

**Sheet Metal, Mechanical, Air Conditioning
and Plumbing Industry**



This study reflects on information derived from insurance claims. These claims form a database that can be analyzed to determine the many and varied causes of loss. CNA Risk Control presents this study of specific CNA claims and industry trends. We begin with a review of exposures inherent to the sheet metal, air conditioning and plumbing contractors industry and conclude with suggested practices to manage these risks.

Sheet Metal, Mechanical, Air Conditioning and Plumbing (SMAP) Industry Defined

For the purpose of this study, SMAP includes heating, ventilation and air conditioning (HVAC) contractors, as well plumbing contractors and sheet metal contractors. Work in this industry includes:

- Heating and Air Conditioning Contractors — Installation, repair, service and maintenance of heating and air conditioning systems in existing buildings, and buildings under construction for commercial, industrial and residential clients.

Work may also include the repair, service and maintenance of compressors, air handling units, duct work, blowers, and accessories such as digital thermostats and other controlling devices.

- Plumbing Contractors — Installation, repair and maintenance of water, waste water, drainage and gas systems in commercial, industrial and residential buildings.

Work may also include installs for water supply lines and smaller piping for bathrooms, kitchens, fire protection/sprinkler systems, as well as pumps, water heaters, dishwashers, water softeners, fixtures, toilets, bathtubs and showers.

- Sheet Metal Contractors — manufacturing, installation and repair of air conditioning, heating, ventilation and pollution duct systems, roofs, siding, gutters downspouts, and skylights.

These products are made for the construction, manufacturing, warehousing, telecommunications, restaurant and retail industries. In many cases, each of the component parts are specifically designed and manufactured to the specifications of the customer. Shops are often using computerized metal working equipment such as plasma cutters to create the various sheet metal products. They will also use shears, benders, shapers and presses to produce the specific components.

In addition to fabricating the component parts, they may also be responsible for the installation of spiral and box ducts, tubes, and pipes at the job site. The sheet metal operations may also specialize in repair work such as testing, balancing, adjusting existing air conditioning and ventilation systems to ensure that they function properly.

SMAP Contractors Industry: An Analysis of Loss Exposures in the Sheet Metal, Mechanical, Air Conditioning and Plumbing Contractors Industry

SMAP operations are typically labor intensive with a significant amount of reaching, working on the floor, climbing on ladders, kneeling, and bending by skilled trades people who also spend a significant amount of time driving to construction and customer sites. The following is a review of exposures based on an analysis of claims incurred by SMAP contractors insured by CNA between January 1, 2004, and December 31, 2007.

Workers' compensation and auto claims accounted for over 86 percent of the total claims frequency. The claim dollar percentage is fairly consistent among workers' compensation, auto and general liability lines. Property claims represent an insignificant portion of the overall frequency and severity, therefore the remainder of this guide will focus on the Workers' Compensation, Auto and General Liability lines of coverage.

Line of Coverage	% of total claims	% of total claim dollars
Workers' Compensation	39	34
Auto	48	28
General Liability	10	31
Property	3	7

Workers' Compensation Claims

By Type of Incident Causing the Injury, Shown as a Percentage of Total Claims

Incident Type	Percent of Total Claims
Manual Handling/Physical Stress	20%
Struck By	18%
Struck Against	11%
Slips/Trips/Falls on Level Surface	7%
Falls from Elevation	7%
Caught In, On, or Between	4%
All Others	33%

Shown as a Percentage of Total Claim Dollars

Incident Type	Percent of Total Claims Dollars
Manual Handling/Physical Stress	23%
Falls from Elevation	24%
Slips/Trips/Falls on Level Surface	12%
Struck By	12%
All Others	29%

This data indicates that worker injuries are most likely caused by manual handling/physical stress, struck by and struck against incidents. Material handling/physical stress, and falls from elevation have the greatest severity of claims (total incurred claim dollars).

Manual Handling and Physical Stress

Claims related to manual handling/physical stress include strains, sprains and hernia ruptures (accounting for 85 percent of manual handling claims) to the lower back, shoulders and knees (collectively 59 percent). These injuries were mainly associated with handling pipe, materials/moveable objects (air conditioning coils, sheet metal, ducts, tools) and machinery and equipment.

