



# Institute of Occupational Safety and Health (IOSH)

## ***2013 Annual Report***



Institute of Occupational Safety and Health (IOSH),  
Council of Labor Affairs, Executive Yuan



# Foreword

Occupational safety and health relates not only to the guarantee of labor's right to live and work stipulated in Constitution of the Republic of China (Taiwan), but also to sustainable operation of enterprises, social stability, and economic development. The purpose of Institute of Occupational Safety and Health (IOSH), Council of Labor Affairs, Executive Yuan is to devote itself to conducting research on occupational safety and health by using the up-to-date science and technologies, investigating, carrying out experiments, analyzing hazardous factors in various working environments, and coming up with solutions in order to improve labors' safety and health.

According to three concepts of "independent labor relations, fair working environment, and developed labor market" and administrative goals of "build a safe and healthy working environment and maintain labors' physical and mental health" set up by Council of Labor Affairs(CLA), Executive Yuan. IOSH focused its research in 2013 on prevention and investigation of occupational injuries and disease, technical research on exposure to hazardous factors in workplaces, technologies and methods for workplace control and management, strategies and policies of labor and occupational safety and health policy, and technical promotion and application of occupational safety and health in order to provide emerging and traditional industries with solutions to occupational safety and health problems, labor conditions, labor relationship, health management, special protection of vulnerable workers. Meanwhile, IOSH drafted various amendments to regulations and standards, improved safety and health systems, and established strategies for disaster prevention in order to achieve a "decent work and safe and healthy working environment" and build an opportunity for sustainable development for industries.

The content of this annual report covers the research activities from January 1, 2013 to December 31, 2013, including 103 research projects completed within this one year span. The major outcome was the publication of 103 research projects and 2 journals. Regarding the promotion of research achievements, the IOSH has successfully hosted 12 academic seminars. With respect to academic capacity, the IOSH has published 59 articles in journals and academic seminars, including 12 SCI journals articles, 3 in international academic seminars, and 47 in domestic academic seminars. With regard to intellectual property achievements, 2 patent applications have been added and there were income in research output totaling NT\$955,960. Moreover, the IOSH has provided governmental entities, industries, and the public with 43 technological and consultancy services; has published 18 industrial safety alerts and press releases; and has produced 24 teaching materials relating to occupational safety and health. The IOSH has accumulated considerable localized research capacity of "safety and health technology". It is expected that this annual report may allow people in all sectors understanding more about this institute

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# Annual Report

## 1. Overview

Established on August 1992, the Institute of Occupational Safety and Health, Council of Labor Affairs, Executive Yuan has become an important research institute for occupational safety and health in Taiwan, dedicating to improve the safe and health level of domestic working environments, manage industrial trends and issues of social development, provide the investigation, evaluation, engineering control, technologies and methods for on-site improvement in hazards to occupational safety and health, and help solve occupational safety and health problems, labor conditions, labor relationship, health management, special protection of vulnerable workers for emerging and traditional industries. Meanwhile, IOSH drafts various amendments to regulations and standards, improves safety and health systems, and establishes strategies for disaster prevention in accordance with the administrative plan of occupational safety and health set up by Council of Labor Affairs in order to achieve a “decent work and safe and healthy working environment”.

According to the technology vision of Council of Labor Affairs, Executive Yuan (hereinafter referred to as CLA), “decent work and safe and healthy working environment”, 2013 administrative guideline, “perfect the legal system of labor contracts, promote labor standards, guarantee labor interests in diverse work patterns, and build a fair working environment; improve nationals’ awareness of industrial safety and ensure the occupational safety and health; manage labor situation in Taiwan and other countries, plan proactive labor policies, promote international and cross-strait work guarantee agreement, and strengthen international collaboration and exchange in labor affairs”, and the policy set up by Ministry of Labor in the future golden decade, “proactively manage issues of economic and social development, strengthen capacity in technical research and development, provide policy mediation and recommendations, improve the working environment, and improve nationals’ awareness of industrial safety”, the following five researches are planned with the focus on strategies for disaster reduction, inspection, evaluation, control, and promotion in terms of workers’ operating environment and occupational safety and health:

(1) Strengthen the research on safety application technologies in terms of construction, chemicals, electromechanical field, and management and enhance the research capacity of domestic occupational safety

(2) Built the inspection of working environment and investigation on exposure to highly hazardous workplaces and promote the technologies for improvement and control of operating environment

(3) Develop the evaluation and control technology of occupational physical, biological, and ergonomic hazards and promote the comfortable workplace

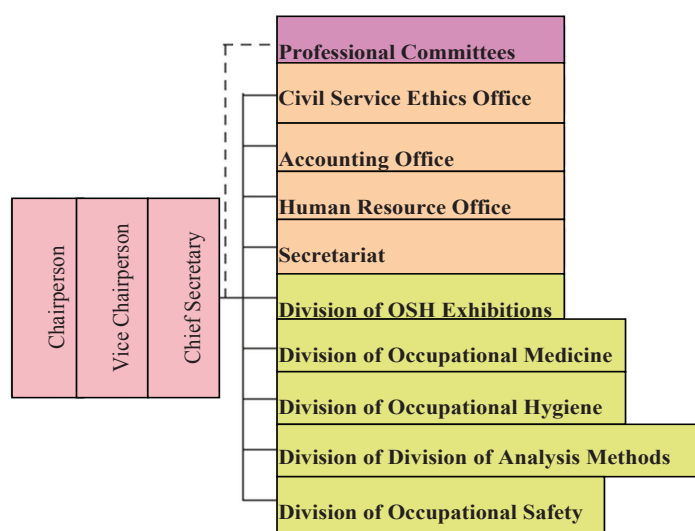
(4) Organize the investigation and inspection of occupational injuries and the occupational disaster prevention for special groups to promote labors' physical and mental health

(5) Organize research achievement exhibition and knowledge distribution to enhance national's knowledge of occupational and industrial safety

In the future, the Institute will continue conducting the in-depth analysis and study on issues of occupational safety and health, enhance international exchange and cooperation, introduce mature technology and standards, proceed cross-field research under cooperation with related academic entities, and promote occupational safety and health through publications, information network, mobile exhibition and technology transfer in order to upgrade the occupational safety and health in Taiwan to international levels.

## 2. Organization and Personnel

The IOSH has one Chairperson, Vice Chairperson, and Chief Secretary, who together oversee and direct the operations of Division of Occupational Safety, Division of Occupational Hygiene, Division of Analysis Methods, Division of Occupational Medicine, and Division of OSH Exhibitions. There are also General Affairs Office, Accounting Office, Human Resource Office, and Civil Service Ethics Office. The number of staff (including two contract-based workers) is 61, among who 49 are research staffs and 12 administrative personnel. Task force units include the Information, Safe Environment, and Promotion Teams. The organizational chart is shown below.



