

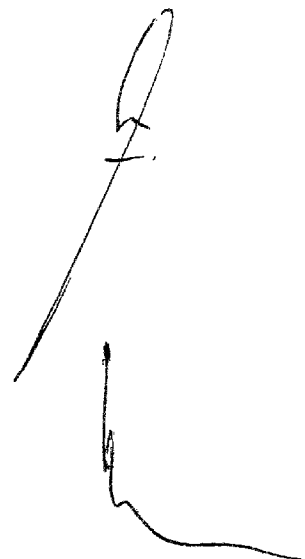

2. 合同評価報告書

JOINT EVALUATION REPORT
ON
THE JAPANESE TECHNICAL COOPERATION
FOR THE PROJECT
ON THE MINE SAFETY AND ENVIRONMENTAL TRAINING CENTER
IN THE REPUBLIC OF CHILE

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF MINING
NATIONAL SERVICE OF GEOLOGY AND MINING
THE REPUBLIC OF CHILE

MARCH 24, 1999
SANTIAGO, THE REPUBLIC OF CHILE



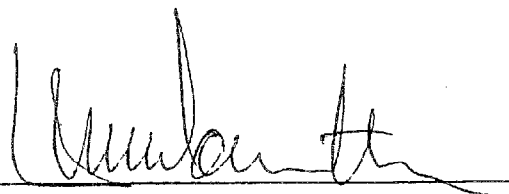
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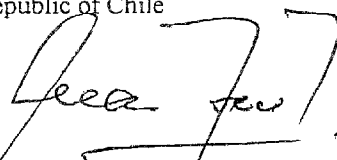
SANTIAGO, THE REPUBLIC OF CHILE



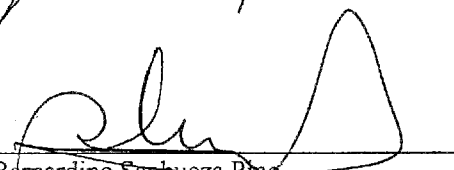
Toshinori Isogai
Leader,
Japanese Evaluation Team
Japan International Cooperation Agency
Japan



César Díaz-Muñoz Cormatches
Undersecretary of Mining
Ministry of Mining
Republic of Chile



Ricardo Troncoso San Martín
National Service of Geology and Mining
(SERNAGEOMIN)
Republic of Chile



witnessed by : Bernardino Sarruza Pino
Acting Executive Director
International Cooperation Agency (AGCI)
Republic of Chile

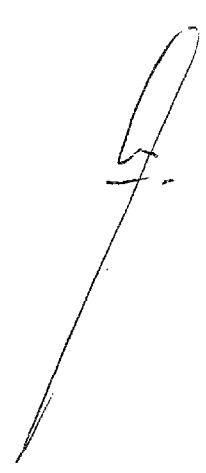
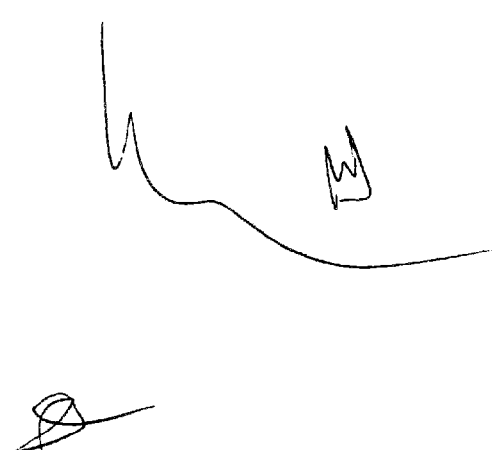
I. INTRODUCTION

1. The Evaluation Teams

The Japanese Evaluation Team (hereinafter referred to as "the Japanese Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Toshinori Isogai, visited the Republic of Chile from March 9 to 25, 1999 for the purpose of evaluating jointly with the Chilean Evaluation Team (hereinafter referred to as "the Chilean Team") the achievement of the Japanese technical cooperation for the Project on the Mine Safety and Environmental Training Center in the Republic of Chile (hereinafter referred to as "the Project") on the basis of the Record of Discussions signed on April 5, 1994 (hereinafter referred to as "R/D").

Both teams reviewed together the progress of the Project and evaluated jointly the efficiency, achievement, impact, relevance and sustainability of the Project implemented in The Mine Safety and Environmental Training Center located in Copiapo, the Republic of Chile (hereinafter referred to as "the Center").

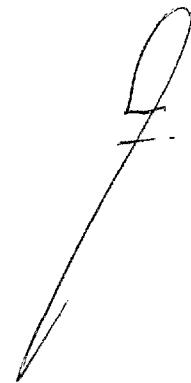
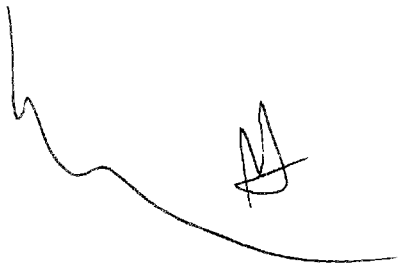
Through careful studies and discussions, both sides summarized their findings and observations as described in this document.



2. Schedule of Joint Evaluation

(March 9 - 25, 1999)

<u>Date</u>	<u>Schedule</u>
	(Member in charge of evaluation analysis)
March 9, 1999	Arriving in Santiago and Meeting with JICA Santiago Office
March 10, 1999	Interview to AGCI, the Ministry of Mining and SERNAGEOMIN
March 11, 1999	(transfer to Copiapó) Visit to the Center and Interview to Japanese Experts
March 12, 1999	Interview to Chilean Counterparts
March 13, 1999	(Evaluation Analysis)
March 14, 1999	(Evaluation Analysis)
March 15, 1999	Interview to ex-trainees
March 16, 1999	(Japanese Evaluation Team) Arriving in Santiago and Meeting with the JICA Santiago Office Courtesy Visit to AGCI and the Ministry of Mining
March 17, 1999	Courtesy Visit to SERNAGEOMIN (transfer to Copiapó) Visit to the Center and Interview to Japanese Experts
March 18, 1999	Courtesy Visit to Superintendent and Governor of 3 rd . Region and SEREMI Interview to the Chilean counterparts and Japanese experts
March 19, 1999	Drafting of the evaluation report
March 20, 1999	Visit to mines (Transfer to Santiago)
March 21, 1999	Drafting of the evaluation report (Both Evaluation Team)
March 22, 1999	Discussion on evaluation and preparation of the joint evaluation report
March 23, 1999	Discussion on evaluation and preparation of the joint evaluation report
March 24, 1999	Joint Committee Meeting (Signing on the joint evaluation report and the minutes of meeting) (Japanese Evaluation Team)
March 25, 1999	Reporting to JICA Office and the Japanese Embassy Leaving Santiago



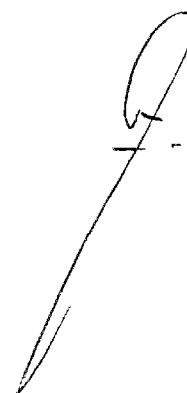
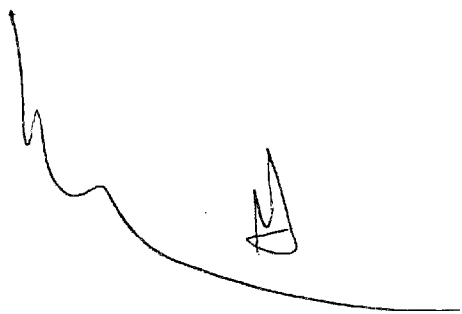
3. Members of Evaluation Teams

3-1. Japanese Evaluation Team

Mr. Toshinori Isogai	Leader
Mr. Izumi Tajiri	Technical Cooperation Planning
Mr. Toshimi Sato	Mine Safety
Ms. Yukari Saito	Evaluation Planning
Mr. Wataru Takada	Evaluation Analysis

3-2. Chilean Evaluation Team

Mr. Ricardo Troncoso San Martin (Leader of the Chilean Team)	National Director, SERNAGEOMIN
Mr. Anton Hraste Carrasco	Regional Director of the III Region, SERNAGEOMIN
Ms. María Cecilia Valderas	Chief of Planification Department, SERNAGEOMIN
Mr. German Contreras E.	Advisor, Ministry of Mining
Mr. Pedro Ramírez Hinrichsen	Coordinator for Area of Infrastructure and Productive Development, AGCI



II. METHODOLOGY OF EVALUATION

1. Method of Evaluation

Both teams agreed to revise the Project Design Matrix (PDM) made June 5, 1998, as shown in Annex 1, and to use it as the basis of evaluation, and evaluated activities using the Evaluation Grid.

2. Aspects for Evaluation

Both teams reviewed all the activities and achievement, and evaluated the project based on the following five aspects:

Effectiveness

Impact

Efficiency

Relevance

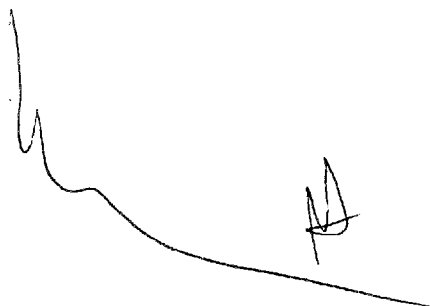
Sustainability

These aspects represent the most important points to be taken into consideration in connection with decisions on development projects.

3. Information for Evaluation

In order to evaluate the past performance, the following materials were used:

- (1) The Record of Discussions (R/D), Tentative Schedule of Implementation (TSI), Technical Cooperation Program (TCP), Annual Work Plans, Minutes of Discussions, and other documents agreed to or accepted in the course of implementation of the Project.
- (2) The Project Design Matrix (Annex 1)
- (3) Data of input to and output from the Project
- (4) Result of series of interviews and questionnaires



III. BACKGROUND AND SUMMARY OF THE PROJECT

1. Outline of Project's Background

While the recent economic development in Chile has provoked an increase of social interest in the conservation of environment in this country, the control of mine pollution is one of the most critical issues as the mining is the biggest industry in this country. At the same time, it is an important subject to be solved to minimize accidents in mining operation especially of medium and small scale mines where are seen frequent accidents due to lack of maintenance.

Under such situation, the government of Chile planned to create the Mine Safety and Environmental Center and submitted to the Japanese government a request for a project type cooperation.

In response to the above request, the Japanese government dispatched the Japanese Expert Survey Team in 1992 and Preliminary Survey Team in 1993. The Implementation Survey Team was dispatched and the Record of Discussions was signed in April, 1994. The Project started on July 1, 1994 with 5 year cooperation period.

2. Chronological Review of the Project

The chronological review of the Project is shown in Annex 2.

3. Objective of the Project

The objectives of the Project were stipulated in the R/D as follows:

Overall Goal of the Project

The overall goal of the Project is to contribute to the improvement of the present situation on mine accident and mine pollution in metallic non-metallic mining industry in the Republic of Chile.

Project Purpose

The purpose of the Project is to train instructors in the field of mine safety and mine pollution control and to implement the training at the Mine Safety and Environmental Training Center.

In addition, the objectives of the Project described above were integrated and compiled into "Overall goal" and "Project purpose" by a logical consequence in PDM as follows:

"Overall goal"

The situation of mine safety and mine pollution control in metallic and non-metallic mining industry in the Republic of Chile is improved.

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"Project purpose"

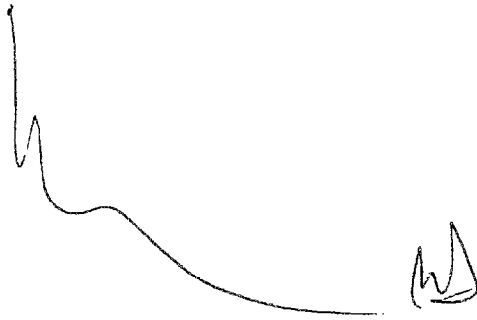
The Mine Safety and Environmental Training Center is able to continuously implement appropriate training courses in the field of mine safety and mine pollution control oriented to the situations of mines in Chile for Chilean mine workers and related persons.

4. Tentative Schedule of Implementation

The Tentative Schedule of Implementation (TSI) is shown in Annex 3.

5. Technical Cooperation Program

The Technical Cooperation Program (TCP) is shown in Annex 4.

