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2012 Modularization of Korea's Development Experience:

Establishment and Operation of Industrial Accident Prevention System

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Ministry of Employment and Labor

OSHRI

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Preface

The study of Korea's economic and social transformation offers a unique opportunity to better understand the factors that drive development. Within one generation, Korea has transformed itself from a poor agrarian society to a modern industrial nation, a feat never seen before. What makes Korea's experience so unique is that its rapid economic development was relatively broad-based, meaning that the fruits of Korea's rapid growth were shared by many. The challenge of course is unlocking the secrets behind Korea's rapid and broad-based development, which can offer invaluable insights and lessons and knowledge that can be shared with the rest of the international community.

Recognizing this, the Korean Ministry of Strategy and Finance (MOSF) and the Korea Development Institute (KDI) launched the Knowledge Sharing Program (KSP) in 2004 to share Korea's development experience and to assist its developing country partners. The body of work presented in this volume is part of a greater initiative launched in 2010 to systematically research and document Korea's development experience and to deliver standardized content as case studies. The goal of this undertaking is to offer a deeper and wider understanding of Korea's development experience with the hope that Korea's past can offer lessons for developing countries in search of sustainable and broad-based development. This is a continuation of a multi-year undertaking to study and document Korea's development experience, and it builds on the 40 case studies completed in 2011. Here, we present 41 new studies that explore various development-oriented themes such as industrialization, energy, human resource development, government administration, Information and Communication Technology (ICT), agricultural development, land development, and environment.

In presenting these new studies, I would like to take this opportunity to express my gratitude to all those involved in this great undertaking. It was through their hard work and commitment that made this possible. Foremost, I would like to thank the Ministry of Strategy and Finance for their encouragement and full support of this project. I especially would like to thank the KSP Executive Committee, composed of related ministries/departments, and the various Korean research institutes, for their involvement and the invaluable role they played in bringing this project together. I would also like to thank all the former public officials and senior practitioners for lending their time, keen insights and expertise in preparation of the case studies.

Indeed, the successful completion of the case studies was made possible by the dedication of the researchers from the public sector and academia involved in conducting the studies, which I believe will go a long way in advancing knowledge on not only Korea's own development but also development in general. Lastly, I would like to express my gratitude to Professor Joon-Kyung Kim and Professor Dong-Young Kim for his stewardship of this enterprise, and to the Development Research Team for their hard work and dedication in successfully managing and completing this project.

As always, the views and opinions expressed by the authors in the body of work presented here do not necessary represent those of the KDI School of Public Policy and Management.

May 2013

Joohoon Kim

Acting President

KDI School of Public Policy and Management

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Summary

This report presents Korea's experience and knowledge on the establishment and implementation of occupational safety and health (OSH) laws and regulations, as well as industrial accident prevention activities. Many injuries and illnesses occurred at work in the process of the country's rapid economic development, and therefore, efforts have been made at the national level to prevent these accidents. The purpose of the research is to help developing countries in establishing national policies and system on OSH and enhancing their level of safety and health techniques, in order to assist them to effectively prevent industrial accidents during the course of economic development. Also, this report is centered on activities carried out by KOSHA to prevent injuries and illnesses at industrial sites.

Korea's high-speed economic growth continued until the 1980s and the incidence of large scale industrial accidents and occupational diseases increased sharply due to larger machineries used in industrial sites, rapidly changing industrial landscape, and the increasing scale of construction works. Against the backdrop, the Korean government enacted the Occupational Safety and Health Act (OSH), an Act for more aggressive prevention activities of industrial accidents, and reorganized the administrative system relevant to the sector. Furthermore, the establishment of KOSHA–a professional organization specializing in industrial accident prevention–and the introduction of mid- to long-term accident prevention plans at the national level helped to not only reduce accidents at work, but also contributed to national development. The details of the country's efforts and progress in OSH are elaborated in the following paragraphs.

Since the initial implementation of the economic development plan in 1962, the Korean economy had posted an average of 8.3% growth per year until 1997. The economy experienced numerous quantitative and qualitative changes during the years of rapid

growth rates and more than a dozen economic slowdowns. From the early 1960s to the mid-1970s—early stages of economic development—non-agricultural sectors benefited from almost unlimited supply of labor force on the back of sustained inflow of human capital into urban areas. In the 1970s, the primary and secondary labor markets were occupied by workers employed in modern industrial sectors in urban areas and informal workers in the cities, respectively. However, in the late-1980s—following the transitional period in the early 1980s—key participants of the primary labor markets were replaced by workers in growth industries and large corporations, while those in the secondary labor market were replaced by workers mainly in vulnerable workplaces or industries on the decline. The Asian financial crisis in late 1997 further aggravated the existing labor insecurity and unequal distribution of income. Even after the financial crisis, declining share of job creation in large corporations and rising share of job creation in smaller companies have added to the problem of high turn-over rates and job instability, accompanied with persistent shortage of decent jobs.

The focus of Korea's industrial structure evolved from light industry in the 1960s, heavy & chemical industries in the 1970s, assembly & processing industries in the 1980s, IT industries in the 1990s and new growth industries with the dawn of the new century. As a result, high production and administrative costs became an issue while the economic and work losses caused by industrial accidents—the dark side of economic development—started to gather attention as an important national issue.

Against the backdrop, the government sought not only to prevent the losses incurred from accidents at work but also to gain additional economic effects. Prevention of injuries and illnesses at work can contribute to upgrading national competitiveness at the national level by reducing production costs, while companies can maximize profits through the protection of material and human resources. In addition, prevention activities may boost productivity by enhancing workers' morale. A systematic approach with a high level of intervention and commitment was required at the national level as well as from companies in order to find fundamental solutions to industrial accidents.

The first laws and regulations on OSH in Korea were derived from chapter 6 of Labor Standards Act promulgated in 1953, through the enactments of Regulations on Labor Safety and Regulations on Labor Health. However, an independent law on occupational safety and health—the OSH Act—was enacted on December 31, 1981 to separate the OSH-related provisions from the Labor Standards Act. This change was in response to the government's measures to tackle problems associated with rapid changes in the industries, namely the skyrocketing number of work-related injuries, fatalities and illnesses, as the economy entered an accelerated growth phase in the early 1980s. The OSH Act established the hazard prevention standards essential for the comprehensive management of OSH and

clarified OSH management system in workplaces. In addition, the Act sought to effectively prevent industrial accidents by facilitating voluntary initiatives taken by employees and professional agencies, and to promote and enhance workers' safety and health through the creation of sound working environment. The advanced industrialization in the years following 1982 presented new challenges which are new types of industrial accidents and novel occupational diseases. Therefore, the OSH Act was overhauled in 1990 and amendments continued to follow in order to supplement or improve any deficiency in the implementation phase.

In Korea, the Ministry of Employment and Labor (MOEL) is in charge of administrative activities pertaining to OSH. The MOEL went through numerous organizational reshuffle, and the overall structure encompassing the HQ and regional labor administrative bodies began to take a more systematic form in the early 1980s when the Industrial Safety Bureau was established in the HQ. Upon the closing of the National Institute for Labor Science—the research institute established in 1977 to conduct research and nurture experts in OSH— in 1989, the responsibilities previously fulfilled by the Institute were transferred to the MOEL and Korea Occupational Safety and Health Agency (KOSHA), an Agency established in 1987. Currently, the MOEL has Industrial Accident Prevention and Compensation Bureau and five subsidiary divisions under the Bureau. In addition, OSH related duties are being fulfilled across the nation in six Regional Labor Offices and 43 Labor Sub-Offices.

The enactment of the OSH Act in 1981 and accompanying prevention activities contributed to reducing injuries and illnesses at work. However, limitations of existing OSH system started to materialize, namely the frequent occurrence of accidents in small workplaces and the advent of new occupational diseases in the early 1990s, which was 10 years after the initial enactment of the Act. In order to make further improvements in accident prevention, the MOEL laid out mid- to long-term visions in line with new policy regime, and devised and implemented systematic action plans. They are: the 1st 6-Year Plan for Industrial Accident Prevention (1990); Comprehensive Measures for Occupational Disease Prevention (1991); Special Project for the Prevention of Occupational Accidents (1994); 3-Year Plan for the Advancement of Occupational Safety (1996); 5-Year Plans for Industrial Accident Prevention (1st round in 1999, 2nd round in 2004 and 3rd round in 2009); and so on.

Although the pace of Korea's economic growth has been truly remarkable up until the mid-1980s, the occurrence of injuries and illnesses at work was considered a serious social problem. Shortage in talents specializing in industrial accident prevention, insufficient roles played by private accident prevention organizations, indifference of employees, lack of effective response measures, etc. have led to a continued rise in occupational injuries and illnesses despite the government's multi-faceted policy efforts to tackle the problem. This

problem has served as the grounds for the government's measures to establish a professional agency specializing in the prevention of occupational accidents, in order to effectively, systematically and aggressively implement prevention activities. As a result, the plan for setting up a legal entity for the prevention of occupational accidents was finalized in 1986, which had been suggested to organize the functions of different OSH organizations. The meetings between relevant government bodies in the following year decided on the creation of KOSHA Act, which was later passed by the National Assembly. Soon after that, KOSHA was officially launched[1] upon the authorization of the Minister of the Employment and Labor.

One of the important data essential for carrying out OSH duties is the statistics data. In the early implementation stage of Industrial Accident Compensation Insurance System, the government took the initiative in collecting and analyzing the data on occupational accidents to produce statistics. Beginning in 1997, KOSHA has been taking approx. 10% of samples for people under medical care due to occupational accidents and analyzing the causes on a yearly basis, and this data was recognized as a government-approved statistics (designated statistics no. 38001) in December 2000 to be produced by KOSHA.

Occupational accidents started to be seen as a serious social issue from the 1970s, when Korea's economic growth was in full swing, and the number of injuries and illnesses reached 139,242 (rate of injuries and illnesses at 4.48) in 1978. Although the industrial structure went through rapid changes in the 1980s on the back of innovations in industrial technologies, many work-related accidents and illnesses continued to occur due to working conditions and work environments remaining at the level seen in the early stages of industrialization. As a result, the number of occupational injuries and illnesses peaked in 1984 at 157,800 workers (rate of injuries and illnesses at 3.60). The establishment of KOSHA in 1987 and the implementation of various accident prevention measures and projects contributed to reducing the rate of accidents beginning in the late 1980s, and the rate further declined to below 1% in 1995 to 0.99%. Since 1999, the rate of occupational injuries and illnesses dipped to 0.7% level, breaking below 0.7% to reach 0.69% in 2010 and posted a remarkable 0.65% in 2011, which is the lowest level since the founding of KOSHA. In addition, fatality per 10,000 workers steadily declined from 3.29 in 1987 to reach the trough at 1.47 in 2011. Although the rate of occupational injuries and illnesses has been hovering around the 0.7% level since 2000, the estimated economic costs per year continue to rise from KRW1.2tn in 1987 to KRW7.7tn in 1997, KRW15.8tn in 2006 and KRW18.1tn in 2011. If the rate of accidents at work did not decline over the past years but remained at 2% level, the estimated costs of accidents would amount to a whopping KRW55.7tn which is a tremendous loss

1. Korea Occupational Safety Agency was changed to Korea Occupational Safety and Health Agency in accordance with the amended KOSHA Act on December 31, 2008.

at the national level. Industrial accident indicators by workplace size show that the rate of injuries and illnesses per 1,000 workers in small workplaces (less than 50 employees) remained from 27.8 (1991) to 9.8 (in 2011) which is significantly higher than that of workplaces with at least 50 employees ranging from 12.7 (1991) to 2.5 (2011). Fatality per 10,000 workers is significantly higher in small workplaces with less than 50 workers ranging from 5.49 (1996) to 1.67 (2011), compared to those with 50 or more workers, which ranged between 3.18 (1994) and 1.23 (2011).

As a professional organization specializing in accident prevention at work, KOSHA has been working to enhance the national economy since its inception by promoting workers' safety and health, and facilitating employers' accident prevention activities. The business areas of KOSHA includes: research, development and distribution of accident prevention techniques; technical guidance and training on OSH; and the inspection and review of hazardous and dangerous facilities. In the early years, KOSHA laid the foundation for the prevention of injuries and illnesses at work by prioritizing prevention activities that are needed the most in workplaces including safety diagnosis and technical guidance on workplaces and vocational training for safety and health managers. In the following years from 1991 to 1995, KOSHA sought to make process and advancement in the industry by implementing the following: introduction of inspection system for dangerous machinery and equipment; research on occupational health and establishment of occupational diseases diagnosis system; promotion of zero-accident campaign; development and dissemination of low-cost, high-efficiency accident prevention techniques; and conducting safety culture campaigns. The rate of injuries and illnesses at work fell below the 1%-level in 1995, marking the first time since the joint-efforts have begun between the government and KOSHA to produce statistics on occupational accidents, which went further down in late 1996 to 0.88%. These progresses laid the groundwork for Korea to realize a welfare society and upgrade the level of OSH on par with that of advanced countries by the beginning of the new century. On the domestic front, the increasing number of small workplaces with poor OSH conditions and the rise in non-regular workers presented more accident risks, while the importance of safeguarding human resources grew with the dawn of the knowledge and information society. At the international level, the unification of OSH standards was started to being recognized as a new global trend. In response, various OSH activities have been implemented in Korea including Clean Workplace project, OSH training for migrant workers, comprehensive support programs for voluntary safety activities, operation workers' health centers and KOSHA 18001 Certification system. In addition, KOSHA has been also very active at the international level. Since being designated as the ILO-CIS National Centre in 1989, KOSHA has been a provider of OSH information at both home and abroad. Furthermore, following the successful hosting of the 14th annual conference of Asia Pacific Occupational Safety & Health Organization (APOSHO), it organized the XVIII

World Congress on Safety and Health at Work in 2008. The systematic implementation and promotion of the Seoul Declaration on Safety and Health at Work, which was adopted during the World Congress held in Seoul, gained momentum in 2011 when KOSHA initiated the set up of the "ISSA Section for a Culture of Prevention" and has been implementing various functions as the chair organization. Also, KOSHA won the bid to host the 31st Congress of the International Commission on Occupational Health in 2015 (ICOH 2015)—the most prestigious gathering in the field of occupational health—and made necessary preparations for its successful organization in Korea. Furthermore, KOSHA established Occupational Safety and Health Training Institute (OSHTI) in 1987—a professional training body providing specialized education on accident prevention at work—and Occupational Safety and Health Research Institute (OSHRI) in 1989—a professional research institute capable of conducting survey, research and technical development on accident prevention at work.

As mentioned, the Korean government enacted the OSH Act as an independent legal framework to aggressively work towards preventing accidents at work and to manage OSH in a systematic manner while overhauling the administrative system on OSH. Also, various efforts have been made for the prevention of accidents at work through the set up of a professional agency specializing in industrial accident prevention—KOSHA—and the establishment and implementation of mid- to long-term national plans on OSH.

As a result, the rate of occupational injuries and illnesses significantly declined from 2.66% in 1987 to 1.76% in 1990, 0.99% in 1995, 0.69% in 2010, and 0.65% in 2011. These improvements are attributable to the aggressive efforts made by the Korean government and KOSHA in preventing industrial accidents and also are the results of higher safety awareness held by the general public.

However, approximately six workers die of accidents at work each day, while some 250 others suffer from work-related injuries and illnesses. In 2011, a total of 54.777 million work days were lost due to occupational injuries and illnesses, which translate into a whopping KRW18.1tn of economic losses. Thus, Korea is faced with the challenge of improving occupational accident prevention system and implementing more aggressive OSH activities in order to prevent accidents that frequently occur at industrials sites. Despite the shortcomings, achievements that the Korean government has made so far through its occupational injury and illness prevention system and OSH infrastructure building will serve as a good example to many developing countries, which are expected to achieve economic growth. It would be desirable if the experience and knowledge of Korea in establishing and operating occupational injury and illness prevention system will contribute to strengthening the OSH systems in many developing countries and enhancing their OSH techniques.

The following are the summary of suggestions Korea can give to developing countries—despite the different internal and external environment of each country—to help them establish an industrial accident prevention system of their own, based on the experience of Korea and the endeavors made by the country for the system's effective operation.

First, the government should possess strong commitments in establishing and improving laws, regulations and administrative systems on OSH, for a systematic set-up of industrial accident prevention system at the national level. The segregated laws and standards resulting from the different interests of government administrations should be improved and integrated, while the system for implementing effective supervisory functions should be established and strengthened.

Second, appropriate and step-by-step mid- to long-term action plans should be devised and implemented, which take into account different level of economic development and internal/external conditions of each country. In order to come up with substantive results, it is necessary to build and execute differentiated policies based on meticulous analysis of socio-economic situations and the industries in general, and to establish development strategies based on the analysis.

Third, efficient implementation of industrial accident prevention activities requires a sound OSH infrastructure, which includes: establishment of industrial accident statistics system; creation and expansion of professional agencies dedicated to accident prevention at work; development of OSH experts ; building collaborative network with domestic OSH organizations; and so on.

Fourth, industrial accident prevention activities that are voluntarily participated by both workers and companies should be encouraged. Strict law enforcement by the government alone is not enough to completely solve the problems at industrial sites, namely occurrence of industrial accidents. Achieving significant results through prevention efforts will be unlikely unless workers and enterprises that are very well aware of the reality at industrial sites pay due interests in OSH, participate in accident prevention activities and make investments with the safety and health management in mind.

Fifth, it is crucial to expand international collaborative network and strengthen exchanges of information and techniques. Industrial accidents have become a global issue due to increased international exchanges on the back of globalization, and accidents at work are wielding more influence on people than ever. The exchange of techniques and information through the network built between countries and international organizations will go a long way in minimizing trials and errors.

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of Industrial Accident Prevention System

Chapter 1

OSH and Labor Market in Korea

1. Change in the Labor Market
2. Importance of OSH

OSH and Labor Market in Korea

1. Change in the Labor Market

1.1. Labor Market before the 1980s

Since the launch of economic development plans in 1962, the Korean economy had posted remarkable growth records averaging 8.3% per year until 1997. The country has transformed itself in both quantitative and qualitative terms not only in times of record growth but also in times of a dozen economic troughs along the way.

At the early stages of economic development from the 1960s to mid-1970s, the migration of people from rural to urban areas supplied almost unlimited labor to non-agricultural sectors. In an industrial structure where labor-intensive industries such as the manufacturing of wigs, shoes, plywood, etc. lead the growth, the required labor force were mainly unskilled manual workers. Vocational high schools and employee training facilities of large companies provided the much needed workers with simple skills. Primary labor market of that time was characterized by high demand of workers with simple skills and abundant supply of quality manual workers. Although the employment rate hovered around 4%, the majority of underemployed workers created secondary labor market near the city serving as potential labor force of the primary labor market.

Since the mid-1970s the labor market started to transform itself while forming close ties with the flow of the real economy. Although the government's focus on developing the heavy chemical industry weighed down the market's ability to accommodate new employment, the supply of Korean workers to the construction sites in the Middle East, as well as the boom in domestic construction industry led to higher demand of the workforce. Concerns about over-supply of labor force did not materialize until the late 1970s and construction

workers in particular enjoyed hefty raise thanks to labor shortages in the industry. However, economic downturn in 1980 triggered by the second oil shock undermined growth of labor demand and the unemployment rate rose significantly to 5.2%. Although excessive growth in large-scale processing industries such as shipbuilding and chemicals led to government mandated restructuring, high flexibility of labor costs and the industries' competitiveness in the global market stabilized the economy without significant impacts on the labor market. The first half of the 1980s was when the inflation rate recorded single-digit growth for the first time.

Since the beginning of the industrialization up till the 1970s, the much-needed labor force in labor-intensive industries was supplied by those who previously worked in the agricultural industry. During those years, the damage done to workers due to excessive work hours, which are characteristic of labor-intensive industries, was the main threat to workers' safety and health. However, the government's policies during the years highlighting economic development provided insufficient legal protection for workers' safety and well-being, and proper regulatory and policy measures for such legal protections had been virtually absent.

1.2. Labor Market from the 1980s to the 1990s

The so-called "three-low boom" which refers to low oil prices, low world-wide interest rates, and low value of the won (KRW) due to the appreciation of the Japanese yen (JPY), markedly improved Korea's export competitiveness. Korea's economy took a great leap forward and the labor market experienced more rapid transformation than ever in the 1980s thanks to the acceleration of trade liberalization movement in the global market, and "three-low" phenomenon in the domestic sphere.

Beginning 1988, the unemployment rate of Korea was lowered to a remarkable level below 3% due to rising demand for labor in manufacturing and service industries. Furthermore, the wage of workers, adjusted for purchasing power, increased significantly thanks to double-digit wage growth under the low-inflation environment. For two-year period from 1988 to1989, the growth rate of wage surpassed that of productivity. This is when overall employment conditions have seen a great advancement and the imbalance in the supply and demand side of the workforce have become an issue in the labor market. Since then, efforts have been made to encourage labor market participation of economically non-active groups – elderly and women– and import of labor force has become an important policy issue.

This was when the blossoming democratization allowed workers to raise their voices, which were largely ignored in the past. While advanced countries suffered labor-management conflicts and the supply and demand imbalance of the labor force during the

industrialization period of the 1950s and 1960s, it was only in the late 1980s that Korea experienced these problems.

Korea's financial liberalization of the late 1980s gave birth to new banks and altered credit allocation method in the domestic capital market. In the 1960s and 1970s effective credit allocation was made possible by extending credit in the form of export financing (Hong, 1998). However, credit allocation during the Roh Tae-woo administration did not take the form of export financing but the favor was mainly given to large corporations, which needed large investments for the expansion of market share and business diversification, through the formation of cozy ties between politics and economics. As a result, the lines of credit in the late 1980s and early 1990s were extended disproportionately toward large companies without proper process of checking effectiveness of the credit system in the capital market.

The demand for capital outstripped supply since the launch of economic development plans until the Asian financial crisis of the late 1990 and securing the line of credit translated into the growth of companies. Businesses forecasted long-term growths in their future when making large scale investment plans and hired large pools of human resources to secure quality labor despite existing labor slack. As companies regularly absorbed young workers into their employment pool, labor market conditions improved to the best state ever for young adults. Furthermore, the employment rate of aged workers increased at an unprecedentedly rapid pace.

The rise in the share of paid workers until 1991 and the increasing share of regular workers out of the total paid workers until 1993 are attributable to development of the goods market and the transformation into the capital market in the preceding years.

Education reform in 1981 more than doubled the enrollment capacity of universities. As a result, the number of highly-educated labor force increased in the late 1980s whereas the supply of production workers contracted in comparison, intensifying the production worker shortage and driving up the relative wage of blue-collar workers. On the other hand, the production and wage gaps among enterprises of different scale had started to widen from the early 1980s and intensified even further from 1988. Low competitiveness (productivity) of small- and medium-sized enterprises (SMEs) compromised their capacity to pay proper wage to workers (low wage) and quality workers left SMEs for larger companies. This vicious cycle aggravated labor shortage in SMEs, which was the result of an inefficient credit allocation in the Korean capital market. In the Koreal capital market, disproportionately large sums of capital flew into large companies, which came to obtain excessive possession of quality human resources and absorb most of the investment.

The years from the late 1980s to early 1990s were when the goods and capital market drove significant changes in the labor market and intensified the imbalance in supply and

demand side of the workforce. In the 1970s, the players in the primary and secondary labor markets were mostly urban workers in modern industries and those of informal sectors, respectively. After the transitional period in the early 1980s, however, the workforce in the primary labor market was replaced by those working for large companies engaging in growth industries, while secondary labor market was composed mainly of workers of small business engaging in industries in decline.

The labor market in the 1980s through the 1990s underwent changes which coincided with structural reform of industries. Former agricultural workers, who filled up the shortages in the labor market, were mainly employed in the light, heavy chemicals and assembly & processing industries. Later when the service industry started to expand, many manufacturing workers landed jobs in the service industry. Workers safety and health, which remained largely unrecognized during the 1960s and the 1970s, became a political agenda in the succeeding years, and workers were protected under the newly established OSH Act and relevant regulations and policies. However, the focus of legal and regulatory protection was mainly on manufacturing workers, while those working in the service industries and under non-regular employment terms remained outside the boundaries of government-led OSH protection measures.

1.3. Labor Market from the 1990s to Pre-2000

While the global-scale trade liberalization began in the 1980s, it was in the 1990s when the pressure of competition in the global market intensified to a new level. Korea's trade balance continued to be in the red despite a rise in exchange rates in the 1990s. On the other hand, purchasing power of workers improved since the late 1980s and stimulated the domestic consumption, helping Korea to reduce its dependency on exports and imports to a new low in the years around 1993. Also, the pressure from advanced nations to liberalize not only the trade but also the capital market of Korea intensified to an unprecedentedly high level in the early 1990s. The liberalization of Korea's capital market accelerated in 1995 when the efforts to join as a member of the OECD kicked off in full force, while this change in the market served as one of the main causes of the Asian financial crisis two years later.

The information and telecommunications (IT) technology became widespread beginning 1993, and the penetration of IT technology started to pick up its speed in 1997. It was around this time when competition in the global market and the impact of technological change became more evident, triggering transformations in work organization and job stability.

The work organization composed mainly of regular workers witnessed increased autonomy of workers, decentralization of decision-making process, and multi-functional

workforce. The necessity of ensuring organizational flexibility not only for the decision-making process but also in preparation for organizational restructuring destabilized the employment market while less-skilled and non-regular workers suffered lower wages in relative terms. As a result, there was deterioration in the overall income distribution.

The financial crisis in late 1997 was a catalyst that significantly aggravated the pre-existing job insecurity and unfair income distribution trends. The crisis triggered a sudden and meaningful change in HR management paradigm in corporations, the change of which had been only gradual before that, and worsened the already insecure employment situations. In the process of economic restructuring, the market demanded more workers with high adaptability. On the contrary, labor-intensive sectors requiring low-skilled workforce were either subcontracted or assigned to non-regular workers almost exclusively.

The average growth rate during the 35-year period before the financial crisis stood at 8.3% per year, but the growth trend slowed down to an average of 4.6% per year since the year of the crisis till 2002. The downturn of growth momentum brought qualitative changes in the labor market by depressing the growth of companies and job creations. On the other hand, financial institutions undergoing the restructuring introduced the concept of risk management and their focus went to securing liquidity, which led a marked slowdown in investment. As the market opened its doors to foreign investors to secure liquidity and corporate governance underwent transformation, companies were left with no choice but to maximize short-term earnings. Furthermore, employment adjustments became a routine and the compensation system as well as the investment on education and training of workers was geared toward skilled workforce, which further deepened the wage gap among workers.

The Asian financial crisis served to widely spread social security system. In the pre-crisis era, the social welfare system started to gradually take root on the back of economic development but the system rapidly expanded in the post-crisis era as a means for social safety net. Immediately after the financial crisis, the rapidly rising unemployment rate called for a social safety net to tackle the issue. However, the demand for the improvement in social safety net still exists till this day, even after the mess of the financial crisis has been cleared up, because the current structure of labor demand is creating ever wider divide among workers in terms of job stability and income distribution.

Influenced by the democratization movement in 1987, labor unions achieved remarkable quantitative growth entering the 1990s. Workers gained more strength in the labor market as well as in the labor-management relations, thus leading to vibrant activities that sought to protect safety and well-being of workers. It was then when the OSH Act underwent a major overhaul. However, quantitative growth of labor unions hardly translated into qualitative growth and workers were put in an even more vulnerable position in the labor market due

to frequent lay-offs and restructuring pursued in the name of flexible capital strategies amid heightened competition in domestic and overseas markets. As a result, the number of non-regular workers and those working in poor working environments started to increase.

1.4. Labor Market since 2000

The expansion rate of employed people from the early 1990s to 1997, just before the Asian financial crisis, stood at 2.4%, surpassing the population growth rate of 1% by far. On the other hand, the labor market was stable with nearly full employment with the unemployment rate remaining at mid-2%. However, the financial crisis led to a rise in the unemployment rate and a fall of economic participation rate, which undermined employment rate in all age groups and genders regardless of educational backgrounds. As more females and workers with low education levels became economically non-active, many of them were no longer counted as labor force. Many highly-educated youth workers who could not find jobs that suited their educational level chose to take jobs where they are considered overqualified, which aggravated the mismatch in the labor market while causing further distortions.

The employment structure has gone through transformations before and after the financial crisis. In the 1990s, some industries including forestry, fishing, and manufacturing no longer created jobs like they used to in the past, while the job creation in the service sector increased significantly in comparison. Furthermore, jobs in labor-intensive areas such as personal services increased greatly in number. Looking at the employment structure by different sections, the number of service industry workers, professionals, technicians, and semi-professionals increased while that of low-skilled workers declined. This demonstrates that the transformation into a more sophisticated industrial structure calls for greater demand in quality workers.

In terms of employment structure of the Korean labor market, it has smaller share of paid workers when compared to other major OECD countries while larger share of workers are self-employed. Also, non-regular workers' portion from the total paid workers far exceeds the level of average OECD countries. The number of non-regular workers quadrupled since the financial crisis, as this type of employment was overused by companies that sought to avoid expensive labor costs and they continue to take up about half of the total paid workers even today. As for the number of workers by business size, large corporations employed relatively less workers after the financial crisis, while more workers are employed in smaller companies. This change is an illustration of increased instability in employment conditions, and the country is still suffering from a shortage of quality jobs.

The labor market situation in Korea is relatively stable with a slow increase in both the number of employees and employment rate. However, it is difficult to say that the country's

labor market completely recovered to the state before the financial crisis as the protracted economic slowdown is taking a toll on the number of economically active population, unemployment rate, as well as the employment rate while more and more people have given up the search for job discouraged by lack of satisfactory positions. Furthermore, as the country enters into a state of low birthrate and aging society, the workers are aging as well. The slow supply of quality labor, changes in industrial structure and the imbalance in supply/demand side of labor caused by higher education levels of workers are factors that have negative effects on the labor markets in general.

The key challenges of the Korean labor market are aggressive policies that will help to minimize idle human resources. These policies would include: improving the employment rate on par with advanced countries to strengthen the nation's growth base; improving job stability and the economic participation rate of female workers; creating decent jobs; and establishing infrastructure that facilitates mid to long-term supply of labor in order to meet the needs of the current labor markets.

After the year 2000, workers found themselves in an even more vulnerable position in the labor market than before due to rapid changes in the industrial structure, namely the sudden growth of the service industry, as well as the imbalance in the supply and demand of workforce. As a result, accident prevention efforts mainly focusing on regular workers in the manufacturing industry encountered limitations, while the societal demand for enhancing the safety and well-being of vulnerable workers, especially those in the service industry, casual workers and female workers started to grow.

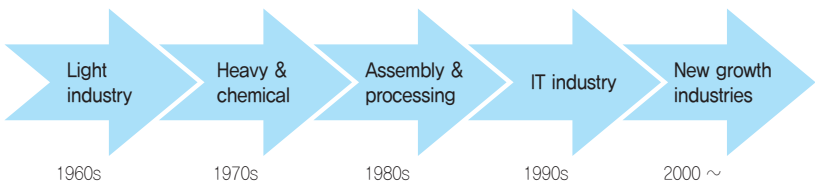
The Korean labor market hardly put much emphasis on OSH due to the inflow of former agricultural workers at the early stages of the country's industrialization and economic growth policies that required long working hours. However, the country's industrial structure transformed along with its economic growth. The light industry had been given the initial focus but the emphasis later shifted to the heavy chemicals industry, assembly & processing industry, service industry, electronic industry and so on. On the other hand, intensified competition in the business circle and in the global arena, and economic crises, namely the Asian financial crisis, led the country to adopt flexible capital strategies, which in turn undermined job security and forced workers to maintain only a disadvantageous position in the labor market. These changes ultimately expanded a call for a social safety net, which will safeguard safety and health of workers. Influenced by democratization movement, OSH became a political agenda and strengthened the government's efforts for accident prevention at work. At the same time, during times of economic crises, namely the Asian financial crisis, the government's deregulation efforts eased OSH regulations, and the emphasis was put on self-regulatory efforts. As a result, changes in the labor market increased the social demand for workers' safety and health, and accident prevention

activities transformed when the government's regulatory strategies underwent changes in accordance with strategic changes in the capital market.

2. Importance of OSH

The focus of Korea's industry switched from light industry to heavy and chemical industries in the 1970s. In the 1980s, the portion of assembly and processing industries in the machineries and electronics sector increased significantly, while the growth of the IT-related industries became prominent from the mid-1990s thanks to the development of relevant technologies. The country's industrial structure continued to emphasize the development of new growth industries for continuous development even after 2000.

The Development of Major Industries in Korea



High production costs and administrative expenses became an issue during the restructuring process, while occupational injuries and illnesses increased economic costs and the lost work hours. Against the backdrop, making efforts to reduce the production and administrative costs in OSH has become very important from the perspective of business management and at the national level.

Against the backdrop, OSH is no longer an issue confined to legal or institutional aspects, but rather its importance is highlighted as an economic issue which improves the competitiveness of countries and companies by functioning as a competitive edge to companies while helping to cut production costs.

2.1. OSH and Economic Benefits

The economic benefits of OSH should be viewed from the perspective of reducing production costs. That is because the economic benefits earned from preventing occupational injuries and illnesses not only prevent the losses due to accidents but also bring about other benefits.

The other benefits are: First, improvement in productivity; Second, enhancement in the quality control of work processes; Third, reduction in loss-related expenses and social insurance bills and expenses on individual level; and Fourth, encouraging concerned parties to proactively respond to pressures regarding safety and health.

Also, from the perspective of economic efficiency on national and corporate level, OSH is a comprehensive and effective system, which is incorporated into each country and corporate governance. In other words, OSH is a management system (OSHMS) that incorporates the effectiveness of comprehensive business management as well as effective management techniques. The system is a necessity for countries and companies in order for them to engage in production activities in an efficient manner.

2.2. Economic Effects of OSH, Which Improves Efficiency through Loss Reduction

To understand the importance of OSH on the national economy, it is important to conduct an evaluation in economic terms about the accidents that did not occur, in other words the injuries and illnesses that have been prevented. However, prevented cases of occupational accidents thanks to OSH activities are not visible and the valuations are not made in economic terms. Therefore, it is important to think outside the box to get a grasp with the economic efficacy of OSH. The records on the severity and structure of accidents and illnesses of the past enable us to understand potential gains and estimate the values that can be achieved through prevention. The scope of the gains and values should be comprehensive enough to consider the productions loss as well as the loss on corporate assets.

