NIOSH Construction Program DRAFT Strategic and Intermediate Goals and Performance Measures

11/21/05 Version

Notes: 1) this version is being shared with stakeholders for comment: 2) the final version will also include a general introduction and additional text to describe issues, baselines, and details for each goal: 3) Annual goals will be added once the strategic and intermediate goals are finalized based on stakeholder input.

Strategic Goal 1: Reduce Construction worker fatalities and injuries caused by falls to a lower level.

Overall Performance Measure: Delivery of the following goals will improve sector capabilities to reduce falls from height to support an ambitious 20% reduction in fall fatality rates by 2016 (using a 2003 baseline).

Background: Falls from height are the leading cause of death in the construction industry. There were 4,124 deaths from falls to a lower level over the period 1992 to 2003 (CPWR, 2005, based on BLS data). Falls to a lower level are also an important source of injuries – they ranked as the third most common cause of non-fatal cases with days away from work in construction in 2003, following contact with objects and overexertion (CPWR, 2005). Injuries caused by falls from height in construction are typically extremely severe, requiring longer periods of treatment and recovery than many other types of injuries. They also result in substantial medical costs. Within construction, special trade contractors (such as structure and roof contractors) and building construction contractors (both residential and industrial construction) are the sub-sectors affected most significantly. The fatality rate from falls varies widely across construction occupations. In 2003, the highest rate was 21.1 per 100,000 FTEs for roofers, about 6 times higher than the average construction rate of 3.6 per 100,000 FTES (CPWR, 2005).

Effective reduction of fall incidents requires focused research on high-risk groups and tasks, ample knowledge of the causes of these injuries, and a good understanding of the bioscience underlying human falls. Developing innovative engineering controls or work methods to eliminate or minimize fall-hazard exposure is essential. In some cases, existing standards or guidelines already exist to substantially reduce the risk of falls, and research is needed to improve understanding of why these methods are not used more widely. In other cases, (e.g. some aspects of residential construction) there is a continuing need to develop technical and feasible solutions to prevent falls.

Working with industry partners to transfer and implement existing and new fall prevention knowledge into routine construction practice is essential to make progress on reducing injuries and fatalities from falls. Worker training, public education to recognize fall hazards, and continued evaluation of barriers and the effectiveness of fall prevention strategies will be needed to address this important and ambitious goal.

IG1.1: Improve tools to identify and prevent fall exposures during access (e.g. ladder and scaffold) and structure work (e.g. roof and leading edge).

PM: Within 4 years, inventory and prioritize exposures associated with fatal and severe falls associated with work on ladders, scaffolds, mobile platforms, roofs, and leading edge decking. Develop guidance and demonstrate pilot programs to identify, prevent, and mitigate these fall exposures.

IG1.2: Target fall initiation and fall survival using innovative biosciences-based strategies.

PM: 1) Fall initiation: within 5 years, develop at least 3 research-based recommendations for optimizing worker balance controls during the tasks on narrow beams, scaffolding boards, roof planks, and slope roofs and transfer at least 2 into construction practice. 2) Fall survival: within 6 years, develop and evaluate at least 3 measures to reduce high-energy impact to the human neck, head, and body for workplaces and tasks and transfer at least 2 into construction practice.

IG1.3: Inventory current fall protection practices and fill gaps where technical approaches either need to be developed in the first place or need modification to be more cost effective for smaller employers.

PM: Within 2 years, inventory existing fall protection regulations and guidelines and identify at least 3 gaps where technical engineering guidance needs to be developed or modified further for fall protection. Within 4 years, identify, develop, and pilot guidelines and disseminate them for implementation.

IG1.4: Expand the use of safe-by-design practices via demonstration projects and outreach to construction partners.

PM: Within 3 years, identify, evaluate, and pilot 3 safe-by-design practices (such as built in safety anchors in building beams) that address falls to lower levels. Partner with OSHA, international construction groups, professional societies, trade associations and unions, architect-engineer-and-designer firms, and insurance companies to expand the use of this approach.

IG1.5: Evaluate the impact of construction procurement practices on the implementation of fall protection.

PM: Within 4 years, examine construction procurement practices used by owners and contractors and evaluate 3 best practices (e.g. addressing fall-protection when pre-qualifying sub-contractors) that address falls to lower levels. Partner with various sector partners to disseminate and transfer effective approaches to construction practice.

IG1.6: Address disproportionate risks to Hispanic construction workers by identifying and addressing unique underlying causes

PM: Hispanic construction workers have a higher rate of fatal falls in comparison with all construction workers. Within 3 years, evaluation of underlying causes will be performed in partnership with stakeholders to identify promising interventions for evaluation and transfer. At least 2 interventions will be piloted and transferred into construction practice.

