

HABIT v2.2.1

Software Release Notes

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1 Introduction

The Computer Codes for Evaluation of Control Room Habitability (HABIT) package is designed to assist in the evaluation of control room (CR) habitability in the event of accidental spills of toxic chemicals.

This document outlines in detail the modifications, additions, and/or removal of features from HABIT v2.2 to HABIT v2.2.1.

This update was intended as a patch to fix various bugs and issues with the installation process and operation of the graphical user interface (GUI).

2 Abbreviations

Table 2-1 Abbreviations

Term	Definition
HABIT	Computer Codes for Evaluation of Control Room Habitability
CR	control room
GUI	graphical user interface

3 Changes

The following sub-sections outline the changes made from HABIT v 2.2 to HABIT v2.2.1. A summary of changes is provided in Table 3-1. Note that some issues have been saved for future updates or closed as duplicates, so certain numbers will be skipped in the issue list.

Table 3-1 Summary of Resolved Issues

Issue #	Description	Section
1	Corrected scaling of EXTRAN, DEGADIS, and SLAB tabs	3.1
4	Clarified a DEGADIS error when default input does not exist	3.2
5	Corrected Exposure Plot 'X-axis in seconds' button behavior	3.3
7	Corrected the 'Adjust Time Scale' slider behavior to properly handle the minimum and maximum data value	3.4
8	Allowed HABIT to be installed and operate out of any directory	3.5
10	Handled exceptions raised when trying to view outputs that do not exist	3.6
11	Fixed 'Load Input' behavior in DEGADIS tab to load the selected file	3.7
12	Handled exceptions when attempting to run DEGADIS and SLAB before loading inputs	3.8
13	Standardized the exponent notation in GUI text	3.9
14	Corrected the DEGADIS Concentration Graph	3.10

3.1 Issue 1: Scaling of EXTRAN, DEGADIS, and SLAB Tabs

When maximizing the HABIT window on larger screens, the automatic scaling of certain tabs (namely DEGADIS and SLAB) causes input fields to become inaccessible. In HABIT v2.2.1, this behavior is corrected as all input fields remain visible and accessible.

Additionally, the 'Plot Exposure' button on the EXTRAN tab may be cut off on smaller monitors, such as those on a laptop. In HABIT v2.2.1, the legend was moved to the empty space in the lower left of the window to allow the buttons to shift up.

Note that this issue specifically targets the scaling of GUI elements when maximizing HABIT. However, there is an overall scaling issue for the HABIT software. The HABIT v2.2 GUI was developed in such a manner that scroll bars do not automatically appear when the contents of the interface do not fit on the user's screen. Therefore, GUI elements can be inaccessible on

very small screens or low resolutions. See Section 4.4 for planned fixes in a future version of HABIT.

3.2 Issue 4: Nonspecific DEGADIS Error

The DEGADIS module relies on having default parameters stored in the installation directory in the file Data/DefaultDG.inp. This allows HABIT to prepopulate the input fields of the DEGADIS tab when adding the DEGADIS module to an input case for the first time. Previously, if the DefaultDG.inp file was missing from the Data directory, an error message occurred that did not properly indicate the problem; this is demonstrated in Figure 3-1.

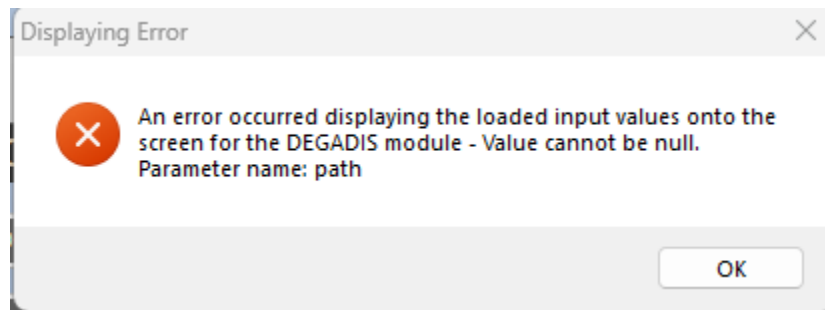


Figure 3-1 Example of the Nonspecific Error Raised When Running HABIT When the DefaultDG.inp file Does Not Exist

The error language has been modified to clearly identify the problem.