Organizational Chart

### 3. Research Budget

The IOSH research budget for 2013:

Budget Items	Annual Budget (Unit: NT\$)
Occupational Safety and Health Research	191,960,073
Division of Occupational Safety	38,259,696
Division of Analysis Methods	29,806,407
Division of Occupational Hygiene	52,197,074
Division of Occupational Medicine	41,850,792
Division of OSH Exhibitions	29,846,104

### 4. Key Research Projects and Achievement

From the perspective of labor and occupational safety and health policy, occupational health promotion, and research and development and counseling of occupational safety and health technology, IOSH sequentially links the strategies for disaster reduction, inspection, evaluation, control and technical promotion of occupational hazards and develops technologies of disaster prevention for emerging and traditional industries, health protection and assistance for special and vulnerable groups, and occupational risk management and communication. In addition, IOSH cultivates talents in technologies for occupational safety and health, encourages domestic businesses to promote various research results through intellectual property exhibitive and other demonstrating methods, and enhances international promotion and collaboration and exchange in labor affairs. After the comprehensive plan is completed, technologies and services of industrial safety and health with “effectiveness” and economic benefits can be provided for labors and employers.

(I) Expand the business of counseling and improvement in workplace, the technical services of preventing occupational accidents, the technical advisory service and the


It is our priority goal to prevent the occurrence of occupational accidents and injuries, guarantee the workers' safety and health, we work together to guide the workers on the spot, the service of prevention techniques, counseling techniques and the publication of research achievement, we provide 51 consulting services of safety and health technology for government agencies, dealers and publics etc.; we have hosted five conferences of research to promote our research findings; finished exposure surveying of 44 high-hazardous industries' environment; and finished counseling ten manufacturers on site and established three health guidance



techniques; and trained 17 research teams of “the scaffolding evaluation group”, etc., and cultivated 35 master and doctoral students in all to provide a reference to industries and CLA.




1. The completion of the research on prevention of the process hazards of printing inks provide the inspection guidelines for curing process of ultra-violet printing inks and write the guidelines on prevention of inks and paints' process hazards as well as the technical manual of preventing the process hazards of printing inks and paints for the industry.
2. The completion of the research on the spontaneous combustion characteristics of crude oil sludge: we find that this type of sludge's spontaneous combustion occurred when iron sulfide react with oxygen at room temperature, so the owners' prevention-focus is to avoid generating iron sulfide by the sulfur of crude oil reacting with iron vessel.
3. The completion of the countermeasures of forwarding agencies' large occupational accidents characteristics and prevention: propose the recommended actions of the main points of preventing accidents, labor inspection and education and training, etc. aspects to the forwarding agencies.
4. The completion of the prevention of electrostatic hazard during spraying operations: we have visited six spraying factories and conducted hazardous measurement, as well as inspecting and discussing the related preventive technique and countermeasures, and write the “technical guideline of preventing fire and explosion caused by the electrostatic discharge during spraying operations”.
5. The completion of planning study on giving professional training for labor inspectors inspecting chemical plant (II): made four teaching materials that give professional training for labor inspectors to inspect chemical plant-management of change, the hazard of



chemical reaction, piping and instrumentation diagram and process flow diagram, and develop a checklist of “management of change” for the labor inspectors to apply in factory.

6. The publication of three industrial safety warning: “the damp and hot environment in summer may cause solar panels’ cutting and hereby lead to the sludge’s self-ignition”, “pay attention to the welding safety of high voltage pipeline”, “organic solvent with static charges of high-velocity flow, no spraying way to entry material and not to expose it in the air; and seal with nitrogen to avoid fire and explosion”.
7. The research and analysis of building workers’ musculoskeletal disorders and physical load: propose to stipulate each work’s standard operation procedure and review whether the relevant assistive devices and protective clothing can be provided to decrease the injury from bad working posture, repetitiveness operation and transporting heavy goods, etc.
8. . The completion of research on various reactors’ explosion of nano mental power under the high speed stirring: we found that when installed ground coil in the vessel and stirring with nano-aluminate powder, it explodes, therefore we speculate that the powders explosion may be caused by the bumping between vanes and mental coil that generated sparks, then exploded; and we put forward related prevention measures according to the test results.
9. The survey on the exposure hazard of harmful substances caused by jeans garment process operations: we suggest manufacturers provide protective devices that are suitable for each individual for workers’ proper use in the regions of having cotton dust and noise hazards.
10. The research on safety and health counseling at the dying and finishing industry: we have counseled five dying and finishing factories that amount two thousand people, and established three whole health counseling techniques of improving the hazards of mechanical equipment and the hazards of electric shock, and the prevention of fire and explosion to provide reference for business and this city safety and health bureau.
11. The evaluation research on the exposure of spraying organophosphorus pesticides on planting crops: we suggest employers should ask workers to participate in the training of pesticides spraying technique personnel before the worker working on spraying, and supervise workers to wear proper personal protective equipment.
12. The survey and technique study on improving socks manufacturing factories’ safety and health status: since there are fewer workers in socks manufacturing factory, the issues related to workers’ safety may be easily neglected, so we suggest CLA conduct safety and





health advocacy and education and training in socks manufacturing factory to prevent and decrease the occupational accidents.

13. The study on decreasing factors and preventing strategies of electrocution in domestic workplace: strengthen the electrified hazard prevention advocacy among self-employed operators and foreign workers, and cooperate with local government or industrial districts to conduct the advocacy of electrified hazard, guiding and inspection.
14. The research on the explosion hazards that microns and nano iron transferred in pure oxygen: we suggest bring old cylinders electrostatic countermeasures into the examination of labor inspection.
15. The analysis and research of different safety belts on the forces of human body: we suggest not conduct elevated operation when the safety belt is too loose, and not wear the safety belt that has gone through the falling.
16. The evaluation of biological exposure at the operation site of slaughtering industry: we suggest install ventilators on the operation site to increase circulation effect so as to decrease the aerosol concentrations of environmental bacteria and fungal organisms. When the slaughterer directly contact the animal body, we suggest that workers should wear personal protective devices(which includes gloves, face masks and working clothes), and use soap to wash intensively after work to decrease the biohazard risk.
17. The planning research of giving professional training for labor inspectors inspecting chemical plant(II): we put forward a proposal of the thirty-hour course plan that give professional training to inspect chemical plant.
18. The discussion of Taiwan nursing personnel's environment and their physical and mental health: the "Holmes and Rahe Stress Scale of nursing personnel traits" can be used as an evaluation tool for the nursing personnel's source of occupational stress in every level of hospitals, to know the risk of the nursing personnel's occupational stress.
19. The investigate and study on workers exposure to formalin and dust in plywood industry: this exposure evaluation shows that the health risks on workers of exposing to formalin and dust in plywood industry is low, but we still suggest manufacturers continuously proceed the imperative hazard communication with employees.
20. The total of five papers was published in the international seminar, such as "Electrostatics 2013", "the twelfth international electrostatic seminar", "the 2013 industrial hygiene and international academic seminar on environmental occupational medical", "the forty

fifth north European engineering seminar”, and “the forty ninth toxicology international seminar”.