OPTIONAL GOAL – Please comment

IG1.7: Work with construction partners to develop and implement a national campaign to reduce fatal and severe injuries associated with falls to a lower level.

> ***PM:*** In light of the importance of fall from height fatalities for construction, and the need to communicate the hazard control strategies to public to bring about reductions in national injury data, NIOSH will work with construction stakeholders to develop a social marketing - based national campaign within 2 years, will provide technical support to participating organizations, and will provide biennial progress reports and an evaluation and final report in 2016.

Strategic Goal 2: Reduce fatal and serious nonfatal injuries caused by roadway construction workers being run over by vehicles and equipment.

Overall Performance Measure: By 2014, achieve a 40% reduction in the number of fatalities and injuries from workers being struck by construction vehicles and equipment in the road construction industry.

Background: Workers in the highway, street, and bridge construction subsector are at risk of fatal and serious nonfatal injury from working near passing motorists, construction vehicles, and equipment. Road construction represents less than 4% of construction employment, but accounts for approximately 10% of the industry's fatal occupational injuries. A review of the 841 highway and street construction fatalities that occurred from 1992-1998, found that in 465 of these 841 cases (55%), the death was either vehicle- or equipment-related and either clearly or probably occurred in the work zone. Furthermore, in 318 of the 465 vehicle- and equipment-related fatalities, a worker on foot was struck by a vehicle or piece of equipment. These victims were as likely to be struck by a construction vehicle (48% of cases) as by a passing motorist (48% of cases) (Fosbroke and Marsh, 2001). NIOSH and OSHA are working with stakeholders and federal and state transportation departments to develop and implement approaches to protect road construction workers from passenger vehicles. There is a need to develop effective interventions to protect road workers from construction vehicles. Work zone safety is a priority for labor, industry, and federal and state agency officials who have expressed concern that increases in road construction and structural changes in the industry will lead to increases in worker fatalities. These concerns are further underscored by the safety-specific language that included in SAFETEA-LU, the reauthorization bill for federal transportation funding and in the FHWA final rule on Work Zone Safety and Mobility.

Thoroughly understanding the injury risks that road construction workers face is essential before worker safety can adequately be addressed. One area of continued concern includes evaluating risks associated with the expanded use of night work in the road construction industry. Another area of concern, as indicated by the statistics presented above, is workers being struck or run over by construction vehicles and equipment. To specifically address this concern, effective interventions need to be identified, developed, and evaluated. Promising interventions that have already been identified include proximity warning systems mounted on road construction equipment, internal traffic control plans implemented at road construction sites, specialized safety orientation training for newly hired workers in English and Spanish, and awareness and use of equipment blind area diagrams by all road construction workers. Evaluating the effectiveness of these and other newly identified interventions requires a research-based approach that depends on accurately quantifying worker exposure to construction vehicles and equipment operating in the work zone.

If an intervention is shown to be effective, it must be adopted by companies throughout the construction industry for there to be any reduction in fatalities or injuries. Therefore, strategies to promote effective interventions and to track implementation and continued usage by construction companies must be developed. Only through widespread adoption and continued utilization of effective interventions will there be safety improvements for workers in the road construction industry.

IG2.1: Quantify worker exposure to being run over by construction equipment operating inside roadway construction work zones

> ***PM:*** By 2008, develop and demonstrate a method of measuring worker exposure to being run over by construction vehicles and equipment operating on road construction sites.

IG2.2: Evaluate the potential for proximity warning system (PWS) use on road construction equipment to reduce worker exposure to being run over. Assess existing systems and explore development of new improved PWS technology.

> ***PM:*** 1) Existing PWS technology: complete the evaluation of sonar, radar, and camera systems by 2008, and if effective, transfer to construction practice. 2) New PWS technology: by 2010, facilitate development and field testing of at least one improved PWS, and if effective, transfer to construction practice.

IG 2.3: Evaluate the potential for Internal Traffic Control Plans (ITCPs) to reduce worker exposure to being run over by construction equipment.

> ***PM:*** By 2008, complete development and evaluation of ITCPs on eight sites. If shown to be effective, transfer to construction practice.

IG2.4: Improve availability and use of operator visibility limit information for road construction equipment.

> ***PM:*** By 2007, publish blind area diagrams for 34 pieces of equipment and develop a web page for dissemination of this information. By 2014, 40% of construction companies surveyed will use blind areas in training truck drivers, equipment operators and workers who work around operating construction equipment.

