1. Introduction

Malta transposed and implemented Directive 2002/91/EC on the Energy Performance of Buildings (EPBD) and its recast, Directive 2010/31/EU, by means of three successive legal notices that were issued between 2006 and 2012. The first law, Legal Notice 238 of 2006, introduced the first set of regulations on the ‘Minimum requirements on the Energy Performance of buildings’ in Malta. The second law, Legal Notice 261 of 2008 retained the original minimum requirements of buildings and introduced Energy Performance (EP) certification and inspection requirements transposing the original EPBD into national law. The most recent legislation, Legal Notice 376 of 2012, issued under the legal chapter of the Building Regulation Act, supersedes the previous legal notices, but retains the original technical guidance on the minimum requirements and has now transposed the EPBD recast into national law.

Up to October 2012, the responsibility for the implementation of the EPBD in Malta rested with the Malta Resources Authority (MRA). After that date, the implementation of the EPBD recast in Malta was passed on to the Building Regulation Office (BRO) and the Building Regulation Board (BRB) within the Ministry for Resources and Rural Affairs (MRRA).

This report describes the current status of implementation of the EPBD recast including EP certification and the logistics of certificate registration, upgrading of the current minimum requirements according to the cost-optimal framework methodology, quality control and auditing, calculation methodology tools, inspection systems, training and registration of qualified EP assessors, information campaigns, incentives and subsidies.

2. Energy performance requirements

Before Legal Notice 238 of 2006 was introduced, there was no legislation regulating minimum EP requirements in buildings. This legislation introduced new requirements for thermal insulation in roofs, limits on window sizes depending on solar gains, improved glazing, the imposition of power and timing regulating controls on heating and cooling systems, the conservation and re-use of rainwater in specially designed systems and increased awareness on the benefits obtained from Renewable Energy Sources (RES). The thermal efficiency of walls that was adopted reflected the local practice of building double walls with an inner and outer leaf constructed with stone blocks and separated by a cavity, a practice which was being replaced in new construction by the use of single leaf hollow concrete blockwork with lower thermal efficiency.

2.1 Progress and current status

Before 2006, there were no minimum EP requirements or certification methodologies for buildings in Malta. Since 2006, Malta introduced the first minimum EP requirements’ guidance document and supporting legislation, an EP certification system supported by...
mandatory legislation, national calculation tools and certified assessors for the energy performance of buildings, as well as measures to control and quality check the certificates.

Since 2009, the Building Regulation Office (BRO) was consulted by the Malta Resources Authority and the Malta Environment and Planning Authority on a small number of large residential and office projects in order to assess the compliance of the buildings with the minimum requirements. The BRO conducted its analysis and issued recommendations on such projects.

The minimum requirements published in 2006 were maintained, but in 2012 the new legislation introduced the concept of cost-optimality for future mandatory revisions of the minimum EP requirements of buildings.

A sizeable data sample of Maltese residential Energy Performance Certificates (EPCs) in the central EPC registry has been analysed. Preliminary data analysis indicates that an energy rating benchmark representing a reduction in calculated energy use of nearly 50% over the current average value can be introduced as a short-term goal for 2016 (Source: Abela A. et al, An investigation into the practical application of residential energy certificates, Nottingham, Trent University, 2012).

2.2 Format of national transposition and implementation of existing regulations

The Minister responsible for Resources and Rural Affairs issued Legal Notice 376 of 2012 on the ‘Energy Performance of Buildings Regulations’ in October 2012 in order to transpose the EPBD recast and to give effect to its provisions. All new and existing buildings that undergo major renovation, as well as the retrofits or replacements of building elements, and the installation, replacement or upgrade of all technical building systems have to comply with these regulations.

The original technical guidance document issued in 2006, containing the minimum requirements on the energy performance of building regulations, has been retained and is part of the regulations.

The set minimum requirements prescribe limits on:

> thermal values of the building fabric, limitation on areas of glazing, both in connection with loss of heat, as well as with solar heat gain and summer shading;
> controls and insulation of heating and cooling systems;
> controls of artificial lighting systems;
> conservation and re-use of rainwater.