21. The total of ten papers was published in the domestic seminar, such as, “the 2013 occupational health seminar”, “the twentieth humanengineering academy annual and academic seminar”, “2013 seminar on labor relations globalization and the prospect of human resources”, “2013 environmental analysis seminar”, “scaffolding safety seminar and demonstration”, “2013 occupational safety seminar”, “the seminar on challenge and prospects of pension system”, “the seminar on maintenance management that integrated with MI and RBI”, “the twenty sixth academic seminar an Acoustical Society of Taiwan ”, and “the thirtieth national academic seminar in Chinese Mechanical Engineering Society”.
22. Held five “102 annual research achievements presentation of labor safety and hygiene research institution” in north, central, south, east and Kinmen, to promote our research achievements.
23. Trained seventeen research groups of “scaffolding’s performance evaluation group”, “identification group on occupational accidents”, “ventilation system’s performance evaluation group”, “identification group on occupational accidents”, “the deliberation working group of suggested permissible norm on the factor of occupational accidents”, “the evaluation group on musculoskeletal hazard and exposure”, “the mentoring team on occupational safety and health and energy saving”, “the steering group on self-managing the safety and health in workplace”, “the team that creating the management platform of the warehouse system of occupational accidents database”, “the promotion and research group of safety and health presentation ”, “the research team of labor inspection policy”, “the group of emergency management and security surveillance”, “the group of diagnosing and training safety culture”, “the consulting experts group of the labor study strategy”, “the advocacy group of preventing aboriginal’s occupational disaster”, “the beauty salon workers occupational hazards exposure and health promotion group”, and “the vocational evaluation group on visual disabilities”, etc.

## (II) Research and promote the new safety and health technology for application in industries

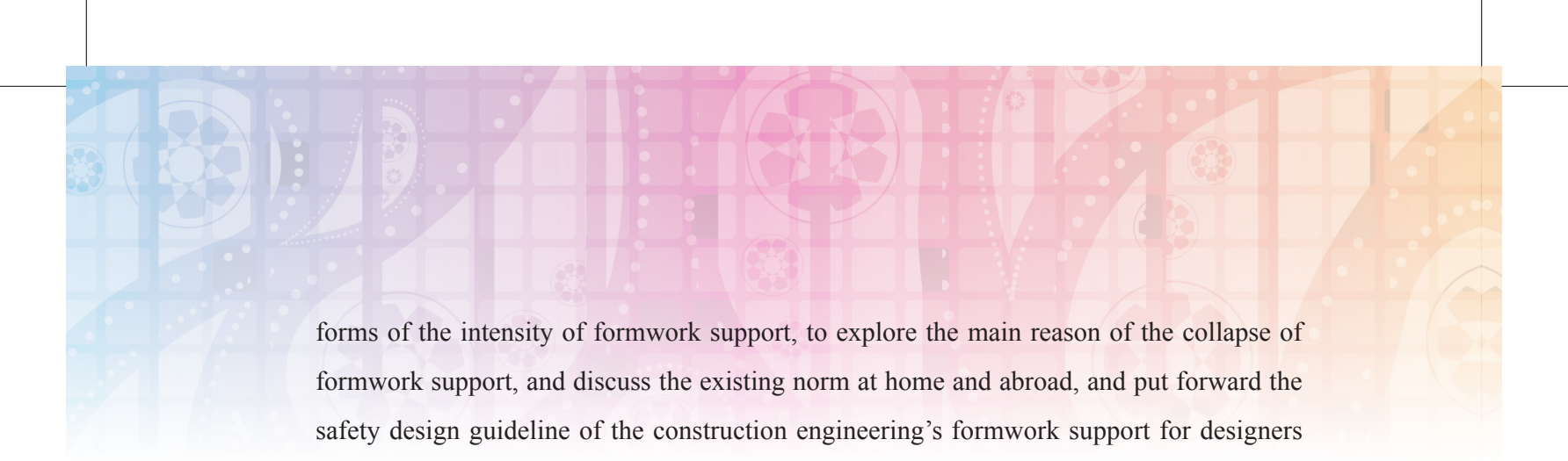
Along with the fast development of science and technology and intensified transition of workplace patterns, in order to acquire exposed profiles of work environment’s hazards in Taiwan, we here by proceed research on both relevant and urgent hazard assessment, and



formulate the strategy and method of preventing hazards for use or application in industries, as well as enlarge the cooperation and promote the results to other relevant department and civic groups. Our obtain one foreign patent this year, and 49 maintenance patents, among them, there are 36 domestic patents and 14 foreign patents; and transfer nine technology that obtained \$519, 680 of patent licensing fees and derivative fees and \$345, 000 of premium; which gained totally \$955, 960 of research achievements in all. This fully presented our ability on research and technology transfer, and we provide new safety and health improvement technology for the public institutions' application, that provide workers a safer and healthier and more friendly environment.


1. The completion of the study on safety operation for wet bench in LED process: make safety checklist of chemical cleaning equipment for dealers and inspectors, and the guideline of preventing the hazards from chemical cleaning equipment for the dealers.
2. The completion of evaluation research on equipment's integrality and tank's applicable criteria: we put forward the technique guideline of inspecting petrochemical industry with venture capital, equipment integrality and maintenance, which can provide reference to petrochemical industry for manage and inspect that being as an equipment pipeline.
3. The completion of the discussion of the stability of formwork support and safety design standard: analyze the stability of formwork structure, and conduct entity test to different

