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Continuing Education Course

Magnetic Resonance Imaging Safety for Firefighters

BY CRAIG JONES

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Magnetic Resonance Imaging Safety for Firefighters

Educational Objectives

On completion of this course, students will:

- Gain an understanding of magnetic resonance imaging
- Identify the hazards to firefighters operating around MRI equipment
- Identify the typical layout of a MRI facility
- Describe the actions firefighters should and should not take in a MRI facility

BY CRAIG JONES

MOST LARGE HOSPITALS AND MANY RESEARCH centers contain specialized equipment used in medical research. For firefighters, most are safe to operate around when responding to alarms or medical calls. However, as with any commercial building, a preincident survey is invaluable in making responders aware of various medical machines, their differences, and specific relevant concerns. The magnetic resonance imaging (MRI) machine is distinct among the medical devices for many reasons, particularly for the very powerful magnet it contains.

Fortunately, there are only a few stories of firefighters injured by MRI machines. The only current documented story I have heard is of a firefighter in Freiburg, Germany, who was called to the MRI suite in which the operator's computer console had short-circuited and produced smoke. Responders requested that the staff leave the room. One firefighter was assigned to check out the room containing the MRI. He was wearing SCBA and was drawn into the MRI machine's opening (called the bore). A news report said that he had been folded in half, with his knees pressed into his chest, and nearly choked to death. MRI staff had to quench (shut down) the magnet to extricate him.

One death and numerous injuries have been reported as a result of metal objects' being drawn into the MRI machine while the patient was in the scanner or near it. The death occurred in 2001 in New York state and involved a six-year-old boy who was having an MRI scan in a hospital. A hospital employee brought a metal oxygen tank too close to the magnet. It flew into the bore of the magnet and caused blunt force trauma to the boy.

A study reviewed five incidents occurring over a 10-year period in which metal tanks became projectiles when brought into the magnet room. In each case, a hospital staff member brought a tank into the scan room without considering whether it would be pulled into the MRI machine. In one case, a patient was pinned in the MRI machine by an oxygen tank. The person suffered facial fractures and had to be removed from the opposite end of the MRI machine. Fortunately, in the other incidents mentioned, no one was injured. This study was based on only two institutions.

(1) A typical clinical magnetic resonance imaging machine found in a hospital or research facility. (Photos courtesy of author unless otherwise noted.)

In another incident, a nurse brought a pair of ferromagnetic scissors into the scan room. They were pulled from her hand by the MRI machine and hit a patient in the head. The patient was cut on the head, but it could have been far worse.

Hopefully with a little knowledge and a good preincident survey, such events will never happen again. It is important that all firefighters, not just the officer in charge, understand the hazards of MRI machines. The technical information below discusses MRI machine operations, magnetic fields, and the firefighting hazards of the MRI area.

MAGNETIC RESONANCE IMAGING MACHINES

MRI machines have been around hospitals and clinics since the late 1970s. They have changed greatly over the past 30 years and have become an extremely important diagnostic tool in uncovering such medical conditions as multiple sclerosis, cancer, and back and knee injuries. There are approximately 10,000 MRIs in hospitals and clinics in the United States and approximately 200 in Canada.

Although hospitals are the obvious place to find an MRI machine, they are also found in private clinics; at research institutes; and on university campuses in chemistry, psychology, neuroscience, and sports medicine departments. The building's size will not necessarily indicate whether an MRI is inside. Some manufacturers have placed MRI machines inside semitrailer trucks that are driven among several hospitals that share the time and expense of the machine. In 2004, there were 30 mobile MRIs in North Carolina alone.

In the 1970s and 1980s, MRI machines were referred to as nuclear magnetic resonance (NMR) machines. Although the word "nuclear" is correct, it had bad connotations for many people. An MRI machine is nuclear because it images the nucleus of the atom; it has nothing to do with nuclear radiation or X-rays. It is among the safest diagnostic imaging machines in use today. In the late 1980s, hospitals changed the name from nuclear to magnetic resonance imaging.

