**IMPLEMENTATION OF SAFETY REGIMENS TO IMPROVE RADON WORKER AND WORKPLACE CONDITIONS**

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**ABSTRACT:** A regulated plan of action to improve radon worker safety reflects responsible and ethical corporate practices. Worker protection solely for avoidance of penalties associated with violations of Federal or State regulations presents only minimum protections. Improvement of radon worker and workplace conditions through implementation of multi-tiered training, behavioral and engineering controls, accident and near-miss analysis, and modes of communication is investigated to compare viable methods applicable for radon enterprises. Understanding worker concerns unique to the radon industry and addressing needs presented by radon professionals and management provide a platform from which to incorporate safety-related guidelines to existing standards, improving workplace quality and worker protection industry-wide.

**BACKGROUND:** Safety related incidents, inclusive of accidents, workers’ compensation claims, and OSHA related citations, were observed to significantly increase the Experience Modification Rate (EMR) in a large radon mitigation company with a presence in 34 states in the United States. A rising EMR increased insurance premiums and decreased options for companies underwriting these policies. Loss of employees and talent due to protracted recovery times had a negative impact on operations and profitability. Development and implementation of a worker safety program over a period of three years was observed to improve awareness of potential safety hazards, increase overall worker safety, and promote employee satisfaction and retention. Reduction in the EMR led to decreased insurance premiums, providing funds for additional development and equipment.


**REGULATORY GOVERNANCE:** The radon industry encompasses a wide variety of tasks which expose workers and occupants to potential safety hazards. In the United States, 29 Code of Federal Regulations (CFR) encompasses Occupational Safety and Health Standards for both Construction (Part 29) and General Industry (Part 1910). In addition to these standards, the United States Occupational Safety and Health Act has a General Duty Clause (29 USC § 654) which states that employers have a duty to provide a workplace “free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees” (5(a)(1)).

**OBJECTIVES:** Given established precedence, which primarily existed as ASTM E2121-13 § 6 and EPA 402.R-79-078 (April 1994) § 12 at the program start, and regulatory governance under 29 CFR 1926 and 1910, the following objectives were established:

1. Identify existing or potential safety hazards based upon recorded incidents / injuries
2. Delegate responsible parties (safety officers) and safety committee for coordination
3. Develop a program to address known deficiencies and initiate standards compliance
4. Implement and revise the safety program to reflect employee adoption and compliance
5. Establish key performance indicators and metrics to reliably predict program success

**INITIAL INVESTIGATION:** A safety committee comprised of executive management, regional management, human resources, an employee liaison, and a corporate safety officer held a two-day meeting to identify safety hazards based upon EMR impacting incident and observations of key personnel. Seven potential safety hazards were identified as requiring immediate attention:

1. Fall Hazard Protection / Ladders
2. Respiratory Protection
3. Lock-out / Tag-out and Electrical
4. Confined Spaces
5. Hearing Conservation
6. Chemical Safety (Global Harmonized System)
7. Radiation Exposure Monitoring / Protection

Initial safety training, based partly upon the voluntary OSHA Outreach Training Program materials for the Construction Industry, provided a general outline for worker safety, which regional managers brought to their individual technicians as an initial solution to training deficiencies. Additional findings of the safety committee were the need for an external source of training (Paychex Loss Prevention) and the establishment of initial (on-boarding) safety training in both classroom and field modules.

**METHODOLOGY:** Consultation with Paychex Loss Prevention and representatives of underwriting insurance companies provided seventeen primary topics and fourteen secondary topics for completion of a compliant safety program. Each topic received input through a seven-stage process from identification to refinement. Respiratory Protection was provided as an example:

- **Stage 1:** Identification — Protection required for particulate and radiation exposure
- **Stage 2:** Recognition — Precedence E2121-13 6.2.6, 6.2.7, Regulatory 29 CFR 1926
- **Stage 3:** Avoidance — Minimize exposure — ventilation
- **Stage 4:** Prevention — Selection of compliant personal protective equipment (PPE)
- **Stage 5:** Standard Operating Procedure — Creation of written documentation (SOP)
- **Stage 6:** Implementation — Issuance of SOP to regional managers / initial safety training
- **Stage 7:** Refinement — Based upon compliance reports and employee feedback

In the case of Respiratory Protection, calculation of working level months as a measure of radiation exposure to radon gas was added to the technician management system and automated. Additionally, as time progressed, changes with regard to 29 CFR 1926.1153 required refinement of both standard operating procedure and personal protective equipment.