3.3 Issue 5: X-axis in Seconds Button Changing Exposure Plot

Each module in HABIT has an Exposure Plot button to display a plot of the exposure over time. If the button 'x-axis in seconds' is checked for any module, the depicted plot is changed to that of the EXTRAN module. This functionality has been modified to retain the displayed plot and only modify the units on the x-axis.

3.4 Issue 7: 'Adjust Time Scale' Slider in Exposure Plot not Properly Handling Minimum and Maximum Data Value

Two separate errors have arisen from the 'Adjust Time Scale' slider in the Exposure Plot window. Moving the slider down by any increment disallows the user from returning the slider to the maximum value of the plot. Additionally, if the minimum time of the plot is significantly greater than 0 and the slider is moved below the minimum, an unhandled exception is raised. Both of these issues have been addressed in HABIT v2.2.1.

3.5 Issue 8: Directory for Install and Operation Hard-coded to 'Documents'

Previous versions of HABIT were configured to only run from the Documents directory. HABIT v2.2 was specifically configured to only operate from Documents\HABIT2.2\. Certain required files were coded with the Documents directory; therefore, if HABIT or one of those files was not in the Documents directory, several errors would be presented, and the modules would ultimately not execute properly.

Furthermore, the installation file for HABIT v2.2 would not provide an option for the user to select the directory to which HABIT would be downloaded, as depicted by Figure 3-2.

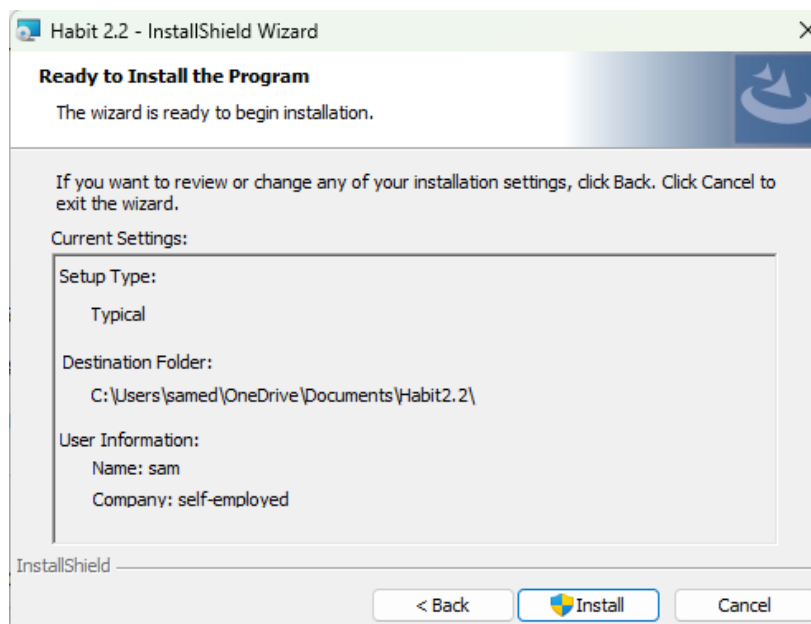


Figure 3-2 The Installation Window for HABIT v2.2

HABIT v2.2.1 has been configured so that it can operate from any directory; additionally, the installation process has been updated to grant users the ability to select the installation file.

3.6 Issue 10: Unhandled Exceptions when Outputs do not Exist

There are two unhandled exceptions that occur with new designs that do not have outputs created yet.

The buttons 'View Run Log' in the Extran and SLAB tabs and 'View Output Log' in the Chem and DEGADIS tabs will cause an unhandled exception on a new design before running the respective module. In HABIT v2.2.1, the output log now states that the output does not exist.