An MRI machine creates a picture by using a very strong magnetic field to align the hydrogen protons of water (the "H" in H_2O) in the body. Then other low-power magnets are switched on and off rapidly while radio frequency pulses are used to make an image of the location and contrast of the body part being scanned. The strong magnetic field is a particular issue for firefighting and medical response calls.

The main magnet is what is typically pictured when showing an image of an MRI system (photo 1). Although two types of magnets are used in MRI machines, the most common one is the superconducting magnet. The donut-shaped magnet consists of a metal tube with approximately several hundred miles of wire windings. Electricity (approximately 400 amps) flows through the wire to produce the magnetic field. Most hospital MRI machines these days are superconducting, which means they are cooled to 4.2° Kelvin (-268° Celsius) by immersing the wire in approximately 1,000 liters of liquid helium. To bring the magnet to the proper field strength, electricity is applied to the windings. There is negligible loss of this electricity, so once the machine is at the desired field strength, it is unplugged from the electricity source. Even though not continually plugged in, an MRI device is *always on*, so there is always a strong magnetic field around the magnet. Other types of magnets (resistive and permanent) are infrequently used for MRI machines.

(2) A typical nuclear magnetic resonance machine used in chemistry departments. Note that the machine is vertical with the bore on the top of the machine. [Photo by Zhimin (Steven) Yan, Department of Chemistry, University of Western Ontario.]

Other types of MRI machines are found in research facilities or chemistry departments. The machines found in a chemistry department (photo 2) may still be called NMR machines and have the bore on the top of the machine.

MAGNETIC FIELD

In grade-school physics, we learned that a magnet has lines of magnetism around it, which was usually demonstrated by placing a piece of glass on top of a magnet and then pouring iron filings on top of the glass. They would quickly orient themselves in very specific patterns around the bar magnet. Likewise, around every MRI machine is an invisible magnetic field that completely surrounds it. Like carbon monoxide, the magnetic field is an invisible hazard that you cannot see, smell, or feel; it is undetectable without specialized equipment.

A magnet's field strength is measured in gauss (G) or Tesla (T) units. One T is 10,000 G. The earth's magnetic field is approximately 0.5 G (0.00005 T). Typically, a hospital MRI machine's magnet will have a field strength of between 1.5 and 3 T, measured at the center (inside) of the magnet. In comparison, a large electromagnet on a crane used to move scrap cars around a junkyard, when on, is approximately 1.5 T. So, the MRI magnet is very powerful. But note that the scrap yard electromagnet can be turned on and off, whereas the MRI machine in a hospital is always on! The NMR machines found in a chemistry department (or elsewhere) can have field strengths of 11.7 T and higher.

The magnetic field's strength decreases quickly as you move away from the magnet. Most importantly, you must know at what distance around the magnet the field strength drops to 5 G. Outside of this boundary, the magnetic field's effect is minimal and need not be considered. However, be careful of bringing any metallic object into this boundary; specific haz-

(3, 4) Signs around the entrance to the magnet room. Typically, MRI rooms have signs to warn people entering to be careful, since the magnet is always on. This door is a typical style door that leads into the magnet room. For most MRI scanners, the 5-G line is inside the door, so tools and equipment can be safely brought just to the area outside the door.

ards are discussed later.

MRI machines in hospitals usually contain some other technology to contain this 5-G boundary to within the magnet room while maintaining the full field strength at the center of the magnet. Active shielding technology is used to reduce the magnetic field outside of the magnet in superconducting MRI machines. The active shielding can reduce the distance of 5-G boundary from dozens of meters away to between two and five meters around a machine. Although most hospital-based MRI machines have active shielding, some MRI machines in research environments may not. In this case, either the 5-G line is outside of the magnet room, or the magnet room's walls may contain several hundred tons of steel to reduce the magnetic field outside the room.

