A

Practical Field Handbook

in

INDUSTRIAL RADIOGRAPHY & RADIOGRAPH INTERPRETATION

Authors: George W. Jaques
Dr. Aziz U. Rehman

George W. Jaques

George Wayne Jaques, the son of the late George and June Jaques, was born in North Sydney, Nova Scotia, Canada, on May 8, 1978. George, with three sisters and two brothers was raised in a Christian family up until the age of 19. He finished high school within the top 3 percent in 1996, and would have moved to pursue his interests in law but this was also the time of the Alberta Oil Boom, when his high school friends and colleagues, started to relocate to Alberta. George, with his two brothers, decided to travel to Edmonton, in 1997, in hopes of a new beginning. It was this time, when George was first introduced into Industrial Radiography, in a small Alberta town, Fox Creek, with Oshanek Inspection. This was the beginning of an illustrious journey in the realms of Industrial Radiography.

George, a detailed oriented individual with an aptitude for learning and excellence in his field, motivated to learn more and reach for higher accolades and echelons, reached out to meet Dr. Aziz U. Rehman. Dr. Rehman, being a scholar with several higher level academic degrees and a very well known NDT professional, trained and mentored George for his successful industrial radiography level III certification from NRCan/CGSB in 2012. This highest recognition in industrial radiography, provided George with an opportunity to join Applus RTD Canada as NDE Level III Radiography Auditor for its Fort McMurray Operations, where George has served for over four years, and carried out numerous audits by going through several thousand radiograph reports and interpretations. In addition, George has also incorporated, Jaques Enterprise Inspection Inc., as a freelance consultant offering Industrial Radiography Consulting Services, independently. George, an active supporter of continuing education furthered his education and pursued both ASNT and ACCP RT Level III certifications.

As an industrial radiography auditor and an active member of the Resources and Development Group of ASME B31.1 Committee, RT Technical Committee of Natural Resources Canada's Nondestructive Testing Certification Body (NDTCB), and a Subject Matter Expert (SME) of Industrial Radiography for the American Society of Mechanical Engineers (SME). of the Quality Control Council of Canada (QCCC) and the American Society of Mechanical Engineers (ASME), George has provided services, to owners and operators, major clients and renowned industry players, through his own company independently or through his employers. During this period, while working as an industrial radiography auditor, George has experience serving the companies, e.g. Suncor, Syncrude, Enbridge, CNRL, Kinder Morgan, Shell Canada, TransCanada, Conoco Phillips, Husky, Meg Energy and other Canadian & International Organizations and contractors. George, also Co-founder (along with Dr. Rehman) of RTFI Pro, an Organization aimed to help in bridging the competency gap globally for industrial radiography with support from their YouTube Channel RTFIPro which currently contains over 4.5k members, providing topical information that is aimed to help standardize the industry. Currently, George is employed as Lead Auditor in one of the Worlds largest construction project overseeing a 100% film review of all welding activities.

In 2011, George married his wife, Angela (Slade) Jaques, and now has two beautiful daughters Julia and Jessica. George, even though a very busy individual, is best described as a family man, any available time, either during his projects or assignments close to his family home, or his time-off from his remote contracts, he can be found spending time with his family. In 2015, George, with support from his family and contribution from Dr. Rehman, started working on developing this handbook. George has dedicated all the work on development, configuration, design and compilation, to his wife, Angela, daughters Julia and Jessica, and to his late parents George and June.

Dr. Aziz U. Rehman

Dr. Aziz U. Rehman, American Society of Quality (ASQ) 2020 Global HROMI Medalist, a Canadian of Pakistani origin, is an Engineer by profession, with a Gold Medal degree in Mechanical Engineering from Pakistan. In addition, Dr. Rehman has a bachelors in Commerce, two Masters: one in Nuclear Engineering and another in Acoustics and Industrial Vibrations, with a PhD in Nondestructive Testing, specializing in Industrial Ultrasonics, from France. Furthermore, Dr. Rehman has completed two post docs: one in Nanyang Technological University, Singapore, and the other in Industrial Material Institute, National Research Council, Boucherville, Quebec, Canada. In 2001, he joined Shaw Pipeline Services Ltd. Calgary, Alberta, for his first industrial Job, as Ultrasonic Design Specialist, and worked in the development of initial ultrasonic phased array systems for automated pipeline inspection.

