World Class Training in NDT

COURSE CATALOGUE

canadian innovation . global knowledge .

TRAINING
NDT technique courses
Professional Development training
Workshops - Certification and Academic
On-site at company locations
Online live interactive and on demand internet delivery

CERTIFICATION
Approved NRCan Test Centre
Free online requirement exams

MEMBER SERVICES
Course fees include FREE 1 YEAR MEMBERSHIP
Ontario PCC Requirements

If you are paying for an Ontario course yourself, your registration falls under the Ontario Private Career College (PCC) Act. Therefore you must:

1. Be a minimum of 18 years of age or older AND have an Ontario Secondary School Diploma or equivalent. OR ...
2. Successfully pass a math skills pre-screen exam.

Documentation proving either of those is required before registering for the course.

NRCan NDT Certifying Body Requirements

Math Skills Pre-Screening
NRCan Accepted Training Organizations (ATO’s) are responsible to pre-screen math skills or administer a math-skill test for students if required for the three volumetric methods (UT, RT, ET). NRCan provides ATO’s with a template math test to be used by the ATO to develop the screening test. ATO’s must individually provide pre-screening criteria to comply with this element.

This math-skill exam can be written or attempted on-line at the CINDE Test Centre in Hamilton.

CINDE members receive one math-skill pre-screen exam FREE!

Materials and Processes*
The NRCan NDT CB Rules of Implementation* state: Accepted training organizations will be responsible for preparing and delivering a 40-hour course (that includes a course completion test) in materials and processes (M&P)**.

*M&P is also known as Engineering, Materials and Components (EMC).

**Students who hold a valid CGSB certification are exempt from this requirement.

For more information, visit: https://www.nrcan.gc.ca/mining-materials/non-destructive-testing/8586

Radiation Safety
The NRCan NDT CB Rules of Implementation state: “The candidate shall complete radiation safety training** (minimum 8 hours) provided by an Accepted Training Organization. The training provided shall be in accordance with an NRCan NDT CB accepted radiation safety curriculum.”

**Students who have successfully completed a Radiation Safety and CEDO Preparation course, or have a valid CNSC CEDO certification are exempt from this requirement.

For more information visit: https://www.nrcan.gc.ca/mining-materials/non-destructive-testing/8586

CINDE offers ALL prerequisite courses.
Register online at https://www.cinde.ca/courses/online.phtml
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**What is NDT?**

Nondestructive testing (NDT) allows us to examine structures, materials or components without damaging or destroying the object being tested. Defects cannot always be detected with visual inspection; they may be too small or located entirely within the material. NDT provides a means to detect such defects without having to cut, etch or otherwise damage the material. Since NDT can often be conducted on site, it is economical both in terms of time and money. Billions of dollars are spent on NDT every year for maintenance in the nuclear, aircraft and petroleum industries alone. In the welding, metal forming and fabrication industries, NDT is a necessary part of the quality assurance process. These are the main NDT methods used most often. The CGSB training standard CAN/CGSB-48.9712 and certification are available for some of these methods:

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Penetrant Testing</td>
<td>A surface method used for both ferrous and non-ferrous materials. A coloured, penetrating dye (often fluorescent) is applied to the part under test and seeps into cracks or other surface openings. The test part is washed and a blotting agent applied which draws the dye from the surface opening to produce a two dimensional, visible indicator of its location.</td>
</tr>
<tr>
<td>Magnetic Particle Testing</td>
<td>A surface method used to detect surface and near-to-surface discontinuities in ferro-magnetic materials. The test material is magnetized and coloured iron filings (often fluorescent) are poured onto the surface. The north/south pole created by a crack or other defect will attract the iron filings and provide a visible indication of the defect’s location.</td>
</tr>
<tr>
<td>Ultrasonic Testing</td>
<td>The use of high frequency sound waves to inspect both internal and surface defects in fine-grained castings, forgings, welds and extrusions as well as non-metallic materials. Sound waves are generated in the test material by a piezoelectric crystal and their travel through the material is monitored. Interference of the sound beam path, caused by discontinuities in the material, is indicated on a cathode-ray-tube display.</td>
</tr>
<tr>
<td>Radiography</td>
<td>A method for detecting internal discontinuities in castings, forgings and weldments. Radiation-sensitive film is placed beneath the test material and x-rays or gamma rays are used to penetrate through the material to the radiographic film. Areas of different material densities are recorded on the film, indicating any cracks, voids, porosity or inclusions.</td>
</tr>
<tr>
<td>Eddy Current Testing</td>
<td>Used to detect surface and near surface flaws in electrically conductive materials. Small circular currents (eddy currents) are generated in the surface of the test material by a test coil. The eddy current flow is disrupted by the presence of discontinuities which changes the electrical impedance of the test coil. Any changes are amplified and indicated on the eddy current instrument. Since eddy currents are affected by metallurgical properties as well as defects, this method can be used for material sorting and hardness and conductivity measurements. It is also widely used in the aircraft and nuclear industries.</td>
</tr>
<tr>
<td>Acoustic Emission</td>
<td>Sensitive listening devices (sensors) are used to detect high frequency acoustic waves emitted due to the sudden release of energy caused by crack growth, plastic deformation or phase transformation. Sensors are mounted on the outside of the test object and stress in the form of pressure, compression, tension or torsion is applied. Acoustic emissions are amplified, filtered and processed for interpretation. Static defects cannot be detected by this method.</td>
</tr>
<tr>
<td>Leak Testing</td>
<td>Widely used in industries such as food, refrigeration and air conditioning, petro-chemical plants and power plants to detect leakage within or outside of a closed system. Leaks may be detected visually or by sonics or smell. Minute leaks may be detected by a soap bubble test, amplified sonic methods or chemicals which produce colour changes. Often, the system is pressurized during testing and a fluorescent dye added to the pressurizing fluid.</td>
</tr>
<tr>
<td>Infrared Thermography</td>
<td>The thermal conductivity or radiative properties of a material are used to test for thermal insulation, bonding or contact between parts, locating hidden objects and for overheating of electronic components and transmission lines. The most common technique employs an infrared camera which produces a temperature profile or thermograph of the object being viewed for inspection.</td>
</tr>
<tr>
<td>Vibration Analysis</td>
<td>Method used to detect vibration, misalignment or unbalance as well as locating broken gears, mismatched fan blades and bent shafts. Static or non-rotating systems are excited by an external vibration source and the motion or sound produced by the test piece is analyzed. In dynamic systems, such as rotating machinery, the test piece is monitored while in operation.</td>
</tr>
</tbody>
</table>