The button 'Plot Results' on all tabs will cause an unhandled exception. The minimum value of the plot defaults to zero which is not handled by the logarithmic scale of the y-axis. In HABIT v2.2.1, a blank plot is now displayed, mirroring the behavior of selecting the 'Exposure Plot' button when no outputs have been generated.

3.7 Issue 11: Loading in DEGADIS Input Files

The DEGADIS module has a 'Load Input' button analogous to the other modules. However, despite producing a prompt for the user to select an input file to load, the default DefaultDG.inp file is always loaded instead. This behavior was corrected in HABIT v2.2.1 to load in the file selected by the user.

3.8 Issue 12: Running DEGADIS & SLAB Modules before Loading Inputs

In order to run the DEGADIS and SLAB modules, additional files need to be generated, specifically a .bat file for each module. This is typically handled by running the EXTRAN module first (or providing these files from a previous run). In HABIT v2.2, if the 'Run' button is selected, an unhandled exception is thrown indicating that this .bat file is inaccessible. In HABIT v2.2.1, this error is handled and gives a message on how to proceed (indicating that the user should run the Extran module).

3.9 Issue 13: Standardizing Exponent Notation in GUI Text

Three modules in HABIT v2.2 have different methods of showing exponents:

- In EXTRAN, no character is used, such as m3/s.
- In CHEM, exponents are displayed as superscripts.
- In DEGADIS and SLAB: exponents appear using two asterisks, such as kg/m**3.

For clarity and consistency, the exponent text in the GUI was updated to all display as superscripts in v2.2.1.

3.10 Issue 14: DEGADIS Concentration Graph

The DEGADIS module has a Graph tab that is intended to depict a plot of the data from the *.SR4 file. However, the implementation of the plot in v2.2 does not properly read in the data. Specifically, HABIT v2.2 plots the data twice and includes the timestamp of any missing data at

time 0. The loading script additionally made some assumptions on the format of the *.SR4 that were not always correct, which sometimes caused plots to not be generated at all in this tab.

This behavior was corrected in HABIT v2.2.1. More specifically, only numerical data is parsed and included in the plot, and the points on the plot are not repeated.

4 Outstanding Changes and Issue Tracker

There were some issues and features that were omitted from inclusion with this version. These are planned for future releases of HABIT. A summary is provided in Table 4-1. Particularly, please note Section 4.3 for an outstanding issue that is a known problem in HABIT v2.2.1.

Table 4-1 Summary of Upcoming Changes and Known Issues With HABIT

Issue #	Classification of Issue	Description	Section
2	Feature	Ensuring HABIT is fully compliant with Section 508	4.1
3	Feature	Updating .NET Framework to .NET Core	4.2
15	Outstanding Issue	Running HABIT with SLAB	4.3
16	Outstanding Issue	Sizing of HABIT screen	4.4
17	Outstanding Issue	Unhandled Exceptions for Files	4.5
18	Outstanding Issue	Different Results when Rerunning HABIT	4.6

4.1 Issue 2: Section 508 Compliance

HABIT is planned to be modified to fully comply with Section 508 guidelines. This includes but is not limited to the following:

- updating colors of GUI elements to satisfactory contrast ratios,
- updating the order that elements are highlighted when hitting the Tab key,
- providing keyboard controls for all GUI elements,
- ensuring that all GUI elements have internal names and descriptions (for compatibility with screen reading technologies),

- and ensuring compatibility with other assistive technologies.

These changes will not impact the current functionality of HABIT and are intended to provide comparable access to individuals with disabilities.

4.2 Issue 3: Updating to .NET Core

Current versions of HABIT are compiled with the .NET Framework version 4.X, which is still deployed but no longer updated by Microsoft. Migration to .NET core intends to address the following:

- ensures that HABIT will continue to function in the future
- and corrects known bugs inherent in the .NET Framework with regards to compatibility with assistive technology.