However, calculating the potential economic gains from prevention does not require understanding of expenses on every category. The more realistic method is to calculate the amount of reductions from the total costs. For example, the rate of occupational injuries and illnesses stood at 2.66% in 1987, but it dropped to 0.65% in 2011. The 75.6% reduction over the years can be translated into economic gain of commensurate value.

Pre-emptive efforts to prevent occupational accidents will upgrade national competitiveness by reducing production cost, maximizing corporate profits by saving material and human resources, and improving workers' productivity by motivating them.

2.3. Setting OSH Goals and the Importance of Taking Actions

While Korea became a more advanced nation with rapid economic growth, the growth was also accompanied with a rise in occupational injuries and illnesses and economic losses resulting from the accidents. Economic losses resulting from occupational injuries and illnesses amounted to KRW1.2tn in 1987 and dramatically increased to KRW8.7tn in 2001 and KRW18.1tn in 2011. Even to this day, some 250 workers get injured and 6 others lose their lives due to accidents occurring at work, which is a tragic reality.

These statistics show that the rate of occupational injuries and illnesses has declined over the years, and they are still having a great impact on the national economy and the bottom

line of companies. Against the backdrop, a systematic approach to prevent occupational injuries and illnesses from a fundamental level is required by the nation's leaders as well as the executive managers in companies and they should be committed to resolving this issue. A successful operation of the system calls for clear policy directions and goals set by the management.

Everyone is entitled to feel a sense of fulfillment and happiness, and realize one's self as he/she works in a safe environment. The country and the companies are responsible for proving safe places for work. A systemic set-up and operation of OSH system will help the system to achieve its goals, which is to prevent occupational accidents, by strengthening national competitiveness and productivity in companies.

2012 Modularization of Korea's Development Experience
Establishment and Operation
of Industrial Accident Prevention System

Chapter 2

Introduction and Development of Prevention System

1. Advances in OSH Regulations
2. Advances in Administrative System on OSH
3. Implementation of Various Accident Prevention Plans
4. Establishment of KOSHA

Introduction and Development of Prevention System

1. Advances in OSH Regulations

The first laws and regulations on OSH in Korea were derived from chapter 6 of Labor Standards Act promulgated in 1953. The regulations on workers' safety as well as the regulations on workers' health were enacted based on the "safety and health" provisions stipulated in the Standards. The current form of OSH Regulations were first enacted in 1981, and are being revised with the advancement of the country's economy as well as social awareness on occupational safety. There are one set of OSH Act and Enforcement Decree, and four different sets of Enforcement Regulations. These laws and regulations provide general rules for occupational accident prevention and the duties of employers, workers and the government.

The Enforcement Decree of the OSH Act is mandatory rules, which are necessary for the proactive prevention of occupational accidents. The Enforcement Decree set out mandatory rules such as holding employers responsible for ensuring safety and health at work. However, except for the most basic rules on safety and health, the focus is tilting toward voluntary safety and health rules aimed at improving competitiveness of companies. The "Act on Special Measures for the Deregulation of Corporate Activities" enacted in 1993 eased the mandatory employment quota imposed on corporation. In addition, The "Framework Act on Administrative Investigation" enacted and enforced as of August 18, 2007 sought to lift the burden on corporation by ensuring the fairness, transparency and predictability of administrative investigations.

1.1. Early Stages of OSH-related Laws and Regulations (1945 ~1980)

The Labor Standards Act provided the basis for OSH Act in Korea. Article 17 of the Constitution (now Article 32) during the First Republic of the Korean administration (1948~) stated that "Standards of working conditions shall be determined by the Act… Special protection shall be accorded to working women and working children…" Five years after on May 10, 1953, the "Labor Standards Act" was enacted and promulgated as the 286th Act of the nation.

Chapter 6 of "Labor Standards Act" had 10 articles on safety and health, which included provisions requiring employees to prevent accidents at work. These include standards on machineries, equipment, facilities at work as well as work conditions, and the requirement to have personnel in charge of safety management and health management. The provisions on safety and health at work had been included in the "Labor Standards Act" for 28 years until the OSH Act was enacted and promulgated later on.

The 1960s was when a systemic framework for occupational accident prevention was established in Korea. A framework for setting out detailed rules for safety and health management was established through the enactment of "Regulations on Occupational Health Management (1961)" and the "Regulations on Work Safety Management (1962)." Furthermore, the "Mining Safety Act" and "Industrial Accident Compensation Insurance Act" were enacted in March and November of 1963, respectively, while the enforcement decree of the Acts were announced and took effect from June 1964.

1.2. The Legislation of an Independent "OSH Act" (1981~1989)

As Korea's economy entered an era of rapid economic development, the occurrences of serious accidents grew in number due to the use of larger machineries and equipment at work, faster work processes, and an increase in the size of construction projects. Furthermore, the massive use of hazardous materials led to new cases of occupational illnesses. The government came to realize that it is important to separate the OSH provisions from the Labor Standards Act and establish an independent Act in order to respond to the rapid changes in the nation's industries.

Statistics on occupational injuries and illnesses show that the number of workers suffering from work-related injuries and illnesses stood at a low level of 37,752 in 1970. However, the figure tripled to 113,375 in 1980. The number of work-related fatalities doubled from 639 deaths in 1970 to 1,273 deaths in 1980, and the victims of occupational diseases increased 6.2 times from 780 in 1970 to 4,828 in 1980. Furthermore, the estimated economic losses from occupational accidents was KRW9.215bn in 1970 but increased a whopping 33.9

times to KRW312.523bn in 1980. These figures show that the human and economic losses from accidents occurring at work have increased at an alarming rate.

Against the backdrop, the bill to enact the OSH Act as an independent legislation was submitted to the National Assembly for deliberation on November 29, 1981 by Mr. Kim, Jib of Health & Social Committee and 35 lawmakers and was passed in the plenary session held on Dec 18, 1981. Finally on December 31, 1981, the OSH Act was promulgated and took effect as Act No. 3532 of the Republic of Korea, which came to govern regulations on OSH with an independent authority.

The OSH Act set out risk prevention rules necessary for a comprehensive OSH management, and clearly defined OSH management system (OSH-MS) in workplaces. The Act was promulgated to improve workers' safety and health by facilitating voluntary OSH activities of employers and professional organizations, effectively preventing occupational accidents, and creating pleasant workplaces. The key ideas of the Act include the following:

First, clarifying workers' and employers' most basic duties for preventing occupational accidents; Second, establishing the OSH Policy Deliberation Committee within the Ministry of Employment and Labor in order to set out prevention measures for occupational accidents in a comprehensive and systematic manner and to deliberate and coordinate key policies regarding occupational accidents; Third, designating safety and health manager, safety manager, and health manager in risky and hazardous workplaces and the set up of OSH Committee. Also, safety and health education is provided to safety and health managers and workers; Fourth, measuring and recording the working conditions of workplaces that are hazardous to workers and provide health check-up for them; and Fifth, defining the types, installation, operation and government support measures regarding prevention facilities of occupational accidents, promoting the R&D and promotion of scientific knowledge on occupational accident prevention, and distributing the results of these activities.

Box 2-1 | Act on Special Measures for the Deregulation of Corporate Activities

In accordance with 23 Acts including the OSH Act, companies are required by the law to hire individuals with 29 different types of qualifications. This requirement puts a strain on companies with higher labor costs, while many small- and mid-sized companies, especially those in rural areas, are finding it difficult to hire individuals with the required qualifications. The Act was promulgated as Act no. 4560 on June 11, 1993 to ease these problems. Out of a total 49 articles in the Act, 9 articles are about occupational safety.

1.3. The Overhaul of the OSH Act (1990~2000)

Rapid industrialization since 1982 reshaped the industrial structure and new types of occupational injuries and diseases have emerged. In response to these changes, the OSH Act went through a full-scale amendment on January 13, 1990 and took effect on June 14 of the same year. After another partial amendment on January 5, 1995, workers' participation in the OSH Committee expanded to represent equal representation as employers, and the system for hiring occupational safety managers and occupational hygienists was put in place. The OSH Act experienced another partial amendment on December 31, 1996 in order to improve and complement operational weaknesses of previous version of the Act.

1.4. The Advancement of the OSH Act (2001~Present)

The rules governing OSH in Korea are composed of an Act, an Enforcement Decree and three Enforcement Regulations.

The OSH Act stipulates the basic rules for preventing occupational injuries and illnesses as well as the responsibilities of employers, workers and the government. On the other hand, the Enforcement Decree of the Act states matters mandated by the Act such as the scope of application, types, and other issues necessary for the implementation of the Act. The Enforcement Regulations of the Act govern matters mandated by the Enforcement Decree i.e. types of serious accidents and their implementation, and regulate technical issues on the OSH standards mandated by the Act.

In addition to what have been mentioned above, there are directives, rules, notices, technical guidelines, work environment standards, etc for the smooth implementation of the Act.

* MOEL Decree on OSH

(1) Enforcement Regulations on OSH (General rules regarding OSH)

(2) Rules on OSH standards (Technical rules about employers' responsibilities on safety and health)

(3) Regulations restricting employment in hazardous or risky jobs (Rules about the qualifications, license, experience, etc. required for working in hazardous or risky jobs)

2. Advances in Administrative System on OSH

In Korea, the Ministry of Employment and Labor (MOEL) is responsible for OSH administration. The changes in the labor-related administration, the OSH administration in particular, are as the following.

2.1. Before 1980: the Early Administrative System on OSH

The MOEL (then Ministry of Labor) was established in July 1945 under Military Government Ordinance no. 97. The Ministry of Labor was once dissolved in November 1948 under the Government Organization Act and its functions were handed over to the Ministry of Social Affairs. Later in February 1955, the Ministries of Health and Social Affairs were combined in accordance with the government's organizational reshuffle, and Labor Department was set up within the Ministry of Health and Social Affairs, the integrated Ministry. At that time, the issues concerning OSH had been handled by Labor Standards Division in the Ministry of Health and Social Affairs.

On August 31, 1963 the Government Organization Act was amended and the status of Labor Department in the Ministry of Health and Social Affairs had been upgraded as a separate agency under the Ministry. The newly-launched Labor Agency took the responsibility for functions related to labor administration. The reorganization of Labor Agency took place on December 7, 1966 and Industrial Safety Division was formed under the Labor Department, which took over the responsibilities on OSH that had been previously handled by Labor Standards Division.

On April 28, 1977 the ILO and the UNDP founded the National Institute for Labor Science, a sub-organization of Labor Agency, as a part of international cooperation project to conduct R & D and train individuals on OSH. Later on June 4, 1979, the Labor Agency composed of divisions was changed into an agency with departments and an occupational safety officer (grade-2 public official). However, the occupational safety officer position was scrapped in just 18 months when the status of Labor Agency was upgraded to the Ministry of Labor.

2.2. The 1980s: The Labor Agency's Promotion to the Ministry of Labor and the Establishment of KOSHA

The Government Organization Act was amended on April 8, 1981 and the status of Labor Agency was upgraded to a Ministry composed of a minister, a vice minister, a bureau, five departments, and a total of 1,952 officials. On the other hand, on December 31, 1982, the Official Appointment Regulations were amended to improve the expertise and capability

of labor inspectors and they formed a separate group of officials in the government with a maximum of 309 positions.

In 1987, the status regional labor offices located in Seoul, Busan, Gwangju, Daegu, Incheon and Daegu were changed to regional labor agencies and 39 subsidiary labor sub offices were stationed to systemize labor administration in regional areas. In addition, Occupational Safety Divisions were set up in regional labor agencies and labor sub offices to take charge of responsibilities related to OSH, while the quota of labor inspectors reached 247 persons.

On December 9, 1987, Korea Occupational Safety and Health Agency (KOSHA) was established in accordance with the Korea Occupational Safety and Health Agency Act (Act no. 3931), which was promulgated on May 30, 1987.

On February 16, 1989, after eight years since the abolition of Occupational Safety Officer position in the Ministry of Labor due to organizational reshuffle, a central administrative agency in charge of OSH-related affairs – Industrial Safety Bureau – was established for the first time in Korea's modern history. With the birth of Occupational Safety Bureau, the National Institute for Labor Science, which was in operation for twelve years, was disbanded and the roles it had taken previously have been transferred to Occupational Safety Bureau of the Ministry of Labor as well as KOSHA.

2.3. In the 1990s: Improvement of Relevant Administrative System and the Set-up of 46 Regional Labor Offices

On November 12, 1994, Safety Bureau for Construction Workers, which had been set up as a temporary organization, closed down and was re-established as Construction Safety Task Force. Industrial Hygiene Bureau was renamed as Work Environment Bureau on May 1, 1995 and Safety Strategy Bureau was renamed as Safety Policy Bureau on June 29, 1996. A regional labor office was set up in Yangsan on February 13, 1992. As a result, a total of 46 regional labor offices have been established to form a nation-wide administrative organization structure on OSH.

2.4. The Year 2000 and Forward: Sophistication of OSH Administrative System

The administrative system responsible for OSH is centered on Industrial Accident Prevention and Compensation Bureau of the MOEL. There are five divisions under the Bureau, which take charge of the implementation of industrial accident prevention policies. They are Industrial Accident Prevention Policy Division, Industrial Accident Compensation

Policy Division, Division for Industrial Accident Prevention in Manufacturing, Division for Industrial Accident Prevention in Construction, and Division for Industrial Accident Prevention in Services. The administrative system on OSH in regional areas is composed of 6 Regional Labor Offices and 43 Local Labor Sub-Offices (including branch offices), which implement OSH related duties.

Table 2-1 | No. of Labor Inspectors in the MOEL

(Unit: person)

	1973	1980	1988	1994	2000	2006
No. of labor inspectors	91	360	432	865	1,055	1,671

Source: Ministry of Labor "History of Labor Administration," 2006

3. Implementation of Various Accident Prevention Plans

3.1. 6-Year Plan for Industrial Accident Prevention

The enactment of OSH Act in 1981 and the endeavors made for accident prevention thereafter helped to bring down the occurrences of injuries and illnesses at work. However, the existing OSH system started to reveal its shortcomings about 10 years after in 1990 when accidents became rampant in medium and small-sized worksites and new types of occupational diseases and accidents started to occur in ever more sophisticated industries.

To solve the new issues and overcome challenges associated with industrial accidents, the MOEL launched the "1st 6-Year Plan for Industrial Accident Prevention." The objective of this plan was to bring down the rate of occupational injuries and illnesses to 0.93% for the six-year period from 1991 to 1996, thereby supporting Korea's economic growth and securing national competitiveness.

A total of KRW443.1bn was invested for the 6-year project. The amount of spending allocated for the project increased every year from KRW34.6bn in 1991 to KRW52.6bn (1992), KRW64.3bn(1993), KRW78.7bn (1994), KRW97.6bn (1995), and KRW115.2bn (1996).

Box 2-2 | Main Objectives of the 1st 6-Year Plan for Industrial Accident Prevention

① Encouraging voluntary accident prevention activities of companies ② Securing the safety of hazardous machinery and equipment in a consistent manner ③ Supporting accident prevention activities in small and medium-sized companies ④ Preventing accidents occurring in outdoor worksites e.g. construction industry ⑤ Strengthening activities to prevent serious or large-scale accidents ⑥ Managing work environment and preventing work-related illnesses ⑦ Establishing the R&D method for accident prevention techniques ⑧ Raising the awareness on safety and health, and the education on accident prevention ⑨ Improving the guidance and supervisory system, and the efficiency in policy implementation ⑩ Globalization of safety and health system in Korea

3.2. Comprehensive Measures for the Prevention of Occupational Diseases

Before the 1980s, the focus of the government was tilted toward ex-post compensation while little attention had been paid to ex-ante prevention. The enactment of OSH Act in 1981 had put in place a prevention system for industrial accidents and reduced the rate of occupational injuries and illnesses. However, occupational diseases increased even after the enactment of OSH Act. This is due to the pre-existing and accumulated hazards at work, worn-down machineries and equipment, and an increase in the use of new chemicals. The number of occupational diseases reported in 1980 was 4,828 but it sharply surged to 6,532 in 1990 and 7,680 in 1990.

The public's concerns about occupational diseases were raised due to a series of illnesses caused at work, namely the carbon disulphide poisonings occurred in Wonjin Rayon Co. in the early 1990s. Against the backdrop, the government laid out and put in force the comprehensive measures for the prevention of occupational diseases on June 14, 1991.

Box 2-3 | Outbreak of Occupational Diseases in Wonjin Rayon Co.

Wonjin Rayon Co. used to be the sole manufacturer of viscos rayon. Second-hand machineries from Toray Rayon Co. of Japan had been imported in 1964, and started operation in 1966. Workers at the company worked without any safety equipment, which exposed them to carbon disulfide (CSs), leading to symptoms like paralysis of the limbs, speech disorder, loss of memory, mental disorder, impotence, kidney failure, etc. Wonjin Rayon was shut down in 1993 and the remaining manufacturing facilities have been transferred to China. Some 950 ex-workers of Wonjin Rayon have been diagnosed as victims of carbon disulfide poisoning.

The primary objective of the measures is to prevent illnesses caused by work. In other words, the measures emphasized the importance of voluntary prevention activities for occupational diseases by requiring employers to provide better protection for workers' health and changing employers' perception about occupational health. Furthermore, work environments have improved and the expert capacity and administrative system for the research in occupational diseases have been built. Together with these improvements, the existing policies further improved by enabling workers who suffer from diseases to recognize that their diseases are work-related and receive proper treatment.

Box 2-4 | Comprehensive Measures for the Prevention of Occupational Diseases and Key Projects

① Implementing the management system for specific medical examination providers and work environment to enhance the reliability of medical examination results ② Prohibiting workers who engage in hazardous works from working extended hours ③ Introducing Health Management Pocketbook system for workers who move to another job after working at a position that handle hazardous materials such as chromium, asbestos, coke, etc., which take long time before causing harm to workers' health ④ Conducting investigations on the hazards of new chemical substances ⑤ Introducing registration system of companies that manufacture or provide services related to work environment improvements ⑥ Establishing Occupational Safety and Health Research Institute ⑦ Introducing and developing medical specialists in occupational medicine

3.3. "Special Project for the Prevention of Industrial Accidents"

In May 1994, Industrial Safety Bureau of the Ministry of Labor set forth "Special Project for the Prevention of Industrial Accident." This project aims to increase investment in prevention efforts of industrial accidents and thereby reduce injuries and illnesses at work and protect capable workers. The ultimate goal was to enhance Korea's competitiveness in the international arena by lifting financial burden of companies. The project was launched in the second half of 1994, spearheaded by KOSHA.

The 3-year project (1995~1997) was to invest KRW300bn in 10 project areas across three different sectors. Through the project, Korea set its goal to bring down the rate of occupational illness and injuries to the level on par with advanced countries (~0.7%) by 1998 when the project is complete, and reduce the number of victims to around 50,000 in 1998 from more than 90,000 in 1993. Furthermore, the project was expected to reduce the direct costs resulting from industrial accidents, the insurance benefits paid to victims, by KRW140bn per year for the 3-year period (KRW420bn in total) while saving indirect costs of industrial accidents by KRW700bn per year (KRW2.1tn in total), which undermines the national economy.

The basic rules in realizing the goals were: First, providing maximum support for workplaces so that they can implement accident prevention activities on a voluntary basis. To that end, the weaknesses faced by workplaces of different sizes and industries were selected for the efficient implementation of the special project. In addition, the majority of project budget went to small and medium-sized workplaces where 70% of all accidents occur, while special attention had been paid to manufacturing and construction industries that suffer higher accident rate than other sectors; and Second, prioritizing project areas that can yield the most visible results during the special project period, while supporting occupational disease prevention activities, which had become one of the key social problems.

Under the guiding principles, the budget for special project was allocated. The spending included KRW150bn for improving safety facilities in vulnerable small workplaces, KRW109.2bn for the safety investment of special industries with high incidences of accidents and diseases, and KRW40.8bn for upgrading OSH system of Korea. However, this special project was later incorporated into the "3-Year Plan for the Advancement of Industrial Safety" which kicked off in the second half of 1996.

3.4. "3-Year Plan for the Advancement of Industrial Safety"

On February 2, 1996, then-President Young-sam Kim of Korea ordered the creation of "Industrial Safety Advancement Strategic Team" which would be in charge of drawing up plans that would reduce the level of industrial accidents in Korea on par with advanced

nations, enhance the quality of life for workers, and improve economic productivity. Shortly after on February 22 the same year, "Industrial Safety Advancement Strategic Team" was launched co-headed by the Minister of Labor and the President of Korea Industrial Safety Association and five task forces were set up to take charge of specific areas.

The 3-Year Plan for the Advancement of Industrial Safety includes eight major areas which will contribute to the enhancement of safety at work by decreasing occupational injuries and illness rate to 0.5% and the death rate per 10,000 workers to 1 by year 2000. KOSHA became the main implementation body of the Plan and started to work on the selected areas from the second half of 1996. The key areas to work on are: ① Sharing the responsibility between workers and employers regarding safety management, ② Ensuring fundamental safety in production facilities where accidents frequently occur, ③ Creating happy and healthy work environment, ④ Eradicating traditional types of accidents in the construction industry e.g. falls, cave-ins, etc., ⑤ Providing focused support on areas vulnerable to industrial safety, ⑥ Emphasizing roles of the private sector while training people to become experts in accident prevention, ⑦ Practicing "Safety First" in everyday lives, ⑧ Advancing laws and regulations on OSH.

A total of KRW1.22tn was injected for this project. The details of the spending are: KRW149bn for the improvement of safety and health in workplaces with less than 50 workers; KRW371bn for the provision of loans to establish accident prevention facilities in workplaces with less than 300 workers; KRW170bn for technical guidance in workplaces; KRW91bn for the operation of accident prevention facilities; KRW203bn for miscellaneous projects related to accident prevention; and KRW18bn for the dissemination of safety culture.

3.5. 5-Year Plan for the Prevention of Industrial Accidents

The Korean government has been active in establishing and implementing various types of projects aimed at preventing industrial accidents including the "3-Year Plan for the Advancement of Industrial Safety (1997~1999)." Backed by the nationwide efforts, the rate of occupational injuries and illnesses steadily declined, dropping below the 1% mark since 1995. However, the level of work-related fatalities and other accidents was still higher than that of advanced countries in 1996.

Since the end of the 20th century, there have been rapid changes in OSH-related sectors at home and abroad. Beginning in July 2000, the coverage of workers' compensation expanded to include all small workplaces, even those with less than 5 workers. As a result, the workers' compensation system added 1.64 million more workers to its coverage, who worked in some 880,000 small-scale worksites with poor safety and health conditions.

A series of deregulations, which had been suggested as a measure to overcome the economic turmoil of Asian financial crisis during the late 1990s, weakened the basis for safety and health management in workplaces. On the other hand, manufacturing companies in Korea started to produce a variety of products in smaller scale, as opposed to mass production of the past, which gave rise to an increase in small-sized enterprises. An increase in the number of temporary, subcontracted, and non-regular workers was also a factor that exposed more workers to accidents. Also, the advent of knowledge and information-based society increased jobs that are mainly done with personal computers, which raised more health issues for workers, namely work-related musculoskeletal disorders, stress-induced illnesses, and so on.

The WTO, an organization created to lower trade barriers around the globe, recognized technological standards that are directly related to the lives and well-being of each member country's citizens and the environmental protection as exceptions, and interrelatedness between the level of OSH and trade have been strenthened. These changes invited the standardization and uniformity of safety and health standards at the international level.

In April 1999, the Korean government organized a working-level strategy team composed of 44 members including safety and health experts in the private sector and relevant public officials, in order to draw up mid-to long-term plans for the prevention of industrial accidents to be implemented in the 21st century. The strategy team had five subdivisions, including safety policy, occupational safety, occupational health, construction safety and education & PR, and the key goals and policy measures for each subdivision were discussed in depth. As a result, the "1st 5-Year Plan for the Prevention of Industrial Accidents" was finalized through the OSH Policy Deliberation Committee convened on December 22, 1999.

The key objective of the Plan was to "enhance the level of OSH in Korea to the level on par with advanced countries by reducing accidents at work and improving health of workers." The key strategic goals of the Plan included: reducing accidents at work and promoting workers' health; raising safety awareness of employers and workers and creating an environment where the laws and regulations on safety and health are strictly observed; and enabling people who are responsible for safety and health to fulfill their duties through an implementation system. Finally, 12 specific policy measures have been selected for the systematic implementation of the Plan.

Table 2-2 | Five Key Strategic Goals and Specific Policy Measures

Key Strategic Goals	Specific Policy Measures
1. Concentrating guidance and support in specific areas that are vulnerable to industrial accidents	⟨1⟩ Prioritizing safety and health assistance toward SMEs ⟨2⟩ Emphasizing the causes of industrial accidents, especially those that are frequent and fatal ⟨3⟩ Strengthening safety and health of areas that are vulnerable to industrial accidents
2. Strengthening OSH policy and the quality of services	⟨4⟩ Establishing service-oriented safety and health management system within the work premise ⟨5⟩ Improving relevant policies that are needed to respond to new safety and health issues
3. Cultivating safety awareness among workers and employers	⟨6⟩ Establishing life-long safety education system that encompasses home, school, and the workplace ⟨7⟩ Creating an environment where applicable laws are strictly observed
4. Clarifying the roles of the public and private sectors and fostering cooperation	⟨8⟩ Reallocation of distinctive roles between the public and private sectors ⟨9⟩ Strengthening the advisory and supervisory roles in safety and health administration ⟨10⟩ Establishing effective information sharing system among agencies devoted to accident prevention
5. Enhancing the efficiency of safety and health management system at work	⟨11⟩ Eliminating redundant provisions in the safety and health laws and regulations ⟨12⟩ Building voluntary safety and health management system participated by both workers and employers

Source: Ministry of Labor the "1st 5-Year Plan for the Prevention of Industrial Accidents" December 22, 1999

The "1st 5-Year Plan" that progressed from 2000 through 2004 contained a total of 134 detailed topics for implementation. Out of the total, 30 have been completed, 71 have been well developed, 24 were performed poorly, while the remaining 9 topics have not been implemented, for the implementation was impossible. The OSH Act was amended on December 30, 2002 and its Enforcement Regulations went through two rounds of amendments in August 2000 and July 2003.

During the five-year period, the relevant laws and regulations were improved to respond to new challenges concerning safety and health. There were some areas that witnessed considerable achievement in their initial goals, such as creation of CLEAN workplace. However, the establishment of Safety and Health Exhibition Hall and some other areas were poorly implemented due to repeated changes in the relevant laws and regulations and limited budget. The ambition to improve statistics related to the rate of work-related injuries and illnesses failed to reach the initial goal.

The government came to a conclusion that a single round of project is insufficient to yield the result that it had planned to achieve, and drew up plans to implement a series of mid to long-term plans in a more systematic manner. After a cold-headed reflection on the 1st 5-Year Plan, thorough understanding of the current status of OSH, and projections about future safety and health environment, the "2nd 5-Year Plan for the Prevention of Industrial Accidents" was launched for the years 2005 through 2009.

For the 2nd round of the 5-Year Plan, mid to long-term advancement measures for OSH were envisioned and OSH strategies of advanced countries were studied. After the government received a wide range of views from workers, employers, academia and relevant organizations, the key strategic goals for the 2nd 5-Year Plan were decided and introduced through the "OSH Policy Deliberation Committee" held on December 14, 2004.

At the "2nd 5-Year Plan for the Prevention of Industrial Accidents", 'the creation of safe and welfare society where the safety and health of all workers are guaranteed' was pronounced as its vision and policy goals were set, which include 'the creation of safe and health workplaces' and 'the maintenance and enhancement of healthy workforce.'

To realize these goals, five key strategies were laid out to select and focus on major issues. The strategies include channeling administrative capacity toward areas that are vulnerable to industrial accidents such as small-sized enterprises or industries, which are more easily exposed to fatal accidents. The key policy directions based on the five key strategies include: ① Focusing on areas vulnerable to safety and health ② Encouraging voluntary prevention activities in workplaces ③ Promoting workers' health ④ Requiring companies to bear more responsibilities ⑤ Advancing OSH. In addition, a total of 113 subsidiary implementation measures were set up for the key strategies above, organized in a code system, and were assessed and managed on a yearly basis to check whether they are being implemented as planned.

The "3rd 5-Year Plan for the Prevention of Industrial Accidents" was introduced for the years 2010 through 2014. Although the 2nd 5-Year Plan achieved its initial goals such as the improvement in laws and regulations and the implementation of industrial accident prevention system, it was not enough to proactively respond to changes of the current regulatory environment such as the changes in the industrial structure, the country's entry into an aging society and the new hazards and risks at work. Furthermore, a new system that can be readily adopted and communicated to workplaces became more important than ever, rather than just a series of plans or programs.

Against the backdrop, the "3rd 5-Year Plan" has been established to lay out mid- to long-term strategic goals responding to new policy environment and put into practice their detailed implementation plans. The Plan was formulated based upon commissioned

research, meetings reviewing each sector (by the MOEL and KOSHA) and advice from workers and employers' representatives as well as experts.

Box 2-5 | Key Policy Directions for the "3rd 5-Year Plan"

- Establishing voluntary prevention activities for industrial accidents through building the foundations for relevant laws and regulations
- Diversifying the service transfer system through participation and collaboration
- Enhancing the effectiveness of the Plan by implementing prevention measures tailored to specific situations
- Building ex-ante management system for disease prevention
- Spreading the awareness on safety and health into people's daily lives by disseminating safety and health culture
- Strengthening administrative capacity on OSH

4. Establishment of KOSHA

4.1. The Search for Prevention Measures against Industrial Accidents

Korea established and implemented the 5-Year Economic Development Plan since 1962 to achieve rapid economic development, and the Plan brought about remarkable progress. However, the rapid growth and industrialization resulted in larger industrial facilities, more complicated industrial processes, higher buildings, exposure to hazardous substances, etc. which had both direct and indirect impact on workers' health and lives.

The statistics on industrial accidents began to be released from July 1964, with the enactment of Industrial Accident Compensation Insurance (the "Workers' Compensation"). From July 1964 to end-1986, the number of victims of occupational injuries and illnesses recorded 2.03 million, of which 23,200 have died, 215,900 were left with permanent disabilities, and the direct and indirect losses on the national economy amounted to KRW6.2735tn.

As industrial accidents rose as a serious social issue, the government enacted and promulgated the OSH Act as an independent act on December 31, 1981, the provisions of

which were used to be incorporated as "10 provisions on workers safety and health" within the Labor Standards Act, enacted on May 10, 1953.

Despite these policy measures, the losses caused by industrial accidents only got more serious each year due to lack of experts specializing in industrial accident prevention, passive performances of private sector organizations working for the prevention of accidents at work, indifference of employers, and lack of effective response measures. The government understood the seriousness of the situation, and sought to establish a professional agency devoted to industrial accident prevention in order to deal with the problems in a more systematic and aggressive manner.

4.2. Enactment of Korea Occupational Safety and Health Agency Act, and the Birth of KOSHA

Realizing the seriousness of industrial accidents, the Ministry of Labor devised a plan on February 24, 1986, to establish a statutory organization devoted to industrial accident as a means to maximize the efficiency of an organization specializing in OSH. After meetings among relevant government agencies were convened, the decision to enact the KOSHA Act was made in 1987. On May 4 of the same year, 33 lawmakers from the Democratic Justice Party submitted the draft of the KOSHA Act and the proposal was accepted at the general meeting of the 133rd session of the National Assembly on May 13. After being put to vote on May 22, the KOSHA Act was promulgated as Korea's Act no. 3931 on May 30, and the grounds for the establishment of KOSHA had been finalized through the announcement of the Enforcement Decree of the KOSHA Act as Presidential Decree no. 12281 on December 1.

With the enactment of relevant laws and regulations, the Labor Standards Bureau of the Ministry of Labor laid out plans for the establishment of KOSHA on May 27, 1987 and the Foundation Committee for KOSHA was launched on June 29.

On September 9, 1987 the basic plans for the establishment and operation of KOSHA were finalized and "Task Force for the Foundation of KOSHA" kicked off on September 15. The office for the Task Force was stationed in National Institute for Labor Science in 34-1, Gusan-dong, Buk-gu, Incheon. The Task Force started to set up detailed plans for the foundation and operation of KOSHA, at last.

The Task Force produced the Articles of Incorporation (Draft) of KOSHA, obtained approval from the Minister of Labor on December 5, 1987, and completed the registration process on December 9. The office of KOSHA headquarters was initially stationed at what is now the building of Occupational Safety and Health Training Institute. With the presence of some 300 participants from the government, National Assembly, labor groups, industry experts, and executives and employees of KOSHA, the Agency celebrated the its

foundation. This is the beginning of KOSHA, the proud organization in Korea responsible for the nation's OSH.

The process of establishing KOSHA was not easy. However, it was founded to contribute to the noble cause of economic development through effective implementation of industrial accident prevention activities, to ensure and promote workers' safety and health and to foster accident prevention activities led by employers. The significance of the birth of KOSHA can be summarized as the following:

First, KOSHA is a special legal entity equipped with professional knowledge and human resources. The establishment of KOSHA had enabled a comprehensive and specialized system for the prevention of industrial accidents at the national level; Second, the establishment of KOSHA was an opportunity for workers to have safer and better working environment, and a chance for Korea to raise public awareness on safety; and Third, KOSHA created the foundation for Korea to upgrade its national competitiveness by significantly reducing industrial accidents, which had been one of the obstacles for the country in joining the ranks of advanced welfare nations.

As mentioned, KOSHA was established with the noble cause of safeguarding workers' safety, health, and even their precious lives. KOSHA finally started its journey, which is to grow into a professional agency specializing in accident prevention, to become a trusted agency enhancing the lives of workers and putting the utmost importance on the prevention of industrial accidents as it works together with the government.

Table 2-3 | No. of Staff in KOSHA

(Unit: person)

	1987	1990	1995	2000	2005	2010
No. of staff	368	631	1,068	1,046	1,273	1,328

Source: No. of staff in KOSHA following organizational reshuffle (2010)

4.3. Key Business Areas of KOSHA

KOSHA's mission is to conduct R&D on prevention techniques of industrial accidents and disseminate the findings, provide technical guidance and education on OSH, inspect hazardous and risky facilities and equipment and many more. By effectively fulfilling its responsibilities related to accident prevention, it aims to ensure and promote workers' safety and health, encourage accident prevention activities to be initiated by employers, and ultimately contribute to economic development of the nation.

