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London Underground

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G1290 ESTEEM Building Surveying Guidance

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1 Purpose

The purpose of this Guidance is to provide background information concerning the ESTEEM (Engineering Strategy for Economic and Efficient Management) Asset Data Warehouse and Reporting system, and describe the methodology for the use of the system in terms of Building Surveying.

2 Scope

This Guidance applies to any activity which will involve the viewing or alteration of Premises asset information held within ESTEEM's Information System.

3 Guidance

3.1 Background

3.1.1 *What is ESTEEM?*

ESTEEM (Engineering Strategy for Economic and Efficient Management) is a framework and toolset for capturing and managing asset data and survey information, and assisting with setting asset management strategy.

There are three main components of the system:

1. A data warehouse for storage of the premises asset catalogue (down to the lowest significant maintainable item), condition survey data, maintainable item degradation and cost profiles, model forecasts, and generated business reports e.g. the ACR)
2. The webscreen interface, facilitating the viewing and modification of asset data, and ESTEEM's asset data change control processes
3. ESTEEM HandHeld, used for editing the asset hierarchy and performing surveys on a mobile device. Using the ESTEEM HandHeld, asset catalogue and condition detail is collected via textual and numeric input supported by photographic information captured during site visits.

By incorporating the maintenance of the asset register into the survey process, along with photograph based authorisation workflow, ESTEEM offers an unprecedented level of accuracy and detail of verifiable asset data to the business.

Recently, London Underground won the Institute of Engineering & Technology (IET) Asset Management Innovation of the Year with ESTEEM for Civils in November 2010.

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3.1.2 *Viewing and editing ESTEEM data*

ESTEEM's information system, containing all recorded asset data, resides on secure servers, and can be viewed either via a Webscreen or the HandHeld. The information is structured around the Asset Hierarchy (See 3.5). Alternate views and hierarchies can be used to drill into the data via pivot tables generated from the data warehouse, available for viewing in the web-browser, and for download into Excel.

To update existing information, or to enter new data, individual or sets of assets can be allocated to a user in the form of Jobs. Jobs are then booked out individually or in groups to a selected user. Editing of the job can be done directly in the Webscreen, or by exporting the Job (or Jobs) to a mobile device.

3.1.3 *ESTEEM management of the asset hierarchy*

ESTEEM is a live data system, meaning asset information including the register can be updated in real-time, with all changes validated through Workflow. All changes to asset information or condition states are recorded historically through the Temporal Asset Hierarchy, viewable via the Webscreens or through pivot table reports. This enables up-to-date reporting of asset condition, along with associated condition history for trend analysis. This facilitates a greater understanding of the associated costs of maintenance, along with providing the sponsor with an efficient method of identifying future works packages.

3.1.4 *ESTEEM degradation and cost modelling*

Once asset register data is captured and all items surveyed according to the procedures contained within this document, ESTEEM's cost modeller can predict likely asset degradation from the recorded condition state, using a set of programed degradation profiles (see Section 3.3) for each maintainable item type. These profiles, developed by Building and Quantity Surveying professionals, also include unit rates for the repair of items based on typical failure characteristics; coupled with a user defined maintenance strategy in the form of condition grades over time, this tool generates the future intervention timings and associated costs for all registered assets.

3.1.5 *ESTEEM and the ACR*

In addition to improving the understanding of maintenance interventions, ESTEEM provides an automated report for Asset Condition Reporting (ACR) covering Residual Life (ACR Code A-D). The Residual Risk (ACR Function Concern Codes 1-4), are captured as part of the 'Report By Exception' facility, for review by the business, in accordance with Standard S1042.

3.1.6 *ESTEEM benefits*

Using the ESTEEM database and HandHeld software for on-site surveys enables London Underground to:

1. Record the material type, size and condition of building fabric elements, known as *Maintainable Items,* or *MIs* (e.g. doors, windows, walls, paint etc.)
2. Edit and maintain the asset hierarchy during on-site surveys, using a mobile hand held device.
3. Propose additions to the corporate dictionary of maintainable item types (e.g. if 'paint' did not exist as a type in the asset register, the surveyor could create the type 'paint' and assign maintainable items to it whilst on-site.
4. Predict change in the condition of maintainable items over time.
5. Maintain a history of condition and environment, providing the facility to feed statistical modelling tools to enhance ESTEEM's predictive accuracy.
6. Assist with the development of the asset management strategy using forecasted maintenance costs and the resulting predicted asset condition.

