

ORDNANCE SURVEY GB

OS MASTERMAP TOPOGRAPHY LAYER – BUILDING HEIGHT ATTRIBUTE – GETTING STARTED GUIDE

Version history

Version	Date	Description
1.0	2017	Initial release.
1.1	10/2020	Minor updates.
1.2	12/2021	Minor formatting updates.

Purpose of this document

This document provides information about and insight into the OS MasterMap Topography Layer – Building Height Attribute product and its potential applications. For information on the contents and structure of OS MasterMap Topography Layer – Building Height Attribute, please refer to the Overview and Technical Specification.

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Contact details

[OS website 'Contact us' page \(https://www.ordnancesurvey.co.uk/contact-us\)](https://www.ordnancesurvey.co.uk/contact-us).

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I. Purpose of this getting started guide

OS MasterMap Topography Layer – Building Height Attribute is an enhancement to the OS MasterMap Topography Layer product. The enhancement is supplied in a comma-separated values (.csv) format and is supplied separately from OS MasterMap Topography Layer’s Geography Markup Language (GML) data files. Therefore, if you want to use the Building Height Attribute data, you will need to join the two files first.

No schema changes to OS MasterMap Topography Layer are required to use the Building Height Attribute data.

The Building Height Attribute dataset is derived from and dependant on multiple other data sources, so is reliant on their accuracy. In addition, if a building has multiple heights or is in close proximity to an extreme landscape change (if it is on a hill or by a river, for example), then this may affect the data quality. Multiple quality checks are made on the data before release to mitigate any errors, and confidence levels are high on the dataset, but please verify or contact OS if any of the data does not look correct.

This Getting Started Guide is designed to walk you through the steps you need to take to join the Building Height Attribute data with OS MasterMap Topography Layer data within a geographic information system (GIS). The guide also outlines how to load the data into a database.

Within this guide, there are parts showing you how to re-structure the unique identifier (TOID: topographic identifier). We would advise against this as doing so means you will be unable to confidently match the feature in the dataset to other OS products or datasets using TOIDs or OpenTOIDs as their feature identifier.

First, you will need to check the format of your TOIDs in your translated OS MasterMap Topography Layer data and compare it to the format of the TOIDs in the Building Height Attribute data. The format of the TOIDs needs to be the same so that the Building Height Attribute data can be joined with the OS MasterMap Topography Layer data. The step-by-step instructions on how to do this can be found in [Section 4](#).

If you will be using the data in a GIS, you will then need to load the Building Height Attribute data into your GIS and join it with the OS MasterMap Topography Layer data. The step-by-step instructions on how to do this can be found in [Section 5](#) and [Section 6](#).

If you will be using the Building Height Attribute data in a database environment, then the data will need to be imported into a database. The step-by-step instructions on how to do this can be found in [Section 7](#).

2. What do I need to use this data?

2.1 System requirements

OS MasterMap Topography Layer – Building Height Attribute is designed to be joined to and then used as part of the OS MasterMap Topography Layer. [Section 6](#) gives guidance on how to join this data to your Topography Layer holding.

As it is a part of the OS MasterMap Topography Layer, Building Height Attribute is designed for use in a digital map within geographic information systems (GIS) and database systems. For details of Ordnance Survey's Licensed Partners who can assist you with incorporating Building Height Attribute in their systems, please see the systems / software [Software for mapping page on the OS website](https://www.ordnancesurvey.co.uk/business-government/tools-support/gis/software) (<https://www.ordnancesurvey.co.uk/business-government/tools-support/gis/software>).

Ordnance Survey does not recommend either suppliers or software products as the most appropriate system will depend on many factors, such as the amount of data being taken, resources available within the organisation, the existing and planned information technology infrastructure and last but by no means least, the applications that the data will be used for. However, as a minimum, the following elements will be required in any system:

- A means of reading the data, either in its native format or by translating it into a file format or for storage in a database
- A means of storing and distributing the data, perhaps in a database or through a web-based service
- A way of visualising and / or querying the data, typically a GIS

2.2 Backup provision of the product

You are advised to copy the supplied data to a backup medium before following the steps in this guide.

2.3 Typical data volumes for the product

For reading purposes, it is recommended that users store the data on a single hard disc as this will speed up the ability of your computer to read the data. The uncompressed file size for the full supply of Great Britain (GB) is 2.6 Gb.

3. Product supply information

3.1 Product supply format

Building Height Attribute data is supplied in comma-separated values (.csv) file format. Files will not be compressed.

3.2 Product supply mechanism

OS MasterMap Topography Layer – Building Height Attribute is supplied as an online download. You can download data in .csv format from the [OS Data Hub \(https://osdatahub.os.uk/\)](https://osdatahub.os.uk/).

The product is currently still available for customers to request through [OS Orders \(https://orders.ordnancesurvey.co.uk/sso/login.shtml\)](https://orders.ordnancesurvey.co.uk/sso/login.shtml).

4. How do I manage the .csv data?

The Building Height Attribute .csv contains the attribute OS_TOPO_TOID, which is the topographic identifier (TOID) from OS MasterMap Topography Layer. This TOID is the attribute that is used to join the data to your OS MasterMap Topography Layer data. More information about TOIDs is available in the OS MasterMap Topography Layer Product Guide and Technical Specification documents, which are both available on the [OS MasterMap Topography Layer Product Support page of the OS website](https://www.ordnancesurvey.co.uk/business-government/tools-support/mastermap-topography-support) (<https://www.ordnancesurvey.co.uk/business-government/tools-support/mastermap-topography-support>).

4.1 Checking TOIDs

TOIDs are stored in GML as a character string, with the prefix 'osgb', and can be comprised of either a 13-digit integer or a 16-digit integer after 'osgb' (for example, osgb1000001799480255). Ordnance Survey recommends that TOIDs are stored in this format.

Note: The changing of a TOID format means that you will not be able to confidently match features with other Ordnance Survey products or with datasets created by third parties using TOIDs or OpenTOIDs as the key feature identifier. We would therefore recommend that, except where absolutely necessary, you do not make changes to the identifier format.