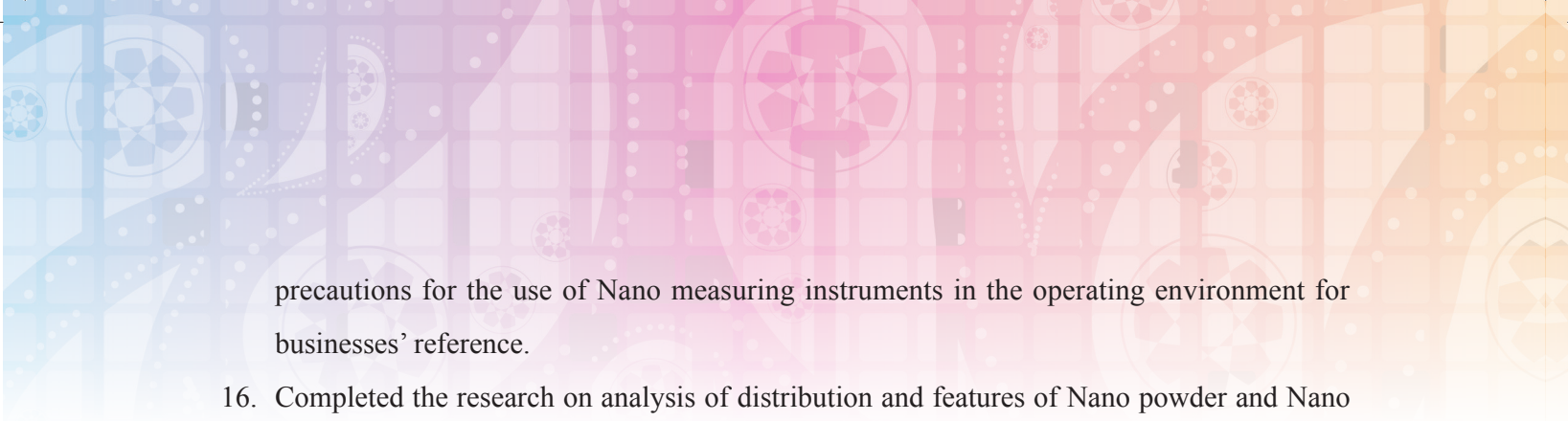




forms of the intensity of formwork support, to explore the main reason of the collapse of formwork support, and discuss the existing norm at home and abroad, and put forward the safety design guideline of the construction engineering's formwork support for designers reference.

4. The completion of research of applying smart handled recorders to the construction safety risk management: integrated the on-site inspection, safety management and information technology, and finished organizing and developing the electronization and remote recording of each operations that go with the function of statistic analysis, which can give back checking information to safety management center in time, which improves the effectiveness and efficiency of safety inspection carried out by public construction institutions
5. The completion of the planning, design and building of safety supervisory system: integrate the monitoring system, disaster prevention devices and the judgment on their relationships for public institutions reference.
6. Accomplish occupational safety and sanitation research of the tire manufacturing industry: assess health harmfulness of the labor working environment in the tire manufacturing industry, and propose the improvement suggestions for the reference to the public institution.
7. Accomplish the practice researches of the thermal harmfulness preventions and inspections of the high temperature outdoor workers in our country: collect and analyze the prevention guidelines and the management measures of the high temperature working environment development in America, Canada, EU, and Japan, providing the reference of the thermal harmfulness preventions to the association.
8. Accomplish the draft that discusses and formulates the harmfulness preventions of the hornet: will continuously collect the distribution of the hornet and the sting cases in our country, and will project the characteristics of the hornet and the avoidance effect test, providing the reference of the harmfulness preventions of the hornet in outdoor workplaces.
9. Accomplish the discussion and study of the simple evaluating techniques of the ventilation installation: will compile the past technical literature, use this technological manual as the teaching materials to train the personnel in the public institution, assess the ventilation effect and to provide the reference to the safety and sanitation personnel of the public institution.

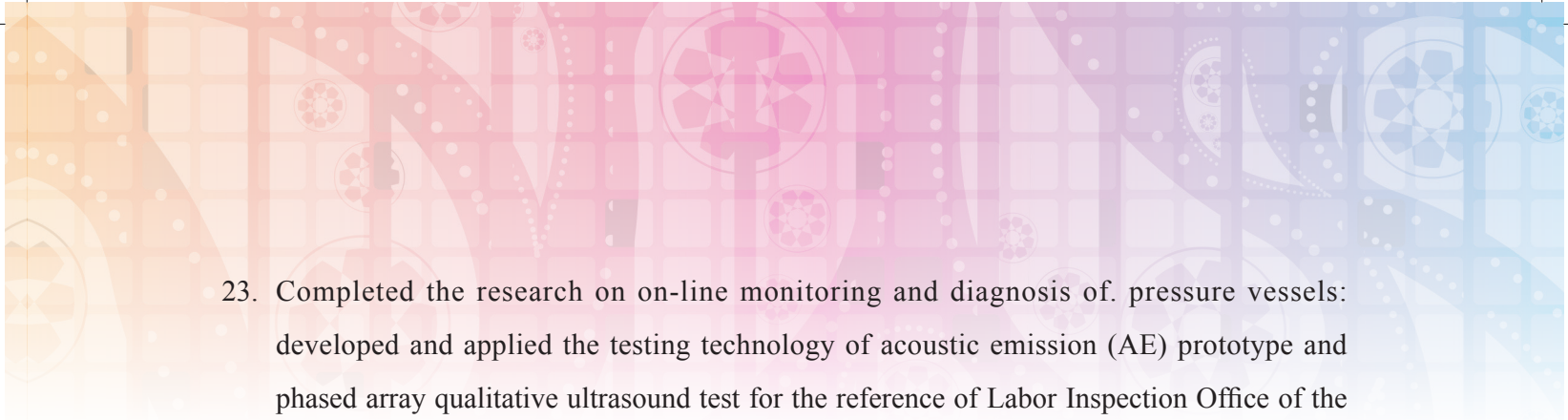
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10. Accomplish the design and strategy research of the specific ventilation installation in 3K industry: systemize the relevant design concept data of the ventilation installation, by systemizing the graphic, coordinating the policy to master the dissipation condition of the harmfulness in 3K industry, and combining the working environment conditions and the design graphic, to come up with the improvement suggestions of the ventilation installation for the reference to the workers.
  11. Accomplish the research of the gas movement trend which is affected by the attaching effect: find the physical conditions that allow the existence of the gas attaching effect through experiments, and make the container surface model that can prevent the happening of the attaching and overflowing phenomenon and the air outlet dynamic model of the attaching effect, these models can be used in the research results exhibition activity of the institution, and provide the reference to the ventilation design.
  12. Completed the research on evaluation and analysis of labors' exposure to workplaces with low-frequency electromagnetic waves and high generating sources: proposed the measurement of low-frequency non-ionizing radiation in domestic workplaces, set up standards for evaluation, which helped evaluate the practical situation of labors exposed to low-frequency magnetic fields, and provided them for reference of businesses and operating personnel when carrying out protective measures.
  13. Completed the research on development and design of new earplugs and survey on comfort: used the database of external auditory meatus measurement to carry out the analysis, revised the size of nationals' canal auditory meatus, and explored the comfort of earplugs through questionnaires; in addition, used the analytic result of statistics to improve the comfort of earplugs and increase labors' willingness to wear earplugs.
  14. Completed the evaluation of effectiveness of air sampling method for *staphylococcus aureus*: compared and analyzed different samplers and media in labs and proposed the preliminarily feasible air sampling method and improvements in subsequent research for future reference.
  15. Completed the research on control of special Nano particle and exploration of protective technologies: measured the number concentration and weight concentration of Nano particles exposed in the operating environments and provided them for the reference to evaluation of exposure risk; evaluated the factors which influenced the measurement of different instruments of Nano particles and precautions upon comparison, and proposed the