These requirements apply to all new buildings and existing buildings that undergo major renovation.
The calculation methodology for the Energy Performance of Residential Dwellings in Malta (EPRDM) takes account of the climate and net energy required for space heating and cooling, water heating, lighting, and ventilation, after subtracting any savings from energy generation technologies. It calculates the annual values of delivered energy consumption (energy use), primary energy consumption, and CO₂ (carbon dioxide) emissions. The procedure is designed to be compliant with the national transposition of the EPBD and is based on CEN standards. It consists of a monthly calculation within a series of individual modules. The individual modules contain equations or algorithms representing the relationships between various factors which contribute to the annual energy demand of the dwelling.

The Malta National Calculation Methodology (MNCM) for non-residential buildings, the Simplified Building Energy Model for Malta (SBEMMt), was adapted from the UK’s SBEM national calculation tool. The calculation process within the MNCM for producing EPCs uses building zones for the calculations in which identifiable, standardised activities take place. It also compares the carbon emissions of the actual building with those of a ‘reference building’, which are subjected to a specified ‘improvement factor’.

EPCs are intended to send market signals about the relative performance of comparable buildings, and so it is necessary that the reference building should be the same for all buildings of a

<table>
<thead>
<tr>
<th>Orientation of opening</th>
<th>Maximum allowable area of opening (%) using a minimal correction factor of 0.95 for glazing/ blind combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>25</td>
</tr>
<tr>
<td>S</td>
<td>20</td>
</tr>
<tr>
<td>NE</td>
<td>17</td>
</tr>
<tr>
<td>E/SE/SW/NW</td>
<td>12</td>
</tr>
<tr>
<td>W</td>
<td>9</td>
</tr>
<tr>
<td>Horizontal (rooftops)</td>
<td>7</td>
</tr>
</tbody>
</table>

Note: The maximum allowable area of glazing for windows with an orientation falling in between the compass directions indicated in the table may be calculated by interpolating the values shown above.

Table 3: Minimum requirements for rainwater cistern sizes.

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Size of cistern (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Domestic dwellings (incl. apartment blocks)</td>
<td>Total roof area (m²) x 0.6 m</td>
</tr>
<tr>
<td>2. Hotels, schools, offices, factories, industrial buildings and hospitals</td>
<td>Total roof area (m²) x 0.6 m</td>
</tr>
<tr>
<td>3. Shops and showrooms, and places of public gathering and entertainment not integrated in 2 above</td>
<td>Total roof area (m²) x 0.45 m</td>
</tr>
<tr>
<td>4. External paved areas (incl. open terraces and balconies)*</td>
<td>Total paved area (m²) x 0.6 m</td>
</tr>
</tbody>
</table>

*Note: This requirement applies only if the total open paved area is greater than 300 m²

Figure 2: Definitions and key parameters of SBEMMt building objects.
given type. In order to provide this consistency, the reference building has a building envelope and orientation that are identical to that of the actual building. The reference building has fixed thermal performance characteristics in the building fabric based on the minimum requirements, while Heating, Ventilation and Air-Conditioning (HVAC) system efficiencies assumed are typical ones for reverse cycle heating and cooling generators. Parameters related to the heating and hot water service, and space heating, and cooling and temperature set points defined in the activity databases are fixed, irrespective of features such as fuel choice in the actual building. The CO₂ emissions arising from the use of the fixed building services in the reference building (in kg CO₂/m².year) are calculated, and then adjusted by an improvement factor of 20%.

The reference building will be defined with these parameters irrespective of any changes in the minimum requirements, thereby ensuring that the energy rating calculation methodology will not change.

2.3 Cost-optimal procedure for setting EP requirements

According to the provisions set out in Legal Notice 376 of 2012, the national minimum requirements shall be reviewed at least once every 5 years by the Building Regulation Board (BRB).