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IV RESULTS OF EVALUATION

1. Summary

Effectiveness

The project purpose and outputs has to be achieved by the end of termination of the cooperation period. The Center has established the basis of training system in the fields of mine safety and mine pollution control, being equipped with facilities and equipment as well as capable instructors. The technology transfer has been conducted appropriately to the Chilean counterpart personnel who are implementing continuously training courses not only in the Center but also outside of the Center, such as in mining companies, communities nearby small scale mining site, even in other countries.

Impact

The Project created the consciousness of all the related to mining to the safety and pollution control in the mining industry. As a matter of fact, more than 3,700 people learned about these issues from training courses and seminars organized by the Center. The statistic shows that the accident frequency index decreased from 23.7 in 1994 to 9.4 (provisional) in 1998. Furthermore, there is a possibility for the laboratory to serve as authorized analysis institution.

Efficiency

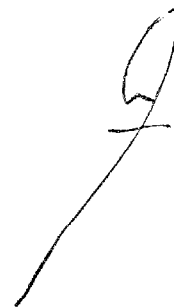
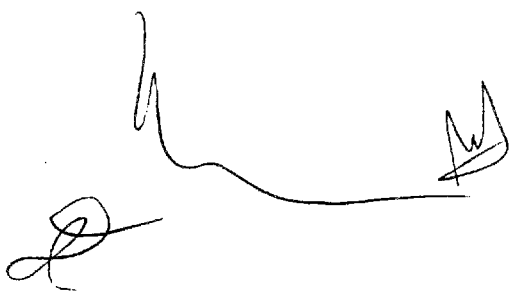
The scale of cooperation as well as the timing of the cooperation were appropriately planned and inputs were efficiently converted to outputs. A continuous political support by the concerned authority including regional authorities and good communications among the all concerned, especially between Japanese experts and Chilean counterpart personnel, have contributed in efficient implementation of the Project.

Relevance

The decision to implement the Project was relevant in view of the keen necessity of training in the fields of mine safety and mine pollution control and the Project was implemented timely to meet the increasing needs. The project purpose and the overall goal were well targeted reflecting the actual situation of mining industry. Scale of inputs and activities, their timing and linkage with output were appropriately designed.

Sustainability

The Project in the Center is institutionally, financially and technically sustainable. There is full institutional and financial support of the government to the Center. The organizational status of the Center is established as a department under National Sub-direction of SERNAGEOMIN. The technology was transferred appropriately to the Chilean counterpart personnel who are continuously implementing training courses. The provided equipment are fully used for training courses. Maintenance of the equipment is possible if sufficient support is provided by manufacturers.



2. Details

2-1. Accomplishment of the Project

Summary of the project	Verifiable Indicators	Achievement	Reference
<p><u>Overall Goal</u> The situation on mine accident and mine pollution in metallic and non-metallic mining industry in the Republic of Chile is improved.</p>	<p>1. Decrease of accidentability index in mining 2. Increase of number of mining companies that perform chemical analysis to accomplish and control of their process and wastes</p>	<p>1. The Frequency Index of Accident was decreased from 23.7 in 1994 to 9.4 (provisional) in 1998. 2. Statistics to show any increase of mining companies that perform chemical analysis to accomplish and control of their process and wastes are not available.</p>	Annex 21
<p><u>Project Purpose</u> The Mine Safety and Environmental Training Center is able to continuously implement appropriate training courses in the field of mine safety and mine pollution control oriented to the situation of mines in Chile for Chilean mine workers and related persons.</p>	<p>1. Level and contents of training courses 2. Middle and long term implementation plan of training courses</p>	<p>1. According to questionnaire survey to mining companies, the level and contents of training courses meet their requirement. 2. Training implementation plan has been prepared for 1999 and is under preparation for 2000.</p>	Annex 18
<p><u>Outputs</u> 0. The management and operation system of the Center is established. 1. Facilities and equipment necessary for the operation of the Center are installed. 2. Technology necessary for instructors on mine safety, mine pollution control and chemical analysis concerning mine safety and mine pollution control is acquired by the counterpart personnel. 3. Training courses in the fields of mine safety and mine pollution control are implemented.</p>	<p>0. Number of staffs, budget allocation and settlement of account 1. Number of installed machinery and equipment 2-1. Actual result of technology transfer activities 2-2. Number of counterpart personnel who can teach as instructors 2-3. Number of machinery and equipment that counterpart personnel can operate and maintain by themselves 2-4. Knowledge level of counterpart personnel 2-5. Ratio of training courses and curriculum that counterpart personnel can teach 3. Number of training courses and number of trainees</p>	<p>0. The Center is well managed by the Director, 5 instructors, one administrative staff and three auxiliary staffs. 1. Total 104 items of equipment necessary for training in the fields of mine safety and mine pollution, chemical analysis equipment, audiovisual equipment for training, vehicles, computers were installed. 2-1. Technology transfer was successfully conducted. Operation and maintenance manuals have been prepared for principal provided equipment. 2-2. 5 instructor are available in the Center. 2-3. Almost all equipment will be able to be operated by Chilean counterpart personnel by the end of the cooperation period. 2-4 Knowledge level of counterpart personnel was proved in successful implementation of training courses. 2-5 In almost all training courses, the Chilean counterpart personnel are teaching as instructor. For 25 special theme in the qualified professional expert training courses, outside instructors has been arranged. 3. Total 112 of training courses have been implemented with participation of 3,741 total trainees.</p>	<p>Annex 13 Annex 11 Annex 14 Annex 16 Annex 17 Annex 17</p>

Activities	Input		
	RD	Achievement	
0-1 Allocate staffs			
0-2 Make operation plan of the Center			
0-3 Make and execute budget plan properly			Annex 8
1-1 Make specification of the facilities and equipment	<u>Inputs by Japanese Side</u> 1. Long-term experts Chief Advisor Coordinator Mine Safety Mine Pollution Control Chemical Analysis	<u>Inputs by Japanese Side</u> 1. Long-term experts Chief Advisor : 2 Coordinator : 2 Mine Safety : 2 Mine Pollution Control : 2 Chemical Analysis : 2	
1-2 Make layout plans for the facilities and equipment as well as phased plans for installation			
1-3 Provide and purchase the facilities and equipment	2. Short-term experts	2. Short-term experts : Mine safety/Mine pollution control: 4 Mine safety : 2	Annex 8
1-4 Transport, install and adjust the facilities and equipment	3. Machinery and equipment	Mine pollution control : 3 Equipment installation : 3 (one short-term expert for equipment will be dispatched in 1999)	
1-5 Procure supplementary materials and accessories.	4. Counterpart training in Japan		
2-1 Make plan and curriculum of technology transfer from Japanese experts to Chilean counterpart personnel	<u>Inputs by Chilean Side</u> 1. Allocation of necessary budget for operation of the Center	3. Machinery and equipment: Equivalent to approximately 151 million yen (equivalent to approximately US\$1.26 million at the exchange rate of 120 yen per US\$1.00)	Annex 11
2-2 Make materials for technology transfer	2. Assignment of counterpart personnel and administrative personnel		
2-3 Implement technology transfer	3. Building and facilities	4. Counterpart training in Japan: Thirteen (13) Chilean counterpart personnel were trained in Japan	Annex 10
2-4 Monitor the progress and achievement of technology transfer	4. Equipment and materials	5. Total budget covering direct operation cost : Approx. JPY 732 million yen (equivalent to approximately US\$6.1 million at the exchange rate of 120 yen per US\$1.00)	Annex 12
3-1 Obtain information from Chilean mining industry through questionnaire on the training courses			
3-2 Fix training courses and course schedule			
3-3 Make training curriculum			
3-4 Make training materials			
3-5 Make recruitment plan of trainees			
3-6 Recruit trainees			
3-7 Implement training courses			
3-8 Monitor the progress of training courses and evaluate courses		<u>Inputs by Chilean Side</u> 1. Allocation of necessary budget covering direct operation cost of the Center : US\$1.82 million	Annex 15
		2. Assignment of counterpart personnel and administrative personnel: During the cooperation period, a total of fourteen (14) counterpart personnel were allocated as instructor for the Project (5 instructors at this moment).	Annex 13
		3. Building and facilities (a) Project Office (b) Training Rooms (c) Laboratories (d) Warehouse	Annex 5

2-2. Analysis on Evaluation Issues

2-2-1. Effectiveness

(1) Contribution of Activities to the Outputs	Effectiveness and Constraints	Indicators/ information
	<p>0. Management and operation system of the Center. The management system of the Center and operation of training courses has been established. The Center is well equipped by a director, 6 instructors (2 instructors each of Mine Safety, Mine Pollution Control and Chemical Analysis) and other administrative and auxiliary staff. The status of the Center is very stable as it has been transferred this year to the direct technical direction of the National Sub-direction of Mining, being recognized as the only training institution of SERNAGEOMIN. The Center is operated with official budget allocated by SERNAGEOMIN.</p> <p>1. Facilities and equipment The Center is also physically established as a training center with necessary building, facilities and equipment, owing to input of both Japan and Chile. The facilities of the Center were constructed by inputs from Chilean sides and were inaugurated in January 1996. These facilities are composed of administration offices, training rooms, laboratory, warehouse and so on. At the same time, equipment necessary for training such as equipment for mine safety and mine pollution control, various measuring equipment, audiovisual equipment for training, vehicles and so on, were installed. Furthermore, a mobile laboratory unit is available for implementing training courses outside of the Center.</p> <p>2. Technology transfer Output of the technology transfer is as targeted. Technology transfer activities have been carried out as scheduled in each area. Two each of Chilean counterpart personnel who are able to conduct training courses as instructor have been available in each area. The technology, knowledge and teaching method acquired by the instructors are highly evaluated by trainees.</p> <p>3. Training course implementation The training courses are being implemented continuously by the Center. The implementation of the first training course started in November 1996. Since then a total of 3,741 trainees have participated in 112 courses. Trainees who participated in the training courses are giving high appreciation to the management of training courses organized by the Center. At this moment, 35 different training courses are available. For implementing special courses such as training course for qualified inspectors, outside instructors are available for about 25 themes. Teaching materials such as texts are sufficiently prepared and these are being improved from time to time.</p> <p><u>Contributing factors:</u></p> <ul style="list-style-type: none"> • The below inhibiting factors were eliminated at the early stage by the efforts of Chilean side. • The close communication among all the concerned was maintained through the cooperation period by the efforts of both sides. • The equipment arrived as scheduled. • Fields survey on the actual mining situation was carried out during construction period. <p><u>Inhibiting factors:</u></p> <ul style="list-style-type: none"> • In the beginning, there were observed frequent changes of Chilean counterpart personnel and some difficulty in the execution of budget. 	<p>Annex 7 Annex 13</p> <p>Annex 6</p> <p>Annex 15</p> <p>Annex 11</p> <p>Annex 3 Annex 16 Annex 17</p> <p>Annex 20</p>

(2) Contribution of output to the project purpose	Effectiveness and Constraints	Indicators/ information
	<p>It is reasonably considered that the Center has established the basis of training system in the fields of mine safety and mine pollution control judging from the fact that training courses have been conducted by Chilean counterparts with total participation of more than 3,700 trainees in a short period of less than three years. Accordingly, the project purpose is considered to be accomplished.</p> <p>According to the result of the monitoring survey, the most of trainees stated that they were satisfied to the contents and level of courses, instructors and text books.</p> <p>Furthermore, all of the mining companies which replied to the questionnaire, commented that the training courses implemented by the Center were useful and that the technical level of their staffs who had participated in such training courses had improved and are taking important roles in introducing measures for mine safety or pollution control.</p> <p>The instructors are improving the quality of courses based on the replies by trainees to questionnaires at the end of each course. The instructors are making best effort to improve teaching method and showing good performance.</p> <p><u>Contributing factors:</u></p> <ul style="list-style-type: none"> • There is a favorable government policy to attach importance to training activities in the area. • The Project started timely to meet the increase of needs for training. • Capable Chilean counterpart were allocated and they remained in the Center. • Recruitment of trainees was conducted effectively. • SERNAGEOMIN maintained close relation with the private mining sector and valuable information was obtained. <p><u>Inhibiting factors:</u></p> <ul style="list-style-type: none"> • Recent difficult situation of mining industry caused by decreased copper price is affecting recruitment of trainees. 	<p>Annex 16 Annex 17</p>

* Effectiveness is a measure of whether the support of the project has been achieved, or how likely it is to be achieved. This then is a question of the degree to which the outputs contribute to achieving the intended purpose. It thus also says something about the content of the project and whether it contributes to development in the expected direction.