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7. Highlight Health and Safety concerns, necessary further investigations and other defects as required by the survey scope for the purposes of ACR and maintenance workbank generation.
8. Plan and monitor future maintenance and major project costs and manage reactive maintenance.

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3.2 General ESTEEM Survey Process

3.2.1 *Nature of site surveys*

ESTEEM Surveys of assets are carried out using the ESTEEM HandHeld software on a mobile device. The assets to be surveyed must be booked out as a Job (or Jobs) to an ESTEEM inspector, and exported to the mobile device as a workfile. Whilst booked out, only the allocated user is able to make changes to that area of the asset register.

Once assets are exported to the ESTEEM HandHeld software, on site surveys are predominantly visual and non-intrusive, but will identify the need for further investigations or tests as appropriate. For example, further investigations for dampness or Civils matters must be requested, according to the appropriate reporting procedure within Section 3.8.6 of this document. Some minor physical inspection may be necessary, for example to identify an unknown material or to evaluate of the extent of timber rot.

3.2.2 *Identifying assets*

Each structure, room or area surveyed must be clearly identified within the asset hierarchy, following the prescribed naming conventions and requirements for identification detailed within this document. Further notes and annotated layouts can be added as additional attributes to clarify areas if needed. Electronic layouts and property schedules are available on the handheld for this purpose, located on the Station Attributes tab. The Station Layouts appear in the first 'Layout Plans' field and the Property Schedules appear in the second.

3.2.3 *Requirements of on-site surveys*

All items maintained by Premises (Maintainable Items) within scope (Section 3.6) must be measured, surveyed and photographed as per the guidance in this document. Additional defects must also be added according to the appropriate Report by Exception procedure in Section 3.8.

3.2.5 *Use of photographs*

Ample photographs must be provided during each stage of the survey procedure, as described in the remainder of this document. Photographs must adequately identify and verify all information entered, sufficient to ensure confidence in the asset registration process. This includes the addition, change of type or removal of assets / maintainable items, along with facilitating the review process of each surveyor's understanding of ESTEEM's condition grade definitions for each maintainable item type.

These photographs are also used as evidence for fully detailed validation checks of data in various reports outputted from ESTEEM, facilitating a high confidence level within the business for information being reported.

3.2.6 *Reviewing data prior to leaving site*

To ensure all necessary work is carried out, users can perform various searches using the 'Custom Search' function of HandHeld. For example, searching for 'Missing Surveys' identifies MIs or areas missing a condition categorisation, whilst blank mandatory data fields (which are prevented by ESTEEM's data governance layer from entering workflow and ultimately prevent Jobs being published) are highlighted in red on the relevant screen, and can be found using the 'Missing Mandatory' search.

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Where new surveys have been entered against previously surveyed maintainable items, ensure all photographs accurately reflect the state of affected assets and MIs as of the date of the survey stated on the 'condition' tab. For example, if a survey is carried out to capture the installation of tactiles on formerly non-compliant platforms, a 'tactile' MI will be entered under the platform node, and have a condition survey entered. Upon removing the LUL Non-Compliant Defect from either the 'Nosing' or 'Floor' MI, attribute photographs for the relevant item must be replaced to illustrate the presence of tactiles. The same should be performed for the attribute photographs of the platform itself. Note that if a condition survey is not being carried out on the 'Nosing' or 'Floor' MI, once the Non-Compliance Defect is removed, the condition photographs may remain, but the 'Survey Date' field must be manually reverted to the date of the original survey.

3.2.7 *Data importing and workflow validation*

Once site work is complete, the user must perform an 'Export to Web' of the workfile on the mobile device. This enables the upload of data back into the ESTEEM Webscreen. Export to HandHeld (Backup) can be used periodically to fully back up the work during the site visit to avoid data loss or for switching devices mid-survey.