IG2.5: Evaluate worker injury risks associated with the expanded use of night work in the road construction industry.

> ***PM:*** By 2008, convene a workshop addressing safety of nighttime road construction to improve understanding of injury patterns associated with night work, along with potential impacts on daytime interventions (e.g. operator visibility limits). By 2009, survey the industry on night work related injuries and prepare guidance for night time work zone operations.

IG2.6: Gain widespread usage of effective prevention measures in the road construction industry

> ***PM***: Beginning in 2007, biennial surveillance reports describing fatal and non-fatal injuries associated with being run over by construction equipment will be disseminated to the road construction industry and partners. In 2009, an industry survey will be performed to create a prevention practice baseline and to provide input for targeting information dissemination efforts. By 2014, the industry will be re-surveyed and effective measures will be

incorporated into road construction contracts, regulatory and consensus standards, guidelines, and best practices and 40% of firms will be using the measures.

Strategic Goal 3 - Reduce fatal and non-fatal injuries from contact with electricity among construction workers.

Overall Performance Measure – Delivery of the following goals will improve sector capabilities to reduce electrical hazards in support of an ambitious 20% reduction in electrical fatalities from all causes by 2016 (using an adjusted 1992-2002 baseline)

Background: Between 1992 and 2002, more than 1,500 construction workers died in electrical accidents. Electrical hazards are the third leading source of fatal injuries among construction workers (BLS, CFOI) and one of every eight construction industry deaths was electrical in origin. Nearly one-half of all on-the-job electrical deaths occurred in the construction industry.

Electrical accidents can be divided into three distinct categories. The leading cause (740 deaths between 1992 and 2002) of electrical deaths in the construction sector is contact with overhead power lines (OHPLs). The second leading cause (487 deaths over this period) is contact with live wiring, transformers, and other electrical apparatus. The third most common cause (163 deaths over this period) is contact with electric current from a machine, tool, appliance, or lighting fixture while engaged in other work activities.

Research is needed to address all three causes -- each is sufficiently different to require different types of interventions. OHPL electrocution accidents will be addressed through a combination of intramural and extramural research. In addition, efforts to improve national standards for OHPL protection will be undertaken. Secondly, research to address non-OHPL injury to electrical workers will study electrical maintenance issues such as work practices and engineering controls, where appropriate. Third, the incidental electrocution of non-electrical workers will be studied. Passive engineering controls that eliminate the hazard (e.g., ground-fault circuit interrupters) are considered to be the most effective interventions. Nonfatal electrical burn injury should continue to be addressed through research into improved hazard communications and improvements to national standards.

Nearly three-fourths of electrical contactors employ 10 or fewer workers. The employees of small electrical contractors represent only one-fifth of the electrical workforce, yet experience two-fifths of the electrical injuries. In addition, a growing Hispanic population is entering the construction field at a rapid rate. These demographics present unique challenges to the effective dissemination of research results.

IG3.1: Reduce the number of fatal electrical injuries resulting from accidental contact with overhead power lines.

PM: By 2009, evaluate and develop interventions (e.g. power line proximity warning alarms, engineering controls, and tool and task designs) to address overhead power lines. Pilot and transfer to construction practice at least 3 effective approaches. Reverse the current increase in this type of fatality towards a 20% reduction goal by 2015.

IG3.2: Reduce the number of electrical fatalities resulting from accidental contact with wiring, transformers, or other electrical components (excluding overhead power lines) during electrical system installation and maintenance.

PM: By 2009, evaluate and develop interventions (e.g. lock out, electrical personal protective equipment) to address accidental contact hazards. Pilot and transfer to construction practice at least 3 effective approaches. Reverse the current increase in this type of fatality towards a 20% reduction goal by 2015.

IG3.3: Reduce the number of fatalities resulting from "contact with electric current of machine tool appliance or lighting fixture".

PM: By 2009, evaluate and develop interventions (e.g. training, engineering controls) to address these appliance and fixture hazards. Reduce construction industry fatalities in this category by 20% by 2015.

IG3.4: Forge new partnerships with small employers and companies with substantial Hispanic employment to more effectively disseminate electrical safety information.

PM: This goal will have been successfully achieved if one or more partnerships are formally established by 2008 to effectively disseminate training materials on electrical injury prevention to each special emphasis population that is identified to ultimately reduce disproportionate risks.

Strategic Goal 4: Reduce the incidence and severity of work-related musculoskeletal disorders in construction work.

