Design Guidelines & Pamphlets for Planning and Designing of Zero Energy Buildings (ZEBs) in Japan

November 2018
Sustainable open Innovation Initiative
Nomura Research Institute, Ltd.
1. Definition of ZEBs

2. Design Guidelines and Pamphlets of ZEB

3. Typical Examples of ZEBs for Each Building Use

4. Aiming to Realization and Dissemination of ZEBs

* ZEBs: Net Zero Energy Buildings
The definition of ZEBs have been established by the ZEB Roadmap Examination Committee*

Comparing with residences, it’s a quite difficult to realize 100% energy saving commercial buildings (ZEBs) with the current off-the-shelf technology.

The concept of ZEBs was expanded to enable aiming to realize ZEBs according to the actual situations of buildings.

What are ZEBs? (Qualitative definition)

ZEBs are defined as buildings using advanced architectural designs that aim to realize substantial energy savings while maintaining the indoor environment by (1) reducing the energy loads, (2) positively utilizing natural energy by applying passive technologies, and (3) introducing high efficiency equipment and systems. They additionally aim to achieve the highest degree of energy independence and reduce the annual primary energy balance to zero by (4) introducing renewable energy.

* In 2015, the Ministry of Economy, Trade and Industry assembled a committee of experts in order to achieve the ZEB policy targets specified in the Basic Energy Plan, and investigated the measures, etc. required for realizing and popularizing ZEBs.
The fossil energy consumption in buildings is reduced by improving the energy-saving performance of the building framework and equipment and utilizing renewable energy generated on the site.
Contents

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4. Aiming to Realization and Dissemination of ZEBs

* ZEBs: Net Zero Energy Buildings
Know-how relating to ZEBs has not been sufficiently spread

The following have been indicated as issues impeding the Realization and Dissemination of ZEBs.

(1) Although measures and activities are promoted by the national government and the construction industry to realize and disseminate ZEBs, and developments that are expected to greatly improve the performance of each of the facilities including air conditioning and lighting have been made, the establishment and sharing of the methods of combining these when designing ZEB buildings have not been adequately implemented.

(2) Until now, trial calculations relating to the costs of ZEB buildings have not been implemented, so that it was not possible to evaluate whether ZEBs could be realized at budgets corresponding to the costs.

The Realization of ZEBs for buildings is essential for achieving the 2030 review of the energy basic plan.

The number of ZEBs that have been developed by leading business operators through incorporating devices in the designs and combining various current technologies is gradually increasing throughout Japan.
In the US, it is possible to obtain 50% Advanced Energy Design Guides free download

ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) is making the Advanced Energy Design Guides for 50% Savings available for free download (PDF) from the website of the (ASHRAE).

Source: 50 Percent AEDG (Advanced Energy Design Guide series) free download webpage
Utilization in energy conservation planning between persons related to building architecture

**design and planning**
Utilizing the ZEB Pamphlets

**Basic designs and working designs**
Utilizing the ZEB Design Guidelines

Proposals of ZEBs
Consultations about ZEBs

Communications relating to the architectural plans and equipment designs required for ZEBs

Design offices, general contractors, architects, consultants, etc.

Real estate business operators, building owners

Architects, architectural designers, etc.

Facility designers
The ZEB Design Guidelines and ZEB Pamphlets have been made to realize further improvements in awareness of ZEBs and to spread know-how on ZEBs.

<table>
<thead>
<tr>
<th>Information media</th>
<th>Purpose</th>
<th>Supplied information</th>
</tr>
</thead>
</table>
| • ZEB Design Guidelines | • To increase awareness and the degree of interest in ZEBs  
• To share ZEB-related know-how | ✓ Combination of technologies for Realization ZEBs (Design knowhow)  
✓ Energy conservation effects and added costs  
✓ Actual design examples  
✓ Advantages due to Realization ZEBs (Energy-saving advantages, improvement of working environment, etc.)  
✓ Methods for achieving ZEBs, actual design examples  
✓ Applicable systems, etc. |
| • ZEB Pamphlets       | • To increase awareness and the degree of interest in ZEBs |                                                                                       |

Design offices, general contractors, real estate business operators (Persons in charge of design)

Building owners, architects, architectural designers, real estate business operators
Made guidelines for each building use based on the subsidy application situations

Office edition

- The energy consumption is the largest among each building use.
- Has the largest number of applications for ZEB verification projects.
- Matching each building size, a medium office edition and small office edition has been created.