2-2-2. Impact

	Contents of Impact	Reference
(1) Direct Impact (Project Purpose Level)	<ul style="list-style-type: none"> • A training center has been established and recognized as the only training institution of SERNAGEOMIN in the fields of Mine Safety and Mine Pollution Control. • 83 qualified professional experts have been prepared. • As a result of training courses and seminar, consciousness of mine safety and environment in the mining sector has increased. • Several seminars were celebrated for government official, mine owners and professionals and as a result consensus to regulate closure of mines is being formed. • Instructors and trainees are disseminating technology and knowledge in other places, such as universities, mining companies and so on. 	Annex 6 Annex 17 Annex 16
(2) Indirect Impact (Overall Purpose Level)	<ul style="list-style-type: none"> • The Frequency Index of Accident was decreases from 23.7 in 1994 to 9.4 (provisional) in 1998. This is because of total effort by SERNAGEOMIN in which the activities of the Center is contributing. The decrease of accident generates regional and national socio-economic benefit including profit of mining industry. • According to questionnaire survey, many companies which participated in the training courses have started or planned new measure on mine safety or mine pollution control. 	Annex 21
(3) Other Impacts	<ul style="list-style-type: none"> • The Center could acquire valuable experience by extending its activities to other countries by the Regional Technical Cooperation Promotion Program. The expansion of activity area strengthened the Center's operative basis. The international activity of the Center complies to the horizontal cooperation policy to which Chilean government is giving emphasis and also it is enjoying a good reputation of those countries who participated in the events organized by the Center. AGCI expects that the Center will contribute in the regional environmental issues by continuing this activity. • Laboratory of the Center is expected to be authorized as a qualified laboratory. • The Center is generating a certain amount of income by implementing charged training courses to mining companies. 	Annex 16

*The impact of the project is both foreseen and unforeseen consequence to society: positive and negative. Assessment here must take as its point of departure the goal and purpose of the project, but goes much further than simply ascertaining whether these have been achieved.

2-2-3. Efficiency

(1) Scale of input	Efficiency	Indicator
	<p><u>Japanese side</u></p> <p>1) Dispatch of Japanese experts The number of experts, their duration of stay and the areas of their expertise are considered appropriate and well balanced to the outputs.</p> <p>2) Provision of equipment Items and quantity of equipment were generally appropriate for implementing technical cooperation. However, it took time to repair or to acquire spare part of some equipment which have no technical support by the manufacturers available in Chile.</p> <p>3) Counterpart training in Japan The number of trained Chilean counterpart personnel was appropriate. The training given to them in Japan was useful for technical transfer from Japanese experts dispatched to Chile.</p> <p><u>Chilean side</u></p> <p>1) Allocation of counterpart personnel Appropriate number of counterparts were allocated. 14 of Chilean counterpart personnel were assigned in total during the cooperation period since 8 have resigned at the early stage. It is indisputable that the high percentage of resignation affected anyway efficiency of technical transfer at the early stage of the Project.</p> <p>2) Construction of building and facilities The building and facilities were prepared properly by input of Chilean side.</p> <p>3) Budget allocation by Chilean side Minimum amount to cover the necessity has been secured.</p>	<p>Annex 8</p> <p>Annex 11</p> <p>Annex 10</p> <p>Annex 13</p> <p>Annex 15</p>

* Efficiency measures the output of the project - qualitative and quantitative - in relation to the total resource of input : in other words, how economically the various inputs are converted into outputs.

	Efficiency	Indicator
(2) Timing of input	<p><u>Japanese side</u></p> <p>1) Dispatch of Japanese experts Both long-term and short-term experts were dispatched timely.</p> <p>2) Provision of equipment The equipment were provided as scheduled. Transport and custom clearance were smoothly conducted and the equipment arrived in the Center as planned owing to best effort of Chilean side.</p> <p>3) Counterpart training in Japan The training of Chilean counterpart personnel in Japan was conducted timely to meet the necessity and contributed in efficient technology transfer.</p> <p><u>Chilean side</u></p> <p>1) Allocation of counterpart personnel Except frequent changes of personnel at the early stage, allocation of personnel was timely.</p> <p>2) Construction of building and facilities The building construction was completed as scheduled, although the start of construction was delayed by approximately 6 months.</p> <p>3) Local cost expenditure At the beginning, some delay in expenditure was observed. But there was not any inconvenience in implementing the Project.</p>	<p>Annex 8</p> <p>Annex 11</p> <p>Annex 10</p> <p>Annex 13</p> <p>Annex 15</p>
(3) Supporting system	<p>1) The Joint Coordination Committee meeting was held once a year at the time of visit of JICA mission and various matters concerned to the Project implementation were discussed.</p> <p>2) The Technical Advisory Committee was organized in Japan in order to support the Project. The committee's meetings were held from time to time when necessity arose to give technical support to the Project.</p> <p>3) The Advisory Committee was formed in SERNAGEOMIN including the National Director, the National Sub-director and chiefs of various departments in order to support technically and administratively the activities of the Center.</p> <p>4) A continuous political support by the concerned authority including regional authorities and good communications among the all concerned, especially between Japanese experts and Chilean counterpart personnel, have contributed in efficient implementation of the Project.</p>	Annex 9
(4) Linkage with other cooperation program	<p>There were exchanges of information with other projects such as JICA projects in ENAMI and CENMA (Centro Nacional del Medio Ambiente) and the German project for strengthening of the engineering and environment department.</p> <p>The Center implemented a training course jointly with the training department of OAS and also with the National Training and Employment Services (SENCE).</p>	

2-2-4. Relevance

(1) Relevance of the Overall Goal	The Overall Goal of the Project is relevant. To decrease accidents in mines and to mitigate mine pollution are critical issues of the Chilean government which is shown by the fact that the Basic Environment Law was enacted in 1994.
(2) Relevance of the Project Purpose	The Project Purpose was considered very opportune and appropriate. While training of people engaged in mining industry is important to improve the situation on mine accident and mine pollution. SERNAGEOMIN lacked permanent basis for training of human resource in these fields.
(3) Relevance of the cooperation planing (target level; relationship among the project goals, output, and input; implementation schedule etc.)	The cooperation planning was relevant as a whole. It is to be especially mentioned that Ministry of Mining and SERNAGEOMIN were very suitable for implementation of the Project, because they could give political support to the Center, being government organization supervising mining industry in Chile (e.g. PAMMA).

*Relevance means an overall assessment of whether the project is in accordance with both the overall objective, the donor and recipient policy, as well as with local needs and priorities. This is intended to help to clarify whither the project should be continued, reformulated or terminated.

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2-2-5. Sustainability

<p>(1) Institutional and managerial aspects</p>	<p>The administrative and operational system of the Center is well organized, being equipped with capable human force. There is a strong governmental support to the Center. Training in the mine safety and mine pollution control is promoted by official subsidy to micro enterprises and also tax credit is applied for the training fee paid to the Center by mining companies. The Center has become the only training center of SERNAGEOMIN in the fields of mine safety and mine pollution control. SERNAGEOMIN is keeping close communication with private sector and collecting information necessary for organizing courses. The Center maintains a good connection with universities. It is possible to operate jointly training courses or seminars and to exchange instructors with them. SERNAGEOMIN is making effort to stabilize employment of staffs of the Center.</p>
<p>(2) Financial Sustainability</p>	<p>The Center will be operated as a public institution and all the expenses are securely covered by the official budget. The income generated by conducting charged training courses is increasing every year and it is expected that this activity may contribute in financial stability of the Center.</p>
<p>(3) Technical sustainability</p>	<p>The instructors have acquired sufficient knowledge and the technique enough to implement the training in each field and to retransfer them to other instructors. Besides, instructors from other departments of SERNAGEOMIN or other organizations are available for implementing training courses. The Center is continuously implementing training courses inside and outside of the Center. All the process of operating training courses such as course planning, recruitment of trainees, preparation of teaching materials, course implementation is managed by Chilean counterpart personnel. Maintenance of the equipment is possible if sufficient support is provided by manufacturers.</p>

* Sustainability is an overall assessment of the extent to which the positive changes achieved as a result of the project can be expected to last also after the project has been terminated. In many ways this is a question of the relation between the necessary local resources and how recipient view the project.



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V. CONCLUSION

1. As the initial project purpose will be achieved by the end of the cooperation period, through continuous efforts by the Chilean counterpart personnel and the JICA experts, it is reasonable to terminate the Project as scheduled.
2. The Project has been implemented effectively and efficiently with appropriate inputs by both of Japanese and Chilean side. Close communications have been maintained through whole the cooperation period among all the concerned.
3. The Project, which aims at a clean and safe production of the mining industry, was timely planned and implemented to meet the national interests in environmental issues.
4. The Project has contributed in human resource development, in creating consciousness to environment, and in decreasing accidents in the mining sectors.
5. The Project has served to increase the national prestige by participating in the horizontal cooperation.

VI. RECOMMENDATION

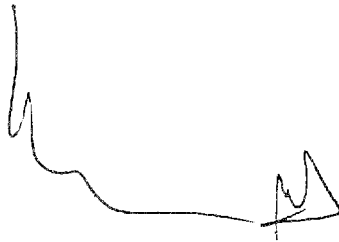
- SERNAGEOMIN should make continuous effort to strengthen the Center both institutionally and financially.
- SERNAGEOMIN should continue regional contribution by disseminating technology and knowledge to other countries.
- The Center should give facilities to instructors in order to improve and renovate their technology and knowledge.
- The Center should prepare a long-term plan for training course implementation.
- The Center should replace or upgrade the equipment provided for training purpose according to necessity.
- The Center should establish follow-up system on a certain period after training courses in order to improve quality of the courses and to develop new needs for training.
- JICA should consider the use of the Center in future cooperation activities towards other countries.
- All the relevant authorities of Japan and Chile should make effort to support realizing the above mentioned recommendations.

VII. LESSONS LEARNED

- Selection of equipment should be arranged considering the situation of recipient country (e.g. standard, maintenance).
- Close communication with the relevant authorities is indispensable for smooth operation of project.
- Concrete design of a project should be defined clearly and agreed by all parties concerned, by using PDM from planing stage.
- In case of one single implementation agency, management of project is conducted smoothly.