This was the start of Dr. Rehman's adventure in the oil & energy industry, where his next stop was to work as a Nondestructive Testing Specialist with IPSCO Saskatchewan (currently known as EVRAZ) from 2002, and moved back to Alberta in 2005, to start the NDT department of Red Flame Hot Tap Service, in Red Deer. Applus RTD was the next stop (2008 – 2014), before joining Metalogic Inspection Services, as Director of Engineering and Technical Compliance, in Edmonton, Alberta, and currently (since 2015) working as an Inspection Technology Engineer, in the Kingdom of Saudi Arabia. This adventurous journey is full of successes and punctuated with recognitions.

In addition, Dr. Rehman holds numerous industry credentials, e.g. Professional Engineer with Alberta and Saskatchewan, multiple NDT Level III Certifications including industrial radiography from NRCan/CGSB, numerous credentials from American Petroleum Institute, Certified Senior Welding Inspector Level III from TWI, Certified Maintenance and Reliability Professional from SMRP, Certified Quality Engineer from ASQ, and Professional Credentials (PMP, PgMP and RMP) from Project Management Institute.

Dr. Rehman is not just a researcher, but contributes actively for the betterment of the NDT profession. For the last twenty plus years, he has published numerous papers in peer review journals, presented in conferences and participated in numerous engineering and technical forums, locally and internationally. Submitted one patent for innovating heat recovery steam generation tubes for internal inspection and currently in the process of filing a second patent covering a novel method using neutron backscattering to improve dewatering in hydrocarbon storage tanks. In addition, he also delivered lectures and conducted formal NDT classes for all levels, and is always available as a mentor to young entrants in the NDT profession.

Dr. Rehman attributes his successful career as an NDT professional to his wife, who joined him while he was pursuing his doctorate in France. Dr. Rehman takes great strength from the prayers of his parents as well as from the affections of his two lovely daughters, and dedicates this effort, which is a collaboration with George W. Jaques, to his late father and the women in his life, Mother, Mother-in-Law, Wife and Daughters.

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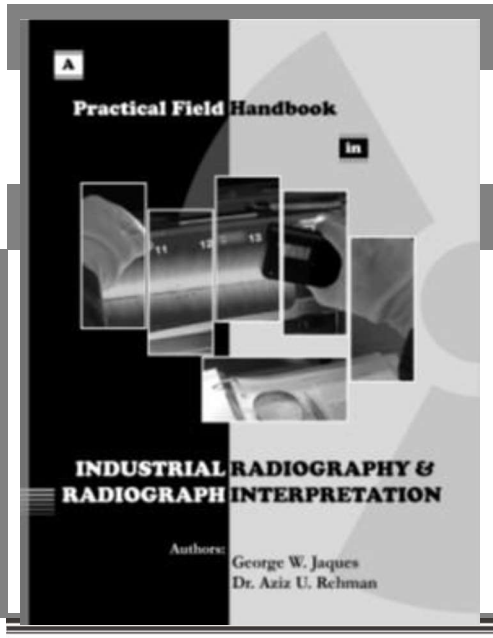
Preface



Industrial radiography is one of the oldest methods in nondestructive testing which has evolved rapidly with the introduction of Cobalt and Iridium after the 2nd World War. The field of industrial radiography covers a broad spectrum of applications with different levels of technician competencies. Though matured, industrial radiography still suffers from inspector subjectivity, interpretation discrepancies and code application variances. Numerous texts, formal trainings, and multitude of specifications are available to cover the training and application aspects of industrial radiography, but still there is a gap, a missing link and a disconnect between the training and the field application of industrial radiography. To increase compliance, improve conformity, decrease subjectivity and reduce interpretation variance, the authors of this handbook with over 40 years of combined industrial radiography field experience, have felt the need to develop a comprehensive text which can serve as a connection between training and application, a bridge between code requirements and correct interpretation, and also a ready reference to guide users in their day-to-day field work when applying their skills in a manner that is safe, reliable, and most importantly, correct.

The handbook is designed with a purposeful scope, covering all levels of inspector competencies, and is configured by taking into consideration all aspects of field industrial radiography (i.e. education & training, qualification & competency, techniques development & application, code compliance & interpretation), and most importantly, will prove to be handy field guide for routine reference.

The handbook contains more than 100 figures, sketches, graphs and illustrations, nearly 100 tables, over 100 industrial radiography techniques with close to 200 radiographs fully interpreted in

compliance with industrial codes, and more than 400 certification questions with numerous calculus examples. It covers in detail the subjects of radiographic film viewing coupled with industrial radiography application techniques, radiograph evaluation and interpretation aligned with prevalent industrial radiography codes and standards. The handbook also presents advancements in industrial radiography.