Such situations are less common, but it will be important to check on a preincident survey. The vertical bore (NMR) machines found in chemistry departments typically have a 5-G line that is 0.5 to one meter from the center of the machine, even though the magnetic field at the center of the magnet is much higher than that of MRI scanners found in hospitals.

QUENCHING

A superconducting magnet *can* be turned off or quenched. Quenching reduces the machine's magnetic pull to 0 G and is manual or spontaneous. For every MRI machine, there is at least one button/plunger to manually quench the magnet. It may be found in the operator's room or in the magnet room. It is typically a plunger-style button and red (although it could be any color).

A quench (manual or spontaneous) takes about a minute and results from the loss of the helium. There may be no noise, or you might hear gas venting to the outside. The helium does not escape into the magnet room, so there is no hazard associated with a quench. You cannot see a magnetic quench except for the plume of helium venting through the piping in the roof. The plume can be quite large, since liquid helium will expand 754 times its volume when it becomes gaseous. When a spontaneous quench (an automatic quench typically resulting from an unsafe condition) occurred at our facility, people outside saw the plume of helium venting from the roof, thought it was a fire, and called the fire department.

For a manual quench, you just have to push the quench button. The helium that keeps the magnet supercooled escapes, and the resistance in the wires increases significantly. The lack of supercooling and increased resistance decrease the electricity going through the wires, therefore decreasing the magnetic field. Several thousand liters of expensive helium are used to cool the wires, so refilling a quenched magnet can cost a minimum of between $10,000 and $20,000.

A second consideration when quenching an MRI machine is that when the helium vents, the wires heat up quickly. If they heat up too quickly, they can melt together, rendering the magnet unusable. So, quench a magnet only in life-threatening situations (see below for more discussion).

MRI SCAN SUITE LAYOUT

MRI suite layouts are relatively similar in most places. In a hospital MRI suite, you pass through the patient waiting area, after which there is the operator's room, from which you can see and possibly access the magnet room containing the MRI machine. Beside or behind the magnet room is the equipment room, containing some of the operating hardware for the machine.

Patient waiting area. In the patient waiting area, you would find at least one hospital staff person, who may be a secretary with little or no knowledge or training in the use of the MRI machine. This room would be outside the 5-G boundary and thus offers a safe and obvious staging area during an incident.

Operator's room. The operator's room contains the computer that runs the MRI machine as well as other computers, monitors, and electronics. In a research facility, this room will have more computers. There is unlikely to be any additional safety concerns in this room. The magnetic field in this area is also low enough so that certain standard precautions should not be required (e.g., removing metal objects such as keys or coins from one's person). An MRI technician, highly trained and knowledgeable about the machine's operation, staffs this room.

Magnet room. The magnet room is indicated by its large heavy door and the posted signs warning of the strong magnetic field present behind the door (photos 3, 4). Before entering the magnet room, remove all metallic objects from your person. The magnet is very large, and its location within a building may have implications for fire suppression.

The room is constructed with very specific considerations for the machine's weight and the vibrations it creates when in use. Typically, the floor is reinforced with concrete, since an MRI machine weighs between five and 10 tons. The door usually contains copper to prevent stray radio frequencies from intruding. In rare cases, the walls may contain steel to reduce the magnetic field outside or copper caging to reduce radio frequency transmission into the room.

All these modifications present potential problems in a large fire that necessitates ventilation. Some MRI areas may have a metal detector near the magnet room door to detect metal items and warn MRI staff to remove them, but this is not yet common. A metal detector should not replace common sense.

Equipment room/electronics. The MRI machine's electronics are contained in a room adjacent to the magnet room. The electronics include a large air conditioner, one or more computers, and several large cabinets of electronics. The incoming electrical power is much higher than that for typical offices. For example, our equipment room has an electrical service of 480 volts/200 amperes. This room may have a raised floor to hide the cables, or the numerous wires may be in cable traps in the ceiling. A built-in extinguishing system may be present. There is typically a button to shut off the electricity to the equipment (but this would not affect the magnetic field of the MRI machine). Photo 5 shows an MRI equipment room for a clinical scanner.