The key work areas of KOSHA to fulfill its founding missions are stipulated in Article 6 of the KOSHA Act, and the key issues include, but not limited to, the following. ① R&D on industrial accident prevention techniques and the dissemination of the findings; ② OSH training; ③ Safety review and inspection on workplaces; ④ Testing the performance of safety devices installed in dangerous machinery and equipment; ⑤ Inspection service of dangerous facilities; ⑥ Technical review of the installment, relocation, or modification plans of workplaces; ⑦ Technical guidance on the prevention of accidents at work; ⑧ Financial support for the installment of facilities for accident prevention; ⑨ Promotional activities for accident prevention e.g. occupational safety campaigns; ⑩ Installment and operation of accident prevention facilities; ⑪ Collection, publication and distribution of information and materials on occupational safety; ⑫ International cooperation on occupational safety; ⑬ Other work areas on occupational safety that are entrusted by the Ministry of Labor or other heads of central administrative agencies; and other responsibilities relevant to the aforementioned 13 work areas.

The work areas entrusted to KOSHA in accordance with Article 47 of the Enforcement Decree of the OSH Act include, but not limited to: ① The organization and operation of "standards approval committee" in each sector, which is necessary for the production of technical guidelines and the enactment and amendment of work environment standards, ② Conducting safety and health assessment when subcontracting hazardous or dangerous works, ③ Education for Safety and Health Managers, ④ Assessing the performance of guarding and protective devices, ⑤ To design and complete the production of dangerous machinery or equipment and to conduct performance and regular tests, ⑥ The receipt, deliberation, and acceptance of applications which are required for the use of safety certification on dangerous machinery and equipment, ⑦ The process related to the application and registration for the manufacturing business of safety devices, ⑧ Provision of Material Safety Date Sheet and other relevant data, ⑨ Quality assurance of medical examination providers, ⑩ Works related to epidemiological studies, ⑪ The receipt, deliberation and acceptance of hazard prevention plan, ⑫ The receipt, deliberation and acceptance of process safety report, ⑬ The provision and financing of relevant costs necessary for implementing industrial accident prevention duties, ⑭ The research and dissemination of voluntary safety and health management system, ⑮ The implementation of zero-accident campaigns, ⑯ The maintenance and management of statistics on occupational accidents, ⑰ Health promotion activities for workers, ⑱ Quality assurance in the monitoring of work environment.

4.4. The Developmental Stages of KOSHA's Work

In the early stages of KOSHA, the focus of its work was prevention activities of industrial accidents, the highest priority at industrial sites, such as safety assessment of workplaces, technical guidance, and vocational training for safety and health managers. In June 1988, however, operation of KOSHA became more systematic through the establishment short and long-term OSH development plan. The total overhaul of the OSH Act in January 1990 was a transitional moment for KOSHA, as its responsibilities related to accident prevention went through massive changes.

Thanks to special business plans for industrial accident prevention laid out by the Ministry of Labor in May 1994, the investment mainly targeting SMEs and vulnerable workplaces became possible. In August 1996, the "3-Year Plan for the Advancement of Industrial Safety" was launched, and it made great strides in enhancing the level of OSH in the early 21st century in Korea. KOSHA evolved over time and its duties have become more sophisticated since its foundation in 1987.

4.4.1. Foundation Phase (1987~1990)

In June 1988, the year after its foundation, KOSHA set accident reduction goals for each year by establishing short and longterm plans for upgrading occupational safety. In order to realize its goals more efficiently, KOSHA outlined three key projects and seven issues, which call for immediate attention.

The three key projects included: First, the establishment of comprehensive collaboration system for safety amongst government agencies, professional organizations and workplaces so that the safety management system could be implemented by work group, and the assessment, education, and PR on OSH could be done in a systematic and comprehensive manner; Second, development of a system for nurturing experts who will be responsible for the planning, management and assessment of prevention activities by providing collective management of workers, offer special guidance on accident-prone sectors, implement zero-accident movement, and provide safety and health training at work; Third, the development of R&D system on OSH technologies, which are necessary for providing guidance to workplaces, preventing occupational diseases, and ensuring the most basic level of safety and health at work.

The seven issues that called for immediate attentions were: ① Ensuring fundamental safety regarding dangerous machinery and equipment, and hazardous substances, ② Comprehensive safety inspection, ③ Dissemination of voluntary safety activities, ④ Promotion of zero-accident movement, ⑤ Promotion of collective management and guidance on safety and health improvement, ⑥ Prevention activities for occupational

diseases, ⑦ Construction industry. These issues were selected based on the characteristics of different accidents occurring at work.

Also in July 1989, the certification of protection and safety devices and the research on OSH, the duties previously fulfilled by the National Institute for Labor Science, were transferred to KOSHA to expand the scope of KOSHA's work areas.

In January 1990, most of the details mentioned in the short- and long-term development plans for industrial safety established by KOSHA were reflected in the amended OSH Act, thereby providing KOSHA the grounds for engaging in accident prevention activities more aggressively. The revised OSH Act set up industrial accident prevention fund, which provided the basis for more stable implementation of KOSHA's activities.

4.4.2. Early Growth and Development Phase (1991~1995)

In 1991, KOSHA engaged in various activities regarding OSH based on the amended OSH Act, which was revised in 1990. Also, this was when the inspection methods for dangerous machinery and equipment and the deliberation process for hazard prevention plan was introduced and developed to secure fundamental safety at work. The establishment of safety and health management system at work provided opportunities for employers and safety and health managers to get necessary vocational training. Also, new standards for accident prevention, including the organization and operation of the standards approval committee, which aims to produce technical guidelines and work environment standards, were introduced.

In 1992, KOSHA took over the research function of occupational diseases from Incheon Workers' Compensation Hospital – the subsidiary of Korea Workers' Compensation & Welfare Service – and the occupational hygiene research function from Occupational Safety and Health Research Institute (OSHRI). This provided opportunity for KOSHA to have its own diagnostic system for occupational diseases and take the leading role in both the prevention of work-related illnesses, as well as protection of workers' health.

In 1993, KOSHA secured the basic data for implementing a scientific accident prevention activity by conducting a survey on all manufacturing companies with five or more employees about the overall work environment including the general issues, the use of machinery and equipment, the use of chemicals. In particular, KOSHA successfully gathered 10 million signatures from workers and the general public from August 1992 to August 1993, who pledged to do their utmost in creating accident-free workplaces, and this helped to disseminate the zero-accident movement.

In 1994, industrial accident prevention methods for workplaces, which were implemented through less costly means, were developed and distributed by KOSHA.

Beginning 1995, the campaign on safe working environment began in full swing, providing the chance for the general public to have better awareness on safety. Also, a total of 300 billion KRW was spent for the three-year period beginning 1995 to provide assistance to SMEs and other workplaces with poor safety and health conditions that are responsible for 73.5% of the total injuries and illnesses at work. Thanks to the special project supporting vulnerable workplaces, the prevention activities of industrial accidents were taken to the next level due to the successful implementation of 10 major projects. Some of these major projects include: improving safety and health facilities in SMEs and vulnerable workplaces; operating risk management rooms in chemical plants; operating mobile construction safety training center; introducing Material Safety Data Sheets (MSDS); and building a comprehensive IT service system for safety and health.

4.4.3. The Pre-Advancement Phase (1996~1999)

In late-1995, for the first time since the statistics on industrial accidents were compiled by the government and KOSHA, the rate of occupational injuries and illnesses fell below 1%. In late-1996, the rate fell even further to 0.88%. However, despite the declining trend in occupational accidents, there were rooms for improvement in the qualitative side of the accidents, in terms of fatality rate, and severity.

Advancing the level of safety and health in Korea to keep up with the progress made, to improve people's quality of life as the nation's income per person reached USD10,000 and to strengthen the competitiveness of companies by preventing human and material losses and disruptions in production, became important challenges for the nation which cannot be put on the back burner. Against the backdrop, the Ministry of Labor launched "The 3-Year Plan for the Advancement of Industrial Safety (1997~1999)" which aims to create safe and healthy work environment, promote "safety-first" culture with respect for humans as the most fundamental value, and create rewarding workplaces where the right to safety and health is guaranteed.

The "3-Year Plan" was composed of eight major goals that needed to be improved urgently in order to achieve the goal of advancing the level of industrial safety in Korea. The goals were: ① Safety management in workplaces jointly conducted by workers and employers, ② Securing fundamental safety of production facilities where accidents frequently take place, ③ Creating happy and healthy work environment, ④ The eradication of traditional types of construction accidents e.g. falls, being struck by falling object, cave-ins, etc., ⑤ Focusing support on areas with poor occupational safety conditions, ⑥ Developing accident

prevention professionals and emphasizing the roles of the private sector, ⑦ Dissemination of safety-first culture into people's daily lives, ⑧ The advancement of OSH policy.

The 3-Year Plan led by KOSHA was put into force since late-1996. Finally, the opportunities had been created for Korea to join the ranks of advanced OSH countries and to become a welfare nation in the 21st century.

In early 1997, KOSHA started to introduce and distribute KISCO TOP 500 program by adopting exemplary cases of the US and the UK, thereby supporting the voluntary safety and health management activities in enterprises. In addition, KOSHA reshaped its method of providing services by focusing on the needs of workplaces. The safety and health management system, which focuses on both safety and productivity with little costs, was developed and distributed for workplaces. The training in OSH also reflected the needs and demand of workplaces and expanded more advanced courses, while curriculum where trainees can get hands-on experience was developed.

4.4.4. Advancement Phase – 1 (2000~2004)

With the dawn of the 21st century, the increase in the number of workers in small-scale workplaces with insufficient safety and health management and the rise in the number of non-regular workers actually raised the risks of accidents. Also, the advent of knowledge and information-based society emphasized the importance of protecting human resources. Also, at the international level, the efforts to achieve global standardization of safety and health-related rules and regulations began in full swing.

On December 22, 1999, the Korean government convened "OSH Policy Deliberation Committee" after reflecting a wide range of feedbacks from the labor organizations, employers' groups, academia, and relevant organizations in order to bring up the level of OSH in Korea. At the Committee, "The 1st 5-Year Plan for the Prevention of Industrial Accidents" was finalized.

The key strategic goals of the Plan were to reduce accidents at work, promote workers' health, raise safety awareness of workers and employers, create an environment where safety and health related laws and regulations are observed, and efficiently allocate roles and responsibilities assumed by safety and health managers. The Plan was announced when the risks of accidents at work were higher than ever due to changing labor intensity with the introduction of five-days-a-week working schedule, flexible employment structure with the expanded employment of non-regular workers, and increasing share of aged, foreign, and female workers in the Korean labor market.

As the industrial landscape went through major transformations and workers' needs for better quality of life were higher than ever, the Korean government expanded the coverage

of relevant laws to all workplaces, even those employing less than 5 workers, beginning July 2000. Clean Workplace project was launched in October 2001 to provide subsidies to workplaces for their overall improvement in safety and health management capability, rather than focusing on improvement in individual equipment or facility. As a result, the project provided efficient support to small manufacturing workplaces with less than 50 workers, which often suffer from monetary shortages. Furthermore, the Plan also focused on providing protection measures in areas that are vulnerable to occupational accidents, through the implementation of various support measures for underprivileged workers including migrant and non-regular workers.

It was around this time when Korea became the shipbuilding powerhouse of the world. Accidents in the shipbuilding industry had gone up significantly until 2003, and have remained almost unchanged since then. KOSHA launched a "Designated Team for the Prevention of Accident in the Shipbuilding Industry" in 2001. This Team provided technical assistance for workers working in the shipbuilding, loading and off-loading operations and provided trainings that were tailored for workers in industrial sites. On the other hand, shipbuilding companies with 100 or more workers operated the voluntary evaluation system, through which they assessed their own level of safety and health. This system enabled the workers and employers to work together to apply the voluntary safety and health assessment standards based on risk assessment, encourage voluntary improvement and engage in self-regulatory safety and health management activities.

In June 2003, the Ministry of Labor and KOSHA started to annually release the names of the companies that are in the top 10% in terms of frequent accidents (by workplace size and industry types) or those that suffer serious large-scale accidents, in government-issued newsletters and periodicals in order to encourage the workplaces to strengthen voluntary safety and health management capability and their commitment to safety and health. Furthermore, the dissemination of the safety and health management system (KOSHA 18001) to SMEs enabled these companies to enhance their capabilities in voluntary safety management.

The amendment of the Enforcement Regulations of OSH Act in July 2003 expanded the scope of workplaces that are subject to the requirement to establish "safety and health improvement plans" from workplaces with 50 or more workers to those with 5 or more workers. As a result, comprehensive safety and health technical assistance was provided to remedy work hazards and risks in small-scale workplaces as well beginning 2004. Also, "Partnership Agreement between Parent-Partner Companies for Mutual Cooperation and Co-Existence" was launched, which was a program through which parent companies provide safety and health knowhow to their partner companies, which lack the resources to implement accident prevention activities.

4.4.5. Advancement Phase – 2 (2005~)

Through the Clean Workplace project, which has become one of the major projects of KOSHA, provided a total of KRW348.7bn to 34,038 workplaces. The number of workplaces that benefited from this project was 5,600 in 2002, 3,266 in 2003, 5,236 in 2004, 10,428 in 2005, and 9,508 in 2006. In terms of providing system, KOSHA provided numerous CLEAN-UP customer services including the application ranking system for workplaces that wish to participate, computation system calculating the amount of financial support, and the guidance system for facility installation companies to better respond to customers' complaints and enhance operation efficiency. The efforts of KOSHA had paid off in 2006 when it received the "Very Best Award" at a competition amongst semi-governmental organizations under the Ministry of Labor, recognizing the organizations' innovative skills in work process.

To enhance the capability and effectiveness of technical support for the manufacturing companies and the like, Industry-specific Handbook in 69 types was developed from 2003 to 2006. Also, 19 Safe Work Manuals for different industry equipment and 65 voluntary risk assessment model were developed and distributed in 2006. Beginning 2006, Regional Training & Information Centers were established in 6 locations across the country, which collaborated with the Regional Training Centers, Regional Offices and Area Offices to strengthen the capacity of providing tailored training programs.

Also, the training programs were upgraded to meet the needs of consumers at worksites by modifying existing curriculum, selecting on-line customized training as an innovative project, conducting promotion activities through EMS, and evaluating the performance of training curriculum through receiving feedbacks. As a result, a total of 5,128 people in 2005 received training through communications means, and 28.5 of which or 1,462 persons received on-line training. In 2006, the proportion of people receiving training online increased, as 3,338 out of 7,006 trainees were trained through the Internet.

Foreign workers entered Korea to become a part of Korea's workforce and industrial accidents among them became a social issue. For the prevention of industrial accidents, 144,472 foreign workers in Korea received OSH education from 2002 to 2006. A total of 106 types of education materials including handbooks and video clips were produced since 2000 in foreign languages.

As a part of the effort to improve construction safety, the Hazard Prevention Plan format was re-written from the accident-type method to process-type methods in 2006. Also, the submission method changed so that it became possible to submit each part of the Plan per process rather than submitting the complete plan before the beginning of construction process. Furthermore, Risk Assessment Model 1, which is composed of five different

construction models to be used for the assessment and approval of the Plan, and Risk Assessment Model 2, a General Risk Assessment Model outlining 171 points to be utilized in construction works, were developed and distributed.

As the regulation-centered policy gradually switched to self-regulatory policies, KOSHA launched "Self-regulatory Comprehensive Support Project" in 2006. This was conducted in line with the MOEL's "2nd 5-Year Plan for the Prevention of Industrial Accident", and "New KOSHA 2010" in order to provide technical support for vulnerable workplaces and disseminate relevant techniques. This project was aimed at improving the level of safety and health in workplaces by facilitating voluntary industrial accident prevention activities in workplaces, which are based on risk assessment. The provision of expertise, funding, training, safety management consulting, and other comprehensive safety and health services sought to eliminate potential risk factors at work.

To meet the needs of workers and workplaces, and to provide more practical consulting on occupational health techniques, the "Workplace Health Managers" program has been implemented since 2007. This program allows everyone in the workplace, including employers, workers, safety and health managers, to request consultations on OSH.

On March 7, 2007, Occupational Health Centers were established in Banwol-Sihwa Areas and workers came to enjoy the benefit of systematic health management, health promotion, and prevention of occupational diseases and work-related diseases. These centers offer consultation on workers' health, test workers physical health, prescribe customized physical exercise, and provide musculoskeletal disorder prevention program, health education class, smoking cessation clinics, work environment improvement. These programs are being offered with the understanding that promoting workers' health and improving the infrastructure for OSH are critical and the nation is faced with many serious issues such as vulnerability of small-sized workplaces, ill-health of workers, aging workers, and the risks of cerebral and cardiovascular diseases.

On the other hand, a total of 4,211 safety certifications have been made from 1997 to 2006 as a part of industrial accident prevention project. Also, MOUs between KOSHA and overseas safety certification agencies have been concluded so that the time and costs for acquiring overseas certification are shortened, and the competitiveness of workplaces has been enhanced. This improvement also served to distribute industrial machinery and equipment produced in Korea by ensuring their safety from the designing and manufacturing processes.

From 1999 to 2006, the OSHMS system (KOSHA 18001) was introduced to a total of 349 workplaces, including 12 construction companies. The system, which aims to prevent the losses that come from industrial accidents, focused on eliminating potential dangers

of workplaces in a systematic manner, managed potential risks in workplaces, thereby reducing the number of occupational injuries and illnesses and contributing to better corporate governance.

The Process Safety Management (PSM) system has been carried out targeting petrochemical plants, and workplaces that handle large amount of hazardous and dangerous substances in order to prevent accidents such as fires, explosions, and leakage of toxic substances. Since the adaption of this system in 1996, the number of serious accidents that occur in workplaces under the system decreased from 19 accidents, 15 deaths and 31 injuries from 1996 to 3 accidents, 1 death and 4 injuries in 2006.

KOSHA's goal is to become the world's leading agency specializing in the prevention of industrial accidents. To this end, KOSHA has been collaborating with relevant agencies in advanced countries to exchange techniques, and conclude MOUs with developing countries to lay the foundation for extending technical support. For example, KOSHA has been offering short-term and long-term technical trainings to be held in advanced countries like the US and Germany and organize such as the U.S., Germany, and organize fellowship training and on-site technical consultationtargeting developing nations. Through these programs, KOSHA is working to upgrade the level of OSH in both home and abroad.

For a more systematic implementation of the "Seoul Declaration on Safety and Health"[2] which was adopted at the 18th World Congress on Safety and Health at Work, KOSHA initiated the set-up of the "ISSA Section for a Culture of Prevention"[3] and actively working as the chair organization. Also, KOSHA is preparing for the organization of the 31st ICOH Congress, a congress with the highest reputation in occupational health, to lead the development of occupational safety at home and abroad, and the exchange of relevant information.

2. Seoul Declaration on Safety and Health at Work: Signed by 46 the representatives of OSH organization around the world during the World Congress on Safety and Health at Work hosted by Korea in 2008, the 1st international Charter on OSH recognized safety and health as workers' basic rights as well as the means for economic development .

3. ISSA Section for a Culture of Prevention: An international network established in June 2011 through the approval from the BOD of ISSA for the systematic implementation of the Seoul Decalation. The members of the Section include ILO, ISSA, andorganizations at home and abroad who specialize in OSH.

2012 Modularization of Korea's Development Experience
Establishment and Operation
of Industrial Accident Prevention System

Chapter 3

Statistics System and Trends on OSH

1. Introduction of Statistics System on Industrial Accidents
2. Statistics on Industrial Accidents

Statistics System and Trends on OSH

1. Introduction of Statistics System on Industrial Accidents

1.1. The Developmental Stages of Statistics System on Industrial Accidents

Industrial Accident Statistics is one of the most important data, which is necessary to perform the duties related to accident prevention at work. Statistics provide the most basic data for understanding the current situation in numeric terms, and allow us to make the right decision and prescriptions.

Industrial Accident Statistics in Korea is closely related to the Industrial Accident Compensation Insurance System and the workers are covered by this insurance scheme. The statistics on industrial accidents were first issued in 1964 with the launch of Industrial Accident Compensation Insurance System. It has been approved as a general statistics in 1977 (no. 11806) in accordance with Article 8 of the Statistics Act. The statistics system evolved over time and took the current shape starting with the launch of Industrial Accident Investigation Rules and the OSH Act in 1981, the establishment of KOSHA in 1987, the establishment of Workers' Compensation and Welfare Service in 1995, the establishment of network dedicated to preparing industrial accidents in 1996 (Workers' Compensation and Welfare Service ↔ KOSHA ↔ MOEL), and the complete transfer of OSH-related statistics duty to KOSHA in 1998.

In the early stages of Industrial Accident Compensation Insurance System, the government took the initiative in the collection and analysis of industrial accident statistics. Until 1992, after Industrial Accident Investigation Regulations had been established, the analysis of the statistics was done using the Industrial Accident Questionnaires that target all victims

of industrial accidents. Starting from 1993, the accident reporting duty of employers had been substituted by sick-leave application report in accordance with the Industrial Accident Compensation Insurance Act, and these applications became the source of statistics counting. The development of information and communications allowed the set-up of a system that integrated the production of statistics amongst professional agencies responsible for the prevention and compensation of industrial accidents, and relevant government agencies. Since then, a variety of industrial accidents statistics analyses are being produced.

The current industrial accidents statistics system applies to industrial accidents occurring in workplace covered by the Industrial Accident Compensation Insurance (with 1 or more full-time workers). Out of the accident cases that require at least 4 days of medical care, the cases that submitted sick-leave application in accordance with the Industrial Accident Compensation Insurance Act and received sick-leave approvals, and data collected through the government are being published as official statistics on a quarterly basis.

However, detailed analysis on the causes is difficult because of the unique characteristics of relevant materials, which are produced for the purpose of compensation. These materials provide insufficient grounds for a more detailed causal analysis. In order to make up for these limitations, the government had analyzed the statistics on the causes of industrial accidents utilizing the Industrial Accident Survey (1983~1992) and Accident Site Survey (1993~present). Also, starting 1997, KOSHA has been selecting 10% of those who used sick-leave due to industrial accidents and analyzed the causes. This type of statistics produced by KOSHA has been approved as official statistics data of the government in December 2000 (no. 38001) and is still being produced.

However, even these statistics have limitations in providing the overall view on the industrial accidents occurring nationwide, and the consensus among workers, employers and the government is that it is still difficult to find out the common causes of frequent accidents in order to come up with ways for industrial accident prevention. Against the backdrop, continued efforts are being made to improve the statistics system through sample studies, customized accident causal analysis, and conducting survey on demand.

1.2. The Changes in Industrial Accident Compensation Insurance Scheme

Looking into the transformation process of the Industrial Accident Compensation Insurance System under the Industrial Accident Compensation Insurance Act, the change has been made in line with the economic development of Korea in terms of industrial structure and the scale.

The compensation of occupational injuries that occurred during the early process of industrialization was made by employers. However, due to the increasing number of mining workers falling victims to industrial accidents, the "Mining Industry Decree" was amended in 1938, and the "Compensation Rules for Mining Workers" were promulgated, which established the legal grounds for compensating accidents occurring at work for miners. Since Korea's independence from the Japanese Colonization, the Constitution stipulated the right to work, 3 major principles of labor, the equal interest share principle, as well as the protection of people that are unable to work. However, lack of relevant regulations forced the compensation of workers to rely on the decision reached in the collective agreement between workers and the management. Chapter 8 of the Labor Standards Law, promulgated in 1953 included a provision that employers are not responsible for accidents occurring at work. However, employers were negatively affected if they were negligent about protecting workers, since large-scale accidents incur great losses to the company and often led to a bankruptcy. The compensation system for workers was established only in 1963, when the Industrial Workers' Compensation Insurance Act was enacted.

In 1964, in the early stages of the Industrial Accident Compensation Insurance, the law was applied to 64 large mining and manufacturing companies with 500 or more workers, which covered a total of 81,000 workers. Later in 1976, the applied workplaces have expanded to include industries including mining, chemical, coal, oil, and rubber and plastic manufacturing workplaces with five or more workers, where a total of 1,833,000 workers work in 21,369 worksites. In 1982, the Workers' Compensation started to cover all workers engaging in construction workers to include 3,941,000 workers in 60,213 worksites. In 1989, the coverage of Workers' Compensation has been expanded to all worksites so that 154,820 additional workplaces and 7,058,000 more workers could benefit from the insurance.

Educational service, health and social welfare service, and R&D sectors were included in 1993 as sectors covered by Workers' Compensation. Also, special treatments were given in terms of the insurance to students in job training, vocational trainees, and workers dispatched to overseas. In 1999, the Insurance scheme covered construction project with 1 or more full-time workers and the project worth 20 million or higher. Furthermore, employers of small enterprises, hiring less than 50 workers, could subscribe to the insurance scheme upon request. So the number of workplaces and workers covered by the insurance increased to 706,231 workplaces and 9,485,000 workers.

In 2004, the number of workplaces covered by Workers' Compensation increased to 1 million, with 10 million insured workers. Also, due to the amendment of relevant laws and regulations, the employment insurance fee and Workers' Compensation fee were collected together. Furthermore, employers who do not hire any other workers could also subscribe

to the insurance scheme if they wanted to. As of 2011, a total of 14,362,372 workers in 1,738,196 workplaces are being covered by the insurance system.

As such, the application of Workers' Compensation has been diversified with wider coverage and the statistics on industrial accidents changed a lot. Therefore, when interpreting statistics on occupational accidents, it is important to keep in mind that the figures may point to different situation, depending on when they were calculated.

2. Statistics on Industrial Accidents

2.1. Yearly Trends on Accidents at Work

The trends of industrial accidents in Korea, based on the data on days away from work, are closely related to the increase in economically-active population and the development of industries in Korea.

During the early 1960s, the early stages of economic development, the number of industrial accidents was low, recording just 1,489 (accident rate 1.82) in 1964. However, starting from 1970, when the economic development began its momentum, industrial accidents became serious social issues. In 1978, the number of industrial accident victims reached 139,242 (accident rate 4.48) in 1978.

In the 1980s, industrial structure changed rapidly due to innovations in industrial technology. However, the working conditions did not improve markedly and led to various work-related accidents and occupational illnesses. As a result, the number of accident victims peaked in 1984 at 157,800 (accident rate 3.60).

This reality provided the opportunity for the government to realize the need for establishing an agency specializing in the prevention of industrial accidents, and the introducing multi-faceted industrial accident prevention policies. As a result, KOSHA was established in 1987 and various prevention policies were implemented and projects were undertaken afterwards. Due to the activities of KOSHA, the rate of occupational accident decreased continuously since the late 1980s to reach 0.99% in 1995, dropping below the 1% mark. From the year 1999 and on, the rate of injuries and illnesses remained at 0.7% level. In 2010, the rate fell below the 0.7% mark to reach 0.69%, and achieved a remarkable 0.65%, which is a record low, in 2011. Fatality per 10 thousand continued to decline from 3.29 in 1987 to the lowest ever at 1.47 in 2011. Since 2000, the rate of injuries and illnesses at work hovered around 0.7%, but the estimated amount of economic losses due to industrial accidents has continuously risen from KRW1.2tn 1987 to KRW7.7tn in 1997, KRW15.8tn in 2006 and KRW18.1tn in 2011. If the rate of accidents remained at the 2% level without much

improvement, they would have cost an additional KRW55.7tn to the national economy. Therefore, it is critical to make efforts to minimize industrial accidents and the consequent economic losses through the introduction of the latest prevention techniques for industrial accidents through practicable means.

2.1.1. Changes in the Number of Industrial Accidents

From 1987, when KOSHA was established, to 2011 the numbers of workplaces, workers, and accident victims have increased. If the figure in 1987 is 100, the number of workplaces, workers, and accident victims changed to 121 and 107, and 100, respectively in 1988, 207, 136, 60 in 1994, 845, 177, 48 in 2000, and 2080, 268, and 65 in 2011. This shows that the number of workplaces and workers have increased steadily, while that of accident victims decreased until 1998 and but increased slightly in recent years.

2.1.2. Changes in the Rate of Industrial Accidents by Industry

Key indicators of industrial accidents are accidents per 1,000 workers, frequency rate, severity rate, death per 10,000 workers and so on. Looking at these indices by year helps to understand the changing trends of industrial accidents.

The accident rate per 1,000 workers and frequency rate in 1987 was 26.62 and 9.77, respectively, and 24.78 and 9.26 in 1988, 11.82 and 4.69 in 1994, 7.27 and 2.89 in 2000, and 6.9 and 3.27 in 2010. These changes show similar trends to that of the number of accident victims. The severity rate decreased from 2.90 in 1987 to 1.89 in 2010, and the figures have shown slight increases and decreases in 4 to 5 years of interval. Death per 10 thousand workers was 3.29 in 1987 and dropped to the record low in 2011 with 1.47.

Table 3-1 | Yearly Trend on Accidents at Work

(Unit: person)

Year	No. of workplaces	No. of workers	No. of accident victims	Accident rate	Fatalities	Death per 10,000 workers
Total	-	-	4,049,274	-	77,079	-
'64	-	81,798	1,489	1.82	33	4.03
'65	-	160,150	9,470	5.91	144	8.99
'66	-	222,456	13,024	5.85	295	13.26
'67	-	336,159	18,207	5.42	319	9.49
'68	-	488,628	22,959	4.70	370	7.57
'69	-	683,377	32,229	4.72	524	7.67

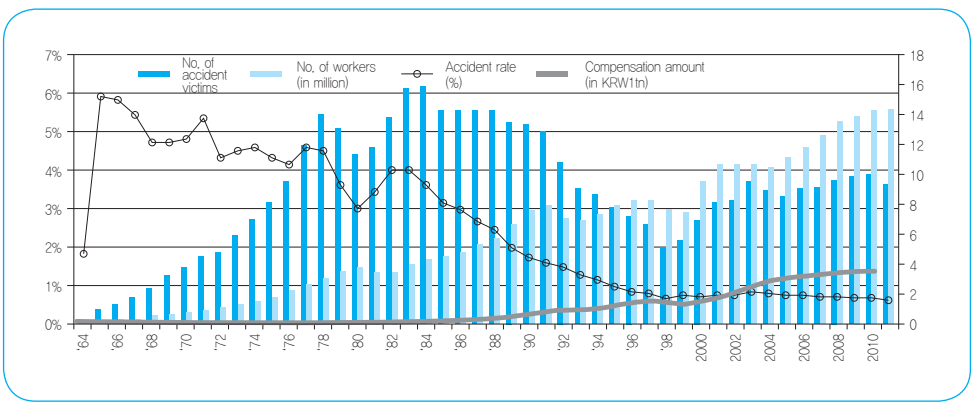
Year	No. of workplaces	No. of workers	No. of accident victims	Accident rate	Fatalities	Death per 10,000 workers
'70	-	779,053	37,752	4.85	639	8.20
'71	-	833,441	44,545	5.34	693	8.31
'72	-	1,077,632	46,603	4.32	658	6.11
'73	-	1,319,501	59,367	4.50	840	6.37
'74	-	1,517,787	70,142	4.62	845	5.57
'75	-	1,836,209	80,570	4.39	1,006	5.48
'76	-	2,269,796	95,289	4.20	887	3.91
'77	-	2,646,542	118,011	4.60	1,174	4.44
'78	-	3,105,757	139,242	4.48	1,397	4.50
'79	-	3,607,595	130,307	3.61	1,537	4.26
'80	-	3,752,975	113,375	3.02	1,273	3.39
'81	59,029	3,456,746	117,938	3.41	1,295	3.75
'82	54,159	3,464,977	137,816	3.98	1,230	3.55
'83	60,213	3,941,152	156,972	3.98	1,452	3.68
'84	64,704	4,384,589	157,800	3.60	1,667	3.80
'85	66,803	4,495,185	141,809	3.15	1,718	3.82
'86	70,865	4,749,342	142,088	2.99	1,660	3.50
'87	83,536	5,356,546	142,596	2.66	1,761	3.29
'88	101,445	5,743,970	142,329	2.48	1,925	3.35
'89	118,894	6,687,821	134,127	2.01	1,724	2.58
'90	129,687	7,542,752	132,893	1.76	2,236	2.96
'91	146,284	7,922,704	128,169	1.62	2,299	2.90
'92	154,820	7,058,704	107,435	1.52	2,429	3.44
'93	163,152	6,942,527	90,288	1.30	2,210	3.18
'94	172,871	7,273,132	85,948	1.18	2,678	3.68
'95	186,021	7,893,727	78,034	0.99	2,662	3.37
'96	210,226	8,156,894	71,548	0.88	2,670	3.27
'97	227,564	8,236,641	66,770	0.81	2,742	3.33
'98	215,539	7,582,479	51,514	0.68	2,212	2.92
'99	249,405	7,441,160	55,405	0.74	2,291	3.08
2000	706,231	9,485,557	68,976	0.73	2,528	2.67
2001	909,461	10,581,186	81,434	0.77	2,748	2.60

Year	No. of workplaces	No. of workers	No. of accident victims	Accident rate	Fatalities	Death per 10,000 workers
2002	1,002,263	10,571,279	81,911	0.77	2,605	2.46
2003	1,006,549	10,599,345	94,924	0.90	2,923	2.76
2004	1,039,208	10,473,090	88,874	0.85	2,825	2.70
2005	1,130,094	11,059,193	85,411	0.77	2,493	2.25
2006	1,292,696	11,688,797	89,910	0.77	2,453	2.10
2007	1,429,885	12,528,879	90,147	0.72	2,406	1.92
2008	1,594,793	13,489,986	95,806	0.71	2,422	1.80
2009	1,560,949	13,884,927	97,821	0.70	2,181	1.57
2010	1,608,361	14,198,748	98,645	0.69	2,200	1.55
2011	1,738,196	14,362,372	93,292	0.65	2,114	1.47

Source: "Yearly trend on accident at work," MOEL

Reference: "Analysis on accidents at work" (2000, 2005, 2010); "Analysis on fatal accidents (2009, 2010, 2011)

Figure 3-1 | Industrial Accident Rate by Year and the Distribution of Industrial Accident Compensation Insurance (1964~2011)



Source: Yearly Analysis on Industrial Accidents, MOEL

2.1.3. Changes in the Rate of Industrial Accidents by Workplace Size

The number of accidents per 1,000 workers in small workplaces with less than 50 workers marked 27.8 in 1991 and 9.8 in 2011. On the other hand, the number of accidents per 1,000 workers in workplaces with 50 or more workers is lower at 1.7 in 1991 and 2.5 in 2011. The rate of death per 10,000 workers is also higher in small enterprises with less than 50 workers at 5.49 in 1996 and 1.67 in 2011 than that in larger enterprises with 50 or more workers, which recorded 3.18 in 1994 and 1.23 in 2011.