Nursing homes and welfare homes edition

- Has the second largest number of applications for ZEB verification projects, following office use.
- In consideration of the aging Japanese society, new constructions can be expected in the future.

Supermarkets and home-improvement centers edition

- The energy consumption is the second largest among each building use, following office use.
- A certain number of new store openings can be expected each year.

Hospitals edition

- The energy consumption is the third largest of each use, following office use and department stores (including supermarkets and home improvement centers).
- By indicating the processes for hospital use which has comparatively high hurdles to overcome for realizing ZEBs, developments will also become possible in medium- to large-sized buildings other than hospitals.
ZEB Design Guidelines and ZEB Pamphlets series
Disclosure on the website (Can be downloaded free of charge)

The information can be downloaded free of charge from the Sustainable open Innovation Initiative website.

https://sii.or.jp/zeb/zeb_guideline.html

☑️ ZEB Design Guidelines
☑️ Calculation Program Sheet (Building Energy Efficiency Act)
☑️ ZEB Brochures
The total number of downloads has reached approximately **43,000** (As of October 2018)

<table>
<thead>
<tr>
<th>Contents</th>
<th>Actual number of downloads</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ZEB Design Guidelines</strong></td>
<td></td>
</tr>
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<td>Medium offices</td>
<td>6,328</td>
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<tr>
<td>Small offices</td>
<td>4,586</td>
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<tr>
<td>Nursing homes and welfare homes</td>
<td>2,474</td>
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<tr>
<td>Supermarkets/Home improvement centers</td>
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<tr>
<td>Hospitals</td>
<td>952</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Calculation program sheets</strong></td>
<td></td>
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<td>Medium offices</td>
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<tr>
<td>Small offices</td>
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<td>Nursing homes and welfare homes</td>
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<td>Supermarkets/Home improvement centers</td>
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<td>Large hospitals</td>
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<tr>
<td>Medium hospitals</td>
<td>533</td>
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<tr>
<td>Schools</td>
<td>0</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ZEB Pamphlets</strong></td>
<td></td>
</tr>
<tr>
<td>Offices</td>
<td>7,732</td>
</tr>
<tr>
<td>Nursing homes and welfare homes</td>
<td>3,287</td>
</tr>
<tr>
<td>Supermarkets/Home improvement centers</td>
<td>2,943</td>
</tr>
<tr>
<td>Hospitals</td>
<td>1,009</td>
</tr>
<tr>
<td>Schools</td>
<td>1,021</td>
</tr>
</tbody>
</table>
Measures for Realization and Dissemination of ZEBs
About the ZEB Design Guidelines and ZEB Pamphlets

ZEB PAMPHLETS
Utilization in the ZEB architectural design and planning stages

- **Proposals of ZEBs**
  - Design offices, general contractors, architects, consultants, etc.

- **Consultations about ZEBs**
  - Real estate business operators, building owners

- **Communications relating to the architectural plans and equipment designs required for ZEBs**
  - Architects, architectural designers, etc.
  - Facility designers

**Utilizing the ZEB Pamphlets**

**Utilizing the ZEB Design Guidelines**
One of the directions in the future for environmentally friendly architecture will be **ZEBs**.

**KEY POINT ❶**
ZEBs are attracting attention as one of the options for environmental buildings.

**KEY POINT ❷**
Situation the actual building conditions and popularization of the concept, the definition of ZEBs has been established.