Hazards. The powerful magnetic field is the primary hazard when working around an MRI machine. It will pull any metal object toward it; the field's strength (force) increases as one gets closer to the magnet. Specialized nonmetallic stretchers are used in this room. A nonmetallic fire extinguisher will be mounted on the wall inside or just outside the room (photo 6). Special nonmetallic oxygen tanks may be present for patients who need to be on oxygen during an MRI scan. Do not be fooled by the presence of these items and that of similar, but metallic, counterparts near the magnet. It is extremely important to understand where the magnetic field's 5-G line lies, what items can and cannot be taken into the magnet room, and how far from the magnet they must be kept.

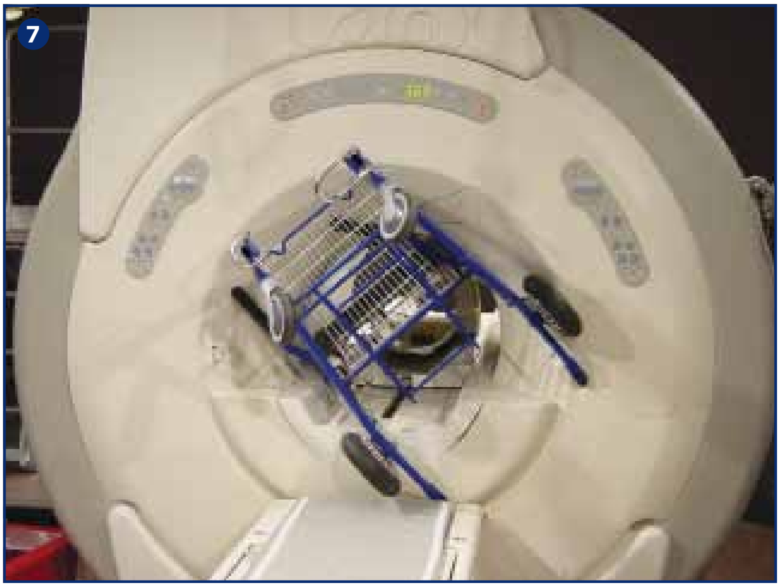
Recall the incident noted above that involved a firefighter at a hospital in Freiburg, Germany. Some reports on the incident indicated that the firefighter was working in one part of the hospital and was dragged into the MRI machine, giving the false impression that he was dragged a significant distance into the MRI machine. This is not possible. He would have had to have been in the magnet room, well within the 5-G line, to be dragged into the opening of the MRI machine.

If there is a fire in the magnet room, you must judge the size of the fire and the resources available. One rule of thumb is that if the fire is the size of a basketball or smaller, use the nonmetallic fire extinguisher to put the fire out. Obviously, you could try other means, too (e.g., smother). If the fire is larger and requires more extinguishers or a fire hose, then quench the magnet.

Do not bring *any* firefighting equipment, such as metallic fire extinguishers, hoses, halligan bars, axes, and portable radios, into the magnet room prior to quenching the magnet.

(5) The MRI equipment room contains the four to five cabinets enclosing a computer and other electronics that enable the magnet to create the images. Significant wiring runs between the cabinets and from the cabinets to the room containing the magnet. A large air conditioner is usually present to maintain constant temperature and humidity. The room has an electrical shutoff plunger, possibly near the door, that shuts off the electricity to this room but does not affect the MRI machine's magnetic field. (6) A nonmetallic fire extinguisher is mounted immediately outside the door to the magnet room. In this case, a sign above the extinguisher states that it is safe to carry it into the magnet room at any time. Do not take an extinguisher from the fire apparatus into the magnet room unless facility staff members tell you that it is safe to do so (that is, that the magnet has been quenched).