This update is mainly to address Section 508 compliance but has the added benefit that HABIT should work on Windows systems released for the foreseeable future.

4.3 Issue 15: Running HABIT with SLAB

This is the most important planned change to HABIT as it is a known problem with HABIT v2.2.1. It was discovered that the relative humidity factor calculated in the Dense Gas Variables of the EXTRAN tab may not get properly carried over to the SLAB tab. There appears to be different behavior depending on whether SLAB is checked for inclusion before EXTRAN is run. If the SLAB module is checked on the main tab, then the relative humidity is carried over correctly; conversely, if the SLAB module is not checked, it looks like the number 0 is populated in the SLAB relative humidity field instead of the calculated number. The results were slightly different between the two behaviors for the test case where this was presented.

4.4 Issue 16: HABIT Sizing Issue

The HABIT v2.2 GUI was developed in such a manner that scroll bars do not automatically appear when the contents of the interface do not fit on the user's screen. Therefore, GUI elements can be inaccessible on very small screens or low resolutions.

The HABIT GUI will likely need to be slightly overhauled to support these changes and the update to more modern versions of the .NET Core to support the Section 508 compliance updates. Newer versions of .NET Core depreciate the default text font used in the HABIT v2.2 GUI, so the current layout of the text fields is not entirely supported in the new versions. Therefore, significant effort may be required to ensure that the GUI will display properly in all environments.

4.5 Issue 17: Unhandled Exceptions when Opening Files

A few unhandled exceptions were encountered during the acceptance testing process. These are planned to be fixed for the next HABIT update. Both unhandled exceptions are related to loading the case database files. If the file that is open no longer exists (for example, an external drive disconnects) or if the intended case file is open in another program, HABIT will throw an unhandled exception error. Clicking continue will allow the program to still operate as intended.

4.6 Issue 18: Rerunning HABIT and Getting Different Results

During testing, it was uncovered that running certain HABIT cases after saving and closing produced different results. This seems to be isolated to the inputs marked N (not used) in the EXTRAN tab. Namely, the error was encountered with a run for the Gas Tank Burst Release Type. Loading in an input file populated the Liquid Heat Capacity and Specific Gravity fields in the Input Selection 3: Chemical Parameters tab. These values were included in the SLAB run. However, after saving the HABIT run, closing the program, reopening HABIT, and running this test case again, those two fields (among others) were not included in the SLAB run. This is demonstrated by Figure 4-1. The file on the left represents the file that was generated by the run after closing and reloading the test case. Notice that certain input fields have changed to zeros or NaNs. This impacts the results of not only this file but the files DesignEX.CNX, DesignCH.TAB, and DesignCH.SPD as well.

There are plans to further characterize and fix this behavior. Reloading and rerunning the same case file should result in the same answers.

