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# Third Edition of the FADGI Technical Guidelines for Digitizing Cultural Heritage Materials

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## Abstract

*The Federal Agencies Digital Guidelines Initiative (FADGI)* Technical Guidelines for Digitizing Cultural Heritage Materials: Third Edition *was published in May 2023 as a comprehensive revision of the 2016* Technical Guidelines*. The latest edition of the guidelines expands on earlier versions and incorporates new material reflecting advances in imaging science and cultural heritage digitization best practices. This paper presents an overview of the document history, the FADGI Still Image Working Group's motivations and approach for this revision project, the updates to the document, and future applications.*

## Introduction

The Federal Agencies Digital Guidelines Initiative (FADGI) *Technical Guidelines for Digitizing Cultural Heritage Materials* have served as a framework for creating and evaluating digital surrogate images for cultural heritage collections items since the first edition was published in 2010. Since then, advances in imaging technology and best practices for digitizing cultural heritage materials have spurred the development of two updated editions of the *Guidelines.* The latest version, the *Third Edition*, was published in May 2023 [1]. This document is the culmination of almost two years of research and revisions by the FADGI Still Image Working Group, a public comment period, and a final project team review and revision period.

This paper details the motivations for the FADGI Still Image Working Group to develop and publish the latest edition of the *Guidelines*, and the approach the project team took for this effort. The paper describes the resulting changes to the document and touches on the intended use of the document, as well as the impact the *Guidelines* have within the field of cultural heritage digitization. The working group submits this paper on the *Third Edition* for the 2023 Archiving Conference in the belief that there will be significant interest from other attendees in our work and the resulting updates to the *Guidelines.*

The members of the FADGI Still Image Working Group that contributed to the revision project are Don Williams and Roger Triplett of Image Science Associates; Michael Horsley of the U.S. National Records and Archives Administration (NARA); Kristin Phelps of the U.S. Copyright Office; and Thomas Rieger, Hana Beckerle, Patrick Breen, Matthew Breitbart, Tanya Brown, Rachel Frederick, and Sarah Mitrani of the Library of Congress. The working group would like to acknowledge the tireless work of numerous other professionals who have contributed to the body of knowledge represented in the current edition of the *Guidelines.*

## History and Intended Use of the Guidelines

The source documents for the *Third Edition* were developed in response to the need for standardization of image quality in the arenas of cultural heritage and government digitization. As an organization, FADGI aims to "articulate a comment set of technical guidelines, methods, and practices for digitized and born digital historical, archival, and cultural content" [2]. The objectives and activities of the Still Image Working Group align with this general goal, in partnership with the FADGI Audio-Visual Working Group and a range of other professional and scientific organizations.

An early predecessor to the FADGI guidelines is *Technical Guidelines for Digitizing Archival Records for Electronic Access: Creation of Production Master Files – Raster Images*, developed by professionals at NARA and published in 2004 [3].

In August 2010, the first iteration of the FADGI Still Image Guidelines was published with the title *Technical Guidelines for Digitizing Cultural Heritage Materials: Creation of Raster Image Master Files* [4]. This original edition of the Still Image guidelines introduced the FADGI star-level rating system for image quality. For each image quality evaluation parameter, the *Guidelines* specified the minimum or range of values an image must meet in order to be considered FADGI 4-star (highest quality), 3-star, 2-star, or 1-star (lowest quality). This star rating system is used by digitization practitioners in a wide range of institutions to characterize and evaluate digitization work, and is the most-referenced element of the Still Image *Guidelines.*

A revision to the 2010 document was published in September 2016 [5], and was the primary source document for the development of the *Third Edition.* The influential star-level rating system has been carried over from the 2010 edition into both subsequent editions.


***Figure 1****. FADGI Logo*

### *Intended Use*

The goal of the FADGI Still Image Working Group is to produce resources that complement science-based technical standards produced by entities such as the International Organization for Standardization (ISO), American National Standards Institute (ANSI), and others. The *Guidelines* are intended to give practitioners and institutions a road map for meeting these standards. Members of the revision project team have undertaken research and testing to develop the criteria values for each of the evaluation parameters, based on the standards set forth by the ISO. In doing so, the working group has laid out a practical companion to international standards and set forth clear and achievable minimum values corresponding to different levels of image quality.