For complete registration information and course dates, please visit www.cinde.ca

☎1-800-964-9488  ✉info@cinde.ca  👁www.cinde.ca and events.cinde.ca
Registration:
Advance registration is required for all courses, workshops and examinations. Registration must be accompanied by full fee or company purchase order (which holds your position, with payments due net 30 days). Student certificates will be withheld until full payment has been received. Cheques (payable to the Canadian Institute for Non-destructive Evaluation), Mastercard, VISA, American Express and direct debit are accepted. All course fees are in Canadian funds. All courses are delivered in English.

Contact us:
Canadian Institute for Non-destructive Evaluation
Mail: 135 Fennell Avenue West
135 Fennell Avenue West 905-387-1655 (local)
Hamilton, ON L8N 3T2 1-800-964-9488
Fax: 905-574-6080
Website: www.cinde.ca Email: info@cinde.ca

Course Locations:
Ontario - West 5th & Fennell, Mohawk College, E006A
Alberta - visit website or call 1-800-964-9488
On-site training - see page 20 for full details

Fees:
Prices may vary due to course location. Please visit the website to confirm course fees.

Cancellations/Transfers:
Courses: If you are registered on a CINDE course and are unable to attend, please notify us as soon as possible as other applicants may be waiting for this course. Substitutions may be made at no cost to you.
Workshops and practical exams: Scheduling of lab facilities for workshops and practical examinations require payment at the time of booking. Substitutions may be made at no cost to you.

Please visit our website for full details on cancellations/transfers. www.cinde.ca/courses/registration.shtml#can

Private Career College:
CINDE is registered as a Private Career College, in accordance with the Private Career Colleges Act 2005. For information on approved programs, please visit www.edu.gov.on.ca.

Refresher Training:
Students are entitled to attend a regularly scheduled course if they have successfully completed that course with us in the past 3 years. See page 6 for full details.

Attendance:
Students must attend 100% of the course to meet CGSB certification requirements. Attendance shall be reported in the course documentation.

Classroom Hours:
Unless otherwise notified, classes will be conducted from 8:30 a.m. to 4:30 p.m. daily.

Textbooks and Course Materials:
Textbooks and course material are provided on the first day of the course.

Curriculum:
CINDE reserves the right to alter course curriculum.

Certificates:
Certificates will be issued to each student who successfully completes the course. The criteria for successful completion is that the student must meet the attendance requirements and attain the following:

- For all courses meeting CGSB requirements, the minimum grade shall be in accordance with the most current version of CAN/CGSB-48.9712.
- For Radiation Safety and CEDO Preparation, the minimum grade shall be 75% and in accordance with the most current version of CNSC regulations.
- For Weld Inspection and Quality Control, the minimum grade shall be 70% or in accordance with the most recent version of W178.2.
- For all other courses, the minimum grade shall be 70%.

Grade Remediation:
This policy describes the circumstances under which a student may apply to attempt an end-of-course exam (final exam) for a second time. This applies to students who have met the attendance requirements but have not achieved a passing grade in a CINDE course delivered at any facility where CINDE does business such as the training centre in Hamilton, colleges, company locations, trade schools or other third-party training facilities. For full details, please visit: https://www.cinde.ca/remediation.phtml

Official Receipt:
An official receipt for course fees will be forwarded to each student with the course certificate. It should be retained for income tax purposes.

Local Accommodations:
Visit our website for a complete listing of local accommodations for all locations. www.cinde.ca/courses/registration.shtml#hot

CINDE Membership:
Course fees include a free one (1) year membership in the Canadian Institute for Non-destructive Evaluation. See Member Benefits and Services on page 17.
Radiography Level 1

Training objectives: This course provides the basic knowledge of industrial radiography to enable the graduate to conduct radiographic inspection to established procedures under the supervision of Level 2 or Level 3 personnel. The course includes hands-on experience in the use of x-ray radiography and darkroom techniques. Training course meets the training syllabus requirements of CAN/CGSB-48.9712, ISO 9712 and SNT-TC-1A.

Total cost: For course price, dates and locations, visit our website.

Prerequisite: Math skill exam, EMC and Radiation Safety course (see inside front cover for full details)

Topics include:  
- Fundamentals of radiation physics  
- Radioactivity  
- Film processing  
- X-ray production and X-ray beam characteristics  
- High energy x-ray sources  
- Radiographic image quality  
- Radiation measurement  
- Origin of penetrating radiation  
- Applied radiographic inspection  
- Mathematical factors governing x-ray exposures

Note: Students must provide their social insurance number to participate in labs.