(7) The MRI machine will attract almost anything metallic regardless of size, including this wheeled patient chair. Other items that have been attracted by the powerful magnet include an industrial floor polisher and a metal oxygen tank. [Photo courtesy of Moriel NessAiver, Ph.D., of Simply Physics (www.simplyphysics.com). Used with permission.]



If the magnet is at full strength, any of these items could be pulled into the machine, damaging the item or the magnet and possibly injuring a person. As noted at the beginning of the course, the object does not have to be large to cause damage or injury; something as small as a pair of scissors could be a problem. If a radio is brought too close to the magnet, the magnetic field can interfere with its computer chip and render it useless. A portable radio in the waiting area will not be a problem (for the radio or the MRI machine).

There is little hazard from the liquid helium (UN #1963), since it is not flammable. However, since it is an asphyxiant, it would displace any oxygen should it be inadvertently released into the room. An MRI machine is constructed to include a vent from the top of the machine to the outside to prevent this danger. Photo 7 shows objects that were attracted to the MRI machine and stuck. Many of them could possibly be pulled from the magnet without quenching it, but it would take at least four people, since the pull is very strong. If you try pulling an object from the scanner, be very careful not to get between the scanner and the object; the object could fly back toward the MRI machine.

Note: Quenching a magnet can render it useless, and bringing a magnet back up to field strength is costly. Discuss with the hospital staff prior to any emergency how and when this decision would be made.

If an object pins someone to an MRI machine, determine the severity of the victim's injuries and whether he can be removed. If the injury is severe or the person's condition deteriorates before the object can be removed, it may be necessary to quench the magnet. However, if the object can be *safely* removed from around the patient (without quenching the magnet), that is preferred. Again, you must discuss specific protocols in such an emergency with hospital staff beforehand.

It is unlikely that the fire department or EMS would respond to a medical emergency in an MRI machine area, since these machines are typically found in hospitals. However, they are also found in private clinics and research institutes. If you respond to a medical emergency in the magnet room of a private clinic or research institute, you must remove the victim from the room *prior* to taking any interventions. Never bring an automatic electronic defibrillator, a crash cart, or any other medical instrument into the magnet room. As noted, the instrument might be ruined or, worse yet, it could become a projectile toward the magnet. Most MRI machine beds are removable and can be rolled outside the magnet room. If this is not the case, transfer the patient onto a nonmetallic gurney, which should be nearby.

For any of these circumstances, the preincident survey will be *extremely important*. There are too many contingencies or variables to attempt to describe each situation, but basic knowledge and precautions are necessary. The MRI technician will be extremely useful during planning and any situations that may arise.

The hazards listed above apply to people entering the magnetic field area. For people undergoing an MRI scan, different additional precautions may be necessary. Persons with a pacemaker, aneurysm clips, or metal in the eye should not receive an MRI. When an MRI machine takes an image, other much smaller magnetic fields turn on and off rapidly; the rapid switching of the magnetic field can cause metal to move. This can cause problems for aneurysm clips or metal in the eye or anywhere else. Although they may not be an issue, discuss these situations with the MRI staff before entering the magnet room, to ensure not only your safety but possibly also your life.

It is best not to ignore or hide a pacemaker. It is better to discuss the matter with MRI staff. Pregnancy was once considered a contra-indication for an MRI scan, although there are no known problems in exposing a pregnant woman to a strong magnetic field. Clinically, it is better to have an MRI scan than a CT or X-ray, and MRI scans are more regularly being done on pregnant women. Discuss situations involving pregnancy and any other matters that may affect the MRI machine magnet with the MRI staff prior to an incident.

PREINCIDENT SURVEY

As in any building with special firefighting considerations, a preincident survey for an MRI suite is vital for ensuring that emergency responders take appropriate actions. In addition to the standard preincident survey data, obtain the following information:

- A list of contact people who are knowledgeable about the MRI machine.
- The location of the equipment room electrical shutdown

and the MRI machine quench buttons.

