Guidance Notes on Use of Building Information Modelling for Mathematical Calculation of Areas

Purpose

1. This Guidance Notes is to set out the electronic format and the pre-requisites for using Building Information Modelling ("BIM") to prepare general building plans ("GBP") submissions to facilitate plan processing by the Lands Department ("LandsD). LandsD generally makes reference to the Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers ("PNAP") ADM-19 on the subject "Consent to the Extraction of Information from BIM Model", "Notes on Submission Drawing Standards in Electronic Format" of PNAP ADV-34 and "Guidelines for using Building Information Modelling in General Building Plans Submission 2019", as available on Buildings Department ("BD") website (https://www.bd.gov.hk). However, to facilitate checking of the area calculations under the lease[1] conditions, the Authorized Person ("AP") should further observe the minimum requirements stipulated in this Guidance Notes.

2. For approval purpose, GBP submissions either in hard copies or, or via the Electronic Submission Hub[2] ("ESH") (in the electronic format accepted by BD) are required. When the minimum requirements set out in the paragraphs 3.1 to 3.6 below are complied with and clearly shown in the submitted BIM files, diagrammatic breakdowns and details of the calculation regarding Gross Floor Area ("GFA"), Site Coverage ("SC") and green features area, etc. would not be required to be included in the GBP submissions. For the avoidance of doubt, annotation and dimension of the areas concerned are required to be indicated on individual floor plans in the GBP submissions for checking purpose.

Minimum Requirements on BIM Files Submission

3. If BIM is used in the preparation of GBP, information contained in BIM files shall be identical to the information shown on the GBP. GBP submitted should be directly generated from the corresponding BIM model. To facilitate checking of the area

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[1] All references to "lease" in this PN shall include Government Lease or Conditions of Sale/Grant/Exchange, etc. (as the case may be) and "lease" shall be construed accordingly.

[2] ESH is a digital platform developed by BD for receiving and processing of building plans, documents and applications submitted under the Buildings Ordinance (Cap. 123), as an alternative means to the present paper-based mode of submission. The system is being implemented in 3 stages. While Stage 1 and 2 have been launched in June 2022 and March 2023 respectively, GBP would only be accepted to be submitted in ESH after the launch of Stage 3. For more details and the scheduled launch programme of ESH, please refer to BD's ESH website (https://esh.bd.gov.hk).

calculations under lease, AP should ensure the minimum requirements listed out in below paragraphs 3.1 to 3.6 on BIM files accompanying the GBP submissions are met before making plan submissions. To ensure the BIM files meet the minimum requirements, AP is strongly recommended to adopt and verify the files by "areas checking plug-in tool" as available on LandsD website (https://www.landsd.gov.hk).

3.1 Format and Software Version

(a) The BIM files should be stored in **non-rewritable DVD-ROM diskette(s) (for GBP hard copy submissions) or submitted via ESH (for GBP submissions in ESH)**. Except otherwise agreed by the Director of Lands, all other electronic submission medias are not acceptable.

(b) Area calculations as shown on the BIM files should be verifiable by either **Revit, ArchiCAD or other BIM software accepted by the Director of Lands**.

(c) BIM files using **Revit version 2023 or later, ArchiCAD version 26 or later or other software versions announced by the Director of Lands** are acceptable.

(d) Revit files should be saved in ".rvt" format and ArchiCAD files in "pla" format only. All other lightweight, compressed or zipped file formats such as ".dwf", ".dwfx" and ".bimx" will not be accepted.

(e) Each BIM file should be limited to the size of 500MB. Each BIM file should contain 3D model, views, schedules, as well as the pre-set drawing sheets including plans, area diagrams, calculation etc. used in the production of the GBP submissions.   A text file should be included in the DVD-ROM or specified in the submission via ESH to describe the linked files' hierarchy structure.

(f) BIM files submitted should be self-contained and detached from the originating server (i.e. openable on any standalone computer with the abovementioned software). All external reference files for the BIM model such as xlsx and pdf files should be stored in respective sub-folders in DVD ROM or uploaded in ESH, and the link between all external reference files and BIM main files should be appropriately connected.

(g) AP should provide a soft copy of the drawing index listing all file names, GBP drawing numbers with brief description on location and contents of the submitted GBP drawings s in the DVD ROM or via ESH.   GBP drawings under different

version must carry a revision letter (e.g. A to Z) for identification purpose. For large and complicated project involving numerous drawing versions/amendments, a revision legend should be provided as well.