Radiography Level 2

Training objectives: This course provides the advanced knowledge required of the Level 2 industrial radiographer, including technique development, film interpretation, general codes, standards and specifications, and federal and provincial regulations pertaining to x- and gamma radiography. Training course meets the training syllabus requirements of CAN/CGSB-48.9712, ISO 9712 and SNT-TC-1A.

Total cost: For course price, dates and locations, visit our website.

Prerequisite: Successful completion of RT Level 1, math skill exam, EMC and Radiation Safety course (see inside front cover for full details)

Topics include:  
- General radiography  
- Radiographic film and processing  
- Radiographic techniques  
- Practical radiography

Note: Students must provide their social insurance number to participate in labs.
Radiation Safety and CEDO Preparation  
Training objectives:  
This training focuses on radiation safety for those using gamma radiography. The course provides a basic understanding of radiation principles, safe working practices and regulations pertaining to the use of ionizing radiation. An excellent preparatory course for industrial radiographers, Radiation Safety Officers and meets the training requirements of the Canadian Nuclear Safety Commission for those seeking their Certified Exposure Device Operator’s (CEDO) license.

Total cost:  For course price, dates and locations, visit our website.

Topics include:  
- Origin of penetrating radiation  
- Fundamentals of radiation physics  
- Maximum permissible doses  
- Emergency situations  
- Regulations  
- Radiation measurement and instrumentation  
- Fundamentals of radiation protection: time, distance, shielding

Prerequisite: Math skill exam (see inside front cover for full details)

Maximum class size: 16

Ultrasonics Level 1  
Training objectives:  
This course provides a basic knowledge of ultrasonic testing fundamentals sufficient to enable the technician to carry out ultrasonic testing to established procedures under the supervision of Level 2 or Level 3 personnel. Training course meets the training syllabus requirements of CAN/CGSB-48.9712, ISO 9712 and SNT-TC-1A.

Total cost:  For course price, dates and locations, visit our website.

Topics include:  
- UT testing equipment  
- Angular incidence  
- Discontinuity variations  
- UT reference blocks  
- Generation of UT waves  
- Inspected part variations  
- UT inspection techniques  
- Test material and sound beam characteristics  
- Fundamental properties of ultrasound

Prerequisite: Math skill exam and EMC (see inside front cover for full details)

Maximum class size: 12

For complete registration information and course dates, please visit www.cinde.ca

☎ 1-800-964-9488 ☎ info@cinde.ca ☐ www.cinde.ca and events.cinde.ca
Ultrasonics Level 2

Training objectives:
This course provides the in-depth knowledge in the principles of ultrasonic testing and the fundamentals of engineering, materials and processes, such that the technician will be able to: identify the suitability of ultrasonic testing for all materials and inspection applications, develop inspection techniques and prepare written instructions that can be followed by a Level 1 technician, document results of the analysis, be familiar with all regulatory codes and specifications for ultrasonic testing and their intent. Training course meets the training syllabus requirements of CAN/CGSB-48.9712, ISO 9712 and SNT-TC-1A.

Total cost: For course price, dates and locations, visit our website.

Topics include:
- Basic and advanced theory
- Codes and specifications
- Applied ultrasonic testing
- Fundamentals of pulse echo
- Calibration of instrumentation

Prerequisite: Successful completion of UT Level 1, math skill exam and EMC (see inside front cover for full details).

Maximum class size: 12

Eddy Current Level 1

Training objectives:
This course provides a basic knowledge of eddy current testing fundamentals sufficient to allow the technician to carry out eddy current testing to established procedures under the supervision of Level 2 or Level 3 personnel. Training course meets the training syllabus requirements of CAN/CGSB-48.9712, ISO 9712 and SNT-TC-1A.

Total cost: For course price, dates and locations, visit our website.

Topics include:
- Fundamental theory
- Testing of tubes and cylindrical components
- Testing with surface probes

Prerequisite: Math skill exam and EMC (see inside front cover for full details).

Maximum class size: 12
Eddy Current Level 2

Training objectives:
This course provides a thorough knowledge in the principles of eddy current testing and the fundamentals of engineering materials and processes, such that the technician will be able to: identify the suitability of eddy current testing for all materials and inspection applications, develop inspection techniques and prepare written instructions that can be followed by a Level 1 technician, provide analysis of inspection data, document results of the analysis, be familiar with regulatory codes and specifications for eddy current testing and their intent. Training course meets the training syllabus requirements of CAN/CGSB-48.9712, ISO 9712 and SNT-TC-1A.

Total cost: For course price, dates and locations, visit our website.

Topics include:
- Fundamental and advanced theory
- Instrumentation
- Testing with surface probes
- Surface probe signal analysis
- Tube testing signal analysis
- Testing of tubes and cylindrical components
- Codes and specifications

Prerequisite: Successful completion of ET 1, math skill exam and EMC (see inside front cover for full details)

Maximum class size: 12

Ten days (80 hours)

Stretch your training dollar

Need to retrain? Refresh your skills? Refresher training available!
Students who successfully complete a CINDE training course may attend again within 3 years of the course completion.

The following conditions apply to refresher training:
- Refresher training is subject to seating availability
- The course fee is discounted 50% and is non-refundable

For complete registration information and course dates, please visit www.cinde.ca
☎1-800-964-9488 info@cinde.ca www.cinde.ca and events.cinde.ca
Exclusive Member benefits to get you from day to day.

View more CINDE Member benefits at www.cinde.ca/benefits.phtml
Liquid Penetrant Levels 1 & 2  
Training objectives:  
This course provides detailed instruction in the theory and practices of liquid penetrant testing, including the capabilities and limitations of penetrant testing. Instruction will be given in generally accepted techniques in accordance with codes and standards. Training course meets the training syllabus requirements of CAN/CGSB-48.9712, ISO 9712 and SNT-TC-1A.

