Communities and Local Government

Energy performance certificates for dwellings in the social and private rented sectors

A guide to generating Energy Performance Certificates for similar dwellings owned by the same landlord

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Department for Communities and Local Government

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Section 1

Introduction

Background

The European Directive on the Energy Performance of Buildings (EPBD) is a key part of strategies for tackling climate change. Nearly half of all carbon emissions in this country come from buildings. The principle underlying the Directive is to make energy efficiency transparent by the issuing of a certificate showing the energy rating of a property, accompanied by recommendations on how to improve efficiency. Article 7 of the EPBD concerning Energy Performance Certificates (EPCs) will be fully implemented by the end of 2008.

Under Article 7 of the Directive, any building which is sold, rented out or constructed must have an EPC. This must be issued by a qualified and accredited assessor in an independent manner.

Once produced an EPC is valid for ten years. The certificate is accompanied by recommendations about how to improve energy efficiency. These do not however have to be implemented. This part of the Directive has been implemented into law in England and Wales by the Energy Performance of Buildings Regulations (2007/991)[1].

Note that this guidance relates specifically to England and Wales. The Devolved Administrations in Scotland and Northern Ireland are responsible for transposing the European directive into their national legislation and landlords with dwellings in those countries should consult those bodies for information about these requirements.

This guide describes the scope and requirements of the Regulations applying to dwellings that are rented out and provides guidance on how these are applied. While this guidance aims to explain how the requirements will work in practice, any interpretation of the Regulations is offered only as a guide, as the Department cannot provide legal advice. Therefore, it is important to read and understand the Regulations as well. In cases of doubt independent legal advice should be sought.

This guidance will be supplemented by additional material in the form of frequently asked questions which will be available on the Communities and Local Government website. It will be periodically updated.

[1] www.opsi.gov.uk/si/si2007/uksi_20070991_en_1

The document is part of a series that explains the introduction of Energy Performance Certificates, Display Energy Certificates and Air-Conditioning inspections in England and Wales.

Key Points

This document describes multiple EPC production techniques that can be used for landlords with large amounts of similar stock in both the private and social sectors. It is more likely to be relevant to the social rented sector rather than the private rented sector. This is because the social sector has traditionally collected large amounts of data on the condition of its stock using professional surveying techniques.

It covers:

- A Common Values approach which involves producing an EPC for one property using data from a similar property that has been amended to account for differences between them.

- Sampling and Multiple Certification under which EPCs for a group of properties are produced following a survey of a sample, where it can be shown that the dwellings are similar enough to make this approach valid.

The guidance also describes how to obtain an overview of the energy efficiency of housing stock from sample EPCs.

The principle of multiple production techniques is that the similarities between dwellings within a selected group enable more efficient EPC production and, as a result, the landlord can commission EPCs for a number of dwellings irrespective of the requirement to make an EPC available to a prospective tenant.

Decisions on how many properties to sample within these groups will be made by individual DEAs together with landlords or other external parties. It is thus essential that consistent principles are established at the outset and applied by all DEAs.

This document is a supplement to more comprehensive guidance on EPC requirements and responsibilities provided in the Communities and Local Government document *Energy performance certificates for dwellings in the social and private rented sectors: a guide for landlords*.

Purpose

This document is intended to help:

- Domestic Energy Assessors (DEAs)[2] and Home Inspectors (HIs)[3] to produce EPCs for similar properties. In the remainder of this document a DEA has been used to represent either type of assessor.
- Accreditation Schemes to develop training and Quality Assurance procedures for their accredited assessors in relation to EPCs for similar dwellings
- Landlords with a portfolio containing similar properties understand the approaches that may be adopted when producing EPCs for these dwellings.

Landlords may choose to have in-house staff as accredited DEAs. Where a landlord uses in-house staff as accredited DEAs, a procedure will need to be in place to ensure that there is no conflict of interest.

All EPCs have the same legal status, whether they are produced from an individual inspection or through a sampling and multiple production technique. All recipients of the EPCs therefore have the same legal rights and protection.

Each EPC must be produced by a DEA and the DEA will be ultimately responsible for the accuracy of the EPC and recommendations report. Each EPC will be lodged on the Domestic Register with reference to the dwelling address, and it will not be possible to separately identify those EPCs created using sampling multiple certification techniques which did not have a full survey.

[2] An assessor who is accredited to produce EPCs for existing dwellings is termed a Domestic Energy Assessor.

