 1 700 | 3 | | 1 700 | BEP : ? |
| Best Practice | | | 1 500 | 5 | | 1 500 | BEP : ? |
| Occupancy 2 | Office | on | EUR per m2 | Score | Values proposed by JMH | instead of | Source |
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 1 120 | -1 | | 1 120 | BEP : ? |
| Acceptable practice | | | 1 100 | 0 | | 1 100 | BEP : ? |
| Good Practice | | | 1 040 | 3 | | 1 040 | BEP : ? |
| Best Practice | | | 1 000 | 5 | | 1 000 | BEP : ? |

| Benchmarks F for designated occupancies in BigTown, Europe | | Uses included | Small Industrial<br>Office<br>0 |
|---|---|---|---|
| New Construction | Design Phase | Generic | . |

| Benchmarks F for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## F2.3 Minimization of operating and maintenance cost.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *To assess the difference between the operating cost of the Design with that of a reference building designed according to standards of Acceptable Practice.* | Applicable phases (Active if green) | | | | | | |
| Indicator | Operating cost per unit area for energy, water & maintenance, according to design documentation. | Dsn | | Ops. | | | | |
| Information sources | The operating cost of a high-performance building should be substantially less than Acceptable Practice, primarily because of reduced energy, water and equipment maintenance costs. | | | | | | | |
| Applicable project type | For individual occupancies, all sizes | | | | | | | |
| Assessment method | Review of operating cost projections by a cost consultant and a person knowledgable in building operations. | | | | | | | |
| Applicable Standards | a | | | | | | | |
| | b | | | | | | | |
| | c | | | | | | | |
| Information Submittals | d | | | | | | | |
| | e | | | | | | | |
| | f | | | | | | | |
| Occupancy 1 | Small Industrial | on | EUR per m2 | Score | Values proposed by JMH | instead of | Source | |
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 17 | -1 | | 17 | BEP : ? | |
| Acceptable practice | | | 15 | 0 | | 15 | BEP : ? | |
| Good Practice | | | 11 | 3 | | 11 | BEP : ? | |
| Best Practice | | | 8 | 5 | | 8 | BEP : ? | |
| Occupancy 2 | Office | on | EUR per m2 | Score | Values proposed by JMH | instead of | Source | |
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 6 | -1 | | 6 | BEP : ? | |
| Acceptable practice | | | 5 | 0 | | 5 | BEP : ? | |
| Good Practice | | | 3 | 3 | | 3 | BEP : ? | |
| Best Practice | | | 2 | 5 | | 2 | BEP : ? | |

## F2.5 Support of Local Economy.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *To encourage the purchase of a significant level of construction goods and services within the economic region.* | Applicable phases (Active if green) | | | based on cost, construction , labour % | | | |
| Indicator | Prediction of the percentage of construction expenditures for goods and services going to firms with permanent offices in the urban region. | Dsn | | Ops. | | | | |
| Information sources | 0 | | | | | | | |
| Applicable project type | For Total Project, all sizes. | | | | | | | |
| #REF! | Review of expendture program and sample analysis of material billing to verify costs. | | | | | | | |
| Applicable Standards | a | | | | | | | |
| | b | | | | | | | |
| | c | | | | | | | |
| Information Submittals | d | | | | | | | |
| | e | | | | | | | |
| | f | | | | | | | |
| Total project | Total Project | | Percent | Score | Values proposed by JMH | instead of | Source | |
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 44% | -1 | | 44% | BEP : ? | |
| Acceptable practice | | | 50% | 0 | | 50% | BEP : ? | |
| Good Practice | | | 68% | 3 | | 68% | BEP : ? | |
| Best Practice | | | 80% | 5 | | 80% | BEP : ? | |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B Energy and Resource Consumption

## B1 Total Life Cycle Non-Renewable Energy

### B1.1 Annualized non-renewable primary energy embodied in construction materials.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the embodied primary energy used in the building, annualized over the estimated lifespan of the building.* | Applicable phases (Active if green) | | |
| Indicator | Estimate of embodied primary energy used for structure, envelope (excl. glazing), and major interior components, as determined by a program designed to estimate embodied energy and emissions through Life Cycle Analysis; also, estimate of lifespan. | | Dsn | Ops. |
| Information sources | Note that minimization of embodied energy may not always be optimal. For example, the greater embodied energy associated with high thermal mass will, in most cases, reduce operating energy, and the total net lifecycle energy could then be reduced. | | ● | ● |
| Applicable project type | All occupancies | Assumed lifespan in years | | 50 |
| Assessment method | Use an embodied energy estimating system, based on LCA (Life Cycle Assessment). Alternatively, use the crude estimating method provided in this system. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| | | | | | |
|---|---|---|---|---|---|
| Occupancy 1 | Small Industrial | GJ/m2 | MJ/m2 per yr. | Score | Data to be received from Italian team |
| Negative | The predicted embodied energy for materials used in the structure and building envelope, as determined an acceptable LCA-based estimating method : | 8.6 | 172 | -1 | |
| Acceptable practice | | 8.0 | 160 | 0 | |
| Good Practice | | 6.2 | 124 | 3 | |
| Best Practice | | 5.0 | 100 | 5 | |
| Occupancy 2 | Office | GJ/m2 | MJ/m2 per yr. | Score | Data to be received from Italian team |
| Negative | The predicted embodied energy for materials used in the structure and building envelope, as determined an acceptable LCA-based estimating method : | 12.6 | 252 | -1 | |
| Acceptable practice | | 12.0 | 240 | 0 | |
| Good Practice | | 10.2 | 204 | 3 | |
| Best Practice | | 9.0 | 180 | 5 | |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B1.2 Annual non-renewable primary energy used for facility heating

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of non-renewable energy (not including on-site renewable energy) used annually for building operations, commensurate with functional needs.* | | | |
| Indicator | MJ of delivered energy per m2 of net area, including fuel and electrical use, as predicted by means of an acceptable method or tool. | | Dsn | Ops. |
| Information sources | See IEA.org for data and case studies. | ● | ● | ● |
| Applicable project type | Any occupancy except for Open Space | | | M |
| Assessment method | During early design stages a screening tool may be used, but in later stages an hour-by-hour simulation program should be used. Benchmarks for Ops should be derived from operational data for the relevant occupancy types, after a period of occupancy of at least one year. Note that benchmarks should be set using Delivered energy data, since this is what is commonly available. SBTool applies a conversion factor to these values to convert them to primary energy for the Results. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | Elec. MJ/m2 per yr | Total MJ/m2 per yr | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 540 | 1460 | -1 | | 1 460 | |
| Acceptable practice | | 500 | 1300 | 0 | | 1 300 | |
| Good Practice | | 380 | 820 | 3 | | 820 | |
| Best Practice | | 300 | 500 | 5 | 144 MJ/m2 | 500 | IBGE 40 kWh/m2 = 144 MJ/m2 |
| Occupancy 2 | Office | Elec. MJ/m2 per yr | MJ/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 320 | 375 | -1 | | 375 | |
| Acceptable practice | | 300 | 350 | 0 | | 350 | |
| Good Practice | | 240 | 275 | 3 | | 275 | |
| Best Practice | | 200 | 225 | 5 | 54 MJ/m2 | 225 | IBGE 15 kWh/m2 = 54 MJ/m2 |

## B1.3 Annual non-renewable primary energy used for facility cooling

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of non-renewable energy (not including on-site renewable energy) used annually for building operations, commensurate with functional needs.* | | | |
| Indicator | MJ of delivered energy per m2 of net area, including fuel and electrical use, as predicted by means of an acceptable method or tool. | | Dsn | Ops. |
| Information sources | See IEA.org for data and case studies. | ● | ● | ● |
| Applicable project type | Any occupancy except for Open Space | | | |
| Assessment method | During early design stages a screening tool may be used, but in later stages an hour-by-hour simulation program should be used. Benchmarks for Ops should be derived from operational data for the relevant occupancy types, after a period of occupancy of at least one year. Note that benchmarks should be set using Delivered energy data, since this is what is commonly available. SBTool applies a conversion factor to these values to convert them to primary energy for the Results. | | | |
| Applicable Standards | a | | | |
| | b | Revise text | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | Elec. MJ/m2 per yr | Total MJ/m2 per yr | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 540 | 1460 | -1 | | 1 460 | |
| Acceptable practice | | 500 | 1300 | 0 | | 1 300 | |
| Good Practice | | 380 | 820 | 3 | | 820 | |
| Best Practice | | 300 | 500 | 5 | 152 MJ:m2 | 500 | IBGE 45 kWh/m2 = 152 MJ/m2 |
| Occupancy 2 | Office | Elec. MJ/m2 per yr | MJ/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 320 | 375 | -1 | | 375 | |
| Acceptable practice | | 300 | 350 | 0 | | 350 | |
| Good Practice | | 240 | 275 | 3 | | 275 | |
| Best Practice | | 200 | 225 | 5 | 152 MJ:m2 | 225 | IBGE 45 kWh/m2 = 152 MJ/m2 |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B1.4 Annual non-renewable primary energy used for lighting and equipment

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of non-renewable energy (not including on-site renewable energy) used annually for building operations, commensurate with functional needs.* | Applicable phases (Active if green) | | |
| Indicator | MJ of delivered energy per m2 of net area, including fuel and electrical use, as predicted by means of an acceptable method or tool. | | Dsn | Ops. |
| Information sources | See IEA.org for data and case studies. | ● | ● | ● |
| Applicable project type | Any occupancy except for Open Space | | | M |
| Assessment method | During early design stages a screening tool may be used, but in later stages an hour-by-hour simulation program should be used. Benchmarks for Ops should be derived from operational data for the relevant occupancy types, after a period of occupancy of at least one year. Note that benchmarks should be set using Delivered energy data, since this is what is commonly available. SBTool applies a conversion factor to these values to convert them to primary energy for the Results. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

Revise text

| Occupancy 1 | Small Industrial | Elec. MJ/m2 per yr | Total MJ/m2 per yr | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 540 | 1460 | -1 | | 1 460 | |
| Acceptable practice | | 500 | 1300 | 0 | | 1 300 | |
| Good Practice | | 380 | 820 | 3 | | 820 | |
| Best Practice | | 300 | 500 | 5 | | 500 | IBGE 2 W/m2*1600h/an*3.6/1000=11.5 MJ/m2 |

| Occupancy 2 | Office | Elec. MJ/m2 per yr | MJ/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | MJ of delivered non-renewable energy per m2 of net area used for operations, as predicted by means of an acceptable method or tool. | 320 | 375 | -1 | | 375 | |
| Acceptable practice | | 300 | 350 | 0 | | 350 | |
| Good Practice | | 240 | 275 | 3 | | 275 | |
| Best Practice | | 200 | 225 | 5 | | 225 | IBGE 2 W/m2*1600h/an*3.6/1000=11.5 MJ/m2 |

## B2 Electrical peak demand for facility operations

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the peak monthly electrical demand for building operations, especially where the grid is near peak capacity.* | Applicable phases (Active if green) | | |
| Indicator | Average of peak monthly electrical demand for one year, W/m2, as predicted by means of an acceptable method or tool. | | Dsn | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | Any occupancy except open space | | | |
| Assessment method | Review of contract documentation and sample equipment specifications by an ouside electrical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | on | W/m2 | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The peak monthly electrical demand for the occupancy, as predicted by means of an acceptable method or tool. | | 6 | -1 | 6 | 6 | o.k. with proposal |
| Acceptable practice | | | 5 | 0 | 5 | 5 | o.k. with proposal |
| Good Practice | | | 3 | 3 | 3 | 3 | o.k. with proposal |
| Best Practice | | | 2 | 5 | 2 | 2 | o.k. with proposal |

| Occupancy 2 | Office | on | W/m2 | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The peak monthly electrical demand for the occupancy, as predicted by means of an acceptable method or tool. | | 0 | -1 | | 0 | BEP : ? |
| Acceptable practice | | | | 0 | | | BEP : ? |
| Good Practice | | | 0 | 3 | | 0 | BEP : ? |
| Best Practice | | | | 5 | | | BEP : ? |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B3 Renewable Energy