**KEY POINT ❸**
The Realization and dissemination of ZEBs are promoted to achieve national government targets.
ZEB Ready and above have not only energy saving effects, but a variety of other merits.
The key points for realizing ZEBs are “load limiting and natural energy utilization”, the “effective use of energy”, and the “creation of energy”.

In addition to limiting the loads and utilizing natural energy, it is important to realize “ZEB Ready” status through energy conservation of 50% or more by changing equipment systems to high efficiency types. Further, according to the building’s actual conditions it is important to aim to realize net energy conservation of 75% or more (“Nearly ZEB”) and additionally aim to realize net energy conservation of 100% or more (“ZEB”) through increased energy conservation and the use of renewable energy such as solar power generation.

Limit the loads, and utilize natural energy

Effectively utilize energy

Change equipment systems to high efficiency types

Create energy

Note: The energy consumption of office automation equipment used by tenants and users is not included here.
ZEB Ready is an achievable target
(50% energy-saving buildings)

- ZEB Ready can be realized if the latest general-purpose technologies and controls are effectively combined.

- ZEB Ready can be realized through an approximately 12% increase in construction costs.

(Trial calculations targeting model buildings)

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Trial calculation results have been disclosed showing that it is possible to realize “ZEB Ready” by combining general-purpose high efficiency energy conservation technologies. In addition, when calculating the necessary equipment and material costs and the construction and administration costs, increased building costs of approximately 12% are incurred compared to buildings corresponding to the Energy Efficiency & Conservation Standards, which indicates that “ZEB Ready” is by no means unattainable. Further, when aiming to realize environmental buildings which attain both the design and further energy conservation (Nearly ZEB and ZEB), it is important to positively utilize passive technologies such as the utilization of natural ventilation and daylight.

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### Energy conservation effects realized by each measure (Rough estimate)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Energy Conservation Effects (MJ/m² year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air conditioning</td>
<td>8% energy conservation</td>
</tr>
<tr>
<td>Air conditioning</td>
<td>27% energy conservation</td>
</tr>
<tr>
<td>Lighting</td>
<td>16% energy conservation</td>
</tr>
<tr>
<td>Ventilation, hot water supply</td>
<td>4% energy conservation</td>
</tr>
<tr>
<td>Elevators</td>
<td></td>
</tr>
</tbody>
</table>

Note: These calculations target the air conditioning, ventilation, lighting, hot water supply, and elevators. They do not include the energy consumption of office automation equipment, which takes up approximately 30% of the overall consumption.

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### Increased amount rate of construction costs (Rough estimate)

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>ZEB Ready Estimated Costs (in millions of yen)</th>
<th>Increased Amount Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building construction</td>
<td>1,160</td>
<td>12%</td>
</tr>
<tr>
<td>Air conditioning equipment (Air conditioning + ventilation)</td>
<td>423</td>
<td>161%</td>
</tr>
<tr>
<td>Electrical equipment (Lighting)</td>
<td>393</td>
<td>117%</td>
</tr>
<tr>
<td>Sanitation equipment (Hot water supply)</td>
<td>191</td>
<td>100%</td>
</tr>
<tr>
<td>Elevators</td>
<td>69</td>
<td>100%</td>
</tr>
<tr>
<td>Temporary construction</td>
<td>246</td>
<td>111%</td>
</tr>
<tr>
<td>Earthworks</td>
<td>111</td>
<td>100%</td>
</tr>
<tr>
<td>Foundation work</td>
<td>144</td>
<td>100%</td>
</tr>
<tr>
<td>Frame construction</td>
<td>741</td>
<td>100%</td>
</tr>
<tr>
<td>Various expenses</td>
<td>457</td>
<td>113%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,935</strong></td>
<td><strong>112%</strong></td>
</tr>
</tbody>
</table>

Price per unit of area: 3,280,000 yen per 3.3 m²

Source: Based on calculation results according to the ZEB Roadmap Follow-up Panel through the cooperation of the Building Surveyors’ Institute of Japan