[3] An assessor who is accredited to produce EPCs within Home Condition Reports is termed a Home Inspector.

Section 2

Multiple EPC Production Techniques

This document sets out two routes to multiple production of EPCs. The first route is to produce an EPC using a Common Values approach. This involves using the data for a similar property and customising it for variations. This could, for example, take the form of producing an EPC for a mid floor flat from the survey results of a top floor flat, if the dwellings are similar in all other respects. Alternatively, it could involve taking the energy data for an adjacent similar dwelling (or for the actual property from an asset management database) and carrying out a survey to confirm which aspects of the existing energy dataset apply and which, if any, need to be amended.

The second route involves identifying a group of similar properties, surveying a sample of them and if the results for the sample are within the required tolerance limits, generating EPCs for other dwellings in the group, using the average (median) result. This sampling and multiple certification approach is the primary focus of this document.

The document also provides guidance on how to obtain an overview of the energy efficiency of the stock from sample EPCs.

Section 3

Common Values

The following method sets out the process to be followed when the Common Values route to EPC production is being applied. Four phases of activity (steps) are described that need to happen in order to apply this approach successfully.

What is the common values approach?

It is the process of producing for EPCs for dwellings that share some similar characteristics but are not suitable for the multiple certification approach described later in this document. This might, for example, be where similar properties differ in build type, glazing type or heating type.

In order to apply the common values approach, the housing stock should be divided into groups of dwellings within which all are expected to share some similar characteristics.

Step 1: Identify dwellings that share similar characteristics

Divide the landlord's stock into a number of groups of dwellings that share some similar characteristics to which the common values approach can be applied. This information will normally be derived from the landlord's asset management database. If the DEA is not directly involved in the selection of the groups, it is advisable that he/she understands the processes involved and how the groupings were derived.

Step 2: Identify common elements

Identify those elements which are common to all of the dwellings in the group. These might, for example, include dwellings in the same age band, of a similar build type or with a similar heating system.

Step 3: Customise the dataset for known variations

Identify those elements which are different. These might include different types of glazing, a different location in a block of flats, eg a ground floor flat rather than a top floor flat, or different levels of insulation. As a general rule, it is suggested that where more than six differences exist between two or more dwellings, the common values approach is not suitable.

Step 4: Enter data and produce an EPC for each dwelling

The DEA will need to visit a sample of the dwellings in order to verify that the variations as described on the landlord's database are correct prior to entering the data and producing the EPC. The number of properties to be visited by the DEA depends on the size of the group. As a minimum, it should be the same as that set out at Table 2 of the guidance.

Case Study 1

Two flats in a block are identical in all respects except one is on the top floor and one is on the middle floor. The top floor flat has been surveyed and the dataset for the middle floor flat is created from this, by removing reference to a heat loss roof.

Case Study 2

The end of terrace dwellings have been surveyed and EPCs for mid terrace properties are created by adjusting the area of the external walls.

Case Study 3

Tenants have been given a choice of whether to have a traditional or combination gas boiler. EPCs based on a sample of surveyed dwellings are created by entering the correct form of heating system for each dwelling where centrally held records exist which accurately denote the boiler type in each property.

Accreditation bodies will expect the DEAs to observe their Quality Assurance procedures.

This may include:

- The schedule of properties from which the groups have been selected (this information however will not be held on the Domestic Register)
- A calculation to show how the DEA determined the number of properties to sample (and the specific addresses of those sampled)
- Records of inspection and photographs for the assessed properties
- The EPC results for each of the surveyed dwellings.

Section 4

Using Existing Data

Where the landlord has invested in creating a comprehensive database of the energy characteristics of the stock this may lead to streamlined EPC production. However the DEA should be satisfied that the data is accurate by visiting a sample of the dwellings. As a minimum, this should be the same as at Table 2.

Case Study 4

A set of energy data exists for a landlord's portfolio. The purpose of sample on-site surveys is to confirm or amend the accuracy of that data prior to producing an EPC. Centrally held records should be updated if any energy improvement works are carried out.

Section 5

Sampling and Multiple Certification

The following method sets out minimum standards when the Sampling and Multiple Certification route to EPC production is to be applied.

Three phases of activity (steps) are described that need to happen in order for a group of similar properties to be identified and sampled and for EPCs for the whole group to be produced.

What is sampling?