Some of the methods available to translate OS MasterMap Topography Layer from GML alter the TOID from the format in which it is supplied in the GML. We have tested a small sample of these methods to ascertain how the TOID is dealt with during some translation processes. The following table details how some of the translators we tested deal with TOIDs; please look at your own data to investigate how your translation process will affect the TOIDs in your data.

Table 1: TOID processing results for four translators.

Translator	Processing of TOIDs
Miso InterpOSe	Removes 'osgb' from the beginning of TOIDs and adds three leading zeroes to 13-digit TOIDs.
Astun Loader	Preserves raw GML TOID format but renames column from TOID to fid.
Pitney Bowes MapInfo	Removes 'osgb' from the beginning of TOIDs.
QGIS	Preserves raw GML TOID format.

It is recommended that the OS_TOPO_TOID attribute in the OS MasterMap Topography Layer – Building Height Attribute .csv files be edited if it is found that the OS MasterMap Topography Layer TOID has been altered during the translation process, although how TOIDs are managed is up to your discretion. To aid this process, we have created some script that can be run alongside a gawk application that will alter TOIDs in the .csv files in two different ways. It is recommended that you create a backup copy of your .csv file before you make any changes to it.

4.2 Databases

If your TOID column requires altering, steps are outlined in [Section 7](#) detailing how this can be achieved in a database environment. This can also be achieved using the gawk process outlined in the following sub-section.

4.3 Reformatting the TOID attribute

There are several options which will allow the user to reformat the TOID attribute before joining it with the TOID field in OS MasterMap Topography Layer.

For smaller amounts of data, the simplest option is to use the free open-source text editor called Notepad++. Using this text editor, simply load up the Building Height Attribute .csv data and then, using the search and replace option, simply replace the 'osgb' part of the TOID name with either nothing or three leading zeroes ('000'). Remember to save the file with a new name once this procedure has been carried out.

The following sub-sections detail other steps that you can take to reformat the TOID attribute in the Building Height Attribute .csv, so that the format matches that of the TOID attribute in your translated OS MasterMap Topography Layer, Topographic Area data. The reformatting of TOID is a very quick option which will take five minutes to set up and process on a national set of data for OS MasterMap Topography Layer – Building Height Attribute.

Note: If the format of the TOIDs in your translated OS MasterMap Topography Layer data matches that in the Building Height Attribute .csv, please skip to [Section 5](#).

Two script reformatting options are presented below:

- **Script to remove 'osgb' from Building Height Attribute TOIDs:** Recommended for use if your translator removes 'osgb' from your OS MasterMap Topography Layer TOIDs but does not add any leading zeroes to shorter 13-digit TOIDs.
- **Script to remove 'osgb' and add '000' to 13-digit Building Height Attribute TOIDs:** Recommended for use if your translator removes 'osgb' from your OS MasterMap Topography Layer TOIDs and adds three leading zeroes to shorter 13-digit TOIDs.

Note: In order to use either reformatting fix, you will need to [download gawk](https://code.google.com/archive/p/gnu-on-windows/downloads) (<https://code.google.com/archive/p/gnu-on-windows/downloads>), a tool that uses pattern-matching principles to do simple data re-formatting tasks.

1. Download the gawk tool and save the zip file in any location.
2. Extract the 'gawk.exe' file to a directory containing the Building Height Attribute .csv file you wish to alter (this must contain only the .csv to alter and no other files). There must be no spaces in the entire file path to that directory as this will cause the process to fail.
3. Both reformatting processes require you to create an .awk file and a .bat file alongside the gawk application. These need to be saved in the same directory as the gawk application and Building Height Attribute .csv file you wish to alter. The structure of the .awk file specified in the following sub-section remains unchanged regardless of which of the two script reformatting options you are using. Unlike the .awk file, the content of the .bat file is different for both reformatting options. The format to use in both instances is described after the .awk file detail in the following sub-section.

4.3.1 Generating the .awk file

1. Copy and paste the following code into a new text editor document (such as Notepad++):

```
# COMMAND LINE gawk -v leadingZeroes=TRUE|FALSE -f bha_fixTOID.awk infile > outfile

BEGIN {
    FS = ","
    OFS = ","
}

{
    sub("osgb","", $1)

    if (leadingZeroes == "TRUE")
        $1 = sprintf("%016d", $1)

    print
}
```

2. Save the file as `bha_fixTOID.awk` in the same directory as the gawk application and Building Height Attribute .csv file.

Note: This code refers to the file name of this .awk file. If you choose to name your .awk file differently to our suggested name, please change the code to reflect the name of the .awk file you are using.

4.3.2 Generating the .bat file

Script to remove 'osgb' from TOIDs:

1. If using the first reformatting option (i.e. Script to remove 'osgb' from TOIDs), please copy the following text into a new text editor document and save the document with a .bat extension in the same directory as the gawk application, .awk file and .csv file:

```
@rem --- Line below to remove OS_TOPO_TOID "osgb" prefix only

FOR /F "tokens=*" %%A IN ('dir *.csv /s/b') DO (gawk -v leadingZeroes=FALSE -f bha_fixTOID.awk %%A > _%%~NA%%~XA)
pause
exit
```

Note: This code refers to the file name of this .awk file. If you choose to name your .awk file differently to our suggested name, please change the code to reflect the name of the .awk file you are using. The .bat file does not have to have a specific name, only the .awk file has to have a specific name because the .bat file refers to the name of the .awk file.

Script to remove 'osgb' and add '000' to 13-digit Building Height Attribute TOIDs:

1. If using the second reformatting option (i.e. Script to remove 'osgb' and add '000' to 13-digit Building Height Attribute TOIDs), please copy the following text into a new text editor document and save the document with a .bat extension in the same directory as the gawk application, .awk file and .csv file:

```
@rem --- Line below to remove OS_TOPO_TOID "osgb" prefix + add leading zeroes
```

```
FOR /F "tokens=*" %%A IN ('dir *.csv /s/b') DO (gawk -v leadingZeroes=TRUE -f bha_fixTOID.awk  
%%A > _%%~NA%%~XA)  
pause  
exit
```

Note: This code refers to the file name of this .awk file. If you choose to name your .awk file differently to our suggested name, please change the code to reflect the name of the .awk file you are using. The .bat file does not have to have a specific name. Only the .awk file has to have a specific name because the .bat file refers to the name of the .awk file.