(h) AP should list out in his covering letter together with the GBP submissions the name(s) of the BIM file(s) and drawing(s) in BIM files that contains the information for area checking under lease conditions. Further, AP should certify in his covering letter that the computations of GFA and SC under lease are derived directly from the corresponding BIM model without manual input.

(i) Title blocks showing corresponding GBP drawing number, revision legends, site/project title, drawing title etc. should be inserted in related drawing(s) in BIM files for identification purpose.

(j) Naming and numbering of drawings in the GBP should be identical to those in the submitted electronic version.

3.2 Referencing System

(a) AP should adopt the following file structures for linked files in the form of external reference of objects/tables/schedules in native files, whichever is appropriate for the project.

  (i) If several BIM files are adopted, all the files should be linked or connected to each other to ensure no information is missing. It is applicable to projects that comprise several buildings/towers or that with the large file size. (e.g. a massive scale development with thousands of apartments);

  (ii) File transmission tool, e.g. eTransmit in Revit, should be adopted to maintain the link file dependency after transmission;

  (iii) Relative paths should be used for linking all BIM files. Relative locations should be used for defining the linking between different BIM files; and

  (iv) If Subfolder layers are used, the number of layers should be kept to a minimum.

3.3 Parameter Organization – Parameter Name and Value Convention

(a) BIM files including floor plans, tables and calculations, etc. should contain all information identical to their GBP in hard copy or the soft copy in ESH.

(b) To facilitate checking of the area calculations, GBP should contain GFA and other areas diagrams for verification. AP should provide information to the relevant parameters according to the list of required information for LandsD's area calculation as specified in Appendix I.

(c) Parameter organization of the file(s) in should be submitted in the DVD ROM or in ESH. As the list in Appendix I is by no means exhaustive, if more parameters are required in the submitted BIM, AP could extend the list of the parameter name and value convention in Appendix I and a legendary description concerning the additional parameter(s) should be provided.

(d) BIM files should contain all elements and information as shown on the GBP submissions to facilitate approval, including inter alias, the area and the dimension information. Elements such as lighting, electric appliances and the like where approval from the Director of Lands is not required under lease should not be shown in the submitted BIM files.

3.4 Presentation Style – General

(a) **Drawing Scale –** Drawing objects in BIM files for checking and area calculation including area diagrams and dimensions should be drawn in true size (i.e. 1 drawing unit = 1 mm) with precision rounded up to the nearest mm unit and in "model" space. The default scale adopted for area checking electronically in LandsD's customized software is in milli-metre.

(b) **Dimension** – All dimensions should be true dimensions generated automatically by the software. Text figures or figures manually inserted, amended or constructed (collectively referred as "typed-in dimension(s)") for calculation purpose in the BIM files are not acceptable.

(c) **Unit and Decimal Places of Areas**: All areas in BIM files should be presented in m^2 units and with precision rounded up to 3 decimal places.

(d) **Maximum Distance Limit**: All elements within a BIM model should follow the "maximum distance limit" specified by software vendor.

(e) **Area diagrams with under-laying floor plans**: Area diagrams in BIM files

should be shown with the corresponding under-laying floor plans for ease of verification. The under-laying floor plans for Coloured Building Plans Diagrams (required under paragraph 6 below) should be shown in full tone.

3.5 Presentation Style – Revit

(a) **Area Boundary** – All drawings in BIM files intended for GFA, SC, NOFA & Open Space area calculations should be defined by "area boundary" diagrams. BIM files containing any "area boundary" with gaps and hidden area boundary will be rejected and the plans will be rejected without further checking.