Towards this end, tenders have been issued to commission a series of studies that will analyse the existing minimum EP requirements for buildings in the Maltese islands by utilising mathematical models established by the Commission Delegated Regulation (EU) No 244/2012 to work out the cost-optimal increase and tightening of the minimum requirements (Technical Guidance Document F presently legislated through Legal Notice 376 of 2012) enabling the setting up of realistic and economically feasible 2018 and 2020 national plans for Maltese Nearly Zero-Energy Buildings (NZEBs). Results from this study are expected to be published during 2013.

Reference benchmarks for each building category, i.e., at least one reference building for new buildings and two for existing buildings subject to major renovation, shall be established. The results of this assessment, including all input data and assumptions used for such standards and the results thereof, will be
reported to the Commission in mid 2013. If the minimum requirements are outside cost-optimal limits, changes suggested by the studies will have to be introduced in phases during 2014 - 2017. Feasibility studies have to be commissioned during 2013 to analyse the impact of the required changes and propose roadmaps for the building construction industry.

The MRA shall also be informed about the results of such reports, and the projected changes in the minimum requirements during 2013. This will help clarify and determine the roadmap in the 2014 National Energy Efficiency Action Plan (NEEAP).

2.4 Action plan for progression to NZEB
Legal Notice 376 of 2012 defines ‘Nearly Zero-Energy Buildings’ as buildings that have a very high EP. The degree of energy efficiency and performance shall be determined through cost-optimal studies which shall be in accordance with the common general framework for the calculation of EP of buildings defined in the same legislation. The nearly zero or very low amount of energy required shall be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby, the latter being, possibly concentrated in communal renewable energy facilities.

The MRA, in collaboration with the BRB and the BRO, shall draw up the NEEAP and other national plans in order to increase the number of NZEBs and measures concerning the use of energy from renewable sources in new buildings and existing buildings undergoing major renovation.

The strategies for achieving the national targets for zero-energy buildings may be twofold:

> tightening existing minimum requirements for the building envelope in new buildings and buildings undergoing major renovation;
> increasing the energy harvest from RES to decrease the use and dependency on fossil fuels by regulating the use of roof space in new buildings or investing in communal RES.

Incentives for the construction or major renovation of buildings shall be set up in schemes that take into account the cost-optimal levels of energy performance for those consumers who want to make the best use of energy resources. The refurbishment and transformation of existing buildings into NZEB stock will be encouraged by means of positive fiscal measures and financial benefits such as rebates, tax credits and advantageous bank loans for those owners who will enter into a commitment that clearly shows that their building will have a higher energy efficiency and nearly-zero net energy use.

3. Energy performance certificates
3.1 Progress and current status on sale or rental of buildings
The EPCs are the end-product of the certification process and include reference values based on the design rating of the building, if the building is not yet constructed and/or finished, or the asset rating, if the building is already constructed and in use. The certificate is valid for ten years from the date of its first issue.

Since the 2nd of January 2009, all residential buildings have to be certified when they are being newly designed, sold or rented. Since the 1st of June 2009, all other buildings have to be certified when they are being newly designed, sold or rented.

All the issued EPCs must be registered in the central database. A registration fee is charged per EPC issued.

The owner of a building shall ensure that when buildings or building units are constructed, sold or rented out the EPC, or a copy thereof, is shown to the prospective new tenant or buyer and handed over to the buyer or new tenant on the date of entering the contract of promise of sale or rent agreement at the latest.

The real benefit of any EPC lies in the recommendations which are mandatory by law. Recommendations are not automatically generated by the EPRDM software but are worked out specifically for each building and officially given to the building owner in the certificate.

When carrying out an EP assessment on an existing building, an EPB assessor has to inspect the property and assess the building taking note of its geometry, construction and finishing material characteristics, any space conditioning installations, lighting installations, hot water systems and any renewable energy systems including rainwater re-use. The
EPB assessor then calculates the energy use rating of the building and issues a registered EPC. The same energy use rating scale is used for all buildings, including those buildings that were constructed before the introduction of the minimum requirements.

Once the energy use rating is calculated and the required improvement measures are identified, the EPB assessor logs into the secure web-based central registration system and uploads the data file which is checked by the system for consistency and compatibility with the then current version of the methodology calculation software. Graphic data files are also uploaded. Before officially registering the EPC, the assessor may save the certificate in a temporary format online and access it later. The system has been designed to handle the registration fee payment and certificate creation in real time. When the certificate is created, the certificate and data files are stored in a secure area which can be accessed by the department for verification and auditing purposes.