### B3.1 Use of off-site energy that is generated from renewable sources.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To encourage the use of sources that generate power by renewable energy means, e.g. 'green power'.* | | | |
| Indicator | Percent of annual purchased electricity consumption for the Total Building that is planned to be obtained from sources that generate power by means of renewable energy. | | Dsn | Ops. |
| Information sources | NABERS (Australian system) defines Acceptable Practice as 20% and Best Practice as 100%, whereas HK-BEAM equivalents are 4% and 20% and BREEAM specifies a threshold of 10%. | Available from grid, per Emission worksheet | | 0.0% |
| Applicable project type | Any occupancy where renewable sources are available. | | | |
| Assessment method | Review of contract documentation and sample equipment specifications by an ouside electrical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Total project | Total project | Percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The percent of annual purchased electricity consumption planned to be obtained from sources that generate power by means of renewable energy : | 0% | -1 | 0% | 0% | o.k. with proposal |
| Acceptable practice | | 0% | 0 | 0% | 0% | o.k. with proposal |
| Good Practice | | 30% | 3 | 30% | 30% | o.k. with proposal |
| Best Practice | | 50% | 5 | 50% | 50% | o.k. with proposal |

### B3.2 Provision of on-site renewable energy systems.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To encourage the use of on-site renewable energy systems.* | | | |
| Indicator | The amount of energy intended to be contributed by renewable energy systems, in MJ/m2 per year, not including daylighting or Ground Source Heat Pumps (GSHP). | | Dsn | Ops. |
| Information sources | We suggest a higher level for Residential and Schools than for Office, because of possibility of using renewable sources for pre-heating Hot Water. E-Benchmark suggests a minimum of 10% and LEED ranges from 5% to 20%. | | ● | ● |
| Applicable project type | Any occupancy except Enclosed Parking and Open Space. | | | |
| Assessment method | Review of contract documentation and sample equipment specifications by an ouside electrical engineer with renewables expertise. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Occupancy 1 | Total project | M | MJ/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The predicted annual contribution of on-site renewable energy planned for operations, as per drawings and specifications : | | 40 | -1 | 40 | 40 | o.k. with proposal |
| Acceptable practice | | | 50 | 0 | 50 | 50 | o.k. with proposal |
| Good Practice | | | 80 | 3 | 80 | 80 | o.k. with proposal |
| Best Practice | | | 100 | 5 | 100 | 100 | o.k. with proposal |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B4 Materials

### B4.1 Re-use of suitable existing structure(s).

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the re-use of any sound structures that exist on the site, as part of the new project.* | Applicable phases (Active if green) | | |
| Indicator | The development of an inventory and the percent, by area, of an existing structure that is re-used or recycled, where the structures are in usable condition. | Dsn | C&C. | Ops. |
| Information sources | 0 | | | |
| Applicable project type | Any occupancy, where an existing structure in usable condition is located on the site. | | | |
| #REF! | If there is an existing structure on the site, the basis of assessment should be a report that provides a structural, functiona and economic assessment of the existing structure, carried out by a team of qualified professionals. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| | | | | |
|---|---|---|---|---|
| Total project | Total project | Percent by area | Score | Not applicable in the context of Cralys |
| Negative | The percentage (by area) of existing sound structures that is planned to be re-used as part of the project : | 13% | -1 | |
| Acceptable practice | | 25% | 0 | |
| Good Practice | | 61% | 3 | |
| Best Practice | | 85% | 5 | |

### B4.2 Use of recycled materials from off-site sources.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the use of recycled materials from off-site sources as part of the new facility, where they are suitable.* | Applicable phases (Active if green) | | |
| Indicator | The percentage, by cost, of the materials, products, and furnishings in the project are recycled from off-site sources. | Dsn | C&C. | Ops. |
| Information sources | LEED ranges from 25% to 50%. | | | |
| Applicable project type | Total building. | | | |
| #REF! | Review of contract documentation by an outside materials specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| | | | | |
|---|---|---|---|---|
| Total project | Total Project | % by cost | Score | Data to be received from Italian team |
| Negative | The percentage (by cost) of the materials, products, and furnishings in the project that are made from materials that recycled from off-site post-consumer sources : | 7% | -1 | |
| Acceptable practice | | 10% | 0 | |
| Good Practice | | 19% | 3 | |
| Best Practice | | 25% | 5 | |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B4.3 Use of bio-based products obtained from sustainable sources.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the use of bio-based products that are certified by a recognized certification agency as coming from renewable sources, or the equivalent.* | Applicable phases (Active if green) | | |
| Indicator | The percentage, by cost, of bio-based products used in the building, including wood and agricultural products, that are certified by a recognized certification agency. | Dsn | C&C. | Ops. |
| Information sources | 0 | | | |
| Applicable project type | Total building, all sizes. | | | |
| Assessment method | Review of contract documentation by an outside materials specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| | | | | |
|---|---|---|---|---|
| Total project | Total Project | Percent by cost | Score | Data to be received from Italian team |
| Negative | The percentage (by cost) of the wood-based products in the building certified by a recognized certification agency as coming from renewable sources : | 9% | -1 | |
| Acceptable practice | | 10% | 0 | |
| Good Practice | | 13% | 3 | |
| Best Practice | | 15% | 5 | |

## B4.4 Use of cement supplementing materials in concrete.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the use of cement supplementing materials in concrete, such as flyash, steel slag or rice ash, in order to reduce GHG emissions from the use of cement.* | Applicable phases (Active if green) | | |
| Indicator | The percentage, by volume, of cement substitute used in concrete. | Dsn | C&C. | Ops. |
| Information sources | Note that up to 50% of CSM has been used, but curing time increases with volume used. Typical industry utilisation ranges from 15% to 25%. | | | |
| Applicable project type | 0 | | | |
| Assessment method | Review of contract documentation by an outside concrete specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Total project | Total Project | % by vol. | Score | Values proposed by JMH | instead of | Source |
| Negative | The percentage, by volume, of an acceptable cement supplementing material used in concrete : | 2% | -1 | 0% | 2% | |
| Acceptable practice | | 10% | 0 | 0% | 10% | No law constraint |
| Good Practice | | 34% | 3 | 10% | 34% | |
| Best Practice | | 50% | 5 | 25% | 50% | |

| Benchmarks B for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## B4.5 Use of materials that are locally produced.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the procurement of high-weight materials such as aggregate, sand, concrete, masonry, steel and glass,from sources within the greater urban region.* | Applicable phases (Active if green) | | |
| Indicator | The percentage, by weight, of the aggregate, sand, concrete, masonry, steel and glass used in the project produced within the greater urban region, if local sources of acceptable quality are available. | Dsn | C&C. | Ops. |
| Information sources | LEED specifies specific distances, but we consider that this is not applicable to all areas. | | | |
| Applicable project type | Total building, all sizes. | | | |
| Assessment method | Review of contract documentation by an outside materials specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | % by weight | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The percentage, by weight, of the aggregate, sand, concrete, masonry, steel and glass used in the project produced within the greater urban region : | 42% | -1 | | 42% | |
| Acceptable practice | | 50% | 0 | | 50% | No law constraint |
| Good Practice | | 74% | 3 | | 74% | |
| Best Practice | | 90% | 5 | | 90% | |

## B4.6 Design for disassembly, re-use or recycling.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage a building design that will facilitate the easy dis-assembly of components so that they can be re-used or recycled at the end of the service life of the components.* | Applicable phases (Active if green) | | |
| Indicator | Measures taken to facilitate future disassembly and re-use or recycling. | Dsn | C&C. | Ops. |
| Information sources | 0 | | | |
| Applicable project type | Total building | | | |
| Assessment method | Review of contract documentation by an outside deconstruction specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | Score |
|---|---|---|
| Negative | No measures have been taken to facilitate future disassembly, re-use or recycling. | -1 |
| Acceptable practice | Limited measures have been taken to facilitate future disassembly, re-use or recycling, such as the use of modular interior partitions and other interior components. | 0 |
| Good Practice | Measures have been taken to facilitate future disassembly, re-use or recycling, such as the use of modular interior components and the use of bolted structural or building envelope components. | 3 |
| Best Practice | Extensive measures have been taken to facilitate future disassembly, re-use or recycling, such as the use of modular interior components, the use of bolted structural or building envelope components, and the non-use of composite or bonded materials. | 5 |

# Benchmarks B for designated occupancies in BigTown, Europe

| Uses included | |
|---|---|
| | Small Industrial |
| | Office |
| | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## B5 Potable Water

### B5.1 Use of potable water for site irrigation.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To discourage the use of potable water for irrigation; and to ensure that any potable water used for irrigation purposes during dry seasons is minimal.* | | | |
| Indicator | The development of a credible irrigation management plan for areas landscaped with non native species (excluding stored rainwater or greywater used for this purpose). | Dsn | C&C. | Ops. |
| Information sources | 0 | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review pf landscaping plans by an outside landscape architect. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Total project | Total Project | $M^3 / m^2$ | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The predicted net annual potable water volume used for irrigation of areas landscaped with non-native species (excluding stored rainwater or greywater used for this purpose) : | 4.8 | -1 | 5% | 4.8 | o.k. with proposal |
| Acceptable practice | | 4.0 | 0 | 4% | 4.0 | o.k. with proposal |
| Good Practice | | 1.6 | 3 | 2% | 1.6 | o.k. with proposal |
| Best Practice | | 0.0 | 5 | 0% | 0.0 | o.k. with proposal |

### B5.2 Use of potable water for building and occupancy needs.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of potable water imported to the site and used for occupancy needs, excluding building system uses or irrigation of exterior areas.* | | | |
| Indicator | Prediction of total potable water use, in L per person per day, based on a credible water management plan for occupancy fixtures and use. Note that the benchmarks are expressed as L / m2 per year in order to allow uses such as indoor parking to be compared to other uses such as office or residential. | Dsn | C&C. | Ops. |
| Information sources | See File C for fixtures and water consumption data for the specific project. | ● | | |
| Applicable project type | By separate occupancies, excluding irrigation water for outdoor areas. | | | |
| Assessment method | Review of contract documentation by a specialist in water use. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | on | L / m2 per year | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | Based on a credible water management plan, the volume of potable water predicted to be used for occupancy needs : | | 1600 | -1 | | 1 600 | BEP : ? |
| Acceptable practice | | | 1500 | 0 | | 1 500 | BEP : ? |
| Good Practice | | | 1200 | 3 | | 1 200 | BEP : ? |
| Best Practice | | | 1000 | 5 | | 1 000 | BEP : ? |

| Occupancy 2 | Office | on | L / m2 per year | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | Based on a credible water management plan, the volume of potable water predicted to be used for occupancy needs : | | 215 | -1 | | 215 | BEP : ? |
| Acceptable practice | | | 200 | 0 | | 200 | BEP : ? |
| Good Practice | | | 155 | 3 | | 155 | BEP : ? |
| Best Practice | | | 125 | 5 | | 125 | BEP : ? |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C Environmental Loadings