<u>Overall Performance Measure - </u>Successful delivery of the following goals will improve sector capabilities to address musculoskeletal disorders in construction. It will demonstrate that successful implementation of interventions, such as those identified and evaluated in IG4:3 can lead to 25% reductions in incidence and severity rates by 2015 for those targeted tasks and trades.

Background: The BLS estimates that musculoskeletal disorders (sometimes referred to by construction stakeholders as non-traumatic soft tissue injuries (NTSTI) (AGC, 2005) account for around 25% of all lost-time injuries and illnesses occurring in the construction industry and nearly 2/3's of these cases are related to activities involving overexertion. Analysis of lost-time data for Special Trade Contractors (NAICS 235) - the largest construction industry division – indicates that back (50% of all cases) and shoulder injuries (10% of all cases) account for most cases.

Construction tasks involve factors such as exertion of physical force during material handling, the use of manual and power tools, repetitive tasks, and awkward work geometry that have been associated with non-traumatic soft tissue injuries. Construction settings present unique challenges to developing effective interventions, such as the absence of permanent workstations, lack of control over the task location, continuously changing surroundings, and multiemployer work sites presenting coordination and communication obstacles. In spite of these drawbacks, effective interventions have been developed and evaluated for various trades or specialties in the construction industry. The reduction of the incidence and severity of construction NTSTI requires the following:

- Advancing our understanding of the extent of the problem and the contribution of antecedent events.
- Reducing the use of human physical forces applied to work, especially for material handling and tool operation.
- Insuring that current and future mechanical systems used to replace human physical forces do not expose workers to physical risk factors for injuries.
- Developing improved methods for the transfer and diffusion of alternative work methods, materials, etc. intended to reduce workers' exposures to NTSTI risk factors.

IG4.1: Identify and evaluate the job demands and associated outcomes relative to workers' capabilities.

> ***PM***: Twenty construction job tasks associated with the development of WMSDs will be identified and evaluated by 2009 (baseline 2003).

IG4.2: Identify and evaluate the impact of construction design and management on the development and severity of non-traumatic soft tissue injuries.

> ***PM:*** By 2010, develop or modify an existing pre-construction and site management audit instrument that can be used to identify and control potential risk factors and evaluate and compare exposures (i.e., WMSD risk factors) and outcomes (i.e., workers' self-reported symptoms and injuries) on 10 construction sites, i.e., 5 sites that implemented the audit instruments and 5 that did not use the instruments.

IG4.3: Increase the number of effective interventions for reducing workers' exposures to risk factors for WMSDs.

> ***PM:*** Identify and evaluate 20 currently available interventions and develop 5 new interventions by 2012 for job tasks and trades where the risk factors are known to have a major impact on measures of injury and lost time.

IG4.4: Improve the transfer and diffusion of effective ergonomic interventions in the construction industry.

> ***PM:*** Develop, validate, and disseminate to stakeholders 40 fact sheets describing available ergonomic interventions by 2011 Increase by 50% the transfer and diffusion of two effective interventions for the concrete sector work by 2010 (2005 baseline).

Strategic Goal 5: Reduce noise-induced hearing loss (NIHL) among construction workers

<u>Overall Performance Measure</u> By 2014, successful accomplishment of these goals will improve sector capabilities to assess, reduce, and control construction noise exposures and to implement effective hearing conservation programs. This will be demonstrated by an ambitious goal to increase the use of audiometric programs by 40% and to reduce hearing loss by 20% (over baseline findings) for targeted groups.

Background: The purpose for this goal is to eliminate or reduce hazardous noise in the construction industry, and thereby reduce or eliminate occupational hearing loss among construction workers. There is no doubt that construction related activities expose workers to hazardous noise. In its 2002 Advance Notice of Proposed Rulemaking for a hearing conservation standard for construction workers, OSHA estimated that the average construction worker is exposed to a time-weighted average (TWA) of 99 dBA. At this exposure level, within one year, 10% of these workers will have permanently lost an average of 13 decibels at 3000, 4000, and 6000 Hz (ANSI, 1996). Waitzman and Smith (1998) determined that "...hearing loss among construction trade workers... was significantly elevated, as much as three and one-half times that of workers in other industries". In fact, by age 25, the average carpenter has been shown to have "50-year old ears", and by age 55, two out of three are past the point of needing hearing aids (Sweeney et al. 2000).