4.3.3 Executing the reformatting operation

1. For both reformatting options, navigate to the directory where the .bat file is saved and execute it by double clicking the file. An MS-DOS window will appear.
2. Once the process is complete, press the return key to close the window.

The directory should now contain a new Building Height Attribute .csv file with the same name as the original but starting with an underscore. This .csv file will contain a copy of the original with the TOID attribute altered.

Note: If you wish to check how this process has altered the TOID attribute, do not open the .csv file with Microsoft Excel because Excel will reformat the TOID and read it as a number field. Instead, open the .csv file in a text editor as this will keep the TOID correctly formatted.

4.3.4 Merging .csv files

It is likely that the user will wish to merge 5 X 5km² tiles together to create an area of interest before loading into a GI application. The following procedure can be followed to undertake this operation:

1. Place all the .csv files into an empty folder.
2. Copy and paste the following script into a text editor (such as Notepad++), and, once copied, give the file a name which explains its function. In this case, we have called the file *mergedBHAdata.bat*.

```
copy *.csv mergedBHAdata.csv
```

Navigate to the directory where the .bat file is saved and execute by double clicking the file. This will create a new file called *mergedBHAdata.csv* from all the component .csv files in the folder.

3. Delete the original 5 X 5km² from the folder, leaving just the newly created *mergedBHAdata.csv* file in the folder.

4. Copy and paste the following script into a text editor (such as Notepad++), and, once copied, give the file a name which explains its function. In this example, we have called the file *Append_BHA_Header.bat*.

`copy BHA_Header.csv+ mergedBHAdata.csv BHA_Data.csv`

5. Download the Building Height Attribute header file from the 'Links and downloads' section of the [OS MasterMap Topography Layer Product Support page on the OS website](https://www.ordnancesurvey.co.uk/business-government/tools-support/mastermap-topography-support) (<https://www.ordnancesurvey.co.uk/business-government/tools-support/mastermap-topography-support>).

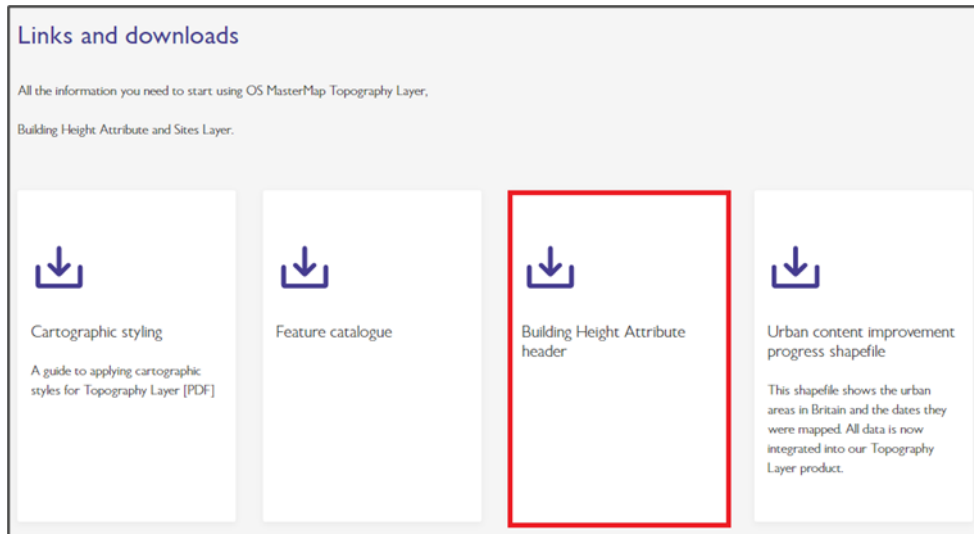


Figure 1: Location of the Building Height Attribute header file on the OS website.

6. Place the downloaded header file for Building Height Attribute data into the same folder as the merged Building Height Attribute data file, along with the batch file that was created in Step 4.
7. Run the batch file. A new merged .csv file containing the header will be created called *BHA_Data.csv*.

5. How do I load the Building Height Attribute product into a GIS?

The Building Height Attribute product can be loaded into several geographic information systems (GIS). This section describes how to load it into commonly used GIS. For more information on other GIS that the Building Height Attribute product is compatible with, please speak to your OS Technical Relationship Consultant.

The format of the TOIDs in your .csv may have an impact on how you import the .csv into a GIS. If you have not had to alter the TOID format, GIS software should read the OS_TOPO_TOID column in the .csv file as a text string automatically, which should match your OS MasterMap Topography Layer TOIDs. Therefore, you do not have to carry out any extra steps when importing your .csv file into a GIS, so you may wish to move on to the next section.

However, if you have had to alter the OS_TOPO_TOID in the Building Height Attribute .csv by removing the 'osgb', this attribute may be read as a number by a GIS; this will mean that any leading zeroes added will be deleted and the TOID field in the .csv will be incompatible with the TOID field in the OS MasterMap Topography Layer data which is formatted as a text string. We have outlined some steps which will allow the user to specify the field types for .csv files being imported to some GIS environments. The processes described in the following sub-sections will work with individual or merged versions of the .csv data.

5.1 ArcMap

These notes outline how to load Building Height Attribute data into ArcMap using the .csv file you have received and / or altered. The notes have been prepared using version 10.5 of ArcMap. The instructions will also work for ArcPro and version 10.6.1 of ArcMap.

If you are importing an unmodified version of the .csv file, then you can import this directly into ArcMap via the *Add Data* button.

If you are importing a .csv with an altered OS_TOPO_TOID attribute, you will need to carry out the steps detailed below before importing.

You can create a schema information file which describes the format of the fields contained within a text file. A schema information file is always named 'schema.ini' and is stored within the same directory as the .csv you wish to import into ArcMap.