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<table>
<thead>
<tr>
<th>Measure</th>
<th>Cost Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air conditioning</td>
<td>3%</td>
</tr>
<tr>
<td>Lighting</td>
<td>5%</td>
</tr>
<tr>
<td>Ventilation, hot water supply, elevators</td>
<td>3%</td>
</tr>
</tbody>
</table>

### ZEB Ready estimated costs

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Cost Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary construction</td>
<td>11%</td>
</tr>
<tr>
<td>Earthworks</td>
<td>10%</td>
</tr>
<tr>
<td>Foundation work</td>
<td>10%</td>
</tr>
<tr>
<td>Frame construction</td>
<td>100%</td>
</tr>
<tr>
<td>Various expenses</td>
<td>13%</td>
</tr>
</tbody>
</table>

Source: Based on calculation results according to the ZEB Roadmap Follow-up Panel

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(A) Corresponding to 2016 standards

(B) ZEB Ready

- In “B. ZEB Ready”, the increased amount rate of the estimated costs for the overall building is 112%. Considering the increased amount rate of the estimated costs for each separate technology, this is 161% in Air conditioning equipment (air conditioning + ventilation), and it is 117% in Electrical equipment (lighting).

- These building costs are trial calculation results targeting model buildings in a case study, and the estimated costs may vary due to variations in commodity prices according to economic conditions and changes in building specifications. Additionally, when designing buildings which exceed ZEB Ready (energy conservation rate of 50%), care will be required when investigating the incorporation of passive technologies (such as the utilization of natural ventilation and daylight by incorporating atriums and voids), which have a high energy conservation effect but also have high initial costs.
Measures for Realization and Dissemination of ZEBs
About the ZEB Design Guidelines and ZEB Pamphlets

ZEB DESIGN GUIDELINES
Utilization in the ZEB architectural basic designs and working designs

Planning and concepts
Utilizing the ZEB Brochures

Basic designs and working designs
Utilizing the ZEB Design Guidelines

- Proposals of ZEBs
- Consultations about ZEBs
- Communications relating to the architectural plans and equipment designs required for ZEBs

Design offices, general contractors, architects, consultants, etc.
Real estate business operators, building owners
Architects, architectural designers, etc.
Facility designers
Japan’s first ZEB realization manual targeting ZEB Ready buildings (50% energy-saving building)

- **KEY POINT** ❶
  Provided with explanations using calculation programs that are compliant with the EE&C standards. (With energy conservation effects and rough cost estimates)

- **KEY POINT** ❷
  Includes renewable energies and points requiring care during operation. (References)

- **KEY POINT** ❸
  Includes actual design examples.

References ZEB Ready model buildings
Ways to use the Design Guidelines (1/6)

First, confirm the energy conservation overall picture (☞ Chapter 2)

- Primary energy consumption in reference office buildings (excluding office automation equipment, etc.)
  - Air conditioning is approximately 800 MJ/m² year.
    (Takes up approximately 60% of the building total)
  - Lighting is approximately 400 MJ/m² year.
    (Takes up approximately 30% of the building total)

- Trial calculation results using model buildings
  - Energy conservation of 45-50% for air conditioning.
    (= 30% energy conservation for the building overall)
  - Energy conservation of 50-80% for lighting.
    (= 15-20% energy conservation for the building overall)
  - Energy conservation in ventilation, hot water supply, and elevators

* However, with regard to passive methods which are difficult to evaluate in the current calculation program, it is also desirable to plan their effective introduction.
Additionally, confirm the overall cost picture (☞ Chapter 2)

The increased amount rate of the estimated costs for the overall building is 112%.

- This is 161% for air conditioning equipment (air conditioning and ventilation).
- This is 117% for electrical equipment (lighting).

* However, there will be the possibility of changes to the estimated cost results due to variations in commodity prices following the economic conditions and changes in building specifications. In addition, when designing buildings which exceed ZEB Ready, it will also be necessary to investigate the introduction of construction methods that have high energy conservation effects, but which also have high initial costs (such as the utilization of natural ventilation and daylight by using atriums or voids).