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Annex 1 Project Design Matrix (PDM)

Project: Mine Safety and Environmental Training Center
 Method of making PDM: Jointly prepared
 Japanese Side: JICA
 Chilean Side: SERNAGEOMIN

Cooperation Period: July 1, 1994 - June 30, 1999
 Target Area: Area concerned with mining industry
 Target Group: Instructors of the Mine Safety and Environmental Training Center
 Chilean mine workers and related persons

Date: March 24, 1999

Summary of the project	Verifiable Indicators	Means of Verification	Important Assumption
<p>Overall Goal The situation on mine accident and mine pollution in metallic and non-metallic mining industry in the Republic of Chile is improved.</p>	<p>1. Decrease of accidentability index in mining 2. Increase of number of mining companies that perform chemical analysis to accomplish and control of their process and wastes</p>	<p>1. Annual report of mining industry (*) 2. Accumulated data in SERNAGEOMIN</p>	<p>a. Governmental policy on prevention of mine accident and mine pollution is not changed. b. Governmental restriction on prevention of mine accident and mine pollution is strengthened.</p>
<p>Project Purpose The Mine Safety and Environmental Training Center is able to continuously implement appropriate training courses in the field of mine safety and mine pollution control oriented to the situation of mines in Chile for Chilean mine workers and related persons.</p>	<p>1. Level and contents of training courses 2. Middle and long term implementation plan of training courses</p>	<p>1. Questionnaire to trainees and mining companies 2. List of training courses to be continuously held</p>	<p>a. Trainees apply the knowledge and technology earned from training courses to their actual work. b. The Government takes necessary measures for mining companies to introduce machinery and equipment for preventing mine accident and mine pollution.</p>
<p>Outputs 0. The management and operation system of the Center is established. 1. Facility and equipment necessary for the operation of the Center are installed. 2. Technology necessary for instructors on mine safety and mine pollution control, and chemical analysis concerning mine safety and mine pollution control is acquired by the counterpart personnel. 3. Training courses in the field of mine safety and mine pollution control are implemented.</p>	<p>0. Number of staffs, budget allocation and settlement of account 1. Number of installed machinery and equipment 2-1. Actual result of technology transfer activities 2-2. Number of counterpart personnel who can teach as instructors 2-3. Number of machinery and equipment that counterpart personnel can operate and maintain by themselves. 2-4. Knowledge level of counterpart personnel 2-5. Ratio of training courses and curriculum that counterpart personnel can teach 3. Number of training courses and number of trainees</p>	<p>0. Personnel record, Accounting record 1. Machinery and equipment record 2-1. Project activities record, Technology transfer materials, Operation and maintenance manuals of machinery and equipment 2-2. List of instructors 2-3. Operation and maintenance record 2-4 Interview to Japanese experts, Questionnaire to trainees 2-5 Record of training courses 3. Record of training courses, List of trainees</p>	<p>a. Appropriate counterpart personnel work continuously at the Center. b. Trainees are collected continuously from mining companies and governmental organizations.</p>
<p>Activities 0-1 Allocate staffs 0-2 Make operation plan of the Center 0-3 Make and execute budget plan properly 1-1 Make specification of the facilities and equipment 1-2 Make layout plans for the facilities and equipment as well as phased plans for installation 1-3 Provide and purchase the facilities and equipment 1-4 Transport, install and adjust the facilities and equipment 1-5 Procure supplementary materials and accessories. 2-1 Make plan and curriculum of technology transfer from Japanese experts to Chilean counterpart personnel 2-2 Make materials for technology transfer 2-3 Implement technology transfer 2-4 Monitor the progress and achievement of technology transfer 3-1 Obtain information from Chilean mining industry through questionnaire on the training courses 3-2 Fix training courses and course schedule 3-3 Make training curriculum 3-4 Make training materials 3-5 Make recruitment plan of trainees 3-6 Recruit trainees 3-7 Implement training courses 3-8 Monitor the progress of training courses and evaluate courses</p>	<p>Inputs by Japanese Side 1. Long-term experts Chief Advisor Coordinator Mine Safety Mine Pollution Control Chemical Analysis 2. Short-term experts 3. Machinery and equipment 4. Counterpart training in Japan</p> <p>Inputs by Chilean Side 1. Allocation of necessary budget for operation of the Center 2. Assignment of counterpart personnel and administrative personnel 3. Building and facilities 4. Equipment and materials</p>	<p>a. Machinery and equipment provided by Japanese side obtain easy custom clearance. b. Appropriate counterpart personnel work continuously at the Center.</p>	
			<p>Pre-conditions a. Strong demand on preventing mine accident and mine pollution exists in mining industry. b. Ministry of Mining has a strong intention to prevent mine accident and mine pollution.</p>

* The accidentability index is affected by other factors and action developed by the mining companies and SERNAGEOMIN.

CHRONOLOGICAL REVIEW OF THE PROJECT

Year	Month	Item
1992	October	The Chilean government submitted a request for a project type technical cooperation
1993	March	Visit of the Japanese Preliminary Survey Team
1994	March-April	Visit of the Japanese Implementation Survey Team and sign of the Record of Discussion (R/D) for technical cooperation (April 5)
	July	Start of the Japanese Technical Cooperation
	July-August	Visit of the first group of long term experts
1995	February-March	Visit of the Japanese Consultation Team
	May	First JICA / SERNAGEOMIN Seminar (Copiapó)
	November	Implementation of the first training course
1996	January	Visit of the Japanese Advisory Team
	January	Opening Inauguration of the building
	June	Second JICA / SERNAGEOMIN Seminar (Copiapó)
	September - October	Implementation of Inter-American Course sponsored by OAS
1997	January	Visit of the Japanese Consultation Team
	June	Third JICA / SERNAGEOMIN Seminar (Copiapó)
1998	May-June	Visit of Japanese Management Consultation Team
	October	Forth JICA / SERNAGEOMIN Seminar (Concepción)
	November	Implementation of an international training course based on the Regional Technical Cooperation Promotion Program of JICA (Copiapó)
1999	February	Implementation of an international seminar based on the Regional Technical Cooperation Promotion Program of JICA (Oruro and Potosí, Bolivia)
	March	Visit of the Japanese Evaluation Team

Annex 3 Tentative Schedule of Implementation (TSI)

Calendar Year	1994				1995				1996				1997				1998				1999		
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III
I Term of the Project	—————																						
II The Japanese Side																							
1 Dispatch of Expert																							
1) Long-term																							
Chief Advisor	—————																						
Coordinator	—————																						
Mine Safety	—————																						
Mine Pollution Control	—————																						
Chemical Analysis	—————																						
2) Short-term (if necessity arises)	- - - - -																						
2 Provision of Machinery & Equipment																							
From Japan	- - - - -																						
In Chile	- - - - -																						
3 Training of Chilean Counterpart in Japan	- - - - -																						
4 Dispatch of Study Team	△				△				△				△				△				△		
	▲				▲				▲				▲				▲				▲		
III The Chilean Side																							
1 Establishment of Center																							
Construction of Center (Laboratory & etc.)	—————																						
2 Allocation of C/P Personnel & Staff	—————																						
3 Arrangement of Buildings & Facilities	—————																						
4 Procurement of Machinery & Equipment	—————																						
5 Allocation of Budget for Operation of Center	—————																						
6 Operation of Training Courses	—————																						
IV Joint Committee					△				△				△				△				△		
					▲				▲				▲				▲				▲		

Note: This Schedule is subject to change in accordance with progress of the Project.
Short-term expert(s) will be dispatched when necessity arises.

2) ——— Original, ——— ● Implementation

Annex 4 Technical Cooperation Program (TCP)

Calendar Year	1994		1995				1996				1997				1998				1999			
Quarter	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	
Term of the Project																						
A Mine Safety Technology																						
A-1 Mining Operation																						
1) Safety Control at openpit mine																						
2) Safety Control at underground mine																						
3) Safety Control for working condition																						
4) Case study																						
A-2 Mill Operation																						
1) Safety control at mill																						
2) Safety control for working condition																						
3) Case study																						
A-3 Measures at Emergency																						
1) Life saving manual																						
2) Life preserver																						
3) System for Emergency																						
4) Case study																						
A-4 Equipment for Mine Safety																						
1) Description on equipment																						
2) Handling																						
A-5 Administration and Policy																						
1) Mine safety administration in Japan																						
2) Approval of equipment																						
3) Mine safety education																						
B Mine Pollution Control Technology																						
B-1 Water																						
1) Water pollution in general																						
2) Water pollutants & water control standard																						
3) Processing Facilities for mine drainage																						
4) Usage of recycled water																						
5) Treatment of sludge																						
6) Treatment of drainage from abandoned mine																						
7) Case study																						

Calendar Year	1994				1995				1996				1997				1998				1999		
Quarter	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III		
Term of the Project																							
B-2 Noise, Vibration and Dust																							
1) Noise pollution control																							
2) Vibration pollution control																							
3) Dust pollution control																							
4) Case study																							
B-3 Administration and Policy																							
1) Mine pollution control in Japan																							
2) Mine pollution education																							
C Technique on Analysis and Measurement																							
C-1 Water Analysis																							
1) Sampling method																							
2) Preparation of sample																							
3) Flow-rate measurement																							
4) Method for water analysis																							
5) Method of element analysis																							
6) Practice																							
C-2 Gas Analysis																							
1) Sampling method																							
2) Method for gas analysis																							
3) Practice																							
C-3 Dust Measurement																							
1) System of dust analysis																							
2) Measurements of dust characteristics																							
3) Apparatus for dust measurements																							
4) Practice																							
C-4 Noise and Vibration Measurement																							
1) Noise measurement																							
2) Vibration measurement																							
3) Practice																							
C-5 Measurement of Physical Properties																							
1) Measurement & examination																							
2) Practice																							

Note : _____ Original, _____ Implementation

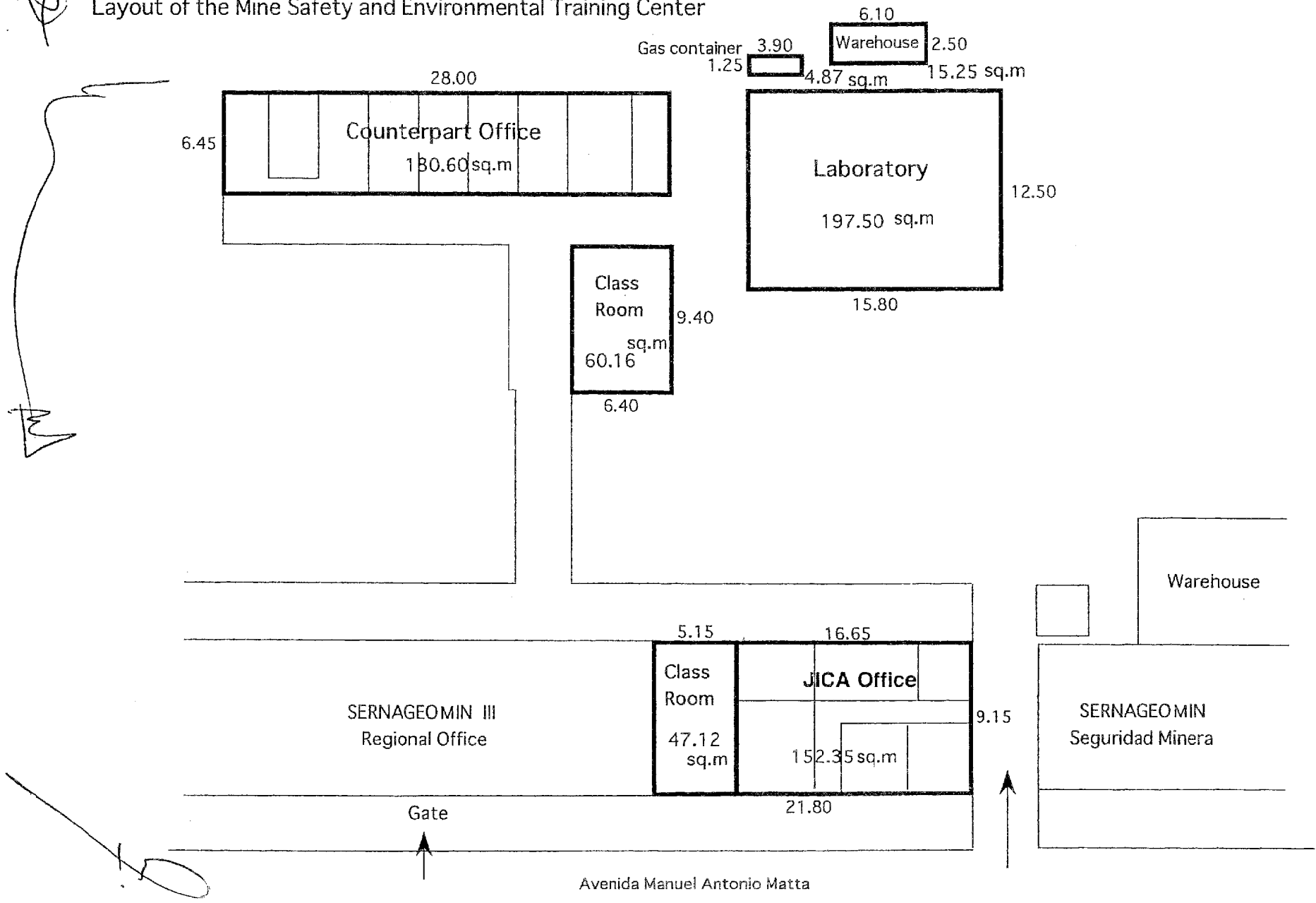
*E Short term expert on Gas chromatographer

