

Office of Nuclear Regulatory Research



HABIT v1.2 (Control Room Habitability)

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*Prepared for 2015 Joint Action Group for Atmospheric Transport and Dispersion
Modeling meeting, at George Mason University, Fairfax, VA: June 9, 2015*



Conservation Equation

$$\frac{\partial \Phi}{\partial t} + \nabla \cdot (\mathbf{F} + \Phi \mathbf{V}) - H = 0$$



HABIT COMPUTER CODE



- HABIT was reengineered from EXTRAN (1991)
- **Version 1.1 (1995):** IBM/DOS code. Available at RSICC/ORNL
- **Version 1.2 (2015):** Windows 7/8 (64-bit) code. Available at RAMP/NRC



[Http://www.USNRC-RAMP.com](http://www.USNRC-RAMP.com)

User-Need Request: NRO-2011-007

- **HABIT Code Evaluation and Update**
 - NRO TL – Syed Haider (NRO/DSRA/SBCV)
 - RES COR – Casper Sun (RES/DSA/RPB)

- **Action Items:**

- Phase 1: Re-hosting HABIT to Windows 7**

- Upgrade FORTRAN and modernize GUI
 - Build-in tooltips and develop “User’s Manual”

- Phase 2: Adding Dense-Gas Functions**

- Add DEGADIS and SLAB to HABIT
 - Update RG 1.78 and associated TBDs

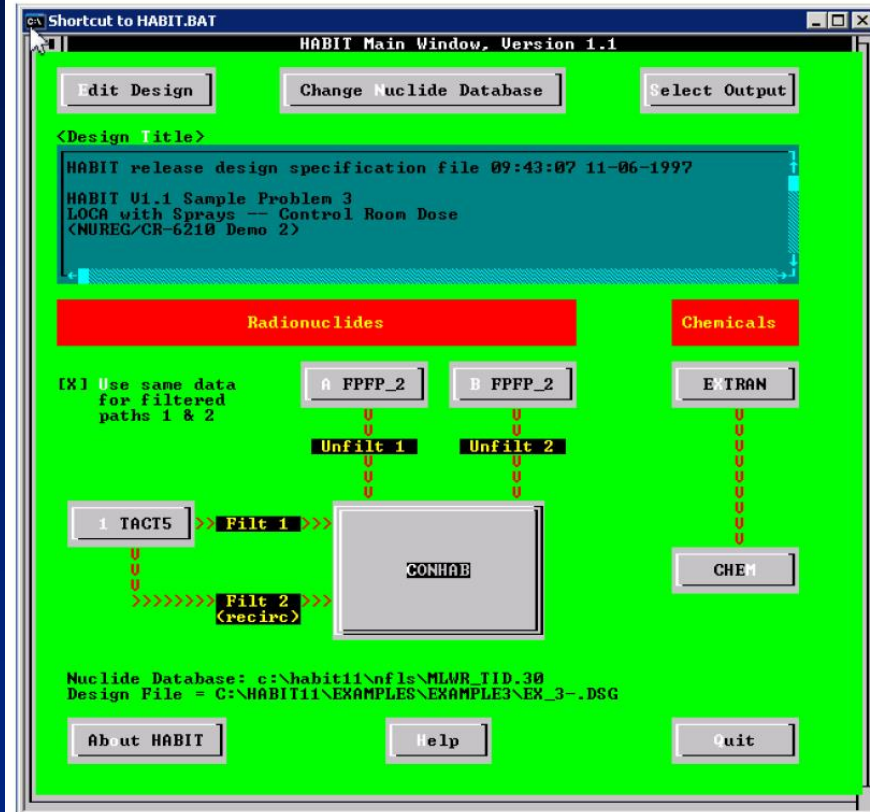


What's New in HABIT v1.2 (2015)