Many of the manual material handling overexertion injuries are the result of employees bending, lifting and reaching throughout the day due to raw materials, finished product and equipment being positioned on the ground. This also includes items stored on pallets, as the pallet height is typically only four inches. The average employee who bends 100 times a day, working 250 days a year will bend 25,000 times annually, exacerbating the risk factor and increasing the probability of developing low back pain.

Falls from Elevation

The majority of falls from elevation involved ladder use resulting in fractures, strains and contusions to the knees, ankles, and back. Ladder-related injuries often result from employees making multiple ascents and descents to retrieve tools, materials and re-position work. With an aging worker population, falls from ladders become more frequent. Ascending and descending a ladder on a frequent basis accelerates the onset of fatigue that in turn contributes to falls from the ladder. When workers are tired they will not use every rung on the ladder or will take shortcuts such as jumping from the ladder. Other claims include falls from scaffolding and buildings while installing hangars and ducts.

Slips, Trips and Falls on Level Surface

Examination of falls on level surface claims indicates that the majority resulted in strains, sprains, contusions, hernia ruptures to the arms, shoulders, lower back and knees. These frequently occurred while handling equipment and materials when walking on jobsites, unpaved surfaces, and stairs. Injuries also resulted from tripping over materials left on the ground (trash, parts, tools, materials) and can be attributed to poor housekeeping. Numerous claims involved accidents where the coefficient of friction was compromised (such as walking on wet/oily/icy surfaces).

Struck By Object

The majority of these claims include lacerations, contusions and fractures to the extremities, i.e., fingers, arms, shoulders, head and thighs. They result from materials, tools and equipment such as sheet metal, pipe, hammers, metal studs, bricks, boards, and beams. These are often the result of actions such as handling, manipulating and maneuvering tools, machinery and equipment.

Auto Claims

By Type of Incident Causing the Loss, Shown as a Percentage of Total Claims

Incident Type	Percent of Total Claims
Rear-ended Other Vehicle	21%
Struck by Object	17%
Backed Into Claimant	7%
Other Vehicle Rear-ended Insured	5%
Insured Vehicle Struck Parked Car	5%
Failure to Yield	3%
Changed Lanes	3%
All Others	39%

Shown as a Percentage of Total Claim Dollars

Incident Type	Percent of Total Claim Dollars
Rear-ended Other Vehicle	35%
Failure to Yield	17%
Changed Lanes	5%
Other Vehicle Rear Ended Insured	4%
Lost Control of Vehicle – Left Road	3%
All Others	36%

Analysis of auto claims data reveals that struck by object, claims related to cracked/broken windshields and windows, and rear-ended other vehicle, are the most frequent incident types. Rear-ended other vehicle and failed to yield have the greatest severity in terms of percent of total claim dollars. Claim frequency data shows that rear-ended other vehicle and struck by object incidents most often involve pickup trucks and vans. Failure to yield accidents frequently consist of pickup and vans hitting other vehicles after running red lights, running stop signs, or turning right on red.

For rear-end accidents and failure to yield accidents, key factors are driver inattentiveness and lack of concentration. This raises the concept of human factors in the cab and how many stimuli the brain can handle while driving/operating a vehicle.

General Liability Claims

By Type of Incident Causing the Loss, Shown as a Percentage of Total Claims

Incident Type	Percent of Total Claims
Leaking/Seeping	32%
Damage to Property	25%
Completed Operations	9%
Fire/Explosion	7%
All Others	27%

Shown as a Percentage of Total Claim Dollars

Incident Type	Percent of Total Claim Dollars
Leaking/Seeping	31%
Fire/Explosion	24%
Completed Operations	16%
Damage to Property	12%
All Others	17%

Review of general liability claims data shows that damage to property and leaking/seeping claims are the most frequent type of loss. Leaking/seeping and fire/explosion claims account for the greatest severity.

A majority of the leaking/seeping claims are water damage to attics, floors, walls, carpet and furniture resulting from worker negligence during repair and installation of air conditioning systems, pipes, valves, and toilets. Often the contributing factor cited was failure of solder joints, valves, pipes and poor quality of installation. The data shows that 44% of the leaking/seeping claims account for 44% of the total claim dollars for this incident type.

