Technical note 2013/01 Internal environmental conditions for condensation risk analysis

JPA|TL

1 Overview

This technical note describes recent changes to the handling of internal environmental conditions for condensation analysis in JPA Designer. It describes the two main approaches to internal conditions and explains how to save sets of internal environmental conditions.

2 Internal conditions in condensation risk analysis

Condensation risk analysis requires monthly temperature and relative humidity data for the internal and external climate. The external climate data comes from weather station data: JPA Designer is supplied with a range of data sets for the UK, Ireland, Middle East, Asia, Australia and New Zealand.

Internal climate conditions are either:

- derived from the external conditions using methods described in ISO 13788:2012[1]. This method is suitable for naturally and mechanically ventilated buildings where the temperature is controlled, but there is no control of humidity.

- entered directly into the software. This method is suitable for buildings with a conditioned internal climate.

Both internal and external climate conditions are set in the **Environmental conditions** dialogue (Figure 1): to open the dialogue use the button on the toolbar or on the **Edit** menu select **Environmental Conditions**.

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[1] ISO 13788:2012. Hygrothermal performance of building components and building elements – Internal surface temperature to avoid critical surface humidity and interstitial condensation methods – Calculation methods.

Figure 1: The **Environmental Conditions** dialogue

2.1 Internal conditions derived from external conditions

In buildings which are heated and/or cooled, but not conditioned, the internal vapour pressure is dependent upon the rate of moisture generation within the building and the external vapour pressure. ISO 13788 has two methods of determining the internal relative humidity from the external conditions:

- a method for maritime climates, such as that in the UK.

- a method for continental and tropical climates.

2.1.1 Maritime climates

For maritime climates ISO 13788 defines five internal humidity classes based on the rate of moisture generation within the building. They are:

1. Storage areas.

2. Offices and shops.

3. Dwellings with low occupancy.

4. Dwellings with high occupancy, sports halls, kitchens, canteens, and buildings heated with unflued gas heaters.

5. Special buildings such as laundries, breweries and swimming pools.

When carrying out condensation risk analysis it is important to select the appropriate climate class. If there is doubt as to which of two classes the building belongs in always select the highest, more onerous one.

To set the conditions for a maritime climate:

1. Open the **Environmental Conditions** dialogue.

2. Select the **Building location**.

3. Tick **Calculate internal conditions based on external conditions**.

4. At **Climate** select *Maritime*.

5. From the **Internal humidity class** list select the class which best matches the building.

6. Set the **Internal temperature**.

7. If the nature of the building means it is more than usually sensitive to interstital condensation select an appropriate **Risk level** (see BS 5250:2011 for details).

8. The program now displays the monthly internal and external temperature and humidity data.

2.1.2   Continental and tropical climates

For continental and tropical climates ISO 13788 considers two occupancy classes:

- normal.

- high.

To set the conditions for a continental climate:

1. Open the **Environmental Conditions** dialogue.

2. Select the **Building location**.

3. Tick **Calculate internal conditions based on external conditions**.

4. At **Climate** select *'Continental' or tropical*.

5. The program now displays the monthly internal and external temperature and humidity data.

2.2 Directly entered internal conditions

For buildings where the internal conditions are known, either from design specifications or through testing, the environmental data can be entered directly. The simplest way to do this is to create and save an internal data set following the instructions in section 3.

To enter the internal conditions directly:

1. Tick **Use design data for internal conditions**.

   The ISO data boxes are hidden.

2. In the list box select one of the standard sets of internal conditions.

   *You can also enter values directly into the **IntT** and **Int RH** columns, but those values will only be available for that calculation.*

3 Saving sets of internal and external environmental conditions

You can build up and save sets of internal and external environmental conditions to use in condensation risk analysis. This is particularly useful when examining air-conditioned buildings which have design values for temperature and humidity.