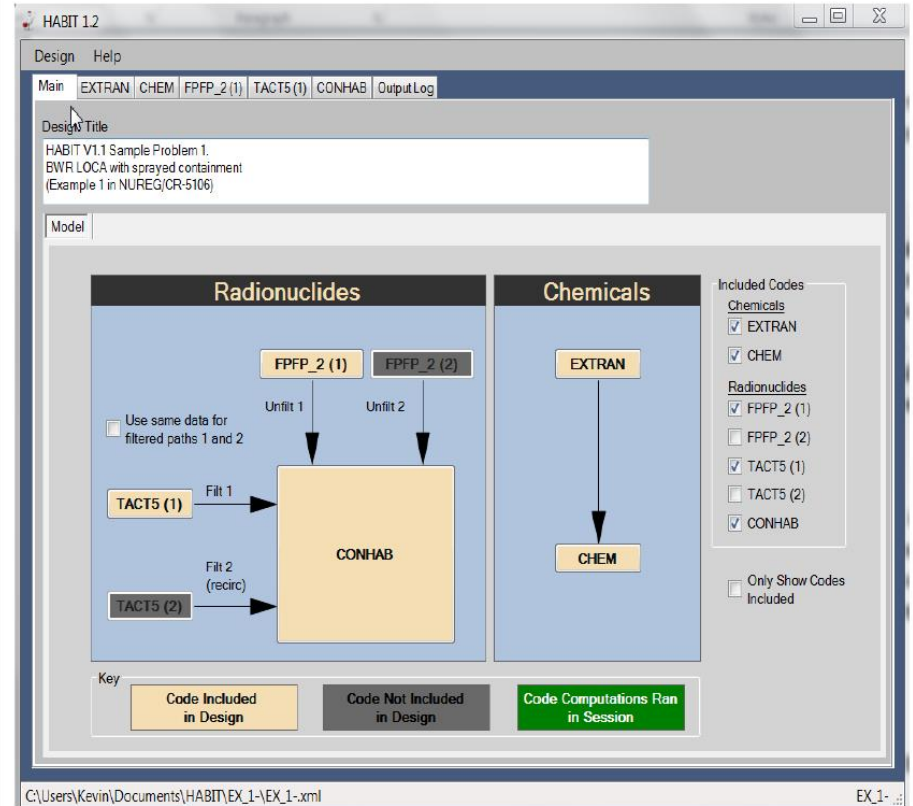
- **Used Intel Visual FORTRAN compiler for compatibility with Windows 7 (64-bit)**
 - I/O are identical as HABIT v1.1
 - Backwards compatible for old designed (.DSG) files and FORTRAN input (.INP) files
- **Used new Microsoft .NET technology for graphical user interface (GUI) development**
 - Consistent module interface design (tabs)
 - Section 508 Compliance (e.g., color blinder or muted use of color, JAWS accessibility)