Damage to property included underground cables, wires and water lines that were cut/damaged during excavation work. There are also numerous claims from damage to vehicles from falling equipment and materials as well as from the operation of industrial equipment such as backhoes and forklifts. Other damaged property includes carpeting, countertops, and damage to equipment and machinery from broken/cut water lines and pipes, and spills.

High dollar fires are often the result of soldering and welding work as well as poor work practices. Overall, 23% of the fire claims account for 88% of the total claim dollars for this incident type.

Leading Issues and Trends

The most critical concern for SMAP contractors is maintaining a skilled workforce that can allow work to be performed on time, on cost and on quality. There has been a demographic shift occurring in the U.S. workforce caused by retiring baby boomers. The SMAP contracting industry is impacted by the baby boomer generation due to a decrease of highly skilled workers entering the various trades that require highly complex fabrication and installation tasks often found in new construction projects and facilities maintenance.

For SMAP contractors to be able to maintain the quality of work and productivity in the shop or on the job site, the industry needs to attract talented young, skilled labor to the trades.

An emerging issue in this industry is the wellness of these workers as obesity has become a growing problem in the U.S.¹ In SMAP trades, obesity can affect the productivity, quality and risk of injury by accelerating the onset of fatigue and increasing risk factors associated with musculoskeletal disorders, trips and falls, and facilitates task shortcuts. Also affected is the overall health of the employee which can contribute to an increase in worker absenteeism. SMAP contractors must become more aware of wellness programs and incorporate these into their operations.

According to the Bureau of Labor Statistics' November 2005 Monthly Labor Review, the number of workers 55 and older will increase by 49 percent from 2004 to 2014. As a result, the percentage of 55 and older will increase from 11.9 percent in 1994 to approximately 21.2 percent in 2014². The average age of the workforce will be 41.6 years by 2014.³ SMAP contractors, unions and the government must begin to cooperatively work together to recruit and develop, through increased education and training, young employees with SMAP specific skill sets and management skills.

Suggested Practices

The analysis of claim data suggests the following basic practices that could be effective in reducing worker injury, property damage and customer losses. The SMAP industry is characterized by a changing workforce impacted by the lack of journeyman and other tradespersons. Workers' compensation losses are driven by poor postures, high fatigue levels, and a maturing workforce. Vehicle losses are the result of driver inattentiveness.

In the general liability area, utilization of utility locators, or call before you dig to locate and mark various utility lines when below surface excavation, is needed as part of the work to be performed. Claims from water damage are frequently due to poor quality control of completed work.

Lean, a methodology to improve productivity, morale, quality, delivery and cost, focuses on the human interface with materials, products, equipment and tools. Lean has been shown to be effective in addressing these exposures. Following are key elements of the Lean methodology.

Workers' Compensation

To address the workers' compensation loss drivers, an approach that focuses on understanding staging, positioning, work flow, and work method techniques from a human factor, Lean and engineering perspective/methodology is necessary.

Manual handling/physical stress, struck by and struck against injuries, are indicated as loss leaders in the workers' compensation analysis. Each of these loss drivers can be addressed through the development and implementation of CNA's "Motion is Money," a process to enhance worker productivity and reduce risk factors. By examining the staging, positioning, work flow and work method techniques of the employees, a business solution can be developed to make changes that will reduce or eliminate the exposures. Evaluating these activities through the application of human factors, using Lean and engineering methodologies, can help to identify and analyze non-value added task elements such as walking, bending, reaching, and twisting. Evaluation is critical to achieving risk reduction, improved productivity and enhanced quality.

Pre-planning of tasks, tools, and equipment to the point of installation can help to reduce the frequency of climbing on ladders. By reducing the frequency of climbing up and down the ladder, fatigue levels and injuries can be reduced and employee productivity increased.

Where appropriate, SMAP contractor should incorporate the use of platform ladders, a folding ladder with a standing platform. Using a platform ladder will allow the employee to freely move and turn, eliminating static, awkward body postures while improving productivity and quality. When possible on the job site, aerial lifts should be used to elevate employees into their work positions to eliminate ladder exposures.