Under Maltese legislation, the building owner is responsible for commissioning an EPC and will typically pay from 250 € to 450 € for a design rating residential EPC and between 400 € and 750 € for an asset rating residential EPC to cover professional fees. The professional fees for non-residential building EPCs vary considerably. The BRO charges a 75 € registration fee for each certificate registration, which covers part of the expenses used to run and update the EPC web portal. An owner who fails to produce the certificate to the authorities, when requested to do so, can incur a fine between 500 € and 1,500 €.

In Malta, prospective EPB assessors must already have a degree in engineering or architecture. Those wishing to qualify as EPB assessors have to successfully undertake a period of training approved by the BRB on the assessment of the energy performance of buildings constructed in Malta. Successful participants have to obtain an overall pass mark of at least 80% after having attended at least 80% of the course lectures. EPB assessors registered in other EU Member States (MS) can register directly with the BRO.

The participants must undergo a test at the end of the course that will:

- assess the participants’ understanding of the EPRDM or SBEMmt methodology, EPC policy, Quality Assurance (QA) requirements, and surveying buildings;
- examine the participants’ ability to recall and apply theory, define information and identify those products and systems in a building that affect the EPC;
- obliged learners to demonstrate their ability to use the EPRDM or SBEMmt software during a practical supervised session for a previously unseen dwelling and to produce an EPC and advisory report. The practical test requires the candidates to apply all aspects of the EPRDM or SBEMmt software.

The BRO has successfully organised a number of courses for EPB assessors (dwellings and non-dwellings). Most of the course participants, around 165, managed to qualify and register as EPB assessors (dwellings) – their list can be viewed by the public on the BRO web portal at epc.gov.mt.
EPB assessors registered in other EU MS can inform directly the BRO of their registration, so that they can issue EPCs for buildings in Malta.

Quality Assurance
The quality of the EP calculations and the EPCs relies to a large degree on self-regulation, which is reinforced by the training background of EPB assessors. The first quality check on the certificates and accompanying calculations is carried out on the EPC web portal which is the official website for registering EPCs. The site engine automatically verifies the pattern in the uploaded XML data file and rejects it if found to be in a non-compliant format.

Since the system was first launched, about five hundred EPCs were registered. A number of these EPCs are visually checked and verified by BRO’s internal auditors. If errors are detected in the visual inspection, a data check review on the XML data and on the result it produces would be carried out. The EPC may undergo a deeper audit if more errors or inaccuracies are detected. An on-site inspection of the building may also be carried out. Detailed audits, especially of complicated buildings, can also be outsourced to external independent auditors.

A random sample of at least 10% of all certificates is routinely audited for QA purposes. Other quality controls include checks that are performed on at least one EPC per assessor per year, checks on EPCs that are repeatedly issued on the same property, checks on EPCs with out-of-range values and checks following complaints from clients.

Depending on the quality of the work encountered and the degree of errors in the EPC being audited, the certificate may have to be revoked and the EPB assessor may be required to re-issue the EPC at his expense. In serious cases, the authorities may issue fines or suspend the assessor’s registration, but this has not happened so far.

The different authorities involved, such as the Malta Environment and Planning Authority (MEPA), the Commissioner of Inland Revenue and the BRO, have co-ordinated their efforts to enable the BRO to start enforcement. However, the enforcement system and quality control checks have to be automated to a higher degree to get the desired results and ensure that EPCs are carried out on a more forceful level.

3.2 Progress and current status on public and large buildings visited by the public
Public display certifications have not yet been enforced as the methodology calculation software iSBEMmt has only been made available in May 2012. Prospective EPB assessors for non-residential buildings will be undergoing exams and should qualify as registered assessors after April 2013.

The government had set up a program for energy audits targeting over 170 buildings used by the public service, including offices, courtrooms, town halls, police and fire stations, schools and community centres. Recommendations for improving the EP of these public buildings, including energy efficient refurbishment measures, such as roof insulation, were listed in the audit reports.