13-	cpsl = 0.00	13+	cpsl = 2180.00
14-	rhosl = 0.00	14+	rhosl = 1050.00
15-	spb = -1.00	15-	spb = -1.00
16-	spc = 0.00	16-	spc = 0.00
17-	ts = 391.25	17-	ts = 391.25
* 24 hidden lines			
42-	density of source gas (kg/m3) - rhos = 1.8705E+00	42-	density of source gas (kg/m3) - rhos = 1.8705E+00
43-	boiling point temperature - tbp = 3.9125E+02	43-	boiling point temperature - tbp = 3.9125E+02
44-	liquid mass fraction - cmed0 = 0.0000E+00	44-	liquid mass fraction - cmed0 = 0.0000E+00
45-	liquid heat capacity (j/kg-k) - cpsl = 0.0000E+00	45+	liquid heat capacity (j/kg-k) - cpsl = 2.1800E+03
46-	heat of vaporization (j/kg) - dhe = 4.0200E+05	46-	heat of vaporization (j/kg) - dhe = 4.0200E+05
47-	liquid source density (kg/m3) - rhosl = 0.0000E+00	47+	liquid source density (kg/m3) - rhosl = 1.0500E+03
48-	saturation pressure constant - spa = 7.4209E+00	48-	saturation pressure constant - spa = 7.4209E+00
49-	saturation pressure constant (k) - spb = 2.9034E+03	49-	saturation pressure constant (k) - spb = 2.9034E+03
50-	saturation pressure constant (k) - spc = 0.0000E+00	50-	saturation pressure constant (k) - spc = 0.0000E+00
* 9 hidden lines			
60-	source area (m2) - as = 5.6953E+03	60-	source area (m2) - as = 5.6953E+03
61-	vertical vapor velocity (m/s) - ws = 0.0000E+00	61-	vertical vapor velocity (m/s) - ws = 0.0000E+00
62-	source half width (m) - bs = 3.7734E+01	62-	source half width (m) - bs = 3.7734E+01
63-	source height (m) - hs = NaN	63+	source height (m) - hs = 4.2579E+01
64-	horizontal vapor velocity (m/s) - us = 0.0000E+00	64-	horizontal vapor velocity (m/s) - us = 0.0000E+00
65-		65-	
66-		66-	
* 37 hidden lines			
104-		104-	
105-		105-	
106-		106-	
107-	x 0.00E+00 zc 0.00E+00 h NaN bb 3.77E+01 b 3.40E+01 bbx 3.77E+01 bx 3.40E+01 cv 1.00E+00 rho NaN	107+	x 0.00E+00 zc 0.00E+00 h 4.26E+01 bb 3.77E+01 b 3.40E+01 bbx 3.77E+01 bx 3.40E+01 cv 1.00E+00 rho 1.87E+00 3.1
108-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	108+	2.87E-02 0.00E+00 4.15E+01 3.86E+01 3.46E+01 3.98E+01 3.46E+01 9.61E-01 1.85E+00 3.1
109-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	109+	1.26E-01 0.00E+00 3.80E+01 4.09E+01 3.65E+01 4.17E+01 3.64E+01 9.22E-01 1.82E+00 3.1
110-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	110+	3.03E-01 0.00E+00 3.27E+01 4.47E+01 3.96E+01 4.59E+01 3.95E+01 8.85E-01 1.80E+00 3.1
111-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	111+	5.08E-01 0.00E+00 2.68E+01 5.00E+01 4.42E+01 5.17E+01 4.38E+01 8.58E-01 1.77E+00 3.1
112-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	112+	9.08E-01 0.00E+00 2.12E+01 5.69E+01 5.00E+01 5.91E+01 4.93E+01 8.20E-01 1.75E+00 3.1
113-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	113+	1.33E+00 0.00E+00 1.66E+01 6.53E+01 5.72E+01 6.80E+01 5.59E+01 7.93E-01 1.74E+00 3.1
114-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	114+	1.83E+00 0.00E+00 1.28E+01 7.52E+01 6.56E+01 7.83E+01 6.36E+01 7.69E-01 1.72E+00 3.1
115-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	115+	2.39E+00 0.00E+00 9.91E+00 8.66E+01 7.53E+01 9.01E+01 7.24E+01 7.47E-01 1.71E+00 3.1
116-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	116+	3.02E+00 0.00E+00 7.70E+00 9.94E+01 8.62E+01 1.03E+02 8.22E+01 7.27E-01 1.69E+00 3.1
117-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	117+	3.71E+00 0.00E+00 6.04E+00 1.14E+02 9.84E+01 1.18E+02 9.31E+01 7.06E-01 1.68E+00 3.1
118-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	118+	4.47E+00 0.00E+00 4.82E+00 1.29E+02 1.12E+02 1.34E+02 1.05E+02 6.80E-01 1.66E+00 3.1
119-	NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN NaN	119+	5.32E+00 0.00E+00 3.93E+00 1.47E+02 1.27E+02 1.52E+02 1.18E+02 6.46E-01 1.64E+00 3.1

Figure 4-1 Difference in the DesignSLAB.PREDICT Files for the Same Case After Reloading and Rerunning