Total cost: For course price, dates and locations, visit our website.

Topics include:  
• Basic principles of liquid penetrant testing  
• Basic steps of liquid penetrant processing  
• Types of penetrants in current use  
• Steps to follow when using different processes  
• System controls  
• Inspection, interpretation and evaluation  
• Inspection procedures and standards  
• Liquid penetrant test equipment and accessories  
• Advantages and disadvantages of various processes

Magnetic Particle Levels 1 & 2  
Training objectives:  
This course provides detailed instruction in the theory and practices of magnetic particle testing, including the capabilities and limitations of the method. Instruction will be given in generally accepted inspection techniques in accordance with codes and standards. Training course meets the training syllabus requirements of CAN/CGSB-48.9712, ISO 9712 and SNT-TC-1A.

Total cost: For course price, dates and locations, visit our website.

Topics include:  
• Basic principles of magnets and magnetic fields  
• Basic steps of magnetic particle testing  
• Magnetization and electric currents  
• Inspection materials  
• Demagnetization  
• Equipment types  
• Materials associated with magnetic fields  
• Following written procedures  
• Selecting the proper magnetization method  
• Inspection, interpretation and evaluation  
• Magnetic field direction and discontinuity detection  
• Codes, standards and specifications  
• Specialized MT equipment  
• Safety factors in magnetic particle testing  
• Advantages and disadvantages of MT testing

Prerequisite: EMC (see inside front cover for full details)

Maximum class size: 18
Level 3 On-line Preparation Courses

Training objectives:
The Level 3 preparatory courses are on-line courses designed to prepare the CGSB Level 2 certified technician for the additional responsibilities and requirements of a Level 3 according to CAN/CGSB-48.9712.

Many of the skills required by the Level 3 are common to each NDT method, thus CINDE has designed a modular online training program which will provide both generic theoretical instruction in engineering, materials and components, procedure writing and other methods of NDT; as well as specific online training to focus on the Level 3 method of choice.

Students preparing for their first Level 3 certification must complete Modules 1 - 3. Students will then select only the specific Module (4 - 8) which coincides with the method they are seeking certification in. For subsequent Level 3 training, students will only be required to select the Module that is specific to their method. Evaluation through examination will be carried out following each Module. This course format has been selected and meets the training syllabus requirements of CAN/CGSB 48.9712 and ISO 9712.

The module final exam must be taken at CINDE or you would need to locate a proctor, pre-approved by CINDE (e.g. NRCAn Accepted Exam Centre staff, a teacher from a primary or secondary school, college or university) who is willing to administer the exam online using a proctor code.

Total cost: For the cost of each module, please visit our website.

Module 1 - Engineering, Materials and Components and Review of CAN/CGSB 48.9712
7 sessions (minimum 28 hours)
Prerequisite: Must hold one valid CGSB Level 2 Certification or equivalent

Module 2 - Basic Understanding of all Methods
4 sessions (minimum 16 hours)
Prerequisite: Must hold one valid CGSB Level 2 Certification or equivalent

Module 3 - Procedure Writing
1 session (minimum 4 hours)
Prerequisite: Must hold one valid CGSB Level 2 Certification or equivalent

Module 4 - Liquid Penetrant Method (Specific)
2 sessions (minimum 8 hours)
Prerequisites: CGSB Level 2 PT Certification or equivalent and Completion of Module 1 - 3

Module 5 - Magnetic Particle Method (Specific)
2 sessions (minimum 8 hours)
Prerequisites: CGSB Level 2 MT Certification or equivalent and Completion of Module 1 - 3

Module 6 - Ultrasonic Method (Specific)
2 sessions (minimum 8 hours)
Prerequisites: CGSB Level 2 UT Certification or equivalent, Completion of Module 1 - 3 and Math

Module 7 - Radiography Method (Specific)
2 sessions (minimum 8 hours)
Prerequisites: CGSB Level 2 RT Certification or equivalent, Completion of Module 1-3 and Math
Weld Inspection and Quality Control Level 1

Training objectives:
This course is designed for anyone who wishes to become qualified as a welding inspector under CSA W178.2 or AWS QC1 or those that require a good general weld inspection background for in-house inspection or supplier auditing. The course material makes frequent references to textbooks, which will be provided on the first day of the course.

Topics include:
1. Design
   1.1 Drawings and symbols
   1.2 Design concepts
   1.3 Codes specifications and standards
2. Materials
   2.1 Base metals
   2.2 Welding consumables
   2.3 Welding metallurgy
3. Production
   3.1 Preparation for welding
   3.2 Production methods
   3.3 Health and safety
   3.4 Elements of supervision
4. Welding
   4.1 Processes
   4.2 Welding equipment
   4.3 Welding consumables
   4.4 Distortion and stress
5. Quality Assurance
   5.1 Basic quality assurance systems
   5.2 Basics of quality control
   5.3 Nondestructive examination
   5.4 Acceptance criteria
6. Qualifications
   6.1 Welders
   6.2 Equipment
   6.3 Procedures
   6.4 Materials
   6.5 Inspectors
   6.6 NDT technicians
   6.7 Welding companies

Ten days (80 hours)
This course meets the training requirements of W178.2. Students meeting the successful completion requirement will be exempt from the closed book CWB Level 1 certification examination.

Textbooks provided:
"Welding Technology Fundamentals"
Bowditch, Goodheart-Wilcox Company Inc.
"The Procedure Handbook of Arc Welding"
The James F. Lincoln Arc Welding

Total cost: For course price, dates and locations, visit our website.