In order to eliminate or substantially reduce occupational hearing loss, a worker's TWA must not exceed 85 dBA (NIOSH, 1998). The best way to ensure workers' exposures do not exceed 85 dBA TWA is to apply control technologies to eliminate the noise hazards. Until control technologies have eliminated noise hazards, workers must use ear muffs and ear plugs to protect their hearing. Unfortunately, recent data have demonstrated that as they are actually worn by workers, hearing protectors will provide only a small fraction of their potential sound attenuation (Neitzel and Seixas, 2005). To effectively implement interventions that reduce workers' exposures to <85 dBA TWA, and to demonstrate the effectiveness of these interventions, the following are necessary:

- Improve our ability to measure TWAs which include impulsive exposure events.
- Develop new methods for applying control technologies to reduce the sound output of construction tools and equipment.
- When control technologies have not yet eliminated hazardous noise, reduce the adverse health effects of noise exposures by improving the effectiveness of hearing protection devices.
- Create an audiometric testing and information management system that will make monitoring audiometry feasible for the construction industry.

Successful accomplishment of the following goals will enable health and safety professionals to accurately assess construction noise exposures, quantify the effectiveness of control technologies, and reduce workers' exposures to <85 dB TWA.

IG5.1: Develop baseline measures for hearing loss, noise exposures, and hearing protection practices.

PM: Within 3 years, create baseline reports describing 1) incidence and prevalence of hearing loss in the construction sector; 2) current noise exposure levels; and 3) current use of practices such as hearing protection and audiometric testing. Updated reports will be generated three and six years after the baseline is completed.

IG5.2: Improve the ability to determine the contribution of impulse noise to construction worker noise exposures

PM: Within 4 years, develop an intrinsically safe impulse sound meter that can integrate impulses up to 165 dB peak SPL, and that can provide measures of metrics such as kurtosis, spectra, and temporal characteristics. Within 2 years following the development of the impulse sound meter, complete a field survey that quantifies construction workers' exposures to impulsive sounds. Within 3 years following the completion of the field survey, develop revised criteria for exposure to impulsive sounds.

IG5.3: Reduce operating engineers' exposures to noise emitted from diesel-powered equipment

PM: Within 5 years, reduce sound levels at the operator's station of diesel-powered equipment by 3 dB. The research will focus on diesel-powered, mobile construction equipment such as bulldozers, tele-handlers, soil and asphalt compactors, skid steer loaders, and front end loaders.

IG5.4: Reduce construction workers' exposure to noise emitted from use of powered hand tools

PM: Within 2 years, a consortium will be formed with at least 2 manufacturers, 3 universities, 1 labor union, NIOSH, and OSHA. Three years after the consortium is formed, projects will demonstrate the feasibility of hand tool noise controls by reducing noise emissions by at least 3 dB on at least one tool in each of 5 categories of powered hand tools. Within 4 years after the consortium is formed, manufacturers will be implementing the consortium's noise control design solutions on their production lines.

IG5.5: Reduce the adverse health effects of hazardous noise by improving the effective use of hearing protection devices (HPDs).

PM: Within three years, develop field-testable HPD training methods that are integrated with NIOSH fit-test hardware, and subsequently initiate a 2-year field study of HPD effectiveness. This goal will have been successful if HPD use increases by 50% and HPD attenuation increases by 6 dB among workers receiving the NIOSH training.

IG5.6: Facilitate the increased use of audiometric testing in construction by developing and evaluating multi-employer systems that can accommodate the mobile construction workforce.

PM: Within 5 years, develop a methodology for collecting worker hearing tests from multiple employers and archiving them in a secure, centralized repository for subsequent remote retrieval, update, and determination of hearing threshold shifts. Disseminate to construction groups to facilitate portability of audiometric test results.

Strategic Goal 6: Reduce occupational illness among construction workers by reducing inhalation exposures to lead, silica and welding fumes.

Overall Performance Measure: Delivery of the following goals will improve sector capabilities to reduce exposures over 10 years as follows:
-Lead: a 40% reduction in the prevalence of blood lead levels exceeding 25 ug/dL among construction workers.
-Silica: a 20% reduction in abrasive blasting exposures, and 40% reductions for building renovation/construction and highway construction exposures.
-Welding fumes: a 20% reduction in overall welding fume exposures, and a 40% reduction for chromium and manganese exposures.

Background: Numerous studies have documented an increased risk of occupationally-related diseases among construction workers resulting from the inhalation of airborne contaminants generated by many construction tasks and operations (Sullivan et al 1995). However, only limited surveillance data exist on the magnitude of the health risks experienced by construction workers due to the underreporting of illnesses (CPWR 2002).