Once the Workfile has been uploaded, the user can continue editing using the web-screen interface. When the surveyor is happy with the state of the survey, individual jobs must pass through the two stage workflow process (IQC and SIM).

3.2.8 *Role of the Information Quality Controller (IQC)*

The first stage of data validation is carried out by an Information Quality Controller, or IQC. The IQC is responsible for validating any changes to the asset hierarchy, including changes to asset attributes, such as the addition or removal of entire assets, renaming of assets or the reconfiguration of assets or rooms. All item classifications must also be validated, along with physical information such as dimensions.

Proposed classifications resulting from the use of 'Create Like' must also be validated by the IQC. The IQC must ensure all information is validated in accordance with this document.

3.2.9 *Reviewing site captured data between IQC and user*

Where information is unclear, or the IQC has queries regarding a specific item, information can be bounced (highlighted to the user via workflow), with a query or comment. Once the job has been fully reviewed by the IQC, the job can then be passed back to the relevant user in order for all bounced items to be modified or further commented upon. Once all bounces have been satisfactorily validated, the job is sent by the IQC to the relevant Survey Inspection Manager, or SIM.

3.2.10 *Role of the Survey Inspection Manager (SIM)*

The SIM is responsible for the initial creation of the job and allocation to the relevant user. As with the IQC process, the SIM must also validate all completed condition survey information and specific defect information in accordance with the requirements of this document. Again, items can be bounced with comments for response/modification from the relevant user, until all such items have been validated. Upon completion of this process, the SIM is then able to publish the job.

The SIM is also required to tutor and monitor the progress of new users of ESTEEM HandHeld in terms of building surveying. One survey from each active inspector must be picked at random on a quarterly basis (or after each multiple of 20 surveys performed, whichever is sooner) in order that the SIM can carry out an on site survey inspection for comparison. This enables an ongoing audit process to assist with the consistency and quality of Surveys across the business.

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3.3 The Asset Hierarchy

3.3.1 *Introduction*

The asset hierarchy contains all asset records held within ESTEEM, and displays either a complete list of the assets, or those contained within a subset, such as a particular Job (see Figure 2). The asset hierarchy is edited by booking out the relevant items in a job, making necessary changes and validating them during workflow. Figure 2, illustrating Job J1920 (in this case Putney Bridge Station), demonstrates how the asset hierarchy is displayed in expanding tree format. This is the same both in HandHeld and the Webscreen. This determines how the survey data is input into the HandHeld software.

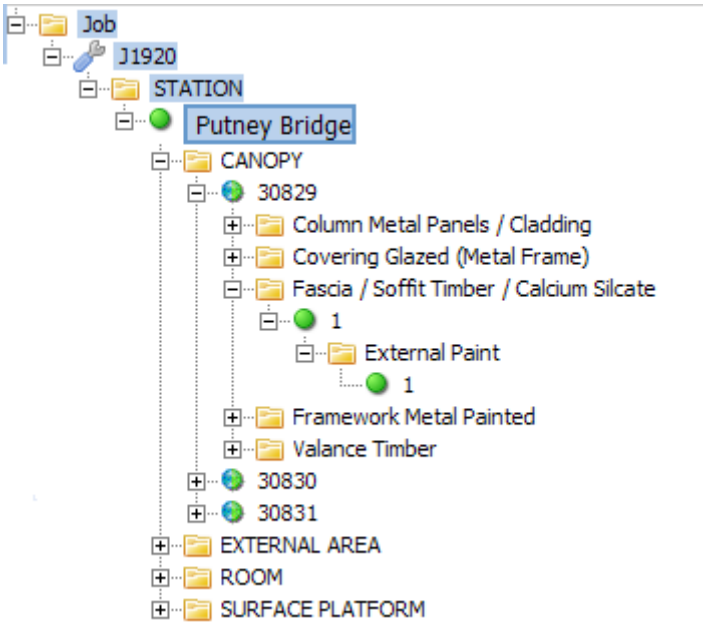

Figure 2. Example Asset Hierarchy

3.3.2 *Asset hierarchy structure*

The asset hierarchy within ESTEEM is made up of 7 levels of nodes (coloured circles in Figure 2). Each level groups assets together according to specific characteristics shared by the nodes in the level below, in the following order:

1. Owner – The highest node within ESTEEM represents all assets owned by a particular asset owner. In this case, the ESTEEM asset hierarchy contains a single owner node, labelled 'London Underground Ltd.'