Sampling is the process of selecting units from a larger group so that by surveying the sample it is possible to obtain representative results which can be applied with confidence to the rest of the group.

In order to apply the principles of sampling and replication of results to EPC production, the housing stock must be divided into groups of properties within which all are expected to be similar. For each group, a sample of properties can be inspected and, if the results justify doing so, an average (median) value can be generated from the properties inspected which represents the whole group. Thus, in addition to producing EPCs for the surveyed dwellings, the median value can be used to produce individual EPCs for those properties in the group that were not inspected directly.

Issues associated with sampling

Social housing providers and private landlords may be familiar with the approach to sampling their housing stock in order to obtain an overall picture. This approach has often been adopted for Stock Condition Surveys for social housing. Although the generic information may not apply to all of the individual dwellings, from the point of view of generating budgets for improvement works, it can provide an appropriate level of accuracy. For example, the dwellings which are better than the average, and require a lower spend, may be balanced by the number which require a higher spend. Even for these purposes, some landlords have stopped using sampling for stock condition purposes because they have found the data collected to be unreliable when applied across the remainder of the group.

In the case of EPC production, it is not sufficient for sampling to generate results which represent the average energy performance of the housing stock. Each EPC is required to be specific to the dwelling and must accurately represent its energy performance and the potential for improvements. This means that landlords should expect that the number of properties which will need to be surveyed to ensure that they are representative is likely to be higher than that required for other purposes. This is likely to influence the decision about whether to mass produce EPCs or prepare them on an as required basis.

Will sampling be suitable?

Achieving a successful outcome from adopting a sampling and multiple production approach will depend on a number of factors, for example:

- The extent to which dwellings have a similar built form, construction and energy efficiency (landlords with portfolios of recently built dwellings and those who have carried out estate-wide programmes of upgrades, rather than maintenance-based repairs, are likely to be in a better position to adopt this approach)
- The extent and quality of existing data, so that similar properties and exceptions can be easily identified
- The ease of gaining access to tenanted dwellings to carry out surveys.

The advantages of this approach will need to be evaluated in the context of:

- the differences between dwellings and the potential to identify a group of sufficiently similar properties
- the tenancy turnover rate and therefore the likelihood of requiring an EPC for those dwellings for which they will be produced. This will vary between landlords and may vary between areas within a landlord's portfolio
- any plans for refurbishing the dwellings which may alter their energy efficiency rating. In this instance the existing EPCs would show a performance which may since have been improved upon. The existing EPCs could, nevertheless, continue to be used within their validity period, and
- any potential difficulties with gaining access to tenanted dwellings to carry out sufficient surveys of sample dwellings.

A landlord may decide to pilot the sampling and multiple EPC production technique for only a proportion of the portfolio of dwellings to determine its suitability.

Responsibilities

If the landlord wishes to commission EPCs using a sampling and multiple certification approach, they will need to ensure that the DEA is suitably competent.

DEAs will need to be trained in these techniques if this is a field in which they wish to offer their services. They will also need to ensure that they meet the requirements of the Accreditation Schemes in respect of the data which they collect, hold and use, and how they apply sampling techniques.

Accreditation bodies will expect the DEAs to observe their Quality Assurance procedures and to provide evidence of their part in the sampling process.

This may include:

- The schedule of properties from which the groups have been selected (This information however will not be held on the Domestic Register)
- A calculation to show how the DEA determined the number of properties to sample (and the specific addresses of those sampled)
- Records of inspection and photographs for the assessed properties
- The EPC results for each of the surveyed dwellings
- Comparison of these results with the specified tolerances (see Table 3)
- How the DEA selected the median result to be replicated for the properties in the group which had not been surveyed.

Step 1: Housing stock analysis

The objective is to divide the landlord's stock into a number of groups of similar dwellings to which sampling can be applied. This step will also enable a list to be created of those dwellings which are not a close match to others, and which would need an individual inspection in the event of an EPC being required. It is for the landlord and DEA to decide who is best placed to undertake this activity or whether to combine their skills. Guidance on dividing the landlord's stock is set out in table 1.

If the DEA is not directly involved in the selection of the groups, it is advisable that he/she understands the processes involved and how the groupings were derived. The fundamental principle of the grouping is to identify dwellings likely to have the same energy efficiency characteristics. As an example, dwellings in a tower block or the mid-terrace properties in a row may have been identical to one another when constructed, but

if they have been subject to different levels of refurbishment for items that influence the energy efficiency of the property (e.g. insulation, heating or glazing), they may no longer constitute a coherent group.