### C1 Greenhouse Gas Emissions

#### C1.1 Annualized GHG emissions embodied in construction materials.

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To minimize the amount of CO2-equivalent emissions from primary non-renewable energy used in the extraction, fabrication and transportation of materials and components in the building.* | Applicable phases (Active if green) | | | |
| Indicator | CO2-equivalent emissions per Kg. per m2 of gross area, as determined by calculations based on design documents and fuel emission values plus process-related emissions related to the region of production, and annualized according to the predicted lifespan of the building. | Dsn | | Ops. | Lifespan = 35 years (Glasgow meeting) |
| Information sources | Benchmarks for GJ/m2 are the same as those selected for Benchmark B1.1. Values in BREEAM range from about 1000 to 300 kgCO2/m2 for Residential, and 100 to 500 kgCO2/m2f or offices (not annualized). | Assumed lifespan in years, from Basic worksheet | | 50 | |
| Applicable project type | All occupancies | kg eCO2 per embodied GJ | | 55 | |
| Assessment method | We recommend that this analysis be carried out only with new projects, since there are likely to be insurmountable difficulties in obtaining emsission data for materials that are located in an existing building. | | | | |
| | a | | | | |
| Applicable Standards | b | | | | |
| | c | | | | |
| | d | | | | |
| Information Submittals | e | | | | |
| | f | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Occupancy 1 | Small Industrial | GJ/m2 | kg/m2 * year | Score | Data to be received from Italian team |
| Negative | The annualized amount of CO2-equivalent emissions from primary non-renewable energy used in materials and components for structure and building envelope, based on design documents : | 8.6 | 9.5 | -1 | |
| Acceptable practice | | 8.0 | 8.8 | 0 | |
| Good Practice | | 6.2 | 6.8 | 3 | |
| Best Practice | | 5.0 | 5.5 | 5 | |
| Occupancy 2 | Office | GJ/m2 | kg/m2 * year | Score | Data to be received from Italian team |
| Negative | The annualized amount of CO2-equivalent emissions from primary non-renewable energy used in materials and components for structure and building envelope, based on design documents : | 12.6 | 13.9 | -1 | |
| Acceptable practice | | 12.0 | 13.2 | 0 | |
| Good Practice | | 10.2 | 11.2 | 3 | |
| Best Practice | | 9.0 | 9.9 | 5 | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C1.2 Annual GHG emissions from all energy used for facility heating.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Intent | *To minimize the amount of CO2-equivalent emissions from all energy used for annual building operations.* | Applicable phases (Active if green) | | | | | |
| Indicator | Annual CO2-equivalent emissions per Kg. per m2 of net area, as determined by an hour-by-hour simulation program and calculations based on regional fuel emission values. | Dsn | | Ops. | | | |
| | Values in the UK BREEAM system range from 167 to 30 kgCO2/m2 for Residential, 250 to 20 kgCO2/m2 for Office and about 48 to 17 kgCO2/m2 for Schools. | | | | | | |
| Information sources | Emissions for Residential taken from average Canadian building stock values for 1999 (NRCan data). | Est. kg CO2 per GJ, Small Industrial | | 55.0 | | | |
| | Emissions for Commercial taken from average Canadian building stock values for 1999 (NRCan data). | Est. kg CO2 per GJ, Office | | 55.0 | | | |
| | 0 | Est. kg CO2 per GJ, 0 | | 55.0 | | | |
| Applicable project type | All occupancies except open space | Values below are based on B1.2 in BmkB | | | | | |
| Assessment method | The use of an hour-by-hour simulation tool, as required for B1.2, will produce annual energy consumption results. These data are combined by SBTool with emission data (see Emissions worksheet) to produce estimates of operating emissions. | | | | | | |
| | a | | | | | | |
| Applicable Standards | b | | | | | | |
| | c | | | | | | |
| | d | | | | | | |
| Information Submittals | e | | | | | | |
| | f | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Occupancy 1 | Small Industrial | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 80 | -1 | | 80 | |
| Acceptable practice | | | 72 | 0 | | 72 | |
| Good Practice | | | 45 | 3 | | 45 | |
| Best Practice | | | 28 | 5 | | 28 | |
| Occupancy 2 | Office | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 21 | -1 | | 21 | |
| Acceptable practice | | | 19 | 0 | | 19 | |
| Good Practice | | | 15 | 3 | | 15 | |
| Best Practice | | | 12 | 5 | | 12 | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C1.3 Annual GHG emissions from all energy used for facility cooling.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of CO2-equivalent emissions from all energy used for annual building operations.* | Applicable phases (Active if green) | | |
| Indicator | Annual CO2-equivalent emissions per Kg. per m2 of net area, as determined by an hour-by-hour simulation program and calculations based on regional fuel emission values. | Dsn | | Ops. |
| | Values in the UK BREEAM system range from 167 to 30 kgCO2/m2 for Residential, 250 to 20 kgCO2/m2 for Office and about 48 to 17 kgCO2/m2 for Schools. | | | |
| Information sources | Emissions for Residential taken from average Canadian building stock values for 1999 (NRCan data). | Est. kg CO2 per GJ, Small Industrial | | 55.0 |
| | Emissions for Commercial taken from average Canadian building stock values for 1999 (NRCan data). | Est. kg CO2 per GJ, kg/m2 per yr. | | 55.0 |
| | 0 | Est. kg CO2 per GJ, 0 | | 55.0 |
| Applicable project type | All occupancies except open space | Values below are based on B1.2 in BmkB | | |
| Assessment method | The use of an hour-by-hour simulation tool, as required for B1.2, will produce annual energy consumption results. These data are combined by SBTool with emission data (see Emissions worksheet) to produce estimates of operating emissions. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

Text to be revised

| Occupancy 1 | Small Industrial | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 80 | -1 | | 80 | |
| Acceptable practice | | | 72 | 0 | | 72 | |
| Good Practice | | | 45 | 3 | | 45 | |
| Best Practice | | | 28 | 5 | | 28 | |
| Occupancy 2 | Office | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 21 | -1 | | 21 | |
| Acceptable practice | | | 19 | 0 | | 19 | |
| Good Practice | | | 15 | 3 | | 15 | |
| Best Practice | | | 12 | 5 | | 12 | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C1.4 Annual GHG emissions from all energy used for lighting and equipment.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *To minimize the amount of CO2-equivalent emissions from all energy used for annual building operations.* | | Applicable phases (Active if green) | | | | | |
| Indicator | Annual CO2-equivalent emissions per Kg. per m2 of net area, as determined by an hour-by-hour simulation program and calculations based on regional fuel emission values. | | Dsn | | Ops. | | | |
| | Values in the UK BREEAM system range from 167 to 30 kgCO2/m2 for Residential, 250 to 20 kgCO2/m2 for Office and about 48 to 17 kgCO2/m2 for Schools. | | | | | | | |
| Information sources | Emissions for Residential taken from average Canadian building stock values for 1999 (NRCan data). | | Est. kg CO2 per GJ, Small Industrial | | 55.0 | | | |
| | Emissions for Commercial taken from average Canadian building stock values for 1999 (NRCan data). | | Est. kg CO2 per GJ, kg/m2 per yr. | | 55.0 | | | |
| | 0 | | Est. kg CO2 per GJ, 20.625 | | 55.0 | | | |
| Applicable project type | All occupancies except open space | | Values below are based on B1.2 in BmkB | | | | | |
| Assessment method | The use of an hour-by-hour simulation tool, as required for B1.2, will produce annual energy consumption results. These data are combined by SBTool with emission data (see Emissions worksheet) to produce estimates of operating emissions. | | | | | | | |
| Applicable Standards | a | | | | | | | |
| | b | | | | | | | |
| | c | | | | | | | |
| | d | | | | | | | |
| Information Submittals | e | | | | | | | |
| | f | | | | | | | |

Text to be revised

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Occupancy 1 | Small Industrial | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 80 | -1 | | 80 | |
| Acceptable practice | | | 72 | 0 | | 72 | |
| Good Practice | | | 45 | 3 | | 45 | |
| Best Practice | | | 28 | 5 | | 28 | |
| Occupancy 2 | Office | M | kg/m2 per yr. | Score | Values proposed by JMH | instead of | Source |
| Negative | Based on the results of an hour-by-hour simulation program and regional fuel emission values, the amount of CO2-equivalent emissions from primary non-renewable energy used for annual operations of the occupancy is predicted to be : | | 21 | -1 | | 21 | |
| Acceptable practice | | | 19 | 0 | | 19 | |
| Good Practice | | | 15 | 3 | | 15 | |
| Best Practice | | | 12 | 5 | | 12 | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C2 Other Atmospheric Emissions

### C2.1 Emissions of acidifying emissions during facility operations.

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To minimize the production of atmospheric emissions from building operations that may result in acidification.* | Applicable phases (Active if green) | | | SO2 (not emitted anymore) replaced by NOx |
| Indicator | SO2 Equiv. per year in kg. per unit net area | Dsn | | Ops. | |
| Information sources | References x, y and z | | | M | |
| Applicable project type | Total project | | | | |
| #REF! | Review of contract documents and equipment specifications. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| Information Submittals | d | | | | |
| | e | | | | |
| | f | | | | |

| Total project | Total Project | Kg. / m2 per yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The predicted emission of SO2 equivalent per year in kg. per unit area net, based on the results of an acceptable hour-by-hour simulation program and taking into account the characteristics of available fuels : | 0.45 | -1 | | 0.45 | |
| Acceptable practice | | 0.40 | 0 | | 0.40 | |
| Good Practice | | 0.25 | 3 | | 0.25 | |
| Best Practice | | 0.15 | 5 | | 0.15 | |

### C2.2 Emissions leading to photo-oxidants during facility operations.

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To minimize the production of atmospheric emissions from building operations that may result in photo-oxidants.* | Applicable phases (Active if green) | | | |
| Indicator | Ethene equiv. per year in gm per net unit area | Dsn | | Ops. | |
| Information sources | References x, y and z | | | | |
| Applicable project type | Total project | | | | |
| Assessment method | Review of contract documents and equipment specifications. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| Information Submittals | d | | | | |
| | e | | | | |
| | f | | | | |

| Total project | Total Project | gm./m2 per yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The predicted emission of Ethene equivalent per year in gm. per net unit area, based on the results of an acceptable hour-by-hour simulation program, and taking into account the characteristics of available fuels : | 0.278 | -1 | | 0.278 | |
| Acceptable practice | | 0.250 | 0 | | 0.250 | |
| Good Practice | | 0.166 | 3 | | 0.166 | |
| Best Practice | | 0.110 | 5 | | 0.110 | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C3 Solid Wastes

### C3.1 Solid waste resulting from the construction and demolition process.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the amount of waste off the site by encouraging the development and implementation of a construction waste management program, with sorting, re-use and recycling measures.* | Applicable phases (Active if green) | | |
| Indicator | The development of a credible construction waste management plan and the percentage, by weight, of construction waste to be re-used (on or off the site) or re-cycled, as predicted in the plan. | Dsn | C&C. | Ops. |
| Information sources | It is assumed that a construction waste management plan is developed, and construction waste is sorted, with specific amounts recorded. | | | |
| Applicable project type | Total Project | | | |
| Assessment method | Review of construction management plan by an outside party with construction and solid waste management expertise. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | Percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The percentage, by weight, of construction waste to be re-used (on or off the site) or re-cycled, as predicted in the construction waste management plan : | -7% | -1 | | -7% | |
| Acceptable practice | | 10% | 0 | | 10% | |
| Good Practice | | 61% | 3 | | 61% | |
| Best Practice | | 95% | 5 | | 95% | |

### C3.2 Solid waste resulting from facility operations.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the provision of facilities for storage of waste on each floor or each major work area, and space for the central sorting and storage of waste, with access to a truck loading area.* | Applicable phases (Active if green) | | |
| Indicator | Facilities provided in the design for the storage and sorting of solid wastes in both dispersed and central locations. | Dsn | | Ops. |
| Information sources | We specify storage areas per dwelling and per work group, and assume that the central storage area will be sized to suit. | | | |
| Applicable project type | Separate criteria for residential and non-residential; NA for parking or open space | | | |
| Assessment method | Review of construction documents by an outside party with solid waste management expertise. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | on | percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | A central sorting and storage area is located close to a truck loading area, and storage has been provided sufficient for all wastes that may accumulate over a period of one week. It is estimated that the percentage of total waste that can be sorted and | | 70% | -1 | | 70% | |
| Acceptable practice | | | 75% | 0 | | 75% | |
| Good Practice | | | 89% | 3 | | 89% | |
| Best Practice | | | 98% | 5 | | 98% | |

| Occupancy 2 | Office | on | percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | A central sorting and storage area is located close to a truck loading area, and storage has been provided sufficient for all wastes that may accumulate over a period of one week. It is estimated that the percentage of total waste that can be sorted and | | 70% | -1 | | 70% | |
| Acceptable practice | | | 75% | 0 | | 75% | |
| Good Practice | | | 90% | 3 | | 90% | |
| Best Practice | | | 100% | 5 | | 100% | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial<br>Office<br>0 |
|---|---|---|---|
| New Construction | Design Phase | Generic | . |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C4 Rainwater, Stormwater and Wastewater