1. Open a new text editor document and copy the following script into it:

```
[_BHA_Data.csv]
Format=CSVDelimited
ColNameHeader=True
Col1=OS_TOPO_TOID Text
Col2=OS_TOPO_VERSION Long
Col3=BHA_ProcessDate DateTime
Col4=TileRef Text
Col5=AbsHMin Double
Col6=AbsH2 Double
Col7=AbsHMax Double
Col8=RelH2 Double
Col9=RelHmax Double
Col10=BHA_Conf Long
```

Note: The section of code within the square brackets refers to the file name of the .csv you wish to import. Please alter this line to reflect the file name of your .csv.

2. Save this in the same directory as the .csv you wish to import into ArcMap, naming it *schema.ini*.

This file will now be read by ArcMap when you import the .csv file into it and will specify the field type for each field within the .csv file. This ensures that the TOID is treated as a text string.

5.2 QGIS

These notes outline how to load Building Height Attribute data into QGIS using the .csv file you have received and / or altered. The notes have been prepared using version 2.14.15 of QGIS Desktop. The instructions will also work for version 3.16 of QGIS.

If you are importing an unaltered .csv file which contains TOIDs in the format they are found in the raw GML, then you can import this file via the *Add Delimited Text Layer* icon. If you wish to import this .csv file via the *Add Vector Layer* option, you will have to create a .csvt file as outlined below or all the fields will be imported as 'String'.

If you are importing a modified version of the .csv file, you must create a .csvt file or the TOID field may be imported as a number.

A .csvt file is the equivalent of a schema.ini file for use in QGIS. It specifies the field types of a text file you are importing into QGIS.

It must be named the same as the .csv file it is referring to and be stored in the same directory as the .csv file you wish to import into QGIS.

1. Please open a new text editor document and copy the following script into it:

```
"String","Integer","Date","String","Real","Real","Real","Real","Real","Integer"
```

2. Save this in the same directory as the .csv file you wish to import into QGIS with the same file name as the .csv file and with the file extension .csvt.
3. You can now import the .csv file into QGIS by selecting the *Add Vector Layer* or *Add Delimited Text Layer* options in QGIS; this file will now be read by QGIS during the import process and will specify the field type for each field within the .csv file.

5.3 MapInfo

These notes outline how to load Building Height Attribute data into MapInfo using the .csv file you have received and / or altered. The notes have been prepared using version 16.0.0 of MapInfo (64bit version).

How you have altered the TOID field in the .csv file will affect the methodology employed when importing the .csv file into MapInfo. If you have retained the raw GML TOID format or added leading zeroes into your TOID field, then MapInfo will automatically pick this up as a character field, so it can be added to MapInfo in the following process:

1. Launch MapInfo.
2. Navigate to the Open dialog box either by using the icon or by clicking *File > Open*.
3. Select *Comma Delimited CSV (*.csv)* from the Files of type drop-down, then navigate to where the .csv file is stored.
4. Select the .csv file you wish to open and click *Open*.
5. The Open dialog box will close, and a Comma Delimited CSV Information dialog box will appear. Ensure the *Use first line for column titles* check box is ticked, then click *OK* to close the dialog box and open the .csv file.

The TOID field should be formatted as a text string and should include leading zeroes.

If you have removed 'osgb' but not added any leading zeroes, please follow the steps outlined above. You should see that the TOIDs are formatted as numbers and contain decimal places. If you then navigate to the directory where you have stored the .csv file, you should see that MapInfo has created a .TAB file with the same name as the .csv file. When this .TAB file is opened within a text editor, something similar to the text below should be displayed:

Note: The field types may vary depending on previous processing. The section of code within the chevrons refers to the file name of the Building Height Attribute .csv.

```
!table  
!version 300  
!charset WindowsLatinI
```

Definition Table

```
File "<_Name of Tile.csv>"  
Type ASCII Delimiter "," Titles Charset "WindowsLatinI"  
Fields 10  
OS_TOPO_TOID Integer ;  
OS_TOPO_VERSION Smallint ;  
BHA_ProcessDate Char (10) ;  
TileRef Char (6) ;  
AbsHMin Float ;  
AbsH2 Float ;  
AbsHMax Float ;  
RelH2 Float ;  
RelHMax Float ;  
BHA_Conf Smallint ;
```

As you can see here, the field OS_TOPO_TOID has a data type of 'Integer'.

6. Manually change this in the text editor to *Char (20)* ; to specify this field type as text, then save the .TAB file before closing.
7. Close the original .csv file displayed in MapInfo by selecting *File > Close Table*.
8. Open the .TAB file that you just edited. The TOID field should now be formatted correctly, and you can use this .TAB file to join to the OS MasterMap Topography Layer data holdings.

Note: If you re-open the .csv file in MapInfo and choose to overwrite the table, the TOID field will be formatted as a number again. Instead, you should use the .TAB file rather than the .csv file.

Now you have loaded the .csv file, you will need to export it as a .dbf (dBASE DBF) file and create an index on the TOID column in the table. To do this, follow these steps:

1. In the ribbon toolbar, select the *Table tab* and then select *Export*. Navigate to where you wish to save the .dbf. Ensure the *Save as type* is set to *dBASE DBF (*.dbf)*.
2. Select the *Table tab* in the ribbon menu, then select *Table* and from that drop-down, select *modify structure*, which opens the Modify table structure dialog box.
3. Ensure you have opened the table structure for the Building Height Attribute data because this is the data we want to create an index on. For the column of data containing the TOID value, tick *Indexed* box. Apply this index by clicking *OK*.

6. How do I join the Building Height Attribute .csv to OS MasterMap Topography Layer?

In order to use the Building Height Attribute data within GIS it must first be joined to OS MasterMap Topography Layer. This section describes this process for some commonly used GIS.

The .csv data should be loaded into your GIS with the TOID column formatted as it is in your OS MasterMap Topography Layer data holdings (see previous sections for more details).