CNA's Housekeeping Program uses the 5S methodology from Lean Manufacturing as a tool for organizing a workplace. Sorting, straightening, shining (i.e., housekeeping), standardization, and sustaining, results in a well-organized workplace complete with visual controls and order. Creating a workplace that is clean, uncluttered and safe can help reduce slip, trip and fall exposures, and should be integrated into the daily SMAP safety process.

A footwear policy combined with a regular ongoing floor and ground maintenance process can help eliminate exposures to oil, water, ice and other agents that reduce the coefficient of friction between the footwear and surface.

CNA's Risk Control construction specialists can assist in the development and implementation of a comprehensive safety program involving CNA's "Motion is Money" process and other safety processes to address the workers' compensation exposures discussed in this guide.

In addition, we offer the Motion is Money pocket guide for superintendents and foreman to conduct observations and measures on the job site to better understand where productivity improvements can be made.

Through our School of Risk Control Excellence, we offer Construction Boot Camps that address exposures and risk management techniques.

To address fall exposures specifically designed for contractors, CNA's Risk Control services include a construction gap analysis to evaluate overall operations and determine strengths and weaknesses. CNA's FallPRO process, a comprehensive method of evaluating and developing business solutions, addresses fall exposures specific to contractors.

CNA's resources, includes guides on ladder safety, scaffolding, and raising materials off the ground and floor, can aid in the implementation of a safety program.

Auto

The fleet safety process should be approached from a human factor perspective, or the iteration of a worker's ability for job requirements, for in and out of cab behaviors such as eating, drinking, smoking while driving, climbing in/out of vehicles and raising and lowering trailers.

Auto safety is an essential part of a company's safety program. Few companies can operate without an occasional business use of hired or non-owned vehicles by employees. Claim data indicates that accidents in which the insured driver rear-ended other vehicles are the leading loss source in terms of accident frequency and severity.

Developing MVR criteria, point systems for driver violations, driver orientation and drug testing of employees should be a part of a comprehensive fleet safety program.

Contractors often complete heavy physical work throughout the day resulting in the accumulation of mental and physical fatigue that can affect their reaction time while driving. Management must understand these issues and provide education on in-cab behavior guidelines to employees. Electrical contactors must begin to explore beyond the traditional vehicle education and training methods and expand into understanding and incorporating human factors methodologies into their fleet.

CNA offers resources, such as the School of Risk Control's Fleet Institute, to aid contractors in addressing issues and exposures presented in this study. CNA's fleet and ergonomic specialists can assist in the development and implementation of a comprehensive fleet process.

General Liability

A formal written quality control process that includes inspection, evaluation/testing and sign off of completed work on a daily basis can help reduce or eliminate the occurrence of claims related to water damage. Pre-planning of the job to ensure that correct tools, materials and setup are used can eliminate unnecessary steps and shortcuts that lead to quality issues.

Having a comprehensive worksite process that includes preplanning of all job tasks pertaining to excavation activities with emphasis on marking, designating and outlining specific utility lines needs to be a routine part of the excavation process. Each foreman and employee operating a piece of excavating equipment should thoroughly review the plan on a daily and hourly basis as the excavation progresses. In addition, management should develop and implement a policy of pot-holing or locating of utility lines for machine operators.

A comprehensive written process should be developed and followed to locate, identify and mark property during a job specific task where the equipment to be used is in close proximity to other property. In addition, a spotter should be used for tasks that require operation of equipment in tight quarters.

Prior to performing soldering or welding work in an enclosed space or roof where combustible materials are present, a documented hot work process should be in place that includes issuance of a hot work permit by a safety professional or manager of the company. The documented hot work process should also include a training component to review casual factors due to improper soldering or welding techniques. Along with this, a spotter with the appropriate fire suppression equipment should be present.

CNA Risk Control offers exposure guides such as Risk Transfer: A Strategy to Help Protect Your Business and bulletins discussing the Safety Responsibility of Jobsite Foreman and Slip and Fall Procedures on Job Sites.