The working group recognizes that operational realities vary greatly across different organizations and programs, and that technical expertise takes time to develop and put into practice. The inclusion of different star-level ratings is in response to this, acknowledging that it's not always possible or desirable to achieve a 4-star rating for every digital image.

Additionally, the sample project workflows and recommended approaches for imaging different types of collection materials are intended to give practitioners an idea of best practices and possible techniques. The *Guidelines* are not intended to supplant individuals' or organizations' technical knowledge, and do not prescribe a single method for achieving success in cultural heritage digitization. Individuals and organizations may adapt FADGI resources to best fit their needs.

## Project Motivations

Since the 2016 edition of the *Guidelines* was published, there have been numerous advances in the fields of digital imaging, archiving, and digital preservation. There are now more and improved tools for producing and evaluating images, as well as for editing, storing, and managing digital image files. There was also a six-year time period between the first and second editions of the *Guidelines*, and the Still Image Working Group noted that the third edition should be published sometime in 2022 or 2023 to remain on a similar cycle for updates between editions. This adolescence period allowed the FADGI effort to grow too. The user community provided very practical suggestions on adapting the criteria to workflows and exceptional use cases, which influenced many of the changes in the *Third Edition*.

In addition to general advances in the field, other motivations for the revision are discussed below.

### *Updates in Technical Imaging Standards*

There have been new and updated international standards related to cultural heritage imaging published in recent years. In particular, ISO 19264-1:2021 [6] for analyzing imaging systems quality for cultural heritage imaging was published in 2021. This was an update to the previous version of ISO 19264, published in 2017. ISO Technical Committee 42 Working Group 18 (TC 42/WG 18), focused on electronic still picture imaging, is engaged in ongoing research to produce other new and updated standards. The evaluation categories and criteria values for assessing image quality according to the FADGI star-level rating system in the 2016 edition of the *Guidelines* became out-of-date given the new ISO standards.

### *U.S. Government Regulations*

In 2019, the NARA published a directive stating that government agencies must transition their records management entirely to an electronic environment by the end of 2022 (originally M-19-21, and later M-23-07) [7]. This mandated U.S. government agencies to digitize a high volume of temporary and permanent records, and created a need for guidelines and standards relating to that digitization. Previous versions of the *Guidelines* did not address the kinds of materials related to this initiative in sufficient detail.

### *FADGI's Reach*

The FADGI *Guidelines* are recognized worldwide by members of the cultural heritage digitization community as a trusted reference source, and as an authoritative guide for producing, evaluating, and managing high-quality digital images. The star rating system is used by digitization professionals from a wide range of public and private sector organizations to characterize and evaluate digitization work.

The *Guidelines* are available to read and download for free, as with all other FADGI documents, from the FADGI website. From April 2018 to April 2023, there were an average of 805 unique visits per month to the home page for the *Guidelines* (https://www.digitizationguidelines.gov/guidelines/digitize-technical.html) [8]. From April 2018 to April 2022, there were an average of 373 downloads of the 2016 edition of the *Guidelines* each month. These visits and downloads represent users from over 150 countries around the world, using over 100 browser languages. This speaks to FADGI's global user community. Official FADGI email addresses receive several inquiries per month from practitioners and managers in the field of cultural heritage digitization, seeking advice and clarification on how to implement the guidelines and best practices.

With this level of interest and use, the working group feels it's imperative that all FADGI documents represent the latest in image quality standards and operational best practices. The 2016 edition still provides reference value, but is no longer reflective of the current environment in the world of cultural heritage digitization.

## Approach to the Revision Project

With the motivations detailed above in mind, the FADGI Still Image Working Group undertook a multi-year, comprehensive review of the second edition of the *Guidelines*. The review and revision process is detailed below.

### *Initial Research*

Members of the FADGI Still Image Working Group began to develop new and updated evaluation criteria parameters for image quality in 2021. Don Williams and Roger Triplett of Image Science Associates spent time throughout the revision project lifespan conducting testing and analysis of image quality to produce updated evaluation metrics for the four "star levels" of image quality as presented in the *Guidelines*. These align to ISO 19264-1:2021.