User data is stored in a file **Env_user.txt** which is kept with the other user data files in **c:\ProgramData\JPA\JPA Designer** (file location correct for Windows 7 - see Technical note 2012/01 for other versions of Windows). Currently, the only way to add data sets is to edit **Env_user.txt** in a text editor, such as Notepad (Figure 2). Before editing **Env_user.txt** make sure JPA Designer is not running.

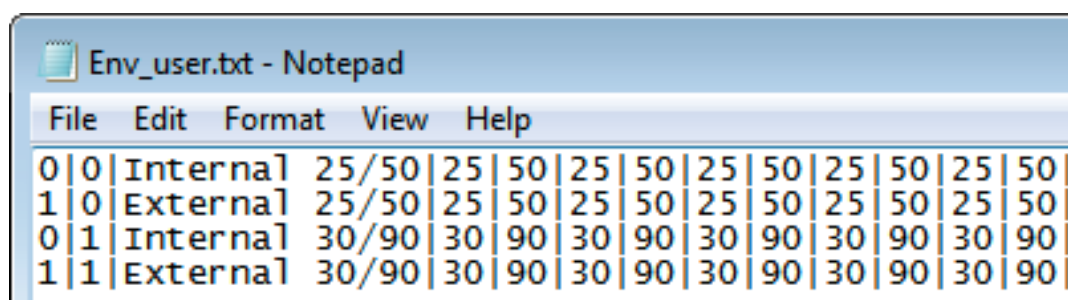Figure 2: Editing the **Env_user.txt** file

Within **Env_user.txt** the data for an external location or an internal design condition is on one line, with each line separated by a return. On each line, the different items of data are separated by the pipe character, |, with no spaces before or after the pipe. The final character on every line is also a pipe.

The data items are:

- Item 1: whether the set is for internal conditions, 0, or external conditions, 1.

- Item 2: whether the set is system data, 0, or user data, 1.

- Item 3: a text description of the data set. This appears in the **Building location** or **internal conditions** lists, which are sorted alphabetically using the text description. This item can start with the tilde character ($\sim$), which does not appear on lists, but controls the way in which items 4--27 are interpreted.

- Items 4–27: these are the monthly temperature and relative humidity figures. Temperatures should be entered in degrees centigrade and relative humidity as a percentage. The order of the data depends on whether item 3 starts with a tilde ($\sim$).

  - If item 3 has a tilde the mean monthly temperatures should be entered in a sequence starting with January, followed by the relative humidity figures, starting with January (so: `Jan temp|Feb temp| … |December temp|Jan %rh|Feb %rh|` etc.)
  - If item 3 has no tilde the temperature and relative humidity values for each month should follow each other (that is: `Jan temp|Jan rh|Feb temp|Feb %rh|` etc).

- Item 28: the country code. UK, 0. Republic of Ireland, 1. Australia, 2. New Zealand, 3. Asia, 4. Middle East, 5.

- Item 29: applies to external environmental sets and indicates whether internal conditions should be calculated on the basis of continental conditions, 1, or maritime conditions, any other value. This item is used only when internal conditions are to be derived from the external conditions: it is not used if fixed internal conditions are specified.

As an example:

`1|1|Newcastle Airport|3.4|92|…|4.2|89|0|0|`

This shows:

- External data (1).

- User data (1)

- Location, with no tilde.

- Paired monthly values for temperature (3.4 and 4.2) and relative humidity (92 and 89).

- UK (0)

- Maritime climate (0).

Once the environmental conditions have been entered and saved in **Env_user.txt** and JPA Designer started, the new data sets will show up in the **internal conditions** list. Note that the conditions will only show if their region matches the region selected for analysis.

If there are several users of JPA Designer within the same organisation the **Env_user.txt** file can be set up on one PC then copied to the others, ensuring everyone is using the same data sets.

4   Further information

Information about JPA Designer may be found on our web site[2].

Technical support enquiries by email only[3].

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[2] http://www.techlit.co.uk
[3] mailto:support@techlit.co.uk