

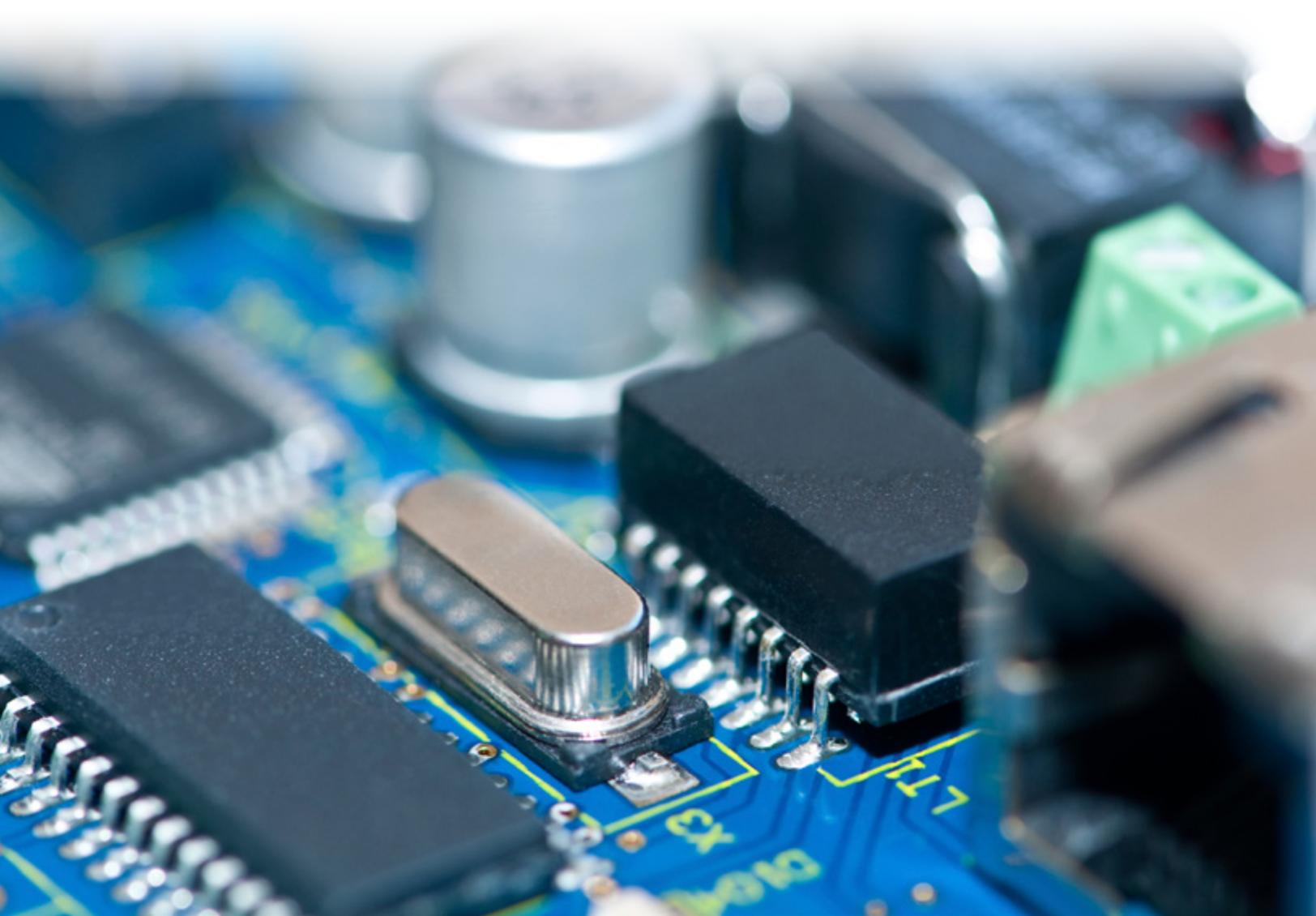
# eQuaLearn<sup>®</sup> Newsletter

**WELCOME TO THE EQUALEARN NEWSLETTER.**

The newsletter is released quarterly and features technical and other articles of interest.