Maximum class size: 18

On-line Training
Let’s You Learn from Home or Work!
CINDE delivers on-line courses, on demand or live interactive.
The Math Preparation is offered as both a live, interactive session delivered ON-LINE via internet conferencing with 2-way audio and interactive display on your computer, or on demand.

Engineering, Materials and Components (EMC), Level 3 Preparation and Radiation Safety courses are available “on demand” when you are ready!

Satisfy the classroom theory requirements at home or work.
Call for details on courses available.

For complete registration information and course dates, please visit www.cinde.ca
☎1-800-964-9488 ⌨info@cinde.ca ⓩwww.cinde.ca and events.cinde.ca
Engineering, Materials and Components (EMC)  
**Training objectives:**  
A strong foundation in engineering, materials and processes is vital to the NDT technician. This training course offers you the opportunity to learn about the materials used in manufacturing, the metallurgical and mechanical properties which determine the strength of the material and how these properties are developed, the means used to process materials and how defects may be introduced into the material through these processes. Understanding the manufacturing process from start to finish is the key to a successful NDT career.

The objective of this course is to provide the fundamental knowledge of materials and processes with respect to the broad sector termed EMC (Engineering, Materials and Components). To meet CAN/CGSB-48.9712, extensive knowledge is required in materials and processes and flaw types specific to welds, castings, forgings, etc. The EMC course is essential for those who intend to challenge the CGSB examinations in any method and for welders, machinists, visual inspectors, manufacturing supervisors and anyone involved in material or equipment reliability.

**Total cost:** For course price, dates and locations, visit our website. On-line training available!  
**Maximum class size:** 18

**Topics include:**
- Nature and properties of materials
- Solidification of metals
- Solid-state changes in metals
- Introduction to heat treatment
- Ferrous metals and their properties
- Nonferrous metals
- Metal specifications and uses
- Loads and material responses
- Inservice behaviour of metals
- Causes and recognition of discontinuities
- Manufacturing methods
- Powder metallurgy
- Heat treatment
- Machining

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Film Interpretation for Quality Control Personnel  
**Training objectives:** This course provides quality assurance inspectors, surveillance personnel and/or anyone with a decision-making role with regards to material acceptance to applicable codes, with the theoretical and practical knowledge required for sound decision-making with regards to radiographic film interpretation.

**Total cost:** For course price, dates and locations, visit our website.

**Topics include:**
- Radiographic image control
- Discontinuities and their radiographic images
- Use and applicability of reference radiographs
- Helpful hints for film interpretation

**Maximum class size:** 12

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For complete registration information and course dates, please visit www.cinde.ca  
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✉️ info@cinde.ca  
🔗 www.cinde.ca and events.cinde.ca
A career in NDT...is it for you?

NDT offers opportunities to develop valuable technical expertise.

If you like math and can stay focused while working in some demanding conditions, then NDT is for you!

Visit our website: www.cinde.ca
or call 1.800.964.9488
Math Preparation - Online (on demand or live interactive)  
**One day (8 hours)**  
**Training objectives:** This course provides for all levels of NDT personnel to refresh their math skills and familiarize them with the use of a scientific calculator and its functions. The one day online course will cover frequently used formulas and their manipulation, applicable units of measure and conversions, and basic order of operations, algebra, logarithms and trigonometry that is required by the training syllabus of the Canadian National Standard for NDT Personnel Certification.

The course final exam must be taken at CINDE or you would need to locate a proctor, pre-approved by CINDE (e.g. NRCan Accepted Exam Centre staff, a teacher from a primary or secondary school, college or university) who is willing to administer the exam online using a proctor code.

**Total cost:** For course price, live interaction dates or on demand information, visit our website.  
**Maximum class size:** 18

Radiation Safety - Online (on demand)  
**One day (8 hours)**  
**Training objectives:** This course is a prerequisite that must be completed before taking a Radiography Level 1 or Level 2 course. See inside front cover for full details.

**Topics:**
- Introduction  
- Basic atomic and nuclear structure  
- Radiation  
- Quantities and units  
- Biological effects of radiation  
- Radiation protection system  
- Normal levels of exposure  
- Occupational exposure  
- Controlled areas  
- Radiation protection programmes  
- Application of annual limits  
- Responsibilities of regulatory bodies  
- Responsibilities of registrants, licensees and employers  
- Responsibilities of workers  
- Training  
- Radiation sources and radiation generators  
- Personal protective equipment  
- Measurement principles and instruments

**Total cost:** Visit our website  
**Maximum class size:** on demand

Radiation Safety - Xray  
**One day (8 hours)**  
**Training objectives:** This course provides a basic understanding of radiation principles and safe working regulations, as they pertain to x-rays.

**Total cost:** For course price, dates and locations, visit our website.  
**Maximum class size:** 18

**Topics include:**
- Properties of radiation and interactions of radiation  
- Background radiation and measurement of radiation  
- Production and characteristics of x-rays  
- Radiation protection legislation (ON Reg 861/90)  
- Biological effects of radiation  
- Control of radiation hazards  
- Quality control
Radiation Safety Refresher - Gamma

**Training objectives:** This course will refresh knowledge in radiation principles and safe working regulations, as it pertains to gamma radiation. Meets the annual training requirements in accordance with CNSC Regulations.

**Total cost:** For course price, dates and locations, visit our website.

**Maximum class size:** 18

**Prerequisite:** Successful completion of Radiation Safety & CEDO Preparation or equivalent

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Principles and Applications of NDT

**Training objectives:** This course provides a basic knowledge of nondestructive testing methods and their applications; demonstrations will be provided. Course can be designed for customer specific needs. Call for details.