### Table: Individual calculation result of increased amount portion

<table>
<thead>
<tr>
<th>Item</th>
<th>Increased amount portion (in millions of yen)</th>
<th>Estimated costs including increased amount B: ZEB Ready (in millions of yen)</th>
<th>Increased amount rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building construction finishing (High thermal insulation/Solar shading)</td>
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<td>☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Air conditioning equipment (Air conditioning + ventilation)</td>
<td>☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Electrical equipment (Lighting)</td>
<td>☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Sanitation equipment (Hot water supply)</td>
<td>☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Elevators</td>
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<td>☐ ☐ ☐ ☐</td>
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</tr>
<tr>
<td>Temporary construction</td>
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<td>☐ ☐ ☐ ☐</td>
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<td>Earthworks</td>
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<td>☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Foundation work</td>
<td>☐ ☐ ☐ ☐</td>
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</tr>
<tr>
<td>Frame construction</td>
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<td>Various expenses</td>
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<td>☐ ☐ ☐ ☐</td>
<td>☐ ☐ ☐ ☐</td>
</tr>
</tbody>
</table>

Source: Based on calculation results according to the ZEB Roadmap Follow-up Panel through the cooperation of the Building Surveyors' Institute of Japan.
Ways to use the Design Guidelines (3/6)

Corresponding to the design, confirm the technical points to be noted and the columns ( Chapters 3-4)

**[図7 建築省エネルギー技術（パッシブ技術）]**

### 外皮断熱

**技術の導入目的**

**断熱対策を図る**

- 外皮断熱計画は、外壁と窓の境界における熱の出入りの抑制を目的としており、無断熱の建物に比べると約10%のエネルギーを節約することが可能である。
- 太陽からの日射により得られるエネルギー（日射取得熱）と内部発熱は、断熱されていない場合は短時間で外へ逃げてしまうが、断熱化により高温を上昇させるための有効なエネルギーとして使用することができる。
- 一方、夜間に断熱化によって熱の侵入を防ぐことが可能であるが、日射取得熱や内部発熱が室内に集まってしまうため、自然通風利用の併用においても考慮が必要がある。

### 外皮断熱を改善する

- 外皮断熱技術により、外壁と窓の境界における熱の出入りの抑制を図ることが可能である。
- 断熱対策により、熱の出入りを抑制することが可能である。
- 外皮断熱技術により、熱の出入りを抑制することが可能である。

### 外皮断熱技術の各性能化に向けたアプローチ

- 外皮断熱技術は、建物に係る熱負荷の抑制に寄与するものである。
- 輸入物は、日射製冷等を一定に保つために自然冷却しないでいるため、熱負荷を抑えることができる。
- 外皮断熱技術により、熱の出入りを抑制することが可能である。

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**補助事業（実証事業）の申請案件における削減率の分布**

- 事務所の用途別では、補助事業（実証事業）の申請案件の分布によると、外皮の高性能化により、節電率が上がると、\( \frac{\text{補助事業}}{\text{実証事業}} \)の削減率が示されている。

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出所：「補助事業（実証事業）の申請案件における削減率の分布」（2022年）
**Ways to use the Design Guidelines (4/6)**

**Confirm the methods of applying the actual data to the calculation programs ( Chapters 3-4)**

- Example) Changing the performance and thickness of the thermal insulation materials for the outside wall and roof

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### Design Guidelines

<table>
<thead>
<tr>
<th>外壁名称</th>
<th>壁の種類</th>
<th>熱貫流率</th>
<th>建材番号</th>
<th>建材名称</th>
<th>厚み</th>
<th>備考</th>
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<tbody>
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<td>内側</td>
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<td>FG1</td>
<td>W1</td>
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<td>せっこうボード</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>外壁</td>
<td>せっこうボード</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>接地壁</td>
<td>内側</td>
<td>10</td>
<td>FG1</td>
<td>W1</td>
<td>40</td>
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<td>接地壁</td>
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<td>10</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>接地壁</td>
<td>せっこうボード</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Corresponding to the standards**