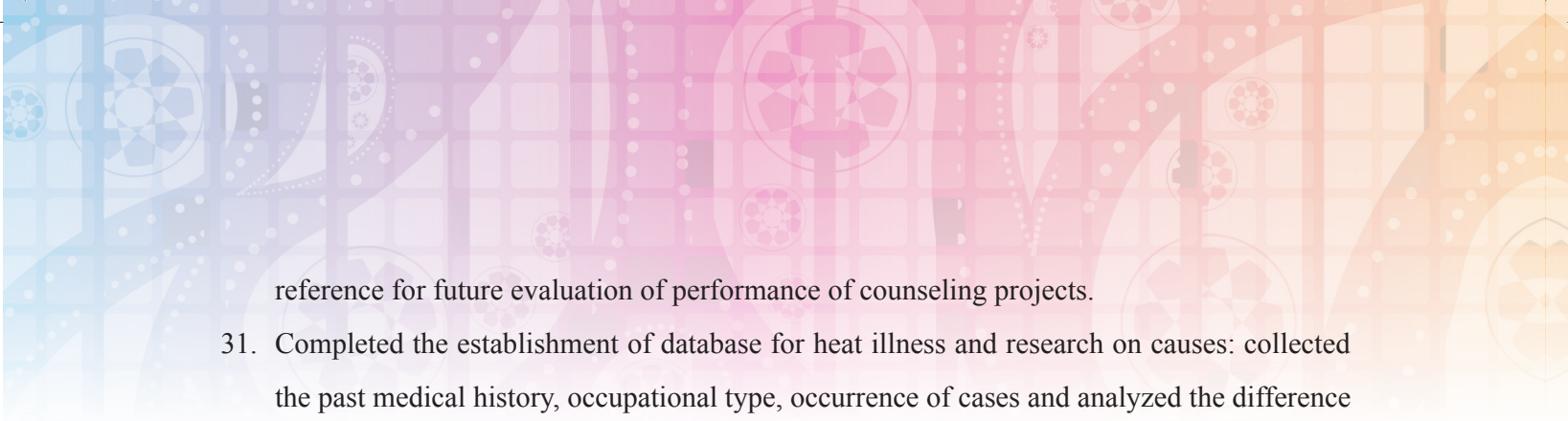


precautions for the use of Nano measuring instruments in the operating environment for businesses' reference.

16. Completed the research on analysis of distribution and features of Nano powder and Nano carbon tubes: modified the locally-designed concentrated Nano particle samplers, and the Nano particles collected by transmissive electron microscope could be used to evaluate the labors' exposure to Nano particles in the workplaces.
17. Completed the research on evaluation of labors' cardiovascular effects due to exposure of Nano metal particles: the Nano metal particles collected in the operating sites would cause the survival rate of cells to reduce significantly, the increase in oxidative stress, and inflammation. Thus, the Institute set up the PEL of zinc oxide in the air in the operating environment and provide it for Department of Occupational Safety for reference.
18. Completed the metal fume sampling methods and efficiency of collection of different metal fumes: the sampling method of filter cassette connected with impingers is better than the existing method in terms of efficiency of collection of different metal fumes.
19. Completed the design of two types of sub-micron particles removing equipment-virtual cyclones and water-film particle impingers: used the measuring technology of Nano particles with standard size to evaluate the cementation of Nano particles, developed or improved traditional technical application to exposure evaluation of Nano particle exposed to the operating environment, and explored the feasible technologies for establishment of skin exposure to Nano particles and biological indexes.
20. Completed the research on measurement and damage judgment of damping of supporting structure of draglifts: in addition to visually inspecting the flaws of supporting structure of draglifts, it was recommended that inspectors use wrenches and hammers to test the attachment. Besides, load tests could record the structural displacement or strain for subsequent follow-up of safety.
21. Completed the dynamic analysis of mobile crane lifting operations: simulated different tilting slopes, windward side, scope of operations, fluctuation angle, and lifting weights, proposed recommendations for lifting safety and systemic stability of overturn prevention, and provided them for applications to operations and teaching materials.
22. Completed the exploration of design of stage introduction of machinery safety standard for risk reduction and case study: proposed the risk evaluation manual based on the design of machinery safety for reference of competent entities and businesses.



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23. Completed the research on on-line monitoring and diagnosis of pressure vessels: developed and applied the testing technology of acoustic emission (AE) prototype and phased array qualitative ultrasound test for the reference of Labor Inspection Office of the Council and related inspection units.
  24. Completed the analysis of factors of occupational disasters of highly hazardous operations and safety protection: proposed the press release of electrified hazards and checklists and precautions of industrial alert of hydrogen leak for reference of related entities.
  25. Completed the research on planning of safety passages and stairs, and safety facilities, for system shoring supports: established the guideline for safety passages and stairs, and safety facilities, for system shoring supports; held the promoting seminar for safety passages and stairs, and safety facilities, for system shoring supports. The research result was provided for reference of civil work-related businesses, structure engineering associations, and civil engineers associations.
  26. Completed the study of the usability and safety of fall-prevention facilities: proposed the countermeasures for use of fall-prevention facilities, improved the labors' awareness of operating safety, and proposed the modification and setting mode of existing fall-prevention facilities in Taiwan.
  27. Completed the research on health effects of chloroprene rubber adhesives for workers in manufacture and operating workplaces: carried out the environmental monitoring and survey on exposure in operating workplaces of three factories and provided them for businesses' reference to improvement in working environments.
  28. Completed the research on exposure assessment of metallic fume from welding processes in pressure vessel manufacturing industry: managed and understood the research on exposure assessment of metallic fume from welding processes in pressure vessel manufacturing industry and established the database for exposure assessment in Taiwan.
  29. Completed the research on safety and hygiene assessment on manufacturing process of photovoltaic industries: managed and understood the survey and research on exposure of hazard substances in manufacturing process of photovoltaic industries and established the database for exposure assessment in Taiwan.
  30. Completed the evaluation of the Effectiveness of Disaster Reduction from Governmental Safety and Health Consulting Program for Small- and Medium-Scale Business: followed up the performance of improvement in 20 traditional manufacturing and provided it as the