**Total cost:** For course price, dates and locations, visit our website.

**Maximum class size:** 18

**Topics include:**
- Introduction to nondestructive testing
- What is NDT and why is NDT necessary?
- When is NDT needed and where is it used?
- Who should perform NDT?
- How are these nondestructive tests performed?
- NDT methods: advantages, applications, limitations, defect detectability, equipment, terminology
- Qualifications and certification of NDT personnel

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Phased Array UT Inspection

**Training objectives:**
This course provides the basic knowledge in the principles of Phased Array such that a Level 2 technician will be able to: identify the suitability of Phased Array for all materials and inspection applications, document results of the analysis, be familiar with regulatory codes and specifications for Phased Array testing and their intent.

**Total cost:** For course price, dates and locations, visit our website.

**Prerequisite:** CGSB UT Level 2 certification and math assessment exam (see inside front cover for full details)

**Topics include:**
- Basic theory
- Digitization principles
- Performance/calibration
- Phased Array technology
- Inspection applications
- Codes and specifications

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For complete registration information and course dates, please visit www.cinde.ca

1-800-964-9488 info@cinde.ca www.cinde.ca and events.cinde.ca
Introduction to NDT and Failure Analysis
As a result of attending this training, participants will learn about the failure modes identified by Nondestructive Testing (NDT) inspection techniques, and the important concepts relating to Failure Analysis techniques and reporting as applied to the failures identified by NDT.

A brief review of the failure modes identified by NDT technologies will be followed by the principles of Failure Analysis. These will include commonly used investigative and failure analysis techniques, as well as the key metallurgical, environmental and equipment operating conditions that lead to failure.

Examples of the high-magnification microscopy used for Failure Analysis will be explained. How to develop root cause solutions to prevent recurring failures is also discussed. Case histories will be used to demonstrate the material that is covered. Students are encouraged to bring examples from their companies for group discussion.

**Total cost:** For course price, dates and locations, visit our website.  
**Maximum class size:** 18

Ultrasonic Weld Inspection
**Training objectives:**
This course is intended to provide Level 2 ultrasonic personnel with advanced background and practical experience to develop confidence in conducting ultrasonic weld inspection. Emphasis is on flaw detection and sizing techniques. The course can be beneficial if preparing for CGSB Level 2 Ultrasonic practical exam.

**Total cost:** For course price, dates and locations, visit our website.  
**Maximum class size:** 12

**Topics include:**
- Review of Level 2 Ultrasonics
- Calibration
- Welding processes and defects
- CSA and ASME ultrasonic weld standards
- Weld inspection techniques
- Practical weld inspection
- Recording results

**Prerequisite:** Successful completion of UT Level 2 course and math assessment exam (see inside front cover for details)

Ultrasonic Spot Weld Inspection
**Training objectives:**
This course will provide a basic knowledge of ultrasonics, the spot welding process and the application of this test method to determine integrity of spot welds. Students may bring with them a flaw detector and appropriate transducer or use a unit provided at the time of the course.

**Total cost:** For course price, dates and locations, visit our website.  
**Maximum class size:** 8

**Topics include:**
- Introduction to ultrasonics and spot welding
- Calibration
- Testing of spot welds
- Evaluation of results
Ultrasonic Thickness Gauging

Training objectives:
This one day course provides the basic theory of ultrasonic technology to a degree that the participants will have an understanding of ultrasonic thickness gauging. Participants in this hands-on workshop will be able to better understand the pitfalls of ultrasonic thickness gauging with respect to material velocities, surface roughness and geometrical configurations.

Total cost: For course price, dates and locations, visit our website.

Topics include:
- Introduction to ultrasonic theory
- Definition of ultrasonic vibrations
- Resolution/sensitivity
- Sound attenuation

Maximum class size: 12

One day (8 hours)

WORKSHOPS - ACADEMIC OR CERTIFICATION (PRACTICAL)

Academic Training Workshops

Academic training workshops are for students seeking to complete the practical lab portion of an academic training course, as required by the NRCan NDT Certification Body. The basic theory and application of the respective NDT technique is explained and demonstrated. Students have the opportunity to practice the appropriate NDT equipment technique.

Students who successfully complete the workshop receive a letter stating the hours of practical instruction that were provided to complement academic theory. Academic training workshops cannot be used to prepare for NDT certification exams.

Prerequisite: Must have completed online training course.

- Certification workshops are kept to a maximum of 3 students (depending on the method) in order that each student may receive individual instruction and assistance with particular problem areas.

- We have a wide range of test pieces with realistic defects for each test method and students are encouraged to also bring their own test pieces for their own test applications and to participate in group discussions and problem-solving.

To request a workshop date, please log into the Member/Visitor area (https://www.cinde.ca/members/index.phtml) to choose “Register for workshops”.

Certification Preparation Workshops

Certification preparation workshops are for students or NDT technicians who are approved by the NRCan NDT Certification Body to attempt a CGSB NDT certification exam. Students have the opportunity to familiarize themselves with the equipment that will be used during an exam; the set up and calibration of test equipment is explained and demonstrated. Students have the opportunity to practice inspecting test pieces with realistic flaws.

Students who successfully complete the workshop receive a letter confirming their attendance.

Prerequisite: Must have completed forty (40) hours of training and have approval from NRCan.
Canada’s National NDT Society
The Canadian Institute for Non-destructive Evaluation (CINDE) is Canada’s national not for profit membership organization dedicated to the people and companies engaged in nondestructive testing (NDT). Member services and benefits such as local chapter meetings, the bi-monthly Journal publication and others listed below are provided to help industry practitioners and professionals to learn, network and stay abreast of new technologies. All CINDE training courses include a free membership and membership is also available to the public at large. Join now!