Also in 2021, Michael Horsley of NARA began developing guidelines that U.S. federal government agencies could reference when digitizing records in compliance with M-19-21/M-23-07. This would become an entirely new material category in the updated version of the *Guidelines.*

### *Working Group Revision Meetings*

Members of the working group from the Library of Congress convened in late 2021 to review and revise sections of the *Guidelines* addressing materials handling, digitization project workflows, metadata, file storage, and more. This intensive review aimed to identify areas that had become out-of-date since the 2016 edition, and to revise the document to have more utility for practitioners.

In early 2022, the revision project team as a whole began to meet regularly to discuss proposed updates to the *Guidelines*. The working group met roughly monthly and discussed specific sections of the working draft document each meeting to form consensus on new and revised content.

### Public Engagement

The research and meetings described above resulted in a working draft of the third edition of the *Guidelines*, published on the FADGI website for public review and comment on June 2, 2022. The public comment period concluded on August 5, 2022. During this two-month period, the Still Image Working Group received numerous inquiries and comments from members of the cultural heritage digitization community. These ranged from questions about wording, requests for clarification about technical aspects, recommended revisions, and more. Hana Beckerle presented on the public working draft during an IS&T Grab-a-Cup meeting in September 2022, allowing attendees to ask questions directly of working group members.

Additional discussion about the working draft took place in relevant forums, listservs, and gatherings. This engagement with the draft by members of related professional communities was invaluable get buy-in from those in the field, and to provide additional perspectives on the technical aspects of the *Guidelines* as well as their overall utility.

### Additional Review and Revision Period

After the public comment period closed, the Still Image Working Group reconvened regular meetings to review community feedback. This included addressing all written inquires submitted via email or through the FADGI website. The responses to each of these inquiries are published on the *Guidelines* webpage for transparency. The working group considered each public comment or question, as well as other general topics raised during discussions about the working draft document. The working group met regularly from October 2022 through March 2023 to revise the working draft.

Members of the working group gave a presentation on this edition and the update process at IS&T's virtual DigiTIPS session on February 23, 2023, providing another opportunity direct engagement with users.

The final *Guidelines: Third Edition* was published in May 2023. A Change Log detailing the revisions made after the public comment period, a table listing all the public comments received through official channels and specific responses to each, and a version of the final *Guidelines: Third Edition* with changes from the June 2022 draft version highlighted are also available on the FADGI website to provide ease of comparison and transparency about certain revisions.

## Changes in the *Third Edition*

As a result of the process described above, the published *Guidelines: Third Edition* contains many changes from previous editions. The most impactful of those updates are summarized below:

- *Addition of the FADGI Code of Ethics for the Still Image Working Group.* This describes the values and responsibility of the cultural heritage community related to digitization. The Code emphasizes the "values of accuracy, integrity, and fidelity to the historic record" and the need for an imaging program to "reflect the completeness, image quality (tonality and color), and reflect the intellectual context of the original material" [1, p. iv]. This Code sets the tone for why the rest of the document is important, and was developed in response to the growing impact of that FADGI Guidelines and as an effort to characterize our "why" as cultural heritage imaging professionals.
- *Addition of "Professional Staff" to the components of the FADGI Conformance Program*. This reflects the need for staff with proper training and technical proficiency to carry out cultural heritage digitization work. The *Guidelines* strive to be a resource for improving the foundational knowledge and technical abilities of digitization professionals. The Still Image Working Group acknowledges that it's not possible to become technically proficient simply by reading the *Guidelines*, however, it is hoped that the documents and resources produced by FADGI are valuable supplements to hands-on, practical imaging work in increasing the overall level of capability among those working in the field.
- *Updates to the descriptions of the digital image conformance evaluation categories*. The descriptions of evaluation criteria have been updated to make them clearer to readers, especially those newer to the field or without in-depth technical knowledge. This includes plainer language and the addition of some graphics to illustrate concepts.
- *Values for evaluation criteria presented as colorimetric L*a*b* values rather than RGB 8-bit count values (also referred to as digital count values)*. With the evolution of imaging science and how it's evaluated, RGB 8-bit count values are no longer considered current for evaluating image quality parameters. The document emphasizes colorimetric values throughout, and digital count values were removed entirely. The L*a*b* values provided in the latest edition do not precisely match digital count values provided in previous editions. A crosswalk between digital count values and L* values may be developed as a future FADGI Still Image Working Group project.
- *Designation of certain digital image conformance evaluation categories as informative/informational.* The Still Image Working Group acknowledges that several of the evaluation parameters are still under development and subject to additional research. These parameters are designated as "informative" or "informational" in the latest edition of the *Guidelines*. They provide value when assessing image quality, however, the criteria level values provided for each of these parameters are not considered "final." These include Gain Modulation (Section 2.4.3, p. 13), Spatial Frequency Response (SFR) at Nyquist Frequency (Section 2.4.8, p. 15), Noise Lower Limit (tables in Chapter 3, beginning p. 27), Highlight/Shadow Tolerance (Section 2.4.15, p. 19), and Dynamic Range (Section 2.4.16, p. 19) [1]. The rows for informational/informative parameters are shaded lighter than the others in the tables for each collection material type in Chapter 3 of the document. There were several questions during the public comment period about why these parameters are displayed differently, and so additional language was added throughout the document to clarify that lighter, grayed-out rows indicate informative/informational parameters.
- *Designation of certain digital image conformance evaluation categories as provisional.* Film and transmissive material types are generally not considered "scene referred," as the images captured on these mediums are removed from the original captured scene. Therefore the evaluation of colorimetric "goodness" can be ambiguous, however, some consistency measure (tolerances) are still important for high-quality digital captures. For transmissive materials types, Tone Response (OECF), White Balance, and Lightness Uniformity are designated as "provisional" evaluation parameters in the evaluation parameter tables in Chapter 3 [1, p. 27] of the *Guidelines.* The criteria level values presented for each are considered "reasonable by experts in the field" (Section 3.9) [1,