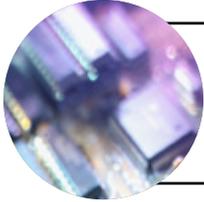
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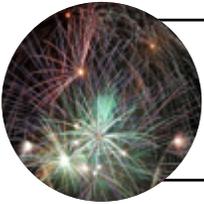
**December 2018**

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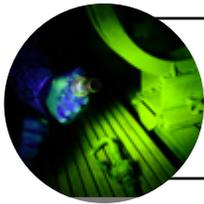
## [The Evolution of Electronics](#)

An overview of the electronics industry from the 1960's to the Nadcap Electronics Task Group



## [2018 - A Year to Remember](#)

2018 truly was an exciting year for eQuaLearn for a number of reasons



## [Error Proofing Your PT and MT Requirements](#)

In 2019, eQuaLearn will release its newest nondestructive testing (NDT) course: Error Proofing Your Penetrant & Magnetic Particle Requirements.



## [Hosting Classes with eQuaLearn](#)

Read about the experience of a company that hosted eQuaLearn classes

## What do you want to read about?

The intent of the eQuaLearn newsletter is to provide timely, valuable and interesting content to support the Nadcap community to continually improve their operations. If there is a specific topic you would like to read about, please tell us via email to [eQuaLearn@p-r-i.org](mailto:eQuaLearn@p-r-i.org).

# The Evolution of Electronics

## From the 1960's to the Nadcap Electronics Task Group

### **WHEN I FIRST STARTED IN ELECTRONICS IN THE LATE 1960'S, CIRCUIT BOARDS WERE A NEW EVOLUTION FROM TERMINAL BOARDS AND WIRE TRACES.**

The boards were single or double sided with copper traces and components were mounted through holes drilled into the fiberglass board and then the leads soldered together. They were referred to as "Bread Boards" because they looked like a slice of bread. Most of the time this process was completed by hand or by using the latest technology of wave soldering developed in the late 1950's.

In 1965, Gordon Moore, co- founder of Intel, observed that the number of transistors on a chip doubled every 12 months. This discovery would continue to trend into the future. The pace of expansion recently slowed to 18 months, which is now referred to as Moore's Law.

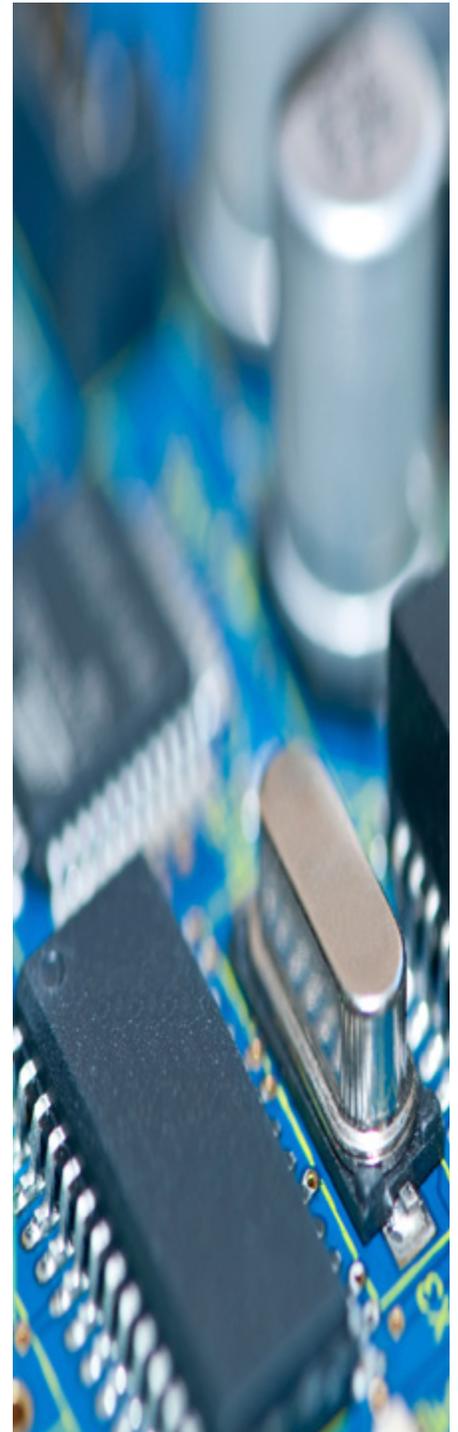
Along with this expansion, the computing capacity and speed of electronics has increased in addition to the miniaturization of circuits and devices. This has led to multi-layer circuit boards and manufacturing innovations, such as surface mounted technology, automated pick and place machines for

component mounting, reflow ovens for soldering, automated optical and x-ray inspection technology and automated coating and testing devices.