Looking at yearly changes, the accident rate per 1,000 workers in small enterprises with less than 50 workers decreased from 27.8 in 1991 to 18.8 in 1994. However, the rate showed slight ups and downs from then to 2006 at 18.8 to 10.8 (recorded in 2000). Death rate per 10,000 workers remained between 5.49 (in 1996) to 3.78 (1998) from 1991 to 1999, and the figure has dipped to 2.23 (in 2007) and 1.67 (in 2011) in the recent five years.

2.1.4. Yearly Statistics on Occupational Diseases

Up until 1990, the cases of work-related illnesses were not included in the category of work-related illnesses, but included in fatality at work. As a result, the rate of work-related illnesses per 10,000 workers ranged from 3.74 (1998) to 2.17 (1990). The statistics on work-related illnesses were categorized separately from 1991. The rate of work-related illnesses per 10,000 workers (including non-fatal and fatal illnesses) recorded 8.77 (2004)-1.27 (1991) range. Due to the changes in criteria defining the work-relatedness of an illness, the rate is showing an increasing trend.

From 1991 to 1998, the rate ranged from 2.57 (1997) to 1.27. However, as the scope of work-related illnesses widened to include noise-induced hearing loss, cerebro and cardiovascular diseases and pneumoconiosis, the rate increased to 3.67 in 1999. Also, as the psychological conditions triggered by work-related stress have been recognized as work-related illness in 2000, the rate per 10,000 workers increased to 4.27, moving within the range of 5.34 (in 2001) and 4.27. Also when skin conditions and liver diseases were included in 2003, the rate increased to 8.61 and moved between the ranges of 6.78 (in 2005) to 8.77 (in 2004) for the past five years.

The newly recognized work-related illnesses for the past 10 years include: cerebro-cardiovascular diseases, illnesses triggered by strenuous body work, pneumoconiosis, lower back pain, noise-induced hearing loss, other work-related conditions, infections due to germs and viruses, organic solvents poisoning, metal & heavy metal poisonings, and so on, in the order of frequency.

2012 Modularization of Korea's Development Experience
Establishment and Operation
of Industrial Accident Prevention System

Chapter 4

Application and Implementation of OSH Policy

Application and Implementation of OSH Policy

It is not an exaggeration to say that most of the direct activities aimed at industrial accident prevention are done in workplaces. Labor-management relationship is one of the factors that determine activities implemented within workplaces to protect workers' health, when relevant regulatory policies of the government are absent. Workers are under employers' control when they are at work, and thus, employers have considerable discretion over workers' health and safety as far as activities on occupational health are concerned. Therefore, it is imperative to establish regulatory policies that safeguard workers' health, considering the government's roles and responsibilities for the preservation of its labor force. Regulatory policies of the government target employers and these regulatory supervisions are conducted based on legal grounds.

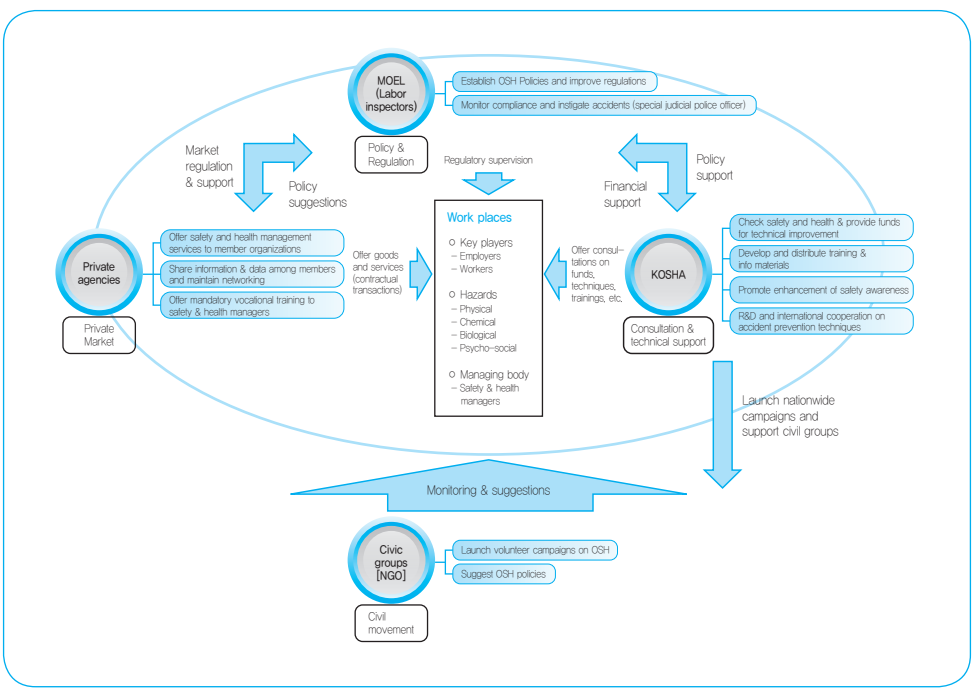
Government regulations safeguarding workers' health mostly require employers to take minimum measures to protect their employees' health. Therefore, employers should tap into professionals or purchase services that are necessary in the OSH market in order to take advanced OSH measures within the boundaries of such regulatory environment. When regulatory policies began to be introduced to Korea, the country's OSH market was very poor, making it very difficult for employers to purchase necessary services in the general market. Therefore, a public agency was established to implement policies that assist both workers and employers. Furthermore, private agencies offering essential OSH services through trade relationships with employers were created. On the other hand, civic groups including labor unions have consistently presented their policy ideas and carried out social movements to protect workers' health while relevant laws and regulations steadily improved, too.

KOSHA conducts government-mandated operations to support the government's regulatory policies, assists workplaces to safeguard workers' health and works on long-

term research that are aimed at developing OSH techniques. KOSHA has been active in enhancing safety and health awareness among employers, workers and the general public, while providing economic, technical and educational support to workplaces utilizing public goods when the private OSH market was sluggish. Such activities emphasized certain sectors and their focus shifted from time to time based on occupational accidents and injuries statistics, in order to achieve steady improvement.

Key players of occupational accident prevention, their key roles and the interactions between them can be described as [Figure 4-1] below. Through regulatory supervision, the Korean government required minimum work environment standards and accident prevention activities by employers aimed at protecting workers' health. KOSHA, on the other hand, which is being operated based on public funds, has been a provider of assistance, consultation and training to ensure safety and health at work. Also, public agencies have been distributors of OSH services to employers while civic groups assumed the role as a monitoring agent, which not only helps to enhance safety awareness among the general public, but also discovers social issues, informs them to the government, KOSHA and workplaces, and provides necessary remedies.

Figure 4-1 | Key Players of Occupational Accident Prevention, their Key Roles and Interactions between them



1. Laying the Foundation for OSH

1.1. Enactment of Technical Guidelines by KOSHA and the Development and Distribution of Relevant Techniques

It was roughly two decades ago in the mid-1980s when the Korean society started to pay attention to work environment, environmental issues and occupational disease. In the past, the country focused on economic development, emphasizing mainly on building and enhancing productivity. The country was not in a position to pay much interest in raising the awareness on OSH or making investment in this area.

In the mid-1980s, large-scale breakouts of occupational diseases occurred in Wonjin Rayon Company, as well of the phenol spill in Nakdong River, the side-effects of the nation's economic development, rose as social issues. These incidences alerted people to pay more attention on OSH.

With rapid changes in the Korean society, the efforts to ensure safety and health at work were diversified. Also, the need to develop and enhance techniques on OSH has grown, which was desirable for Korea.

1.1.1. Organization and Operation of "Standard Setting Committee on OSH Techniques"

The amended OSH Act enacted on January 13, 1990 included provisions on the establishment of technical standards. In accordance with the new provision, technical guidelines and work environment standards on safety measures to be followed by workers had to be established, which are adequate for domestic situation. As the modern society evolved into a more complex industrial society with the advent of new industries, production techniques and methods, a higher level of safety and health standards was called for.

Developed countries have already begun to strengthen their OSH standards, while the public's needs and awareness on safety and the environment grew at a rapid clip. Under these circumstances, the establishment and operation of a committee responsible for the setting of relevant techniques became extremely important, which can upgrade the existing OSH standards in Korea to become more objective and realistic through the participation of experts from various fields.

The necessity of a professional agency, as opposed to an administrative body, arose in order to put in place more sophisticated and complete technical standards, and to implement relevant operations in an effective manner. As a result, in accordance with Article 47 of the Enforcement Decree of the OSH Act, which was amended on July 15, 1990, the organization

and operation duties of the Sector-based Standard Setting Committee were entrusted to KOSHA. On June 14 of the following year, the rules on "Standard Setting Committee on OSH Techniques" was established and promulgated as Rule no.199 of the MOEL, in accordance with Article 27 (Technical Guidelines and Work Environment Standards) of the OSH Act.

As a result, KOSHA established and enacted Operational Rules on OSH (Rule no.83 of KOSHA) on July 10, 1991—a subsidiary enforcement regulation necessary for the operation of Standard Setting Committee—to begin establishing technical standards in earnest.

The Standard Setting Committee was comprised of and operated as two separate committees, which are the General Standard Setting Committee and the Sector-based Standard Setting Committee. The Sector-based Committee was responsible for the standards of eight sectors in total, which include five safety sectors and three health sectors. The safety sectors include general occupational safety, machine safety, electric safety, chemical safety and construction safety. Health areas include occupational health management, occupational medicine and industrial hygiene.

The General Standard Setting Committee was comprised of some 20 members including the President and Director General for Technology at KOSHA, heads of each sector under the Sector-based Committee and experts with the knowledge and experience in the OSH field. Their key responsibilities included the resolution, review and finalization of any issues arising from overlapping technical guidelines established by the Sector-based Standard Setting Committee or any other disputes.

The Sector-based Standard Setting Committee was comprised of experts from KOSHA as well as representatives from relevant government agencies, relevant agencies and academia. Professional technical standards and guidelines of respective sectors are deliberated and decided through the Sector-based Committee.

1.1.2. Development and Distribution of Technical Standards by KOSHA

Before KOSHA took over the duties of establishing relevant standards, technical standards on OSH had been produced and released by the MOEL. However, these standards had been mainly on general safety, rather than technical ones. Therefore, it was only after mid-1991 when technical standards worth of their names were introduced through the official launch of the Standard Setting Committee by KOSHA. And these standards were distributed to workplaces in the form of a notice released by the MOEL.

The technical standards proclaimed by the MOEL in the form of a notice were mandatory requirements to be observed in workplaces. However, Article 27 of the OSH Act amended

on January 5, 1995 changed the previous requirements into recommendations and guidance to be provided by employers in order to ensure safety at workplaces on a voluntary basis.

As a result, the technical standards were announced in two forms, either as a notice released by the MOEL or as technical standards of KOSHA (KOSHA Code). The MOEL notice was limited to technical standards that are essential to ensuring OSH, while other technical standards were released as KOSHA Code authorized by the President of KOSHA to be applied in workplaces on a voluntary basis. On the other hand, mandatory technical standards to be abided by at work were included in the Regulations on Occupational Safety Standards revised on January 11, 1997 and most of the existing notices that had been released by MOEL came to be substituted with KOSHA Code.

Before KOSHA took over the responsibility to release necessary standards, the MOEL was in charge of 84 technical guidelines in total. Since being charged with the duty in July 1991, KOSHA newly released or revised 139 standards. New standards were enacted and revised in 1991 (9 enactments; 14 revisions), 1992 (22 enactments; 15 revisions), 1993 (25 enactments and 17 revisions) and 1994 (28 enactments and 9 revisions).

All of the 23 technical standards enacted and revised by KOSHA in 1991 were adopted as MOEL notices. In 1992, 19 out of 37 standards were accepted as MOEL notices, 10 others as MOEL technical guidelines (78.4% selection rate). In 1993, 18 out of 42 were adopted as MOEL notice and 1 as technical guideline (45.2% selection rate). However, the selection rate plummeted to 8.1% in 1994 when only 3 out of 37 standards have been chosen by the MOEL. This shows that the revised or established technical standards have become more specialized to those confined to safety, and it became increasingly unlikely for administrative bodies to release professional technical standards as notices.

Article 27 of the OSH Act revised on January 5, 1995 stipulated that technical guidelines and work environment standards to be followed by employers shall be established and be instructed and recommended to employers. Based on these rules, KOSHA produced KOSHA Code so that safety can take root in workplaces on a voluntary basis.

A total of 809 KOSHA Codes have been produced and announced so far, including 89 Codes on general occupational safety, 157 on machine safety, 170 on chemical safety, 121 on electric safety, 64 on construction safety, 32 on health management, 76 on industrial hygiene, 50 on occupational medicine, and 50 on risk management. All KOSHA Codes have been registered in KOSHA Net so that all workplaces can have access to the website and search and print out the information they need.

Based on recent experiences of KOSHA in carrying out technical support programs for developing countries, requests have been made for the provision of detailed and practical

technical guidelines such as KOSHA Code. Therefore, the establishment and utilization of such codes will offer realistic benefits to developing countries.

1.2. Securing the Safety of Production Facilities with Frequent Accidents

As the scale of domestic industries becomes bigger, the production facilities are becoming increasingly more sophisticated, and systemized. Also, the installation and use of dangerous machinery and equipment expands at a rapid pace. Recent study on the causes of industrial accident revealed that a quarter of accidents come from the use of dangerous machinery and equipment. Therefore, securing the safety in production facilities that are prone to accidents is the utmost priority in order to minimize accidents at work.

Article 33 of the OSH Act requires that protective devices—installed in dangerous machineries and equipment—should be checked to see whether they are performing properly and only those with proven performance level be used at work. This is to systemically manage production facilities in accident-proneindustries, and to ensure safe use of dangerous machinery and equipment by workers. Also, article 34 of the Act requires people who produce, install or use the dangerous machinery or equipment to have the safety level confirmed, especially before and after the production stage, and before and during the use. Also article 35 of the Act requires safety testing of protective devices used by workers so that only the protective devices with guaranteed level of safety can be manufactured and used at work.

These safety requirements have developed over time thanks to the cooperation of employers and active participation of workers, and they have contributed greatly to the prevention of industrial accidents. The background, development, current status, and key accomplishments of the abovementioned activities are elaborated as the following.

1.2.1. Inspection of Dangerous Machinery, Equipment and Facilities

a. Introduction of Inspection System

The 1st 5-Year Economic Development Plan, launched in 1962 triggered industrialization of Korea. During this period, the nation developed in both quantitative and qualitative terms, by expanding the basis for industrial production and modernizing production facilities. The increased scale of industries brought about even larger potential risks at work because the dangerous machinery and equipment used at industrial sites became more complex, diversified and larger.

Against the backdrop, the safety measures to protect workers from hazardous machineries became an absolute necessity. In response, the Korean government wanted to pre-emptively eliminate the risks of dangerous machinery and equipment and ensure fundamental safety at work, thereby protecting the precious lives and assets of people from industrial accidents. As a result, the OSH Act was amended in 1990 to introduce inspection system on dangerous machinery and equipment.

The inspection system for dangerous machinery and equipment was introduced to ensure safety in each of the design, manufacturing and installation stages, rather than producing countermeasures only after the occurrence of accidents. This is one of the most effective means to prevent industrial accidents, and was introduced to enhance productivity, which can be achieved through the harmony between workers and employers in an environment valuing lives of workers and strengthen national competitiveness.

b. Changes in Relevant Laws and Regulations on Inspection Duties

① Legal Grounds for Conducting Inspection Duties

The legal ground for inspection system was established on January 13, 1990 when the OSH Act was amended to include provisions on inspection system in article 34. The amended Act allowed the establishment of manufacturing and safety standards, concerning the safety of dangerous and hazardous machinery, equipment and facilities.

The Enforcement Regulation of the Act mandates 7 out of 17 dangerous machinery and equipment to be tested for their safety. These include cranes, lifts, elevators, pressure vessels, presses, air compressors and boilers that are prone to accidents. Also, detailed inspection procedure has been set up, which lists the documents that need to be submitted when applying for the inspection and the processing of the inspection results.

② Enactment and Amendment of Inspection Regulations

In accordance with the OSH Act and the Enforcement Regulations, "Regulation on the Inspection of dangerous machinery, equipment, and facilities (Notice no. 1990-78 of the MOEL, January 3, 1991)" was established to set out the procedure of inspection duties entrusted by the Minister of Labor. The Regulation includes details about administrative procedures on inspection duties including the person subject to inspection, application procedure, the time required for inspection and processing of the results as well as the necessary preparations to be made at workplaces. Six revisions have been made to the Regulation so far, due to the amendments of superior laws and to streamline inspection procedures.

③ Inspection Process

Dangerous machinery and equipment go through 3-step inspection procedures to ensure their safety.

The design inspection is conducted on each type of machinery and equipment to see whether the drawing documentation satisfy the manufacturing and safety criteria which include the design drawing, strength calculation sheet, electrical circuit plan and specifications on protective devices. Also the final inspections are conducted by each inspection items e.g. crane, lift, etc. to check safety before they are put into use, and to see whether the completed products are manufactured as planned.

The performance testing on pressure vessels, presses, shearing machine, rollers, etc. is conducted at the manufacturing plant by each product type to see whether they are manufactured as planned.

Regular inspection is done in every two to four years, depending on the item to be inspected, to see whether the protective devices function properly.

④ Enactment and Amendment of Inspection Standards

The OSH Act provided the legal grounds for establishing manufacturing and safety standards on dangerous machinery and equipment, and the standards for the manufacturing, safety and inspection of each dangerous machinery and equipment have been established. The manufacturing standards stipulate specific rules that manufacturers or installers should follow during the design, manufacturing and installation stages, while safety guidelines are about the requirements necessary for ensuring safety in the manufacturing process. Also, the inspection standards apply to inspections conducted during the design, completion, performance testing, etc. processes.

The standards on manufacturing, safety, and inspections have gone through many revisions to reach the level on par with internationally-accepted specifications and standards, and to upgrade the reliability and quality of inspection. As a result, the standards on cranes have been revised three times, while that of pressure vessels and lifts have been revised four times, each.

The amendment of crane standards on Oct 10, 2001 required that earthquake loads shall be considered from the designing stage, while reinforcing safety standards as the use of remote controllers is more common. Also, the structure was enhanced to prevent buckling or other types of physical damage.

The standard on pressure vessels was revised on Oct 10, 2001 in conformity with the ASEM standards of the US, which is being observed by many domestic pressure vessel users and manufacturers. According to the revised standards, steel with high carbon content

cannot be used as the material of a pressure vessel to be welded. Also, the impact of high wind was considered in the designing process. Also, the materials for pressure vessels have become more diverse.

The revisions on Oct 10, 2001 and December 31, 2004 for standards on lifts have provided new rules on remote controllers, and also introduced new standards on common industrial work lift and aerial work platform.

⑤ Changes in the Machinery, Equipment and Facilities Subject to Inspection

There were seven types of dangerous machinery and equipment when the inspection system was first introduced in 1990. However, the machinery and equipment that suffer accident frequently were also included as items subject to inspection, while those with low risks were removed from the inspection list.

On March 29, 1994, the scope of lifts subject to inspection was expanded to include lifts with 18 meter or higher of hoistway and at least 0.5 ton of load as accidents involving low-capacity lifts continued to grow. On the other hand, air compressors were excluded from the inspection list as accident involving them became less frequent and less severe since the introduction of mandatory inspection.

The enactment of The Special Act on Deregulation of Corporate Activities on June 11, 1993 eased the scope of regular inspection for pressure vessels from 0.2 kgf/cm^2 to 2 kgf/cm^2. On May 1, 1997, presses and lifts were removed from the list of industrial machinery and equipment subject to mandatory inspections.

The scope of inspection for small-scale cranes and presses were expanded through the revision of the Enforcement Regulations of the Act on Oct 16, 1997 as industrial accidents involving them became much more frequent since 1990. Therefore, cranes subject to inspection were expanded to include those with 0.5 ton or heavier static carrying capacity (previous regulation: 3 tons or heavier), whereas the scope of presses subject to inspection expanded to cover all presses (previous regulation: at least 30 tons in pressure capacity). In addition, shearing machines and rollers were also included in the list subject to mandatory inspection.

1.3. Building Prevention System for Major Industrial Accidents

As industries developed further, a wider range of chemical substances came to be used in industrial sites. Also, with the increase in the size of equipment and facilities, the amount of chemicals used increased as well. As a result, potential risks of accident became more diversified, and the scale of human and material losses became much larger. Against the backdrop, the Process Safety Management (PSM) System was launched to facilitate more

scientific and systematic management of process safety, which accommodates people's needs for safer livelihood.

1.3.1. Introduction of Process Safety Management System

a. Background

As one of the process manufacturing industries, the chemical industry emphasizes safety issues of the facility, etc. from the designing stage, and therefore, frequency of accidents is lower than that of other industries. However, even a single accident caused by a breakdown of the facility or operational mistake can cause accident of an enormous scale, leading to serious damage.

As a result, the ILO categorized this type of industrial accidents as "major accident" and is making full-fledged efforts to implement various prevention activities.

In Korea, there have been a number of major accidents over the past few decades, which caused huge damage and stirred up social concerns. They are: high-pressure pipe explosion in Hyundai Refinery Co. (now Hyundai Oilbank) (in 1991); TDA and Tar leaks in Dong Yang Chemical Co. in Gunsan (1991); LPG Tank fire in Hae Yang City Gas Co. (1990); MEK-PO reactor explosion of Hosung Chemex (now Dongsung Highchem Co.) in Yeosu (2000); and poisonous substance leaks in Yeosu and Ansan (2005).

Countries outside Korea have also suffered serious human and casualty losses due to large-scale industrial accidents. They include: cyclohexane leak in Flixborough, UK (1974); dioxin leak in a pesticide manufacturing plant in Seveso, Italy (1976); LPG explosion in Mexico City (1979); and toxic substances leak in Bhopal, India (1984).

Frequent occurrences of serious accidents triggered international organizations including the ILO, OECD, EU and UNEP to propose guidelines which help various activities aimed at the prevention of industrial accidents.

b. Process of Implementing Process Safety Management System

Large-scale industrial accidents occur not only in Korea but also in other countries around the world. Korea stepped up its efforts to make preparations for establishing policies on accident prevention only after many international organizations had started to strengthen prevention policies. In July 1993, an international seminar on the prevention of major accidents was organized in Seoul. After that, seminars and discussion sessions were organized in regions such as Ulsan, Yeosu and Daesan—areas with high density of chemical factories—to introduce the PSM system.

Article 49-2 of the amended OSH act was enacted on January 5, 1995 provided legal grounds for the introduction of the PSM System as well as the deliberation and confirmation

system of Process Safety Report effective January 1, 1996. The existing hazardous and dangerous facilities were given a total of four years to complete the report starting 1996, during which only 1/4 of Process Safety Report is to be produced per year for the existing facility, and to be submitted to KOSHA on or before September 30 of each year during the four-year period.

On May 16, 1997, the synthetic resin manufacturing industry was included in the list of hazardous and dangerous industries. The revised OSH Act enacted on January 7, 2000 eased rules regarding the submission of Process Safety Report so that the submission and review of the Report on existing facility, which were previously done every five years, became unnecessary and the Report is to be supplemented and made available only when there is a reason for such change. However, the rules above were once again strengthened through an addition of paragraph 8, article 49-2 of the Act on March 31, 2005, which required re-submission of Process Safety Report if the supplemented information is not sufficient based on the evaluation.

In March 2005, KOSHA established "Major Industrial Accident Prevention Centers" in four major areas with chemical industrial complexes, which are Ulsan, Ansan, Yeosu and Cheonan. Also, KOSA and Korea Gas Safety Corporation have been conducting sequential and joint inspections of Process Safety Report and Safety Improvement Plan since May 2007.

c. Framework of Process Safety Management System

The legal grounds for Process Safety Management System can be found in Article 49-2 (Submission, etc. of Process Safety Report) of the OSH Act.

Facilities that manufacture, handle, use and store more than a certain amount of hazardous substances and all the relevant process facilities for their operations are required to submit Process Safety Report. In addition, there are seven high-risk industries that are also subject to submitting Process Safety Report. The seven industries include: crude oil refineries; reprocessing of other fractionated petroleum; manufacturing of petrochemical basic chemicals, synthetic resin & other plastic materials; manufacturing of nitrogen phosphorus and potassium fertilizers; manufacturing of compound fertilizer; manufacturing of pesticides; and manufacturing of firework products.

There are 12 main elements in the Process Safety Report. The operation of Process Safety Management System usually takes the following steps: technical data and drawings related to the manufacturing process are specified and the process risk assessment based on these data is implemented to identify or take necessary measures. And then, errors at work are minimized through the set-up and implementation of safe operation procedures and subcontracting management standards. In addition, the design, production, operation

and repair standards are systematically carried out in order to flawlessly maintain the performance of facilities.

Furthermore, plans for emergency measures are devised and carried out in order to prepare for contingencies, thereby minimizing damage should they occur. Finally, the implementation of process safety management is ensured by providing education and training to all employees and conducting regular internal inspections in order to comply with relevant procedures and standards, and remedy identified problems if there are any.

d. Results of the System

In 1996, when Process Safety Report submission requirement was introduced for the first time, the number of major industrial accidents stood at 20, with 15 fatalities. However, a decade later, the number of accidents dropped to three, and fatalities decreased to five persons. The rate of injuries and illnesses in workplaces subject to submitting Process Safety Report decreased from 0.83% in 2005 to 0.67% in 2006, which is well below the average accident rates of other manufacturing sectors.

The PSM system is proven to be effective in reducing major industrial accidents and thereby minimizing associated losses. Furthermore, it is contributing to generate profits at the national level, since the risk assessment that is conducted when plants are exported to the overseas market is based on home-grown techniques. According to a survey done in workplaces that submit PSM reports, 83% of the respondents said that the system boosted productivity, while a whopping 98% said it helped to promote safety culture. As a result, the mindsets of employers changed from "investment in safety is a loss and costly" to "safety is a business and profit."

1.3.2. Establishment and Operation of Comprehensive Risk Management System

The Korean government extensively nurtured the oil refining and petrochemical industries since the 1960s and 1970s. The stellar growth f these industries made Korea the world's 4th largest manufacturer of chemicals as of 2003. However, as the facilities got larger and older, the risks of major industrial accidents, namely fire, explosion, and hazardous substance leak are on the rise. Against the backdrop, Korea institutionalized the PSM system in 1995 and enforced it since 1996, which proved to be highly effective. However, the PSM system was not enough to completely eliminate the social fears and human and property losses of major industrial accidents, when they occur. Therefore, the needs of workplaces for a more advanced form of prevention techniques of major industrial accidents rose, and in response, KOSHA established the "3-Year Plan for the Advancement of Occupational Safety" in 1997 to put in place the Comprehensive Risk Management System.

The Comprehensive Risk Management System is a quantitative assessment tool introduced to assist the PSM system, which aims to prevent major accidents at work. The System refers to a computerized program helping to predict risks at work, which selects virtual accident scenarios that may occur in work processes and calculates the possibility of accidents and their scope of damage.

Upon completion in 2002, pilot implementation of the Comprehensive Risk Management System began in 2003. After the full implementation of the System was carried out in all workplaces subject to the PSM system, relevant training was provided, and post-implementation is continuously managed to improve the performance.

During the "People's Government" (the administration held by then-President Kim, Dae-jung, 1998~2003)), the Comprehensive Risk Management System was selected as one of the 100 major national projects, while the succeeding "Participatory Government" (then-President: Roh Moo-hyun; 2003~2008) also included the System as one of the pledges during the presidential campaign. It was given the "Jury's Award" at the 4th Public Sector Innovation Contest in 2002. Also, in 2001, at the OECD international workshop for the prevention of major industrial accidents held in Seoul, the Comprehensive Risk Management System was recommended as a risk assessment model for the OECD.

Comprehensive Risk Management System can bring the following technical and economic benefits.

In terms of technical benefits, the management of Process Safety Reports ensures an accurate understanding on comprehensive and systematic data gathering and management status of major high-risk facilities. Also, analysis of the collected data can be used as the basis for establishing effective and comprehensive safety management and emergency response measures, and well as prevention schemes. In addition, the development of accident cause analysis and prevention techniques, and a more comprehensive and objective risk assessment on chemical processing are possible through the database on the credibility of chemical processing-related facilities in Korea. These efforts contribute to reducing major industrial accidents and mitigating associated damage through reasonable safety management, emergency preparedness plans, and damage minimization plans in chemical plants and their neighboring areas.

In terms of economic benefits, the management of Process Safety Reports can translate into reducing major industrial accidents, as they can be utilized as the basis for producing comprehensive and effective in-depth safety measures that help to prevent accidents in chemical plants. Also, home-grown technologies predicting the scope of damage spared Korea from being overly dependent on overseas technologies and enabled the country to make necessary investments in safety. In other words, the beginning of the Comprehensive

Risk Management System was a transition point, when the awareness on quantitative risk assessment in domestic chemical plants went through important changes.

On the other hand, the current form of "order & control" regulatory framework is to change into a systems approach—voluntary regulatory framework—for Korea to joint the ranks of advanced countries. Also, one of the major issues to gain much attention would be the transition of focus from qualitative risk assessment into quantitative risk assessment. As a result, quantitative risk assessment-based Comprehensive Risk Management System will rise as a core implementation tool in risk assessment.

2. Technical Guidance and Support Program that Bring Changes to Worksites

2.1. Supporting Safety Management in Small Worksites

Improving safety and health facilities in Korea's small businesses is particularly difficult due to their insufficient financial and technical capabilities, while mandatory improvement through enforcement has its limitations. Therefore, the government was in need of realistic measures, which included subsidizing a portion of costs necessary for safety and health facility improvement in private companies, in order to encourage employers to make investments in accident prevention facilities and revitalize voluntary safety and health activities.

Against the backdrop, various OSH-related programs have been launched and undertaken. They include: "Loans Program for Building Industrial Accident Prevention Facilities" launched in February 1984 to reduce industrial accidents and facilitate voluntary prevention activities in workplaces; "Support Programs for Safety Facility Improvement, Protective Equipment Installation and Work Environment Enhancement" launched in November 1994 to reduce traditional types of accidents and prevent occupational diseases; and "Clean Workplace Program" launched in October 2001 to create safe and healthy workplaces.

The loans and subsidies provided to upgrade the prevention facilities for industrial accidents come from government funding. Through relevant policy activities workers employed in workplaces with poor financial and technological conditions are protected from industrial accidents, thereby safeguarding the labor force of the country as a whole, while supporting safety management in small and hazardous workplaces.

2.1.1. Clean Workplace Program

a. Introduction

Globalization of the Korean industries has accelerated the globalization of OSH sector as well. Thus, Korea has continued to implement various programs including "Technical Support for Accident Prevention," "Subsidization Program," etc. targeting small workplaces prone to industrial accidents in order to raise the level of OSH on par with that of the advanced countries. Despite the efforts, less attention and investment have been made to these small-scale workplaces in comparison to larger ones and, therefore, it has become increasingly important to provide assistance to these workplaces through policy measures and other support programs.

Manufacturing sites with less than 50 workers are responsible for some 70% of accidents in the manufacturing industry due to their lack of technical expertise on safety and health, insufficient finance, poor safety and health awareness of workers and employers, increasing number of non-regular workers, aging of workforce, and so on. Furthermore, their poor working condition, the so-called "3D"—refers to dangerous, dirty and difficult work exposes workers to the use of hazardous machinery and equipment, toxic gas, dusts, noise and so on. Many of these 3D jobs are not favored by jobseekers and small-sized manufacturing companies are hit by a double whammy of labor shortage and frequent injuries and illnesses.

Against the backdrop, KOSHA started to provide a comprehensive safety and health consultation targeting small- and medium-sized enterprises. Based on the results of the consultation, KOSHA provided a portion of necessary costs for eliminating work hazards through the Clean Workplace Program. Aiming to create a safe and healthy workplace, the Clean Workplace Program substituted the existing subsidies which had been provided to upgrade safety equipment, install protective devices, enhance work environment, replace and improve presses, and so on. The Program officially kicked off in October 2001 not only to prevent accidents at work but also to secure the competitiveness of small companies.

b. Key Business Areas and Progress

Although the Clean Workplace Program was launched in October 2001, the extent of support provided in its initial stages was very limited, and the full-fledged support only began in 2002. The main target of the Program remains unchanged—manufacturing workplaces with less than 50 workers—but the items eligible for support, maximum funding amount, supporting methods, etc. have been adjusted in accordance with the circumstantial changes associated with the Program's implementation.

Due to positive reaction from employers and relevant agencies about the Program's effectiveness in strengthening corporate competitiveness and reducing accidents, the number

of workplaces applying for the program increased. Accordingly, the funding expanded from KRW50bn in 2002 to KRW36.5bn in 2003, KRW70bn in 2004, and KRW100bn, each, for the years 2005 through 2007.

In the first year of the Program's launch, the maximum amount of funding to be provided to a workplace was KRW30mn for 60 items. It is broken into: KRW10mn in base subsidy funding 100% for 60 support items; KRW10mn in safety facility upgrade subsidy funding 50% of the expenditure; and another KRW10mn to enhance working conditions. In 2003, the maximum amount of funding to be provided to a workplace was reduced to KRW20mn, which included KRW10mn in base subsidy for 57 support items and another KRW10mn for either safety facility improvement or work environment enhancement or both. The number of support items expanded to 75 in 2004, while hazardous industries, namely the casting, plating, leather-producing and coloring industries were given subsidies twice as much compared to those of general industries with the ceiling of KRW40mn. The maximum amount of subsidies increased to KRW30mn in 2005 due to concerns that some workplaces might hesitate to participate in the Program because the costs of investment for facility improvement exceeds the amount of subsidies. Furthermore, the number of support items increased from 79 to 90 to include facilities especially for injuries and illnesses prevention such as musculoskeletal disorder and devices that help to mitigate occupational risks. In 2006, risk assessment has been introduced to substitute the existing 'safety and health comprehensive consulting' and to quantitatively assess real and potential risks at work, which continues to be in operation until today.

"Clean Workplace Program Improvement TFT" had been organized from March to December 2006 to upgrade the Clean Workplace Program, comprised of experts in the OSH field, scholars and professionals. Policy suggestions were made by the TFT and the following changes have been applied to the Program starting in 2007.

First, up until December 2005, 52.1% of the participating workplaces upgraded their work environment solely using the base subsidy, which means that the majority of employers consider the Clean Workplace Program as a government funding and they were unwilling to make their own spending. In order to redress this misconception, workplaces with at least 10 workers were required to make their own contribution amounting to 20% of the base subsidy awarded.