One approach that a landlord with a diverse stock may wish to adopt would be to review a database containing information on the physical and energy efficiency related characteristics of the properties. By applying a series of criteria, the properties can be divided into groups sharing similar traits and therefore likely to be suitable for the application of sampling and multiple EPC production.

Table 1: Ways to divide a portfolio of dwellings into coherent groups

It is suggested that the following selection criteria are applied in sequence:

1. Divide the portfolio into properties to be included/excluded from the assessment – exclude those with a low tenant turnover or those known to be unique or unusual
2. Divide the properties which are to be included into geographically distinct groups – to ensure they are in the same degree day region[4] and that travel times will be minimised
3. Divide each group from the previous step into properties with the same age and built-form
4. Divide each group from the previous step into properties of the same size/number of bedrooms – refer to Table 3 for the acceptable tolerance on floor areas
5. Divide each group from the previous step into properties with the same space and water heating fuel
6. Divide each group from the previous step into properties with the same space and water heating system – take the age of the system into consideration if available
7. Divide each group from the previous step into properties with the same glazing type, loft and wall insulation

Ideally, the division of dwellings into groups at each of stages 3, and 5 – 7 should be based on the RdSAP[5] dataset i.e. the age bands, built forms, heating types etc.

For flats and maisonettes it is important to take account of the heat loss surfaces. Therefore the built-form should distinguish between top-floor, mid-floor and ground-floor dwellings.

At each stage in the process, there will be groups of properties that can be taken forward to the next stage. There will also be properties which do not fit into any sizeable group and which will therefore have to be subject to individual inspection to produce an EPC for that property if one is required.

[4] England and Wales are divided into different degree day regions according to the amount of heating which is required over the course of a year to achieve a standard internal temperature, taking into account regional variations in the external temperature. See www.carbontrust.co.uk/resource/degree_days/default.htm

[5] RdSAP stands for Reduced data Standard Assessment Procedure, and it is the Government approved energy model for existing housing.

The output from this stage of work will be:

- Groups of properties which are considered coherent within the group and therefore suitable for sampling to produce EPCs for the whole group
- A list of properties which fall outside the coherent group and therefore require individual inspections to produce an EPC, probably on an as required basis.

It is important to review the number of groups and the number of dwellings within each group to determine if sampling is likely to provide a sufficient number of EPCs to justify adopting a proactive approach.

Step 2: Visual inspection of the group and sample selection

The objective of this step is for the DEA to satisfy themselves that the proposed groups of properties are suitable for sampling, and to determine the size of the required sample of dwellings in compliance with Table 2.

On receiving a list of properties that the landlord considers to be a coherent group, the DEA should request details of the "definition" of the group and the process by which it was created. An example group definition might be:

> *The group comprises 1900-1929 semi-detached three-bedroom properties with single glazing and gas-fired central heating and hot water provided by 10 year old combi boilers and with loft insulation installed in the 1980s*

The DEA should create a list of representative properties to inspect in order to determine whether multiple certification techniques can be used, prior to notification to tenants of the intention to carry out surveys.

Visual Inspection

Once given the group description, the first task of the DEA is to undertake an external visual inspection of all of the properties. This will involve visiting and visually inspecting the external attributes of each property. Landlords should notify tenants in advance.

The external inspection should be undertaken from the property boundary. Unless specifically agreed with the landlord, a DEA is not expected to enter individual gardens, but would be expected to take advantage of any public space to achieve the best possible view of the property without intruding on the privacy of the tenants.

The purpose of the visual inspection is as follows:

- Easy identification of non-standard properties that can be removed from the dataset
- Assessment of whether the remaining properties are likely to constitute a coherent group or whether the group needs to be divided into smaller property sets.

Not all features of the group definition can be ascertained through an external visual inspection, but key construction aspects can be usefully checked to avoid obvious errors and wasted sampling.

Things to look out for when undertaking the visual inspection are:

- Do all of the properties conform to the overall description of the group nominated by the landlord? *(e.g. 1900-1929 semi-detached 3 bedroomed houses)*
- Are there any fundamental discrepancies between the construction of the properties that would affect results or recommendations? *(e.g. some have a flat roof and others have a pitched roof)*
- Have any properties been converted with a room in the roof or is there evidence of other work that suggests the property has been changed in a way that is fundamentally different to the other properties in the group?
- Are there visible differences in the use of external cladding or cavity fill insulation between the properties?
- Is the glazing different to the other properties in the group?
- Do any properties have conservatories?