p. 55] and may be adopted provisionally with acknowledgement of the unique nature of imaging transmissive materials.

- *Addition of "Gain Modulation" as an image conformance evaluation metric*. This metric was added (Section 2.4.3) [1, p. 13] in response to its inclusion in the latest ISO standards [6]. Gain modulation is a "measure of the localized slope of the OECF (tone response) when plotted as Lout* (y-axis) versus Lin*(x-axis)" [1, p. 13]. This metric allows an operator to objectively measure and detect clipping or soft clipping distortion behaviors. At this time, this is an informative metric, meaning images are not required to meet the criteria values to be considered FADGI-conforming.
- *Additional language on color management as an image quality conformance measure*. As imaging technology evolves and improves, color management is becoming more complex, and the working group felt that this section should be expanded. Section 2.4.17 [1, p. 19] provides an overview of the International Color Consortium (ICC) color management system and how it may be employed in cultural heritage digitization to achieve more consistent results for color management. This section also notes the challenges in achieving consistent color quality across different imaging systems. This section does not correspond to a specific evaluation parameter in the tables in Chapter 3 [1, p. 27], but is intended to highlight an approach to achieving better results related to color management, and to lay the groundwork for evaluation parameters that may yet be developed.
- *Removal of one-star specifications for rare and special collections material categories*. As noted in Section 2.1 [1, p. 10], a "one-star" image quality level is suitable to provide a reference to locate an original object, for internal research or organizational purposes, or when it's not possible to achieve a higher level of image quality. The working group does not believe that a one-star image may serve as an official digital surrogate for rare or special collections items. The one-star values for all evaluation parameters were removed from Section 3.1 on Bound Volumes: Rare and Special Materials (p. 27) and Section 3.3 on Documents (Unbound): Manuscripts and Other Rare and Special Materials (p. 34) [1].
- *Addition of the "Modern Textual Records" material category with specifications and information provided by NARA*. As noted above, this is in response to the implementation of the M-19-21/M-23-07 [7] directive for U.S. government agencies, which are the original constituency of FADGI. For this category (Section 3.5) [1, p. 41], the *Guidelines* do not include different star levels; images either meet the specifications or they do not (pass/fail). The evaluation parameter values for this collection material category are based upon the three-star level values for Documents (Unbound): General Collections (Section 3.4) [1, p. 38].
- *Updates to sample digitization project workflows*. Chapter 5: Imaging Workflow [1, p. 78] discusses considerations for managing a digitization project or program. This includes questions for planning digitization projects, sample digitization project workflows, and links to external resources. The sample workflows may be adapted by organizations and individuals to their specific project needs. While this document is primarily focused on the technical aspects of producing high-quality images, a solid project management approach is just as critical to achieving consistent results over the lifespan of a project or throughout a larger digitization program.
- *Updates to the "Adjusting Image Files" (post-processing) chapter to reflect current best practices (Chapter 6) [1, p. 86].* Since the second edition of the *Guidelines* was published in 2016, there have been improvements in technology tools and programs for manipulating and editing digital images. Chapter 6 [1, p. 86] better reflects current practices. While the intention of cultural heritage digitization should be to produce a faithful reproduction of an original object to serve as a digital surrogate, a certain level of adjustment may be required to create images that are suitable as archival master and access copies. This chapter stresses the need for good imaging practice and color management, while post-capture adjustments may be employed to achieve the final desired results.
- *Updates to Chapter 8: Metadata [1, p. 93] to reflect current standards*. This chapter provides users with foundational knowledge on best practices for metadata associated with digital surrogate images. It's intended to serve as a general discussion of metadata practices, which can be adapted to best suit the needs of any digitization and/or digital content management programs. This section also emphasizes the importance of metadata for identification, management, access, use, and preservation of digital surrogate images, and that quality metadata is equally important as good imaging practice.
- *Addition of a glossary within the document, with links to the online FADGI glossary entry for every term*. Appendix A: Glossary [1, p. 111] was added to serve as a direct reference tool that a reader may use without leaving the document itself. It's intended to make the document more user-friendly and self-contained. All the terms in this document glossary are linked to their corresponding page in the online FADGI glossary, where some have extended definitions and additional resource links. The online glossary will be continuously updated and maintained, and should be considered more comprehensive than the quick-reference document glossary [1, p. 111].
- *Removal of the "Resources" and "Technical Implementations" sections, which can now be found on the FADGI website*. Previous editions of the *Guidelines* contained sections listing links to additional resources, and a practical guide to implementing some of the information contained in those guidelines. While these sections included valuable information, moving this content online rather than within the document will allow it to be more efficiently updated and kept current.
- *Update to general document format.* The working group slightly reformatted the document, adding more structured chapter, section, and sub-section headings. While not a major content change, this will allow for easier reference to information within the document. This may be used for citations, in developing supplemental job aids, contract language, and more.

