

Vibration Analysis Training and Certification Movement toward standardized certification requirements

Summary

In the past, certification in the field of vibration analysis has been offered by training organizations and companies that specialize in training seminars (e.g. Vibration Institute, Technical Associates, Update International) as well as instrumentation vendors (e.g. Entek IRD, CSI, SKF, Bently Nevada). All of these entities still provide training. However, many of these are now seeking validation for their certification from a governing body.

Two major United States governing bodies are now providing standards for vibration analysis training and certification, the American Society of Nondestructive Testing (ASNT) and the American National Standards Institute (ANSI). The ANSI and ASNT standards are similar, although there is one major difference. ANSI is the U.S. member of the International Standards Organization (ISO), so ANSI certification is equivalent to ISO certification. The two largest training providers in the country, The Vibration Institute and Technical Associates, have aligned themselves with the ANSI (ISO) and ASNT standards, respectively.

ANSI / ISO Certification

The ISO standard defines four different levels of certification and designates them as *Category I* through *Category IV*. Each level defines a quantity of training hours, an experience requirement, and certification test guidelines in order to qualify. The standard specifies the topics to be covered by training for each category (see *ISO Required Training Topics*). However, the standard does not specify how the training is obtained, and in fact, it allows for self-study. The following table summarizes the certification requirements:

Classification	Prerequisite Certification	Training Hours	Cumulative Experience	Examination Details	
				# Questions	Time (hrs)
Category I	none	32	6 months	50	2
Category II	none	70	1.5 years	100	3
Category III	Category II	110	3 years	100	4
Category IV	Category III	174	5 years	60	5

Certification Exam , Testing Bodies, and Accreditation

The ISO organization will not provide certification directly. Instead, private organizations will be accredited by the ISO to provide the testing. To date, there are no organizations fully accredited to provide ISO certification testing. The nonprofit organization, The Vibration Institute, is currently in the process of becoming accredited and will be the first organization to do so. Once accreditation is obtained, all of the students who have completed the experience requirements and passed their ISO compliant exams will be grandfathered into ISO certification.

Our company, Pioneer Engineering, has decided to forgo the lengthy and expensive accreditation process and to provide ISO certification via The Vibration Institute as a third party provider. At the completion of a Pioneer Engineering training course, a student who meets the experience qualifications outline above can choose to take The Vibration Institute's ISO compliant (soon to be certified) exam for \$200. This is the amount that The Vibration Institute charges to write and grade the exam. Additionally, a \$60 yearly ISO certification is required by The Vibration Institute in order to maintain a database that tracks ISO certified analysts. This annual charge includes a membership to The Vibration Institute and a subscription to their publications.

Alternatively, students can choose not to take the The Vibration Institute's ISO exam and instead take Pioneer Engineering's exam which has no experience requirement or additional cost beyond the cost of the class.

ISO Required Training Topics

The content of the training courses are specified by the ISO standard. Below is a brief synopsis of each category:

Category I – One will be able to:

- operate portable instrumentation on pre-assigned routes
- acquire readings from permanently installed instrumentation
- input results into a database and download routes from a computer
- conduct testing under steady-state operating conditions
- recognize when no signal is present
- compare overall or single value vibration measurements against pre-established alert settings

Category II – One will be able to:

- select the appropriate machinery vibration measurement technique
- set up instruments for the basic resolution of amplitude, frequency and time
- perform basic vibration analysis of machinery and components (such as shafts, bearings, gears, fans, pumps and motors) using spectrum analysis
- maintain a database of results and trends
- perform basic single channel impact tests to determine natural frequencies
- classify, interpret and evaluate the test results in accordance with applicable specifications and standards
- recommend minor corrective actions
- understand basic single plane balancing concepts
- be aware of some causes and effects of bad measurement data

Category III – One will be able to:

- select the appropriate machinery vibration analysis technique
- specify the appropriate vibration instrumentation hardware and software for both portable and permanently installed systems
- measure and perform diagnosis of single-channel frequency spectra, as well as time domain plots such as waveforms and orbits, under both steady-state and unsteady operating conditions, with or without a phase trigger
- establish vibration monitoring programs, including determination of machines for periodic and continuous monitoring, frequency of testing, route plans
- establish programs for the specification of vibration levels and acceptance criteria for new machinery
- measure and analyze basic operating deflection shapes

- understand and be able to direct the use of alternative condition monitoring technologies (i.e. acoustic emission, thermography, motor current and oil analysis)
- recommend field corrective actions, such as balancing, alignment, and replacement of machine parts
- use acceleration enveloping (demodulation)
- perform single plane field balancing
- report to management regarding program objectives, budgets, cost justification and personnel development
- prepare reports for appropriate personnel on machine condition
- recommend corrective action and report on the effectiveness of repairs
- provide instructions and technical direction to vibration trainees

Category IV – One will be able to:

- apply vibration theory and techniques, including measurement and interpretation of multi-channel spectral results such as frequency response functions, phase and coherence
- understand and perform signal analysis, including understanding of frequency and time domain processing, including orbits and their limitations
- determine the natural frequencies, mode shapes and damping of systems, components and assemblies
- determine the operating deflection shapes of machines and connected structures and recommend means for correction
- use generally recognized advanced techniques for vibration analysis, parameter identification and fault diagnosis
- recommend corrective actions and/or design modifications, including component change or repair, isolation, damping, change of stiffness and change of mass
- provide technical guidance to vibration trainees
- interpret and evaluate published ISO codes of practice, International Standards and specifications
- recognize vibration caused by gas pulsation in machines such as reciprocating machines and screw compressors and to measure the necessary parameters and recommend means for correction
- recommend corrective actions for resilient mounting and other holding-down and foundation problems
- apply the basic principles of rotor-bearing dynamics to vibration diagnosis
- conduct basic two-plane field balancing
- recommend advanced two-plane influence coefficient or static/couple balancing

More Information

- ISO standard 18436-2, *Condition monitoring and diagnostics of machines – Requirements for training and certification of personnel – Part 2: Vibration condition monitoring and diagnostics*
- ASNT Recommended Practice SNT-TC-1A
- For more information see: www.pioneer-engineering.com