Main Screen Makeover

Original

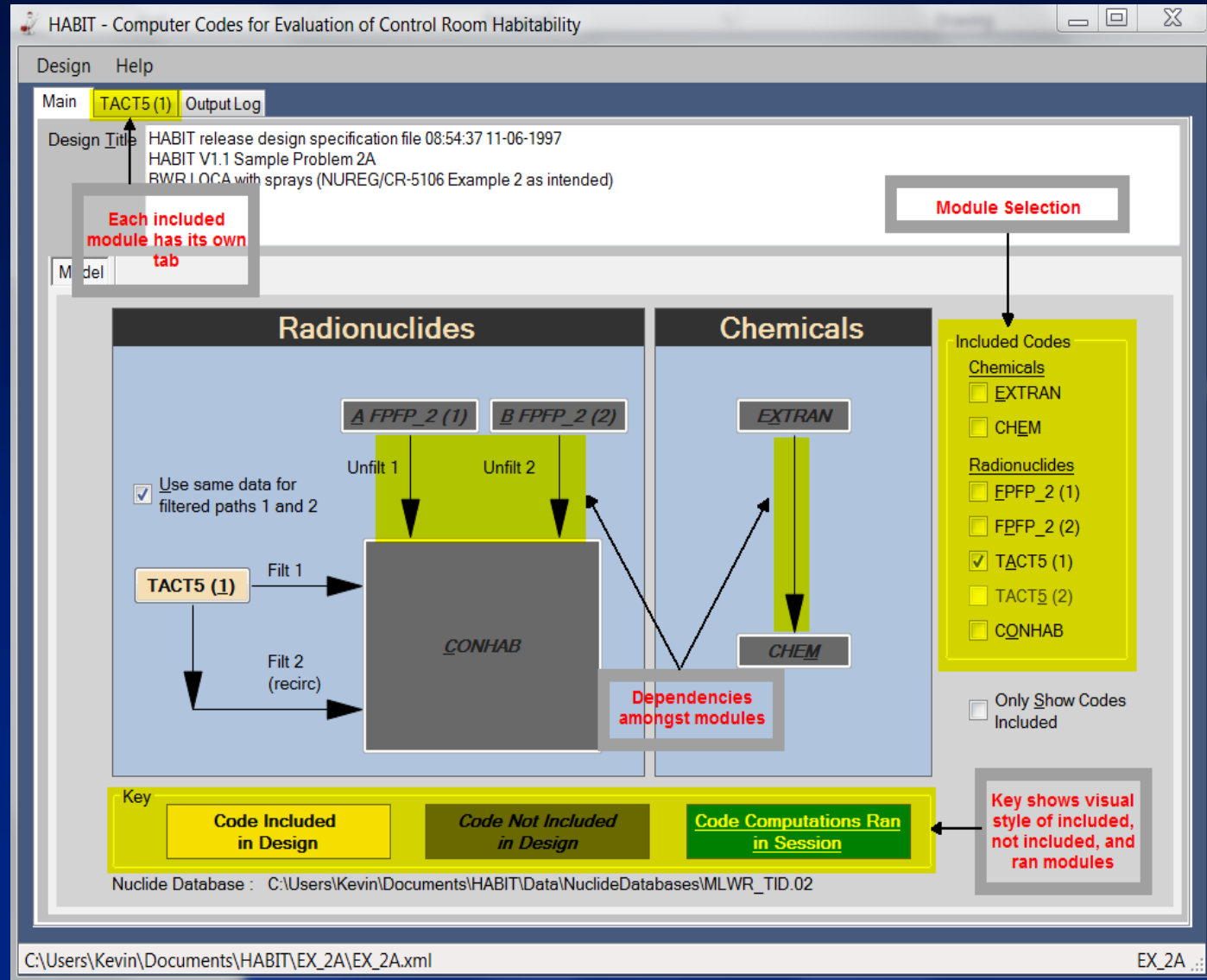


New



HABIT v1.2: GUI

The GUI
(1) depict the relationships between the modules and
(2) show running modules in the current calculation.



GUI: Input to Modules

Input to modules are selected from the main GUI screen. Each module has its own I/O tab.

HABIT - Computer Codes for Evaluation of Control Room Habitability

Design Help

Main | EXTRAN | CHEM | FFP2_2 (1) | TACT5 (1) | CONHAB | Output Log

Run Title: TACT5A release.
HABIT release design specification file 12:29:06 11-06-1997
HABIT V1.1 Sample Problem 5

Load Input Clear Values Run TACT5

Nuclides | Time steps | Node Design | Plant Parameters | Time Dependent Data

☐ Initial Activity Distribution
☒ Fraction ☐ Curies
☐ Independent of Isotopic Group
☒ Continuous Activity Distribution
☒ Fraction / Hour ☐ Curies / Hour
☐ Independent of Isotopic Group
☒ Removal Rate Coefficients
☒ Filtered Transfer Rates between nodes and filter efficiencies
☒ Unfiltered Transfer Rates between nodes
The following are used for TACT5 doses only and are NOT used by CONHAB
☐ Travel Time to receptor points
☐ Leak Rate of Primary containment (Used only in computing unreduced dose)
☒ Dilution Factor (X/Q)
☒ Breathing Rate

Continuous Activity Distribution (fraction / hour)
Group: NobleGas Form: N/A Node: N/A Isotope: N/A