covered in B-2

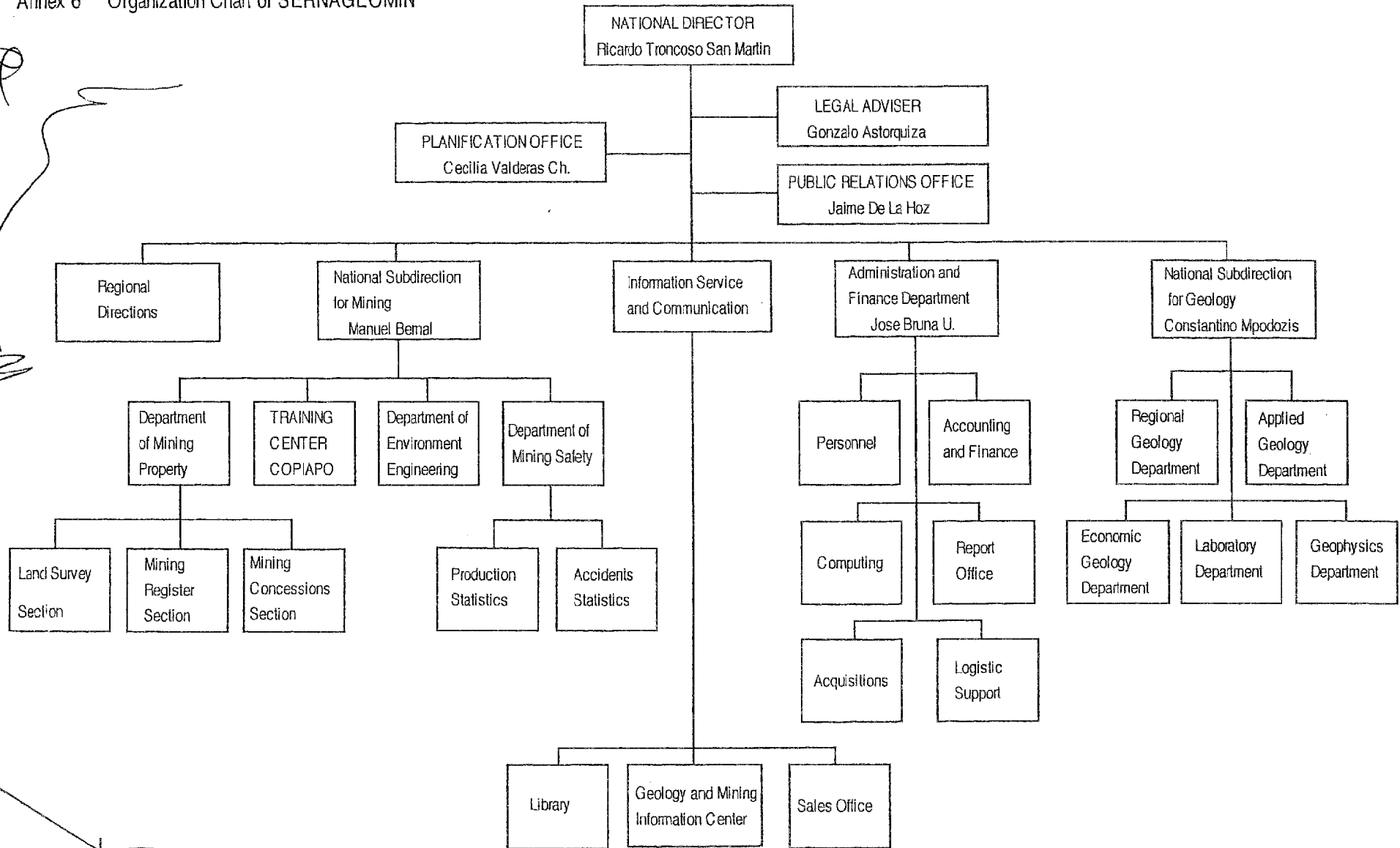
covered in B-2

covered in A-1
(Earth & Roof Pressure gauge)

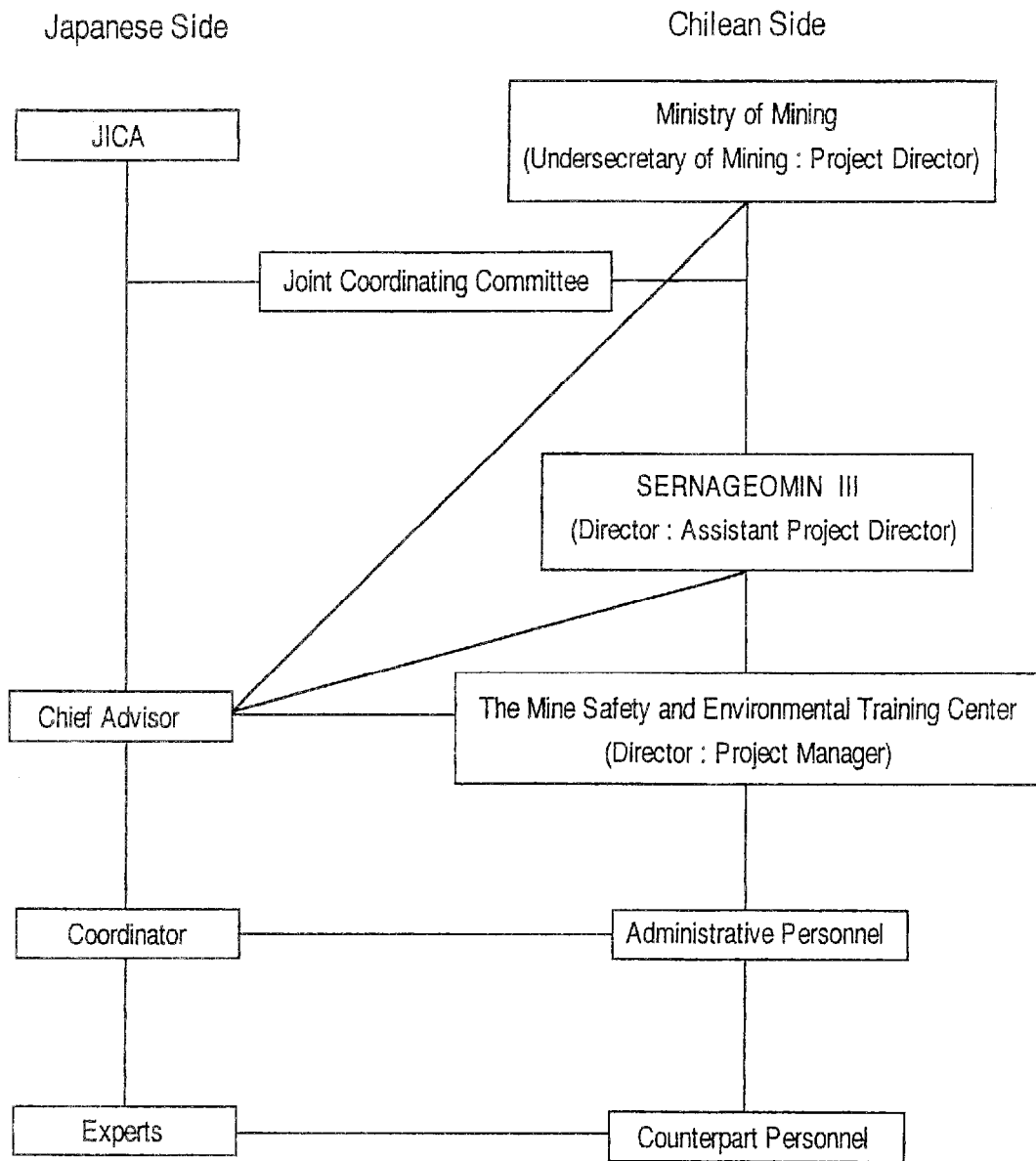
Annex 5
 Layout of the Mine Safety and Environmental Training Center



Annex 6 Organization Chart of SERNAGEOMIN



Annex 7 Organization Chart of the Project



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Annex 8 Japanese Experts Dispatched by JICA

Long term

Name	Field	Term
Mr.Shozo Sawaya	Chief Adviser	94/8/08 - 97/9/07
Mr.Minoru Fujita	Chief Adviser	97/8/27 - 99/6/30
Ms.Futaba Ando	Coordinator	94/7/21 - 96/6/01
Mr.Takeshi Saito	Coordinator	96/5/25 - 99/6/30
Mr.Mitsuhiro Ota	Mine Safety	94/8/08 - 96/8/07
Mr.Yoshikane Harada	Mine Safety	96/7/17 - 99/6/30
Mr.Atsushi Kawadai	Mine Pollution Control	94/8/08 - 96/8/07
Mr.Suzuo Yamaguchi	Mine Pollution Control	96/7/17 - 99/6/30
Mr.Eiichi Hoka	Chemical Analysis	94/8/08 - 97/8/07
Mr.Michihiro Ando	Chemical Analysis	97/6/28 - 99/6/30

Short term

Name	Field	Term
Mr.Hiroto Kidane	Mine Safety	95/5/16 - 5/30
Mr. Masaaki Yoshida	Installation of Atomic Absorption Spectrometer and Spectrophotometer	95/9/29 - 10/12
Mr.Hiroshi Kashiwagi	Installation of Gas scrubber	95/11/14 - 11/23
Mr.Shigeo Yamano	Environmental Regulation of Japan	96/6/21 - 7/04
Mr.Tadao Inoue	Treatment of abandoned mine	96/6/21 - 7/04
Mr.Jun'ichi Sato	Rock Pressure Measurement	96/11/22 - 12/03
Mr.Chuichi Nakata	Installation of Gas chromatography	97/5/30 - 6/10
Mr.Elji Kuboki	Policy of abandoned mine	97/6/21 - 7/03
Mr.Mitsuya Hirokawa	Treatment of abandoned mine	97/6/21 - 7/03
Mr.Masato Koie	Coal Mine Closure	98/10/16 - 10/26
Mr.Masayuki Yamada	Coal Mine Closure	98/10/16 - 10/26
Mr.Yoshitaka Kurokawa	Coal Mine Closure	98/10/16 - 10/26
to be specified	Chemical Analysis Instrumentation	(if necessary)

Annex 9 Japanese Survey Teams Dispatched by JICA

Name of the Mission	Members	Term
Implementation Study Team	Mr.Saburo Yamaguchi Mr.Kouetsu Fujii Dr.Kenji Tomita Mr.Yoshiaki Tsuboi Ms.Noriko Takasu	94.3.28 - 4.05
Consultation Team	Dr.Umetaro Yamaguchi Mr.Junichi Ozeki Mr.Takamitsu Morisada Mr.Sinya Tomonari	95.2.27 - 3.07
Advisory Team	Mr.Hiroshi Shiojiri Mr.Yoshio Sato Mr.Takamitsu Morisada Mr.Sinya Tomonari	96.1.10 - 1.12
Consultation Team	Dr.Takeshi Usami Mr.Makoto Takuwa Mr.Takamitsu Morisada Mr.Yuichi Endo	97.1.13 - 1.21
Management Consultation Team	Dr.Takeshi Usami Mr.Takahiro Matsubuchi Mr.Yasuhiko Wada	98.6.01 - 6.08
Evaluation Team	Mr. Toshinori Isogai Mr. Izumi Tajiri Mr. Toshimi Sato Miss Yukari Saito Mr. Wataru Takada	99.3.16 - 3.25

Annex 10 Counterpart Personnel Trained in Japan

Name	Title	Training field	Term
Mr.Ricardo Troncoso	National Director, SNGM	Mine Safety Policy & Pollution Control	95/1/23 - 2/05
Mr.Jorge Guerra	Director, Training Center	Mine Safety & Pollution Control	95/1/23 - 2/18
Mr.Julio Morales	C/P, Mine Safety	Mine Safety	95/9/03 - 10/03
Mr.Hugo Aguirre	C/P, Mine Safety	Pollution Control	95/9/03 - 10/03
Dr.Andres Gomez-Lobo	C/P, Mine Safety	Chemical Analysis & Pollution Control	95/9/03 - 10/03
Mr.Anton Hraste	Regional Director, III Region, SNGM	Mine Safety Policy & Pollution Control	97/3/02 - 3/15
Mrs.Vinka Rakela	C/P, Chemical Analysis	Chemical Analysis	97/7/046 - 8/01
Mr.Guido Montuschi	C/P, Chemical Analysis	Chemical Analysis	97/7/046 - 8/01
Mr.Juan-Maya Bruna	Chief, Administration, III Region, SNGM	Mine Safety & Pollution Control	98/1/25 - 2/14
Mr.Manuel Bernal	National Vice Director for Mining, SNGM	Mine Safety Policy & Pollution Control	98/8/30 - 9/15
Mr.Eduardo Vega	C/P, Mine Pollution Control	Mine Pollution Control	98/8/30 - 9/30
Mr.Carlos Flores	C/P, Mine Safety	Mine Safety	99/1/17 - 2/16