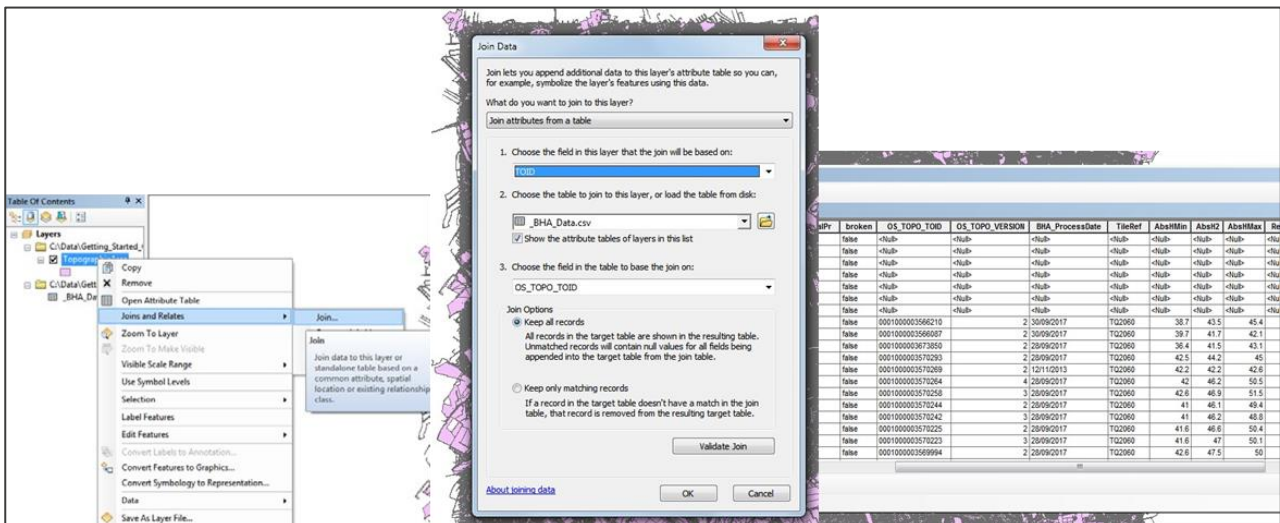
A join between these two datasets will link them together based on the unique identifier between the two datasets: the TOID. This will result in the buildings in your OS MasterMap Topography Layer data holdings being associated with a set of building heights.

6.1 ArcMap

These notes outline how to join Building Height Attribute data to OS MasterMap Topography Layer in ArcMap. The notes have been prepared using version 10.5 of ArcMap.

In the procedure described below, it is assumed that the user has converted OS MasterMap Topography Layer from the .gz supply into an ESRI shapefile format using translation software. It is important to ensure that any pre-processing of Building Height Attribute data is completed before commencing an ESRI ArcGIS session.

1. Launch ArcMap and load the Building Height Attribute .csv file and the OS MasterMap Topography Layer shapefile.
2. Right-click on the Topographic Area Layer in the table of contents, navigate to *Joins and Relates* and select the *Join...* option as shown in the following screenshot:



3. In the Join Data dialog box that opens, select the .csv file you want to join to the OS MasterMap Topography Layer data from the drop-down under option 2 in the list.

4. For options 1 and 3 listed in the Join Data dialog box, select the TOID column in each dataset to specify this as the common attribute between the data that you wish to join on.
5. In the Join Options section of the Join Data dialog box, you can choose to keep all records or keep only matching records; this will mean that you will only have the buildings with heights left after the join.
6. Select *OK* to carry out the join – it is better not to choose the *Validate Join* option as this requires a longer processing time.

When you open the attribute table of the layer you have joined the .csv file to, you should see the Building Height Attribute columns at the end of the attribute table. You can use the 'Select by attribute tool' to display all the buildings in the attribute table to inspect the Building Height Attribute data more easily in ArcMap. If you experience long processing times when querying this join, please export the file and then carry out these queries (see step 7 for more details on exporting the file).

7. Lastly, in order to save this join to the layer, close the attribute table and right-click the layer in the table of contents. Select *Data > Export Data* to save a copy of this shapefile with the Building Height Attribute data joined to it. Please be aware that large volumes of data may increase the processing time of this step.

6.1.1 Alternative method to speed up the join process

If you are finding that the join process is taking a long time, you can try the alternative method outlined below which will speed up the join.

Before loading the .csv file into the GIS, you could use ArcCatalog to export the .csv table into a Geodatabase (single). When doing this, you will have the option to edit the format of the field properties for the TOID data. This will allow you to add an attribute index to the table. Once the index has been added, the join process should be quicker. The notes below outline these steps fully:

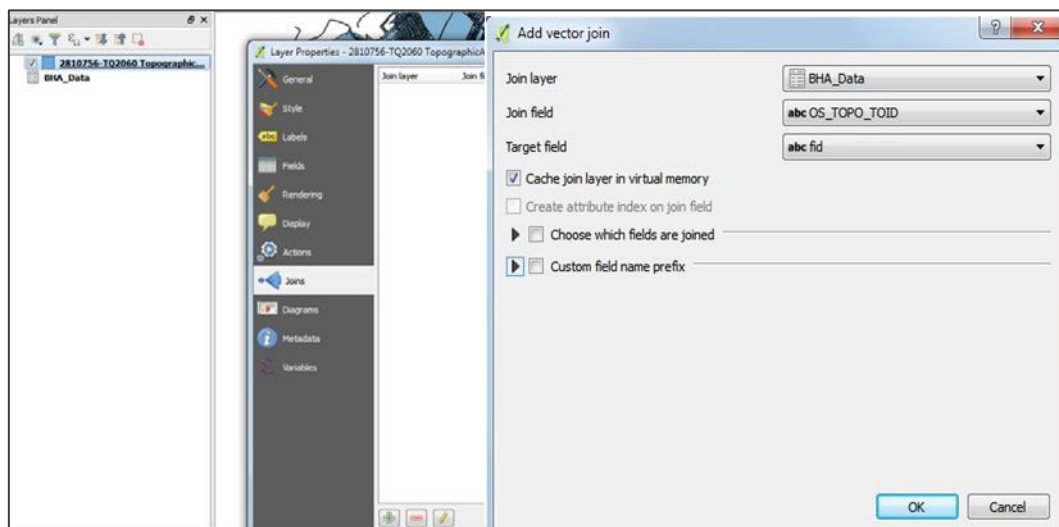
1. Navigate to the .csv file in ArcCatalog.
2. Right-hand click on file and select the drop-down *Export*, then choose *To Geodatabase (single)*. This will open up the Table to Table dialog box.
3. Select an output location, which needs to be within a file geodatabase, and create a name for the new table you are going to create.
4. Finally, in the Field Map (optional) window, right-click on the *TOID field* and select the *Properties* option, which will open the Output Field Properties dialog box.
5. In the Properties box, there will be a row called 'Length' with a number. This number has to be less than 80 to allow you to add an attribute index later in the process. As TOIDs are never more than 20 characters in length, this number has to be greater than 20.
6. Click *OK* to close the window.
7. To complete the export, select *OK*.
8. Open up ArcGIS and navigate to the Arc Toolbox.
9. Select *Data Management Tools*, then choose *Indexes* from the drop-down and open the *Add Attribute Index* tool.