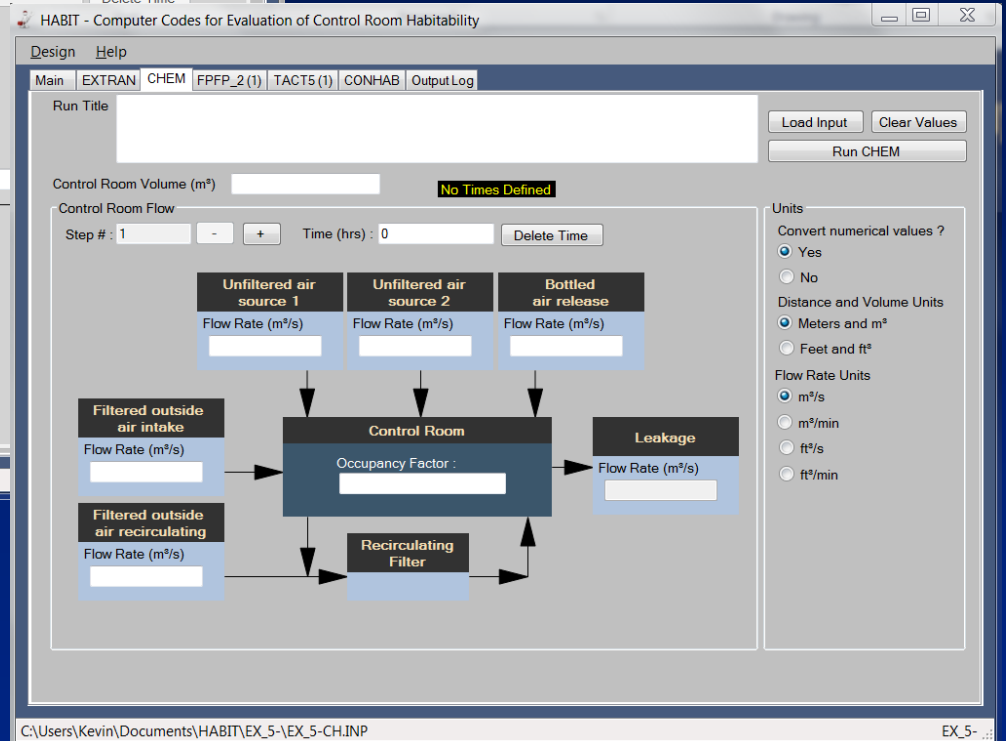
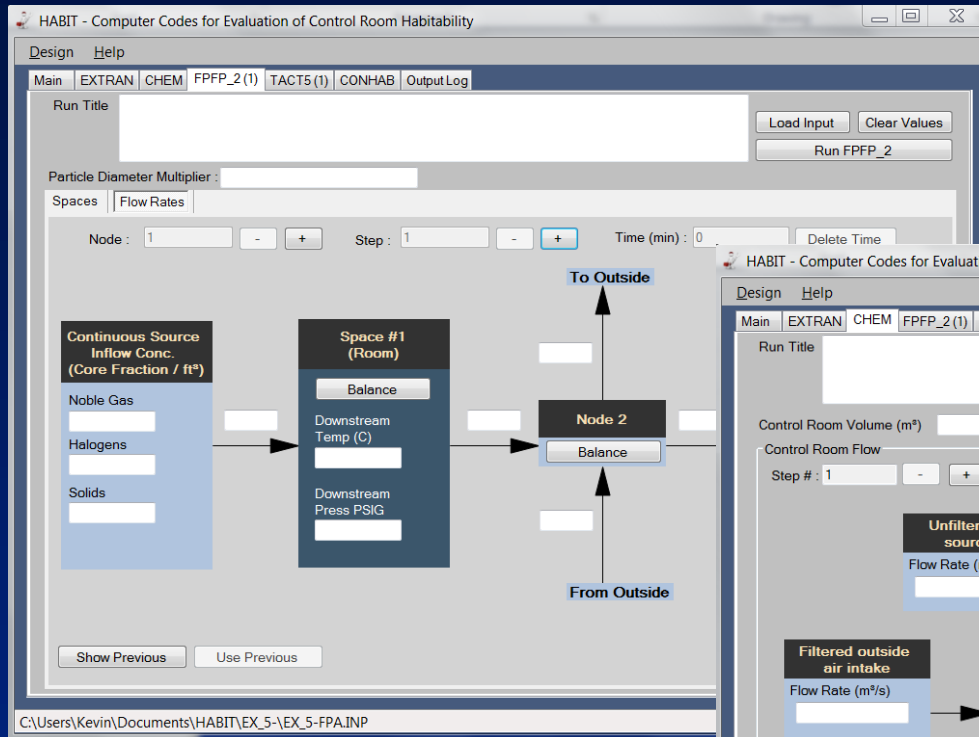
	Step	Time (hours)	Spray	NoSpray
▶	1	0	0.083	0.017
	2	0.00556		
	3	0.0226		
	4	0.5	0.5254	0.1076
	5	0.553		
	6	2	0	0
	7	8		
	8	8.69		
	9	24		
	10	96		
	11	672		
	12	675		
	13	696		
	14	696		