School of Risk Control Excellence

Courses applicable for the Sheet Metal, Mechanical, Air Conditioning and Plumbing Industry:

- Accommodating the Maturing Driver** – Highlights how age impacts driving and what safety measures can be adopted
- Case Management – A Partner With Workers' Compensation** – Addresses techniques to maximize the delivery of healthcare and return-to-work outcomes
- Contractor Utility Disruption** – Offers precautionary practices to follow prior to the start of any underground work
- Controlling Equipment Theft** – Identifies ways to control equipment theft and mitigate the associated risks
- Department of Transportation (DOT) Primer** – Covers how to comply with DOT regulations, such as driver qualification files, vehicle inspection and maintenance, substance abuse and driver training requirements
- Dock Safety Cargo Securement — Flatbed** – Identifies how to avoid costly claims and improve customer satisfaction through proper flatbed material handling
- Dock Safety Overview** – Identifies overall risks of dock work, the lines of insurance that can be affected, and controls to put into place to minimize these exposures
- Drug and Alcohol Prevention** – Identifies ways to properly manage the work risks and legal issues of drug screening with pre-employment, post-accident, reasonable suspicion and random testing
- Employment Practices Liability (EPL) and the Risk Management Process** – Provides an overview of EPL, including statistics, exposures, risk mitigation and insurance solutions
- FallPRO** – Outlines steps for implementing a comprehensive fall protection process for the leading cause of fatalities in the construction industry
- In-Cab Behaviors** – Introduces human factors concept of addressing vehicle accidents
- Incident Investigation** – Identifies causes that can lead to incident investigation steps
- Infrared (IR) Thermography** – Explains the science behind IR, potential benefits that can help reduce costs by reducing losses
- Lower Back Pain and Manual Material Handling** – Covers symptoms, characteristics and risk factors that contribute to the development of lower back pain
- Managing Your Hearing Loss Trends** – Identifies risk management steps to limit further loss of hearing claims
- OSHA 10-Hour for Construction** – Provides training on construction safety, health and emphasizes hazard identification, avoidance, control and prevention
- Return-to-Work Process** – Explores elements of the return-to-work process and workers' compensation requirements
- Risk Transfer** – Addresses the importance of developing a risk transfer strategy and gives practical guidelines for establishing a risk transfer program
- Risk Transfer for Construction** – Addresses strategies for allocating and insuring risks to help minimize exposure and shift it to the responsible party
- Sheet Metal, Mechanical, Air Conditioning and Plumbing Boot Camp** – Addresses industry loss drivers from a safety and industrial practice viewpoint
- Slips, Trips and Falls** – Explains how to implement an effective slip, trip and fall prevention program
- Understanding Driver Fatigue** – Highlights sources of driver fatigue and provides controls that companies can use to reduce exposures
- Warehousing – Controlling Your Property Exposures** – Analyzes sprinkler systems to help make informed business decisions to maximize the ability of the fire prevention system

To find out more about these classes, go to: www.cna.com/riskcontrol

Footnotes

- ¹ Salinsky, E. & Scott, E. Obesity in America: a growing threat. National Health Policy Forum. July 2003. Retrieved January 15, 2009 from http://74.125.95.132/search?q=cache:zTck2QIXkWwJ:www.nhpf.org/pdfs_bp/BP_Obesity_703.pdf+obesity+has+become+a+growing+problem+in+the+U.S.&hl=en&ct=clnk&cd=1&gl=us
- ² Employment outlook: 2004-14, labor force projections to 2014; retiring boomers. The Bureau of Labor Statistics. *Monthly Labor Review*. November 2005. Retrieved January 15, 2009 from <http://www.bls.gov/opub/mlr/2005/11/art3full.pdf>
- ³ Silverstein, M. (2007, December). Will you still need me when I'm 64? Designing the age-friendly workplace. *EHS Today*. Retrieved October 9, 2008 from http://ehstoday.com/safety/ehs_imp_77115/

To learn more about how CNA Risk Control can work with you to help you mitigate risks, please speak with your local independent agent, call us toll-free at 866-262-0540, or view our Risk Control tools online at www.cna.com/riskcontrol.

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