### C4.1 Liquid effluents from facility operations sent off the site.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the volume of waste water, including effluent, sent off the site to be treated.* | Applicable phases (Active if green) | | |
| Indicator | The volume of liquid waste per person per day that is sent off the site for treatment. | Dsn | | Ops. |
| Information sources | The default (0) volume is assumed to be 95% of the potable water consumption with no on-site treatment, as per BmkA 5.2 (see cells at right) | 1425 | 190 | 0 |
| Applicable project type | By separate occupancies. | | | |
| Assessment method | Review of contract documents. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | on | L / m2 * yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The predicted volume of liquid waste per m2 per year to be sent off the site for treatment | | 1520 | -1 | | 1 520 | |
| Acceptable practice | | | 1425 | 0 | | 1 425 | |
| Good Practice | | | 1140 | 3 | | 1 140 | |
| Best Practice | | | 950 | 5 | | 950 | |

| Occupancy 2 | Office | on | L / m2 * yr. | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The predicted volume of liquid waste per m2 per year to be sent off the site for treatment | | 204 | -1 | | 204 | |
| Acceptable practice | | | 190 | 0 | | 190 | |
| Good Practice | | | 147 | 3 | | 147 | |
| Best Practice | | | 119 | 5 | | 119 | |

### C4.2 Retention of rainwater for later re-use.

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the retention of rainwater on the site for later re-use.* | Applicable phases (Active if green) | | |
| Indicator | The percent of annual rainwater falling on the site that is planned to be retained on the site for future use on the site or in the building in holding ponds or tanks. | Dsn | | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of contract documents and landscaping plans by a person with experience in this field. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | Percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The percent of annual rainwater falling on the site that is predicted to be retained on the site for future use on the site or in the building in holding ponds or tanks. | 0% | -1 | | 0% | |
| Acceptable practice | | 0% | 0 | | 0% | |
| Good Practice | | 45% | 3 | | 45% | |
| Best Practice | | 75% | 5 | | 75% | |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C4.3 Untreated stormwater retained on the site.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the volume of stormwater sent off the site.* | Applicable phases (Active if green) | | |
| Indicator | Percent of stormwater that is retained on the site. | Dsn | | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | By separate occupancies. | | | |
| Assessment method | Review of contract documents and landscaping plans by a person with experience in this field. | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Total project | Total Project | Percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The percent of stormwater retained on the site, on an annualized basis: | 10% | -1 | | 10% | |
| Acceptable practice | | 25% | 0 | | 25% | |
| Good Practice | | 70% | 3 | | 70% | |
| Best Practice | | 100% | 5 | | 100% | |

**N.A.** N.A. ● ●

## N.A. N.A.

| | | | | |
|---|---|---|---|---|
| N.A. | N.A. | Applicable phases (Active if green) | | |
| N.A. | N.A. | Dsn | C&C. | Ops. |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | Score |
| N.A. | N.A. | | | -1 |
| N.A. | N.A. | | | 0 |
| N.A. | N.A. | | | 3 |
| N.A. | N.A. | | | 5 |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

N.A. N.A.

| | | | | |
|---|---|---|---|---|
| N.A. | N.A. | Applicable phases (Active if green) | | |
| N.A. | N.A. | Dsn | C&C. | Ops. |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | Score |
| N.A. | N.A. | | | -1 |
| N.A. | N.A. | | | 0 |
| N.A. | N.A. | | | 3 |
| N.A. | N.A. | | | 5 |

N.A. N.A.

| | | | | |
|---|---|---|---|---|
| N.A. | N.A. | Applicable phases (Active if green) | | |
| N.A. | N.A. | Dsn | C&C. | Ops. |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | Score |
| N.A. | N.A. | | | -1 |
| N.A. | N.A. | | | 0 |
| N.A. | N.A. | | | 3 |
| N.A. | N.A. | | | 5 |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

N.A. N.A.

| | | | | |
|---|---|---|---|---|
| N.A. | N.A. | Applicable phases (Active if green) | | |
| N.A. | N.A. | Dsn | | Ops. |
| N.A. | N.A. | ● | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | |
| N.A. | N.A. | | | Score |
| N.A. | N.A. | | | -1 |
| N.A. | N.A. | | | 0 |
| N.A. | N.A. | | | 3 |
| N.A. | N.A. | | | 5 |

| **C6 Other Local and Regional Impacts** | ● | ● | Not applicable (decided in Glasgow) |
|---|---|---|---|

C6.1 Cumulative thermal changes to lake water or sub-surface aquifers.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that building operations involving ground-source or ground-water heat pumps do not change the average annual temperature of sub-surface aquifers, nor affect the water quality of such aquifers.* | Applicable phases (Active if green) | | |
| Indicator | Predictions of changes in the average annual temperature of sub-surface aquifers, determined by simulation studies. | Dsn | | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | For Total Project if a water-source or ground-source heat pumps (GSHP) is being used. | | | |
| #REF! | Review of mechanical drawings, specifications and equipment by geophysical engineer. | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Total project | Total Project | | Deg. C | Score |
| Negative | Studies predict that operations of ground-source or ground-water heat pumps may change the average annual temperature of sub-surface aquifers by : | | 1.8 | -1 |
| Acceptable practice | | | 1.5 | 0 |
| Good Practice | | | 0.6 | 3 |
| Best Practice | | | 0.0 | 5 |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C6.2 Heat Island Effect - landscaping and paved areas.

Not applicable to Crealys context

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that open areas of the site are either landscaped, or are paved with reflective materials, to minimize infrared re-radiation to the atmosphere that would increase the urban heat island effect.* | Applicable phases (Active if green) | | |
| Indicator | Reflectance and area of paved and landscaped areas, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | Total Project | | | |
| Assessment method | Review of landscaping plans and design team analysis. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Total project | Total Project | | Percent | Score |
| Negative | Drawings and specifications indicate that the area of landscaped open area plus paved areas with a surface reflectance of 60% or greater, as a percentage of total open area (site area minus building footprint) is : | | 40% | -1 |
| Acceptable practice | | | 50% | 0 |
| Good Practice | | | 80% | 3 |
| Best Practice | | | 100% | 5 |

## C6.3 Heat Island Effect - roofing.

Not applicable to Crealys context

| | | | | |
|---|---|---|---|---|
| Intent | *To encourage the use of roofing systems with high reflectance or a landscaped or green roof, or a combination of these, so that reflected infrared radiation to the atmosphere is minimized.* | Applicable phases (Active if green) | | |
| Indicator | Reflectance and area of roofing material; or the use of a green roof, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | References x, y and z | | | |
| Applicable project type | Total Project | | | |
| Assessment method | Review of roofing specifications. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Total project | Total Project | | Percent | Score |
| Negative | According to drawings and specifications, the percentage of total roof area provided with a Green roof or a roofing system with a surface reflectance of 60%, or a combination of these, is : | | 0% | -1 |
| Acceptable practice | | | 0% | 0 |
| Good Practice | | | 60% | 3 |
| Best Practice | | | 100% | 5 |

| Benchmarks C for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## C6.4 Atmospheric light pollution.

Not applicable to Crealys context

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize the spillage of light into the atmosphere from ground-level sources.* | Applicable phases (Active if green) | | |
| Indicator | Percentage of total exterior light output that lies outside a vertical 120 degree cone, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | 0 | ● | | |
| Applicable project type | Total Project | | | |
| Assessment method | Review of building and site illumination plans and design team analysis. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | Percent | Score |
|---|---|---|---|
| Negative | The percentage of total exterior light output that lies outside a vertical 120 degree cone, as indicated by drawings and specifications is : | 90% | -1 |
| Acceptable practice | | 75% | 0 |
| Good Practice | | 30% | 3 |
| Best Practice | | 0% | 5 |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

# D Indoor Environmental Quality

## D1 Indoor Air Quality

### D1.1 Pollutant migration between occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *Ensure that areas that contain equipment or activities generating chemical pollutants, are separately ventilated and isolated from other occupied spaces. Examples include copier rooms, waste storage areas and janitorial rooms.* | Applicable phases (active if green) | | |
| Indicator | Measures taken to isolate areas or rooms where pollutants may be generated, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | 0 | ● | | |
| Applicable project type | Separate by occupancy type. | | | |
| #REF! | Review of contract documents and mechanical system by an oustide mechanical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | on | | Score |
| Negative | Drawings and specifications indicate that some rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants are not separately ventilated. | | | -1 |
| Acceptable practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated. | | | 0 |
| Good Practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated and there is little possibility of migration to or from other occupied spaces. | | | 3 |
| Best Practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated and there is NO possibility of migration to or from other occupied spaces. | | | 5 |
| Occupancy 2 | Office | on | | Score |
| Negative | Drawings and specifications indicate that some rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants are not separately ventilated. | | | -1 |
| Acceptable practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated. | | | 0 |
| Good Practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated and there is little possibility of migration to or from other occupied spaces. | | | 3 |
| Best Practice | Drawings and specifications indicate that all rooms and spaces in this occupancy that contain equipment or activities generating chemical pollutants, are separately ventilated and there is NO possibility of migration to or from other occupied spaces. | | | 5 |

### D1.2 CO2 concentrations in indoor air.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *To ensure that carbon dioxide concentrations stay below acceptable levels in typical primary occupancy areas.* | Applicable phases (active if green) | | | | | | |
| Indicator | Designs for HVAC systems that conform to ASHRAE, CIBSE or other acceptable protocol. | Dsn | | Ops. | | | | |
| Information sources | Reference x, y and z | | | | | | | |
| Applicable project type | Non-residential Occupancies, except for Open Space. | | | | | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | | | | | |
| Applicable Standards | a | | | | | | | |
| | b | | | | | | | |
| | c | | | | | | | |
| | d | | | | | | | |
| Information Submittals | e | | | | | | | |
| | f | | | | | | | |
| Occupancy 1 | Small Industrial | on | ppm | Score | Values proposed by JMH | instead of | Source: EN 13 779 | |
| Negative | Designs for HVAC systems, carried out in accordance with ASHRAE, CIBSE or other acceptable standards, predict concentrations of CO2 during operating conditions equal to or less than : | | 1160 | -1 | 1 000 | 1 000 | 1 200 | |
| Acceptable practice | | | 1050 | 0 | 800 | 800 | 800 | |
| Good Practice | | | 720 | 3 | 700 | 700 | 500 | |
| Best Practice | | | 500 | 5 | 600 | 600 | 350 | |
| Occupancy 2 | Office | on | ppm | Score | Values proposed by JMH | instead of | Source: EN 13 779 | |
| Negative | Designs for HVAC systems, carried out in accordance with ASHRAE, CIBSE or other acceptable standards, predict concentrations of CO2 during operating conditions equal to or less than : | | 640 | -1 | 1 000 | 1 000 | 1 200 | |
| Acceptable practice | | | 600 | 0 | 800 | 800 | 800 | |
| Good Practice | | | 480 | 3 | 500 | 700 | 500 | |
| Best Practice | | | 400 | 5 | 350 | 600 | 350 | |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D1.3 IAQ monitoring during project operations.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure long-term indoor air quality in non-residential occupancies by installing a permanent carbon dioxide monitoring system to provide objective data on indoor air quality, with monitoring points located in typical primary occupancy areas.* | Applicable phases (active if green) | | |
| Indicator | Measures anticipated to ensure adequate monitoring of IAQ quality. | Dsn | | Ops. |
| Information sources | Reference A, B and C. | | | |
| Applicable project type | By separate occupancies except outdoor space. | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | on | | Score |
| Negative | No specific measures are anticipated to ensure adequate and on-going monitoring of IAQ quality in public areas. | | | -1 |
| Acceptable practice | Annual monitoring is anticipated to assess IAQ quality in public areas. | | | 0 |
| Good Practice | Quarterly monitoring is anticipated to assess IAQ quality in public areas. | | | 3 |
| Best Practice | Daily monitoring is anticipated to assess IAQ quality in public areas. | | | 5 |
| Occupancy 2 | Office | on | | Score |
| Negative | No specific measures are anticipated to ensure adequate and on-going monitoring of IAQ quality in public areas. | | | -1 |
| Acceptable practice | Annual monitoring is anticipated to assess IAQ quality in public areas. | | | 0 |
| Good Practice | Quarterly monitoring is anticipated to assess IAQ quality in public areas. | | | 3 |
| Best Practice | Daily monitoring is anticipated to assess IAQ quality in public areas. | | | 5 |