Dwellings in the social sector are unlikely to have had conservatories retrofitted, but some may have been extended or converted to accommodate tenants with disabilities.

If this visual inspection identifies more than 10% of properties in the group as being clearly different from the others in the group, the DEA should review the results with the landlord before proceeding with the sampling.

Sample Selection

The number of properties to be inspected (the sample size) depends on the size of the group as specified in Table 2 below.

Table 2: Dataset Sample Size		
Size of Group	**Sample Size**	**Example**
10 properties or fewer	50%	If there are 6 dwellings in a group, at least 3 would need to be surveyed
11 – 50 properties	5 plus (30% of group minus 10)	If there are 37 dwellings in a group, at least 14 would need to be surveyed (5 plus 30% of 27)
Over 50 properties	15 plus (10% of group minus 50)	If there were 250 dwellings in a group, at least 35 would need to be surveyed (15 plus 10% of 200)

Once the sample size is known, the actual selection of properties can take place.

It is always advisable to allow a contingency when selecting the dwellings to be surveyed as the DEA may not always gain access to survey a property, even when a firm appointment has been agreed.

The results of the visual inspection can be used to assist in determining the actual spread of properties. For example, there may be several different designs of property within the overall group (albeit that they all have the same age/built-form/size) and the sample should include a spread across these designs.

Similarly, the sample should include properties from across the geographical spread of the group, rather than being tightly grouped.

In a group comprising mid-floor flats in several blocks, the sample should include properties from each of the different blocks and should also seek to include those in each of the different locations and each of the various internal layouts within the blocks.

Access arrangements will also need to be taken into account prior to conducting energy surveys.

Issues to be considered include:

- Notification arrangements – who will contact the tenant to schedule visits and what form of notification should be used?
- Void properties – should these be included or excluded? There are generally no reasons why these should be excluded

- Do any of the properties occupied by a tenant require an accompanied visit?
- Are any of the selected properties occupied by a tenant where there is a history of problems gaining access?

Once the sample dwellings have been selected, and access arrangements put in place, the DEA should carry out surveys to gather the RdSAP input data. This should then be entered into appropriate software to create the EPCs and recommendations reports for the surveyed dwellings.

The output from this stage of work will be:

- A completed external visual inspection of all properties in the group defined in Step 1
- A list of properties excluded from the group – identified during the visual inspection as being exceptions rather than similar to others in the group
- The results of energy surveys for a representative sample of properties from within the group.

Step 3: Analysis of results of sampling

The objective of this stage is for the DEA to use the results of the sample to confirm whether the group is coherent. The principle being followed is to identify the "typical" result from the sampled properties. If the variation is sufficiently small it will be reasonable to use the typical result as the basis for providing EPCs for those properties that were not inspected.

For the purpose of producing EPCs, the **typical** record is considered to be the median record when ranked by:

- Increasing Energy Efficiency (SAP) rating; then
- Increasing Environmental Impact (EI) rating; then
- Decreasing floor area[6]

[6] In order to determine the median record, the DEA should place the records of the sampled properties in order of increasing SAP rating. If there are multiple records with equal SAP ratings, then these records should be put in order of increasing EI. If there are records with the same SAP and EI ratings, they should be put in order of decreasing floor area.
Having ranked the records on this basis, the median record is the middle record or, if the number of records (i.e. the sample size) is even, then the median record is the record with the lower SAP/EI of the middle two records if they are not the same.

The next step is to compare the results with tolerances in Table 3.

Table 3: Sample Tolerances	
Parameter	**Tolerance**
SAP rating	90% of the sample properties should have a SAP rating within +/– 4 SAP points of the SAP rating of the median record; and 95% of the sample properties should have a SAP rating within +/– 6 SAP points of the SAP rating of the median record
EI rating	90% of the sample properties should have an EI rating within +/– 4 EI points of the EI rating of the median record; and 95% of the sample properties should have an EI rating within +/– 7 EI points of the EI rating of the median record
Floor area	90% of the sample properties should have a floor area within +/– 5% of the floor area of the median record; and 95% of the sample properties should have a floor area within +/– 7.5% of the floor area of the median record.
Recommendations	95% of reports should contain identical recommendations; and no reports should contain recommendations that would be fundamentally inappropriate for other properties in the sample.[7]

If, following the analysis of the initial sample, the results are outside these tolerance limits, then the process to be followed is:

1 Identify any exceptions. Consider the exceptions and decide whether the group needs to be further sub-divided, or the exceptions simply excluded. What has caused them to be exceptions? The DEA should report findings to the landlord to consider whether the data they already hold or data from the external visual inspection can be used to repeat the stock analysis taking account of this feature in order to create more coherent groups.

