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Lighting Analysts Software – Quality Assurance and Validation

This document briefly describes the processes employed to verify and validate all releases of software programs AGi32, ElumTools and Photometric Toolbox supplied to licensees worldwide.

All processes are performed at Lighting Analysts, Inc., Littleton, Colorado, USA (LAI) or the offices of byHeart Consultants, Ltd. of Vancouver, Canada under the subsequently described Quality Assurance Plan for the development and maintenance of software and its related documentation.

Lighting Analysts Quality Assurance Program conforms to the following standards:

- 1. LAI follows a complete quality management approach from conceptualization to final implementation of all software products.*
- 2. All software components and methods perform within recognized industry standards.*
- 3. Software functionality is thoroughly tested prior to each release.*
- 4. Software calculation algorithms are tested against a continually evolving set of validation test problems.*
- 5. All major releases are subject to peer review by multi-tier alpha and beta test participants.*
- 6. Customer support contacts are logged and matched against known issues published in a public Knowledgebase.*
- 7. Software is progressively maintained with maintenance releases posted for all users regularly.*

The actual procedures which are followed and that conform to the aforementioned standards are described below.

Quality management of product development

Improvements to Lighting Analysts software products are driven by: 1. Industry demand through the implementation of new calculation standards or lighting criteria, 2. User request to make features more friendly or effective. Lighting Analysts participates in industry committees and consults with influential organizations for the development of important industry procedures. Lighting Analysts also logs all user requests in database form with incidence of a request being noted. The most requested features receive first evaluation for new development. All software features are designed by committee and peer reviewed prior to implementation.

Recognized industry standards

All software calculations and methods are in accordance with accepted practices published by the

Illumination Engineering Society (IES) and/or Commission International de l'Eclairage (CIE) and similar bodies worldwide.

All 3rd party tools and controls utilized by the software are extensively evaluated and tested prior to inclusion into our standard products. It is our policy to minimize the number of 3rd party software components used in any product.

Functionality testing

Prior to each release, all Lighting Analysts software is subject to the following process to assess general program functionality:

1. General in-house testing intended to ensure successful operation of the program under normal use. Within this process we:
 - a. Use pending release for all in-house technical support. In this process new releases see a wide variety of customer issues at random.
 - b. Use pending release for customer training (if appropriate) and as coordinated with trainer.
2. Quality Assurance Checklist – A comprehensive functionality test of program features including installation and setup performed by LAI Customer Care staff. Additional tests may be added as program functions evolve.
 - a. General functionality – 62-point checklist
 - b. Associated documentation and materials – 8-point checklist
 - c. Program setup – 6-point checklist
 - d. Installation and License Manager - 17-point checklist
3. Targeted testing of new and affected features: intended to test specific parts of the program which have changed.
 - a. Administered by the development team.
 - b. Assign targeted testing task, monitor and follow-up. This promotes accountability.
 - c. Developers identify affected code addition or modification (feature/effect).

Testing of calculation algorithms

Prior to each release where modifications have been made to illumination engineering level features, all Lighting Analysts software is subject to the following process to assess calculation integrity:

1. Targeted testing of new and affected features similar to item 3 in Functionality Testing. If new features demand additional testing environments, they are added as required.
2. A “Test Suite” consisting of 19 separate test environments is processed. All deviations are tracked statistically.
3. If necessary, the software may be benchmarked against competitive software to ensure an understanding of any real or perceived deviations.

Expanded user review

All major releases are subject to review by hand selected groups of Alpha and Beta testers. This extends the range of in-house targeted testing to a larger user base:

1. Alpha test group is specially selected based on skill set and knowledge.
2. Beta group is broader, with diverse set of qualifications.
3. Specific task(s) are assigned and guidelines on how to report issues presented for efficient review and categorization.
4. Administered by LAI Customer Care department

Customer Support and error reporting

All customer contacts are logged and reported issues directed to a tracking database. Online support reports are available from within each software program, allowing users to submit a detailed hardware and operating system description with their request for assistance. For each issue reported:

1. Stage 1: A detailed verification process is performed.
2. Stage 2: If it can be replicated, it moves on evaluation of necessary repair and implication of changes.
3. Stage 3: Issue is eliminated and published with the next software release. A Knowledgebase article is created notifying users of repaired issue. All repairs are published in README for next release.

Maintenance releases

Lighting Analysts maintains a very aggressive posture with respect to the issue of maintenance releases. Within each major software generation, which are typically one year apart, there may be as many as nine maintenance releases. These maintenance releases are primarily produced to issue repairs for new issues.

Lighting Analysts [Knowledgebase](#) contains a list of known issues and workarounds if they exist. Articles are identified as impacted by program addition or modification and verified when repairs or workarounds are published.

Other Considerations

Lighting Analysts has retained an outside contractor to perform the testing required by **CIE 171:2006 Test Cases to Assess the Accuracy of Lighting Computer Programs**. Results are published online: <http://www.agi32.com/index.php?id=26>

DISCLAIMER

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