As technology advances into new areas like fiber optics and chip on board for example, the Nadcap Electronics Task Group (ETG) is developing new audit criteria (AC) to monitor these processes. To support the Nadcap Electronics Task Group and Aerospace Suppliers, eQuaLearn developed the Nadcap Audit Preparation- Electronics course, which provides a complete overview of Nadcap requirements related to the Nadcap Electronics audit.

The Nadcap Electronics Task Group has developed AC7119 Bare Board Manufacturing, AC7120 Board Assembly along with 12 slash sheets, and AC7121 Cable and Wire Harness Assemblies, which are available in eAuditNet under Resources / Documents / Audit Criteria / Electronics. Each one of these checklists also has a slash sheet which is used for personnel qualifications.

Companies have two options. First, they can elect to train their employees and have them submit to the IPC online test. Second option would be to develop their own training that is in line with the IPC requirements and complete



their own testing. Companies that do not employ personnel who have IPC certificates are required to include the training slash sheet in the scope of their audit and will be audited to the requirements. Also, all employees involved in assembly, test, and inspection of electronic products are required to pass a visual acuity and color blindness test. Corrective lenses may be worn during the test to assist with passing.

Bare Board Manufacturing is audited to the requirements of AC7119 with 3 slash sheets. AC7119/2 addresses flex and ridged flex boards and AC7119/4 covers audit criteria for qualifications of personnel manufacturing printed boards. Printed Board Manufacturing has approximately 33 processes controlled by the IPC standards and customer requirements. Some of the processes are sequential and some are repeated for multilayers. The control of heat, chemical composition of baths, pressures, time, and inspection - both visual and automated - are among the processes that are audited and



## There are over 12 exacting standards controlled by the IPC that the boards and material must meet.

addressed in the new eQuaLearn Electronics course.

Along with visual inspection, cross section analysis needs to be performed. There are over 12 exacting standards controlled by the IPC that the boards and material must meet. In addition to the review of procedures, a compliance audit is performed in the factory to assure the procedures and standards are being met.

Board Assembly Criteria is outlined in AC7120 along with 12 slash sheets. Multiple processes are backed by industry standards, and customer requirements are flowed down. Depending upon the technology, not all processes are performed. The slash sheets are used to include the process(es) in the scope of the audit. These processes may include temperatures, linear motion, chemical composition, humidity, electrostatic discharge, time, cleanliness, soldering, moisture sensitive components, shelf life, conformal coating and testing.

Cable and Wire Harness Criteria are outlined in the AC7121 and AC7121/1 checklist. There are 22 processes involved in cable and wire harness manufacturing. For example;

soldering, crimping, splicing, wire cutting and stripping. There are also requirements for electrostatic discharge, chemical mixing and viscosity, potting and molding. Tensile testing is required to international standards. All sections in the scope are reviewed for procedure and compliance.

This article provided a quick overview of the Nadcap Electronics Task Group Audit Criteria. eQuaLearn's Nadcap Audit Preparation- Electronics course provides a more in-depth review of each Nadcap Electronics Checklist.

In 2019, eQuaLearn will offer the Nadcap Audit Preparation-Electronics training course in Torrance, CA; Cincinnati, OH; and Manchester, UK. Please visit the eQuaLearn website for a complete list of all upcoming eQuaLearn training locations and dates.

[Contact](#) an eQuaLearn team member with any questions or for assistance with registration.

Article written by: Don Grimley, eQuaLearn Instructor and Nadcap Electronics Auditor

Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position or views of the Performance Review Institute or any of its employees or programs.