# D2 Ventilation

## D2.1 Effectiveness of ventilation in naturally ventilated occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that the number, placement and type of windows or other openings in a naturally-ventilated building are capable of providing a high level of air quality and ventilation.* | Applicable phases (active if green) | | |
| Indicator | Area and location of windows that provide natural ventilation. | Dsn | | Ops. |
| Information sources | Cross-ventilation is defined as spaces where openable windows are located on at least two separate walls. | ● | | |
| Applicable project type | By separate occupancies for buildings under a defined height limit. | Height limit, floors | | 16 |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer with specific knowledge of natural ventilation issues. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | M | | Score |
| Negative | The aggregate area of openings from primary occupancy areas to the exterior is less than 5% of the aggregate primary floor area, and less than 50% of all primary spaces have cross-ventilation. | | | -1 |
| Acceptable practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 5% of the aggregate primary floor area, and more than 50% of all primary spaces have cross-ventilation. | | | 0 |
| Good Practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 5% of the aggregate primary floor area, and at more than 75% of all primary spaces have cross-ventilation. | | | 3 |
| Best Practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 10% of the aggregate primary floor area, and more than 90% of all primary spaces have cross-ventilation. | | | 5 |
| Occupancy 2 | Office | M | | Score |
| Negative | The aggregate area of openings from primary occupancy areas to the exterior is less than 5% of the aggregate primary floor area, and less than 50% of all primary spaces have cross-ventilation. | | | -1 |
| Acceptable practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 5% of the aggregate primary floor area, and more than 50% of all primary spaces have cross-ventilation. | | | 0 |
| Good Practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 5% of the aggregate primary floor area, and at more than 75% of all primary spaces have cross-ventilation. | | | 3 |
| Best Practice | The aggregate area of openings from primary occupancy areas to the exterior is at least 10% of the aggregate primary floor area, and more than 90% of all primary spaces have cross-ventilation. | | | 5 |

# Benchmarks D for designated occupancies in BigTown, Europe

| Uses included |
|---|
| Small Industrial |
| Office |
| 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## D2.2 Air quality and ventilation in mechanically ventilated occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that mechanical ventilation and cooling systems are designed in a manner that will ensure a satisfactory level of air quality and ventilation.* | Applicable phases (active if green) | | |
| Indicator | Conformance of the design to the requirements of a recognized relevant standard, such as ASHRAE or CIBSE. | Dsn | | Ops. |
| Information sources | Reference x, y and z | | | |
| Applicable project type | Any occupancy except Outdoor Area | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | | M | Score |
| Negative | Mechanical ventilation in some primary occupancy areas does not fully satisfy the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | -1 |
| Acceptable practice | Mechanical ventilation in some primary occupancy areas meets the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 0 |
| Good Practice | Mechanical ventilation in more than 50% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 3 |
| Best Practice | Mechanical ventilation in 100% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 5 |
| Occupancy 2 | Office | | M | Score |
| Negative | Mechanical ventilation in some primary occupancy areas does not fully satisfy the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | -1 |
| Acceptable practice | Mechanical ventilation in some primary occupancy areas meets the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 0 |
| Good Practice | Mechanical ventilation in more than 50% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 3 |
| Best Practice | Mechanical ventilation in 100% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 5 |

## D2.3 Air movement in mechanically ventilated occupancies.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *To ensure that air movement in mechanically ventilated occupancies is sufficient to satisfy requirements for human comfort.* | #REF! | | | | | | |
| Indicator | Predicted air speed in m/s, as indicated by an analysis of proposed HVAC system characteristics or by post-occupancy monitoring. | Dsn | | Ops. | | | | |
| Information sources | Reference x, y and z | | | | | | | |
| Applicable project type | Total project | | | | | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | | | | | |
| Applicable Standards | a | | | | | | | |
| | b | | | | | | | |
| | c | | | | | | | |
| | d | | | | | | | |
| Information Submittals | e | | | | | | | |
| | f | | | | | | | |
| Occupancy 1 | Small Industrial | on | m/s | Score | Values proposed by JMH | instead of | Source | |
| Negative | An analysis of proposed HVAC system characteristics indicates that air speed at working level during typical operating conditions is likely to be : | | 0.0 | -1 | | 0.0 | | |
| Acceptable practice | | | 0.0 | 0 | | 0.0 | | |
| Good Practice | | | 0.0 | 3 | | 0.0 | | |
| Best Practice | | | 0.0 | 5 | | 0.0 | | |
| Occupancy 2 | Office | on | m/s | Score | Values proposed by JMH | instead of | Source | |
| Negative | An analysis of proposed HVAC system characteristics indicates that air speed at working level during typical operating conditions is likely to be : | | 1.2 | -1 | | 1.2 | | |
| Acceptable practice | | | 1.5 | 0 | | 1.5 | | |
| Good Practice | | | 2.4 | 3 | | 2.4 | | |
| Best Practice | | | 3.0 | 5 | | 3.0 | | |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D2.3 Air movement in mechanically ventilated occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that mechanical ventilation and cooling systems are designed in a manner that will ensure a satisfactory level of air quality and ventilation.* | Applicable phases (active if green) | | |
| Indicator | Conformance of the design to the requirements of a recognized relevant standard, such as ASHRAE or CIBSE. | Dsn | | Ops. |
| Information sources | Reference x, y and z | | | |
| Applicable project type | Any occupancy except Outdoor Area | | | |
| #REF! | Review of contract documents and mechanical system by an outside mechanical engineer. | | | |
| Applicable Standards | a | | | |
| | b | text to be revised | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | M | | Score |
| Negative | Mechanical ventilation in some primary occupancy areas does not fully satisfy the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | -1 |
| Acceptable practice | Mechanical ventilation in some primary occupancy areas meets the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 0 |
| Good Practice | Mechanical ventilation in more than 50% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 3 |
| Best Practice | Mechanical ventilation in 100% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 5 |
| Occupancy 2 | Office | M | | Score |
| Negative | Mechanical ventilation in some primary occupancy areas does not fully satisfy the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | -1 |
| Acceptable practice | Mechanical ventilation in some primary occupancy areas meets the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 0 |
| Good Practice | Mechanical ventilation in more than 50% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 3 |
| Best Practice | Mechanical ventilation in 100% of primary occupancy areas exceeds the minimum requirements of ASHRAE 62-2001: Ventilation for Acceptable Indoor Air Quality or the equivalent CIBSE or other standard. | | | 5 |

## D2.4 Effectiveness of ventilation in mechanically ventilated occupancies.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *Ensure, through the use of appropriate simulation programs, that the ventilation system in mechanically-ventilated non-residential occupancies will bring ventilation air to where it is needed, i.e. to seating areas or workers or visitors.* | Applicable phases (active if green) | | | | | | |
| Indicator | Percent of ventilation air reaching work surfaces, as indicated by an analysis of proposed HVAC system and room characteristics. | Dsn | | Ops. | | | | |
| Information sources | Reference x, y and z | | | | | | | |
| Applicable project type | Non-residential Occupancies. | | | | | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | | | | | |
| Applicable Standards | a | | | | | | | |
| | b | | | | | | | |
| | c | | | | | | | |
| | d | | | | | | | |
| Information Submittals | e | | | | | | | |
| | f | | | | | | | |
| Occupancy 1 | Small Industrial | on | Eac | Score | Values proposed by JMH | instead of | Source | |
| Negative | An analysis of proposed HVAC system and room characteristics in mechanically ventilated areas of the occupancy indicates that the air change effectiveness (Eac), as determined by ASHRAE 129–1997 or equivalent CIBSE or other standard, of : | | 80% | -1 | 80% | 80% | o.k. with proposal | |
| Acceptable practice | | | 80% | 0 | 80% | 80% | o.k. with proposal | |
| Good Practice | | | 89% | 3 | 89% | 89% | o.k. with proposal | |
| Best Practice | | | 95% | 5 | 95% | 95% | o.k. with proposal | |
| Occupancy 2 | Office | on | Eac | Score | Values proposed by JMH | instead of | Source | |
| Negative | An analysis of proposed HVAC system and room characteristics in mechanically ventilated areas of the occupancy indicates that the air change effectiveness (Eac), as determined by ASHRAE 129–1997 or equivalent CIBSE or other standard, of : | | 80% | -1 | 80% | 80% | o.k. with proposal | |
| Acceptable practice | | | 80% | 0 | 80% | 80% | o.k. with proposal | |
| Good Practice | | | 89% | 3 | 89% | 89% | o.k. with proposal | |
| Best Practice | | | 95% | 5 | 95% | 95% | o.k. with proposal | |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D3 Air Temperature and Relative Humidity

### D3.1 Air temperature and relative humidity in mechanically heated occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure acceptable temperature and humidity control within established ranges per climate zone, and to provide on-going monitoring of thermal comfort performance and the effectiveness of humidification and/or dehumidification system.* | Applicable phases (active if green) | | |
| Indicator | Compliance of mechanical ventilation systems with recognized design standards such as ASHRAE or CIBSE. | Dsn | | Ops. |
| Information sources | Reference x, y and z | | | |
| Applicable project type | All mechanically ventilated occupancies. | . | | |
| #REF! | Review of contract documents and mechanical system by an outside mechanical engineer. | | | |
| Applicable Standards | a<br>b<br>c | text to be revised | | |
| Information Submittals | d<br>e<br>f | | | |

| Occupancy 1 | Small Industrial | on | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The mechanical system design does not comply with ASHRAE 55-1992, or other similar standard such as CIBSE, or the variation from setpoints exceeds 5 deg. C: | | -1 | ≥ 19°C | < 5°C | |
| Acceptable practice | The mechanical system design complies with ASHRAE 55-1992, or complies with other similar standard such as CIBSE. Temperature variation from setpoints does not exceed 3 deg. C. | | 0 | ≥ 21°C | < 3°C | RGPT |
| Good Practice | The mechanical system design complies with ASHRAE 55-1992, or complies with other similar standard such as CIBSE. Temperature variation from setpoints does not exceed 2 deg. C. | | 3 | ≥ 23°C | < 2°C | intermediate value between neighboor ones |
| Best Practice | The mechanical system design complies with ASHRAE 55-1992, or complies with other similar standard such as CIBSE. A permanent monitoring system provides feedback on temperature and humidity conditions. Temperature variation from setpoints does not exceed 1 deg. C. | | 5 | ≤ 25°C | < 1°C | smallest PPD as possible |

### D3.2 Air temperature and relative humidity in mechanically cooled occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure acceptable temperature within established ranges per climate zone in naturally ventilated occupancies.* | Applicable phases (active if green) | | |
| Indicator | Predicted ability of natural ventilation systems to maintain temperatures within an acceptable range, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | ASHRAE 55-1992, Addenda 1995 or equivalent CIBSE or other recognized standard. | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer with specific knowledge of natural ventilation issues. | | | |
| Applicable Standards | a<br>b<br>c | text to be revised | | |
| Information Submittals | d<br>e<br>f | | | |

| Total project | Total Project | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|
| Negative | According to recognized predictive techniques, the temperature in primary occupancy areas can NOT be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 6 deg. C. | -1 | ≤ 28°C | 90% in range of 6°C | ASHRAE |
| Acceptable practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 4 deg. C. | 0 | ≤ 24°C | 90% in range of 4°C | RGPT |
| Good Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 3 deg. C. | 3 | ≤ 22°C | 90% in range of 3°C | intermediate value between neighboor ones |
| Best Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 2 deg. C. | 5 | ≤ 20°C | 90% in range of 2°C | smallest PPD as possible |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D3.3 Time lag and decrement factor

| | | Applicable phases (active if green) | | |
|---|---|---|---|---|
| Intent | *To ensure acceptable temperature within established ranges per climate zone in naturally ventilated occupancies.* | | | |
| Indicator | Predicted ability of natural ventilation systems to maintain temperatures within an acceptable range, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | ASHRAE 55-1992, Addenda 1995 or equivalent CIBSE or other recognized standard. | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer with specific knowledge of natural ventilation issues. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

text to be revised

| Total project | Total Project | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|
| Negative | According to recognized predictive techniques, the temperature in primary occupancy areas can NOT be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 6 deg. C. | -1 | 6°C | 90% in range of 6°C | o.k. with proposal and confirmed other values |
| Acceptable practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 4 deg. C. | 0 | 4°C | 90% in range of 4°C | RGPT : 20 to 24°C |
| Good Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 3 deg. C. | 3 | 3°C | 90% in range of 3°C | intermediate value between neighboor ones |
| Best Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 2 deg. C. | 5 | 2°C | 90% in range of 2°C | NEN 13 779 |