2 If there are no clear traits identified that are causing the exceptions, agree with the landlord whether to expand the sampling and undertake more surveys or not.

3 If the landlord instructs the DEA to proceed with additional sampling from the original groups, a selection of an additional sample of 30% of the size of the original sample should be made and inspections on these properties undertaken.

4 Add the additional results to the collected dataset and see whether the larger sample complies with the required tolerances.

5 If necessary, keep repeating these steps until the tolerances are reached or the entire group has been inspected individually.

[7] For example, no report should include a recommendation to install cavity wall insulation if there are other sample properties with solid walls.

The DEA can only advise of his/her findings and the final decision to extend the sampling, or to rely on any EPCs produced so far as only usable for the dwellings assessed rests with the landlord.

Issuing sampled EPCs and further EPCs for unsurveyed dwellings

EPCs should be produced for each dwelling that has been surveyed. Having identified the typical (i.e. median) record for the group, the DEA can copy this exact dataset in order to produce EPCs for those properties that were not inspected for sampling.

Auditing of the EPCs for both surveyed and unsurveyed dwellings will be carried out by Accreditation Schemes. Specific guidance concerning evidence requirements to support auditing will be issued by the individual Accreditation Schemes.

The output from this stage of work will be:

- EPCs for surveyed properties
- If tolerance levels are met, a dataset for a median EPC
- EPCs created from the median for other dwellings in the group, and
- EPCs for any exceptional properties which have been surveyed but do not fall within the required tolerances