- 
- reference for future evaluation of performance of counseling projects.
31. Completed the establishment of database for heat illness and research on causes: collected the past medical history, occupational type, occurrence of cases and analyzed the difference between cases and control groups as the reference to heat illness prevention.
  32. Completed the evaluation of the performance for the removal of bioaerosols in workplaces using metalworking fluids: explored the efficacy and factors of ventilation facilities in workplaces using metalworking fluids and compiled the report for ventilation protective technology and management in workplaces using metalworking fluids as the reference for businesses.
  33. Handled the research on relationship between the non-operating human-computer interface design and major occupational disasters: explored and understood the influence of improper design of human-computer interface on major occupational disasters in Taiwan, proposed strategies for improvements, analyzed the specifications of existing human factors, and established the checklist of human-computer interface as the reference to businesses.
  34. Completed the research on workers' hazardous exposure survey in ceramic manufacturing industry: isolated or improved the operating areas with serious dust emission, and controlled dust emission to effectively reduce the concentration of dust exposure in the entire factory.
  35. Completed the survey on workers' exposure to heavy metals during manufacture and cut construction boards and bricks: the concentration of dust in the cutting operating area, sanding operating area, and papermaking operating areas is higher. It was recommended that the composition of ash be confirmed further to prevent workers from being excessively exposed to hazardous substances outside dust.
  36. Completed the research on safety and hygiene assessment on manufacturing process of photovoltaic industries: managed and understood the research on exposure assessment of hazardous substances (gas, particle and inorganic acid) in photovoltaic industries, established the database for exposure assessment in Taiwan. The research result was provided for businesses as the reference to environmental inspection.
  37. Completed the research on assessment of safety and strength reduction in aged scaffold: proposed the analysis of factors of disasters due to frequent use of aged scaffold and provided it for operating personnel as the reference to disaster prevention.
  38. Developing the sampling method for analysis of 1,1,2,2-tetrachloroethane, methyl

n-butanone, cyclohexanol, naphthalene and methyl formate and provided it for CLA's reference.

39. Completed the development of a localized vocational evaluation tools for visually impaired workers: provided the developed vocational evaluation tools for visually impaired workers for Vocational Training Center of CLA apply to the employment matching.
40. Completed the collection of questionnaires on labor happiness and labor human right in OECD, UN, EU, France, UK, Japan, ILO, and Taiwan. The research result could be included in the reference of structured questionnaire for future employees.


### ( III ) Study on applications in proactive policy development, regulatory, and institutional improvements, as well as standard-setting measures

Through proactive data collection domestically and internationally, the IOSH provided the solution to occupational safety and health problems and countermeasures for protection for emerging and traditional industries and drafted amendments to various regulations and standards as well as improved safety and health system and set up strategies for disaster prevention in response to the administrative plan of occupational safety and health set up by Ministry of Labor. In 2013, the IOSH completed 7 amendments and references to Acts and Regulations of “heat hazard”; completed 3 the sampling methods for analysis of three hazardous substances; completed the five proposals of special health examination: established the database




for 18,520,000 case of occupational injuries, “health surveillance of occupational disasters prevention in labor insurance” for 380,000 data, and database for reports on occupational needle sting for 12,179 data, updated the database for healthy physical norm in manufacturing for 932 data, and set up the database for working ability index in manufacturing for 932 data as well as the database for survey on exposure of hazardous substances for 2,256 data. The





IOSH established dignified labor and health and safety working environments and created an opportunity for industries to achieve sustainable development.

1. Completed the research on exposure assessment of organic solvents of workers of automobile manufacturing, body repair and spray painting: although the on-site concentration in private-run automobile repairers was lower than the regulatory standard, the operating workers shall improve their knowledge of safety and health of spray painting.
2. Completed the research on the hazard assessment of silica exposure in stone manufacturing industry: according to “Dust Hazard Prevention Standard”, operating workers did not need to wear protective gears in the wet operation and no ventilation equipment was needed. It was recommended that the standard be amended, or the necessary ventilation equipment and personal protective gear be added to the description of first and second dust exposure.
3. Completed the study on exposure of hazardous substances for footwear industry workplaces: caviled and the promotion of occupational safety and health in footwear industry, including the organic solvent act, prevention of occupational illness, regulations of knowledge of hazards, and information on prevention of additives hazards to health, in order to protect labors’ health.
4. Completed the review and deliberation of factors and recommended exposure limits (RELs) for workplace chemical hazards (II), including vinyl chloride and other two substances: finalized the document of recommended exposure limits (RELs) for workplace chemical hazards (II), including vinyl chloride and other two substances, listed it in the “Notice of In traded Charged”, and published it with references on the website of the Institute for three months for external review.
5. Completed the study on sleep management for directors of labors: completed the quality of sleep for directors of labors using single-signal ECG for automatic identification and verified the feasibility. It was recommended that it be included in the reference of Labor Safety and Health Act in the future.
6. Completed abnormal cases analysis of labor insurance data on physical examinations for occupational disease prevention: added the English script to Item 26 and 27 of health examination in accordance with amendments to Labor Safety and Health Act and provided it for Bureau of Labor Insurance and 145 hospitals.
7. Completed the standards and discussion of explosion-protected non-electrical equipment for use in explosive atmospheres: summarized and analyzed the standard (EN 13463 series)



relating to explosion-protected non-electrical equipment in the guideline of ATEX. It was recommended that the standard of explosion-protected non-electrical equipment be adopted in Taiwan before the international standard is set up.

8. Completed the evaluation of the correlation between occupational exposure and cardiovascular disease: according to the survey on the structural cardiovascular diseases, about 10% of 250 labors in the high-risk group suffered from structural cardiovascular diseases. However, no specific symptom occurred in daily life. After the evaluation, the occurrence of structural cardiovascular diseases was influenced by personal work load, fatigue, and organizational stress. The evaluation was provided for businesses as the reference to health management.
9. Completed the research on effects of occupational exposure on the health of interior decoration carpentry workers: conducted the measurement analysis of lung function and biological effects urine specimen of free silica for interior decoration carpentry workers in North, Central, and South Taiwan. The samples of 10 workers (8.3%) included respirable crystalline free silica, which had no relationship with F2-IsoPs in urine. It was recommended that occupational safety and health education and engineering control be strengthened to reduce the possible exposure to dust hazards.
10. Completed the epidemiological study for lung adenocarcinoma in cooks: established the method for analysis of polycyclic aromatic hydrocarbons in cooking smoke and the method for analysis of aldehydes and provided them for CLA's reference.
11. Completed the hairdressers exposed to occupational hazards and health protection in assessment studies: when handling the occupational education promoting seminar of hairdressers, it was recommended that indoor ventilation, use of protective gears, long standing, and working hours be improved.
12. Completed the research on workplace health management program for aboriginal workers: completed the improvement in the weaving machine in one weaving business, solved the musculoskeletal pain due to non-coordination of human and machine (human factor engineering); reallocated the lighting equipment to improved the visual fatigue. In addition, counseled the employers to build a health-friendly and supportive environment, such as providing exercises and training in during work, spontaneously promote the improvement in stay-up and sleepy conditions through health promotion, and compiled the health management manual based on the model in order to effectively improve the occupational



hazards and health promotion for indigenous workers.