The preferred risk management approach to preventing and controlling worker inhalation exposures to a hazardous substance is to: a) identify the tasks and/or processes likely to create exposure to the substance, b) quantitatively determine whether exposure to the substance presents a risk, c) substitute the substance with a less hazardous material when possible, and d) implement appropriate engineering controls and/or provide personal protective equipment (PPE) and a program to support its effective use. Construction work environments present a number of challenges to implementing this approach. Many construction contractors are small businesses and do not have full-time safety and health staff capable of identifying job tasks and exposures that pose a health risk to workers. Construction sites are ever-changing, and installation of permanent engineering controls at the site is often not practical or feasible. However, tools designed with controls (e.g., exhaust ventilation, water generation) along with good work practices have been shown to be effective in reducing worker exposures to some hazardous airborne contaminants at construction work sites. The use of respiratory protection has also been used to protect workers at job tasks where exposures can not be reduced through engineering control measures.

The proposed intermediate research goals focus on reducing exposures to silica, lead and some of the toxic components of welding fume because of their potential to cause adverse health effects. Human studies have shown that exposure to silica dust can cause silicosis and lung cancer, and has been linked with causing kidney disease and autoimmune disorders [NIOSH 2002]. Studies have also shown that exposure to lead can cause many adverse health outcomes including neurological, reproductive, liver, and blood effects [Srianujata 1998]. Likewise, exposure to welding fumes has been linked to causing acute and chronic respiratory disease as well as other adverse health outcomes including neurological disorders and cancer [Antonini, 2003]. Exposure to these agents frequently occurs at many types of construction work sites.

Effective reduction of these inhalation exposures requires focused research to address key obstacles. Because recognition of exposures by contractors and competent persons is an important prerequisite for controlling or preventing exposures, one goal aims to improve the user friendliness and expand the use of basic methods to detect air contaminants. Another goal addresses improved recognition via creation of a shared database to increase the availability of information about exposures associated with common tasks. Investigation of “control banding” as an alternative approach to control solutions is also included, as are development of new engineering approaches and work practices for silica and welding fumes. There is a need to improve understanding obstacles to implementing existing effective control methods, and research on this important area is also included.

Accomplishment of the proposed research goals is expected to lower blood lead levels (to be demonstrated using reports from the NIOSH Adult Blood Lead Epidemiology and Surveillance (ABLES) Program), reduce the risks of developing silicosis, and reduce respiratory and other diseases resulting from exposure to welding fumes. It is expected that the lessons learned in identifying measures for these targeted substances will be applicable to the reduction of other inhalation hazards that occur at construction work sites.

IG6.1: Improve recognition of high exposure task and job situations by expanding the use of field-portable methods by construction employers

PM: For lead, stakeholder input will be used to identify strategies for increasing the use of existing NIOSH field portable methods (i.e., NIOSH Methods 7700, 7701, 7702, 9100, 9105) within 2 years. Within 4 years, training, guidance, and case studies of successful use of field-portable methods specifically designed for construction employers and competent persons will be developed and transferred to construction practice.
For silica, stakeholder input will be used to evaluate the potential use of a construction version of a real-time person wearable dust monitor along with other promising methods within 1 year. Within 4 years, training, guidance, and case studies will be developed and transferred to construction practice.
For welding fumes, within 2 years, field portable methods for monitoring airborne exposures to chromium and manganese will be developed. Within 4 years, these methods will be evaluated in the field and guidance will be developed and transferred to construction practice.

IG6.2: Improve recognition of high exposure task and job situations as well as effective control methods through improved sharing of construction exposure data

PM: In coordination with surveillance intermediate goal 8.2, evaluate within 2 years options for a shared database system that would allow stakeholders to input and retrieve silica and lead exposure data. Implement, market, and populate the system within 5 years.

IG6.3: Identify, evaluate, and address obstacles to implementing existing effective control methods that would reduce lead and silica exposures

PM: Stakeholder input from employers, worker representatives, trade associations, equipment manufacturers and other partners will be solicited within 1 year to identify and prioritize obstacles to implementing controls. At least 5 target interventions will be developed in partnership with stakeholders to address obstacles within 3 years. These will be evaluated and at least 3 interventions found to be effective will be transferred to construction industry practice within 5 years.

IG6.4: Develop new approaches for reducing silica exposures: "Control Banding" and new engineering solutions

PM: For control banding, 3 important silica operations/tasks will be identified within a year for development and validation of a control banding approach. Within 3 years, research will be finalized and technical reports and user friendly control banding guides will be published and transferred to industry practice. For engineering solutions, at least 3 new engineering solutions will be identified and developed to address gaps in existing controls within 6 years.