Member Services and Benefits
Over 38 years of commitment and progress of Canada’s national NDT membership society have made our organization a valuable contributor to NDT technicians in the field while also advancing the scientific engineering and technical knowledge of nondestructive evaluation, testing and inspection. We are dedicated to serving our members by providing information that is useful to your career, your company and to the general public at large.

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Industrial Eyes - Safety Eyewear discount (see members area for application)
Smart NDT Reports (15% discount)
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Resume viewing and Job Postings in Journal and on the CINDE website
CINDE Member Affinity Program
Company acknowledgement plaque
3 company members with full-voting privileges, additional memberships at 50% of individual rate

*Students must provide proof of registration in a full-time College or University program of studies that has nondestructive testing, evaluation or inspection in the curriculum.
Consulting
Services are available on a contract basis to provide Level 3 consulting, training and technical support for certification of personnel to SNT-TC-1A as well as the auditing of NDT programs. CINDE can provide personnel and expertise to develop and administer all employer-based training and certification programs as well as review your present written procedures or develop new procedures.

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- Participate in Chapter technical meetings and conferences
- Promote and Support “YOUR” local Chapter!
- Tours and networking events!
- Take advantage of educational offerings in YOUR area

Contact CINDE for full Chapter details or visit http://www.cinde.ca/chapters.shtml

Register online at www.cinde.ca

- Interested in being active in technical meetings

ANNUAL MEMBERSHIP FEES

- Student (full time day school)* .......................... $ free
- Individual ...................................................... $ 85.00
- Small Business ............................................. $ 200.00
- Corporate ..................................................... $ 525.00
- International ............................................... $ 110.00

*Students must provide proof of registration in a full-time College or University program of studies that has nondestructive testing, evaluation or inspection in the curriculum.

CANADIAN INSTITUTE FOR NON-DESTRUCTIVE EVALUATION

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Written and Practical Exams can be attempted at CINDE's Approved Test Centre (Hamilton facility only), conducting Canadian General Standards Board (CSGB) examinations on behalf of Canada's NDT certification body, the Department of Natural Resources Canada (NRCan), and Certified Exposure Device Operator (CEDO) examinations for the Canadian Nuclear Safety Commission (CNSC).

Payment for written and practical examinations must be prepaid in order to reserve facilities. The following are the various forms of payment accepted by the Canadian Institute for NDE...cash, cheque, money order, debit card, AMEX, VISA and Mastercard.

Written Examinations: To book a written exam, please log into your CINDE member/visitor area and choose Task 19 - “Register for practical and/or written examinations”.

Exams are available most Tuesdays and Thursdays, starting a 9:00 a.m. or 1:00 p.m. Ample time should be allowed for registration on the day of the exam; fifteen (15) minutes are suggested. All registration is in the main office (Room E006a).

Practical Examinations: Practical exams are arranged by appointment at CINDE (Hamilton facility only). To schedule your exam date, please log into your CINDE member/visitor area and choose Task 19 - “Register for practical and/or written examinations”.

If you wish to take your written exam consecutively with your practical, please do so at this same link. CINDE is equipped to conduct examinations in radiography, ultrasonics, liquid penetrant, magnetic particle and eddy current.

For more information about Canada’s NDT Certifying Body for CGSB or CEDO examinations, please call 1-866-858-0473 or visit http://www.nrcan.gc.ca/mining-materials/non-destructive-testing/8578

IMPORTANT INFORMATION FOR BOTH WRITTENS AND PRACTICAL EXAMS:

Students must present the admittance form issued to them by NRCan along with photo ID before an examination can be started. Nothing can be brought into the exam area (i.e. pencil cases, etc.). We will supply everything that you will need:

- ✔ scientific calculator
- ✔ pens and pencils
- ✔ scrap paper

For students taking their practical exam, safety shoes and long pants are mandatory. If a lunch is brought in for a practical exam, it will be checked. Students wishing to use their own equipment must receive prior approval.

We look forward to being your government approved Test Centre
Let us bring the training to You!

If you are scheduling training for multiple people or require an in-house certification program, you should consider on-site training at your company. This convenient, cost-effective option can save you thousands of dollars in travel expenses and allows you to customize course content and course dates to fit within your schedule.

On-site training is the most economical way to train your staff. You won’t have to pay airfare, hotel accommodations, or meal reimbursements for multiple people. Plus, you’ll gain productivity when your employees are not away from work.

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Our first-rate instructors can customize training courses to focus on your company’s precise needs. It allows students to learn with work-related examples and, because training is on-site, confidential and sensitive work issues can be openly discussed and resolved. On-site training is an ideal opportunity for employers to prepare their NDT employees for recertification to CAN/CGSB-48.9712, ISO 9712 and SNT-TC-1A.

Let us bring the classroom to you!

Julie Bush
Supervisor - Training
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Al Higgins - Engineering, Materials and Components (EMC), Level 3 Training, Weld Inspection and Quality Control, UT, PT, MT: Al is a graduate of Mohawk College, Mechanical Technology. He has over 35 years of experience in heavy industry, with management responsibilities for nondestructive evaluations, quality assurance, maintenance technologies, operational maintenance and utilities. Al is currently president of a consulting firm specializing in quality assurance. He holds CGSB certification in PT, MT and UT Level 3.