Second, hazardous industries had been given an additional KRW10mn more than the general industries because improving dangerous processes is much more costly. However, there were cases when the additional amounts had been granted even when no portion of the subsidies was used to improve the dangerous processes. Therefore, additional subsidies up to KRW40mn were offered only when facility upgrades for dangerous processes had been made.

Third, workplaces had to apply for the Clean Workplace Program on a quarterly basis in order to get selected, causing administrative inconveniences due to the requirement to apply repeatedly. Therefore, the application system has changed to receive applications only once a year—at the beginning of the year.

Fourth, rules restricting the participation of companies specializing in safety facilities enhancement were scrapped. Prior to the change only the "safety facilities enhancing companies" that have submitted an application and completed training were allowed to participate in the Clean Workplace Program. However, after the lift of restriction, any companies could participate in the Program as a safety facilities enhancing company, and this provided more convenience to workplaces that wish to upgrade safety.

Fifth, support items have been reclassified and their number increased from 90 to 160 to make fundamental improvements to the hazards and risks at work. Also, work environment monitoring against hazards and specific medical examinations for workers have become mandatory requirements.

Lastly, technical support has been strengthened for participating workplaces after they receive the Clean Workplace status, and therefore, workplaces that fail to maintain their Clean Workplace status shall continue to be monitored and supervised. This is to maximize the Program's effectiveness in minimizing accidents by encouraging participating workplaces to maintain their Clean Workplace status.

The Clean Workplace Program had been improved to expand the number of participating workplaces, which was achieved through effective use of the resources and efficient execution of the budget. In the long-run, the program is expected to be increasingly effective in preventing accidents by empowering employers to enhance their capabilities in voluntary safety management.

2.1.2. Provision of Loans for the Improvement of Facilities Devoted to Industrial Accident Prevention

a. Provision of Financial Support through Loans

Since the 1980s, workers have become more concerned about their rights to a decent living and improvement of their quality of life. With the enactment of the OSH Act, workplaces had to make large investments and efforts in order to prevent injuries and illnesses at work in accordance with the safety and health standards stipulated in the laws and regulations.

However, many workplaces were financially incapable of making safety and health improvements in the early enforcement stages of the OSH Act. Therefore, the government introduced a new system to provide loans to workplaces in 1984, aiming at rapid reduction

of occupational injuries and illnesses and facilitation of voluntary accident prevention activities.

b. Progress to Date

The loan program was launched on February 10, 1984 to provide financial assistance for small- and medium workplaces with no more than 300 employees and the expenditure of the loan was earmarked for specific investments, namely the installation of protective devices for dangerous machineries. However, the loan program evolved over time and expanded to include all workplaces as eligible recipient regardless of their size, and the money could be spent to replace existing dangerous machinery or facilities or to make a new purchase.

In the initial stage of the program, the capital mainly came from the special account of the Industrial Accident Compensation Insurance while the MOEL took charge of the operation and administrative duties. The amount of fund secured for the loan program stood at KRW2bn in 1984, KRW3bn in 1985, KRW4bn in 1988, KRW3bn in 1989, and KRW3bn in 1990. The actual loans provided were KRW100mn for 11 workplaces in 1984, KRW380mn for 13 workplaces in 1985, KRW760mn for 19 workplaces in 1986, KRW3.56bn for 35 workplaces in 1987, KRW3.79bn for 55 workplaces in 1988, KRW3.54bn for 46 workplaces in 1989, and KRW3.29bn for 40 workplaces in 1990. A total of KRW15bn was secured to provide KRW1bn~3bn of loans per year but the limited funding was not enough to satisfy the employers' needs for more investments.

In 1990 and onwards, amendment of the OSH Act provided the capital base for the industrial accident prevention fund. On November 7 of the same year, the responsibilities of providing loans for the prevention of industrial accidents were delegated to KOSHA, in accordance with the notice of the MOEL (no. 90-55). Also, on March 5, 1991, the loan program became more standardized through the enactment and implementation of Regulations on Provision of Loans for Industrial Accident Prevention Facilities (Rule no. 190 of the MOEL).

Loans dispensed by KOSHA after the responsibilities were transferred from the MOEL in 1991 expanded to include all workplaces as eligible applicants regardless of size and industries. In addition, the program is constantly being improved in a constructive manner in order to achieve sustainable results according to changes in the business environment.

Various national plans have been devised and implemented over the years which include: 3-Year Plan for the Advancement of Industrial Safety; Special Project for the Prevention of Industrial Accidents; the 1st and 2nd 5-Year Plans for the Advancement of Industrial Accidents (2000~2004; 2005~2009); and many more. Against the backdrop, larger amount of resources have been put in for the loan program and the details of the support measures have gone through numerous changes.

2.2. Emphasis on Sectors Vulnerable to Industrial Accidents

Support programs targeted workplaces and industries prone to industrial accidents. The focus areas of the programs were: prevention of accidents in workplaces with less than 50 workers; establishment and dissemination of accident prevention measures for different types of dangerous equipment; accident prevention techniques in agricultural, forestry and fishing industries; technical support customized to each regional area; and technical support for shipbuilding, repairing, loading & unloading industries.

KOSHA launched accident prevention activities that aimed to dramatically reduce accidents at smaller workplaces by focusing its technical support towards workplaces with less than 50 workers in accident-prone industries and those suffering from high fatality rates.

Special response teams have been created in each geographical region to deal with dangerous facilities and processes, which are the culprits of accidents that lead to fatalities and physical disabilities. The teams contribute to the prevention of the occurrence of similar accidents by establishing and distributing fundamental safety measures including the development of safety devices.

More sophisticated accident prevention activities are called for in the shipbuilding industry, considering Korea's reputation as a leading shipbuilder in the world and increasing shipbuilding orders. Thus, a task force team was created in 1991 at KOSHA headquarters, comprised of experts with rich experience in the shipbuilding, repairing, loading & unloading industries. Following the accident involving fires on a ship under repair by Hanjin Industries & Construction, the Risk Management Team for Shipbuilding Industry was created upon government initiative in 1995. In addition, Shipbuilding Industry Accident Prevention Team was established in Busan Regional Office of KOSHA in 2002 in order to reduce accidents occurring in the shipbuilding, repairing, loading & unloading industries.

2.2.1. Technical Support for Workplaces Vulnerable to Industrial Accidents

a. Introduction and Progress

Since its inception, KOSHA has been the provider of accident prevention measures and training programs customized to the needs of workplaces, starting with technical support programs for hazardous workplaces and small workplaces with less than 50 employees that have insufficient safety management capabilities. Starting from 2001, KOSHA started to fund facility improvements in workplaces that are committed to make improvements but

lack the capacity to do so, aiming at eliminating hazards and risks at work and enhancing the effectiveness in accident prevention activities.

Technical support for workplaces vulnerable to industrial accidents was provided through a two-pronged approach, one as a support for vulnerable workplaces, and the other as a specialized project targeting each geographical region. However, the support measures were consolidated to take into account the different characteristics of each region in 2003, raising the efficiency of accident prevention efforts.

b. Key Implementations

Technical support for workplaces vulnerable to industrial accidents had been implemented from 1991 to 1996, centered on accident prevention activities already in place in area offices of KOSHA which included specialized projects for accident prevention mainly targeting accident-prone workplaces with less than 50 workers and industries suffering from frequent accidents, and joint inspections with regional labor offices. This support program led to the creation of "Accident Prevention Committee" by industry in later years. Furthermore, accident prevention techniques suitable for different size of workplaces within a single industry had been suggested.

Safety devices for dangerous facilities were developed and provided to workplaces in 1999, in order to significantly lower accidents that lead to fatalities or physical disabilities. In other words, KOSHA developed fundamental measures for technical support to be distributed to workplaces through the organization and operation of special response teams in each of its regional & area offices, in order to analyze accidents leading to fatalities and physical disabilities, identify dangerous facilities, and develop safety devices that prevent the occurrence of accidents.

To this end, KOSHA headquarters provided underlying data and analysis sheets on accidents that cause fatalities and physical disabilities and distributed them to regional & area offices. Regional & area offices, in turn, analyzed the causes of accidents by cause and type, selected facilities for which safety devices were to be developed, and organized task force teams. The task force teams established technical measures for fundamental prevention of accidents, namely the development of safety devices, installed and operated the safety devices in the model workplaces to verify their effectiveness, held seminars by each dangerous facility task force team and, distributed the safety devices to workplaces where they can be utilized.

The scope of technical support program expanded to include all workplaces, even those employing less than five workers, as these workplaces also became the target of the OSH Act from 2000. Also "Clean Safety Techniques Support Program" was implemented in workplaces to improve OSH, focusing on those with poor OSH and less than 50 employees

in the 3D industries, which had experienced accidents including fatalities and exceeded the permitted exposure level of work hazards.

Regional & area offices of KOSHA have continued to offer specialized regional programs on a voluntary basis, which take into account different accidents found in each region. Through the programs, workplaces in each industry that are vulnerable to industrial accidents (e.g. manufacturing industry) are selected, and then their needs and countermeasures against accidents are identified to provide customized technical support for each workplace. The technical support for risks faced by non-regular, senior and female workers are emphasized, while the support covers all the details related to work including the appropriateness of work posture, methods and procedures, and whether or not working standards and safety guidelines are made available to workers.

Furthermore, KOSHA continues to develop and distribute technical information that is suitable to be utilized through specialized regional programs. For agricultural, forestry and fishing industries in particular, training-based technical support is being offered jointly with interested agencies.

2.2.2. Technical Support for Shipbuilding, Repairing and Loading & Unloading Industry

a. Introduction and Progress

Korea's shipbuilding industry was at its peak when the fire accident erupted in February 1995 in a ship owned by Hanjin Heavy Industries & Construction. Accidents in the shipbuilding industry received much public attention and, as a result, the MOEL established a "Shipbuilding Industry Risk Management Division" as a means to tackle problems in the industry. KOSHA also established "Shipbuilding Industry Risk Management Team" in January 1996 to provide technical support while the work organization reshuffle in July 1999 dispatched shipbuilding experts to relevant area offices of KOSHA to provide technical support programs. "Shipbuilding Industry Accident Prevention Team" was established in January 2002 to take full charge of accident prevention in shipbuilding companies across the country, especially those with more than 100 employees. Shipbuilding Industry Accident Prevention Team is still in operation to support workers and employers in the shipbuilding industry.

Korea is the world's largest shipbuilding powerhouse in terms of the number of orders received, completed ships, and ships under construction and the industry is to enjoy its heyday for at least the next 10 years to come. In addition, the number of large container ships and high value-added LNG vessels being built by Korea is steadily on the rise. Despite the increasing number of ships being built, the revenue of the industry as a whole

is in decline due to changes in the internal/external conditions, namely the rising costs for building ships as well as falling price of ships and rising labor costs. Thus, the industry is in search for low-cost, high-efficiency measures to boost productivity while minimizing the occurrence of accidents.

The workloads in the loading & unloading industry are on the rise as the country actively engages in international trades. However, few improvements are being made to accommodate the changes in work methods of workers while relevant regulations have not caught up with the development in the industry. As a result, the quality of work employees do remains stagnant, which raises the risks of accidentswhile the quality of work being done in the industry is being compromised.

Accident rate trend in the shipbuilding industry is as follows: 2.05% in 1993; 2.22% in 1996; 1.38% in 2000; 2.01% in 2002; 2.02% in 2004; 1.46% in 2005; and 1.89% in 2006. The rate of accidents in the shipbuilding industry is about double that of industries in general, and it continues to experience a high level of accidents without much improvement unlike other industries that witness a decline in accidents.

The number of fatalities in the shipbuilding industry is constantly on the rise as follows: 23 in 1993; 36 in 1996; 33 in 2000; 42 in 2002; 44 in 2004; 40 in 2005; and 48 in 2006.

Major causes of injuries and illnesses are frequent shift of work areas, works involving the installation and dismantling of facilities, fall from elevated work areas, fire and explosion caused by operating in small and confined spaces (e.g. welding work), and musculoskeletal disorders. The industry is also exposed to large-scale calamities due to the handling of heavy materials and large industrial machineries. In reflection of this reality, the labor unions of the shipbuilding industry are asking for a better "quality of life" rather than higher wages, putting OSH on the spotlight. Also, self-regulatory safety management, namely risk management, is being emphasized.

b. Key Implementations

A customized risk assessment method or a systematic prevention of industrial accidents in the shipbuilding industry was developed in 2002 while specialized technical support was provided to larger shipbuilding companies with at least 300 workers who engage in complex shipbuilding procedures. In addition, technical seminars were organized targeting OSH managers in the industry to improve the level of safety management skills at work. Also, "Shipbuilding Industry Safety and Health Council" was set up to facilitate the exchange of information between shipbuilding companies and to promote efforts on safe management. Furthermore, OSH technical materials with particular focus on the shipbuilding industry had also been produced and made available in workplaces.

In 2003, the target of technical support expanded to include shipbuilding companies with at least 100 workers, as they had high potential risks to accidents. KOSHA color-coded shipbuilding companies with at least 100 employees in blue, yellow and red and focused on yellow-colored workplaces as its target of technical assistance. For large shipbuilders with at least 1,000 employees, the assistance was provided by each process and dock while 6 types of teaching materials were developed and distributed for the training of workers in subcontracting companies of the industry. For workers in the loading & unloading industry, the focus of technical assistance had been placed on risks involved in the loading & unloading operations, application of new technology, and guidelines on handling heavy loads so as to improve safety awareness of workers.

Seven shipbuilders were selected in 2006 to enhance their capabilities in conducting voluntary safety management while organizing a technical workshop to share ideas on real risks lurking in each work process, best practice in safety management, and relevant technical discussions. The seven selected shipbuilders set their accident reduction targets and designated persons in charge by geographical region to minimize fatalities. Furthermore, a website dedicated for the prevention of accidents in the shipbuilding, repairing, loading & unloading industries was created and relevant information has been offered.

Other than the seven shipbuilders mentioned above, shipbuilding companies with at least 100 workers are being offered technical support based on the experience of larger shipbuilders in the areas including work involving fire, handling heavy loads, work at height, handling of manual tools, etc., so that smaller shipbuilding companies can benefit from the experience and best practices of larger companies.

2.2.3. Major Accident Investigations

a. Introduction and Progress

One of the techniques of accident prevention is to analyze the causes of accidents that occurred in the past, establish countermeasures, and take actions to prevent recurrence of similar accidents in the future. The basics of accident prevention at work is to stave off accidents from happening over and over again through technical investigations, analysis and suggestions of prevention measures, which have been made possible by visiting the sites of major accidents.

Article 26, Paragraph 4 of the OSH Act stipulates that “If a serious accident or disease occurs, the Minister of Employment and Labor may investigate the accident to find out the cause or establish preventive measures, and may have a labor inspector and related experts make a safety and health diagnosis, and take other necessary measures.”

The key objectives of major accident investigations carried out by KOSHA are to conduct investigations on major accidents requested by the MOEL regarding professional technical support and high-profile accidents that have been reported through the media. The results of the investigation would be helpful in providing information to those who work in the industries where the investigation is being conducted and in offering prevention measures. Related to these efforts, "High-Five Campaign" was introduced in 2005 participated by both workers and employers through which each workplace selected top five work processes that are most likely to cause fatal accidents and searched for ways to minimize accidents.

b. Key Implementations

Investigation on major accidents not only probes their causes, but also leads to the utilization of analysis results to produce "Major Accidents Report," news alerts, articles in academic journals, and dissemination of the information through broadcasting. These efforts aimto provide the facts about the accidents to industries and workplaces concerned and prevent the occurrence of similar or identical accidents.

The types of accidents subject to major accident investigation are: ① crush injuries by machineries or equipment ② fall from height, especially from permanent or temporary structures in construction sites ③ injuries caused by being hit by falling or flying tools or materials during construction ④ serious accidents that require technical investigations to identify their cause, namely electrocutions ⑤ accidents that are requested to investigate by the Minister of Employment and Labor or the head of regional labor offices. The above mentioned accidents all merits public attention, and accidents whose investigation is requested by the MOEL take the priority.

The investigation report is required to be completed within one day from the field investigation date to be submitted to a regional labor office in charge. However, accidents that require more time to fully investigate the causes shall be supplemented with an opinion report stating such view to the MOEL within seven days from the field investigation date, in consultation with a labor inspector in charge.

The Report on the Investigation Result of Major Accident shall include the status of accident investigation, the type and detail of the work process, circumstances leading to the accident, how the accident happened, the presumed causes of the accidents including physical and human risk factors, and measures to prevent recurrence. Details about accident cases that are worth notifying to relevant industries are put into newsfeeds to be distributed to relevant agencies and workplaces through KOSHA Net and KOSHA EMS (E-mail Marketing System), and they have been well received by the recipients.

High-Five Campaign introduced in 2005 guides each workplace to select on their own top five risky work processes from the list of 20 high-risk work processes that are prone to fatal accidents and implement prevention activities . The details about the Campaign are: announcement on the kick-off of the High-Five Campaign; development of safety measures and provision of training for each work process; and safety activities such as safety meetings, inspections, and maintenance and cleaning of the workplaces. The Campaign is a voluntary and system-based safety movement that seeks to make continuous OSH improvements through the analysis and review of the results, and KOSHA is an active supporter of this Campaign.

Also, the top 20 work processes that are most prone to fatal accidents are categorized into either the manufacturing or the construction sectors, and technical materials are developed and provided to workplaces in order to significantly help the prevention activities for fatal accidents at work.

2.3. Laying the Groundwork for Voluntary Safety Management at Work

Since the 1980s when the Korean government began efforts to prevent industrial accidents in earnest, the rate of occupational injuries and illnesses at work declined at a steady pace to reach a trough in 1998 at 0.68%. However, the rate has been hovering around 0.80% after that.

In December 1981, Korea enacted the OSH Act and relevant safety regulations, health regulations and government notices have been incorporated into the laws and ordinances. These strict government-led policies have been effective in bringing substantial reductions in accidents.

However, the regulatory regime under which all the technical requirements are stipulated in the laws and whose compliance is monitored and supervised directly has its own limitations and is highly inefficient, especially when it is imperative to adapt to rapidly changing technology and work environment. Against the backdrop, the risk assessment system introduced in the EU in the 1990s is being recognized as a method for advancing safety at work and is being offered as an alternative means for regulation.

Risk assessment was introduced in the mid-1990s to countries with advanced safety measures such as the UK and Germany. It is a comprehensive risk management technique, which helps to identify and improve work hazards and risks through the collaboration of workers who have the best knowledge about the hazards and risks at work and employers who are responsible for ensuring safety and health at work.

It is inevitable that the main drivers of OSH policies are shifting from governments to workplaces due to rapid changes in internal/external environment that favor smaller governments, advent of the era of global corporate governance, sophistication of industrial structure, enhancement of workers' OSH awareness and the diversification of workers' needs.

2.3.1. Introduction and Progress of Comprehensive Support Program for Voluntary Safety Management

In 2006, KOSHA developed the "Comprehensive Support Program for Voluntary Safety Management" and operated the program on a pilot basis, in order to contribute to accident prevention activities at work and enhance OSH in workplaces that participate in the programs through voluntary prevention activities engaged by both workers and employers. The program targeted manufacturing companies with less than 300 workers to apply 4M risk assessment technique (4M: Man, Machine, Media, Management), which was accompanied with comprehensive technical, educational and financial support.

The implementation of the Program demonstrates that programs on accident prevention are no longer focused on the command and control imposed by the relevant laws and regulations, but rather the self-regulatory approach is preferred, in which the actual implementation of risk management efforts is based on voluntary participation of workplaces. While the direction of the previous programs centered on mandatory provision of technical support led by the government with the emphasis on accident, the direction of recent programs shifted to voluntary accident prevention schemes implemented by workplaces which focus on risk assessment that identifies potential risks and hazards at work and establish and implement countermeasures through the participation of workers and employers. In response to these changes, KOSHA also changed the ways to provide support to workplaces into a customer-based consulting on the overall OSH, which is a major improvement from the previous methods that had been hardware-based and focused on projects mandated by law.

KOSHA designated the year 2007 as a period for the voluntary safety management to take root in the society. As a part of this plan, KOSHA decided to provide support to a total of 500 workplaces mainly utilizing risk assessment techniques, and 217 workplaces received support in 2006. The goal of these support measures was to provide a comprehensive technical support to workplaces, in order to nurture them into the best companies in terms of OSH. Against the backdrop, Comprehensive Support Program for Voluntary Safety Management is to be developed as one of the representative programs of KOSHA, which continues to provide support regarding the fundamental elimination of risks and hazards at work, technical support on OSH, funding, training, consulting on safety management

and so on. A total of 65 risk assessment models have been developed for sub-industries namely the auto parts manufacturing, in order to assist the risk assessment activities in these workplaces. Thanks to these efforts, most of the manufacturing sectors have their own risk assessment models to refer to.

2.3.2. Introduction and Progress of Technical Support Program in Workplaces That Implement OSH Advancement Plans

KOSHA was established in 1988, and the first technical guidance program provided by the OSH Diagnosis Division was safety and health inspection program, which was subsidized by the government. This program was implemented in accordance with the safety and health improvement plans stipulated in Article 36 of the OSH Act (Article 50 of the OSH Act today), and it had been carried out by the Korea Industrial Safety Association and sponsored by the MOEL before KOSHA was launched to take over the responsibility.

The program's name changed from "Safety and Health Diagnosis for Accident-prone Workplaces" in 1989 to "Technical Guidance for Workplaces Implementing Safety and Health Improvement Plan" in 1991, and it continued to be one of the core programs of KOSHA that provides technical assistance. In accordance with the revision of the Enforcement Regulation of the OSH Act in 2003, workplaces eligible for selection in the program expanded to include all workplaces with at least five workers from the previous requirement of only the workplaces with designated safety and health managers. Since 2005, the workplaces eligible for participation in the program expanded to include those with at least five workers in manufacturing and other selected industries.

Through the program, KOSHA provides a comprehensive technical support to workplaces that need an overall safety and health improvement for accident prevention, and it also helps to ensure occupational safety by establishing and implementing safety and health improvement plans. The workplaces eligible to participate in the program are: ① workplaces that have higher than average accident rates compared to their peer group in terms of workplace size and industry type ② workplaces that experience at least 2 major accidents per year ③ workplaces with poor working conditions ④ workplaces designated by the Minister of Employment and Labor.

The details of support provided by KOSHA through the program are: understanding and analysis of accidents occurring in the workplace concerned; understanding of manufacturing process flow and identification of risks and hazards at work; and technical support for each item. The detailed list of the items for support includes: 10 items for safety and health management; 10 items for machine safety; 11 items for electrical safety; 11 items for chemical engineering and safety; 11 items for work environment; and 6 miscellaneous items.

If the workplace improvement takes time due to the technical support such as the modification of artifacts or partial or whole modification of work process, or if there are multiple items subject to facility improvement that requires at least 3 months to work on, these workplaces would be selected as the subjects for the Safety and Health Improvement Plan if the employers of the worksites concerned are committed to making improvements. However, even for the workplaces requiring long-term intervention, if the employers of the workplaces do not make commitments to improve the working conditions or if facility improvements can be made in a relatively short period, the MOEL issues a correction order to make the improvements without delay.

Based on the outcome of Safety and Health Improvement Plan implemented by worksites, KOSHA analyzes the effectiveness and categorizes the results into "complete," "in progress (provision of support is to continue in the following year)," and "administrative measure." In this review process, the results are reported to respective labor offices and the workplaces to encourage continuous improvement efforts.

2.4. Risk Assessment System: Laying the Groundwork for Voluntary Safety Management at Work

2.4.1. Introduction

Selection of subjects for accident prevention services from the perspective of the OSH providers and the "one-size-fits-all" approach emphasizing relevant laws and regulations are not enough to facilitate voluntary and sustainable accident prevention activities in workplaces, and they are unlikely to significantly lower the occupational injuries and illnesses. Furthermore, KOSHA's one-time visit to workplaces is not enough to identify work hazards, while the discovery of potential risks in each work process and operation is extremely difficult. In other words, KOSHA's efforts alone have limitations in fundamentally resolving the issues of risks and hazards at work.

Against the backdrop, KOSHA has been seeking ways to develop accident prevention projects which is to actively engage workers who are the most knowledgeable about the unique characteristics of the workplace concerned, so that they can take the initiative in identifying work hazards and risks. Thus, "Risk Assessment" has been introduced to Korea tailored to the needs of domestic industries after it had proved its much contribution for the dissemination of voluntary safety management in advanced countries, such as the EU nations.

2.4.2. Key Implementations

The risks and hazards by work process have been divided into four areas—machinery, material/environmental, human, managerial—so that they can be easily identified and the risk assessment techniques developed in the advanced countries can be customized to fit Korea. Also, based on the analysis and calculation of the frequency in accidents for each risk and hazard type in industries and the number of lost work days over the past 3 years, the data on "frequency" and "severity" have been quantified.

One of the major projects that adopted the 4M-Risk Assessment is the "comprehensive support program for voluntary safety activities." Clean Workplaces Program, government-commissioned OSH Support Program, and KOSHA 18001 are some examples of the projects launched by KOSHA that apply various types of risk assessment techniques. Risk assessment techniques are to be applied in all future technical support programs provided by KOSHA.

The comprehensive support program for voluntary safety activities aims to facilitate accident prevention activities with proactive participation from workers and employers. The process of the program is: introduce risk assessment and training → apply risk assessment in the selected work processes (participated by some members from workplaces) → apply risk assessment in all work processes (within the workplace concerned) → review the adequacy of improvement measures and evaluate safety and health (by KOSHA) → encourage and assist with the implementation of voluntary safety management (KOSHA 18001 certification). In this process, KOSHA is merely a supporter while the workplaces are the main players who actually implement the prevention activities to prevent industrial accidents.

3. Accident Prevention in Construction Industry through Participation and Support

3.1. Characteristics and Status of Construction Accidents

3.1.1. Analysis on Accidents in the Construction Industry

For 20 years since KOSHA's establishment in 1987, the proportion of accidents victims in the construction industry out of all the industries combined has decreased from approximately 53.4% to 30.8%. However, the number of fatalities has increased during the period by 36.5%. Although accidents in the construction industry steadily fell from 1984 to 1989, the government's policy to build additional 2 million new homes from 1990 to 1992 dramatically increased them in the industry, as new cities had been constructed in Bundang, Pyeongchon, Ilsan, Jungdong, and so on.

However, in the aftermath of the Asian financial crisis and the slowdown in the construction industry that followed, accidents in the construction industry reached the bottom in 1999 to 10,996 injuries and illnesses, taking up 0.60% in all injuries and illnesses. In 2003, however, the number of industrial accident victims rose again due to a construction boom. In the years following 2003, the expansion of the construction market was accompanied by a steady decline in injuries and illnesses within the industry, thanks to government-driven and system-based safety management including stringent accident prevention policies and safety management programs. Despite these improvements, the number of fatal accidents in the industry remains stagnant without further improvements as the construction works pose higher risks due to the building of taller high-rises.

3.1.2. Changes in Domestic Construction Market

The volume of construction orders reached KRW107.3tn in 2006, which is an increase by 407% compared to the level seen in 1990. Also, the amount of construction completed reached KRW117.9tn in 2006, which is an increase by 564% from 1990. In the meantime, the number of construction companies during that period increased by a whopping 1,407% from just 918 to 12,914. However, the rapid increase in the number of construction companies have resulted in excessive competition and negatively affected accident prevention efforts within the industry due to declining margins and sluggish investment in safety management.

3.1.3. Stagnant Rate of Accidents in the Construction Industry and the Associated Issues

The rate of injuries and illnesses in the construction industry has a high correlation with the size of construction market, professionals dedicated to accident prevention, socio-environmental issues, and so on. In statistical terms, the industry achieved quantitative growth of 564% during the years from 1990 to 2006, but injuries and illnesses in 2006 declined to 30.8% of the level seen in 1987 from 2.27% in 1987 to 0.70% in 2006. In other words, the accident prevention activities implemented since the foundation of KOSHA have been effective. The significant improvements are the results of the government's efforts to ameliorate regulations on construction safety, technical support provided by KOSHA and relevant agencies, voluntary efforts made by construction companies, and various endeavors made by different sectors in the society.

However, the supply of professionals who specialize in accident prevention in the construction industry is limited given the large size of the construction market. As of 2007, the number of KOSHA employees in charge of the construction industry stands at 157, which means each employee is responsible for an average of KRW751.2bn in completed construction amount. Therefore, the traditional type of technical support, where the

KOSHA experts visit construction sites in person, is not enough to provide effective support for accident prevention. Against the backdrop, multi-faceted and more effective accident prevention measures are called for in order to lower the level of accidents on par with that of advanced countries.

First, accident prevention measures for unskilled and migrant workers are urgently needed as their number is rapidly increasing while the skilled and experienced workers are facing retirement. Many of the skilled workers, who have been active in domestic/overseas construction sites in the 1970s and 1980s, are starting to retire. However, not enough training has been provided to younger workers to replace them and the vacancies are not being properly filled. With rapid changes and developments in the society, people are demanding a better quality of life and younger workers are reluctant to take blue-collar jobs. Under these circumstances, workers who are less competitive in the Korean labor market, namely older, unskilled or migrant workers are filling up the positions in the construction sites. Migrant workers in particular, often fall victims to industrial accidents due to difficulties in communication, differences in culture, and inadequate skills that they possess.

The fundamental solution to these problems is to improve work environments in the construction industry so that younger workers become more willing to work in construction sites. Also, unskilled and migrant workers should be given trainings and necessary preparatory measures before they begin working in the industry, so that they can acquire the basic construction skills in advance.

Second, excessive competition among construction companies to win construction orders is eating away their profit margin, and ultimately leads to poor safety management with few investments made on safety. The number of general construction companies increased by 1306.8% from 1990 to 2007 which means that the number of construction companies grew from merely 918 to 12,914. This led to overly competitive environment for getting construction orders, and eroded corporate earnings by promoting low-price orders.

Companies that place construction orders are required to put aside 1 to 2% of the construction value for OSH management expenses in order to ensure safety and improve working conditions in the construction sites. However, with the exception of a few large-scale construction companies, most of the companies are reluctant to make investments in OSH and little investment is actually being made, because they regard the OSH investment as additional costs of construction.

Third, the government's reckless easing of regulations on workers' safety management has undermined safety managers' morale and weakened the OSH system. The Asian Financial Crisis in the late 1990s raised the voice for deregulation in the society in general. Employers started to argue that safety management was not a necessity to construction projects but

rather a regulation, and in response, the government accepted the demands of employers indiscriminately. As a result, government's responsiveness to the construction industry's demands undermined employers' safety management duties including the termination of vocational training for safety managers, and the easing of regulations requiring safety managers. These changes downgraded the position of safety managers as mere non-regular or contract workers, significantly tarnished their work morale and commitments, and imposed new obstacles to the development of safety management.

3.2. Introduction of Hazard and Risk Prevention Plan

3.2.1. Introduction and Progress

Employers are required to submit Hazard and Risk Prevention Plan to KOSHA prior to starting the construction work, which is to be reviewed and confirmed in order to prevent accidents that might occur. This is aimed at ensuring the implementation of safety and health measures against work hazards and risks to secure safety and health of workers by reviewing the construction design, safety action plan, etc.

The total overhaul of the OSH Act in January 1990 introduced the Hazard and Risk Prevention Plan in the construction industry. In February of the same year, the implementation guidelines on hazard and risk prevention were made available to the public, which included details about work processes and required documents for submission. The implementation of Hazard and Risk Prevention Plan reached maturity through the revision of relevant legal procedures and constant promotion and training efforts made by KOSHA.

KOSHA took over the role of Hazard and Risk Prevention Plan recipient, which used to be submitted to regional labor offices, in March 1994 through the revision of the Enforcement Regulations of the OSH Act and this simplified the submission procedure of the Plan. The review of the Plan, which had previously been done by the head office of KOSHA, was transferred to OSHTI. This transition resolved the inconvenience felt by workplaces as both the review and confirmation can be done by the same agency.

In the previous system, detailed procedures including the review, confirmation and construction subject to submission of the Hazard and Risk Prevention Plan had all been decided through the notice of the MOEL. However, the Plan became a part of the Enforcement Regulations of the OSH Act amended in October 1997. Also, a voluntary scheme was introduced to allow the designated construction companies with excellent OSH records to obtain the review and confirmation of the Plan on a voluntary basis, at the discretion of the construction company concerned. These designated construction companies subject to voluntary submission were exempted from submitting the Hazard

and Risk Prevention Plan for new construction projects launched during a certain period, and only their internal review report was to be submitted to KOSHA. The new construction works launched by these designated companies did not have to get the official Hazard and Risk Prevention Plan confirmed by KOSHA.

In August 1999, the number of construction works subject to submission of the Hazard and Risk Prevention Plan reduced from 8 to 5. The specific details of the Plan were changed to include risks by work process, rather than risks by construction type, while the deadline for submission changed from 30 days prior to the beginning of construction to 1 day before the construction. In July 2003, the construction works subject to submission of the plan expanded to include those with more than a certain floor area which was in response to frequent accidents in large-scale construction works, and to fundamentally prevent accidents in construction sites which build large structures such as cultural and congregational facilities.

Revisions were made again in January 2007 so that the Hazard and Risk Prevention Plan is to be written by construction type rather than by each risk at work. This change was made according to the introduction of risk assessment technique, which is one of the most efficient tools for safety management, to enhance the usefulness of the Plan and make it more adaptable for workers.

3.2.2. Current Status of the Program and Accomplishments

Review and confirmation of the Hazard and Risk Prevention Plan by KOSHA has fundamentally guaranteed safety and health at work. By engaging in this duty, KOSHA has been able to promote its reputation as an agency that provides technical services with a high level of expertise. Also, KOSHA has been an active promoter of the Hazard and Risk Prevention Plan and upheld its guiding principles to secure safety and health at work.

Even after the completion of the review on the Hazard and Risk Prevention Plan and the beginning of the construction work, on-site inspections are performed at least quarterly or bi-annually to check whether the construction work is being done as planned and whether the suggestions made during the review are being applied, and to see if there are any additional risks or hazards. Construction companies with lower accident rate than the industry average are subject to less strict on-site inspections. For example, the inspection frequency for relatively safer workplaces shall be reduced from every quarter to once every 6 months or a year, and those already subject to bi-annual inspection shall be visited once a year or every other year.