13. Completed the collection and exploration of marketing supervision of mechanical appliances after type certification in every country: referred to ISO 17020 to carry out the review and management of operating qualification of private manufacturing verification and testing institutes, and conduct sampling tests of mechanical appliances in the market or production lines in manufacturers in order to meet the compliance with production and verification.
14. Completed the construction of a workplace mental health promotion model: interviewed 27 employees in four enterprises and set up the preliminary model of workplace mental health management and provided it for businesses to build related measures and healthy workplaces.
15. Completed the survey of perceptions of safety and health in the work environment in 2013 Taiwan: understood the safety and health condition of 21,000 workers and conducted the survey on workers' perception of safety and health in the work environment, health examination and safety and health education, physical and mental health condition and healthy behaviors as the reference to prevention of occupational injury and policy and research on safety and health.
16. Completed the study on physical fitness and work ability among aging workers: the result showed that the quality of sleep, eating habits, flexibility, muscular endurance, and cardiorespiratory function were factors in work ability among aging workers. The promotion of physical fitness helped promote work ability among aging workers. In addition, the Institute updated the norm of physical fitness in manufacturing, established the database for index of work ability, and provided them for the Council to plan the policy of employment and health promotion among aging workers in the future.
17. Completed the research on current status of use of hazardous substances in science and industrial parks: the database could provide more thorough information on prevention of hazardous substances and harmful materials for businesses to make decisions in case of emergency.
18. Completed the analysis of occupational slipping and falling cases: according to Article 21 of Rules of Occupational Safety and Health Facility, "Employers shall keep the passages, floors, and stairs in workplaces in a safety condition which will not cause workers to fall, slip, and trample, or take necessary preventive measures". It was recommended that the



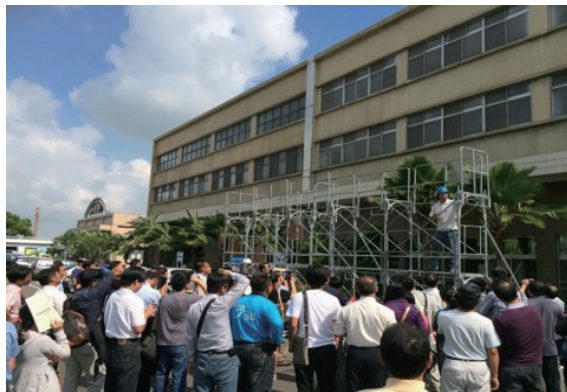
falling prevention and management measures shall be added and amended in details in order to promote the prevention of falling hazards.

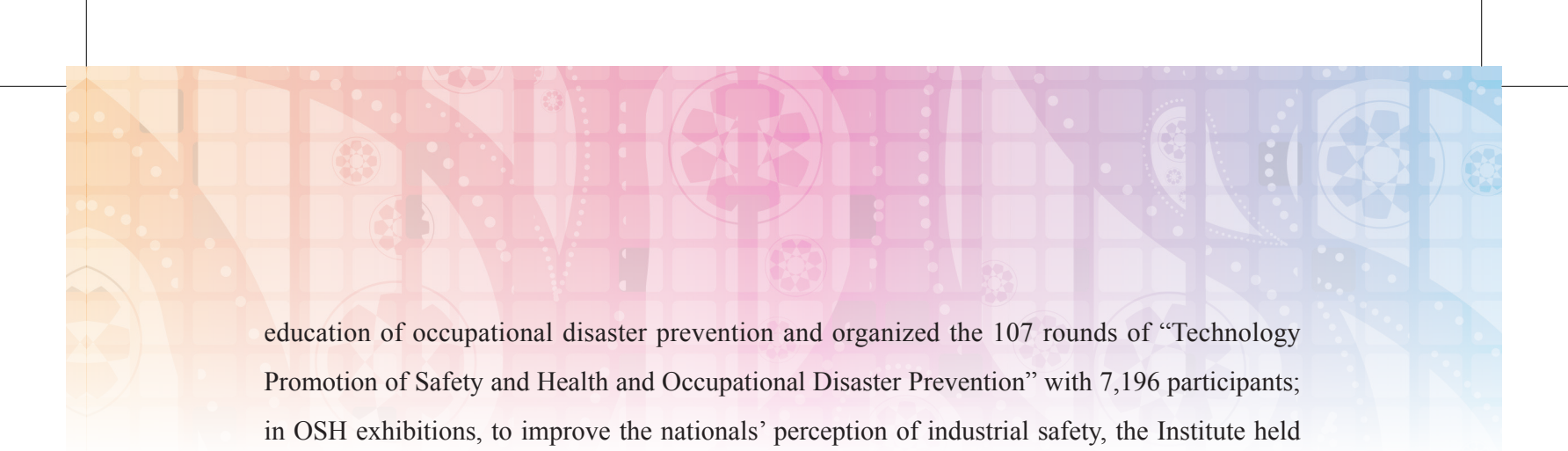
19. Completed the research for improvement for occupational safety inspection techniques (2): compiled the manual of prevention of phenol formaldehyde reactions for businesses to refer to, and completed the evaluation of drafted manual of safety and health examination.
20. Completed the mechanism for mobile crane boom fracture the research on technologies of dynamic examination: proposed the guideline of examining technology of mobile crane booms and provided it for Labor Inspection Office and related inspecting units.
21. Completed the research on establishment of a supervision system for construction safety: explored the matters of safety and health to be inspected and the implementation based on the contract of supervising vendors, and planned the drafted contract of occupational safety and health supervision for the reference of the Council, construction owners and related entities.
22. Completed the research on exposure assessment of hazardous substances in the fiberglass reinforced plastics industry: evaluated six FRP manufacturers and recommended manufacturers that they improve the operating environments where the concentration of hazardous substances exceeded regulatory limits.
23. Completed the research on sampling technologies of analysis of hazardous substances: completed the recommended exposure limits of workplace hazardous factors, including acetone, vinyl chloride, and indium tin oxide and provided them for Council's reference to the establishment of exposure limits of workplace hazardous factors.
24. Completed the feasibility assessment for guideline development of bioaerosols in occupational environments: collected international bioaerosol exposure guidelines/standards , investigated the current status of exposure of bioaerosol and risks of health in workplaces with high biological hazards, and explored the feasibility of establishment of bioaerosol exposure guidelines/standards in our country.
25. Established 380,000 data in "inspection of health examination for occupational illness prevention in labor insurance", and conducted the analysis of major causes of death. The result showed that cancer, accidental injuries, and heart diseases were three major causes which led to the death of labors, which were significantly different from the rankings for nationals. The result was provided for the Ministry to refer to when planning the policies relating to occupational safety and health.