No time steps First Previous Next Last

Insert Time Delete Time Delete All

C:\Users\Kevin\Documents\HABIT\EX_5-\EX_5-T5A.INP EX_5-

Example screens HABIT v1.2 GUI



HABIT v1.2: Tooltips

Tooltips provide a convenient way to see the expected range for fields and provide validations to prevent entering bad data.

A screenshot of a software interface showing a 'Volume (ft³)' field. The field contains the value '125000'. A tooltip is displayed over the field, showing the valid range: '1E-06 <= value <= 3000000'. The text 'Valid Range' is written in red.

A screenshot of a 'Number Error' dialog box. The dialog box contains a red 'X' icon and the text: 'The entered value is not a valid number. Re-enter a valid number'. Below the text, the words 'Validation Error' are written in red. An 'OK' button is located at the bottom right.

A screenshot of a software interface showing a 'Volume (ft³)' field. The field contains the value '-5'. A tooltip is displayed over the field, showing the valid range: 'The value -5 is out of range. The valid range is between 1E-06 and 3000000.'. The text 'Range Validation Warning' is written in red.

A screenshot of a software interface showing a field labeled 'Initial Mass (kg)'. The field is empty. A tooltip is displayed over the field, showing the text: 'Field is required'. The text 'Required Field Warning' is written in red.

Verification and Validation



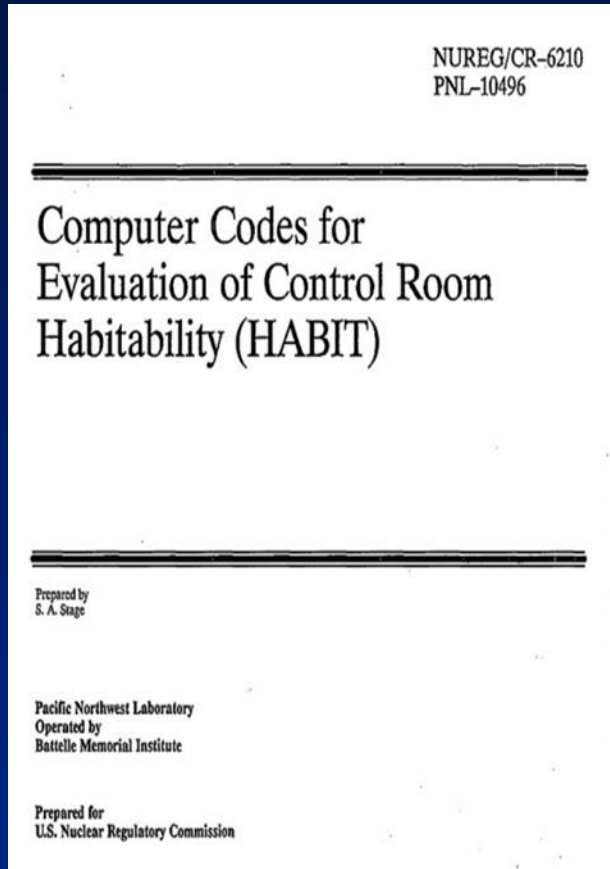
- **FORTTRAN modules and I/O data:**
 - Bugs identified and modified in HABIT v1.1
 - Precision of reproduced results
- **Operational steps in the new HABIT v1.2 “User Manual”**

Dense-Gas Models

- **DEGADIS** solves the gas concentrations by gravity-driven, over flat terrain, then into the entrainment layers
- **SLAB** solves gas concentrations by mass, energy, and momentum balances at downwind locations.
- **Both Models can perform for release from pool evaporation, jets, and explosion scenarios.**



Work-in-Progress



- Re-host **DEGADIS** and **SLAB**
- Improve **HABIT** ATD computations
- Design GUI and interface I/O with **Excel**®
- Update TBDs

On-Going Enhancements

- Add **SI units**
- Add **chemicals**
- Add **ICRP 60/103 dose coefficients**
- Move into RAMP





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