- Circumstances requiring electrical shutoff or MRI machine quenching, and the person authorized to make that decision.
- The boundary of the 5-G line (which should not be crossed unless the magnet is turned off).
- The location of the nonmagnetic fire extinguisher.
- Fire prevention/extinguishment precautions in addition to the nonmagnetic extinguisher.

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In magnetic resonance imaging machines, the magnetic field is the primary concern for firefighters. It is important that you prepare a preincident survey for each MRI machine location in your jurisdiction and discuss the protocols in place for emergencies with the staff of the MRI location. Note the locations of the magnet rooms, the magnet field lines, nonmetallic fire extinguishers, and the quench button. ●

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Notes

Magnetic Resonance Imaging Safety for Firefighters

COURSE EXAMINATION INFORMATION

To receive credit and your certificate of completion for participation in this educational activity, you must complete the program post examination and receive a score of 70% or better. You have the following options for completion.

Option One: Online Completion

Use this page to review the questions and mark your answers. Return to **www.FireEngineeringUniversity.com** and sign in. If you have not previously purchased the program, select it from the "Online Courses" listing and complete the online purchase process. Once purchased, the program will be added to your **User History** page where a **Take Exam** link will be provided. Click on the *"Take Exam"* link, complete all the program questions, and Submit your answers. An immediate grade report will be provided and on receiving a passing grade your *"Certificate of Completion"* will be provided immediately for viewing and/or printing. Certificates may be viewed and/or printed anytime in the future by returning to the site and signing in.

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COURSE EXAMINATION

1. The incident in Freiburg, Germany described in the course involved a smoking:
   a. the MRI's sliding bed
   b. an electrical panel
   c. a computer
   d. a trash can

2. The firefighter in the Freiburg incident was drawn into the MRI machine was wearing/holding:
   a. a portable radio
   b. an ax
   c. a metal fire helmet
   d. SCBA

3. Shutting down an MRI is also known as:
   a. quenching
   b. quitting
   c. breaching
   d. bracing

4. A study of 5 instances of tanks being drawn into MRI machines over a 10 year period involved:
   a. 10 institutions
   b. 1 hospital
   c. 2 institutions
   d. 8 hospitals

5. In the United States, there are approximately how many MRI's in hospitals?
   a. 5,000
   b. 15,000
   c. 25,000
   d. 10,000

6. An MRI uses:
   a. a nuclear fusion
   b. a nuclear fission
   c. a magnetic field
   d. proton accelerator

7. How much electricity (current) runs through the MRI?
   a. 2,000 amps
   b. 400 amps
   c. 250 amps
   d. 150 amps

8. How much liquid helium is used for cooling in an MRI machine?
   a. 500 cubic feet
   b. 500 gallons
   c. 1,000 liters
   d. 1,000 gallons

9. An MRO device is always:
   a. in a room with sprinklers
   b. energized
   c. in a room with smoke detectors
   d. a platinum lined room

10. It is important to know the "boundary" of the MRI where the magnetic field strength is:
    a. 1 G
    b. 200 T
    c. 5 G
    d. 200 G

11. How long does it take to quench?
    a. 30 seconds
    b. 1 minute
    c. 2 minutes
    d. 2.5 minutes

12. An MRI machine weighs between:
    a. 1-2 tons
    b. 2-3 toms
    c. 10-15 tons
    d. 5- 10 tons

Magnetic Resonance Imaging Safety for Firefighters

13. In the magnet room, there may be nonmetallic oxygen tanks and:
    a. nonmetallic fire extinguisher
    b. a nonmetallic fire ax
    c. a nonmetallic computer
    d. a titanium bench

14. If a fire breaks out in an MRI, is bigger than a basketball, and requires a hoseline, you should:
    a. first quench the MRI
    b. shut down the computer in the operators room
    c. call for mutual aid
    d. evacuate the building

15. Portable radios:
    a. cannot be brought into the waiting area.
    b. will be useless inside the building.
    c. can be damaged by the magnetic field.
    d. must be digital in an MRO facilty.