# 2018 - A Year to Remember



## **2018 TRULY WAS AN EXCITING YEAR FOR EQUALEARN: WE CELEBRATED 10 YEARS OF PROVIDING SUPERIOR TRAINING TO SPECIAL PROCESS AND QUALITY PROFESSIONALS.**

eQuaLearn offered free training during the largest Nadcap meeting in Europe and reached the milestone 4,000+ learners at Nadcap meetings over the years; eQuaLearn also developed new courses to meet our customers' needs.

## **eQuaLearn is 10 years old!**

eQuaLearn celebrated our exciting 10-year milestone in April 2018. To provide our customers with a bit of eQuaLearn history, we posted a series of fun facts on [LinkedIn](#) to mark the occasion.

Over the past 10 years, eQuaLearn has trained over 30,000 people thanks to our 56 subject matter expert instructors, who are located around the world. eQuaLearn has delivered training in 34 countries, in 9 different languages.

Thank you for supporting eQuaLearn over the past 10 years!

## **LinkedIn**

eQuaLearn doubled the number of LinkedIn followers over the past 12 months – thank you to all our followers for becoming members of the eQuaLearn community.

Our [LinkedIn](#) page provides access to technical and quality articles from subject matter experts. We post about course updates based on revisions made to the Nadcap Audit Criteria, free eQuaLearn training at Nadcap Meetings, and upcoming course training opportunities.

[Follow us](#) on LinkedIn, there may be discounts from time to time...



## Nadcap Meeting Complimentary Training

eQuaLearn offered complimentary training at the three Nadcap Meetings held in 2018, with more than 640 people in total benefiting from the complimentary training. That's over 150 people more than in 2017.

Did you know?

- The February Meeting in Madrid, Spain was the largest Nadcap Meeting ever held in Europe.
- At the London Meeting in June, participants from 23 countries attended the complimentary courses.
- A new NDT AC7114/1 and AC7114/2 course was piloted at the October Nadcap Meeting in Pittsburgh. This course was very well received and will be available in 2019.

## Training with eQuaLearn

eQuaLearn is dedicated to meeting the training needs of aerospace professionals globally. In 2018, we delivered 240+ courses to 3,255 learners to date in 2018, with 35% of the courses taught in local languages, such as Chinese, French, Japanese and Spanish. Keep an eye on our [website](#) and our [LinkedIn](#) page for upcoming training solutions in your area.

### Introduction to Pyrometry

The [Introduction to Pyrometry](#) course remains as popular as ever, with sold out sessions in Indianapolis, IN in August and Torrance, CA in November, as well as in Nagoya, Japan and in Suzhou, China.

As usual we received great feedback, such as “an excellent tool in taking me from a complete novice to having a fairly in-depth understanding of pyrometry”.

## Nadcap Electronics

eQuaLearn developed a Nadcap Electronics course this year in response to the increasing global customer demand. The new [Nadcap Audit Preparation – Electronics](#) course thoroughly covers the Nadcap Audit Criteria (AC) AC7119, AC7120 and AC7121. This course will be available in 2019 – visit our [website](#) to register or [contact](#) a team member if you have any questions.

### Webinars

eQuaLearn is expanding its online training, launching the first webinars for Asia Suppliers: Root Cause Corrective Action - Nadcap Style and Contract Review will be hosted from the eQuaLearn Beijing office to allow Asian aerospace suppliers to join during their working day.

The Root Cause Corrective Action - Nadcap Style webinar was also translated into French. We anticipate

offering more webinar courses in different languages in 2019, such as the Nadcap Audit Preparation webinar in French and German. These courses are ideal for companies that are new to Nadcap. [Register](#) now on our website or [contact](#) the eQuaLearn team to learn more.

## Customized Learning

Are you aware of all eQuaLearn training options? Our team can assist you in determining the best fit for you and your company.

### Public courses

eQuaLearn offers training in venues across the [Americas](#), [Europe](#), and [Asia](#). These sessions have specific dates and are taught by our subject matter expert instructors. This option is great to train an individual or a small number of employees. All

public course schedules are available on our website.

### Hosted training sessions

Your company hosts eQuaLearn courses at your facility, allowing external participants to attend the course. This option is ideal if you need to train 4-5 employees and are willing to open your facility to external attendees. eQuaLearn works with you to organize and promote the session, offering your company discounts for employees and networking opportunities.