3.3. Technical Assistance on Safety and Health for Small-Scale Construction Sites

KOSHA provides comprehensive OSH consultations to the head offices of construction firms in order to prevent accidents in small-sized construction companies with poor OSH management and low safety awareness among workers. Safety and health technical support program for small-sized construction sites began in 1999 by KOSHA to prevent accidents in these worksites, which sought to enhance safety awareness through the efforts made by managers, improve head offices' voluntary safety management capabilities and provide safety and health techniques in construction sites.

The technical support provided to small-scale construction sites changed into "Support Program for CLEAN 3D Workplace" in 2001, and it helped to create clean and safe workplaces especially targeting those with less than KRW300mn in construction value. In addition, loans for basic safety facilities including mobile scaffolding, safety guardrail, safety platform, etc. were offered while personal protective equipment was supplied free of charge to ensure workers' safety and health.

However, "Support Program for CLEAN 3D Workplace" was scrapped in 2003 because the Program was not deemed suitable for the characteristics of construction sites and employers were reluctant to participate. Instead, target construction sites located in the specific areas such as places with higher concentration of apartment complex, industrial complex, factories, schools, commercial buildings, etc. have been selected especially those with KRW20mn to KRW200mn in construction value or KRW20mn to KRW100mn in value in case of electric or IT facility construction sites. Three major causes of accidents (openings, platforms, scaffoldings) and whether or not workers are equipped with personal protective devices have been checked. Furthermore, safety enhancement measures have been suggested for eight different temporary structures in construction sites which include work platforms, covers or openings, safety guardrails, mobile scaffoldings, safety net against falls, facilities equipped with safety belts, and ladders.

In 2005, construction sites eligible for receiving technical support from the accident prevention agencies expanded to include those with no more than KRW300mn in construction value. Against the backdrop, the OSH technical support for small construction sites also changed to cover construction projects with no more than KRW300mn or KRW100mn in value in case of electrical and IT construction sites.

Starting from 2006, KOSHA tried to enhance safety in construction workplaces through the provision of OSH management consulting services. Through this consulting service, KOSHA provided on-site technical support to raise safety awareness among employers and endeavored to improve voluntary safety management capabilities in the headquarters of

construction companies, especially those that were not included in the top 1,000-construction companies in terms of construction value. For the enhancement of safety awareness among workers, KOSHA produced and distributed booklets on safety measures and construction safety guidance for each high-risk work process of the industry.

Technical support for safety and health in small construction companies was later commissioned to other agencies across the country which specialized in accident prevention. A total of 48 agencies participated in this program to provide technical support and 1,000 head offices of small construction firms and other 3,000 construction firms benefited. These efforts continued into 2007, through which a total of 52 agencies specializing in industrial accident prevention also made contributions.

3.4. Technical Support on the Supervision and Inspection of Construction Sites

"Technical Support on the Supervision and Inspection of Construction Sites" targets workplaces prone to industrial accidents such as falls from height, trippings, or cave-ins. Technical supports are provided by the MOEL or relevant agencies upon the requests from workplaces in which potential risks are identified and eliminated before these risks lead to accidents in the construction industry.

At initial stages, the technical support program had been divided into the following separate projects: "Construction Patrol" which conducted safety patrol activities targeting construction sites worth no more than KRW10bn; "Comprehensive Inspection for Accident-prone Seasons" which was a joint inspection conducted by the MOEL, KOSHA, the Ministry of Land, Transport and Maritime Affairs, the Ministry of Public Administration and Security, and the Prosecutors' Office targeting small- and medium-sized construction sites in the thawing season, monsoon season, and in winter; and "SOC Accident Prevention Project for Construction Sites." However, these three separate projects have been combined in 2007 to constitute the "Technical Support on the Supervision and Inspection of Construction Sites."

"Construction Patrol" began in August 1996 when the eased administrative regulations weakened self-regulatory activities in construction sites and the rising number of unskilled workers boosted the number of major accidents. Aiming to dramatically reduce fatal accidents in smaller construction sites, the Construction Patrol promoted strict observance of safety standards in construction sites and focused inspection activities on the risks at work including the improper use or absence of protective devices worn by workers. A total of 25,787 construction sites were provided with on-site technical support until the end of 2006.

"Comprehensive Inspection for Accident-prone Seasons" began in 1992 and launched each year afterwards for the respective seasons. The projects focused on construction sites that were exposed to unique risks in each season: March (thawing season) – risks of cave-ins of grounds or foundations during excavation work; June (monsoon season) – risks of submersions, cave-ins, and electrocutions during excavation and steel frame work; and November (winter) – risks of ruptures caused by frozen materials, fires, and explosion. KOSHA suggested safety and health guidelines for each high-risk season and a total of 39,120 worksites were provided with on-site technical support until the end of 2006.

"SOC Accident Prevention Project for Construction Sites" began in 1990 for efficient prevention activities, especially in 7 construction types which are subway, high-speed railway, power plant, highway, national road, harbor, and dam constructions. This project sought to understand the accidents occurring in these sectors and managed each sector by grading them according to their respective rate of accidents. A total of 3,319 technical supports had been provided to construction workplaces until the end of 2006.

However, these projects mainly composed of the supervision and inspection of the MOEL alone were not enough to improve safety management capabilities in construction sites. Also, the encouragement of continuous safety management activities was deemed difficult if the focus was placed on technical safety measures emphasizing risks that were present at the timing of inspection. Against the backdrop, safety management techniques that encourage the participation of both workers and employers are chosen by workplaces as a means to continue safety management in construction sites. In other words, each construction site is to establish its own accident prevention program contributed by both workers and employers on a bi-annual basis and submit it to a regional labor office. Construction sites that have submitted their plans shall be exempted from the MOEL-led inspections and supervisions and the only worksites with a record of major accidents or socially problematic injuries or illnesses shall still be subject to supervisions. Due to the change in the Program, the number of technical support provided to workplaces by KOSHA has plummeted to five cases.

3.5. Establishing OSH Management System in the Construction Industry

Introduction of the "Safety and Health Management System in the Construction Industry" is one of the means to disseminate KOSHA 18001, which is an OSH management system combining OSH with corporate management. The OSH management system in the construction industry has been implemented based on the applications received by public agencies, regional organizations and CMs (including designing and administering

companies). Workplaces that demonstrate OSH management system and activities above the prescribed level are given the KOSHA 18001 certification, which encourages workplaces to actively engage in the voluntary safety, health, and accident prevention activities.

The focus of the OSH management system in the construction industry is to instill safety management in the mindsets of executives in construction companies. It emphasizes on safety management organization, on-site support system, and the application of risk assessment by the head office of the construction company concerned while on-site review, consultation, certification review, and ex-post facto management are conducted. Adoption of the system by specialized construction firms is expected to maximize the ripple effects across the companies in the industry.

3.6. Basic OSH Training for Construction Workers

High turnover of workers in the construction industry produced blind spots in safety educations. Through "Basic Safety and Health Training in the Construction Industry," safety training for construction workers is provided through a specialized training institute encompassing the industry in general, but not by individual work sites. This approach is to contribute to preventing accidents at construction workplaces by raising safety awareness among construction workers.

KOSHA has been commissioned by the MOEL to perform the overall duties related to training as well as the review and evaluation of training institutes that wish to register as official providers of the OSH training. The training institutes are required to keep records of individual trainees (issuance of training completion certificates and computer-based record keeping) in order to provide a more systematic safety training for construction workers, while KOSHA conducts general monitoring and evaluation of the training institutes through on-site visits in order to have an understanding of their training capabilities.

4. Improving Work Environment and Health Management for Workers

4.1. Diseases Occurring at Work and Environmental Changes

4.1.1. Environmental Changes and Work-Related Diseases

The health of people and workers of a country largely depends on the size of the economy and structure of the country concerned. Changes in the domestic environment over the past

20 years have greatly affected the way how work-related diseases came to light in Korea. The changes witnessed in Korea over the years are as follows:

First, there are changes in the industrial structure. Following the Korean War, the main industry in Korea was agriculture. Over time, its focus changed from export-oriented industries to IT and service industries. Due to the globalization and the emphasis on IT, the weight given to the manufacturing industry would decline while that of service industry would rise, causing continued changes in the industrial structure.

The change in the industrial structure focused on manufacturing led to a rise in industrial accidents and the advent of new occupational diseases. The development of other service industry, namely the telecommunications industry, gave rise to new health problems such as musculoskeletal disorders. In other words, the sophistication of industries had a major impact on workers' health, as new types of illnesses occurred in each developmental phase.

Second is the change in the labor market. The Korean society is rapidly aging due to falling fertility rates and longer life expectancies. On the other hand, it continues to witness continuous inflow of female and migrant workers. The aging of the population has become a factor that increases sensitivity to occupational injuries and illnesses due to deteriorating physical functions, as it is directly related to the incidence of geriatric diseases and led to changes in the main causes of death. Also, increased flexibility in the labor market has increased the proportion of temporary and daily workers, aggravating the problem associated with work-related illnesses. Furthermore, introduction of 40 working hours per week has shortened the hours people engage in work, but labor intensity has increased.

Third is change in policies. The changes in relevant policies and systems should be carefully observed due to the policy directions more and more centered on self regulations by employers, the globalization of safety and health issues, activate labor unions, and changing criteria for determining work-related illnesses.

4.1.2. Work-Related Diseases

Back in 1987 when KOSHA was established, a total number of workers with work-related illnesses stood at 1,623 out of total 5,356,546 workers (morbidity per 10,000 workers was 3.0%). However, cerebral and cardiovascular diseases and musculoskeletal disorders were not included in the list of work-related illnesses at that time. Although the number of work-related illnesses displayed a declining trend from 1987 to 1994, it increased from 1995 to 2004 but declined once again in the following years. The workers receiving medical care due to work-related injuries stood at 3.0 per 10,000 workers in 1987, but increased by 160% to 7.8 as of 2006 (figures are calculated allowing for the changes in the total number of workers). In other words, the figure increased at a pace of 8.4% per month.

It was in 1999 when the number of work-related illnesses (those under medical care plus fatal work-related illnesses) was complied by identifying the cause of death. According to this method, the number of work-related illnesses per 10,000 workers increased by 139% over the 8-year period from 3.67 in 1999 to 8.76 in 2006. As the number of workers suffering from lower back pain (3,612 workers) caused by industrial accidents was re-categorized as work-related illness from work-related injury, if this portion is excluded, it would mean that there has been 54.3% growth over the 8 year-period to 5.67 in 2006.

Over the eight-year period beginning in 1999, occupational diseases increased by 17.8%, while work-related illnesses increased by 81.8%. Also, occupational diseases caused by certain chemical materials and pneumoconiosis increased by 85.2% and 40% respectively, while those due to organic solvents, heavy metals and noise-induced hearing loss decreased by 83.2%, 78.8%, and 15.1%, respectively. As for work-related illnesses, cerebral and cardiovascular diseases and lower back pains increased by 535.4% and 250% respectively, while those caused by strenuous body work declined by 15.3%.

The Asian financial crisis slowed industrial activities in 1998, leading to fewer work-related illnesses. However, increased average operation hours in the manufacturing industry, the rising number of temporary and daily laborers, and coverage of financial and insurance sectors under the Workers' Compensation scheme in 1999 significantly increased the number of work-related illnesses. Also, the number of occupational diseases and work-related illnesses recorded a significant jump year-on-year in 2003 (by 68.5%) with 3,713 illnesses and diseases.

4.1.3. Occupational Diseases

Starting from 1999, the work-related illnesses under medical care and the fatal illnesses have been counted separately, unlike in the past when the fatality caused by illnesses was included in the number of fatal injuries making it difficult to obtain exact number of people with work-related illnesses.

It seems that the decrease in the number of occupational illnesses in 2000 arose from a significant decline in the number of diagnosed cases of pneumoconiosis. Also, the pickup in the number of occupational diseases in 2001 was attributed from the expansion of coverage of the Workers' Compensation, as well as the changes in determining work-relatedness of pneumoconiosis. The number of occupational diseases dramatically increased in 2003, because the amendment in the Enforcement Decree and Enforcement Regulations of the "Industrial Accident Compensation Insurance Act" on July 1, 2003 expanded the definition of workers with work-related pneumoconiosis to include "those with no disability in cardiopulmonary functions but diagnosed with type-1 pneumoconiosis" and added them in the 13th category of disability level of workers with pneumoconiosis. With the amendment

of relevant regulations, these workers have become able to receive sick-leaves based on the work-relatedness of their illness.

In recent years, many hospital workers are exposed to infectious diseases. Occupational asthma in the past used to originate from isocyanate or other reactive dyes. However, the incidence of asthma has frequently been caused by a wide range of materials including flour dust, grain dusts and formaldehyde. Another type of occupational diseases getting a lot of attention is occupational cancer. In particular, mesothelioma caused by asbestos is on the rise, while the diseases caused by various other carcinogens, namely chrome, coke, benzene, etc., are also becoming common.

4.2. KOSHA's Activities for the Enhancement of Safety and Health

4.2.1. KOSHA's Activities during the First 10 Years

For 10 years since its foundation, KOSHA focused its efforts to understand OSH in Korea and implemented prevention measures to reduce occupational diseases, which were traditional types of work-related illnesses. Prior to 1994, the focus had been placed on work environment and work processes that involved chemical substances. However, the proportion of technical support for musculoskeletal disorder prevention increased in the following years.

KOSHA conducted surveys on the various hazards at work and produced and distributed safety and health guidelines based on them. The workplaces subject to survey were selected by the MOEL, and the actual survey was jointly conducted by KOSHA and the MOEL. In 1988, KOSHA administered the "Government-funded OSH Diagnosis Program" to provide safety and health guidance to workplaces. Although the program was 100% funded by the government at that time, it was similar to the today's "Work Environment Measurement and Guidance Project" currently being implemented at workplaces at their expense. Also, "Safety and Health Managers Card System," "Loans Program for Installation of Accident Prevention Facility" were also introduced.

In 1898, a total of 42,159 manufacturing companies across the country were surveyed as a part of research on the "use of chemical substance at work." Based on the results of the survey, inspections ensued. Also, various projects on the prevention of occupational diseases had been implemented including work environment improvement for workplaces handling organic solvents, hazards study on welding work, health survey on workplaces handling minerals, work environment survey on casting work, occupational health measures in VDT workplaces, etc.

Also, "focused inspection on workplaces prone to occupational accidents" began in 1990 based on the "use of chemical substance at work survey" in 1989. The MOEL and KOSHA conducted joint inspections on the 1,598 workplaces identified as those with poor working conditions and they included workplaces handling mercury and manganese. Also, the "Work Environment Management for Workplaces Handling Restricted Substances Program" provided work environment improvement guidance to those handling hazardous materials (e.g. carcinogens excluding asbestos) who were required to obtain license in order to handle them. In 1991, precision testings were implemented targeting workplaces that handled heavy metals and heavy work loads, while support measures were offered to vulnerable workplaces and those in the process of improving OSH.

Work environment management techniques were provided for 15 high-risk industries, namely the shoe manufacturing, while guidelines on work environment were developed for 9 substances (e.g. lead, asbestos) in 1992. For two years starting in 1991, "Hazardous Factors Designation Program" was implemented to nurture professional talents specializing in various hazardous substances such as organic solvents, dust, heavy metals, physical & chemical factors, etc. From 1993 to 1995, "Pilot Program for Providing Guidance on Standardized Work Environment Model" was launched in 12 workplaces. In this pilot program, workplaces were given partial subsidies to turn their workplaces into best practice workplaces to show to other workers in the same industry sector during the tours. The main purpose of this program was to urge workplaces to install proper facilities including localized ventilation or noise reduction facilities. The 2nd "Work Environment Survey for the Manufacturing Industry" was conducted targeting 52,799 workplaces in 1993. Also, "Pilot Workplaces for Health Promotion" had been selected to encourage workers' health promotion activities. Also, KOSHA took over the responsibility from the MOEL to publish "ealth management pocketbook for former workers" in 1995.

Musculoskeletal disorders became a social issue beginning in 2002. Against the backdrop, "VDT Workers Disability Prevention Guide" was included as a part of technical project in 1994. In the following years, "Health Promotion for VDT Workers," "Prevention of Lower Back Pain for Work Handling Heavy Loads," and "Guidance for VDT and Simple Repetitive Work" were administered in the mid 1990s and onward.

Material Safety Data Sheet (MSDS), a pivotal system in terms of chemicals management, was introduced in the OSH Act in 1995. Since then, a contract was concluded with the MDL Co. to purchase MSDS. As a result, KOSHA was able to provide online services for the establishment and distribution of DB on chemical substances for 7,000 types in 1996 and 23,000 types in 1997. Also, KOSHA expanded its support towards vulnerable workplaces by providing OSH assistance through agencies that offered specialized services and the number of workplaces benefitting from this program has increased each year since 1995.

Workplace inspections on the handling of carcinogenic substances in 1997 were a part of the new occupational disease prevention measures aimed at strengthening inspections. Overall survey was conducted on workplaces that handle asbestos, including not only 49 asbestos-handling workplaces, but also 5 shipyards and 8 auto repair shops. Also, relevant working rules and guidelines were improved to implement the "Clean Work Environment Creation Campaign" where subsidies were provided to improve the working environment, namely the localized ventilation, automation of equipment, etc. Subsidies were also provided to restaurants and hygiene sectors to improve working conditions, while work environment improvement projects targeting shipbuilding and welding work were also launched.

4.2.2. KOSHA's Activities from 1998 to Present

Since 1998, the focus of OSH activities have been on the creation of pleasant working environment, occupational health services, safe handling of hazardous substances, prevention of musculoskeletal disorder, health promotion, and infrastructure for OSH sector.

"Establishment of a Monitoring System for Workplaces with Poor Working Conditions or Risks for Occupational Diseases Project" administered from 1998 through 2003 was replaced with Workplace Health Partner (WHP) which began in 2007 as an end-user-oriented program. In addition, technical support and best practice presentations have been offered to promote workers' health activities while health training centers have been made more widely available. Also, "statistics on the safety and health of workers" has been compiled. On the other hand, until the start of the 2007 business promoting women workers' health protection measures for vulnerable workers' and improve the work environment Facility supplier registration. Furthermore, "Health Promotion for Female Workers" and "Registration System of Worksites that Successfully Improved Working Environment" were some of the programs that had been launched for vulnerable workers and continued up until 2007.

"Support Program for the Creation of Clean Work Environment" began in 1997 and continued until the end of 2001 with a special focus on enhancing occupational health. The program facilitated the provision of technical support, funding and promotion of the best practices but was replaced by the "Clean Workplace Project," which is a comprehensive OSH support program targeting small workplaces (with less than 50 employees). Also, a "survey on the application of MSDS system" was jointly conducted with the MOEL in the form of on-site inspection in order to encourage the use of the system.

"Work environment survey for manufacturing industries" was conducted in 1999 through 2004 and the results were made available for future OSH projects on the computerized network of KOSHA and the MOEL. Also, "Chemical Substances Handling Guideline" for 10 industries (e.g. printing and plating industries) was developed, while the number

of facilities measuring workers' physical strengths increased to 8 locations. A labor-management meeting which discussed prevention measures for cerebro-cardiovascular diseases was held for the first time and relevant trainings began to be provided for such work-related diseases.

In 2000, "health management survey for construction workers" and "survey on agricultural workers" were conducted to provide information and guidance on health hazards in the agricultural industry such as emergency measures against pesticide poisonings. "Task Force Team for the Development and Provision of Work Environment Improvement" which was formed in 1999 developed 56 processing techniques by the year 2002 and VTR tapes, pamphlets, etc. were produced and distributed as best practice guidelines. In addition, best practice cases such as the development of low-noise nozzle were applied for a patent and a new design for practical use.

"Prevention of Asphyxiation Due to Oxygen Deficiency" was another activity organized by KOSHA. Through the program, 339 workplaces were provided with oxygen concentration meters, air respirators, ventilation fans, etc. for free in 2002. The training and support programs for confined spaces at work continued until 2007. "Guidance on the Prevention of Cerebro-cardiovascular Diseases" was launched beginning in 2000 in order to reduce the morbidity associated with the diseases and to prevent fatalities. KOSHA offered this program with the emphasis on the provision of technical guidance and data until 2003, but the responsibility was delegated to the professional health agencies from 2004.

"Clean Workplace Projects" were launched in October 2001 to offer four different types of support to workplaces with less than 50 employees which include: financial support for building OSH related facility; technical support on OSH; OSH support through relevant agencies; and the operation of Health Partners. "Clean Workplace Projects" became one of KOSHA's main activities since 2002, but its role changed to a provider of funds beginning in 2007. Various "Clean Workplace Projects" were launched under different names. They include: Creation and Funding for Clean Workplace—OSH related area of the project; Clean OH Technical Support—technical support provided directly by KOSHA for workplaces with less than 50 workers; Clean Technical Support for Health Management—which was offered by health management agencies; and Health Partner Program—offered until 2003 by hiring non-regular workers to provide the service. From 2006, Safety Technology Department of the KOSHA was handed over with the duties of implementing Clean Workplace Programs.

"Survey on working conditions of female workers" was conducted in 1997 and various health promotion programs for them began in full swing since 1998. Also, health management project for senior workers, another vulnerable working population, kicked off in 2004 jointly with prevention projects for cerebro-cardiovascular diseases and continued until 2007.

Survey on health management in construction sites was conducted in 2000 as a part of occupational diseases prevention project among construction workers. Technical support was provided to construction sites beginning in 2001 focusing on the management of hazardous substances (e.g. MSDS system), health check-ups and accidents involving suffocation. Similar technical supports followed in 2003, 2006 and 2007. Technical support for the specialized industrial sectors—medical sector—was provided for two years beginning in 2006. Also, "Air Quality Assessment and Improvement in Offices" began in 2005 and continued for two years.

Since its inception, KOSHA has launched various activities to manage working environment under different names and implementation methods. Relevant projects include the management of workplaces vulnerable to occupational diseases (launched in 2000), technical support for workplaces handling carcinogenic materials, technical support for workplaces with higher than permitted exposure level of hazardous substances and other focus and specialty programs. In 2005 when there was a massive breakout of occupational diseases among migrant workers who handled n-Hexane, KOSHA provided extensive technical support for businesses that hired foreign workers.

Entering 2000, KOSHA was supported by the MOEL to provide various programs related to the management of chemical substances used at work, which included conducting studies on the hazards of new chemical substances, inspections on the application of MSDS system, etc. "Survey on the distribution and use of hazardous chemical substances" was done from 2006 through 2007 to identify the line of distribution and exposure levels of six hazardous substances (e.g. TCE:Trichloroethylene) which pose threats on workers' health and to come up with countermeasures against each substance.

One of the unique projects launched by the MOEL after 2004 was "Technical Review on License Application for the Dismantling and Removal Works." The number of application for such technical review program was a mere 43 cases in 2004 but the requests increased to 1,353 cases as of July 2007.

During the three years from 2005, "Technical Support for Health Management in Compact Industrial Complex" was launched as a pilot program to prevent work-related illnesses. In 2007, "Regional OH Center" supported by Health Promotion Fund was opened in the Banwol-Sihwa region to promote workers' health in small workplaces within domestic industrial complexes.

A special team dedicated to prevention efforts of musculoskeletal disorders (MSDs) was established in KOSHA headquarters for the three-year period beginning in 2003, in order to proactively respond to the rising incidence of the health disorder. Up until 2007, KOSHA provided assistance in technical support programs for the prevention of MSDs

and in indentification of the hazards and developed and distributed technical materials that helped to nurture professionals in the area.

"Enhancement of Working Conditions in Noisy Environments" was launched in 2005 as a new funding program in the OH sector. The program was initially managed by the Safety Technology Department in 2006, but was transferred to the Occupational Safety Department in 2007. This program continues to this date under the name of "Financial Support Program for Improving Hazardous Working Environment" by incorporating the existing "Financial Support Program for the Prevention of MSDs."

"Technical Support Program for Workplaces with Potential Risks of Occupational Diseases" and "Reliability Evaluation on the Results of Working Environment Monitoring" were offered in 2006 whereas "Workplace Health Partner: WHP" program—end user-oriented technical support program—is being offered beginning in 2007.

4.3. Introduction of MSDS and GHS

Material Safety Data Sheets (MSDS) refer to information on the hazards and risks of chemical substances such as the name, physical properties, contents, procedures for safe and healthy handling, health and environmental effects and so on. MSDS is an essential document which should be provided by the manufacturer and producer of chemical materials to those who handle, distribute and actually use the chemicals. The MSDS system includes the provision of warning signs to raise the awareness on the importance of MSDS when distributing chemical materials and the provision of training which helps workers to easily get access to and understand the data sheets.

Since the 1980s, occupational diseases caused by hazardous chemicals such as CS_2, 2-Bromopropane (1995), N, N-Dimethylformamide and TCE occurred while major industrial accidents continued to happen which involved leakages and explosions in chemical facilities. Main causes of these accidents were the failure to provide information about the hazards and risks of chemicals and the lack of timely detection measures that signals health problems. In other words, problems in the Risk or Hazard Communication System led to improper use of chemicals that caused serious industrial accidents. Also, the increasing use and distribution of these chemicals amplified risks and hazards of these substances.

Against the backdrop, the OSH Act requires provision of accurate information on hazardous materials in order to prevent the occurrence of accidents and illnesses through pre-emptive training and to take necessary follow-up measures should accidents happen. The OSH Act was revised to include Article 41 (preparation, record keeping, etc. of Material Safety Data Sheet) on January 5, 1995 which became effective from July 1, 1996.

Numerous revisions that followed later on stipulated that: details that are considered as trade secrets and worthy of protection are exempted from disclosure; handling method of hazardous substances needs to be specified by work process; person or entity who made request to an employer for MSDS information shall be designated, etc.

Changes witnessed across the globe and the integration of the global markets into a large single market call for the application of standardized global standards in the policies and systems of each country. UN recommends the adoption of the "Globally Harmonized System of Classification and Labeling of Chemicals (GHS)" and Korea has also established a task force committee comprised of various government ministries including: Ministry of Labor; Ministry of Commerce, Industry and Energy; Ministry of Environment; Ministry of Agriculture and Forestry; Ministry of Marine Affairs & Fisheries; and National Emergency Management Agency. The GHS task force committee organized six meetings between April 2004 and October 2005 to facilitate the cooperation among participating government ministries and translate the national guidelines for GHS.

Center for Chemical Safety and Health of OSHRI, KOSHA and MOEL participated in the GHS task force committee in which they took the leading role in translating national GHS guidelines. A meeting was held on March 31, 2005 to discuss the adoption of GHS and an official translated version was completed and announced on July 13, 2005. Also, a task force team comprised of representatives from the MOEL and experts in GHS was organized to discuss changes in the OSH Act ahead of the adoption of the GHS system. A public gathering was held on April 19, 2006 to collect ideas on the revised "classification and labeling of chemicals and MSDS" as suggested by the task force team. Finally on September 25, 2006, the Enforcement Regulations on the OSH Act was revised and the "standards on classification and labeling of chemicals and MSDS" was amended in conformity with the global standards (GHS) as appeared in the notice of the MOEL (no. 2006-36) and it took effect on July 1, 2008.

4.4. "Health Management Pocketbook" System for Workers Handling Carcinogenic Materials

4.4.1. Introduction and Progress

Workers who have been exposed to carcinogenic substances (e.g. asbestos) that may cause occupational cancer are given Health Management Pocketbooks in accordance with Article 44 of the OSH Act, and they are entitled to free medical check-ups even after a transfer to another job. Initially, the issuance of Health Management Pocketbooks was limited to retired workers only, and therefore, the medical check-up was once called 'health check-ups for former workers.' However, changes in the relevant laws on August 28, 1999

expanded the coverage of the health check-ups to current workers and they are all given the Pocketbooks. Amendments to the Enforcement Regulations of the OSH Act on Oct 7, 2005 newly added three carcinogenic substances (benzene, nickel, cadmium). Therefore, workers handling any of the 14 substances are entitled to health check-ups and they are issued with the Pocketbooks.

Former workers who used to handle carcinogenic substances can receive Health Management Pocketbooks and they are entitled to annual medical examinations free of charge. Hazardous substances in general do not cause occupational diseases if workers are no longer exposed to the substances. However, past exposures to carcinogenic substances still pose threats of cancer even if workers are no longer exposed and this is why it is essential to continue to monitor the health status of former workers. Against the backdrop, the ILO Convention no. 139 (Occupational Cancer Convention, 1974) requires the provision of medical examinations to the previously exposed workers.

Box 4-1 | ILO Convention 139–Occupational Cancer Convention, 1974

Each Member who ratifies this Convention shall take measures to ensure that workers are provided with such medical examinations or biological or other tests or investigations during the period of employment and thereafter as deemed necessary to evaluate their exposure and monitor their state of health in relation to the occupational hazards.

4.4.2. Workers Entitled to "Health Management Pocketbook," Distribution Process, and Their Medical Checkups

Health Management Pocketbooks are issued to workers who handle one or more of the 14 types of carcinogenic substances (e.g. asbestos) for a specified period of time or longer in accordance with Article 44 of the OSH Act and Article 108 of the Enforcement Regulations of the Act. Carcinogenic substances do not cause all the cancers but some cancers are more frequently discovered than others due to their own characteristics. Beta-naphthylamine and benzidine increase the risk of bladder cancer; beryllium, bis (chloromethyl ether), arsenic trioxide, coke, certain dusts, and chromium increase the risk of lung cancer; vinyl chloride increases the risk of liver blood vessels sarcoma; and asbestos increases the risk of lung cancer and malignant mesothelioma. The newly-added carcinogens are known to cause various cancers: lung cancer and prostate cancer for cadmium, lung cancer for nickel and leukemia for benzene.

In accordance with Articles 108-109 of the Enforcement Regulations of the OSH Act, the workers who handle carcinogenic substances or their employers can submit applications to KOSHA HQ or its regional or area offices to receive Health Management Pocketbooks within 10 days inclusive of the time required for documentation reviews and confirmations. Workers with the Pocketbooks are entitled to annual specialized medical examinations even after changing to another job or position, just by presenting the Pocketbook to nearby medical facility.

4.5. Prevention of Musculoskeletal Disorders (MSDs)

4.5.1. Laws and Regulations on the Prevention of Musculoskeletal Disorders

Recent advancement in the industrial structure led to an increase in simple and repetitive work process, faster work speed and heavier workload, while bodily strengths of people weakened due to insufficient physical activities. These social issues led to rapid increase in MSDs among workers, and therefore, relevant laws and regulations underwent changes.

In 1997, work management guidelines for workers using video display terminal (VDT) and for those engaging in simple and repetitive tasks were established as in the MOEL notice and went into effect. However, as these notices are mere recommendations for employers to refer to as opposed to regulatory requirements, they have limitations to be utilized as regulatory measures for prevention of MSDs. Against the backdrop, best practices, relevant regulations, etc. of the advanced countries were studied which showed comprehensive and detailed measures for MSDs prevention and Korea also developed its own prevention rules that are adequate for its socioeconomic conditions.

On December 30, 2002, a provision on the "health problems caused by simple and repetitive work or by excessive physical labor" was added to Article 24 (Health Measures) of OSH Act. Also, a provision on the "management of work processes for the prevention of health problems pursuant to Article 24, Paragraph 1, Subparagraph 5 of the Act" was added to Article 17, Paragraph 1, Subparagraph 2 (duties of health managers) of the Enforcement Decree of the Act, which was newly enacted on June 30, 2003. Also, a total overhaul of "Regulations on Occupational Health Standards" on July 12, 2003 newly included Chapter 9 which stipulated rules on "prevention of health problems caused by work that puts musculoskeletal strains. "Notice on work causing musculoskeletal strains" was announced as notice 2003-24 of the MOEL on July 15, 2003.

In response to policy and regulatory changes, KOSHA established KOSHA Codes on technical issues to provide detailed guidelines on the prevention of MSDs: "Guidelines on

Work Management to Prevent Occupational Lower-back pain (H-05-1998)"- employers and workers' to-do list to prevent lower-back pain; "Guidelines on Identifying Hazards That Cause Musculoskeletal Strains (H-30-2003)"- a specific and standard guideline on MSDs hazards survey including the objective, timing, method, content, subject and results and countermeasures based on survey results; and "Prevention of MSDs at Work (H-31-2003)"- a standardized action plan for implementing MSDs prevention programs including identification and improvement of hazards, medical treatment, education, etc.

4.5.2. Cases of Musculoskeletal Disorders

The number of workers with MSDs continued to hover around 200 until 1999 but started to skyrocket from 2000. According to statistics released by the MOEL, the number of workers suffering from MSDs such as physical strains, lower-back pain and lower-back pain caused by accidents stood at 6,233, up 3,332 persons compared to the previous year, which accounts for 60.9% of the total work-related illnesses. The rise in MSDs is aggravating socioeconomic problems in that it takes a toll on workers' quality of life as well as leads to lost work days, compromised quality of goods produced and increased in expenditures on workers' compensation insurance.

Since 2000, MSDs have increased sharply mainly in large-sized corporations. The reported cases of MSDs jumped due to changes in Industrial Accident Compensation Insurance made on July 29, 2000 which broadened the coverage of work-related MSDs to include chronic lower-back pains. Massive breakout of occupational diseases in large companies, a rapid increase in accident victims, etc. are some of the major OSH problems, and they are the leading causes of labor-management disputes and social issues especially in manufacturing industry, namely auto, shipbuilding, and heavy industries.

Under the circumstances, small-and medium-sized workplaces at disadvantageous economic and social conditions are finding it extremely difficult to devise an appropriate way for the prevention and management of MSDs. The increasing number of workers with MSDs is a huge burden for a company and undermines effective completion of work. In addition, such work-related health problems are particularly detrimental to corporate competitiveness in the technology-intensive industries and those with heavy reliance on skilled workers.

The percentage of workers' compensation insurance benefits paid to victims of MSDs was mere 4.47% as of 2005. However, the benefits paid to MSDs victims increased by a whopping 23 times from KRW5.9bn in 2000 to KRW135.1bn in 2005. The average amount of insurance benefits paid per MSDs victim was KRW5.849mn in 2000, which was 27.7% level of what was paid to an average accident victim (KRW21.1213mn) but it surpassed that of the accident benefits in 2005. Complete cure of MSDs is difficult and the workers are

likely to suffer a relapse when they go back to their duty, and therefore, they are unlikely to return to their previous job position. In consideration of these facts, the percentage of workers' compensation insurance benefits paid to workers with MSDs is likely to increase significantly.