2. Infraco – Each infraco beneath the 'Owner' node is represented by a single node, labelled with the Infraco name, e.g. 'SSL' or 'BCV'. The owner node is known as the parent node of the child infraco node.

3. Line – Beneath each Infraco node, each Line will be represented by a separate node, e.g. Central or District. This is a child node to the Infraco parent node.

4. LCS – ESTEEM employs a coding system used on the London Underground known as the Location Coding System to identify sections of each Line. Each section of track on each Line is represented by a node labelled either with an LCS identifier (e.g. 'C062' for

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a section of the Central Line) or by a Station name (Putney Bridge in Figure 2). In this case, the LCS node is the child node of the Line parent node.

5. Asset – Beneath the LCS node, there are currently 9 groups of specific asset types that can be represented by a node at asset level. These are 'Canopy', 'Cut and Cover Platform', 'Deep Tube Platform', 'External Area', 'LSB Room', 'Roof', 'Room', 'Station Auxiliary Building Room' and 'Surface Platform'. As part of the 'create like' function, any groups at the Asset level or below can be modified, merged or added to. An example of an asset node would be the 'Canopy' node labelled 30829 in Figure 2.

6. Maintainable Item Level 0 – Building fabric items that generally form a substrate (and are maintained by Premises) e.g. 'Wall Plaster', are represented as child nodes beneath the relevant asset. For example, the 'Fascia/Soffit Timber/Calcium Silicate' node in Figure 2 represents one of the substrate elements that make up 'Canopy 30829'.

7. Maintainable Item Level 1 – Certain building fabric elements may also be made up of an additional finish or maintainable component, such as 'Internal Paint' to a 'Wall Plaster', or an 'HDLT Nickel Bronze Nosing' to a 'Step Tread/Riser Ceramic Tile'. These are known as 'Maintainable Item Level 1' items, and appear as child nodes to M.I. level 0 items; for example, the 'External Paint' node beneath the 'Fascia/Soffit' node in Figure 2. This is the lowest level within the asset hierarchy.

3.3.3 *Editing the asset hierarchy*

Once a job containing the necessary assets has been booked out to an ESTEEM user with Inspector privileges, changes can be made to the data. The largest subset that can be booked out in one job is an LCS node and its child nodes (a user can however have more than one job issued to them). If changes above LCS level are required (e.g. allocating a station to a different Line or creation of a new Infraco) this must be carried by contacting ESTEEM support.

3.3.3 *Asset naming conventions*

The parent and child nodes within the hierarchy must follow strict naming conventions to enable quick identification of areas, and for reporting to be consistent with London Underground standards. Note that for all areas, photographs must be added to the attributes tab to assist identification, in conjunction with annotated layout plans if needed. The naming conventions are as follows:

Stations - Station Name, e.g. Putney Bridge. Disused stations are to be named as per their LCS identifier, e.g. D078(W042) for Tower Hill Disused station.

Station External Areas - Where possible, use SID codes present on Station Layout plans. In the absence of a SID, a short descriptive name can be used, e.g. 'Adjacent to Car Park'. Elevations should simply be North, South, East or West, again with annotated layouts as necessary.

Station Canopies - 'Entrance Canopy A/B/C etc.' for entrance canopies. 'Canopy to X/XXX', where 'X/XXX' is the SID code for the platform in question for Platform Canopies.

Station Platforms/Rooms - All names should be as per the SID code on the relevant Station Layout Plan, in accordance with the Category 1 Standard 1-035: Location Coding System (note that errors in the coding, e.g. a room below ground level is prefixed by a letter, this can be recorded as an LUL Non-Compliant Defect – see section 3.8.9). Lines served, direction and platform can be entered within the Colloquial Reference field.

Station Roofs – Roofs should be named 'A', 'B', 'C' etc., where A is the first level above ground floor areas, B the next level up (roof over 1st floor) etc. Where distinct roofs exist at the same level, add an identifying number (e.g. A1, B3 etc.).

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