### Onsite training sessions

eQuaLearn organizes a private training session at your location for your employees. We will schedule the instructor, ship materials to your location and include personalized certificates for every participant. We can also take examples of problems

your company faces and incorporate them into the course. This is a great option if you need to train 8 or more participants on a specific topic. Onsite training saves the company travel expenses and time out of the office.

### Webinar training

eQuaLearn offers online training throughout the year on various topics, such as [Quality](#), [Heat Treat](#) or [Non-Destructive Testing](#). Training is conducted live. Participants are able to ask questions throughout the training from the convenience of their desk. The complete 2019 webinar schedule is available on the eQuaLearn website. Private webinars are also an option, similar to onsite training but delivered over the internet. This is a great cost-effective alternative to onsite training, especially if your company has several sites spread over different locations.

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# eQuaLearn Memberships

[eQuaLearn Membership](#) is a prestigious association with an international organization dedicated to developing quality professionals and improving special process technical skills. Membership is a powerful and efficient way to support the need for continuous staff development and improved productivity. Membership is available for anyone interested

in advancing their learning in the quality or special process field. If you are a quality manager, engineer, or employee in any department related to quality or special processes, there is an eQuaLearn membership level to help you and your company meet your educational goals. eQuaLearn Membership provides a way for both companies and individuals to achieve their professional development goals.

## Benefits of Membership

- Allow companies to invest in staff development
- Provide customized benefits and options
- Offer increased levels of service
- Generous discounts and preferential rates

Learn more at [www.eQuaLearn.com](http://www.eQuaLearn.com)



eQuaLearn is on [LinkedIn](#) - please follow us to keep up-to-date with our news.



## Free Training at the February 2019 Nadcap Meeting in New Orleans

Would you like to attend an eQuaLearn training free of charge? [Registration](#) is now open for training during the New Orleans, LA, USA, Nadcap Meeting! eQuaLearn will be providing seven complimentary courses 18-21 February 2019 in New Orleans. In addition to these free trainings, eQuaLearn is excited to offer its first Chemical Processing Open Discussion Forum.

# Free Training Schedule in New Orleans

Course Title	Course Summary	When
Nadcap Audit Preparation	Designed to provide a complete overview of Nadcap requirements related to the audit.	18 February (1:00pm-4:00pm) 21 February (10:00am-1:00pm)
eQualLearn Chemical Processing Open Discussion Forum	A panel of several Nadcap Subscribing Voting Members of the Chemical Processing Task Group, PRI Chemical Processing Staff Engineers, and a Nadcap Chemical Processing Auditor will address the following topics in an open discussion forum: <ul style="list-style-type: none"> <li>• Review of the Top Non-Conformances (NCRs)</li> <li>• Review of Significant Checklist Sections</li> <li>• How to do a Nadcap Audit (Auditor's Perspective)</li> <li>• How to Manage a Nadcap Audit (Supplier's Perspective)</li> <li>• Open Question &amp; Answer Session (Subscribers, Staff Engineer's and a Nadcap Auditor will be available to address questions)</li> </ul>	18 February (1:00pm-5:00pm)
Contract Review	Contract Review is a multi-disciplinary process which should ensure that all potential problems are identified and addressed before any commitment to supply is made. This course describes what must be done. The requirements are explained and illustrated by discussions around common problems and weaknesses.	19 February (8:00am-11:00am)
Internal Audit Systems Overview	Designed to assist in the process of building an internal audit system and how to structure the key elements of this system for success while also explaining the vital relationship between Quality and Management.	19 February (1:00pm-4:00pm)
Nadcap PT & MT Self Audit Risk Assessment	This new NDT course is designed for reviewing the potential failure modes of some of the most common findings associated with penetrant and magnetic particle checklists, and the associated NDT quality system questions in the AC7114 checklist. This is a dynamic course focusing on predicting the failure modes of common findings starting from the AC7114 checklist, through the AC7114/1 and AC7114/2 checklists. The course content will briefly highlight some of the most common findings documented within the past year to eighteen-months.	19 February (8:00am-11:30am)
Process FMEA	This course presents the use of Process FMEA as part of Advanced Process Quality Planning in the Aerospace industry and describes the concepts of PFMEA, how it fits into Quality Planning, and the role PFMEA has in Risk Management.	19 February (8:00am-5:00pm)
Introduction to Aerospace Quality	Created to introduce the concept and key definitions of quality in the aerospace industry to professionals who are new to the quality field. It presents Aerospace Quality Management and the role of Nadcap, ISO 9001 and AS / EN / JISQ9100, aerospace audits including what you must know pre- and post-audit, quality tools, remedies to non-conformances, and maintaining the quality system.	20 February (8:00am-5:00pm)
Root Cause Corrective Action Nadcap Style	Designed to provide an understanding of the basic concepts of Root Cause Corrective Action (RCCA) and application of how to apply those concepts to eliminate errors and defects. This training provides a basic understanding of the requirements needed to respond to a Nadcap audit NCR.	20 February (1:00pm-4:00pm)