IG6.5: Improve understanding of dose-response relationships in welding fume toxicity and develop new approaches for reducing toxic metal exposures from welding fume

PM: Within 5 years, laboratory studies will be completed to elucidate dose-response relationships in welding fume toxicity and to identify proposed work practices and/or welding process modifications that can reduce welding fume exposures where this has been demonstrated to reduce toxic effects. Within 5 years, proposed work practices and/or welding process modifications that can reduce exposures will be evaluated for their effectiveness in the field. Within 8 years, technical reports and user-friendly worker guidelines that combine toxicity reduction and exposure reduction strategies will be prepared and disseminated to appropriate construction stakeholders.

IG6.6: Demonstrate that elevated blood leads among construction workers can be reduced via a focused surveillance and intervention program.

PM: This goal will be met by identifying 2 state partners within 2 years for a demonstration project to focus technical assistance, training, and surveillance resources on the occurrence of elevated blood leads reported by construction employees. Within 6 years, this demonstration project will result in a 75% reduction in occurrence of blood lead levels exceeding 25 ug/dL among participating construction workers.

Strategic Goal 7: Reduce dermal exposure and associated occupational illnesses among construction workers.

Overall Performance Measure The successful completion of this strategic goal will result in a 30% decrease in the reported incidence of irritant dermatitis in targeted construction industry groups by 2016.

Background: Occupational skin diseases and disorders are the most commonly reported non-trauma-related category of occupational illnesses in the United States, comprising up to 40% of all non-fatal occupational diseases with the majority of cases being either allergic or contact dermatitis. Loss workdays and loss productivity associated with occupational skin diseases across all sectors exceeds $1 billion annually.

According to the 2002 and 2003 Bureau of Labor Statistics (BLS), 5% of all occupational skin diseases can be related to the construction industry, with the annual reported incidence rate being about 4 per 10,000 full-time workers. Within the construction industry, the four most affected occupations include: tile setters/terrazzo workers, painters, construction/cement workers and wood processors (Bock et al., 2003).

Once a construction worker develops dermatitis, it is very hard to treat. Prevention rather than intervention represents the most rational strategy to for addressing construction-related dermatitis. NIOSH is proposing to reduce the incidence of dermatitis in the workplace by 33% in targeted construction industry groups by 2016. In order to accomplish this strategic goal, NIOSH scientists, dermatologists, industrial hygienists, health communications experts and representatives from targeted unions and trade associations will work together to undertake a multi-prong approach composed of overlapping intermediate goals. These intermediate goals will aim to: quantify the incidence and prevalence of construction related dermatitis; characterize as well as workplace related conditions/practices responsible; develop and validate improved laboratory and field techniques for identifying responsible agents; disseminate databases of suspected construction-related dermatotoxic agents; develop model intervention approaches and programs; and identify and disseminate effective skin protection and communication management programs.

IG7:1: Quantify incidence and prevalence of construction industry related dermatitis and characterize work-related conditions and practices that impact on the frequency and severity

PM: Within 3 years, create baseline reports describing prevalence and severity of skin disease in the construction sector, along with identification of tasks and materials most commonly associated with construction-related skin disease. Use conclusions as baseline data to demonstrate the effectiveness of research in NIOSH Strategic Goal 7 in the reduction of skin exposure and skin diseases.

IG7.2: Develop and disseminate databases containing known and suspected skin sensitizers and irritants

PM: Within 4 years, develop a database that is used by construction stakeholders.

IG7.3: **Develop and validate improved laboratory, clinical and field surveillance methodology for hazard identification, exposure characterization and risk assessment of chemicals that cause irritant and allergic contact dermatitis.**

PM: Within 3 years, improved and validated laboratory, clinical, and field surveillance methodology will be available and will be used by stakeholders.

IG7.4: Develop and evaluate model intervention approaches and programs to prevent induction of irritant and allergic dermatitis in the construction industry

PM: Within 5 years, Develop and successfully pilot test construction-specific model skin protection programs for two different types of dermal hazards.

IG7.5: Develop and implement strategies to reduce skin cancer in construction workers resulting from overexposure to UV sunlight.

PM: Within 2 years, perform a baseline study of worker and employer attitudes on the use of protective measures against sunlight/UV exposure. Within 5 years, collaborate with stakeholders on demonstration projects to increase the use of protective measures at outdoor sites and disseminate results to the construction community.

IG7.6: Identify and disseminate effective skin protection communication and management programs in the construction sector, targeting decision makers, employers, workers, and health care providers to improve recognition and control of skin disease.

PM: Within 5 years, develop and publicize NIOSH guidance documents and educational materials to recommend effective strategies for training of workers and for skin-care management. Within 8 years, measure the extent to which these strategies are adopted in the workplace and the changes in workplace practices that occur as a result of adoption, anticipating a 33% reduction.