10. Select the table in the File Geodatabase you have just created. In the 'Fields to Index' window, tick the box next to the row which contains the TOID.
11. Select *OK* to carry out this operation.
12. Once the index has been added, carry out the instructions at the beginning of the section to join the Building Height Attribute data to your OS MasterMap Topography Layer data.

6.2 QGIS

These notes outline how to join Building Height Attribute data to OS MasterMap Topography Layer in QGIS. The notes have been prepared using version 2.14.15 of QGIS Desktop. The instructions will also work for version 3.16 of QGIS.

1. Launch QGIS and load the .csv file and the OS MasterMap Topography Layer data.
2. Right-click the *Topographic Area Layer* and select *Properties* from the options list.
3. Click the *Joins* tab within the Layer Properties dialog box.
4. Press the green plus icon at the bottom of this dialog box, and in the Add vector join dialog box that opens, select the .csv file as the Join layer.



5. For the Join field and Target Field options in the Add vector join dialog box, select the TOID column in each dataset to specify this as the common attribute between the data you wish to join on.
6. Select *OK*, then close the Layer Properties dialog box.
7. When you open the attribute table of the Topographic Area Layer, you should see the Building Height Attribute columns at the end of the attribute table. You can use the Select features by expression tool to display all the buildings in the attribute table to inspect the Building Height Attribute data more easily in QGIS.

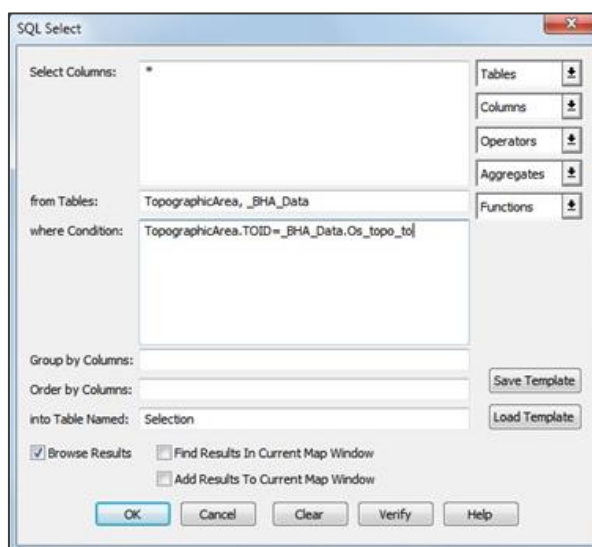
reasonForChange	descriptiveGroup	descriptiveTerm	make	physicalLevel	i_OS_TOPO_TOID	Data_BHA_Process	BHA_Data_TileRef	BHA_Data_AbsHMir	BHA_Data_AbsH2	BHA_Data_AbsH	
7	(1:New)	(1:Building)	NULL	Manmade	50	2	2017-09-30	TQ2060	38.7	43.5	4
8	(1:New)	(1:Building)	NULL	Manmade	50	2	2017-09-30	TQ2060	39.7	41.7	4
9	(1:Modified)	(1:Building)	NULL	Manmade	50	2	2017-09-28	TQ2060	36.4	41.5	4
10	(1:New)	(1:Building)	NULL	Manmade	50	2	2017-09-28	TQ2060	42.5	44.2	
11	(1:New)	(1:Building)	NULL	Manmade	50	2	2013-11-12	TQ2060	42.2	42.2	4
12	(3:New,Attributes)	(1:Building)	NULL	Manmade	50	4	2017-09-28	TQ2060	42	46.2	5
13	(1:New)	(1:Building)	NULL	Manmade	50	3	2017-09-28	TQ2060	42.6	46.9	5
14	(1:New)	(1:Building)	NULL	Manmade	50	2	2017-09-28	TQ2060	41	46.1	4
15	(2:New,Attributes)	(1:Building)	NULL	Manmade	50	3	2017-09-28	TQ2060	41	46.2	4
16	(1:New)	(1:Building)	NULL	Manmade	50	2	2017-09-28	TQ2060	41.6	46.6	5

8. Lastly, in order to save this join to the layer, close the attribute table and right-click the layer in the table of contents. Select *Save as* from the options list to save a copy of the layer with the Building Height Attribute data joined to it.

6.3 MapInfo

These notes outline how to join Building Height Attribute data to OS MasterMap Topography Layer in MapInfo. The notes have been prepared using version 12.0.2 of MapInfo.

1. Launch MapInfo and load the .dbf file and the OS MasterMap Topography Layer .TAB file.
2. Select the *SQL Select* button on the ribbon toolbar, and choose the *SQL Select option* which opens the SQL Select dialog box. Leave the "*" (asterisk symbol) in the Select Columns box to preserve all fields in both tables.
3. From the Tables drop-down, select the OS MasterMap Topography Layer data and the .dbf file you wish to join. This will populate these tables within the 'from Tables' box.



4. Click within the 'where Condition' box, then select from the Columns drop-down the TOID field from the OS MasterMap Topography Layer data. This will populate this field within the 'where Condition' box.