## D3.4 Air temperature in naturally ventilated occupancies.

| | | Applicable phases (active if green) | | |
|---|---|---|---|---|
| Intent | *To ensure acceptable temperature within established ranges per climate zone in naturally ventilated occupancies.* | | | |
| Indicator | Predicted ability of natural ventilation systems to maintain temperatures within an acceptable range, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | ASHRAE 55-1992, Addenda 1995 or equivalent CIBSE or other recognized standard. | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer with specific knowledge of natural ventilation issues. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Total project | Total Project | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|
| Negative | According to recognized predictive techniques, the temperature in primary occupancy areas can NOT be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 6 deg. C. | -1 | 6°C | 90% in range of 6°C | o.k. with proposal and confirmed other values |
| Acceptable practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 4 deg. C. | 0 | 4°C | 90% in range of 4°C | RGPT : 20 to 24°C |
| Good Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 3 deg. C. | 3 | 3°C | 90% in range of 3°C | intermediate value between neighboor ones |
| Best Practice | According to recognized predictive techniques, the temperature in primary occupancy areas can be kept, for more than 90% of occupied hours, within a swing range (+ or -) of 2 deg. C. | 5 | 2°C | 90% in range of 2°C | NEN 13 779 |

# Benchmarks D for designated occupancies in BigTown, Europe

| Uses included | |
|---|---|
| | Small Industrial |
| | Office |
| | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## D4 Daylighting and Illumination

### D4.1 Daylighting in primary occupancy areas.

| | | Applicable phases (active if green) | | |
|---|---|---|---|---|
| Intent | *To ensure an adequate level of daylighting in all primary occupied spaces.* | | | |
| Indicator | The predicted Daylight Factor in a typical occupancy area located on the ground floor of the building, as indicated by drawings and specifications. | Dsn | | Ops. |
| Information sources | x | | | |
| Applicable project type | By separate occupancies | | | |
| Assessment method | Review of contract documents by an illumination specialist. | | | |
| Applicable Standards | a<br>b<br>c<br>d | | | |
| Information Submittals | e<br>f | | | |

| Occupancy 1 | Small Industrial | M | DF | Score | Values proposed by JMH | instead of | Source: littérature |
|---|---|---|---|---|---|---|---|
| Negative | The predicted Daylight Factor in a typical workspace located on the ground floor of the occupancy, as indicated by drawings and specifications. | | 1.8% | -1 | 1.0% | 1.6% | circulation areas |
| Acceptable practice | | | 2.0% | 0 | 2.0% | 2.0% | standard workshop |
| Good Practice | | | 2.6% | 3 | 3.0% | 2.4% | (intermediate value) |
| Best Practice | | | 3.0% | 5 | 5.0% | 3.0% | for precise tasks |
| Occupancy 2 | Office | on | DF | Score | Values proposed by JMH | instead of | |
| Negative | The predicted Daylight Factor in a typical workspace located on the ground floor of the occupancy, as indicated by drawings and specifications. | | 0.0% | -1 | 1.0% | 0.0% | circulation areas |
| Acceptable practice | | | | 0 | 2.0% | | standard office |
| Good Practice | | | 0.0% | 3 | 3.0% | 0.0% | (intermediate value) |
| Best Practice | | | | 5 | 5.0% | | drawing office |

### D4.2 Glare in non-residential occupancies.

| | | #REF! | | |
|---|---|---|---|---|
| Intent | *To ensure that glare conditions are minimized in main occupancy areas during periods of maximum exterior brightness, through the use of exterior or interior shading.* | | | |
| Indicator | The predicted maximum ratio of contrast in illuminance between windows and adjacent wall areas in a typical occupancy area, as indicated by design characteristics. | Dsn | | Ops. |
| Information sources | Glare shall be measured by the contrast between window areas and adjacent wall areas, as seen from the interior. | | | |
| Applicable project type | Non-residential occupancies | | | |
| Assessment method | Review of contract documents by an illumination specialist. | | | |
| Applicable Standards | a<br>b<br>c<br>d | | | |
| Information Submittals | e<br>f | | | |

| Occupancy 1 | Small Industrial | on | Ratio | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The predicted maximum ratio of contrast in illuminance between windows and adjacent wall areas in a typical occupancy area, as indicated by design characteristics is : | | 59 | -1 | 40 | 59 | "Médecine et risque du travail" (Ed. Elsevier, 2003) |
| Acceptable practice | | | 50 | 0 | 20 | 50 | |
| Good Practice | | | 23 | 3 | 10 | 23 | |
| Best Practice | | | 5 | 5 | 3 | 5 | |
| Occupancy 2 | Office | on | Ratio | Score | Values proposed by JMH | instead of | Source |
| Negative | The predicted maximum ratio of contrast in illuminance between windows and adjacent wall areas in a typical occupancy area, as indicated by design characteristics is : | | 59 | -1 | 40 | 59 | "Médecine et risque du travail" (Ed. Elsevier, 2003) |
| Acceptable practice | | | 50 | 0 | 20 | 50 | |
| Good Practice | | | 23 | 3 | 10 | 23 | |
| Best Practice | | | 5 | 5 | 3 | 5 | |

| Benchmarks D for designated occupancies in BigTown, Europe | Uses included | Small Industrial |
|---|---|---|
| | | Office |
| | | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## D4.3 Illumination levels and quality of lighting.

| | | Applicable phases (active if green) | | | |
|---|---|---|---|---|---|
| Intent | *To ensure that lighting systems provide adequate illumination and quality levels in public and work areas; and that there is a capability to support the provision of suitable task lighting in work areas.* | | | | |
| Indicator | Appropriateness of illumination levels and lighting quality to planned tasks, in Lux, as indicated by design characteristics. | Dsn | | Ops. | |
| Information sources | Acceptable values range from 30 to 500 Lux for normal tasks, and up to 10,000 Lux for demanding tasks. | ● | ● | ● | 20 to 500, up to 2 000 lux |
| Applicable project type | Non-residential Occupancies, all sizes. | | | | |
| Assessment method | Review of contract documents, especially lighting plans and specs, by an illumination specialist. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| | d | | | | |
| Information Submittals | e | | | | |
| | f | | | | |

| Occupancy 2 | Office | on | Score |
|---|---|---|---|
| Negative | The design indicates that illumination levels and quality of lighting will not be appropriate to planned tasks in the occupancy, and no provision is made for task lighting. | | -1 |
| Acceptable practice | The design indicates that ambient illumination systems will provide illumination levels appropriate to tasks in the occupancy, and provision is made for task lighting. | | 0 |
| Good Practice | The design indicates that ambient illumination systems will provide illumination levels appropriate to tasks in the occupancy, dimmable ballasts are provided, and provision is made for task lighting in each 15 m2 work zone. | | 3 |
| Best Practice | The design indicates that ambient illumination systems will provide illumination levels appropriate to tasks in the occupancy, dimmable ballasts are provided, and provision is made for task lighting in each 10 m2 work zone. | | 5 |

## D5 Noise and Acoustics ● ●

## D5.1 Noise attenuation through the exterior envelope.

| | | Applicable phases (active if green) | | |
|---|---|---|---|---|
| Intent | *Ensure that noise attenuation through the wall facing the noisiest site boundary is adequate to provide interior noise levels that will not interfere with normal tasks.* | | | |
| Indicator | The predicted noise attenuation performance of the exterior wall most exposed to potential sources of noise, as indicated by design characteristics. | Dsn | | Ops. |
| Information sources | http://greenbuildings.santa-monica.org/envelope/envventilation.html | | | |
| Applicable project type | Total Project | | | |
| Assessment method | Review of design team analysis by a noise specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Total project | Total Project | STC | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | Design documents indicate that windows in the exterior wall of the Design exposed to the most significant sources of external noise will have a Sound Transmission Class, or equivalent, of : | 29.7 | -1 | 26.0 | 29.7 | |
| Acceptable practice | | 27.5 | 0 | 29.0 | 27.5 | standard value of STC |
| Good Practice | | 34.1 | 3 | 34.0 | 34.1 | acoustic glass |
| Best Practice | | 38.5 | 5 | 41.0 | 38.5 | 2 glasses + 10 cm space between them |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D5.2 Transmission of facility equipment noise to primary occupancies.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that HVAC systems and equipment rooms are designed to minimize noise transmission to primary occupancies.* | Applicable phases (Active if green) | | |
| Indicator | Noise Reduction Criteria ratings of mechanical equipment and equipment rooms, as indicated by design characteristics. | Dsn | | Ops. |
| Information sources | Reference x, y and z." | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of contract documents and mechanical system by an outside mechanical engineer. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Total project | Total Project | NRC | Score | Values proposed by JMH | instead of | Source: Belgian acoustic standard |
|---|---|---|---|---|---|---|
| Negative | Design documents indicate that HVAC systems and equipment rooms are designed for a Noise Reduction Criteria (NRC) of : | 37.0 | -1 | 37.0 | 37.0 | |
| Acceptable practice | | 35.0 | 0 | 29.0 | 35.0 | normal acoustic comfort |
| Good Practice | | 29.0 | 3 | 34.0 | 29.0 | intermediate value |
| Best Practice | | 25.0 | 5 | 41.0 | 25.0 | superior acoustic comfort |

## D5.3 Noise attenuation between primary occupancy areas.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that measures have been taken to reduce noise impacts between all tenancies and occupancy types.* | Applicable phases (active if green) | | |
| Indicator | Minimum Sound Transmission Class of partitions between primary occupancy areas, as indicated by design characteristics. | Dsn | | Ops. |
| Information sources | Reference x, y and z." | | | |
| Applicable project type | Total project | | | |
| Assessment method | Review of design team analysis. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Total project | Total Project | STC | Score | Values proposed by JMH | instead of | Source: Belgian acoustic standard |
|---|---|---|---|---|---|---|
| Negative | Design documents indicate that the Minimum Sound Transmission Class of partitions between primary occupancy areas will be : | 23.0 | -1 | 50.0 | 23.0 | |
| Acceptable practice | | 25.0 | 0 | 54.0 | 25.0 | standard: normal comfort |
| Good Practice | | 31.0 | 3 | 59.0 | 31.0 | |
| Best Practice | | 35.0 | 5 | 62.0 | 35.0 | standard: superior comfort |

| Benchmarks D for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## D5.4 Acoustic performance within primary occupancy areas.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that primary occupancies are designed to ensure a satisfactory level of acoustic performance.* | Applicable phases (active if green) | | |
| Indicator | Predicted reverberation time in seconds, as indicated by design characteristics. | Dsn | | Ops. |
| Information sources | Although acoustics is a complex science, only reverbation time is dealt with here. | | | |
| Applicable project type | Non-residential occupancies, all sizes | | | |
| Assessment method | Where needed, review of design team analysis by an acoustic specialist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Occupancy 1 | Small Industrial | on | | Score |
| Negative | Design documents indicate that reverberation time in primary occupancy areas will be more than 3.5 seconds or less than 0.5 second. | | | -1 |
| Acceptable practice | Design documents indicate that reverberation time in primary occupancy areas will be between 3.5 seconds and 0.5 second. | | | 0 |
| Good Practice | Design documents indicate that reverberation time in primary occupancy areas will be between 3 seconds and 1 second. | | | 3 |
| Best Practice | Design documents indicate that reverberation time in primary occupancy areas will be between 2.5 seconds and 1.5 second. | | | 5 |
| Occupancy 2 | Office | on | | Score |
| Negative | Design documents indicate that reverberation time in primary occupancy areas will be more than 3.5 seconds or less than 0.5 second. | | | -1 |
| Acceptable practice | Design documents indicate that reverberation time in primary occupancy areas will be between 3.5 seconds and 0.5 second. | | | 0 |
| Good Practice | Design documents indicate that reverberation time in primary occupancy areas will be between 3 seconds and 1 second. | | | 3 |
| Best Practice | Design documents indicate that reverberation time in primary occupancy areas will be between 2.5 seconds and 1.5 second. | | | 5 |