(b) **Room** – All drawings in BIM files intended for UFA & Usable Floor Space (UFS) area calculations should be defined by "room" diagrams. "Room Area Computation" should be set at "wall core layer". All finishes should be turned off and should not affect detection of UFA and UFS. BIM files containing hidden room bounding elements or with rooms defined by discontinue room bounding elements will be rejected. In the case where a "room" is defined by room bounding element which is not vertical, AP should list out "Room Computation Height" for associated level on a text file which should be included in the DVD ROM or as supplementary information in ESH. For avoidance of doubt, example of non-vertical bounding elements is illustrated at Diagram 1.
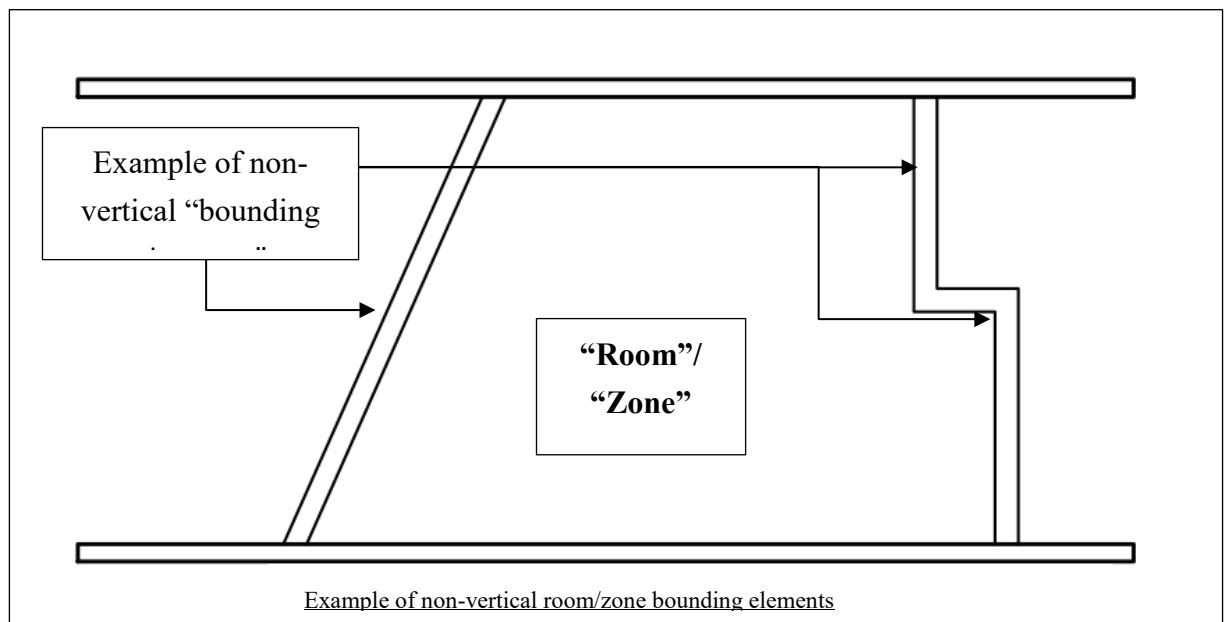

Example of non-vertical room/zone bounding elements

Diagram 1 - Section across "Room" / "Zone"

(c) **Filled Region** – All drawings in BIM files intended for area calculations of

vertical greening and greening on slopes/retaining structures with gradient steeper than 45° should be defined by "filled region".

(d) **Greening** – Greening with gradient equal or less than 45° should be defined by either "area boundary" or "room".

3.6 Presentation Style – ArchiCAD

(a) **Zone for GFA & SC** – All drawings in BIM files intended for GFA, SC, NOFA & Open Space area calculations should be defined by "zone polygons". "Manual" or "Reference Line construction method" should be used to define the "zone polygons". If "Reference Line construction method" is used, the "Zone Polygon Display" should be set to "Gross". "Measured Area" should be used to list out areas defined by the "zone polygons".

(b) **Zone for UFA & UFS** – All drawings in BIM files intended for Usable Floor Area (UFA) & Usable Floor Space (UFS) area calculations should be defined by "zone polygons". "Manual" or "Inner Edge construction method" should be used to define the "zone polygons". If "Inner Edge construction method" is adopted, finishes should not be built in the submission model. In the case where a zone is defined by zone bounding element which is not vertical, AP should list the "Bottom Offset Level to Home Story" on a text file which should be included in the DVD ROM or as supplementary information in ESH. In addition, "Subfloor Thickness" should be set to "0". "Measured Area" should be used to list areas defined by the "zone polygons" BIM files containing hidden zone bounding elements or with zones defined by discontinue zone bounding elements will be rejected.

(c) **Fill** – All drawings in BIM files intended for area calculations of vertical greening and greening on slopes/retaining structures with gradient steeper than 45° should be defined by "fill". If parameter is not available for "fill", then the "fill" should be allocated to a "layer" representing vertical greening. Greening with gradient equal or less than 45° should be defined by "zone polygon". "Manual", "Reference Line construction method" or "Inner Edge construction method" should be used to define the "zone polygons". If "Reference Line construction method" or "Inner Edge construction method" is adopted, requirements as stated under paragraph 3.6(a) and 3.6(b) should also be applicable for greening area measurement.