- Enter an equals sign after this column name and then use the 'Columns' drop-down to select the TOID field from the .dbf file which will populate this field after the equals sign in the 'where Condition' box. This action will have written the SQL query to join these tables via the TOID columns; the SQL query should look similar to that shown in the preceding screenshot.
- In the 'into Table Named' box, enter the name you wish to call the new table containing both the OS MasterMap Topography Layer data and .dbf file data.
- Click *OK* to close the SQL Select dialog box.
- A new table will open containing the joined records.

DescriptiveGroupCount	DescriptiveTerm	DescriptiveTermCount	Make	PhysicalLevel	PhysicalPresence	broken	Os_topo_to	Os_topo_to_2	Bha_proces	Tileref	Abshmin	Absh2	Abshmax	Relh2
1		-9.999	Manmade	50		false	0001000003566210	2	2017-09-30	TQ2060	38.700000000	43.500000000	45.400000000	4.800000000
1		-9.999	Manmade	50		false	0001000003566087	2	2017-09-30	TQ2060	39.700000000	41.700000000	42.100000000	2.000000000
1		-9.999	Manmade	50		false	0001000003673850	2	2017-09-28	TQ2060	36.400000000	41.500000000	43.100000000	5.100000000
1		-9.999	Manmade	50		false	0001000003570293	2	2017-09-28	TQ2060	42.500000000	44.200000000	45.000000000	1.700000000
1		-9.999	Manmade	50		false	0001000003570269	2	2013-11-12	TQ2060	42.200000000	42.200000000	42.600000000	0.000000000
1		-9.999	Manmade	50		false	0001000003570264	4	2017-09-28	TQ2060	42.000000000	46.200000000	50.500000000	4.200000000
1		-9.999	Manmade	50		false	0001000003570258	3	2017-09-28	TQ2060	42.600000000	46.900000000	51.500000000	4.300000000
1		-9.999	Manmade	50		false	0001000003570244	2	2017-09-28	TQ2060	41.000000000	46.100000000	49.400000000	5.100000000
1		-9.999	Manmade	50		false	0001000003570242	3	2017-09-28	TQ2060	41.000000000	46.200000000	48.800000000	5.200000000
1		-9.999	Manmade	50		false	0001000003570225	2	2017-09-28	TQ2060	41.600000000	46.600000000	50.400000000	5.000000000
1		-9.999	Manmade	50		false	0001000003570223	3	2017-09-28	TQ2060	41.600000000	47.000000000	50.100000000	5.400000000
1		-9.999	Manmade	50		false	0001000003569994	2	2017-09-28	TQ2060	42.600000000	47.500000000	50.000000000	4.900000000
1		-9.999	Manmade	50		false	0001000003569974	3	2017-09-28	TQ2060	35.400000000	38.400000000	38.900000000	3.000000000
1		-9.999	Manmade	50		false	0001000003569914	3	2017-09-28	TQ2060	39.400000000	43.100000000	44.800000000	3.700000000

- Select the *Files* drop-down from the top toolbar, then choose the *Save Query* option to save this join.

If you close the query table and open the version you have saved, a map view of the join will open in a window browser. Please be aware that as you are dealing with large files, these steps may take some time to process.

6.4 Dealing with duplicate records

Users should be aware that in Building Height Attribute data, features are not broken at tile edges. Therefore, once the .csv files have been merged and then joined with features in the OS MasterMap Topography Layer Topo_Area table, duplicate records will exist in the data. Depending upon which GI application is being used, tools are available within the application to remove duplicate features.

- ESRI ArcGIS:** In ArcGIS, use the option *Geoprocessing > Dissolve* to remove the duplicate features within the merged data. The output can be saved into file geodatabase, created as described earlier in this section.
- QGIS:** In QGIS, use the option *Vector > Geoprocessing > Dissolve* to remove the duplicate features within the merged data. The output will be a shapefile containing the de-duplicated data.
- MapInfo Professional:** There are several ways to remove duplicate features in MapInfo Professional. The following article from precisely.com details how to use the Delete Duplicates tool in MapInfo Professional to remove duplicate records but retain map objects:
 - [Precisely.com article on 'Deleting duplicate records and retaining map objects in MapInfo Pro'](https://customer.precisely.com/s/article/Deleting-duplicate-records-and-retaining-map-objects-in-MapInfo-Pro?language=en_US#:~:text=Open%20the%20table%20or%20tables,Duplicates%20on%20the%20Running%20tab.) (https://customer.precisely.com/s/article/Deleting-duplicate-records-and-retaining-map-objects-in-MapInfo-Pro?language=en_US#:~:text=Open%20the%20table%20or%20tables,Duplicates%20on%20the%20Running%20tab.)

7. How do I import the Building Height Attribute product into a database?

The Building Height Attribute product can be loaded into several databases. This section describes how to load it into commonly used databases, including PostgreSQL and Oracle. For more information on other databases that the Building Height Attribute product is compatible with, please speak to your OS Technical Consultant.

7.1 PostgreSQL

These notes outline how to load Building Height Attribute data into a PostgreSQL database using the .csv file. The notes have been prepared using version 2.0 of PostGIS for PostgreSQL 9.3.

7.1.1 Loading instructions

1. Open the PGAdmin tool (this can be found on the *Windows Start Menu > PostgreSQL*).
2. Either connect to an existing database or create a new database.
3. Open the public schema (although in a production environment, it is advised to use a different schema) and create the table using the following, or similar, script:

```
create table <Insert table name>(
OS_TOPO_TOID character varying (20),
OS_TOPO_TOID_VERSION smallint,
BHA_ProcessDate date,
TileRef character varying (6),
AbsHMin real,
AbsH2 real,
AbsHMax real,
RelH2 real,
RelHMax real,
BHA_Conf smallint
);
```

4. Once the tables have been created, the data can be loaded into the table using the SQL COPY, adding the .csv option as the first line contains a header record.

```
COPY <Insert table name> FROM '<Insert file path to bha.csv>' DELIMITER ';' CSV HEADER;
```

Note: The sections within the chevrons require your postGIS table name and the file path to your data (the latter must contain no spaces in the path).

7.1.2 Altering the TOID

The following section details the steps that you can take to reformat the TOID attribute in the Building Height Attribute data you've loaded, so that the format matches that of the TOID attribute in your translated OS MasterMap Topography Layer Topographic Area data.