Note: C/P Counterpart personnel of the Project

Mr.Nibaldo Gonzalez	C/P, Mine Safety	Coal Mine Safety (JICA group training)	94/9/13 - 12/09
Mrs.Yanett Omega	C/P, Mine Pollution Control	Environment Impact Assessment (JICA group training)	95/1/23 - 3/12

Code	Item	Description	Quantity
A-1	CO gas measurement unit	Carbon Monoxide Detector Alarm, Model:CM-2B	10 units
A-2	Inflammable gas measurement unit	Combustible Gas Sampling Pump Kit, Model:XPO-317	10 units
A-3	Gas detector tube	Gas Sampling Pump Kit, Model:NO-800	10 units
A-4	Portable digital gas detector	Portable Gas Sampling Pump Kit, Model:XP-302II	10 units
A-5	Hot wire type anemometer	Hot Wire Anemometer, Model:DP-70B	10 units
A-6	Windmill type anemometer	Windmill type anemometer, Model:No. 27	10 units
A-7	Barometer	Aneroid Barometer, Model:No. 3-1050-01	10 units
A-8	Smoke tube	Smoke Tester Kit, Model:NO.500	10 units
A-9	Digital Hygrometer	Digital Hygrometer, Model:SK-80TRH	3 units
A-10	Self-rescue unit	Escape Mask, Model:MINI-2/RM-102 Slide Mounted Gas Mask, Model:HV-111 Self Contained Breathing Appartus (S,C,B,A), Model:L2-815	3 units 3 units 4 units
A-11	Oxygen breathing unit	Oxygen Breathing Apparatus, Model:MARK10 Maintenance and Inspection Equipment, Model:Tester 3	10 units 1 unit
A-12	Safety helmet	Helmet	10 units
A-13	Safety goggles	Protective Goggle	10 units
A-14	Dusk mask	Dust Respirator	10 units
A-15	Safety shoes	Safety Shoes	10 pairs
A-16	Safety belt	Safety Belt	10 units
A-17	Helmet light	Miner's Cap Lamp, Model:YL2000 Flash Lamp	10 units 10 units
A-18	Charger for battery light & Dynamo	Recharger For Northern Light Miner's Lamp, Model:YL-5120-05 Generator Yanmar, Model:YDG300S-5E	2 units 1 unit
A-19	Earth & roof pressure gauge	Soil Pressure Transducer, Model:SMD-20A/BE-20KE	1 unit
A-20	Rope checker	Rope Measuring Gage, Model:TWT-550A	1 unit
A-21	Leg drill	Leg Rock Drill, Model:YS-77LDV Leg Rock Drill, Model:YS-77LD	2 units 1 unit
A-22	Stoper	Stoper, Model:BBD-46 WS6	3 units
A-23	Parts for rock drill	Air Hose 1" 150m, Air Hose 1/2" 150m, Hose Coupling 1" 10pcs	---
A-24	Insert Bit	Integral Drill Steel, Chisel Bit	50 units
A-25	Rod polishing machine	Grinding Machine, Model:TEROC64	1 unit
A-26	ANFO charger	Loader Fixed Type, Model:B. C. Loader Portable Type, Model:S. C. B-20	1 unit 2 units
A-27	Blasting unit	Blasting Machine, Model:Nissan DX-100A	2 units
A-28	Blasting tester	Tester, Model:R-3-200	2 units
A-29	Photo-cell tester	Safety Circuit Tester, Model:SAFTY-C	2 units
A-30	Stray current measurement unit	Leakage Current Detector, Model:NISSAN	2 units
A-32	Blasting cap binder	Blasting Cap Binder	5 units
A-33	Dust sumpler	Air Sampler, Model:L-15P	3 units
A-34	Digital dust-meter (portable type)	Digital Dust Indicator, Model:P-5H2	2 units
A-35	Noise-meter	Noise Meter, Model:NA-24	2 unit
A-36	Air compressor	Portable Air Compressor, Model:EC75ZS-3	1 unit
B-1	pH meter	pH Meter, Model:D-14	3 units
B-2	Turbidimeter & thermometer	Water Quality Checker, Model:U-10 Water Quality Checker, Model:WQC-20A	1 unit 2 units
B-3	Ion meter	Ion Meter, Model:IM-7B Ion Meter, Model:290A	1 unit 2 units
B-4	Water quality meter (potable type)	Potable Water Anylisis Laboratories, Model:HACH DR/2000	3 units
B-5	Conductivity meter	Electric Conductivity Meter, Model:CM-14	3 units
B-6	Electromagnetic flow meter	Portable Electromagnetic Current Meter, Model:LP-201 Electric Current Meter, Model:TK-105X	1 unit 1 units
B-7	Digital stop watch	Digital Stop Watch, Model:SVAD 001	3 units
B-8	Thermometer	Thermometer, Model:SK-1250MC	3 units
B-9	Transparency meter	Transparency Meter, Model:8053-052	3 units
B-10	Cyanide measurement unit	Cyanide Measuring Apparatuses, Model:CN-S	1 set
B-11	Noise meter	Integrating Sound Level Meter, Model:NL-05A	1 unit
B-12	Vibration meter	Vibration Level Meter, Model:VM-50	1 unit
B-13	High volume sampler	High Volume Air Sampler, Model:HVC-1000N	1 unit
B-14	Low volume sampler	Low Volume Air Sampler, Model:SLT-20	1 unit
B-15	Desiccator	Desiccator, Model:DC-11	1 unit
B-16	Flow-meter	Rotameter Kit with Needle Valve, Model:2833-01	1 unit
B-17	Digital dust meter	Digital Dust Indicator, Model:PCD-1	1 unit

Code	Item	Description	Quantity
B-18	Dust jar	Dust Jar, Model:Code No. 8008-05	1 unit
B-19	Electronic balance	Electronic Balance, Model:EB-3200-SA Electronic Table Balance, Model:EB-4300SW	1 unit 1 unit
C-1	Atomic absorption spectrometer	Atomic Absorption Spectrophotometer, Model:Z-6100 Hydrogen Formation System, Model:HFS-3	1 unit 3 units
C-2	Spectrophotometer	Spectrophotometer, Model:U-2000	1 unit
C-3	Gas chromatograph	Gas Chromatograph, Model:G-6800 Suck In Pump, Model:NG-20A	1 unit 2 units
C-4	Laboratory pH Meter	Laboratory pH Meter, Model:F-22	1 unit
C-5	Ion meter	Ion Meter, Model:IM-40S	1 unit
C-6	Electro-conductivity meter	Electric-Conductivity Meter, Model:CM-40V	1 unit
C-7	Deminerallizer	Water Softener, Model:TSF-25 Water Stills Barnstead Type, Model:SE-10 Deionazing Equipment, Model:MA-4	1 unit 1 unit 1 unit
C-8	Deminerallizer for soft water	Deionazing Equipment for Water Softner, Model:IONPET-5	1 unit
C-9	Thermostat dryer	Forced Convection Drying Oven, Model:FV-410 Drying Oven, Model:MOV-112	1 unit 1 unit
C-10	Vibrating mill	Vibration Mill, Model:T-100	1 unit
C-11	Thermostat dryer	Muffin Furnace, Model:KL-160 Muffin Furnace, Model:ELF-11/14 91e	1 unit 1 unit
C-12	Vacuum pump	Diaphragm Vacuum Pump, Model:DAT-50D Vacuum Pump, Model:OFD-50S	1 unit 1 unit
C-13	Centrifuge	Table-Top Centrifuge, Model:5100 Centrifuge, Model:H108M2	1 unit 1 unit
C-14	Shaker for separating funnel	Separatory Funnel Shaker, Model:MW-1 Shaker, Model:MW-J	1 unit 1 unit
C-15	Draft chamber	Draft Chamber, Model:SFA-180S Draft Chamber, Model:806E50NU	1 unit 1 unit
C-16	Gas scrubber	Exhaust Purifier, Model:JR-G-10	1 unit
C-17	Drainage treatment unit	Heavy Metal Waste Water Treatment Equipment, Model:LIP-20AHF	1 unit
C-18	Refrigerator	Refrigerator, Model:MPR-411F Medical Refrigerator, Model:MPR-511	1 unit 1 unit
C-19	Electronic balance	Analytical Balance, Model:AT-261	1 unit
C-20	Magnetic stirrer	Magnetic Stirrer, Model:MGM-66	2 units
C-21	Automatic mortar	Grinding Mixer, Model:Type#18	2 units
C-22	Sieve shaker	Sieve Shaker, Model:AS-200	1 unit
C-23	Sample splitter	Sample Divider, Model:Type#10	1 unit
C-24	Sieve	Sieve (29kinds/set)	1 set
C-25	Voltage stabilizer	Automatic AC Voltage Regulator, Model:VRS1001 Automatic Voltage Regulator, Model:SVC-10100A Voltage stabilizer, Model:ITS 4000h	1 unit 1 unit 1 unit
C-26	Consumables for chemical analysis	Beaker	---
C-27	Reagents for chemical analysis	Reagents for Chemical Analysis	279 items
C-28	Hot plate	Hot Plate, Model:ASP-650 Hot Plate, Model:TH-550	1 unit 1 unit
C-29	Microscope	"NIKON" Stereoscopic Microscope, Model:SMZ-1-3	1 unit
D-1	Video-camera	HI-8 Videl Camera Model:Sony, CCD-TR550	2 units
D-2	Video-desk	VHS/SMM Video Cassette Recorder, Model:WV-F1	2 units
D-3	Video-editor	Editing Control Unit, Model:RM-E1000	1 unit
D-4	TV	25-Inch Color TV Model:KV-K25MFJ	2 units
D-5	Slide projector	Slide Projector, Model:SOUND CABIN AFR	2 units
D-6	Screen	Screen, Model: WS-18DX	2 units
D-7	OHP	Over Head Projector, Model:Cu-650AF Transparency Film Maker, Model:4550	2 units 2 units
D-8	Recorder	Cassette Tape Recorder, Model:TCM-57	2 units
D-9	35 mm camera	Single Reflex Camera, Model:EOS KISS	2 units
D-10	Electronic white board	Electronic Bord With Copy System, Model:Kakitorikun Sansei 1800	1 unit
D-11	Microphone, amplifier, speaker, etc.	Microphone, Model:DM-703 Speaker, Model BS-102SA Amplifiers, Model:A31E Power Megaphones	1 unit 1 unit 1 unit 1 unit

Code	Item	Description	Quantity
E-1	Mobile training Unit	Mobil-Laboratory, (Model:NPR) Mobil-Haulage, (Model:L1418E/51)	1 unit 1 unit
F-1	Technical literatures & reference	Slide (Mine Safety) Text (Japanese) Text (English or Spanish) Chilean Norms	23 pcs 126 vols 65 vols 116 vols
F-2	Video tapes for training	Video (Analysis)	10 pcs
F-3	Photostat copy machine	Photostat Copy Machine, Model:FT4220	1 unit
F-4	Personal computer	Personal Computer, Model:LC575 Personal Computer, Model:PB180C 4/160 Personal Computer, Model:PC-9821Ne340/W Personal Computer, Model:Power Book 520C Personal Computer, Model:Performa 6310 Personal Computer, Model:Power Book 190CS/66 Personal Computer, Model:LC5800 8/800/14 Laser Printer, Model:LP-8500 Printer, Model:WRITEMOVE II Printer, Model:BJ-220JS Printer, Model:BJ-30V Printer, Model:Color Style Writer 2200 Word Processor, Model:285HL	2 units 1 unit 1 unit 5 units 1 unit 1 unit 4 units 2 units 1 unit 1 unit 2 units 3 units 1 unit
F-5	Micro-bus	Micro-bus, Model:96year, LO-812	1 unit
F-6	Station wagon	Toyota Land Cruiser 4WD 2-Door Hardtop, Model:FZJ75LV-MRU	1 unit
F-7	Fax	Fax, Model:240	1 unit
F-8	Wireless set	Transceiver, Model:FT-80C with Long Wire Antenna Set Transceiver, Model:FT-80C with Auto Antenna Tube	1 unit 2 units