4.5.3. Prevention of Musculoskeletal Disorders

MSDs are work-related conditions that mainly affect neck, shoulder, elbow, wrist, finger, waist, leg, etc. among other body parts and are attributable to changes in the industrial structure and social environment. Legal definition of MSDs as stipulated in the Health Regulations is the conditions that are caused by repetitive movement, inappropriate posture, excessive use of physical force, or physical contact with sharp surfaces or other health problems caused by vibration, temperature, etc. that affect the abovementioned body parts and nearby areas.

The first reported occupational disease due to MSDs in Korea was to a typist who worked for a TV broadcasting station. Also, massive breakouts of shoulder-arm syndrome in 1996 due to work involving VDT among customer service workers of a telecom company became a social issue. Technological development in the modern industrialized society gave rise to simple and repetitive tasks, while automation of manufacturing facilities and reduced leisure hours at work increased labor intensity. Flexible business strategies under neo-liberalism in the aftermaths of the Asian financial crisis brought changes in the working environment, namely the intensification of labor and irregular labor tasks. These changes are some of the leading causes that increase MSDs by putting more physical and mental strains on workers.

OSHA established mid-to long-term plans for MSDs prevention in September 2002 and reported details about the organization and operation of "MSDs Prevention Team" to the MOEL in November 2002. Through organizational reshuffle in January 2003, "MSDs Prevention Team" was officially launched with five staff. Before relevant laws were revised, Health Promotion Team of the OH Department in KOSHA offered technical assistance for the prevention of MSDs including the shoulder-arm syndrome among workers using VDT and the lower-back injuries among workers handling heavy loads. However, the launch of "MSDs Prevention Team" signaled a full-fledged operation of the relevant activities. Furthermore, other activities for the prevention of MSDs followed such as the provision of prevention techniques, organization & operation of special committee, operation & support of prevention programs, establishment & operation of internet website, training programs for nurturing professionals, technical seminars & best practice presentations, development of technical data, statistical analysis of workers with MSDs cases, etc.

In response to the increasing needs of workers based on the demands made by labor unions and the government's legislation efforts, various activities are underway in order to prevent MSDs and large corporations are taking the leading role. These include improving work environment to become ergonomic workplaces, introducing MSDs prevention programs and providing medical care. Activities to prevent MSDs are seen not only in the manufacturing industry but also in the overall industries including construction, hospital, hotel, distribution, clerical and service sectors.

5. Securing Professional Knowledge and Capacity in OSH

5.1. Establishment of OSHRI

Korea achieved rapid economic growth during the 1960s and 1970s under the national goals of increasing production, exports and construction projects. However, industrial accidents did not get sufficient attention they deserved due to the country's excessive focus on economic growth. However, as the economy reached higher level of development, the living standards of people improved and they started to call for a better quality of life. Based on the hardline recommendations suggested by the ILO, the awareness on the seriousness of industrial accidents was raised while the need for prevention activities grew.

Against the backdrop, the government came to realize the necessity of a professional research institution that focuses on industrial accident prevention. Through consultations with experts in the academic and business circles and domestic experts on OSH as well as by benchmarking organizations of similar functions in the advanced countries, a professional research institute, fully equipped with the capabilities of research, study and technological development functions for the prevention of accidents at work, was established.

5.1.1. Establishment of OSHRI

Korea Occupational Safety and Health Agency was launched on December 9, 1987 to function as a professional agency dedicated to preventing accidents at work. The government closed down National Institute for Labor Science on February 16, 1989 and established Occupational Safety and Health Research Institute (OSHRI) on July 19, 1989 under KOSHA to implement more effective prevention activities.

Organizational restructuring which became effective on January 18, 1992 separated OSHRI into Occupational Safety Research Institute and Occupational Health Research Institute, but these two institutes were remerged on November 18, 1998 and the OSHRI was once again in operation.

5.1.2. Center for Chemical Safety and Health

A technology transfer agreement was signed between Korea and Japan in May 1990 to enable Korea to adopt Japan's advanced techniques in the prevention of occupational diseases caused by chemical substances. Key details of the agreement included transfer of Japan's advanced technologies in mutagenicity and inhalation toxicity tests, dermal toxicity tests and clinical pathology. Also, the agreement entailed introduction of key equipment for related research. Based on the agreement, studies in these areas started in full swing in May 1995 while construction for research facilities began in Daedeok Research Complex to accommodate the donated research equipment, which provided a convenient venue for research exchanges and supply of animals for testing. Later on September 5, 1997, "Industrial Chemicals Research Center" was established in Daejeon after receiving transfer approval from the Ministry of Science and Technology.

Operation of the research facility was largely guided by advice from "Bio Assay Research Center" of Japan and professional institutes specializing in animal testing in the US. The air quality within the research facility, especially in the animal cages, was maintained at class 10,000 level and the facility was equipped with highly sophisticated barrier system for inhalation toxicity studies.

The research facility engaged in studies that contributed to preventing occupational diseases among workers through various toxicity studies. The studies included hazard analysis of chemical substances and provision of industrial toxicity data to ensure safe handling of chemical substances. Also, joint research and technical collaboration with domestic universities and research institutes helped to prevent occupational diseases. On January 28, 2005, the name of the research center changed to "Center for Chemical Safety and Health."

5.2. Research Project of OSHRI

5.2.1. Study on Safety Management Policies

OSHRI conducts research to establish policies, improve OSH system, link social issues with accident prevention activities and maximize the effects of accident prevention projects. Also, it functions as a coordinator in establishing mid- to long-term goals in OSH research and helps the implementation of efficient and systematic research.

- Research and analysis of trends in OSH policies and systems
- Socio-science and legal studies on OSH
- Theoretical study on safety management system
- Setting mid- to long-term goals and strategies for OSH research

5.2.2. Study on Safety Engineering

OSHRI conducts practical research to produce realistic prevention measures against accidents by analyzing the causes of work-related accidents that frequently occur in industrial sites. OSHRI conducts studies that aim to produce scientific measures through the research and analysis of each industry and sector (e.g. manufacturing, service and construction sectors), machine and equipment used in each occupation, and risks. These researches help to develop safety system, protective devices, etc. that are actually applicable to industrial sites and in improving OSH policies.

- Research for the prevention of frequently occurring occupational accidents
- Study on accident prevention by industry (e.g. manufacturing, service, construction)
- Investigation and analysis on serious accidents

5.2.3. Study on Work Environment

Various studies are conducted to scientifically assess chemical and physical work hazards that are lurking in worksites. In order to satisfy workers' right to know and to meet the target for occupational disease prevention, OSHRI conducts studies on management techniques on work environment, establishes exposure standards and measurement system, develops home-grown tools for work-environment measurements and analysis, develops evaluation techniques for the analysis and measurement of hazards, assesses and manages special working environments, and so on.

- Finding solutions to new OSH issues related to new materials industries and new growth sectors
- Techniques on the measurement and analysis of chemical, physical and biological hazards
- Study on the characteristics of working environment and exposure to hazards
- Assessment of health hazards in working environment
- Study on asbestos and exposure characteristics

5.2.4. Study on Occupational Diseases and Workers' Health

Causal analysis of work-related diseases, health protection of workers in vulnerable occupations and specialized health check-up are some of the research topics conducted by OSHRI, while studies on the analysis and improvement of OH policies are also being carried out.

- Development of OH measures to manage occupational diseases and improve working conditions
- Reduction of work-related illnesses in hazardous industries and studies on prevention measures in response to changes in industrial and employment structures
- Establishment of the basis for occupational disease prevention research and study on occupational disease in undeveloped sectors.

5.2.5. Study on Chemical Substances

Studies on the hazards and dangers of chemical substances are conducted to prevent associated risks and to protect workers' health.

- Enhancement of efficiency in the management and information transfer system of chemical substances in Korea
- Identification of toxic mechanism of chemical substances and evaluation of hazards
- Analysis on physical and chemical characteristics of chemical substances; risk assessment on fire, explosion, etc.

5.3. Specialized Projects Conducted by OSHRI

5.3.1. Epidemiological Study on Work-Related Illnesses

Epidemiological studies are being conducted in accordance with Article 43, Paragraph 2, Subparagraph 1 of the OSH Act. Epidemiological studies are conducted to identify the correlation between hazards at work and the diseases of workers and to suggest alternative solutions in order to make diagnosis of work-related diseases and identify their root causes. Korea Workers' Compensation Service, employers, workers, health managers, doctors from health check-up agencies, head of regional labor offices, etc. may request OSHRI to conduct epidemiological studies on work-related diseases pursuant to Article 107, Paragraph 2 of the Enforcement Regulations of the OSH Act. Furthermore, OSHRI also selects its own subjects for epidemiological studies in order to pre-emptively prevent diseases.

5.3.2. Operation of Surveillance System on Work-Related Illnesses

Surveillance system on work-related illnesses allows the development of techniques related to the systematic collection, analysis, management and distribution of data on occupational illnesses in order to understand the trend on incidence, receive feedback on the exposure to hazards and help to establish appropriate prevention and management measures.

Surveillance system on lung cancer, hematological cancer, mesothelioma, and needle stick injuries is under operation on a regional basis while a central surveillance system center takes charge of the management and support of each surveillance system.

5.3.3. Quality Assurance of Private Sector Occupational Health Service Providers

OH service providers in the private sector are reviewed for their capabilities in the measurement, analysis and decision-making process in order to maintain and improve the quality of service they provide. Quality assurance programs are offered in five different sectors, which include specific health check-up, pneumoconiosis, hearing ability, work environment and asbestos. The private OH service providers are assessed one to two times per year to make sure that they are capable of offering such services.

5.3.4. Provision and Management of Data on Chemical Substances

Some 14,700 chemical substances are categorized and labeled based on the GHS standards and MSDS system and are currently being provided through the Internet. The MSDS editing program developed by OSHRI is being offered to workplaces in order to enable them to easily classify hazards and dangers of chemical compounds and create needed warning labels.

5.3.5. Hazard and Risk Analysis and Safety Assessment on Chemical Substances

The Hazard & Risk Evaluation of Chemicals (HREC) is being offered to workplaces in reflection of the hazards, exposure level and volume of chemical substances that are being used. Also, socio-economic evaluations are conducted to monitor the level of regulatory and management status of the OSH Act, which contribute to the founding of a systematic management method of chemical substances. Furthermore, hazard and risk assessment is being done to substances that are likely to cause health disorders and their hazards and exposure levels, etc. are also measured in order of priority with the highly carcinogenic substances and high reproductive toxicity and hazards on top.

Reliable data on the physical hazards of chemical substances that are at risk of chemical accidents are produced by an internationally recognized testing institution (Korea Laboratory Accreditation Scheme: KOLAS). Also, efforts are made to prevent chemical accidents and identify their causes through testing and assessments of chemical substances.

5.3.6. Laying the Foundation for OSH Study

OSH Briefs are produced on a monthly basis in order to inform social leaders and OSH officials of domestic/overseas academic data, policies and system on OSH and to lead Korea's OSH development through continued promotion of OSHRI's research performance. Also, the international journal SH@W--Safety and Health at Work—is being published every quarter (published in every March, June, September and December) in order to contribute to enhancing the level of OSH research on par with global levels.

6. Enhancing the Level of Expertise in OSH Training

6.1. Laws and Regulations on Safety and Health Training and Relevant Training Projects

6.1.1. The Progress in Safety and Health Training

Beginning in December 1987, KOSHA began to develop and implement various OSH training curriculum in order to lay the groundwork for voluntary safety management through active implementation of OSH training at workplaces in accordance with Article 31 (Safety and Health Education) and article 32 (Education for Safety and Health Manager, etc.) of the OSH Act.

Since its foundation through May 1997, KOSHA provided OSH training mainly focusing on mandatory vocational training in accordance with Article 32 of the OSH Act. When the OSH Act was completely amended in 1990 and vocational training requirement for safety and health managers became stricter, training programs offered by KOSHA leaned toward legally mandated vocational training which targeted safety and health managers.

Revisions to the "Act on Special Measures for the Deregulation of Corporate Activities" in May 1997 eliminated the legally mandated vocational training targeting OSH officials, which weakened voluntary safety management efforts in workplaces. Against the backdrop, KOSHA launched various programs including training curriculum to provide supplementary trainings.

Since then, KOSHA has been offering various training programs by accident cause, accident type, etc. so that workplaces can voluntarily take part in the trainings while efforts have been made to meet the training demand of trainees in workplaces. Beginning in 1998, trainings tailored to the characteristics of different regions in consideration of specific industrial structures were offered, led by training and promotion team in the respective regional or area offices. From 2000, the development of new training program

picked up the speed while KOSHA also offered training programs for employers who ran small workplaces (less than 50 workers) in high-risk industries. Experience-based safety training centers were established in 6 regions across the nation beginning in 1997 so that supervisors in construction sites, safety managers, workers and the general public could receive hands-on OSH trainings. Regional and area offices of OSHA categorized training subjects into senior managers, mid-level managers, employers and workers vulnerable to industrial accidents, thereby providing on-site and tailored training programs suitable for each training subject.

It had been frequently suggested that the elimination of legally mandated vocational training for OSH managers, etc. undermined the OSH managers' ability to do their job and discouraged investment, thereby compromising the effectiveness of accident prevention activities. In reflection of such concerns, the "Act on Special Measures for the Deregulation of Corporate Activities" was revised on August 3, 2007 to revive the mandatory vocational trainings required for OSH supervisors, safety managers and health managers effective from January 2009. KOSHA is working to expand its training facilities to accommodate more trainees while developing new training curriculum and methods in response to changes in relevant laws and regulations.

6.1.2. OSH Training Body in KOSHA

OSH training body under KOSHA is comprised of the following: OSH Training and Promotion Department in the headquarters which is in charge of the overall curriculum development and operation; Occupational Safety and Health Training Institute which offers specialized training curriculum for safety and health managers; 6 regional training and information centers which provide practical training program for OSH inspectors in locally accessible training locations; and 20 training and promotion teams in KOSHA's regional and area offices. KOSHA is playing a pivotal role in the vitalization of OSH training in Korea by offering a diverse range of programs tailored to the needs of end-users.

6.2. Establishment of OSHTI

6.2.1. Establishment of Professional Training Institute for Industrial Accident Prevention

Economic development plans carried out in Korea since the 1960s expanded industrial facilities, refined Korea's industrial structure and broadened the scope of the country's industries. Although Korea's industries achieved remarkable developments, such progress was accompanied by ever increasing and larger accidents at work. This resulted in huge economic costs and loss in human resources which had been accumulated for the past

decades and undermined workers' work morale. In other words, occupational injuries and illnesses became a major social problem. The government recognized the seriousness of rising occupational accidents and realized the necessity of a professional training agency which would be responsible for OSH education.

During that time, private institutions including Korea Industrial Safety Association and Korea Industrial Health Association provided trainings on OSH and the prevention of accidents at work. However, their facilities were not adequate and curriculums were far from systematic. Therefore, it was deemed necessary to establish a professional training institute on OSH, which is similar to those operated in advanced countries like Germany and Japan with a long history and a high level of OSH.

In 1985 when a technical exchange between the MOEL of Korea and Germany was discussed regarding occupational safety, Dr. Fritz of BG, Germany provided technical advice on Korea's OSH and proposed the introduction of German-developed OSH system as well as the establishment of a training institute on OSH.

In March 1985, Industrial Safety Department of Labor Standards Division at the MOEL drafted plans to launch a professional training institute on OSH. As a result, a building (6,204 square-meter, 1-level underground, three floors) located in 34-3, Gusan-dong, Bupyeong-gu, Incheon was completed on October 28, 1987 for occupational safety training even before the establishment of KOSHA.

Occupational Safety Training Institute was launched on December 9, 1987 with the founding of KOSHA and the Institute became one of the subsidiary organizations of KOSHA. Since then, the training institute had offered various accident prevention trainings to OSH managers at industrial sites in order to provide technical training and case studies that contributed to enhancing OSH managers' capabilities.

6.2.2. Organizational Reshuffle of OSHTI

OSHTI began with 61 employees in March 1988 and its 1st Director General was Mr. Gang Soo-heon. Organizational structure of OSHTI at the beginning was comprised of professors division and three teams (administration team, curriculum team, and teaching team). In 1991, the total number of staff members in OSHTI reduced to 57 but three departments were set up in order to enhance the level of education (safety management dept., safety engineering dept., and industrial safety dept.).

In 1992, designated teaching assistants were hired and training administration division was newly launched to increase the number of total staff back to 61 (organization: 3 divisions, 1 department and 3 teams). In 1994, the functions of teaching team were incorporated into administration team while curriculum development team and professional committee

system were adopted. In addition, training support team had administration, curriculum and textbook development functions. The total number of staff in 1992 increased to 79 (3 divisions, 1 department and 3 teams).

In January 1998, textbook development function was transferred to materials development function in the Promotion Department in KOSHA headquarters to streamline the organization (3 divisions, 1 department and 2 teams; a total of 58 staff). In December 1998, the three divisions were integrated as a single body "department for professors" to form two-department and 2-team organizational structure, while the total number of staff stood at 47. In 2006, due to plans on the streamlining of organizational structure to eliminate overlapping functions, administration team and curriculum team under training support department were integrated to result in a total of two departments (training support & professors), and the total number of staff was reduced to 44. Since then, organizational structure and the number of staff in OSHTI has remained unchanged.

6.3. Training on Occupational Safety

6.3.1. Analyzing Conditions for the Establishment of OSH Training System

Accidents caused by human factors such as insufficient training or improper work management account for approx. 71% of the total fatal accidents. Thus, strengthening safety trainings to prevent these accidents is becoming more important than ever.

Box 4-2 | Analysis on the Causes of Industrial Accidents using Data on Fatal Accidents

- 51.3% of accidents are associated safety training: poor knowledge on safety; insufficient training on safe working methods, etc.
- 19.6% of accidents occur due to causes related to work management: inadequate work instructions; insufficient preparation before engaging in work, etc.
- 21.9% of accidents are caused by technical reasons: improper installation and poor maintenance of machinery and equipment, etc.

Source: 2005, survey conducted by labor inspectors of the MOEL on the causes of fatal accidents

According to a survey on OSH trends conducted by Occupational Safety and Health Research Institute (OSHRI), the completion level of regular trainings in the manufacturing industry which is offered in accordance with Article 31 of the OSH Act is 58% among white-collar workers, 51.4% among blue-collar workers, and a mere 30.7% among supervisors

and managers. Furthermore, job trainings for newly hired workers and for those transferred to another duty were only 28.3% and 34.6% of the time, respectively. These results are attributable to low OSH awareness in workplaces, insufficient in-house trainers, inadequate facilities, and so on.

6.3.2. Customized Training Programs for Different End-users

a. Training Program for Employers and Managers

The annual gathering of senior managers reminds them of the importance of safety awareness and encourages more OSH investments by presenting them with actual cases which demonstrate ways to enhance a company's competitiveness through the creation of a safe workplace. Among workplaces employing less than 50 workers with a high incidence of accidents, selected workplaces in each regional area are given training on safety management, analysis on the causes of accidents by industry and safety measures in order to encourage voluntary safety management and reduce accidents in workplaces.

b. Training Program for Mid-level Managers

KOSHA seeks to reduce accidents at work by developing and operating region-specific training programs based on the analysis of industrial structure and accident characteristics of each region. In 2006, KOSHA established six regional training centers to offer more training opportunities in workplaces across the country especially for mid-level managers, focusing on a more practical training. Also, KOSHA is strengthening customized trainings, namely the provision of comprehensive OSH consulting services based on workplace risk assessment.

c. Training Program for Workers

Training and promotion teams in KOSHA's regional and area offices offer on-site, customized training services using buses equipped with audio-visual devices to provide mobile safety trainings. These buses target workers in manufacturing and construction workplaces who lack proper OSH training due to insufficient training facilities or trainers. Small- and medium-sized workplaces, which find it difficult to organize in-house trainings due to insufficient OSH knowledge, can be provided with professional trainers based on applications made by employers. Also, tailored trainings for specific regions are being offered in accordance with the analysis on industrial accidents by geographical region and the needs of each area.

d. Training Program for Vulnerable Workers

The number of foreign workers in industrial sites is constantly on the rise. Therefore, OSHTI has established a systematic and comprehensive OSH training support system

including on-site training in industrial sites where many foreign workers are employed and provided OSH trainings during vocational training courses in order to prevent injuries and illnesses among these workers and protect their human rights. Since many foreign workers experience communication difficulties and are vulnerable to accident, KOSHA develope and provide various educational materials namely "Safety Guide for Foreign Laborers" for the convenience of foreign workers.

Furthermore, students in industrial high schools, Korea University of Technology & Education and Korea Polytechnics are offered safety education to enhance the safety awareness among future industrialists and prevent accidents among newly-employed workers. Senior and female workers are given case-based training programs in order to prevent MSDs and cerebro-cardiovascular diseases and are educated about accident cases and prevention measures by industry.

e. Practice- and Exercise-Based Safety Training

KOSHA offers experience-based safety training through which workers can experience accident situations, such as fall from the height, in order to encourage safe working habits in industrial sites. There are six experience-based safety training centers which allow first-hand experience in some 30 safety items for workers and supervisors such as safety belts, fall-proof safety nets, testing on safety helmets, fire extinguishing exercises, emergency rescue measures and many more. These experience-based and practical trainings help trainees to significantly raise their awareness in safety.

Virtual Safety Training Center, on the other hand, enables trainees to identify risks and causes of accidents by themselves through the use of virtual reality computer technology. Together with the experience-based safety training centers, the Virtual Safety Training Center, which has received positive reviews, is available to the general public including workers and students free of charge.

f. Training Courses for the Development of Safety and Health Professionals

OSHTI is making endeavors to nurture OSH professionals by offering various curriculums on vocational training, professional training, telecommunication-based training, etc. that are essential for developing OSH managers and supervisors at work in order to prevent occupational injuries and illnesses and to promote workers' health. Long-distance learning through mail and internet is also available to improve capabilities among OSH supervisors without having to spend much time and money required for offline group courses.

Table 4-1 | OSH Training Records (1988~2011)

(Unit: person)

Training targets	Total	1988~2004	2005	2006	2007	2008	2009	2010	2011
Total	8,699,307	3,443,286	530,060	509,703	622,466	624,032	745,402	1,251,060	973,298
Workers	7,590,821	3,291,773	486,668	415,279	491,399	508,007	669,763	966,804	761,128
Employers (senior management)	634,593	106,768	16,965	20,211	25,486	27,009	26,147	249,858	162,149
Foreign workers	473,893	44,745	26,427	74,213	105,581	89,016	49,492	34,398	50,021

Source: "Status on key businesses," KOSHA

Table 4-2 | Result of the Survey on the Satisfaction Rate of Trainings (2008~2011)

(Unit: %)

Year	Satisfaction on training	Improvement in safety awareness	Satisfaction of government clients
2011	92.21	92.68	92.0
2010	90.19	90.66	91.4
2009	90.00	90.21	90.0
2008	88.85	89.08	85.3

Source: "Status on key businesses," KOSHA

7. Raising Safety Awareness at the National Level

7.1. Safety Culture Campaign for Higher Awareness on Safety

Industrial developments have made our industrial structure more diverse and complex, which led to high incidence of unexpected and frequent accidents in people's daily lives. In response, the government has been making efforts to build a welfare state, where various incidences of occupational injuries and illnesses are prevented and a safe and clean social environment is created. To this end, "Safety Culture Campaign"—aiming at the internalization of safety awareness in people's mind and the promotion of relevant activities—has been launched to lower the level of occupational injuries and illnesses on par with the level seen in the advanced countries and to ensure safety both at work and outside the work.

7.1.1. Promotion of "Safety Culture Campaign"

At the 6th Cabinet Meeting on February 15, 1995 in the aftermath of a fire at Hanjin Heavy Industries in Busan earlier in the month, then-Prime Minister Lee Hong-gu ordered the execution of a nationwide campaign for promoting safety culture. The campaign was to induce the participation of all government ministries to help to plant safety awareness in people's daily lives and safety culture by facilitating the implementation of government-issued safety measures by front-line workers.

As a result, the government ministries embarked on safety culture campaigns in their respective fields. The launch of Safety Culture Campaign by the MOEL coincided with the Ministry's establishment of policy measures on safety culture within the framework of occupational safety on March 21, 1995. The Campaign launched by the MOEL sought to prevent occupational injuries and illnesses from the fundamental level and respond to the increasing risks and hazards at work. Also, the Campaign sought to identify the causes of work-related illnesses which were triggered by the diversification and expansion of industrial structures as well as the extensive use of new chemical substances.

"Central Council for Safety Culture Promotion" was organized on May 29, 1995, chaired by the Prime Ministers and participated by relevant government ministries (public council members) and heads of private institutes (private council members). The Council outlined the basic strategies for the promotion of safety culture and coordinated the roles and responsibilities of each participating sector.

The official launch of the Council was made on August 16, 1995 in Seoul. Between September and October in the same year, "Regional Council for Safety Culture Promotion" and the regional offices were set up in 14 area offices of KOSHA. Thereafter, the Council's system of activities became more well-established and the current structure took shape with the setup of regional councils in Ulsan and Eastern Jeonnam as well as additional regional offices.

7.1.2. The Designation and Commemoration of "Safety Check Day"

Beginning in April 1996, Council for Safety Culture Promotion designated the 4th day of every month as "Safety Check Day" in a nationwide safety activity participated by the general public. The designation of the Day was to help people develop the habit of identifying and checking risks in their surrounding environment and thereby contributing to the prevention of accidents.

The details on the implementation of "Safety Check Day" underwent a major change in January 2006 in order to improve some of the operational problems reported during the operation. The format of safety check changed from an event-oriented inspection to a more

practical one, targeting workplaces that voluntarily applied for the safety inspection. Also, event-like details of the Safety Check Day commemoration were completely eliminated to enable practical and sustainable safety inspections participated by many people in workplaces. Also, aggressive promotional activities through the Internet, campaigns, and media were implemented to make safety inspections more widespread and popular.

7.1.3. Safety Training in Schools

The rate of occupational injuries and illnesses, which fell below 0.8% in 1999, has hardly made any progress. The importance of safety should be deeply engraved in people's mind and they should voluntarily take part in activities that help to mitigate accidents at work, if we are to dramatically reduce occupational injuries and illnesses. In particular, the importance of early education on safety should not be taken lightly as it is highly effective to educate the impressionable and sensitive young children and teenagers whose knowledge and values are still under development.

Against the backdrop, KOSHA contributed to the development of school education curriculum to include safety training since 1991, even before safety culture campaigns were intiated. KOSHA provided safety training to pre-, primary and secondary school students and teachers to prevent safety accidents occurring in school, and reminded students of the importance of safety. The training aimed to help the students grow into responsible adults who fulfill their respective roles for accident prevention.

Safety training programs that have been provided in schools are: ① Research on the systemization of contents of safety & health training in schools in consideration of the safety trainings that are already offered; ② Operation of pilot schools on safety training; ③ Safety & health training for pre-, primary and secondary school students and teachers; and ④ Development and distribution of safety training materials to be used in schools.

7.1.4. Occupational Safety and Health Week

In accordance with Article 4, Paragraph 1, Subparagraph 5 of the OSH Act, the "Occupational Safety and Health Week" is commemorated in the first week of July each year to pay tribute to those contributed much for the prevention of accidents at work and to heighten public attention on safety and health through the exchange of relevant techniques and knowledge.

The OSH Week starts with the OSH Conference, followed by various exhibitions, seminars, festivities, and so on. They include: exhibitions on international safety devices, work environment improvement and fire prevention industry; domestic & international technical seminars; best practice presentations; forums; academic conferences; academic

paper presentations; video & poster festivals and many more. Furthermore, campaigns and promotional activities through the media (TV broadcasting, radio, newspaper, magazine, and internet) and outdoor billboards are more visible around this period.

The OSH Week celebrated the 45th anniversary in 2012. The annual gathering of employers, workers, those working in the field of safety and health, general public and various consumers has developed into the largest safety & health event of the country which provides a good opportunity to spread safety culture in the society while helping safety to take root in our society as an essential value.

7.2. Zero-Accident Campaign

7.2.1. Definition and Objectives

"Zero-Accident" refers to a risk-free state, in which not only workers are unharmed in their workplaces but also no risks are present at work that may threaten workers' physical well-being. The essence of Zero-Accident Campaign in workplaces lies in human respect as well as reasonable corporate management. In other words, Zero-Accident Campaign aims to secure OSH through active participation of all members in workplaces—executives, managers, workers, etc.—and to create a happy and healthy working environment with the underlying theme of human respect.

7.2.2. Development of Zero-Accident Campaign

Since its launch in 1979, Zero-Accident Campaign continued to make progress by going through different phases of development. They are: ground-laying phase; dissemination phase; advancement phase; substantiating phase; voluntary settlement phase; and revival phase.

① Ground-laying phase (September 1979~October 1989): The MOEL introduced and administered the Campaign

② Dissemination phase (November 1989~July 1992): The responsibility of administering the campaign was delegated to KOSHA and it began to introduce the campaign in workplaces

③ Advancement phase (August 1992~February 1993): The MOEL established and implemented Special Measures for Industrial Accident Reduction

④ Substantiating phase (March 1993~June 1997): Campaigns aimed at disseminating safety culture in workplaces were launched to reduce the rate of occupational injuries and illnesses to below 1%

⑤ Voluntary settlement phase (July 1997~November 2006): Circumstances had changed to promote voluntary execution of Zero-Accident Campaigns in workplaces while the

"Zero-Accident Record Certification" system replaced the "Zero-Accident Achievement Award." Also, the responsibility for administering Zero-Accident Campaign was fully transferred from the Ministry to KOSHA

⑥ Revival phase (December 2006~present): Efforts to revitalize Zero-Accident Campaign, whose progress has been sluggish over the past few years, are being made such as the overhaul of relevant regulations and guidelines, development of an IT program dedicated for Zero-Accident Campaign, and database-building.

7.2.3. Implementation of Zero-Accident Campaign

Employers who wish to carry out Zero-Accident Campaigns in their own workplaces are required to inform workers about their participation in the campaign through OSH training sessions or internal meetings. The launch of the campaign and implementation details should be notified through appropriate means such as company notice boards or newsletters. In addition, a report announcing the start of Zero-Accident Campaign should be submitted to KOSHA's regional or area offices within 14 days from the launch through fax, internet or delivery in person.

KOSHA provides all the training materials and information as well as campaign techniques needed for carrying out the Zero-Accident Campaign in workplaces that have declared their participation in the campaign. KOSHA endeavors to provide the maximum support for an active implementation of the campaign by supporting the provision of relevant trainings to employees of participating workplaces when requests are made.

For employers to receive a certification for achieving the Zero-Accident target, the certification application must be submitted to the relevant regional or area office of KOSHA within 60 days from meeting the target. The regional or area office of KOSHA that received the application is required to make a visit to the workplace concerned within 14 days from the receipt and conduct inspections on: whether or not an accident has occurred; the adequacy of Zero-Accident target; and the accuracy of Zero-Accident days (hours) calculation. The results of the inspection are to be notified to the workplace in a written form.

7.2.4. Accomplishments of Zero-Accident Campaign

The positive effects of Zero-Accident Campaigns on enhancing corporate governance are well known through the experience of many workplaces that have introduced and implemented the campaign. Positive outcomes of the campaign can be summarized as the following.

First, the creation of amicable corporate environment facilitates the true harmony between workers and executives. Introduction of the campaigns bolsters the efforts to

protect the lives of workers, while invigorating safety meetings or group discussions aimed at safeguarding the safety of family members which ultimately leads to the creation of accident-free workplaces. These efforts translate into more friendly working environment and collaborative labor-management relations.

Second, the campaign boosts productivity and contributes to better corporate governance. Early detection and proactive response to unsafe and potential risk factors at work help to maintain talented individuals while reaping economic benefits from the prevention of losses such as workers' compensation expenditures and other indirect spending. Also, the creation of safe work environment significantly improves corporate governance through improved product quality, cost saving and observance of deadlines as workers can have a peace of mind and concentrate on their work.

Third, the achievements made through the campaign ensure prosperity of companies. As the living standards of workers improve, they pursue more decent living and better working conditions which also means safe working conditions. Active implementation of Zero-Accident Campaigns by workplaces helps them to secure human talents through the creation of safer work environment, efficient corporate governance and improved corporate reputation. In addition, workers are less likely to consider changing their jobs and the company becomes more competitive when workers show higher level of loyalty to the company, considering it as their second home or a subject for their life-long devotion. These changes would translate into a workplace that continues to grow through the creation of harmony between labor and management.

8. Advancement and Globalization of OSH

8.1. The Grounds for International Cooperation

8.1.1. Rationale behind International Cooperation

a. Domestic Factors: Poor Awareness and Insufficient Infrastructure on OSH

Up until the 1980s, Korea had been at the center of the world's attention due to its unprecedented pace of economic development. However, the economic development was accompanied by a tragic social problem which was the high number of injuries and illnesses of workers in Korea's industrial sites, who had been the pivotal players in building the basis and growth for the national economy.

Due to insufficient OSH policies, inadequate OSH investments made by companies whose only focus was to maximize profits, poor working conditions, and lack of awareness

on safety and health, the tragedy in industrial sites continued. Against the backdrop, the Korean government and the society as a whole sought to lay the groundwork for implementing accident prevention activities by strengthening OSH policies, establishing KOSHA—the professional agency for the prevention of industrial accident—and thereby providing OSH techniques in industrial sites.

However, the policies and systems on OSH had been inadequate when KOSHA was first established and infrastructure for accident prevention activities had not been built due to lack of experts in the filed. Thus, building a systematic OSH infrastructure which would enable effective technical support to workplaces by fostering professional talents and improve the level of technical expertise by learning accident prevention techniques of advanced countries became extremely important.

b. Global Factors: Intensifying Global Competition and Unification of International Standards

As countries around the world become more open to others and many multinational corporations make inroads into the domestic market, the competition against countries around the world is becoming ever fiercer whereas the global competition on OSH technology is also intensifying. Due to the reorganization of the global markets and the formation of regional unions namely the EU, NAFTA and ASEAN, protectionism against countries outside one's own region is becoming ever more serious while safety and environmental issues have emerged as new trade barriers.

Thus, OSH is becoming more important than ever as international organizations (e.g. OECD) are working to consolidate the standards of individual countries into a unified international standard due to increasing needs to establish international standards that encompass safety, health, environment, and quality.

8.1.2. Information and Techniques Exchanges through International Cooperation

Since its inception, KOSHA has been working to enhance accident prevention techniques on par with those in the advanced nations by exchanging relevant techniques and information with professional OSH organizations overseas. Also, it has contributed to the globalization of Korea's OSH sector. In particular, international cooperation programs implemented in the early stages of KOSHA such as overseas training of KOSHA employees and invitation of overseas experts for consultations have significantly helped Korea to further develop its OSH techniques.