**Corresponding to ZEB Ready**

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25
**Ways to use the Design Guidelines (5/6)**

**Apply the calculation programs (in Chapter 7 or in an Excel sheet) to calculate the energy savings**

*Because the descriptions are only examples in model buildings, be sure to change the equipment, numerical values, etc. to match each building, and use the results as an assistive measure when aiming to realize ZEBs.*
Ways to use the Design Guidelines (6/6 * If there is scope for further measures)

Confirm the use of renewable energy and the points to be noted during operation ( Chapters 5-6)

Verification of renewable energy technologies that are integrated into construction materials (Example):
Wall surface-mounted solar power generation system

- The development of building technologies where the integration of renewable energy systems is essential. This is important as the building incorporates the building's energy efficiency and the building's energy consumption. This is advantageous for the building's efficiency as it can be achieved in the space between the building and the structure. This can be achieved in a recent building as well.

- The development of building technologies where the integration of renewable energy systems is essential. This is important as the building incorporates the building's energy efficiency and the building's energy consumption. This is advantageous for the building's efficiency as it can be achieved in the space between the building and the structure. This can be achieved in a recent building as well.

- The development of building technologies where the integration of renewable energy systems is essential. This is important as the building incorporates the building's energy efficiency and the building's energy consumption. This is advantageous for the building's efficiency as it can be achieved in the space between the building and the structure. This can be achieved in a recent building as well.

Example of Realization ZEBs for an office building, including the aspect of continuous usage

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Wall surface mounted solar power generation system

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1. Definition of ZEBs
2. Design Guidelines and Pamphlets of ZEB
3. Typical Examples of ZEBs for Each Building Use
4. Aiming to Realization and Dissemination of ZEBs

* ZEBs: Net Zero Energy Buildings
ZEB Example – Office (1)

To realize a ZEB for this headquarters building, it was planned to reduce the building’s overall energy load by primarily using a passive building design that enhanced the building envelop insulation performance and utilized daylight and natural ventilation as far as possible. Secondly, regarding the parts of the load that could not be reduced using the above measures, it was planned to implement thorough energy conservation using high efficiency air conditioning, lighting, and hot water supply. Additionally, the introduction of BEMS to understand and evaluate the actual energy consumption was to lead to further reductions in energy consumption with the operations management.

<table>
<thead>
<tr>
<th>Concept for ZEB realization</th>
<th>To realize a ZEB for this headquarters building, it was planned to reduce the building’s overall energy load by primarily using a passive building design that enhanced the building envelop insulation performance and utilized daylight and natural ventilation as far as possible. Secondly, regarding the parts of the load that could not be reduced using the above measures, it was planned to implement thorough energy conservation using high efficiency air conditioning, lighting, and hot water supply. Additionally, the introduction of BEMS to understand and evaluate the actual energy consumption was to lead to further reductions in energy consumption with the operations management.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project location</td>
<td>Hamamatsu, Shizuoka</td>
</tr>
<tr>
<td>Building use</td>
<td>Office (Part used as a warehouse)</td>
</tr>
<tr>
<td>Structure</td>
<td>S construction</td>
</tr>
<tr>
<td>Total floor area</td>
<td>3,704.10 m²</td>
</tr>
</tbody>
</table>
ZEB Example – Office (2)