There are plans to measure the footprint for energy and water consumption within government buildings, and to set up a framework with benchmarks and targets for energy use reduction.

Following a successful pilot energy saving project, the Housing Authority began to incorporate energy saving features, where possible, in its new housing projects. Typical measures implemented by the authority in almost 150 newly built social housing units include double glazing, louvers and external shading devices for glazed apertures, roof insulation, installation of solar water heaters, efficient cooling/heating systems and rainwater run-off collection for use as second class water.

Figure 6: Energy efficient secondary school building at St Benedict’s College, Kirkop, Malta.
The Foundation for Tomorrow’s Schools has been building, upgrading and refurbishing State schools with the following features: sun pipes for maximising the use of natural daylighting, double glazing and polyurethane roof insulation for increased thermal comfort, efficient lighting systems with Plug-In Light Bulb technology, automated dimmer lights, etc., solar water heaters, photovoltaic systems to meet part of the buildings’ electricity demand, water conservation systems including collection and reuse of rainwater for cleaning, flushing and irrigation.

3.3 Implementation of mandatory advertising requirement – status

According to the current legislation, Legal Notice 376 of 2012, the owner or his agent shall ensure that, where buildings having an EPC are offered for sale or for rent, the EP indicator of the EPC of the building or the building unit, as the case may be, is stated in the advertisements in commercial media.

Regulations to administer, implement and enforce the inclusion of such indicators in the advertisements still have to be set up by the authorities.

3.4 Information campaigns

Citizens have to be well informed on the value of EP certification as a marketing tool and basis of comparison between building properties. The BRO, in coordination with the MRRA Public Relations Office, has been actively involved in informing the public on the EPCs by taking part in several events such as:

- Regular information sessions and programmes on radio and television broadcasts with live phone-ins from the public and video footage on energy efficient design principles in local buildings.
- Several seminars and presentations targeted towards different audiences, such as the general public, architects and engineers, building contractors, estate agents, research bodies and students.
- Promoting energy efficiency themes with brochures and videos in various events through a supporting campaign called the Switch campaign.
- Preparing and delivering a series of lectures for an in-service course for teachers on Climate Change and Energy Efficiency in Buildings.
- Delivering lectures on the EPC and the centralised web portal during the EPRDM Energy Performance Assessors’ courses for Dwellings.
- Coordinating summer courses for young students on energy efficiency of buildings & climate change.
- Contributing towards the creation of brochures and web information material with frequently asked questions on the EPC and tips on energy saving measures.

3.5 Any other relevant information

The government provided incentives mainly in the form of rebates/subsidies or grants on the purchase and installation of:

- provision of energy efficient light bulbs to every family in Malta;
- air-conditioning with a minimum energy efficiency class A and an output equal to or less than 12 kW;
- double glazing;
- solar water heaters;
- roof insulation;
- photovoltaic panels;
- micro wind turbines.

The RES installations all have a positive effect on EPC ratings. Awareness on renewable technologies is progressively increasing by the government’s continued promotion of these technologies.
There is scope to give incentives to owners of buildings with lower energy use ratings, thereby making EPCs more popular with prospective buyers and property developers.

4. Inspection requirements - heating systems, air-conditioning

Malta adopted mandatory inspections under option A of the EPBD and their transposition into law was incorporated in Legal Notice 238 of 2006. Regular inspections have to be carried out on the accessible parts of systems used for heating buildings, such as the heat generator, control system and circulation pump(s), with boilers of an effective rated output for space heating purposes of more than 20 kW. Regular inspections also have to be carried out on the accessible parts of air-conditioning (AC) systems having an effective rated output of more than 12 kW.

4.1 Progress and current status on heating systems

Inspections on boilers are still in their early stages and no reports have been registered at this stage. The methodology for boilers has been based on the CEN standard MSA EN 15378:2007 ‘Heating systems in buildings - Inspection of boilers and heating systems’. The methodology, reporting and recommendation formats on how to carry out these inspections have already been set up by the BRO but the practical implementation of the system has yet to be reviewed by the BRB as stipulated by law. The inspection report includes the running condition, efficiency and design adequacy of the installations, and accompanying recommendations include practical details on how to improve the overall system efficiency.