16. The MRI may be quenched by:
    a. pushing the plunger in the magnet room
    b. pushing the plunger in the equipment room
    c. deactivating power to the building
    d. activating the fire extinguishing system

17. The magnet room door usually has what to prevent stray radio frequencies:
    a. wood
    b. lead
    c. copper
    d. steel

18. If the helium is vented, the MRI's:
    a. wires can melt
    b. enclosure can melt
    c. computer can be corrupted
    d. pull metal objects up the vent stack

19. Scissors in the magnet room:
    a. are too small to be attracted
    b. are needed by technicians
    c. are made of heavy cardboard
    d. will be attracted by the MRI

20. Chemistry department often use:
    a. nonmetallic scissors
    b. vertical bore MRIs
    c. horizontal bore MRIs
    d. quick quenchers

Notes

Magnetic Resonance Imaging Safety for Firefighters

PROGRAM COMPLETION INFORMATION

If you wish to purchase and complete this activity traditionally (mail or fax) rather than Online, you must provide the information requested below. Please be sure to select your answers carefully and complete the evaluation information. To receive credit, you must answer at least six of the eight questions correctly.

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First Name

Profession/Credentials License Number

Street Address

Suite or Apartment Number

City/State Zip Code

Daytime Telephone Number with Area Code

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❑ I have enclosed a check or money order.
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Please provide the following (please print clearly):

Exact Name on Credit Card

Credit Card # Expiration Date

Signature

ANSWER FORM

Please check the correct box for each question below.

1.	❑ A	❑ B	❑ C	❑ D	11.	❑ A	❑ B	❑ C	❑ D
2.	❑ A	❑ B	❑ C	❑ D	12.	❑ A	❑ B	❑ C	❑ D
3.	❑ A	❑ B	❑ C	❑ D	13.	❑ A	❑ B	❑ C	❑ D
4.	❑ A	❑ B	❑ C	❑ D	14.	❑ A	❑ B	❑ C	❑ D
5.	❑ A	❑ B	❑ C	❑ D	15.	❑ A	❑ B	❑ C	❑ D
6.	❑ A	❑ B	❑ C	❑ D	16.	❑ A	❑ B	❑ C	❑ D
7.	❑ A	❑ B	❑ C	❑ D	17.	❑ A	❑ B	❑ C	❑ D
8.	❑ A	❑ B	❑ C	❑ D	18.	❑ A	❑ B	❑ C	❑ D
9.	❑ A	❑ B	❑ C	❑ D	19.	❑ A	❑ B	❑ C	❑ D
10.	❑ A	❑ B	❑ C	❑ D	20.	❑ A	❑ B	❑ C	❑ D

COURSE EVALUATION

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 1.

1. To what extent were the course objectives accomplished overall?	5	4	3	2	1
2. Please rate your personal mastery of the course objectives.	5	4	3	2	1
3. How would you rate the objectives and educational methods?	5	4	3	2	1
4. How do you rate the author's grasp of the topic?	5	4	3	2	1
5. Please rate the instructor's effectiveness.	5	4	3	2	1
6. Was the overall administration of the course effective?	5	4	3	2	1
7. Do you feel that the references were adequate?		Yes		No	
8. Would you participate in a similar program on a different topic?		Yes		No	

9. If any of the continuing education questions were unclear or ambiguous, please list them.

10. Was there any subject matter you found confusing? Please describe.

11. What additional continuing education topics would you like to see?

PLEASE PHOTOCOPY ANSWER SHEET FOR ADDITIONAL PARTICIPANTS.

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INSTRUCTIONS
All questions should have only one answer. Grading of this examination is done manually. Participants will receive confirmation of passing by receipt of a verification form.

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COURSE CREDITS/COST
All participants scoring at least 70% on the examination will receive a verification form verifying 4 CE credits. Participants are urged to contact their state or local authority for continuing education requirements.

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