Note: If you have used the gawk application process outlined in Section 4 or if the format of the TOIDs in your translated OS MasterMap Topography Layer data match that in the Building Height Attribute data, you do not require this step.

Two reformatting options are presented below:

1. Script to remove 'osgb' from Building Height Attribute TOIDs:

Recommended for use if your translator removes 'osgb' from your OS MasterMap Topography Layer TOIDs but does not add any leading zeroes to shorter 13-digit TOIDs.

Run the following SQL command:

```
UPDATE <insert table name> SET <insert TOID column name> = trim('osgb' from os_topo_toid);  
COMMIT;
```

2. Script to remove 'osgb' and add '000' to 13-digit Building Height Attribute TOIDs:

Recommended for use if your translator removes 'osgb' from your OS MasterMap Topography Layer TOIDs and adds three leading zeroes to shorter 13-digit TOIDs.

Run the following SQL command:

```
UPDATE <insert table name> set <insert TOID column name> =  
(CASE  
WHEN char_length(<insert TOID column name>) = 20 THEN trim('osgb' from <insert TOID column  
name>)  
ELSE ('000' || trim('osgb' from <insert TOID column name>))  
END);  
COMMIT;
```

Note: The sections inside the chevrons require your postGIS table name and TOID column name.

7.2 Oracle

The following set of instructions assumes a basic knowledge of Oracle databases and SQLLDR, which is the package that can be used to load Building Height Attribute .csv into the database. Other options are available for loading data into Oracle databases.

If required, copy the data file(s) to an appropriate location. It is worth noting that the file(s) will need to be unzipped and therefore you will need in the region of 1.3 Gb of free space.

Once the data is in an appropriate location, the next stage is to uncompress the *.zip file to .csv. This can be done using a package such as WinZip or 7Zip.

7.2.1 Loading instructions

1. Create the tables using the SQL below.
2. Prior to running the script, the tablespace that the tables are going to reside in needs to be altered from **<TablespaceName>** to the tablespace that is being worked in.
3. If the table already exists, you will firstly need to drop the table using the following SQL:

```
DROP TABLE <Insert Table Name> CASCADE CONSTRAINTS;
```

4. Next you will need to create a new empty table using the following SQL:

```
CREATE TABLE <Insert Table Name>  
(  
  MI_PRINX NUMBER (38, 0),  
  OS_TOPO_TOID VARCHAR2 (20),  
  OS_TOPO_VERSION NUMBER,  
  BHA_PROCESSDATE DATE,  
  TILEREF VARCHAR2 (6),  
  ABSHMIN FLOAT,  
  ABSH2 FLOAT,  
  ABSHMAX FLOAT,  
  RELH2 FLOAT,  
  RELHMAX FLOAT,  
  BHA_CONF NUMBER  
);
```

```
DROP SEQUENCE BHA_data_S;  
CREATE SEQUENCE BHA_data_S  
START WITH 1  
INCREMENT BY 1;  
COMMIT;
```

5. Create an SQLldr control file containing the following information:

```
OPTIONS (SKIP=1, BINDSIZE=20971520, READSIZE=20971520, ROWS=2500, ERRORS=10, SILENT =  
FEEDBACK )
```

```
LOAD DATA  
CHARACTERSET WE8ISO8859PI  
INFILE '<Insert file path to bha.csv>'
```

APPEND

```
INTO TABLE BHA_data  
FIELDS TERMINATED BY ","  
OPTIONALLY ENCLOSED BY ""  
TRAILING NULLCOLS  
(  
MI_PRINX EXPRESSION " BHA_data_$.NEXTVAL",  
OS_TOPO_TOID,  
OS_TOPO_VERSION,  
BHA_PROCESSDATE DATE "YYYY-MM-DD",  
TILEREF,  
ABSHMIN,  
ABSH2,  
ABSHMAX,  
RELH2,  
RELHMAX,  
BHA_CONF
```

) Preface

Note: The sections inside the chevrons require you to input your table name and the file path to your data (the latter must contain no spaces in the file path).

6. Once this file is created, it can be called from a .bat file to run it on the box that holds the database rather than a remote machine. The contents of the .bat file should be similar to the following:

```
@sqlldr <username>/<password>@<service name> control= <name of ctl file created previously>  
Pause
```

7. 'Double click' the .bat file that you've just created to load the data into the BHA_DATA table in your database.

7.2.2 Altering the TOID

Note: If you have used the gawk application process outlined in Section 4 or if the format of the TOIDs in your translated OS MasterMap Topography Layer data match that in the Building Height Attribute data, you do not require this step.

Two reformatting options are presented below:

1. Script to remove 'osgb' from Building Height Attribute TOIDs:

Recommended for use if your translator removes 'osgb' from your OS MasterMap Topography Layer TOIDs but does not add any leading zeroes to shorter 13-digit TOIDs.

Run the following SQL command:

```
UPDATE <Insert Table Name> set <Insert Table Name>.<insert TOID column name>=substr(<Insert Table Name>.<insert TOID column name>,5);
```

2. Script to remove 'osgb' and add '000' to 13-digit Building Height Attribute TOIDs:

Recommended for use if your translator removes 'osgb' from your OS MasterMap Topography Layer TOIDs and adds three leading zeroes to shorter 13-digit TOIDs.

Run the following SQL command:

```
UPDATE <Insert Table Name> set <Insert Table Name>.<insert TOID column name>=  
(CASE  
WHEN length(os_topo_toid) = 20 then substr(<Insert Table Name>.<insert TOID column name>, 5)  
ELSE ('000' || substr(<Insert Table Name>.<insert TOID column name>, 5))  
END);
```

Note: The sections inside the chevrons require you to enter your table name and TOID column name.

8. Further information about the Building Height Attribute product

Further information about the Building Height Attribute product (including FAQs) can be found on the [Product Support page for OS MasterMap Topography Layer on the OS website](https://www.ordnancesurvey.co.uk/business-government/tools-support/mastermap-topography-support) (<https://www.ordnancesurvey.co.uk/business-government/tools-support/mastermap-topography-support>).