26. Established 12,179 data in the “database of report on occupational needle stings”. According to the statistics based on occupational types, location and objects of needle stings, the most frequent occurrence was in wards; most of nursing personnel were stung by disposable syringes in specific steps during treatment; most of doctors were stung by suture needles in operating rooms during operation. Most cases were reported to be nursing personnel since the number of nursing personnel was larger than personnel with other medical types; the organization and allocation of duties in the nursing division were clearer and nursing personnel tended to well abide by the policies, so the education and promotion of needle sting prevention was easy to be effective. Compared to 2012, the number of needle sting cases was reduced by 983 in 2013.
27. Regularly updated and analyzed the occupational illness monitoring system and health database for aboriginal people and managed the trend of occupational illness for aboriginal people. By December 31, 2013, the number of insured indigenous people was 149,088. In 2013, the number of occupational disasters was 888 (7 cases for death, 88 cases for disability, and 793 for injuries), which was reduced by 2.4% compared to 910 cases in 2012 (11 cases for death, 83 cases).

#### (IV) Strengthened resources sharing and applications of safety and health technology, facilitated safety and health knowledge communication

The IOSH combined the local cultural and creative industries and the research results, improve the nationals’ perception of labor and industrial safety, and enhanced the establishment of safety and health knowledge network; published 100 publications, including journals and research reports; allowed 189,0000 users to browse or download the entire e-research results; organized 8 forums for labors, employers, politicians, and scholars; held five rounds of research result conference across Taiwan to promote the research results of the IOSH; fulfilled the





education of occupational disaster prevention and organized the 107 rounds of “Technology Promotion of Safety and Health and Occupational Disaster Prevention” with 7,196 participants; in OSH exhibitions, to improve the nationals’ perception of industrial safety, the Institute held special exhibitions, regular exhibitions and 15 tour exhibitions with 180,000 visitors. Experts from Institute of Safety and Health in UK and Institute of Occupational Safety and Health in Singapore visited the IOSH. Through the visit of international VIPS, the important results of research on safety and health and emphasis on labors’ life in Taiwan could be demonstrated and promoted.

1. Completed the research on safety culture and management strategies: organized the “2013 Technology Promotion of Safety and Health and Occupational Disaster Prevention” with North Area Labor Inspection Office of the Council to improve labors’ knowledge and skills of safety and health; organized “2013 Taiwan Safety Cultural Forum and Safety and Health Visit”, invited representatives from international enterprises to publish presentations, and provided the safety and health communication platform, which helped businesses improve the safety culture and performance of safety.
2. Organized the two-day “Scaffolding Operating Safety Seminar and Demonstration” and 563 and 470 people participated in the seminar in each day. The Seminar carried out the exchange for results of research on scaffolds to increase participants’ understanding of scaffolds; demonstrated the scaffolds and safety facilities for participants to visit and observe; and demonstrated and explained the safety technique drill to improve the safety of scaffolding operation.
3. Organized “2013 Conference on Environmental Science and Technology” and about 400 experts and scholars in this field participated in the conference.
4. Promoted the research on the control, technologies, counseling, and management system of improvement in working environments: completed the follow-up and technology promotion of safety and health counseling and improvement in surface processing industries and held three promoting events in North, Central and South Taiwan.
5. Organized 8 forums for labors, employers, politicians, and scholars, including the work guarantee for labors stationing overseas, basic wage system and roles, labor happiness index, supply and demand of workforce in electronic components manufacturing, and invited representatives from labors, employers, politicians, and scholars to participate in the discussion.



6. The e-research results were published on the “Publish” of the website for the 1,890,000 users to browse and download and effectively promote the exchange of knowledge of safety and health.
7. Organized the management of Division of OSH Exhibitions of the Institute and actively invited schools, unions, and governmental entities to visit. The annual number of participants was 12,052 and 30 training courses were held.



8. To improve nationals' perception of industrial safety, the Institute cooperated with National Museum of Natural Science to organize “Industrial Safety Visual Exhibition” on May 22, 2013 for five months with 46,395 visitors.
9. Organized the “Occupational Safety and Health Hazard Prevention National Tour” and completed 15 activities in Gangshan Toll Station of Taiwan Area National Freeway Bureau, Department of Labor, Taipei City Government, Chaoyang University of Technology, Southern Taiwan Science Park, Taiwan Industrial Park Information Service, Kinmen Kaoliang Liquor Inc. with 125,071 participants.
10. To fulfill the education of occupational disaster prevention, the Institute and Labor Inspection Office of the Council cooperated with North Area Labor Inspection Office, Central Area Labor Inspection Office, and South Area Labor Inspection Office, Kaohsiung Labor Inspection Office, Labor Affairs Department, Tainan City Government to organize “Technical Promoting Plan of Safety and Health Prevention of Occupational Disasters” and hold 107 rounds with 7,196 participants as of December 31, 2013.
11. Completed the production of 3D animation “Death hit the jackbox”—objects falling down.
12. Published 100 governmental publications, including research reports, technical books, annual report, and safety and health e-books; published four quarterly journals and six occupational safety and health texts on Category; and provided them for 249 governmental

- entities, 253 colleges and libraries, and 208 unions for free.
13. Held annual research result conference through themes, forums, issue publication, sale of publications, and result promotion in Taipei, Taichung, Kaohsiung, Hualien, and Kinmen with 1,314 participants.
  14. Promoted the application of technology transfer and held three patent promoting seminars in Taichung, Tainan, and Taipei to promote 11 patented technologies of “wireless sensors and real-time systems of Scaffolding safety”.
  15. 9 students in PhD and Master Programs of College of Public Health, Harvard University visited the IOSH. The visit included Division of OSH Exhibitions and labs of Division of Occupational Safety and Division of Occupational Hygiene, and opinion exchanges exchange for international safety and health trend.
  16. Mr. Gregory Junemann, Vice Chairman of AFL-CIO and other 9 personnel visited the IOSH under the lead of the Council. Through the visit of international VIPS, the important results of research on safety and health in Taiwan could be demonstrated and promoted.
  17. Edward Morland, Director of Institute of Safety and Health in UK and Jukka Takala, Director of Institute of Occupational Safety and Health in Singapore visited the IOSH and carried out academic exchange for international safety and health development.
  18. Appointed personnel to publish articles in Switzerland, Hungary, and Iceland and make arrangements with international cooperation.



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