Annex12 Expense by Japanese Side

(Japanese Fiscal Year)	1992	1993	1994	1995	1996	1997	1998(F)	Total
Amount	13,535	10,214	112,317	197,311	156,914	122,365	119,800	732,456
Dispatch of Japanese Experts	3,134	1,000	59,426	89,123	112,985	111,866	111,000	488,534
Training of Counterparts in Japan	0	0	1,420	1,993	770	2,471	2,500	9,154
Provision of Equipment	0	0	39,208	96,440	37,293	8,028	300	181,269
Mission	10,401	9,214	12,263	9,755	5,866	0	6,000	53,499

(thousand Yen)

Annex 13 List of Chilean Counterpart

Job Description	Assigned Personnel	Remarks
(Head Office in Santiago)		
National Director of SERNAGEOMIN	Ricardo Troncoso San Martin	
National Vice Director of Mining	Manuel Bernal Leon	
Chief of Planing Office	Cecilia Valderas	
Chief of Administration & Finance Department	Jose Bruna Uribe	
Chief of Mine Safety Department	Daniel Alcayaga	
Chief of Environment Department	Silvia Defranchi Contreras	
(III Region Office in Copiapo)		
Regional Director of SERNAGEOMIN	Anton Hraste Carrasco	
(Counter part)		
Director of Mining Safety and Environmental Training Center	Jorge Guerra Casanova	
Instructor on Mine Safety	Nibaldo González Nicolás	
ditto	Carlos Flores	
Instructor on Mine Pollution Control	Andrés Gómez-Lobo Rodriguez	
ditto	Eduardo Vega Donoso	
Instructor on Chemical Analysis	Vinka Rakela Aranza	
ditto	Guido Montuschi Muga	
(Staff)		
Chief of Administration Department	Juan Maya Bruna	not full time
Secretray	Magda Traslaviña Araya	
Secretray	Fresia Cortes Vasquez	
Driver	Ricardo Araya Espinoza	

Annex 14 Supply of Equipment and Materials by the Chilean Side

- 1 Installation of Equipment provided by the Japanese Side

- 2 Additional works of the Laboratory
 - (1) Partition work of the Laboratory
 - (2) Construction of Warehouse for Reagents
 - (3) Procurement of Chemical reagents, consumables for the Laboratory
 - (4) Lamps for Atomic Absorption Spectrophotometer
 - (5) Air-conditioner of the warehouse for reagents
 - (6) Unit for Bacteriological Analysis

- 3 Audio-visual unit
 - (1) Video projector
 - (2) Scanner



Annex 16 List of Seminars
(organized by / cooperated with the Training Center)

Year 1994

Date : 21-24 November, 1994
Subject : Optimizing of Operation and Management in Plant
Mining Security and Environmental Training Center
Site : Hidalgo de Parral, Mexico
Number of attendance: 120

Year 1995

Date : 21-25 May, 1995
Subject : Risk and Environmental Care (I JICA - SERNAGEOMIN Seminar)
Site : Copiapo
Number of attendance: 100

Date : 14-15 November, 1995
Subject : Mining and Environment
Environmental Matters in Small Mining
Site : Chañaral
Number of attendance: 60

Year 1996

Date : 26-27 June, 1996
Subject : Environmental Matters in Mining / Planning for Mine Closure
(II JICA - SERNAGEOMIN Seminar)
Site : Copiapo
Number of attendance: 100

Date : 28-30 August, 1996
Subject : Introduction to Environmental Concept
First Journey National Paritary of Health and Security Committee
Site : Copiapo
Number of attendance: 200

Date : 23 September - 11 October, 1996
Subject : First Inter-American Course on Mining Security and Environment
Site : Copiapo
Number of attendance: 25 From 12 countries

Date : 6 - 8 November, 1996
Subject : Environment, Concept and Responsibilities
 III National Convention of Risk Prevention Experts
Site : Antofagasta
Number of attendance : 120

Date : 20-22 November, 1996
Subject : Mining and Environment
Site : Algarrobo mine, Vallenar
Number of attendance : 160

Year 1997

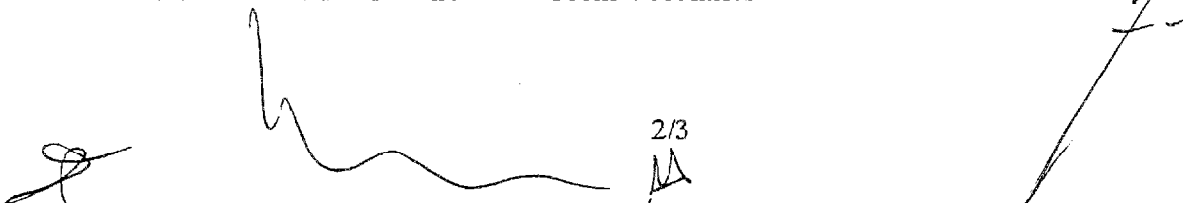
Date : 19 - 20 June, 1997
Subject : Introduction of Environmental Theme in Contractor Companies
 First Regional Meeting of Mining Enterprises and Contractors
Site : Copiapo
Number of attendance : 100

Date : 25 - 26 June, 1997
Subject : Environment : Applied Technology for abandoned mining site
 (III JICA - SERNAGEOMIN Seminar)
Site : Copiapo
Number of attendance : 110

Date : 1 July, 1997
Subject : Introduction to Environment
Site : Antofagasta
Number of attendance : 120

Date : 10 - 11 July, 1997
Subject : Studies and Declaration of Environmental Impact : Plans, Responsibilities and
 Control
 CORESEMIN, IV Region Seminar on Environmental Law applied to Mining
Site : La Serena
Number of attendance : 80

Date : 17 - 21 November, 1997
Subject : International Seminar : Risk and Environmental Management
Site : Copiapo
Number of attendance : 20 From 4 countries

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Year 1998

Date : 5 June, 1998
Subject : Mining and Environment
Site : Copiapo
Number of attendance: 100

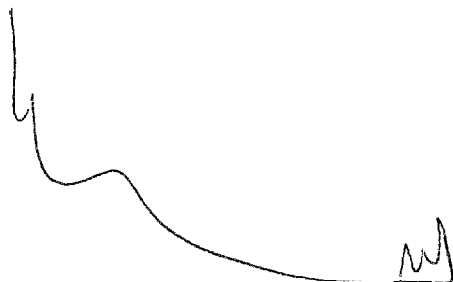
Date : 20 - 21 October, 1998
Subject : Environment and Mining in South Chile
(IV JICA - SERNAGEOMIN Seminar)
Site : Concepcion
Number of attendance: 120

Date : 23 - 27 November, 1998
Subject : International Seminar: Risk and Environmental Management
Site : Copiapo
Number of attendance: 30 From 16 countries

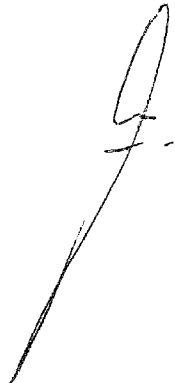
Year 1999

Date : 5 February, 1999
Subject : International Seminar: Mining and Environment
Site : Oruro, Bolivia
Number of attendance: 30

Date : 8 February, 1999
Subject : International Seminar: Mining and Environment
Site : Potosi Bolivia
Number of attendance: 30



3/3



Annex 17 Summary of Operation of Training Courses

Target	Total No. of Participants	Topics of Course, Seminar	No. of Courses	No. of Participants	
Training Course					
Prevention of Risks (Mine Safety)	Professionals	475	Creation of Expert in Mine Safety	3	90
			Prevention of Risks of Cave-in	1	30
			Mine Safety Law	7	355
	Mine Workers	400	Creation of Monitors	7	205
			Mine Safety for Foreman	2	60
			Inventory of Critical Risks	3	60
			Improvement of Work Procedure	3	60
			Prevention of Risks of Cave-in	-	-
	Miners of Small Mine	120	Risk Control in Underground Mining	1	15
Creation of Monitors			3	65	
Environment (Pollution Control)	180	Mine Safety for Foreman	3	55	
		Basic of Mine Safety and Environment	1	180	
Environment and Chemical Analysis	220	Basic Education of Environment	5	125	
		Risk of Mercury in Amalgamation	2	30	
		Management of Waste	2	45	
		Environmental Impact and Mining	1	20	
Chemical Analysis	800	Environmental Law No/19300	20	498	
		Implementation of Control of Environment	16	302	
		Technics of Sampling	-	-	
Small and Artisan Mining	10	Monitoring, Analysis and Evaluation	1	10	
		Technical of Sampling			
		Environment and Small Mining Plant			
Small and Artisan Mining	210	Integral Management of Enterprise	5	100	
		Technology applies to Small Scale Mining	9	90	
		Maintenance of Mining Machinery	1	20	
Total(Person)		2,415			
Seminar					
National JICA-SNGM	Professionals Public Organizations	370	Prevention de Riesgos (1995)	-	-
			Mine Closure and Environment(1996)	2	170
			Measures applied to Closed Mines(1997)	1	100
			Environment and Mining of South Chile(1998)	1	100
Outside Chile		380	Environment and Mining(Catamarca, Arg.)	1	350
			Environment and Mining(Catamarca, Arg.)	1	30
Total(Person)		750			
International Training Course					
Latin America	Professionals Mining related Organizations	48	Integral Management of Risks in Operation(1996)	1	15
			Control of Risks and Environment(1997)	1	6
			Control of Risks and Environment(1998)	1	27
Lectures and Expedition	University, Vocational School	448		7	448
SERNAGEOMIN	Officers of SERNAGEOMIN	80		-	80
Grand Total(Person)		3,741	Total No. of Courses and Seminars		112

Annex 18

PROGRAM OF OPERATION OF TRAINING COURSES AT
THE CENTER 1999

NAME OF COURSE	DATE/MONTH DURATION (HOURS)	- N° PARTICIPANTS	NUMBER OF COURSES
ENVIRONMENT AND SAFETY MINING ORURO AND POTOSI-BOLIVIA	05 FEBRUARY 08 FEBRUARY 300	- PROFESSIONALS OF MINING-BOLIVIA 30 by course	2
CREATING OF EXPERTS FOR PREVENTION OF RISK IN MINING INDUSTRY	02 JUNE - 02 JULY 300	- PROFESSIONALS OF MINING 30	1
CREATING OF EXPERTS FOR PREVENTION OF RISK IN MINING INDUSTRY	05 OCTOBER - 26 NOVEMBER 300	- PROFESSIONALS OF MINING 30	1
MINING SAFETY F FOR LEADER WORKERS	APRIL MAY JUNE JULY 40	- WORKERS OF small MINING COMPANIES AND INDIVIDUAL 20	4
EVALUATION OF ENVIRONMENT IMPACT	AUGUST SEPTEMBER 24	- MINING COMPANIES AND INDIVIDUALS 30	2
PREVENTION OF RISK FOR USE OF EXPLOSIVES	30-31/07 24	- WORKERS OF MINING 30	2
ENVIRONMENTAL AUDITOR	24-25-26 JUNE 6-7-8 OCTOBER 24	- MANAGERS AND SUPERVISORS 25	2
CREATING OF MONITORS FOR MINING SAFETY	OCTOBER NOVEMBER 40	- WORKERS OF MINING COMPANIES	2
ENVIRONMENTAL MANAGEMENT LAW ISO 14000	JUNE JULY 16	- PROFESSIONALS OF MINING 30	2
INVESTIGATION OF ACCIDENTS	APRIL MAY	- PROFESSIONALS OF MINING 30	2