- Thermal insulation materials (Glass wool)
- Solar power generation system
- Lithium ion storage cells
- Outdoor units
- Natural lighting blinds
- Natural ventilation system
- Natural lighting cloth
- 4th floor
- 2nd and 3rd floors
- 1st floor
- Natural lighting panels
- Low-E multi-layered glass
- LED lighting
- LED lighting (with controls)
- High efficiency air conditioner + total heat exchanger
- CO₂ sensor
- Temperature and humidity sensors
- Meeting rooms
- Light breeze ceiling fans
- High efficiency air conditioning + Heat pump type desiccant air conditioning outdoor unit
- BEMS
- Light ducts
- Motion detectors
- LED lighting
- Heat pump air conditioning system utilizing well water
- Toilets, corridors, warehouse, etc.
- Light panels
- Water sprinkling system
- Greening of site
- Greening of car park
- Solar shading louvers (Sunlight tracking form)
- Industrial EcoCute
- Top Runner transformers
- Greening of site
- Industrial EcoCute
- Top Runner transformers
- 4th floor
- Natural lighting blinds
- Natural ventilation system
- Natural lighting cloth
- 2nd and 3rd floors
- Thermal insulation materials
- 1st floor
**ZEB Example – Office (3)**

[Energy performance evaluation]

- The design primary energy consumption of this building is 632 MJ/m² year (431 MJ/m² year when including the renewable energy), which realizes energy conservation of approximately 51% compared to the reference.
Planning the hospital construction, an advanced hospital that consumes less energy was to be operated by limiting the air conditioning load as far as possible through the utilization of highly efficient thermal insulation materials and high performance windows, introducing energy-efficient equipment, and implementing energy consumption management using BEMS.
ZEB Verification Example – Hospital (2)
ZEB Example – Hospital (3)

Energy performance evaluation

The design primary energy consumption of this building is 1,474 MJ/m² year (931 MJ/m² year when including the renewable energy), which realizes energy conservation of approximately 55.6% (including the renewable energy and cogeneration) compared to the reference.
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* ZEBs: Net Zero Energy Buildings
ZEB Planner Registration System
(Development of ZEB expert engineers, and management of voluntary action plan)

- To promote ZEB building business, design companies, design and construction companies, and consulting companies which have knowledge of energy saving buildings are registered as ZEB Planners and establish consultation service and inform the general public them available.

- Disclosure of the list of ZEB Planners and their achievements on the website of the subsidy executive body

Based on the registered information, it is planned to investigate further measures for Realization ZEB popularization.

No. of registered companies as of October 15, 2018: 125
(79 design companies, 59 design construction companies, 97 consulting companies
* Each company can register multiple categories.)
The number of ZEB buildings is increasing each year

The number of ZEB buildings, comprising not only buildings developed by general contractors and major design offices, but buildings created by a variety of business operators in recent years, is increasing.

No. of subsidized projects

<table>
<thead>
<tr>
<th>Year</th>
<th>Total buildings</th>
<th>10 or more buildings</th>
<th>5-9 buildings</th>
<th>2-4 buildings</th>
<th>1 building</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>5 buildings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014 revised (2015)</td>
<td>16 buildings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>36 buildings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>40 buildings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>37 buildings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(As of October 15)

Up until FY2016, the figures indicate the number of confirmed projects, while the figures for FY2017 and FY2018 indicate the number of confirmed grants. Also includes the number of buildings in projects subsidized by Ministry of the Environment.
Aiming to Realization and Dissemination of ZEBs

By 2030, to achieve ZEBs as the average for newly constructed commercial buildings.

- **2017**: ZEB Realization resulting from ZEB Leading Owner registration
- **2020**: Utilization of ZEB Design Guidelines
- **2030**: Increase in awareness of ZEBs

**ZEB Dissemination**

- **CSR**: Sending out information as CSR
- **PR**: Conducting PR as examples of advanced activities implemented for the environment

**ZEB**

**ZEB LEADING OWNER**

**ZEB PLANNER**
Aiming to Realization and Dissemination of ZEBs

- The interest in ZEBs is rapidly increasing in Japan as well, and the number of ZEB buildings developed by “ZEB Leading Owners” registered on the SII website has increased to 168 buildings nationwide, extending across a variety of building uses and sizes.

- SII continues to investigate to clarify the energy saving effects and advantages of further Realization ZEBs, cooperating with Ministry of Economy, Trade and Industry and Ministry of the Environment.

- We would be happy if our presentation today will be useful for your activities.
Thank you for your attention.