## Future Applications

With the publication of the *3rd Edition*, the FADGI Still Image Working Group is considering several projects to enhance the utility of the document. As noted above, the Technical Guidelines Resources page on the FADGI website (https://www.digitizationguidelines.gov/guidelines/digitize-technical-resources.html) [9] will be the primary location for members of the cultural heritage digitization community to find additional materials to supplement the guidelines. Members of the document revision team are currently working on presentations and practical job aids (such as checklists) based upon the *3rd Edition* to support users in implementing the revised guidelines.

The working group will also soon begin developing a series of short videos that explain concepts described in the guidelines, and demonstrate certain steps from the sample imaging workflows. Another potential project for the working group would be a crosswalk between digital count values and L* values to assist practitioners in transitioning between the two.

There was an average of 462 downloads per month of the draft version of the *Third Edition* from when it was published in June 2022 through April 2023. This was an increase from the average number of downloads for the 2016 edition. As this is only one quantitative measure of the *Guidelines'* use, the Still Image Working Group may undertake a more in-depth analysis of the adoption and use of the document and related resources within the community. This might also include more qualitative research and analysis of the impact and value that the guidelines provide to practitioners and organizations.

In the longer term, the latest edition of the guidelines will eventually support the development of future editions. The FADGI Still Image Working Group welcomes conversation and involvement from the professional community on content and document elements to include in future iterations of these guidelines.

## Conclusion

The final document is now current with ISO standards and reflective of present best practices for cultural heritage digitization, as determined by the FADGI Still Image Working Group and confirmed through engagement with other professionals in the field. There was a great deal of anticipation and discussion within the cultural heritage digitization community leading up to the publication of the *Guidelines: Third Edition*. As with all FADGI products, the *Guidelines* are available for free on the FADGI website. As a result, practitioners and cultural heritage organizations have a high-quality, no-cost reference document that can be utilized to develop and maintain digitization programs that meet current standards for image quality.

We look forward to sharing and discussing our work with the imaging and archiving community.

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## Author Biography


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