Strategic Goal 8: Improve surveillance at the Federal, State, and private level to support: the identification of emerging technologies, hazards and associated illnesses and injuries; the evaluation of intervention effectiveness; and the identification of future health and safety priorities in construction.

Overall Performance Measure: This goal will be successfully achieved if by 2016, current surveillance systems are adapted for use by NIOSH and stakeholders to track construction injuries and illnesses; used to monitor and evaluate intervention effectiveness; and contribute to identifying future health and safety priorities in construction.

Background: Creating strategic goals requires that relevant and reliable outcome data be available to serve as performance measures to judge progress. Efforts to create these draft construction goals have served to re-emphasize the important role of surveillance activities for improving safety and health. Surveillance statistics provide a tool for taking stock of progress and monitoring trends over time. They also provide an important starting point for identifying emerging problems.

The construction industry consists of large numbers of mostly small employers and numerous parties responsible for managing health and safety risks. These characteristics have generally created barriers to ongoing, systematic, and integrated collection of information which increases our useful knowledge of construction hazards and patterns of illness and injury. Such information is useful for planning assessments of worker health and safety, for targeting interventions, for determining the impact of prevention and control activities, and for identifying future priorities. The NIOSH surveillance program must improve its ability to support these public health functions and also improve its capacity and flexibility to identify any new occupational health and safety issues which will undoubtedly emerge in the construction sector over the next decade.

This strategic goal cannot be achieved without strengthening partnerships with other Federal, State, and non-governmental organizations. At the Federal level, NIOSH surveillance resources need to be complemented by effective collaboration and sharing of resources with other Federal agencies. For State-based surveillance, NIOSH needs to not only to foster collaborations with and between States, but to also assist in supporting the state level capacity to augment Federal surveillance programs. NIOSH also needs to provide technical guidance and to develop collaborations with non-governmental organizations which may provide new opportunities for surveillance partnerships. These efforts overall can help ensure that NIOSH and its partners can effectively participate in an integrated and comprehensive program for surveillance of hazards, injuries and diseases in the construction industry.

IG8.1: Improve the quality and quantity of injury, illness, and exposure surveillance data for prioritizing construction safety & health research and tracking progress.

> ***PM:*** By 2006, NIOSH will inventory existing injury, illness, and exposure datasets to develop baseline goal metrics and to identify and prioritize upgrades needed to improve construction sector surveillance. By 2012, NIOSH will have implemented 3 injury surveillance upgrades, 2 illness surveillance upgrades, and 2 exposure surveillance upgrades. NIOSH will provide construction program status reports every third year, and will prepare a report describing remaining national surveillance needs along with a national construction industry scorecard in 2015.

IG8.2: Improve the exchange and use of construction-related exposure, safety, and health information by developing a centralized reporting and retrieval system for public use.

> ***PM:*** Develop the framework for a centralized information management and retrieval system framework within 3 years. Establish agreements with data sources (including BLS,

OSHA, NIST, DOT, unions, insurance carriers, workers compensation bureaus, etc.) within 4 years. Implement and market the centralized information retrieval system within 5 years. Continue to populate/update the data system annually.

IG8.3: Increase the occupational injury, illness, and exposure information available for the three construction sub-sectors: 1) Building construction; 2) Heavy and Civil Engineering Construction; and 3) Specialty Trade Contractors) and periodically examine emerging technologies and associated hazards.

PM: Within 6 years, targeted surveys will be conducted to address gaps in knowledge and to enhance understanding of construction program goal issues and baselines at the sub-sector and trade level. Developments and trends in construction technology will be evaluated by meetings with construction stakeholders every five years.

IG8.4: Strengthen the capacity of States to conduct occupational surveillance and prevention activities in construction.

PM: Provide assistance to and collaborate with state partners to establish and optimize 1) construction sector reporting and 2) outcome reporting relevant for the construction goals (e.g. silicosis, or hearing loss, or Hispanic worker fatalities, etc). By 2012, expand construction goal-relevant outcome reporting to no fewer than 7 States, and develop a construction intervention project in 2 States.

IG8.5: Promote effective surveillance conducted by employers, unions and other non-government construction stakeholders by expanding the use best practices and performance indicators

PM: Convene meetings within two years with stakeholders to evaluate the current state of surveillance programs within the industry. Within four years develop a demonstration program to evaluate the introduction of performance indicators in 2 construction trade associations, 2 construction labor organizations, and 2 other non-government organizations (e.g. professional association or insurance carrier) that had not previously used this approach.

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