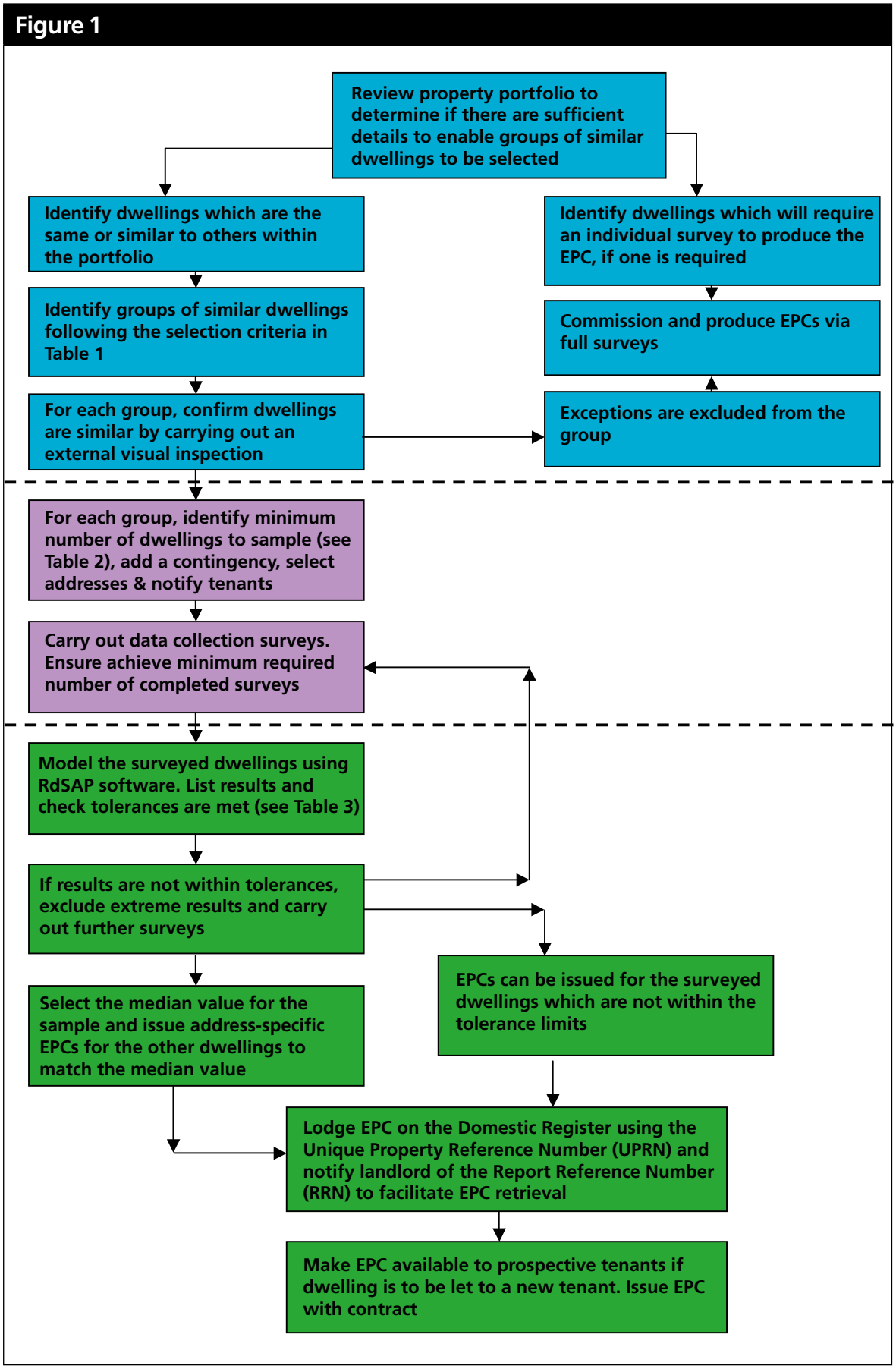
Or

- EPCs for the surveyed properties only.

In the latter case the inability to produce EPCs across the group may be due to access difficulties preventing sufficient samples carried out or results varying too widely to enable an acceptable median value to be generated.

The three steps to the sampling and multiple certification approach are summarised in Figure 1 below:

Figure 1



Section 6

Obtaining an Overview of the Energy Efficiency of the Stock from Sample EPCs

Some landlords may wish to obtain an overview of the energy efficiency of their stock using a sampling approach to inform policy making. Sampling may be used to estimate, at a high level, the current performance, the potential for energy efficiency improvements, and the potential CO_2 savings. The RdSAP methodology can be used in these circumstances, with EPCs produced for the surveyed dwellings. However, in the situation described here, EPCs produced for the sample dwellings cannot be used to create EPCs for the whole stock.

Any activity undertaken by the DEA in terms of an added value service to provide whole stock information from sample EPCs would not be quality assured by the DEA's Accreditation Scheme. The landlord, therefore, would need to satisfy themselves that the DEA had the required competencies to undertake such work.

Case study 5

A landlord wishes to understand the current energy efficiency of their stock and what could be done to meet a targeted reduction in CO_2 emissions over a 5 year period. They may wish to understand, say, the potential for a 5%, 10% or 25% reduction in CO_2 emissions from the existing baseline, whilst not currently knowing what this baseline figure is.

Through analysing the existing stock data, the appointed DEA identifies the most common building types, age and forms of heating, and selects a number of representative property groups. The DEA then determines a suitable number of dwellings to sample in each group. They have made a judgement that the sampled dwellings are representative of the stock and will be sufficient to provide the level of detail the landlord is seeking.

Tenants are notified, energy surveys are carried out for the selected sample dwellings and, from these, EPCs are produced. In this way, existing energy ratings and the potential improvement measures (cost-effective and further measures) are identified and can be compared to the alternative CO_2 savings targets.

It is assumed that the EPC sampling tolerances will not be applied and that EPCs will not be produced for the whole stock. Typically, in order to do so, many more groups and sample surveys would be needed. Instead the results are scaled up to provide an overview giving an indication of the potential measures, energy & cost savings, and capital costs that would be incurred if the measures were applied across the stock. The landlord will also have EPCs for the sampled dwellings.

Case study 5 *(continued)*

The results can be used to inform a decision about which CO_2 reduction target to set. Furthermore, the building-focused energy efficiency measures can be compared to alternative energy and CO_2 reducing measures such as district heating or large scale renewable energy systems.

Two further benefits from this approach could be:

- Identifying whether the dwelling specific information centrally held within a database is consistent with that obtained via the energy surveys or if the database is inaccurate/out of date.
- Identifying the types of property with the lowest EPC energy efficiency ratings, such that these can be targeted as a priority for improvement.

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