MACCS Software Quality Assurance Plan

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Outline

- NRC Software Quality Assurance (SQA) Requirements

- Graded Approach to Quality Assurance (QA)

- Nuclear QA (NQA) Requirements for Software

- Activities of Safety SQA DOE Order 414.1

- MACCS SQA requirements from User Perspective

- Verification and Validation

- Software Error Reporting and Corrective Actions

- Software Error Reporting and Tracking (Bugzilla)

- Discussion and Feedback

NRC SQA Requirements for MACCS computer code

- NRC/RES Office Instruction (OI) PRM-012, "Software Quality Assurance for RES-Sponsored Codes" (ML17047A448)

  1. NRC Management Directive (MD) 11.7, Procedures for Placement and Monitoring of Work with the U.S. Department of Energy (DOE).

     - All software development, modification, or maintenance tasks shall follow general guidance provided in NUREG/BR-0167, "Software Quality Assurance Program and Guidelines"

  2. DOE Order 414.1C Quality Assurance
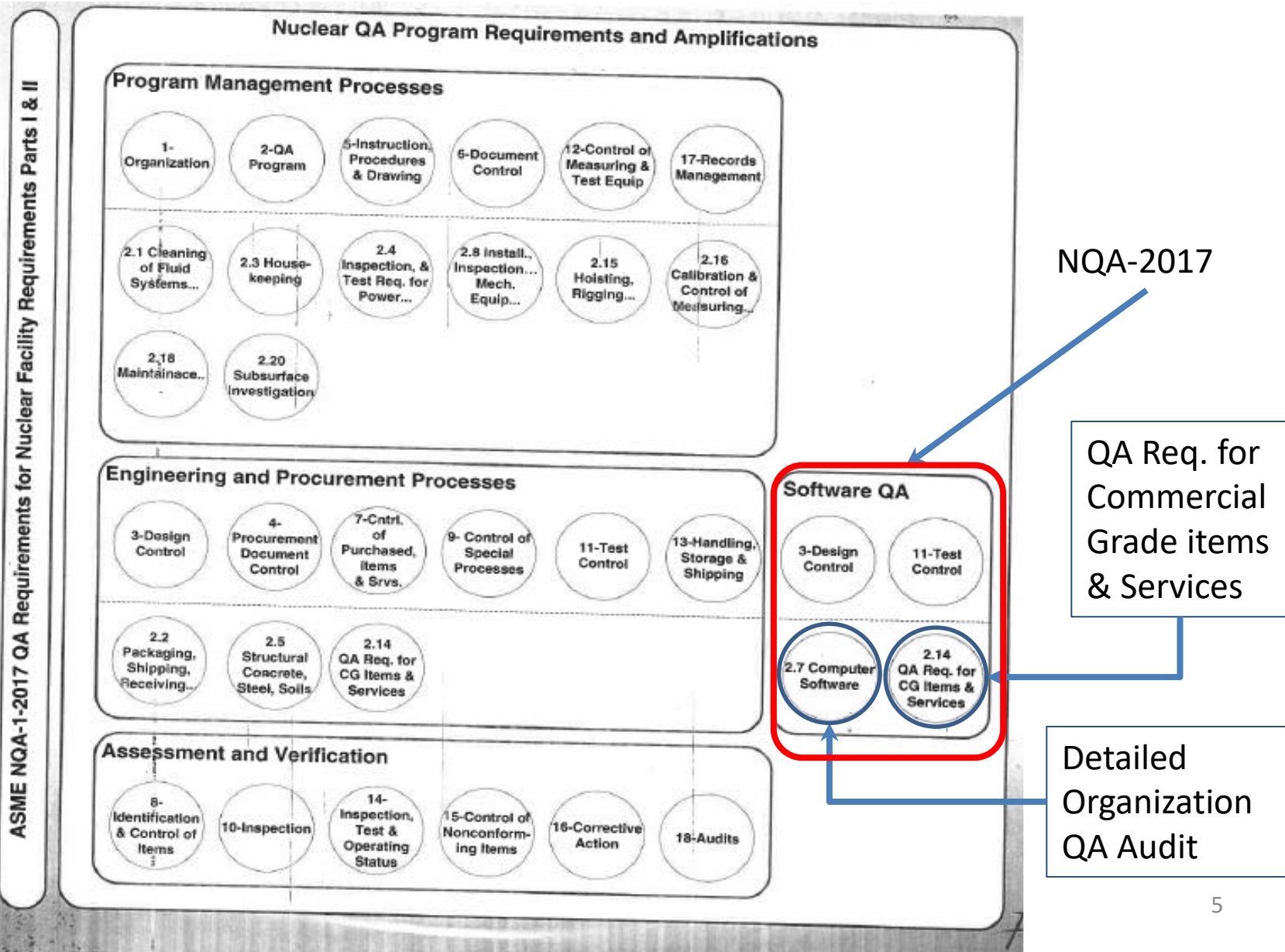
Graded Approach to QA

Based on relative importance to nuclear safety
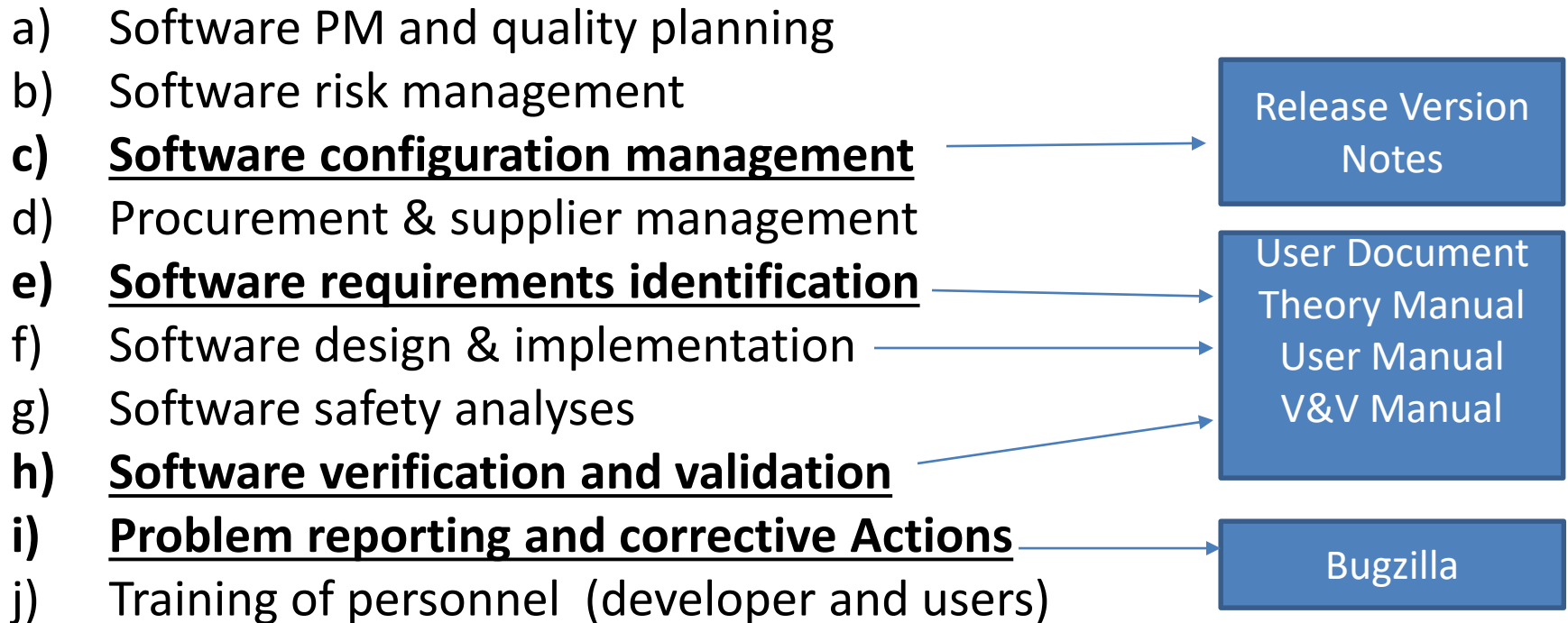[Reference IAEA Code and Safety Standard Guides Q1-Q14]