# Error Proofing Your Penetrant and Magnetic Particle Requirements

**IN 2019, EQUALEARN WILL RELEASE ITS NEWEST NONDESTRUCTIVE TESTING (NDT) COURSE: ERROR PROOFING YOUR PENETRANT & MAGNETIC PARTICLE REQUIREMENTS.**



If you are thinking about taking this course then you already know that NDT is used to maximize the reliability of aircraft, machines, equipment, etc. You know that penetrant (PT) and magnetic particle (MT) are just two of the NDT methods used to do this.

You will also be aware that a Level

1 (Level 1-Limited) is the first level of certification in which you can perform NDT tasks without someone constantly looking over your shoulder or standing close enough to whisper in your ear.

You are also conscious of the date your Level 2 or Level 3 certification expires and whether you must test again; or you have some type of

responsibility and knowledge of the PT and MT processes performed at your facility (perhaps through quality, auditing, management, etc.). You should also know that there are penetrant and magnetic particle Nadcap Audit Criteria checklists. And, you are definitely aware of how difficult it is to walk into your Nadcap audit fully confident that you can anticipate your audit results.

eQuaLearn's new NDT course will be a dynamic training which helps with the latter, by using the Nadcap checklist to "anticipate audit results" by understanding how to error proof the PT and MT processes, and assess or limit the risk when error proofing is not possible or too costly. This course will demonstrate ways to help you remove the variation within the processes.

How is this course different than the other well-prepared penetrant and magnetic particle courses offered through eQuaLearn? The objective of this course is to have you walk away understanding how to predict which findings you are more at risk to receive during your Nadcap audit. The current NDT courses listed below focus on the duties and responsibilities of the Level 1, Level 2 and Level 3:

The NDT Penetrant Operator and NDT Magnetic Testing Operator courses are an introduction (overview) to penetrant and magnetic particle. This training provides the Level 1 with the information necessary to improve their skills and competencies in the aerospace workforce. It can also be used to provide a basic understanding of the penetrant and magnetic particle process.

The NDT Penetrant Planner and NDT Magnetic Testing Planner courses focus on the increased duties and responsibilities of the Level 2 for penetrant and magnetic particle. This training provides the Level 2 with the information necessary to further improve their skills and competencies in the aerospace workforce.

The NDT Penetrant Owner and NDT

Magnetic Testing Owner courses are an excellent review of the responsibilities of penetrant and magnetic particle with respect to the Level 3.

I invite you to attend the [Error Proofing Your Penetrant & Magnetic Particle Requirements](#) course and challenge yourself to look at the checklists from a different perspective.

In the Error Proofing Your Penetrant & Magnetic Particle Requirements course you will look at the Nadcap checklist questions not merely to determine compliance, but to predict failure. By understanding how non-compliance to the question can occur, you can help remove or predict the failure points.

For example, one of the Nadcap checklist questions states, "Is a degradation check performed for the known defect standard at least annually?". Your answer would probably be "yes", and state that evidence is in the log book. Question complete – right?

This eQuaLearn course will look at most frequent non-compliance questions by asking, how can we not be in compliance with the question. Then, we will discuss ways to remove the variation or assess risk to the question.