**PROGRAM DEVELOPMENT:** Effective safety programs cannot be fully developed in an office / classroom setting. Initial feedback from regional managers and technicians in the field provided valuable input to development of a program which communicated essential safety information while maintaining relevance. The following actions provided essential information for development and refinement of the safety program:

1. Quarterly safety meetings — including field liaison
2. In-field assessment — determination of best practices
3. Compliance checks / audits including jobsite appearance
4. Injury review — pinpointing safety deficiencies, if any
5. Employee suggestions / feedback — at quarterly meetings
6. Loss run review — to monitor safety related trends
7. On-boarding safety training courses — behavior controls to reduce exposure — ventilation
8. Standard Operating Procedure review by loss prevention and third parties
9. Use of technology to provide access to the latest information, such as Safety Data Sheets and Standard Operating Procedures, helped to accelerate dissemination of program elements as they were developed and refined.

**IMPLEMENTATION:** Promulgation of a culture of safety within a company was found to be most effective by instilling a “nobody is exempt” mentality. For example, during a site visit conducted in-field assessments, they were required to don the same PPE as the technicians. In some instances technicians voiced that PPE was not worn either because it was inferior (uncomfortable) or because it was not emphasized during training. Consultation with manufacturers and vendors of safety equipment, and field trials by both field technicians and management enabled selection of PPE which would become consistently used. Implementation emphasized training and compliance:

1. On-boarding safety training — the first week of employment — training and test
2. Field reinforcement and verification of classroom safety topics
3. On-the-job safety training by regional manager — local safety
4. “Van Checks” / “Warehouse Checks” for PPE and cleanliness
5. Chemical safety audits — compliance with OSHA and SDS
6. Annual retraining — major topics plus local emphases
7. Site specific safety training — per job or monthly relevance
8. On-site safety audit — job site compliance / procedure check
9. Radiation safety review — greater than half of the monthly threshold (0.3 WLM)

Information gleaned from implementation actions was ported into program refinement.

**METRICS:** Safety incidents, whether workers compensation claims, citations, or minor injury, produce lost time and revenue. An aggregate of incidents provides the best measure of program success. This is represented as a “Percent Safety Incidents”, which reflects total incidents, whether impacting EMR or not, divided by the total number of employees. The following chart reflects percentage data presented by implementation year:

**FINDINGS:** Development and implementation of a corporate safety program indicated:

1. Instituting a safety program resulted in a 6% drop in incidents within the first year.
2. Refinement of the safety program resulted in a 15% drop in incidents by the second year
3. Partial year (2017) data indicates a 6% increase in incidents to date, but with a significant increase in employees and new reporting of near-miss incidents (reduction of metric)
4. Reduction in EMR as a result of reduction in loss run cases stabilized insurance costs
5. Economic impact of improved safety provided funds for additional safety equipment
6. Technician compliance relied extensively upon observation of management compliance and reinforcement through annual and specific retraining sessions

**INDUSTRY IMPLICATIONS:**
- With enforcement of crystalline silica regulations (29 CFR 1926.1153), radon mitigation professionals may want to develop comprehensive worker protection plans and programs
- Radon mitigation mandates may need periodic revision to provide pertinent revisions to safety regulations (i.e. GHS or crystalline silica) and information to protect technicians
- Incident reduction through awareness may help to reduce insurance premiums industry-wide, particularly if safety standards are clarified and adopted in revised publications

**PRESENTER:** Gordon Satoh (NRPRT RMT-106785 / RT-107203) is Director of Safety and Technical Services for S.W.A.T. Enterprises, LLC / S.W.A.T. Environmental. His primary interests are in development of new technologies for the radon industry and enhancing methods for assuring radon worker and client safety. He is a graduate of The University of Michigan (1990, B.S. Natural Resources) and Texas A&M University (1993, Entomology). Presently he lives in the Lansing, Michigan area with his wife and son, and enjoys digital photography, music, and collecting pens.

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