The handbook not only provides readers with the learning opportunity for attaining industrial radiography certification, but also serves as a field reference where all relevant data (i.e. sensitivity charts, density tolerances, several inspection techniques & other relevant information), are available in one treatise, for a code compliant radiographic inspection and evaluation with correct interpretation.

The handbook, a one of its kind, is aimed at both the practical and field aspects of industrial radiography. It is an effort focused on reducing inspector subjectivity and interpretation variances. The main goal is to give readers, novice or experienced, a structured approach in developing radiographic inspection techniques with a focused understanding on application of different industrial codes with correct interpretation. The handbook also provides readers with a side by side comparison of the use and application of different industrial codes, and will educate users in applying sound judgement while using the acceptance criteria.

This handbook provides readers with some basic understanding in radiation safety, however the main emphasis is to guide the users in correct application of industrial radiography.

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FOR IMMEDIATE RELEASE

George W. Jaques and Dr. Aziz U. Rehman are to be Honored by ASQ for their Contributions and Achievements in Quality

MILWAUKEE, Wis., April 26, 2021 — *George Jaques*, of *George's River, Nova Scotia* and *Dr. Aziz U. Rehman* of *Inspection Department*, *Saudi Aramco, Saudi Arabia* will be honored by ASQ, the world's largest network of quality resources and experts, for their noteworthy contributions and achievements in quality.

Jaques and *Dr. Rehman* will be recognized in May prior to ASQ's annual World Conference on Quality and Improvement.

Jaques and *Dr. Rehman* will receive ASQ's 2021 Phillip B. Crosby Medal for those who have authored a book, published within the past three years, contributing significantly to the extension of the philosophy and application of the principles, methods, or techniques of quality management.

George W. Jaques and *Dr. Aziz U. Rehman*, both Canadians, and are internationally recognized SMEs with multiple credentials, accreditations and certifications in the field of engineering and nondestructive testing. Pioneering a global effort through their book, and contribution in different code committees and professional forums to help improve standardization in industrial radiography. Continuously offer mentoring through different media channels, and currently carrying out a data analytics project for understanding the variances in radiograph interpretation.

Visit the ASQ website at https://asq.org/about-asq/asq-awards/2021-recipients for a full list of winners.

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September 3, 2019

Mr. George Jaques
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Subject: 3rd Revision - Copyrighted Material

Dear Mr. Jaques:

In response to your e-mail dated May 18, 2019, ASME grants you and your Co-author Dr. Aziz U. Rehman permission to use excerpts from the standards and Codes listed below:

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Sincerely,

Ivette Estevez

Ivette Estevez
Manager, Standards IPR
(212) 591-8482

/ie

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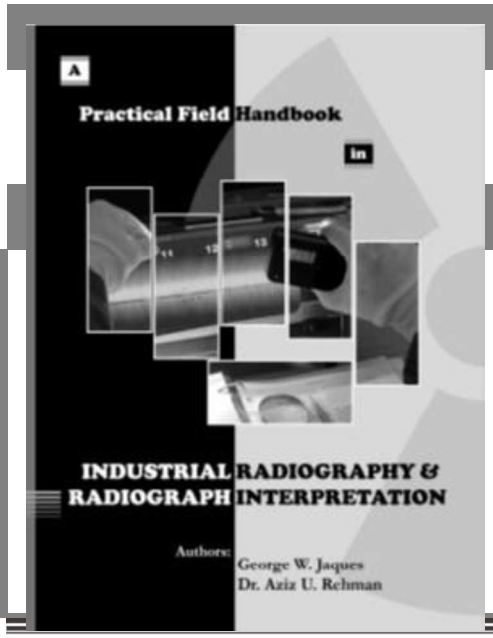

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Industrial Radiography Weld Examination in Accordance with CSA Z662

Example Procedure

Prepared By:
George W. Jaques

Reviewed & Approved By:
Dr. Aziz U. Rehman

Procedure RT-01
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This handbook is the first and only text book which is aimed at the practical and field aspect of industrial radiography which contains more than 100 sketches, graphs & illustrations. In addition, it contains nearly 100 tables, over 100 industrial radiography techniques, 400 certification questions and close to 200 radiographs which are fully interpreted in compliance with industrial codes. It covers in detail the subjects of radiographic film viewing coupled with industrial radiography application techniques, radiograph evaluation & interpretation aligned with prevalent codes and standards, and also the advancements in industrial radiography.

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