International cooperation projects have been implemented in diverse ways. First and foremost, international arrangements with professional agencies specializing in

accident prevention were signed with countries including Germany, US, UK and Japan. Also, international cooperation expanded into the world-renowned accident prevention organizations including: National Safety Council (NSC) of the US; Berufsgenossenschaft (BG) of Germany; Institution of Occupational Safety and Health (IOSH) of the UK; and Japan Industrial Safety and Health Association (JISHA). International organizations including International Labor Organization (ILO), World Health Organization (WHO), International Social Security Association (ISSA), Organization for Economic Cooperation and Development (OECD), International Organization for Standardization (ISO), and Asia Pacific Occupational Safety and Health Organization (APOSHO) and government agencies including Occupational Safety and Health Agency (OSHA) of the US, Health and Safety Executive (HSE) of the UK and Bundesministeriums für Arbeit und Soziales (BMAS) are some of KOSHA's partners for technical exchanges aimed at preventing accidents.

After Korea achieved a certain level of technical expertise in OSH, it has been active in providing technical support to developing countries in Asia to help them improve their safety and health. KOSHA signed MOUs with 10 government agencies in 8 developing countries including Mongolia, Vietnam and Cambodia in order to share Korea's experience in OSH development and provide fellowship trainings, on-site technical consultations and OSH trainings. Furthermore, joint-studies are being conducted with MOU counterparts while OSH training materials and safety devices are also being offered. On the other hand, long- and short-term overseas training programs are being provided to KOSHA employees to enhance their capabilities and technical expertise. KOSHA also provides the latest overseas OSH information since designated as the ILO-CIS National Centre. Information exchange programs utilizing international network continue while various technical materials on OSH are being translated and distributed to other countries.

International cooperation phases are as follows:

① Initial phase (1987~1995): Korea received technical advice from advanced countries (e.g. Germany, Japan) and initiated the participation in the ILO-CIS (Occupational Safety and Health Information Centre).

② Foundation-building phase (1996~2000): The basis for OSH was established and the techniques of advanced countries were introduced to Korea by concluding international arrangements.

③ Infrastructure-building phase (2001~2005): OSH techniques were provided to developing countries in Asia as a support program in collaboration with ILO, while joint research and long-term training programs were conducted with overseas OSH organizations to strengthen KOSHA's capabilities. These activities helped KOSHA to improve its global reputation and KOSHA was able to secure talented safety and health professionals.

④ Active phase (2006~2008): A website facilitating international cooperative network was established and began operation, while domestic and overseas safety and health information was distributed. The 18th World Congress on Safety and Health at Work was successfully hosted in Korea.

⑤ Proactive implementation phase (2009~2012): Joint activities with international organizations are in full swing through dispatch of KOSHA experts and organization of international conferences. The level of international exchanges becomes more sophisticated by building and strengthening international collaborative network, which aims to reinvent KOSHA as a world-renowned professional agency in OSH.

2012 Modularization of Korea's Development Experience
Establishment and Operation
of Industrial Accident Prevention System

Chapter 5

Assessment and Application of Industrial Accident Prevention System

Assessment and Application of Industrial Accident Prevention System

1. Laws and Regulations on Industrial Accident Prevention and Relevant Administrative System

1.1. Evaluation

The first laws and regulations on OSH in Korea can be found in Chapter 6 of the Labor standards Act promulgated in 1953. However, they were insufficient to systematically manage and prevent injuries and illnesses at work, which became ever more frequent with the increasing scale of machineries and construction projects on the back of rapid economic growth.

Against the backdrop, the Korean government recognized the needs to enact separate laws and regulations on OSH in order to readily respond to environmental changes and prevent accidents in a systematic manner. Later in 1981, the OSH Act was enacted and its enforcement decree and enforcement regulations followed to govern specific and technical areas of OSH. The laws and regulations went through numerous amendments by the government in order to effectively respond to the reorganization of industrial structure, changes in labor demand and new risks in industrial sites. Furthermore, ordinances, rules, notices, technical guidelines, work environment standards, etc. were announced to ensure effective implementation of the laws and regulations.

The MOEL is in charge of the administrative affairs on OSH in Korea, which has evolved constantly to build the current administrative system aiming at effectively executing laws and supervising workplaces. The Ministry's administrative system has become more complete through the designation of a separate division in regional labor offices specifically dealing with OSH issues and the deployment of labor inspectors. In addition, the divisions

within the Ministry have been reorganized to carry out accident prevention policies by different sector.

However, administrative duties on OSH are separately handled by different government ministries and laws in Korea. The fact that workplaces are subject to overlapping regulations imposed by different regulators and the lack of uniform laws and regulations on safety are some of the challenges Korea has faced.

1.2. Application

Each country has its own laws, regulations, and administrative system on OSH. However, many developing countries in Asia, whose economic development is at its infancy, lack infrastructure on OSH and have incomplete legal and organizational framework on OSH. Although some developing countries have a well-established legal system by adopting that of advanced countries, the majority of them have insufficient technical capabilities, budget and human resources to fully take advantage of the borrowed legal system and the actual and systematic implementation of the legal framework is rare.

OSH—the public property which is prone to market failure—requires government-led initiatives at its early stages to bring about successful outcome and the legal institutionalization and the establishment of administrative system are essential components for the success. Therefore, the priority should be given to the establishment of laws and regulations on OSH and streamlining of overlapping laws and regulations in order to set up a new legal system. After that, continuous efforts should be made to ensure the implementation of the laws by supplementing them with relevant technical standards.

In addition, leadership and the development of professionals in OSH are critical in order to establish and operate efficient and aggressive OSH policies. The global trend on OSH emphasizes a cultural approach through the dissemination of prevention culture and it is necessary to benchmark exemplary activities in countries with advanced OSH measures.

The introduction of the OSH Act and relevant regulations in Korea has been led by a few outstanding talents in the field. The elite professionals in the MOEL were selected to take charge of OSH and they played pivotal roles in helping the OSH Regulations to take deep root in our society. Since all laws and regulations are managed by people, the initial focus of safety and health development should be placed on securing talented professionals (interview with former Director Lee, Kyoung-nam of KOSHA).

In addition, it is imperative to enhance the capabilities of safety and health managers and to have well-established central and regional organizations for the execution of effective supervision duties. The OSH managers in the Asia-Pacific region are only a few in number and the majority of them are not technical experts in their field. Because a systematic system

for nurturing OSH professionals is lacking, the priority should be given to establishing a training system (or program) which can enhance the expertise of safety and health managers and supervisors of each country (interview with Professor Noh, Young-man of Yonsei University).

The biggest concern of companies when they experience occupational accidents is economic costs resulting from expensive fines and penalty as well as the damage to the corporate reputation (intangible assets). Relatively little focus is given to personal punishment namely imprisonment. Therefore, disclosing the list of workplaces with frequent accidents in government newsletters, daily newspapers, internet, etc. can be considered as one of the options for facilitating prevention activities in companies. Also needed is a cultural approach to accident prevention. In other words, the creation of a cultural environment where OSH is valued is critical for improving safety and health at work along with the establishment of relevant laws and regulations (interview with former Professor Lee, Young-soon of Seoul National University of Science & Technology).

2. Establishment and Implementation of Industrial Accident Prevention Strategies

2.1. Evaluation

Despite stricter accident prevention activities and supervisory functions following the enactment of the OSH Act, the existing OSH system reached its limitations due to the increasing number of accidents in small- and medium workplaces and the advent of new occupational diseases.

In response, the Korean government has established various mid- to long-term national strategies for accident prevention at work, which seek to understand the current trend while developing and implementing effective accident prevention policies that are in line with internal/external environmental changes. The plans laid out by the government are: the 1st 6-Year Plan for Industrial Accident Prevention (1990); Comprehensive Measures for Occupational Disease Prevention (1991); Special Project for the Prevention of Occupational Accidents (1994); 3-Year Plan for the Advancement of Occupational Safety (1996); and 5-Year Plan for Industrial Accident Prevention (1st in 1999, 2nd in 2004, and 3rd in 2009). These plans have been adequate in responding to changing landscape of OSH environment and they have reflected the government's commitment to exercise aggressive OSH policies (interview with former Director Lee, Kyoung-nam of KOSHA).

Thanks to these efforts, the rate of injuries and illnesses at work continuously declined to fall below 1% for the first time in 1995. New mid- to long-term visions and strategic goals are being envisioned that revisit the progress that have been made in the past and put forth new ideas that reflect new policy environment.

2.2. Application

Solving issues at hand is important to generate desirable outcomes based on a well-established industrial accident prevention system. However, what is even more important is to build and effectively put into practice mid- to long-term plans that could induce changes in the OSH regulations and policies at home and abroad, thereby suggesting and determining policy direction on accident prevention in response to the changes.

Developing countries have a huge growth potential and they will be heavily affected by external safety and health environment through globalization. Therefore, industrial accident prevention strategies should reflect the future industrial structure and labor environment of developing countries, in anticipation of the following changes:

First, new safety and health issues are anticipated to arise in developing countries, as they did in advanced nations due to changes in industrial structure, such as the decline of the manufacturing industry and growth of the service industry; Second, the need for customized accident prevention activities is rising due to the diversification of workforce including senior and female workers, which is what had happened in Europe and Japan; Third, the developing countries will soon follow the lead of advanced countries to enter into the knowledge-based society, which would trigger new safety and health issues (e.g. occupational diseases) and the need for more OSH training.

Having sufficient discussion and collaboration amongst workers, employers, and governments' representatives are crucial to establish effective and practical mid- to long-term plans that overcome the limitations of government-led OSH policies.

It is important for developing countries, in particular, to establish plans in consideration of the industrial structure suitable for their level of economic development as well as their labor environment, infrastructure, and so on. Also, new policy direction should be set forth and implemented, which includes identifying possible problems that may arise in future development stages and establishing mid- to long-term plans adequate for domestic and international OSH environment in order to minimize trials and errors. On the other hand, it is worth finding out an industry that needs accident prevention activities the most and figuring out ways to come up with a systematic solution (interview with Professor Gal, Won-mo of Eulji University).

3. Introduction and Operation of Statistics System on Industrial Accidents

3.1. Evaluation

The key objectives of producing statistics on industrial accidents are to understand the root causes of industrial accidents, establish and execute effective prevention policies and provide underlying data. Therefore, it is essential to put in place a system for accurate statistics calculation. Countries around the world have their own statistics system for industrial accidents in reflection of the purposes of statistical data usage, availability of underlying data and social background.

Korea introduced workers' compensation system in 1964 and the collection and analysis of survey data on industrial accidents began in 1972. The computing network for accident statistics was built in 1996 and the duties relevant to industrial accident statistics have been transferred to KOSHA in 1998. In 1999, KOSHA was designated as an "agency in charge of statistics compilation." For the past years, KOSHA has improved statistics system on numerous occasions to update the statistics on industrial accidents and their causes and these data have been used as the underlying data for implementing prevention policies. As a result, the rate of occupational injuries and illnesses plummeted from 5.9% in 1965 to lower than 1% in 1995, and further down to 0.65% in 2011.

However, diversification of the industrial society and increased attention paid towards the socially disadvantaged are calling for a more in-depth analysis on the causes of accidents, especially for social groups that are more prone to accidents. The results of the analysis should be utilized as the means to produce accident prevention policies tailored to each accident cause. However, continuous improvement of the statistics system is required going forward since the existing system has many limitations in flexibly responding to the needs of the times.

3.2. Application

Statistics on industrial accidents must be trustworthy in order to be utilized as a means to produce effective national policies and implementation policies on accident prevention. According to "Prevention of Industrial Accident Recommendation, 1929 (no. 31)" by the ILO, the study on the causes and conditions of industrial accidents would provide a good basis for prevention of accidents.

So far, many developing countries have pursued growth-oriented policies rather than focusing on workers' rights or safety, and therefore, the awareness on the occurrences

of industrial accidents and associated issues is low. It can be estimated that the actual number of industrial accidents in developing countries is higher than what is seen from official statistics, which demonstrate that their statistics system and relevant regulations on industrial accidents still have room for improvement.

Therefore, in order to get reliable statistical information on accidents at work, the reporting of industrial accidents should become mandatory. Also, it is important to create the network and professional talents who can effectively manage the system. By doing so, the basic data such as the distribution of industrial accidents by industry, size, geographical location, time of the accident, and so on and the characteristics of workers such as gender, age, work experience, education background, employment status, can be utilized as the underlying data for policy making.

4. Establishment and Operation of an Independent Organization Specializing in Industrial Accident Prevention

4.1. Evaluation

Rapid economic growth and industrialization in Korea caused industrial accidents and occupational diseases, which became serious social issues. Against the backdrop, the Korean government enacted the OSH Act as an independent Act to improve the administrative system on OSH and fully engage in prevention activities. However, despite these efforts, the need for establishing a professional agency specializing in the prevention of accident at work remained. To this end, the Korean government established KOSHA, a semi-governmental agency, to provide technical support in domestic industrial sites based on its professional capability.

With the establishment KOSHA, safety and health policies by the government came to be directly managed and implemented by a professional organization. Furthermore, KOSHA was able to provide reliable OSH services to workplaces, which had been difficult for them to implement on their own such as technical support, training, education, campaign, and many more. The professional organization, equipped with human talents and techniques, was able to provide a comprehensive accident prevention system at the national level and a safe working environment for workers, while spreading safety awareness among the general public.

In 1987, when KOSHA was established, the number of accident victims stood at 142,596 and the rate of accident was 2.66%. However, through various accident prevention policies

by the government and effective implementation of the plans, the statistics on industrial accidents declined to 93,292 victims and the accident rate, to 0.65%.

Provision of a more efficient technical support requires organic collaboration and active exchange of information between front-line bodies in the MOEL and regional & area offices of KOSHA. Furthermore, networking with regional organizations and governments should be strengthened as well.

Division of roles between the government (MOEL) that has administrative authority and KOSHA, an agency with the technical expertise, created the burden of overlapping regulations and processes while KOSHA faces many difficulties when providing technical support due to its lack of regulatory capacity (interview with former Director Lee, Kyoung-nam of KOSHA).

4.2. Application

In most developing countries, the Labor Departments are responsible for handling OSH-related affairs at the governmental level and they also take charge of regulatory and supervisory roles in accordance with relevant laws and regulations. However, these types of system provide insufficient service to workplaces, as the support is limited to the management of workers and workplaces from the perspective of public administration.

In order to provide the techniques and services actually needed in workplaces, it is efficient to establish a professional agency with proven capability in OSH. The combination of field experience, techniques by professionals, and the technical support services to be provided through the system will be more effective. However, these require sufficient funding.

To that end, it could be possible to establish such an organization as a subsidiary organization of a government ministry or an existing organization can just expand its scope of functions and roles. The functions of industrial accident prevention and industrial accident compensations are sometimes integrated, and in other times, separated. Therefore, it is critical to establish a professional organization that is most appropriate for the country's existing system. On the other hand, it would be possible to continuously nurture professional talents by strengthening research and training. This can be done by the operation of designated institutions for research and training.

In the early stages of the establishment, the professional organization on OSH could begin by providing services that are wanted from the workplaces such as safety inspection, technical assistance, training for safety and health managers, and so on. Afterwards, mid- to long-term plans can be set up to make detailed goals of the organization and it can expand the scope of the business one step at a time. Furthermore, concentrating the capabilities of

the organization through network building with OSH organizations in Korea and enhancing the level of expertise through the acquisition of relevant knowledge and information from advanced nations would be very important. To this end, continuous collaboration with OSH organizations from home and abroad will be critical.

When KOSHA was established, its first President took the initiative to obtain technical consultations from experts of the field including those from the Korean Society of Safety. In addition, KOSHA benchmarked OSH agencies in advanced countries including the US and UK to introduce their best practices to Korea. In addition, through the organization of international seminars, KOSHA learned the advanced OSH system and activities from overseas experts and applied them to vitalize safety and health activities in Korea. Therefore, international collaboration through the learning of experiences of international players in OSH and actively adopting their cases would be highly beneficial to countries in the process of developing OSH (interview with former Professor Lee, Young-soon of Seoul National University of Science & Technology).

In the early stages of OSH activities in Korea, the technical levels between the workers in industrial sties and experts from KOSHA displayed a big difference, and the KOSHA Code, the guidelines to be applied in workplaces, was highly effective. There is no doubt that laws and regulations are of great importance. However, what is also useful are specific technical guidelines which can actually be utilized in industrial sites for technical support and on-site guidance (interview with Professor Noh, Young-man of Yonsei University).

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Chapter 6

Conclusion

Conclusion

Korea demonstrated unprecedented pace of growth in the 1970s and 1980s. However, as the nation's industry became more sophisticated with the use of larger industrial equipment, rapid turnovers, and construction projects in large sizes, the rate of industrial accidents, particularly major accidents increased rapidly with the advent of new occupational diseases. As industrial accidents became a social issue, the economic losses and mental sufferings of individual workers, their family, and the country as a whole became victims of the accidents. Therefore, accident occurring at work became a national challenge.

Against the backdrop, the Korean government has enacted the OSH Act as an independent legislation, reorganized the administrative system, and established KOSHA for the efficient management of OSH system. Also, various efforts have been made to effectively launch accident prevention activities including the setup of mid- to long-term national goals on OSH.

Thanks to the efforts, the rate of accidents at work dramatically decreased from 2.66% in 1987, the year when KOSHA was founded, to 1.76% in 1990, to 0.99% in 1995, and to 0.69% in 2010. The rate further went down to reach a record low at 0.65% in 2011. This improvement is the result of KOSHA and the government's dedication as well as the overall improvement in safety awareness among the general public.

However, average of 6 workers die every day at industrial sites and 250 others get injured or suffer from work-related illnesses. The lost work days due to occupational accidents in 2011 alone recorded 54.777 million days and the economic losses amounted to KRW18.1tn. If the rate of occupational accidents did not decrease but remained at the 2% level just like in the past, the estimated economic loss in 2011 would have amounted to a whopping KRW55.7tn, taking a huge toll on the national economy. Luckily, the rate of accidents at

work posted remarkable improvements, but the efforts to significantly reduce the absolute number of injuries and fatalities should continue.

The recurrences of accidents at industrial sites around the country are partly due to poor understanding about the rights and responsibility on safety. Reducing industrial accidents requires systematic accident prevention system and actions that support the system. These days, the risks at work are being passed onto SMEs, non-regular workers, and migrant workers from large corporations and regular workers. However, the safety and health infrastructure available for them is still very limited. Therefore, public support and infrastructure building should be strengthened in order to present realistic protection measures for those particularly vulnerable to industrial accidents—non-regular workers, migrant workers, workers in small workplaces—so that they do not become workers at risk of accidents at work. Also, the labor, management and government should speak with one voice in terms of recognizing the importance of industrial accident prevention. Fortunately, though, the issues on OSH are an area where consensus has been reached for tripartite collaboration.

Therefore, providing a venue for discussion between tripartite groups, improving relevant laws and regulations, and reaching an agreement between them on major OSH issues would allow the establishment of a more effective policymaking and help workers to do their work under safer and healthier conditions.

Korea is still in the process of actively engaging in OSH activities and improving relevant policies to prevent accidents that frequently occur at worksites. Although Korea's OSH is still in progress, the accomplishments it has made so far through infrastructure building and policymaking on OSH would present a good example to developing countries in establishing their own system in the future. It would be desirable for Korea's experience and know-how to contribute to suggesting a direction to many developing countries in strengthening their own OSH system and raising the level of technical standards. The following are some of the suggestions from Korea which can be useful to other countries in building the industrial accident prevention system, protecting workers and helping national development.

First, for a systematic construction of accident prevention system, the government and the country as a whole should demonstrate a strong commitment in establishing and improving relevant laws and administrative system. The laws and regulations on OSH managed by different government agencies should be streamlined and integrated in order to make an effective system for supervising OSH-related issues.

Second, mid- to long-term national plans on OSH should be established which take into consideration the different levels of economic development in each country. For effective implementation of the plan, it is critical to conduct a thorough analysis on the overall social

and industrial conditions and plan and execute customized policies that are appropriate for the country's situation.

Third, effective accident prevention activities should be accompanied with relevant infrastructure building. To this end, statistics system, specialized institutes for accident prevention, development of OSH experts, networking with international organizations on OSH, and so on are required.

Fourth, voluntary accident prevention activities participated by both workers and employers should be carried out, accompanied by various other activities facilitating the promotion of prevention culture. Strict execution of laws is not enough to solve problems at work. Without the investment in OSH management system and participation of both workers and employers in prevention activities who have the utmost interest in OSH, it would be difficult to yield positive results in terms of accident prevention.

Fifth, it is important to strengthen the international collaborative network and exchange knowledge and technical information. Due to increased international exchanges triggered by globalization, industrial accidents have become a global issue and they have a tremendous impact on the global economy. Therefore, working together with other OSH organizations overseas will help the countries in the process of economic development to minimize trials and errors and achieve the wanted results in a rapid manner.

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Appendix 1: Indicators of Occupational Injuries and Illnesses

- Rate of occupational injuries and illnesses: the number of injuries and illnesses per 100 workers (%)

$$\cdot \text{Rate of occupational injuries and illnesses} = \frac{\text{No. of workers with occupational injuries and illnesses}}{\text{No. of workers}} \times 100$$

- Injuries and illnesses per 1,000 workers: the number of workers with occupational injuries and illnesses per 1,000 workers

$$\cdot \text{Injuries and illnesses per 1,000 workers} = \frac{\text{No. of workers with occupational injuries and illnesses}}{\text{No. of workers}} \times 1{,}000$$

- Frequency rate: the number of occupational injuries and illnesses per 1 million working hours

$$\cdot \text{Frequency rate} = \frac{\text{No. of occupational injuries and illnesses}}{\text{Total working hours}} \times 1{,}000{,}000$$

- Severity rate: the number of lost work days per 1,000 working hours

$$\cdot \text{Severity rate} = \frac{\text{No. of lost work days}}{\text{Total working hours}} \times 1{,}000$$

- Fatality per 10,000 workers: the number of deaths per 10,000 workers

$$\cdot \text{Fatality per 10,000 workers} = \frac{\text{No. of deaths}}{\text{No. of workers}} \times 10{,}000$$

Appendix 2: Injuries and Illnesses by Industry (2009~2011)

Year			2009	2010	2011
Total	No. of workers		13,884,927	14,198,748	14,362,372
	No. of workplaces		1,560,949	1,608,361	1,738,196
	No. of injuries and illnesses (rate)		97,821(0.70)	98,645(0.69)	93,292(0.65)
	Fatality	Total (fatality rate)	2,181(1.57)	2,200(1.55)	2,114(1.47)
		No. of fata injuries (rate)	1,401(1.01)	1,383(0.97)	1,383(0.96)
		No. of fatal illnesses (rate)	780(0.56)	817(0.58)	731(0.51)
Mining	No. of workers		13,732	12,548	12,088
	No. of workplaces		1,146	1,117	1,029
	No. of injuries and illnesses (rate)		1,118(8.14)	1,084(8.64)	1,103(9.12)
	Fatality	Total (fatality rate)	399(290.56)	386(307.62)	375(310.23)
		No. of fata injuries (rate)	29(21.12)	20(15.94)	16(13.24)
		No. of fatal illnesses (rate)	370(269.44)	366(291.68)	359(296.99)
Manufacturing	No. of workers		3,182,262	3,196,182	3,333,131
	No. of workplaces		257,686	269,630	285,993
	No. of injuries and illnesses (rate)		32,997(1.04)	34,069(1.07)	32,294(0.97)
	Fatality	Total (fatality rate)	561(1.76)	618(1.93)	548(1.64)
		No. of fata injuries (rate)	392(1.23)	422(1.32)	387(1.16)
		No. of fatal illnesses (rate)	169(0.53)	196(0.61)	161(0.48)
Construction	No. of workers		3,206,526	3,200,645	3,087,131
	No. of workplaces		236,747	221,617	283,861
	No. of injuries and illnesses (rate)		20,998(0.65)	22,504(0.70)	22,782(0.74)
	Fatality	Total (fatality rate)	606(1.89)	611(1.91)	621(2.01)
		No. of fata injuries (rate)	559(1.74)	556(1.74)	577(1.87)
		No. of fatal illnesses (rate)	47(0.15)	55(0.17)	44(0.14)
Electricity & Gas	No. of workers		52,952	54,080	54,759
	No. of workplaces		1,110	1,173	1,485
	No. of injuries and illnesses (rate)		114(0.22)	85(0.16)	86(0.16)
	Fatality	Total (fatality rate)	9(1.70)	7(1.29)	4(0.73)
		No. of fata injuries (rate)	4(0.76)	3(0.55)	2(0.37)
		No. of fatal illnesses (rate)	5(0.94)	4(0.74)	2(0.37)

Year			2009	2010	2011
Transport & warehouse	No. of workers		708,584	711,094	719,488
	No. of workplaces		44,356	46,264	48,640
	No. of injuries and illnesses (rate)		4,372(0.62)	4,365(0.61)	4,226(0.59)
	Fatality	Total (fatality rate)	132(1.86)	122(1.72)	134(1.86)
		No. of fata injuries (rate)	101(1.43)	81(1.14)	108(1.50)
		No. of fatal illnesses (rate)	31(0.44)	41(0.58)	26(0.36)
Financial & insurance	No. of workers		579,275	601,637	624,816
	No. of workplaces		35,257	35,995	36,812
	No. of injuries and illnesses (rate)		484(0.08)	489(0.08)	429(0.07)
	Fatality	Total (fatality rate)	12(0.21)	18(0.30)	18(0.29)
		No. of fata injuries (rate)	3(0.05)	5(0.08)	2(0.03)
		No. of fatal illnesses (rate)	9(0.16)	13(0.22)	16(0.26)
Forestry	No. of workers		74,109	77,232	93,814
	No. of workplaces		8,494	7,540	8,715
	No. of injuries and illnesses (rate)		3,091(4.17)	2,164(2.80)	1,984(2.11)
	Fatality	Total (fatality rate)	23(3.10)	34(4.40)	20(2.13)
		No. of fata injuries (rate)	19(2.56)	29(3.75)	16(1.71)
		No. of fatal illnesses (rate)	4(0.54)	5(0.65)	4(0.43)
Fishing	No. of workers		2,940	3,212	3,378
	No. of workplaces		877	942	1,046
	No. of injuries and illnesses (rate)		66(2.24)	70(2.18)	77(2.28)
	Fatality	Total (fatality rate)	3(10.20)	4(12.45)	4(11.84)
		No. of fata injuries (rate)	1(3.40)	3(9.34)	4(11.84)
		No. of fatal illnesses (rate)	2(6.80)	1(3.11)	0(0.00)
Agriculture	No. of workers		42,445	46,663	40,017
	No. of workplaces		4,922	5,462	6,311
	No. of injuries and illnesses (rate)		620(1.46)	645(1.38)	575(1.44)
	Fatality	Total (fatality rate)	11(2.59)	11(2.36)	9(2.25)
		No. of fata injuries (rate)	9(2.12)	11(2.36)	7(1.75)
		No. of fatal illnesses (rate)	2(0.47)	0(0.00)	2(0.50)

Year			2009	2010	2011
Service	No. of workers		6,022,102	6,295,455	6,393,750
	No. of injuries and illnesses (rate)		970,354	1,018,621	1,064,304
	No. of injuries and illnesses (rate)		33,961(0.56)	33,170(0.53)	29,736(0.47)
	Fatality	Total (fatality rate)	425(0.71)	389(0.62)	381(0.60)
		No. of fata injuries (rate)	284(0.47)	253(0.40)	264(0.41)
		No. of fatal illnesses (rate)	141(0.23)	136(0.22)	117(0.18)

Appendix 3: Analysis on Work-related Injuries (2000, 2005, 2010)

Injury types	2010	incidence	2005	Incidence	Dec. 2000	Incidence
Falls from height	14,040	15.5	10,814	13.9	8,044	12.4
Slips & trips	21,242	23.4	15,071	19.3	11,208	17.3
Collisions	8,663	9.5	9,125	11.7	6,613	10.2
Being struck by falling or flying objects	7,899	8.7	6,454	8.3	5,695	8.8
Cave-ins, collapses	847	0.9	813	1.0	807	1.2
Being caught between objects	16,881	18.6	16,557	21.2	18,124	27.9
amputations	7,979	8.8	4,087	5.2	1,948	3.0
electrocutions	464	0.5	469	0.6	576	0.9
explosions	373	0.4	423	0.5	0	0.0
ruptures	58	0.1	847	1.1	0	0.0
fires	403	0.4	547	0.7	1,217	1.9
Contact with erratic temperatures& pressures	2,554	2.8	1,412	1.8	1,301	2.0
drowning	27	0.0	51	0.1	50	0.1
accidents in mines	1	0.0	2	0.0	0	0.0
strenuous body movements	2,328	2.6	6,535	8.4	4,521	7.0
hazardous chemicals (poisonings), suffocation	462	0.5	340	0.4	304	0.5
traffic accidents within work premises	107	0.1	367	0.5	93	0.1
Injuries during sports activities	1,506	1.7	0	0.0	0	0.0
violence	426	0.5	0	0.0	0	0.0
injuries caused by animals	294	0.3	0	0.0	0	0.0
others	11	0.0	1,645	2.1	857	1.3
traffic accidents outside work premises	4,062	4.5	2,306	3.0	2,852	4.4
cannot be classified	215	0.2	51	0.1	715	1.1
total	90,842	100.0	77,916	100.0	64,925	100.0

Work-related injuries: fatal and non-fatal work-related injuries

Appendix 4: Investigations on Industrial Accidents – Analysis on the Cause of Fatal Accidents (2009, 2010, 2011)

• Cause of accidents: factors which led to accidents

Factors which led to accidents	Year	No. of victims					
		2011	incidence	2010	incidence	2009	incidence
Facility&machinery		291	25.2	319	26.7	305	26.1
Mobile and hand-held machinery & equipment		17	1.5	22	1.8	12	1.0
Parts, components, materials		92	8.0	97	8.1	81	6.9
Buildings, structures and their surface		394	34.1	383	32.0	398	34.0
Vessels, supplies, furniture, appliances		21	1.8	24	2.0	18	1.5
Chemical substances & products		13	1.1	38	3.2	15	1.3
Transportation means		276	23.9	263	22.0	284	24.3
Humans, animals & plants		30	2.6	33	2.8	36	3.1
Working environment, atmospheric conditions, and other natural phenomenon		18	1.6	13	1.1	6	0.5
Other factors			0.0		0.0		0.0
No factors			0.0		0.0		0.0
Cannot be classified		2	0.2	4	0.3	15	1.3
Total		1,154	100.0	1,196	100.0	1,170	100.0

• Cause of accidents: work area, work process

Accident causes by work process	Year	No. of victims					
		2011	incidence	2010	incidence	2009	incidence
Production site & production process of raw materials		51	4.4	40	3.3	37	3.2
Manufacturing site and process of assembled metallic products, machineries & equipment		56	4.9	85	7.1	69	5.9
Manufacturing site & process of certain products		117	10.1	107	8.9	140	12.0
Storage, transport, and walking areas		335	29.0	395	33.0	324	27.7
Construction area & process of civil engineering, construction and plant sites		432	37.4	446	37.3	431	36.8
Land, marine, atmospheric and farming areas		46	4.0	50	4.2	59	5.0
Supply of energy and associated areas		54	4.7	34	2.8	54	4.6
Clerical, service and residential areas		61	5.3	39	3.3	56	4.8
others		1	0.1		0.0		0.0
Cannot be classified		1	0.1		0.0		0.0
Total		1,154	100.0	1,196	100.0	1,170	100.0

• Cause of accidents: performed works

Accident causes by performed works	Year	No. of victims 2011	incidence	2010	incidence	2009	incidence
Processing and handling of objects		85	7.4	119	9.9	70	6.0
Connection, assembly, installation and dismantling of objects		196	17.0	206	17.2	194	16.6
Transportation, loading, unloading and driving operations		450	39.0	458	38.3	490	41.9
Installation and maintenance of machinery and equipment		201	17.4	205	17.1	195	16.7
Other operations involving construction works		111	9.6	97	8.1	90	7.7
Operations involving mining and logging		8	0.7	12	1.0	23	2.0
Administrative, medical, etc. services		27	2.3	31	2.6	23	2.0
Cleaning and other operations		64	5.5	56	4.7	73	6.2
Others		11	1.0	12	1.0	11	0.9
Cannot be classified		1	0.1		0.0	1	0.1
Total		1,154	100.0	1,196	100.0	1,170	100.0

• Cause of accidents: unsafe conditions

Accident causes by unsafe condition	Year	No. of victims 2011	incidence	2010	incidence	2009	incidence
Intrinsic defects in objects and facilities		87	7.5	116	9.7	86	7.4
Inadequate protective measures		246	21.3	272	22.7	229	19.6
Inadequate and dangerous location e.g. passageway		111	9.6	160	13.4	110	9.4
Risks associated with handling objects, machinery & equipment		65	5.6	64	5.4	68	5.8
Inadequate work processes & procedures		280	24.3	257	21.5	291	24.9
Inadequate environment and conditions		14	1.2	17	1.4	11	0.9
Other intrinsic risks during work		234	20.3	203	17.0	228	19.5
Inadequate condition and functioning of protective devices		87	7.5	82	6.9	87	7.4
Others		20	1.7	15	1.3	22	1.9
Cannot be classified		10	0.9	10	0.8	38	3.2
Total		1,154	100.0	1,196	100.0	1,170	100.0

• Cause of accidents: unsafe behaviors

Accident causes by unsafe behaviors	Year	No. of victims					
		2011	incidence	2010	incidence	2009	incidence
Inappropriate use and management of facilities, equipment and substances		175	15.2	179	15.0	183	15.6
Failure to discover dangerous structures or negligence of risks		214	18.5	197	16.5	178	15.2
Careless performance of operations and violation of proper procedures		297	25.7	274	22.9	288	24.6
Unsafe work posture			0.0		0.0		0.0
Errors during performance of work		222	19.2	222	18.6	225	19.2
Careless or unnecessary actions or behaviors		42	3.6	61	5.1	27	2.3
Improper use of clothing or protective devices		167	14.5	235	19.6	206	17.6
Other unsafe behaviors		27	2.3	18	1.5	25	2.1
Cannot be classified		10	0.9	10	0.8	38	3.2
Total		1,154	100.0	1,196	100.0	1,170	100.0

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