Ciprian Pancescu - UT, ET, Weld Inspection Quality Control Level 1, Engineering Materials & Components: Ciprian, a graduate of the Mohawk College Quality Engineering Technician NDE program, joined the Canadian Institute for NDE in 2013 as an assistant instructor in UT, ET, and PT workshops and courses. Ciprian gained his CGSB Certification in UT, ET, and MT Level 2, CWB Weld Inspection Level I certification and has remained active in the nuclear inspection industry. Ciprian also holds a Bachelor Degree in Engineering from Romania.

Claude Lord - UT, PT, MT, ET: Claude joined the Canadian Institute for Non-destructive Evaluation April 2014. Claude holds Level 3 certification in ET, MT and UT as well as Level 2 certification in PT as well as a Bachelor of Applied Science. Previous industrial experience; includes; Atomic Energy of Canada Limited and Hydro-Quebec. Claude is highly experienced in his field and has many years experience working within nuclear energy.

Douglas Whitely - UT, RT, EMC, Level 3, CEDO, Phased Array: Doug graduated from Sir Sandford Fleming College with a diploma as a Material Testing Technician and holds CGSB Level 3 certification in PT, MT, UT, RT, Qualified Operator and PCN UT Level 2 certification in weldments and Phased Array. Doug has over 30 years experience in both NDT and Predictive Maintenance. Doug has served as President of CSNDT, Chairman of the CSNDT-Ontario Chapter, Chairman of the CSNDT Journal Committee and Board member of CINDE.

John Baron - ET: John has been involved in NDT technology since 1974. His career has centred in the nuclear power industry, first with Westinghouse Canada and then Ontario Hydro and its successor, Ontario Power Generation. In addition, John has provided extensive assistance to the International Atomic Energy Agency in NDT endeavours. John is a member of the Canadian Nuclear Society and a long time member of the Canadian Institute for NDE. He is the CANDU representative on the European Network for Inspection Qualification (ENIQ) and scientific committee member on the Joint JRC/IAEA International Workshop for Qualification Bodies. He holds CGSB certification in ET Level 3.

John deLuca - PT, MT, RT, CEDO: John is a graduate of Mohawk College's Industrial Instrumentation Mechanic Program. He joined the Canadian Institute for NDE in 1985, specializing in liquid penetrant and magnetic particle inspection. John has extensive years of teaching experience and holds CGSB certification in PT and MT Level 3 and RT Level 2 and Qualified Operator.

Julie Bush - PT, MT, ET, Math: Julie has been involved with NDT since 2005 and has 10 years experience in quality assurance in a variety of industries. Julie currently holds Level 2 CGSB certification in PT, MT, ET, and CEDO.

Here's what our students have to say about CINDE courses and instructors!

“Al Higgins was very informative and helpful if needed”
Weld Inspection and Quality Control Level 1, April 2013, Lucas Thompson

“John deLuca presented the information in a knowledgeable and helpful way. Kept a good pace. Was enthusiastic in delivering the course material.”
Radiation Safety and CEDO Preparation, April 2013, J. Higgins

“Can’t wait to learn from Doug Whitely again. Hope to take UT2 with him eventually.”
Ultrasoundics Level 1, November 2014, Thomas Dearden

“John Baron did a great job answering all questions and taught us all a lot.”
Eddy Current Level 2, November 2012, Eric Holtz

“John deLuca is a great instructor. I had no problem hearing him. He repeats relevant information 2 or 3 times in different ways so you really get it drilled into your head. I would definitely and hopefully get to take another course with John. I really feel like he is the best. Thank you CINDE!”
Liquid Penetrant 1 & 2, August 2013, Darryl Hoogendam

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If we knew the behavioral style of our employees, it would be easy to make the perfect team. Wouldn’t the customer be impressed? Could this be your new dream team? Detail oriented? Pay good attention to detail? Be a self-starter? There is the clockwork. If we knew the behavioral style of our employees, it would be easy to make the perfect team. Wouldn’t the customer be impressed? Could this be your new dream team? Detail oriented? Pay good attention to detail? Be a self-starter? There is the clockwork.

We can also apply this philosophy to the team that is already in place. We built our new dream team! Now we just have to keep it. To help us provide an environment where they can work to their natural talents the best—requiring less effort and increasing the possibility that we made a good hire.

So far we discussed the current state of the industry and how we are suffering due to a lack of qualified skilled technicians. We presented a few ideas on how to ensure that those candidates entering our industry are trained and mentored to be the best that they can be, and now described a process that we can apply to new and current technicians.

In part 4 of this series, we will provide some insight on retention and engagement to make sure that the team we built will not disappear tomorrow.

The Universal Language DISC—A Reference Manual

Bibliography:

- Bill J. Bonnstetter and Judy I. Suiter
- The Universal Language DISC—A Reference Manual
- Fulvio Mini holds a Bachelor degree in Physics from McGill University, and holds CGSB Level 2 Certification in Non-Destructive Evaluation. He has over 20 years experience in NDT related to the aerospace industry: from manufacturing of airframe, engines and components of commercial and private jets. His latest project is the development of an inspection environment to those entering the field and seeking experience.
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- Mentor EM—Eddy Current Inspection
- DMS Go+—Thickness Gauge
- Mentor Visual IQ—Videoscope
- mPulse—LIBS Metals Analyzer
- PMI-Master Smart—Truly Portable OES
- XMET 8000—Handheld XRF Analyzer
- RT Film & Accessories
- Agfa NDT Film & Chemistry
- Siefert—isovolt & X-ray Equipment
- UT Equipment & Accessories
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TecScan solutions are being used to inspect Rolls Royce, P&W, GE, TurboMeca components. It has obtained several approvals and meet numerous NDT repair procedures requirements.

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