

# **INSPECT–PBEE: INelastic Seismic Performance Evaluation Computational Tool for Performance-Based Earthquake Engineering**

Copyright © 2019, Dr. Mohammad AlHamaydeh et al.  
All rights reserved.

The *INSPECT–PBEE* program is designed to simplify the process of structural modeling as well Performance-Based Earthquake Engineering (PBEE) utilizing the IDARC-2D program. The creation of the input text file for IDARC-2D is facilitated by the GUI pre-processor, while running analyses and manipulating outputs are fully automated by the GUI post-processor in *INSPECT–PBEE*. The high-level handling and automation capabilities provided by *INSPECT–PBEE* liberate the structural/earthquake engineer from the distractions of maneuvering through the minute syntax details. Thus, transforming the PBEE from a tedious exercise into a streamlined and seamless experience without compromising its inherent rigor. *INSPECT–PBEE* would be found useful and appealing to structural/earthquake engineering students, researchers and practitioners alike. The freely distributed executable version of the IDARC-2D program [which is made free and publically available at this webpage: <http://civil.eng.buffalo.edu/idarc2d50/>], is included within the *INSPECT–PBEE* package. The redistribution of the IDARC-2D executable is done with the explicit written permission from the IDARC-2D copyright holders, represented by Prof. Andrei M. Reinhorn of the University at Buffalo-SUNY.

Redistribution and use in source and binary forms, with or without modification, are permitted provided that the following conditions are met:

1. Redistributions of source code must retain the above copyright notice, this list of conditions and the following disclaimers. Redistributions in binary form must reproduce the above copyright notice, this list of conditions and the following disclaimers in the documentation and/or other materials provided with the distribution.
2. All publications resulting from the use of the *INSPECT* or *INSPECT–PBEE* software in any of their forms must make reference to the *INSPECT* and *INSPECT–PBEE* packages and their developers. Proper reference for the *INSPECT* and *INSPECT–PBEE* software packages and their developers is:
  - AlHamaydeh, M., Najib, M., Alawnah, S. (2016). “INSPECT: A Graphical User Interface Software Package for IDARC-2D.” *SoftwareX*, 5, 243–251, DOI: 10.1016/j.softx.2016.10.004.
  - AlHamaydeh, M.; Aly, N.; Najib, M.; Alawnah, S.; "INSPECT-PBEE: A Performance-Based Earthquake Engineering GUI for IDARC-2D," *SoftwareX*, 9, 132-144, DOI: 10.1016/j.softx.2019.01.010.
3. Neither the name of the copyright holder nor the names of its contributors may be used to endorse or promote products derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT HOLDER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

## **SUPPLEMENTAL DISCLAIMER**

The computational tool [program] “**INSPECT-PBEE**”, herein referred to as the program. The ownership of the program remains with the developers. Whether subroutines of the program or the whole program is incorporated into the executable binary code or the source code of any other program(s), any program(s) utilizing or containing **INSPECT-PBEE** or any of its subroutines shall explicitly acknowledge acceptance of the subsequent DISCLAIMER OF WARRANTY. Furthermore, such incorporation of the **INSPECT-PBEE** program does not create any business relationship between the developers of **INSPECT-PBEE**, nor their institutions, and the developed or derived program’s user(s). The names of **INSPECT-PBEE** program, its authors and their institutions, shall not be used in the promotion of any such developed or derived products without prior explicit written permission from the authors of **INSPECT-PBEE**.

The creators of the **INSPECT-PBEE** program spared no effort in verifying it; significant time and effort have been put towards its development and testing. However, the authors do not accept any responsibility for inadequate use of the program or any analysis results produced by it. The ultimate responsibility of verifying analysis results rests solely upon the user. The user should have adequate knowledge of structural dynamics, nonlinear analysis and modeling, earthquake engineering as well performance-based seismic design and evaluation techniques. The subsequent DISCLAIMER OF WARRANTY applies to the user of the program **INSPECT-PBEE** and all of its associated subroutines.

## **DISCLAIMER OF WARRANTY**

The **INSPECT-PBEE** program, all its data files, and all its associated subroutines, are provided on an “**AS-IS**” basis without any warranty. The authors and their institutions disclaim any and all liability for direct or indirect damages resulting from use of the program. The authors and their institutions make no warranties, explicitly or implicitly, that the program is error-free or is consistent with any particular set of standards, or that the program will meet any particular application requirements. The program should not be relied on for solving any engineering problems where an erroneous solution may cause potential personal injury or property loss. If the program is used in such a manner, it should be explicitly understood that it is done at the user’s discretion and own risk.

**INSPECT-PBEE** is developed by:

<b>Mohammad AlHamaydeh, Ph.D., P.E.</b> Associate Professor of Structural/Earthquake Engineering <a href="mailto:malhamaydeh@aus.edu">malhamaydeh@aus.edu</a>	<b>American University of Sharjah</b> <b>Department of Civil Engineering</b> PO Box 26666, Sharjah United Arab Emirates Tel +971 6 515 2647
<b>Nader Aly</b> Former Graduate Research Assistant <a href="mailto:nader_aly@alumni.aus.edu">nader_aly@alumni.aus.edu</a>	
<b>Mohamad Najib</b> Former Undergraduate Research Assistant <a href="mailto:b00045708@alumni.aus.edu">b00045708@alumni.aus.edu</a>	
<b>Sameer Alawnah, MSc.</b> Laboratory Instructor/Research Associate <a href="mailto:salawnah@aus.edu">salawnah@aus.edu</a>	<b>Department of Computer Science &amp; Eng.</b> Tel +971 6 515 4940

**INSPECT-PBEE**

**Version 1.0 2019**

Kindly report problems and bugs to:

## Acknowledgements

Special thanks to **Prof. Andrei Reinhorn** from the State University of New York (SUNY) at Buffalo, for granting the permission to redistribute the free version of IDARC-2D with the INSPECT and INSPECT-PBEE packages for additional user convenience.

The splash screen contains graphics designed by [Freepik.com](http://www.freepik.com)

The following software components is used in *INSPECT-PBEE*:

- Nelder-Mead optimization method implementation by Kris Kniaz [<http://www.kniaz.net>].
- ZedGraph charting library [<http://sourceforge.net/projects/zedgraph>]
- Math.Net computing library [<http://www.mathdotnet.com>]
- SqlLite database engine [<https://www.sqlite.org>]