## D6 Control of electromagnetic emissions

| | | | | |
|---|---|---|---|---|
| | | ● | ● | "magnetic" instead of "electromagnetic" |
| Intent | *To ensure that electro-magnetic emissions are kept to a level that does not harm human health.* | Applicable phases (Active if green) | | |
| Indicator | | Dsn | | Ops. |
| Information sources | The report shown below states that there is no certain standard for EMF. | | | |
| | Environmental Health Perspectives | | | |
| Applicable project type | Total Building, all sizes. | | | |
| Assessment method | 0 | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Total project | Total Project | | | Score |
| Negative | XXXa. | | | -1 |
| Acceptable practice | XXXs | | | 0 |
| Good Practice | XXXd. | | | 3 |
| Best Practice | XXXg. | | | 5 |

text to be revised

| Benchmarks E for designated occupancies in BigTown, Europe | | Uses included | Small Industrial<br>Office<br>0 |
|---|---|---|---|
| New Construction | Design Phase | Generic | . |
| **E Service Quality** | | | ● |

# Benchmarks E for designated occupancies in BigTown, Europe

| Uses included | |
|---|---|
| | Small Industrial |
| | Office |
| | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## E1 Automation of building systems to maximize operational efficiency

| | | | | | |
|---|---|---|---|---|---|
| #REF! | *To encourage the commissioning of building systems with critical functions.* | Applicable phases (Active if green) | | | |
| #REF! | The development of a commissioning plan and the range of systems to be commissioned. | Dsn | C&C. | Ops. | |
| #REF! | It is strongly recommended that the architects and engineers should be involved in the commissioning process, to ensure that the design intent is respected. Costs are estimated as ranging from 0.5% to 1.5%, with specialized facilities much higher. | ● | ● | | |
| Applicable project type | Total building where total net area is more than threshold area. | Threshold area, m2 | | 10 000 | Not applicable to Crealys context |
| #REF! | Review of commissioning management plan. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| | d | | | | |
| Information Submittals | e | | | | |
| | f | | | | |

Revise text

| #REF! | Total project | Score |
|---|---|---|
| Negative | No commissioning plan has been developed and no commissioning activities are planned. | -1 |
| Acceptable practice | A commissioning plan has been developed and some building systems with critical functions are to be commissioned, including life safety systems, central HVAC systems and electrical systems. | 0 |
| Good Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control and electrical systems. | 3 |
| Best Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control, electrical systems and the building envelope. | 5 |

| Benchmarks E for designated occupancies in BigTown, Europe | Uses included | Small Industrial |
|---|---|---|
| | | Office |
| | | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## E2 Ability to modify facility technical systems.

| | | | | |
|---|---|---|---|---|
| #REF! | *To encourage the commissioning of building systems with critical functions.* | Applicable phases (Active if green) | | |
| #REF! | The development of a commissioning plan and the range of systems to be commissioned. | Dsn | C&C. | Ops. |
| #REF! | It is strongly recommended that the architects and engineers should be involved in the commissioning process, to ensure that the design intent is respected. Costs are estimated as ranging from 0.5% to 1.5%, with specialized facilities much higher. | ● | ● | |
| Applicable project type | Total building where total net area is more than threshold area. | Threshold area, m2 | | 0 |
| #REF! | Review of commissioning management plan. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

Revise text

| #REF! | Total project | Score |
|---|---|---|
| Negative | No commissioning plan has been developed and no commissioning activities are planned. | -1 |
| Acceptable practice | A commissioning plan has been developed and some building systems with critical functions are to be commissioned, including life safety systems, central HVAC systems and electrical systems. | 0 |
| Good Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control and electrical systems. | 3 |
| Best Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control, electrical systems and the building envelope. | 5 |

| Benchmarks E for designated occupancies in BigTown, Europe | Uses included | Small Industrial |
|---|---|---|
| | | Office |
| | | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## E3 Commissioning of facility systems

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To encourage the commissioning of building systems with critical functions.* | Applicable phases (Active if green) | | | |
| Indicator | The development of a commissioning plan and the range of systems to be commissioned. | Dsn | C&C. | Ops. | |
| Information sources | It is strongly recommended that the architects and engineers should be involved in the commissioning process, to ensure that the design intent is respected. Costs are estimated as ranging from 0.5% to 1.5%, with specialized facilities much higher. | ● | ● | | |
| Applicable project type | Total building where total net area is more than threshold area. | Threshold area, m2 | | 10 000 | Not applicable to Crealys context |
| #REF! | Review of commissioning management plan. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| | d | | | | |
| Information Submittals | e | | | | |
| | f | | | | |

| #REF! | Total project | Score |
|---|---|---|
| Negative | No commissioning plan has been developed and no commissioning activities are planned. | -1 |
| Acceptable practice | A commissioning plan has been developed and some building systems with critical functions are to be commissioned, including life safety systems, central HVAC systems and electrical systems. | 0 |
| Good Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control and electrical systems. | 3 |
| Best Practice | A commissioning plan has been developed and all building systems with critical functions are to be fully commissioned, including life safety systems, central HVAC systems, lighting, building control, electrical systems and the building envelope. | 5 |

| Benchmarks E for designated occupancies in BigTown, Europe | Uses included | Small Industrial |
|---|---|---|
| | | Office |
| | | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## E4 Maintenance of Operating Performance

### E4.1 Maintenance of building envelope performance.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure that detailed design minimizes the risk of moisture accumulating in the building envelope, where it is likely to shortn the lifespan of building elements, especially if constructed of wood in areas where temperatures can fall to below 0 deg.C.* | Applicable phases (Active if green) | | |
| Indicator | In areas where applicable, the existence of a report that describes and details the measures taken to ensure long-term integrity of the building envelope. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | Any occupancy type where winter design temperatures fall below 0 deg. C. | | | |
| Assessment method | Review of contract documents and engineering analysis of performance during winter conditions. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| #REF! | Total Project | Score |
|---|---|---|
| Negative | Envelope detailing and construction does not follow industry good practice. | -1 |
| Acceptable practice | Envelope detailing and construction follows industry good practice. | 0 |
| Good Practice | Envelope detailing and construction follows best practices, and at least one air-depressurization test is carried out. | 3 |
| Best Practice | Envelope detailing and construction follows best practices, and air-depressurization tests are carried out before and after interior finishes are applied. | 5 |

# Benchmarks E for designated occupancies in BigTown, Europe

| Uses included | |
|---|---|
| | Small Industrial |
| | Office |
| | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## E4.2 Development and implementation of a maintenance management plan.

| | | | | | |
|---|---|---|---|---|---|
| Intent | *To ensure the availability and implementation of a plan for the long-term maintenance and efficient operation of the facility.* | Applicable phases (Active if green) | | | |
| Indicator | The availability of a comprehensive and long-term plan at the end of Design phase, and evidence of its implementation during Operations phase. | Dsn | | Ops. | |
| Information sources | 0 | | | | |
| Applicable project type | Total project, where gross area exceeds threshold area. | Threshold area, m2 | | 10 000 | Not applicable to Crealys context |
| #REF! | Review of operations and maintenance management plan. | | | | |
| Applicable Standards | a | | | | |
| | b | | | | |
| | c | | | | |
| Information Submittals | d | | | | |
| | e | | | | |
| | f | | | | |

| #REF! | Total Project | Score |
|---|---|---|
| Negative | No explicit plan exists for future maintenance and efficient operation of the facility. | -1 |
| Acceptable practice | An explicit plan exists for future maintenance and efficient operation of the facility, but it is not comprehensive and is not long term. | 0 |
| Good Practice | An explicit plan exists for future maintenance and efficient operation of the facility, covering main technical systems, and providing performance targets, system maintenance and replacement guidance over at least a 10-year period. | 3 |
| Best Practice | An explicit plan exists for future maintenance and efficient operation of the facility, covering all technical systems, and providing performance targets, system maintenance and replacement guidance over a 25-year period. | 5 |

| Benchmarks E for designated occupancies in BigTown, Europe | | Uses included | Small Industrial |
|---|---|---|---|
| | | | Office |
| | | | 0 |
| New Construction | Design Phase | Generic | . |

## E4.3 On-going monitoring and verification of performance.

| | | | | |
|---|---|---|---|---|
| Intent | *To ensure the ongoing optimization of building energy and water consumption performance over time.* | Applicable phases (Active if green) | | |
| Indicator | The provision of energy sub-metering systems and water consumption monitoring systems, according to design documentation. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | 0 | | | |
| Assessment method | Review of contract documentation, with special emphasis on the capability of the computerized building management system to manage the gathering and analysis of data from many dispersed locations. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |
| #REF! | Total Project | | | Score |
| Negative | According to design documentation, no sub-metering of energy use will be provided for major occupancies. | | | -1 |
| Acceptable practice | According to design documentation, an energy submetering system is provided for a few major occupancies. | | | 0 |
| Good Practice | According to design documentation, an energy and water submetering system will be provided for the occupancy, occasional air quality tests will be carried out, and a reporting system will be provided. | | | 3 |
| Best Practice | According to design documentation an energy and water submetering system linked to a building management system will be provided for the occupancy, regular air quality tests will be carried out, and a reporting system will be provided. | | | 5 |

# Benchmarks E for designated occupancies in BigTown, Europe

| Uses included |
|---|
| Small Industrial |
| Office |
| 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## E4.4 Retention of as-built drawings and documentation.

| | | | | |
|---|---|---|---|---|
| Intent | *Ensure that as-built architectural, mechanical and electrical drawings, and equipment manuals are available to operating staff and owners, so that they will be able to operate the building efficiently.* | Applicable phases (Active if green) | | |
| Indicator | The scope and quality of design documentation retained for use by building operators, according to design documentation. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | 0 | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| #REF! | Total Project | | | Score |
| Negative | Operations and maintenance manuals have not been provided, or are deficient. Plans for operation do not provide for recording, reporting and documentation protocol for maintenance, or it will be inconsistent with the size and complexity of the building. | | | -1 |
| Acceptable practice | A full set of systems manuals and complete as-built drawings will be been provided. There will be a partial recording, reporting and documentation protocol for maintenance, but somewhat inconsistent with the size and complexity of the building. | | | 0 |
| Good Practice | A full set of operations and maintenance documentation, including a full set of systems manuals, complete as-built drawings and an operations and maintenance guide will be provided. | | | 3 |
| Best Practice | A full set of operations and maintenance documentation, including a full set of systems manuals, complete as-built drawings and an operations and maintenance guide will be provided in both hard-copy and electronic forms. | | | 5 |

# Benchmarks E for designated occupancies in BigTown, Europe

| Uses included |
|---|
| Small Industrial |
| Office |
| 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## E4.5 Provision and maintenance of a building log.

| | | | | |
|---|---|---|---|---|
| Intent | *Assess whether operating events, such as significant events, occupancy density, operating schedule, energy and water consumption, renovations and equipment changes, etc., are all recorded in a building log for future analysis and reference.* | Applicable phases (Active if green) | | |
| Indicator | The maintenance of a building log, of varying degrees of comprehensiveness. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | 0 | | | |
| | a | | | |
| Applicable Standards | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| #REF! | Total Project | Score |
|---|---|---|
| Negative | A building log is not maintained, or it is only sporadically maintained. | -1 |
| Acceptable practice | A building log is continuously maintained, but only a few key parameters are covered, such as energy and water consumption. | 0 |
| Good Practice | A building log is continuously maintained, and contents include all key operating parameters, as well as most relevant supporting data. | 3 |
| Best Practice | A building log is continuously maintained, and contents include all key operating parameters, as well as most relevant supporting data. The log is maintained in a software form that collects operating data from the BMS system. | 5 |