- DOE uses MACCS to determine whether a nuclear facility is safe enough to be authorized to operate
    - *The MACCS code has been identified as <u>"Safety Software"</u> in accordance with SS-R89727 Appendix E, "Instructions for determining whether a software product should be categorized as DOE O 414.1D safety software."*

- NRC uses MACCS to risk-inform decision making including regulatory analyses, e.g., to determine whether improvements to a plant or its operations are cost-effective.
    - MACCS may be used in informing regulatory decisions; NRC does not rely on MACCS alone in making regulatory decisions.

Relative importance of nuclear safety, safeguard, and security;
Magnitude of any hazard involved; life cycle stage of facility or item;
programmatic mission of facility; particular characteristic of a facility or item;
relative importance of radiological and non-radiological hazards;
and any other relevant factor. [Reference DOE 414.1D Definitions]

NQA Requirements

Nuclear QA Program Requirements and Amplifications

NQA-2017

QA Req. for Commercial Grade items & Services

Detailed Organization QA Audit

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NQA-1: Module 4
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Activities of Safety SQA DOE Order 414.1D and G

a) Software PM and quality planning
b) Software risk management
c) **Software configuration management**
d) Procurement & supplier management
e) **Software requirements identification**
f) Software design & implementation
g) Software safety analyses
h) **Software verification and validation**
i) **Problem reporting and corrective Actions**
j) Training of personnel (developer and users)

Release Version Notes

User Document
Theory Manual
User Manual
V&V Manual

Bugzilla

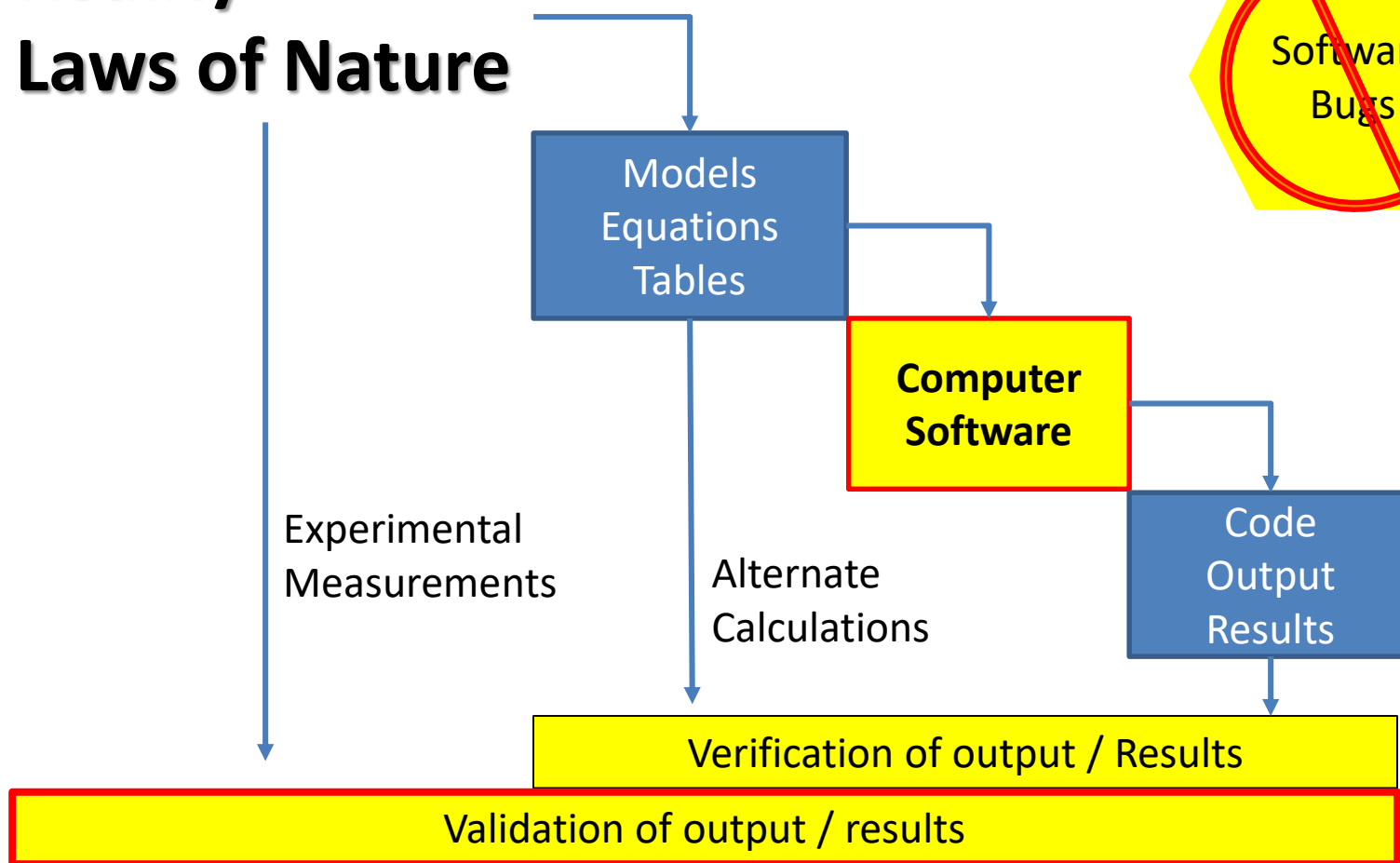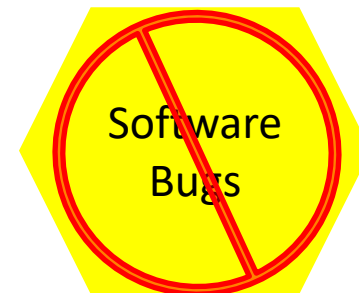**DOE Order 414.1G: Table of Cross-walk with ASME NQA-1**