3.7 Text Style

(a) Text style in BIM files is not compulsory.   Conventional text fonts are suggested. Common type such as "Romans" font is recommended for use in the text.

<u>Administrative Arrangement</u>

4.   If the submitted BIM files are found not conforming to the minimum requirements as set out in above paragraphs 3.1 to 3.6, the AP will be informed by LandsD to replace the DVD-ROM or re-submit in ESH. The AP should take note that the time specified in our performance pledge is deemed to have been "frozen" at this point.   If a replacement DVD-ROM, or for submissions in the ESH, a replacement BIM file is received within 7 calendar days from the date of notification, the time of our pledge period will count again immediately upon receipt of the replacement DVD-ROM/BIM files.   If the replacement DVD-ROM/BIM files are received after 7 calendar days, the pledge time will be re-set afresh as a new start on the date of receipt of the replacement DVD-ROM/BIM files.   In the event no replacement DVD-ROM/BIM files are received before the expiry of the pledge time, the general building plans submission will be rejected without further scrutiny on the ground of insufficient information.

5.   In particular, if the following scenarios are still observed in the replacement DVD-ROM/BIM files, **the GBP may be rejected without further checking on grounds of incorrect or missing information.**

(a) Information shown in the BIM files and plans submitted for approval do not tally with each other;

(b) The required information in paragraphs 3.1(h) have not been clearly provided in or along with the covering letter;

(c) BIM files are not created following the format and software version requirements in paragraph 3.1 (b), (c), (d) and (e);

(d) BIM files do not follow the parameter name and value convention in paragraph 3.3(b);

(e) The general presentation style do not follow the requirement laid down in paragraphs 3.4(a) to 3.4(d); and

(f) The following prohibited actions are noted in BIM files:

   (i) BIM files containing hidden room bounding elements and/or rooms in Revit BIM files defined by discontinue room bounding elements as prohibited in paragraph 3.5(b) in Revit BIM files; and

   (ii) BIM files containing hidden room bounding elements and/or rooms in BIM files defined by discontinue room bounding elements as prohibited in paragraph 3.6(b) in ArchiCAD BIM files.

Guidelines on Preparation and Submission of Coloured Building Plans

6. To facilitate compliance checking of area calculations under lease, AP should submit a full set of floor plans duly coloured to show the extent of SC, transfer plate, GFA accountable and non-accountable areas under lease ("Coloured Building Plans"). Sample Coloured Building Plans are attached at Appendix II for illustration purpose. One set of Coloured Building Plans in hard copy or, for submissions in ESH, in pdf format should be submitted to LandsD through BD under the Centralised Processing System together with the GBP submission. Requirements as set out in the following paragraphs should be observed. Plans may be rejected on grounds of insufficient information if these requirements are not complied with.

Colour Code

7. All categories of GFA such as office, retail/commercial, hotel and residential GFA under lease should be coloured in accordance with the standard colour code at Appendix III. In other circumstances, e.g. sites restricted for industrial purposes, sites with provision of government accommodations as required under the lease, AP may propose additional colours that are required to indicate GFA categories other than those listed in the standard colour code and AP should clearly mark in his correspondence with LandsD the use of additional colours and the corresponding categories of GFA. AP may suitably adjust the level of colour transparency such that the colouring on the plans will not visually block the details of the floor plans.

Format of Coloured Building Plans

8. If hard copy of the Coloured Building Plans is submitted, the Coloured Building Plans should be printed in the same scale and size as the corresponding floor plans in the GBP submission. For submissions in ESH, the Coloured Buildings Plans shall fulfil the requirements laid down in PNAP ADM-17. Coloured Buildings Plans should contain all information including dimensions and annotations identical to the

corresponding floor plans.

9. The extent of the SC, transfer plate, GFA accountable and non-accountable areas as shown on the Coloured Building Plans should be in line with the GFA/SC calculations and GFA/SC diagrams in the GBP submissions. Otherwise, the GBP submission may be rejected without further checking due to the incorrect information.

Building Plan Unit

Development Control Section

Lands Department

March 2024

Appendices

I   List of Area Information and Parameter Naming

II   Sample Drawings of Coloured Building Plan (BIM)

III   Standard Colour Code for Coloured Building Plans (BIM)