# Benchmarks E for designated occupancies in BigTown, Europe

| Uses included | |
|---|---|
| | Small Industrial |
| | Office |
| | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## E4.6 Skills and knowledge of operating staff.

| | | | | |
|---|---|---|---|---|
| Intent | *To increase the probability that tenants and occupants will operate building systems under their control in an efficient manner. This probability will be increased if incentives are built into sales or lease agreements.* | Applicable phases (Active if green) | | |
| Indicator | The presence of sales agreements or leases that will incent owners or tenants to operate the facilities efficiently. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | All occupancies | | | |
| Assessment method | Review of proposed lease agreements to ascertain incentives and disincentives for efficient day-to-day management. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| #REF! | Total Project | Score |
|---|---|---|
| Negative | Sales agreements or leases will contain no information relating to efficient building operations and heating, cooling and power costs are paid by the building owner. | -1 |
| Acceptable practice | Planned leases will require tenants to pay directly for heating, cooling and electric power usage. | 0 |
| Good Practice | Planned leases will require tenants to pay directly for heating, cooling and electric power usage and information is provided about performance requirements and recommended practices. | 3 |
| Best Practice | Planned leases will require tenants to pay directly for heating, cooling and electric power usage, information is provided about performance requirements and recommended practices and performance incentives are provided. | 5 |

| Benchmarks F for designated occupancies in BigTown, Europe | | Uses included | Small Industrial<br>Office<br>0 | |
|---|---|---|---|---|
| New Construction | Design Phase | Generic | | . |

## F Social and Economic aspects

### F1 Social Aspects

rejected in Glasgow, because considered as mandatory

#### F1.1 Minimization of construction accidents.

| | | | | |
|---|---|---|---|---|
| Intent | *To minimize accidents causing injury or death to construction workers.* | Applicable phases (Active if green) | | |
| Indicator | Target rate for accidents on the jobsite requiring hospitalization per 100,000 hours worked. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | 0 | | | |
| Assessment method | Review of construction management plans by specialist in construction safety. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Total project | Total Project | Rate | Score |
|---|---|---|---|
| Negative | Target rate for accidents on the jobsite requiring hospitalization per 100,000 hours worked is : | 0.60 | -1 |
| Acceptable practice | | 0.50 | 0 |
| Good Practice | | 0.20 | 3 |
| Best Practice | | 0.00 | 5 |

| Benchmarks F for designated occupancies in BigTown, Europe | | Uses included | Small Industrial<br>Office<br>0 | |
|---|---|---|---|---|
| New Construction | Design Phase | Generic | | . |

## F1.2 Access for physically handicapped persons.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To assess the relative ease of access and use of facilities for persons with physical handicaps.* | | | |
| Indicator | The scope and quality of design measures planned to facilitate access and use of building facilities by handicapped persons. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | By separate occupancies | | | |
| Assessment method | Review of construction documents by a specialist in universal access design. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | On | Score |
|---|---|---|---|
| Negative | Design documentation indicates that not all key facilities in the occupancy, including entry points, washrooms and vertical circulation systems, are accessible to wheelchair users and visually impaired persons. | | -1 |
| Acceptable practice | Design documentation indicates that all key facilities in the occupancy, including entry points, washrooms and vertical circulation systems, are accessible to wheelchair users and visually impaired persons. | | 0 |
| Good Practice | Design documentation indicates that all key facilities in the occupancy, including entry points, washrooms, vertical circulation systems and support facilities, are accessible to wheelchair users and visually impaired persons. | | 3 |
| Best Practice | Same as Good Practice. | | 5 |

| Occupancy 2 | Office | on | Score |
|---|---|---|---|
| Negative | Design documentation indicates that not all key facilities in the occupancy, including entry points, washrooms and vertical circulation systems, are accessible to wheelchair users and visually impaired persons. | | -1 |
| Acceptable practice | Design documentation indicates that all key facilities in the occupancy, including entry points, washrooms and vertical circulation systems, are accessible to wheelchair users and visually impaired persons. | | 0 |
| Good Practice | Design documentation indicates that all key facilities in the occupancy, including entry points, washrooms, vertical circulation systems and support facilities, are accessible to wheelchair users and visually impaired persons. | | 3 |
| Best Practice | Same as Good Practice. | | 5 |

# Benchmarks F for designated occupancies in BigTown, Europe

| Uses included | |
|---|---|
| | Small Industrial |
| | Office |
| | 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## F1.3 Access to views from work areas.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Intent | *To assess the extent to which the distance from a workstation to the exterior and the interior organization of the space does not limit visual access to exterior views.* | Applicable phases (Active if green) | | | | | | |
| Indicator | Distance of the most remote workstation in a typical primary occupancy from exterior windows; and the extent to which interior organization provides exterior views. | Dsn | | Ops. | | | | |
| Information sources | 0 | | | | | | | |
| Applicable project type | For non-residential occupancies, all sizes. | | | | | | | |
| #REF! | Review of analysis prepared by the design team. | | | | | | | |
| Applicable Standards | a | | | | | | | |
| | b | | | | | | | |
| | c | | | | | | | |
| | d | | | | | | | |
| Information Submittals | e | | | | | | | |
| | f | | | | | | | |
| Occupancy 1 | Small Industrial | on | m. | Score | Values proposed by JMH | instead of | Source | |
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 11 | -1 | | 11 | | |
| Acceptable practice | | | 10 | 0 | | 10 | | |
| Good Practice | | | 6 | 3 | | 6 | | |
| Best Practice | | | 4 | 5 | | 4 | | |
| Occupancy 2 | Office | On | m. | Score | Values proposed by JMH | instead of | Source | |
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 11 | -1 | | 11 | | |
| Acceptable practice | | | 10 | 0 | | 10 | | |
| Good Practice | | | 6 | 3 | | 6 | | |
| Best Practice | | | 4 | 5 | | 4 | | |

## F1.4 Social utility of primary building function

rejected in Glasgow

| | | | | |
|---|---|---|---|---|
| Intent | *To assess the extent to which the primary occupancy function of the project satisfies basic societal needs.* | Applicable phases (Active if green) | | |
| Indicator | The degree of social relevance of the primary occupancy. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | All occupancies | | | |
| Assessment method | Review of planned primary occupancy type by expert panel that includes a sociologist and an economist. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |
| Total project | Total Project | | | Score |
| Negative | The planned primary occupancy serves a function that will work against regional social values or stability. | | | -1 |
| Acceptable practice | The planned primary occupancy serves a function that is not likely to have either a negative or positive impact on regional social values or stability. | | | 0 |
| Good Practice | The planned primary occupancy serves a function that is likely to have a positive impact on regional social values or stability. | | | 3 |
| Best Practice | The planned primary occupancy serves a function that is likely to have a very positive impact on regional social values or stability. | | | 5 |

# Benchmarks F for designated occupancies in BigTown, Europe

| Uses included |
|---|
| Small Industrial |
| Office |
| 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## F2 Cost and Economics

### F2.1 Minimization of life-cycle cost.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To assess the level of total Life Cycle Cost of the project* | | | |
| Indicator | Predicted Life Cycle Cost over a 25-year period, with calculations carried out in accordance with recognized procedures. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | 0 | | | |
| Assessment method | Review of LCC analysis by a qualified cost consultant. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | on | EUR per m2 | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 9 880 | -1 | | 9 880 | |
| Acceptable practice | | | 9 500 | 0 | | 9 500 | |
| Good Practice | | | 8 360 | 3 | | 8 360 | |
| Best Practice | | | 7 600 | 5 | | 7 600 | |

| Occupancy 2 | Office | on | EUR per m2 | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 12 840 | -1 | | 12 840 | |
| Acceptable practice | | | 12 000 | 0 | | 12 000 | |
| Good Practice | | | 9 480 | 3 | | 9 480 | |
| Best Practice | | | 7 800 | 5 | | 7 800 | |

### F2.2 Minimization of construction cost.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To assess the difference between the capital cost of the Design with that of a reference building designed according to standards of Acceptable Practice.* | | | |
| Indicator | Predicted construction cost per unit area, according to design documentation. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | For individual occupancies, all sizes | | | |
| Assessment method | Review of cost analysis by a qualified cost consultant. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| Information Submittals | d | | | |
| | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | on | EUR/m2 | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 2 100 | -1 | | 2 100 | BEP : ? |
| Acceptable practice | | | 2 000 | 0 | | 2 000 | BEP : ? |
| Good Practice | | | 1 700 | 3 | | 1 700 | BEP : ? |
| Best Practice | | | 1 500 | 5 | | 1 500 | BEP : ? |

| Occupancy 2 | Office | on | EUR per m2 | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 1 120 | -1 | | 1 120 | BEP : ? |
| Acceptable practice | | | 1 100 | 0 | | 1 100 | BEP : ? |
| Good Practice | | | 1 040 | 3 | | 1 040 | BEP : ? |
| Best Practice | | | 1 000 | 5 | | 1 000 | BEP : ? |

| Benchmarks F for designated occupancies in BigTown, Europe | | Uses included | Small Industrial<br>Office<br>0 |
|---|---|---|---|
| New Construction | Design Phase | Generic | . |

# Benchmarks F for designated occupancies in BigTown, Europe

| Uses included |
|---|
| Small Industrial |
| Office |
| 0 |

| New Construction | Design Phase | Generic | . |
|---|---|---|---|

## F2.3 Minimization of operating and maintenance cost.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To assess the difference between the operating cost of the Design with that of a reference building designed according to standards of Acceptable Practice.* | | | |
| Indicator | Operating cost per unit area for energy, water & maintenance, according to design documentation. | Dsn | | Ops. |
| Information sources | The operating cost of a high-performance building should be substantially less than Acceptable Practice, primarily because of reduced energy, water and equipment maintenance costs. | | | |
| Applicable project type | For individual occupancies, all sizes | | | |
| Assessment method | Review of operating cost projections by a cost consultant and a person knowledgable in building operations. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

| Occupancy 1 | Small Industrial | on | EUR per m2 | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 17 | -1 | | 17 | BEP : ? |
| Acceptable practice | | | 15 | 0 | | 15 | BEP : ? |
| Good Practice | | | 11 | 3 | | 11 | BEP : ? |
| Best Practice | | | 8 | 5 | | 8 | BEP : ? |

| Occupancy 2 | Office | on | EUR per m2 | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|---|
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | | 6 | -1 | | 6 | BEP : ? |
| Acceptable practice | | | 5 | 0 | | 5 | BEP : ? |
| Good Practice | | | 3 | 3 | | 3 | BEP : ? |
| Best Practice | | | 2 | 5 | | 2 | BEP : ? |

## F2.5 Support of Local Economy.

| | | Applicable phases (Active if green) | | |
|---|---|---|---|---|
| Intent | *To encourage the purchase of a significant level of construction goods and services within the economic region.* | | | |
| Indicator | Prediction of the percentage of construction expenditures for goods and services going to firms with permanent offices in the urban region. | Dsn | | Ops. |
| Information sources | 0 | | | |
| Applicable project type | For Total Project, all sizes. | | | |
| #REF! | Review of expendture program and sample analysis of material billing to verify costs. | | | |
| Applicable Standards | a | | | |
| | b | | | |
| | c | | | |
| | d | | | |
| Information Submittals | e | | | |
| | f | | | |

based on cost, construction , labour %

| Total project | Total Project | Percent | Score | Values proposed by JMH | instead of | Source |
|---|---|---|---|---|---|---|
| Negative | The maximum distance from the most remote work location in a typical primary occupancy to exterior windows is : | 44% | -1 | | 44% | BEP : ? |
| Acceptable practice | | 50% | 0 | | 50% | BEP : ? |
| Good Practice | | 68% | 3 | | 68% | BEP : ? |
| Best Practice | | 80% | 5 | | 80% | BEP : ? |