The inspection reports will be centrally registered on the EPC web portal, which will allocate a unique authentication number for each inspection report. Audits will be carried out on the reports to check their quality and effectiveness.

The frequency of such inspections shall be decreased or increased as appropriate, where an electronic monitoring and control system is in place. The BRB shall set different inspection frequencies depending on the type and effective rated output of the heating system whilst taking into account the costs of the inspection of the heating system and the estimated energy cost savings that may result from the inspection.

4.2 Progress and current status on AC systems

Inspections on air-conditioning (AC) systems are still in their early stages and no reports have been registered at this stage. The methodology for AC installations follows guidelines in TM44: 2007 ‘Inspection of Air Conditioning Systems’ issued by the Chartered Institution of Building Services Engineers. The methodology, reporting and recommendation formats, on how to carry out these inspections, have been prepared by the BRO, but the practical implementation of the system has yet to be reviewed by the BRB as stipulated by law. The inspection report includes the running condition, efficiency and design adequacy of the installations and accompanying recommendations include practical details on how to improve the overall system efficiency.

The inspection reports will be centrally registered on the EPC web portal which will allocate a unique authentication number for each inspection report. Audits will be carried out on the reports to check their quality and effectiveness.

The BRB shall set different inspection frequencies depending on the type and effective rated output of the AC system, whilst taking into account the costs of the inspection of the AC system and the estimated energy cost savings that may result from the inspection.
5. Conclusions and future plans

The impact of the introduction of the Energy Performance (EP) requirements in new and renovated buildings has not yet been accurately quantified. According to the Second National Energy Efficiency Action Plan (NEEAP) for Malta, the savings in energy consumption levels achieved in 2010 as a direct effect of the minimum requirements were estimated between 5% and 10%. There are new legal requirements ensuring that incentives for the construction or major renovation of buildings require cost-optimal levels to be applied, thus ensuring that consumers make the best use of energy resources. The renovation of privately owned buildings can be pushed to new levels by introducing subsidised schemes based on Energy Performance Certificate (EPC) ratings and practical recommendations. Further reductions in energy consumption will probably be achieved when Nearly Zero-Energy Buildings (NZEBs) are promoted and constructed on a wider scale by the building sector. Currently, less than 6,000 new buildings are built each year in Malta and, with the recent growth in the rehabilitation market, major renovations start to have a significant impact especially in the commercial sector. Therefore, the requirements of the recast Directive on the Energy Performance of Buildings (EPBD) for new buildings and major renovations will bring important energy savings in the near future, although new and renovated buildings only represent a small share of the entire building stock in Malta.

On the other hand, additional free training should be offered to architects, engineers and qualified experts, to improve their skills in energy audits and to share best practices in economic and technological building improvement solutions.

Malta is acquiring experience through the EPBD implementation and will use it to achieve the final goal of NZEB by 2020.

The main challenges and future developments of the minimum requirements, monitoring, enforcement and certification systems for the short and medium term are to:

> introduce new ICT monitoring systems to increase co-ordination between the various entities;
> introduce new incentives to popularise certifications;
> continue the improvement of the EPC web portal and back-office, including online audit reports, data entry validation, preview facilities and automation of the Quality Assurance (QA) process;
> upgrade the Energy Performance of Residential Dwellings Malta (EPRDM) software to include various enhancements and data input checks;
> reinforce the QA scheme, increasing the number of light checks on input and creating customised auditing track software for assigning and tracking audits;
> provide additional training for qualified experts on Heating, Ventilation and Air-Conditioning (HVAC), Domestic Hot Water (DHW) and Renewable Energy Sources (RES) systems, as well as more effective auditing techniques;
> carry out changes to the minimum requirements as a result of the cost-optimal studies;
> carry out more studies and gather more data on EPBD implementation in order to make the general public more aware of the benefits that can be derived out of the EPC schemes.

Figure 10: Thermally insulated concrete blockwork used in local construction.