MACCS SQA Requirements
Users Perspective

- Configuration Management Release Version Notes
- Users Manual
- Theory Manual
- Verification And Validation Report
- Error Reporting and Corrective Actions
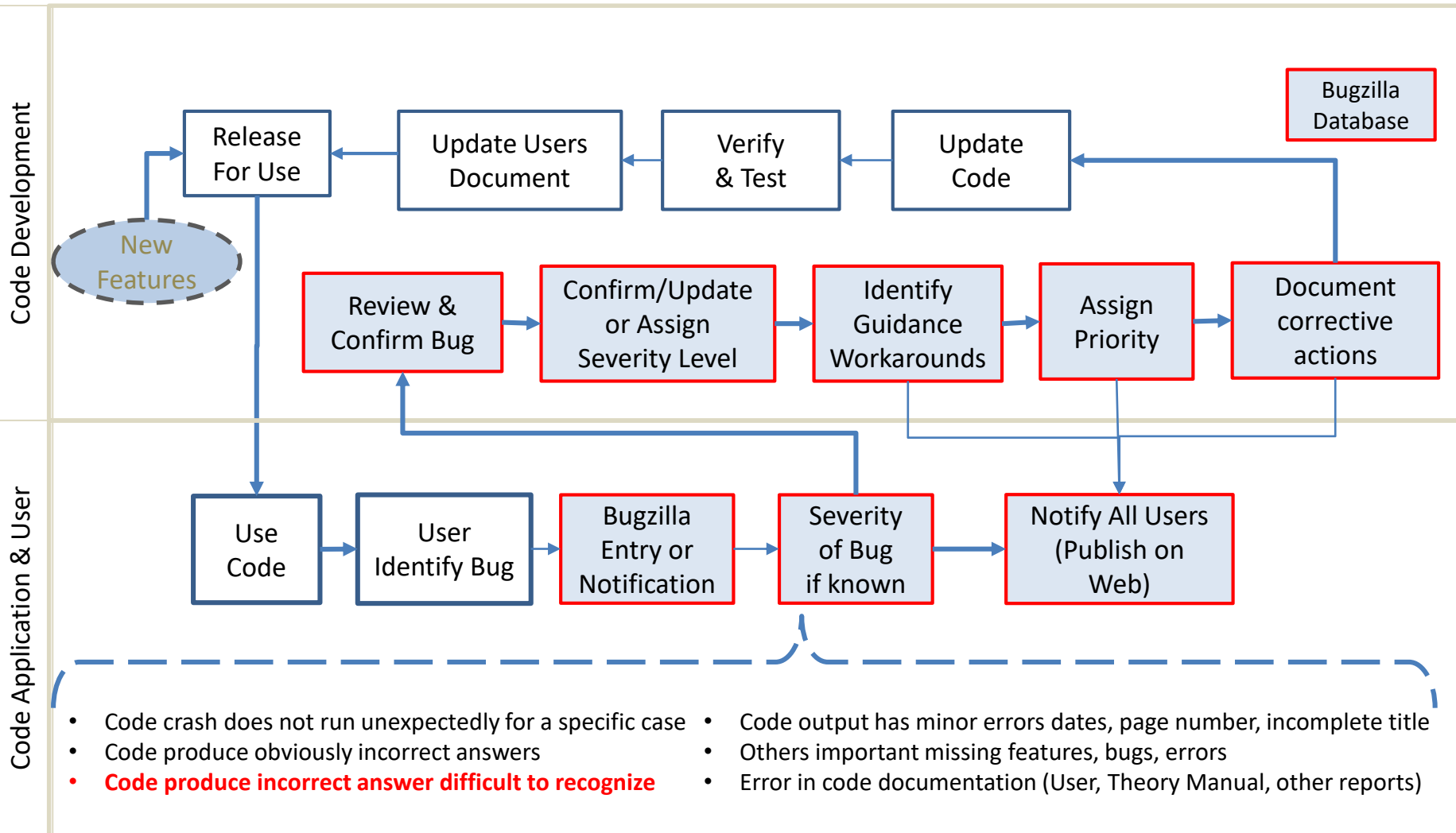- Training and User Support

These items ensure partial compliance with ASME-NQA-1 and DOE Order 414.1 and other standards.

Verification & Validation

**Reality
Laws of Nature**

Software Bugs

Models
Equations
Tables

Computer
Software

Code
Output
Results

Experimental
Measurements

Alternate
Calculations

Verification of output / Results

Validation of output / results

Proposed Software Error Reporting and Corrective Actions

Code Development

Bugzilla Database

Release For Use → (from) Update Users Document → (from) Verify & Test → (from) Update Code

New Features

Review & Confirm Bug → Confirm/Update or Assign Severity Level → Identify Guidance Workarounds → Assign Priority → Document corrective actions

Code Application & User

Use Code → User Identify Bug → Bugzilla Entry or Notification → Severity of Bug if known → Notify All Users (Publish on Web)

- Code crash does not run unexpectedly for a specific case
- Code produce obviously incorrect answers
- **Code produce incorrect answer difficult to recognize**
- Code output has minor errors dates, page number, incomplete title
- Others important missing features, bugs, errors
- Error in code documentation (User, Theory Manual, other reports)

Software Error Reporting and Tracking

Bugzilla (BugReporting) Site
We plan to update this site for MACCS

https://melcor.sandia.gov/bugreporting.html

MELCOR Home   About MELCOR   **Report a Bug (Bugzilla)**   Contact Us   Internal Links (use IE)

Get MELCOR

Downloads

FAQs

The bug-tracking system for the MELCOR Code.

Bugzilla User Guide [pdf 1.2mb]

Bugzilla Support Documentation

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Password:

☑ Restrict this session to this IP address (using this option improves security)

Login

If you have an account, but have forgotten your password, enter your login name below and submit a request to change your password.

Submit Request

MELCOR is developed at
Sandia National Laboratories
for the
U.S. Nuclear Regulatory Commission

Questions
Feedback
Discussion