Going back to the question, "Is a degradation check performed for the known defect standard at least annually?".

How many things can you come up with that might make that question non-compliant?

- Of course, not performing the check at all.
- Not have the check defined in your procedure.
- Not performing the check annually.
- Not performing the check with "new" materials.
- Not comparing the results to the baseline.
- Not calculating the defect measurements correctly.
- Not measuring the same number of defects as the baseline (maybe originally 5 defects were noted and measured and now only 4).
- Not realizing that the customer has a lesser specification frequency stated.

Now can you think of ways to error proof the process and remove the variation from the process? Are there any variables that you can't error proof? What's the risk for failure? How can you minimize the risk?

eQuaLearn's Error Proofing Your Penetrant & Magnetic Particle Requirements course will launch in Torrance, CA on 2 April 2019. Visit the [eQuaLearn website](#) for a complete list of training dates and locations or [contact an eQuaLearn team member](#) if you have any questions. Come join us, and I promise you that at the very least, you will walk away looking differently at your penetrant and magnetic particle questions, prior to answering "YES" or "NO", and stating that the evidence is in the file cabinet.

By: Linda Beene, eQuaLearn Instructor and Nadcap NDT Auditor

Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position or views of the Performance Review Institute or any of its employees or programs.

# Hosting Classes with eQuaLearn

**PK Calibration and Consulting Labs Ltd. is based in Israel and has hosted eQuaLearn courses since 2013. Sivan Kornhauser, Co-CEO of the company, agreed to share their experience of collaborating with eQuaLearn.**

“PK Calibration and Consulting Labs Ltd. is a provider of calibration services for measuring equipment to a wide range of organizations in Israel. Our CEO and founder, Peter Kornhauser, attended the eQuaLearn Introduction to Pyrometry course in Europe a few years ago and was very impressed with the quality of training and delivery.

“Some of our customers also attended eQuaLearn courses every year in Europe; it is very costly and time consuming to come to Europe for training for just a couple of days. They contacted us at PK Calibration and Consulting Labs Ltd to ask us to organize an eQuaLearn seminar in Israel.

“We got in touch with the eQuaLearn team in the European office to figure out where to start and we found the whole process very easy. The eQuaLearn staff are always very professional and responsive, as well as warm and friendly. We advised the team which courses we would be interested in, and they did a survey of Israeli aerospace suppliers to understand what would be most relevant to the Israeli market.

“It was clear that the best courses were the Nadcap Audit Preparation – Heat Treatment and the Introduction to Pyrometry courses, as Heat Treating is the main Nadcap commodity Israeli aerospace suppliers are involved with.

“Once we decided which courses were going to be held during the training session, the eQuaLearn team made sure every aspect of the process was well organised and managed so we would have everything we needed to run the training session in Israel. Course material was sent one week in advance and the eQuaLearn Instructor was always promptly on time to meet with participants.

“The attendees from our company commented that their knowledge had been challenged and improved by the Instructor’s teaching, and that the Instructor took the time to answer all their questions.

“We have held four hosted sessions, and have always found the eQuaLearn training to be valuable and the experience with the Instructor and the team in the office to be professional and productive.

“We are proud to host eQuaLearn classes. It has brought us a lot of respect among our clients and offered us the opportunity to reach new industries and to expand our customer base. The training sessions are a great means for the promotion of our business to representatives of relevant industries in Israel and allow us to work on our existing professional relationships within the aerospace industry.”

If you want to learn more about hosting opportunities, please contact the eQuaLearn team at [eQuaLearn@p-r-i.org](mailto:eQuaLearn@p-r-i.org)

# Our Team

If you are registered to attend the Nadcap meeting in New Orleans, LA, USA in February 2019, please visit the eQuaLearn Helpdesk to discuss public, hosting or onsite training opportunities with the team.



**MICHELE STEFANCHIK**  
MANAGER



**CRYSTAL KURTYKA**  
SPECIALIST

For any additional questions regarding training, please contact an eQuaLearn team member at [eQuaLearn@p-r-i.org](mailto:eQuaLearn@p-r-i.org) or visit our website [www.eQuaLearn.com](http://www.eQuaLearn.com).



**STACEY ALLAN**  
COORDINATOR



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