(*) other courses and seminars may be planned

Annex 19 List of Field Surveys Conducted in the Project

Date	Mine, Facility	Region	Surveyers
1996/10/1	Planta Salado	III	Hoka, Yamaguchi, Harada, Saito
1996/10/2	CMP Mina Argarobo	III	Hoka, Yamaguchi, Harada, Saito
1996/10/2	CMP Pellet Plant	III	Hoka, Yamaguchi, Harada, Saito
1996/10/3	Mina La Canderalia	III	Hoka, Yamaguchi, Harada, Saito
1997/1/21	Mina La Canderalia	III	Hoka, Yamaguchi, Harada, Gonzalez, Vega
1997/3/5	Mina Mantos de Cobre	III	Harada, Morales, Gonzalez
1997/3/12	Mina San Marcos	III	Harada, Morales, Gonzalez
1997/4/1	Area Inca de Oro	III	Yamaguchi, Vega
1997/4/2	Area Inca de Oro	III	Yamaguchi, Vega
1997/4/3	Area Inca de Oro	III	Yamaguchi, Vega
1997/4/4	Area Inca de Oro	III	Yamaguchi, Vega
1997/4/5	Area Inca de Oro	III	Yamaguchi, Vega
1997/4/6	Area Inca de Oro	III	Yamaguchi, Vega
1997/4/7	Area Inca de Oro	III	Yamaguchi, Vega
1997/4/8	Area Inca de Oro	III	Yamaguchi, Vega
1997/4/9	Area Inca de Oro	III	Yamaguchi, Harada, Vega, Montuschi
1997/4/16	Planta Union	III	Yamaguchi, Harada, Vega, Montuschi
1997/4/17	Planta Union	III	Yamaguchi, Vega
1997/5/12	Area Cerro Negro	III	Yamaguchi, Vega
1997/5/13	Area Cerro Negro	III	Yamaguchi, Vega
1997/6/5	Planta Dai	III	Yamaguchi, Harada, Guerra, Vega
1997/6/27	Mina La Canderalia	III	Hoka, Yamaguchi, Harada, Vega
1997/6/28	Area Jesus Maria	III	Yamaguchi, Vega
1997/7/2	CIMM	Santiago	Hoka, Ando
1997/7/2	Laboratorios, SNGM	Santiago	Hoka, Ando
1997/7/3	CENMA	Santiago	Hoka, Ando
1997/7/17	Mina La Canderalia	III	Hoka, Ando
1997/7/9	Mina Escondida	II	Hoka, Yamaguchi, Harada
1997/7/10	Planta Cosoro, Escondida	II	Hoka, Yamaguchi, Harada
1997/7/11	Mina Chuquicamata	II	Hoka, Yamaguchi, Harada
1997/11/17	Mina Manto Verde	III	Yamaguchi, Harada, Flores, Vega, Rakela, Montuschi
1998/3/25	CENMA	Santiago	Fujita, Yamaguchi, Harada, Ando, Saito
1998/5/18	Planta Salado, ENAMI	III	Fujita, Yamaguchi, Harada, Ando
1998/10/23	Mina Andina, CODELCO	V	Fujita, Yamaguchi, Harada, Saito

Annex 20 List of Textbooks for Training Courses

Area	Ref. No.	Title : Español / English	Remarks
Chemical Analysis		Mejoramiento de la Calidad en la Preparación de Muestras de Minerales	Training Course
	ChA-1	Improvement of the Quality in the preparation of Mineral Samples	
Chemical Analysis		Muestreo, Analisis de Aguas y de Residuos Liquidos Industriales y Uso de Equipos de Medición (VIDEO)	Training Course
	ChA-2	Sampling, Analysis of water and industrial residual fluid and Measurement Equipment	
Mine Pollution Control		Control de Ambiente Minero	Formation of Expert
	MP-01	Control of Environment of Mining	
Mine Pollution Control		Evaluación de Impacto Ambiental	Training Course
	MP-02	Evaluation of Environmental Impact	
Mine Pollution Control		Instrumentos de Política Ambiental - Marco Legal	Training Course
	MP-03	Measures of Environmental Policy - Legal Framework	
Mine Pollution Control		Introducción a Los Sistemas de Gestión Ambiental	Training Course
	MP-04	Introduction to the System of Environmental Control	
Mine Pollution Control		Law of the General Bases for the Environment (English Text)	Training Course
	MP-05	Law of the General Bases for the Environment	
Mine Pollution Control		Ley del Medio Ambiente y la Minería	Training Course
	MP-06	Law of Environment and Mining	
Mine Pollution Control		Manejo de Basura y Residuos	Training Course
	MP-07	Management of Waste and Residuals	

Annex 20 List of Textbooks for Training Courses

Area	Ref. No.	Title : Español / English	Remarks
Mine Pollution Control		Metodología para Realizar Prevención de Contaminación	Training Course
	MP-08	Methodology for implementation of prevention of Contamination	
Mine Pollution Control		Normativa Ambiental Basica para la Actividad Minera	Training Course
	MP-09	Requirement of Basic Environment for Mining Activities	
Mine Pollution Control		Permisos Ambientales y Planes de Abandono	Training Course
	MP-10	Environmental Risk and Mine Closure	
Mine Pollution Control		Problemas Ambientales Asociados a la Minería y Posibilidades de Solución	Formation of Expert
	MP-11	Medio Ambiente (Módulo 4) Environmental Problems associated to Mining and Possibility of Solution	
Mine Pollution Control		Riesgos del Mercurio en Procesos de Amalgamación	Training Course
	MP-12	Risks of Mercury in process of Amalgamation	
Mine Pollution Control		Sistemas de Gestión Ambiental según las NORMAS ISO 14000	Training Course
	MP-13	System of Environmental Control under the Standard ISO 14000	
Mine Pollution Control		Gestión de Riesgos y Medio Ambiente	Training Course
	MP-14	Control of Risks and Environment	
Mine Safety		Beneficio de Minerales	Training Course
	MS-01	Mineral Processing	
Mine Safety		Equipos Mineros	Training Course
	MS-02	Equipment of Mining	

Annex 20 List of Textbooks for Training Courses

Area	Ref. No.	Title : Español / English	Remarks
Mine Safety		Fundamentos de Higiene Industrial y Caracterización del Riesgo Ambiental Minero	Training Course
	MS-03	Fundamentals of Occupational Disease and the Character of Environmental Risk of Mining	
Mine Safety		Instructivo sobre la Investigación de Accidentes	Training Course
	MS-04	Instruction for the Investigation of Accidents	
Mine Safety		Reglamento de Seguridad Minera, DS 72, y La Ley de bases del Medio Ambiente y la Minería Introducción al Reglamento de Seguridad Minera, DS 72	Training Course
	MS-05- 1	Regulation of Mine Safety DS72, and Basic Law of Environment and Mining	
Mine Safety		Reglamento de Seguridad Minera, DS 72, y La Ley de bases del Medio Ambiente y la Minería Ley de Bases del Medio Ambiente y la Minería	Training Course
	MS-05-2	Regulation of Mine Safety DS72, and Basic Law of Environment and Mining	
Mine Safety		Prevención de Riesgos en el Uso de Explosivos	Training Course
	MS-06	Prevention of Risk in the Use of Explosives	
Mine Safety		Prevención de Riesgos por Caída de Rocas	Training Course
	MS-07	Prevention of Risks of Cave-in	
Mine Safety		Reglamento de Seguridad Minera, Decreto Supremo No.72	Training Course
	MS-08	Regulation of Mine Safety, Decree Supreme No.72	
Mine Safety		Riesgos Generales a la Explotación de Minas	Training Course
	MS-09	General Risks of Exploitation of Mines	
Mine Safety		Seguridad Minera para el Trabajador Lider	Training Course
	MS-10	Mine Safety for Foreman of workers	

Annex 20 List of Textbooks for Training Courses

Area	Ref. No.	Title : Español / English	Remarks
Production Technology	MS-11	Curso de Inducción Cia.Minera Cerro Colorado Course of Induction	Training Course
Mine Safety	MS-12	Estadística de Accidentes Statistics of Accidents	Formation of Expert
Mine Safety	MS-13	Primeros Auxilios First Aid	Formation of Expert
Mine Safety	MS-14	Riesgos en Minería a Rajo Abierto Explotación Minera a Tajo Abierto Risks in open pit mining	Formation of Expert -1995
Mine Safety	MS-15	Control de Riesgos en la Gestión de Empresas Control of Risks in the Management of Companies	I Inter-American Seminar on Integrated Control of Risk in Mine Operation
Mine Safety	MS-16	Control de Seguridad Minera en Japón - Seminario Control of Mine Safety in Japan	Seminar
Mine Safety	MS-17	Control de Riesgos para el Trabajador Lider, Volumen 1 Control of Risks for Foreman, Volume 1	Training Course
Mine Safety	MS-18	Control de Riesgos para el Trabajador Lider, Volumen 2 Control of Risks for Foreman, Volume 2	Training Course
Mine Safety	MSSC-01	Mantencción Electrica de Plantas Mineras, Volumen 1 -Capacitación en Interpretación de Planos e Introducción a PLC Maintenance of Electricity of Mining Plant, Volume 1	Training Program for "Chile Youth"

Annex 20 List of Textbooks for Training Courses

Area	Ref. No.	Title : Español / English	Remarks
Mine Safety	MSSC-02	Mantencción Electrica de Plantas Mineras, Volumen 1 -Capacitación en Ley de Ohms Potencia, Leyes de Kirchhoff Maintenance of Electricity of Mining Plant, Volume 1	Training Program for "Chile Youth"
Mine Safety	MSSC-03	Mantencción Electrica de Plantas Mineras, Volumen 1 -Motores Eléctricos Maintenance of Electricity of Mining Plant, Volume 1	Training Program for "Chile Youth"
Mine Safety	MSSC-04	Mantencción Electrica de Plantas Mineras, Volumen 2 -Electricidad Basica Primera Parte:Nivelación Matematica Maintenance of Electricity of Mining Plant, Volume 2	Training Program for "Chile Youth"
Mine Safety	MSSC-05	Mantencción Electrica de Plantas Mineras, Volumen 2 -Beneficio de Minerales Maintenance of Electricity of Mining Plant, Volume 2	Training Program for "Chile Youth"
Mine Safety	MSSC-06	Mantencción Electrica de Plantas Mineras, Volumen 2 -Capacitación en Instrumentos de Medidas Electricas Maintenance of Electricity of Mining Plant, Volume 2	Training Program for "Chile Youth"
Mine Safety	MSSC-07	Mantencción Electrica de Plantas Mineras, Volumen 2 -Conceptos Basicos Maintenance of Electricity of Mining Plant, Volume 2	Training Program for "Chile Youth"
Mine Safety	MSSC-08	Mantencción Electrica de Plantas Mineras, Volumen 2 -Electricidad Basica Maintenance of Electricity of Mining Plant, Volume 2	Training Program for "Chile Youth"
Mine Safety	MSSC-09	Mantencción Electrica de Plantas Mineras, Volumen 2 -Instalaciones de Alumbrado Circuitos Electricos Maintenance of Electricity of Mining Plant, Volume 2	Training Program for "Chile Youth"
Mine Safety	MSSC-10	Mantencción Electrica de Plantas Mineras, Volumen 2 -Seguridad Basica Minera Maintenance of Electricity of Mining Plant, Volume 2	Training Program for "Chile Youth"

Annex 20 List of Textbooks for Training Courses

Area	Ref. No.	Title : Español / English	Remarks
Administration		Gestión Integral de Empresas - Administración de Empresas Mineras	Training Course
	MSSC-11	Integrated Management of Companies - Administration of Mining Company	
Mine Safety		Comunicaciones	Seminar
	MSSC-12	Communication	
Mine Safety and Mine Pollution Control		Sumarios de la Política y las Leyes Relacionadas con el Medio Ambiente en Caso del Japón	JICA-SERNAGEOMIN seminar
	Sem-01	Summary of the Policy and Regulations relating to the Environment in the case of Japan	
Mine Pollution Control		Ejemplos de Medidas Tomadas para Evitar la Contaminación por Minas Cerrada	JICA-SERNAGEOMIN seminar
	Sem-02	Examples of Measures taken to prevent the contamination by closed mines	
Mine Pollution Control		Experiencia de Planes abandono en Faenas Mineras de Japón	JICA-SERNAGEOMIN Seminar
	Sem-03	Experience of Planning of Mining Works in Japan	
Mine Pollution Control		Gestión Ambiental en las Empresas Mineras - Experiencias en Planes de Abandono	JICA-SERNAGEOMIN Seminar
	Sem-04	Environmental Control in Mining Companies in practice of Planning Closure	
Mine Pollution Control		Marco Legal Actual en Chile, Política Ministerial Referente a Planes de Abandono	JICA-SERNAGEOMIN Seminar
	Sem-05	Actual Leagl Framework in Chile, Ministerial Policy for Mine Closure Planning	
Mine Pollution Control		Permisos Ambientales y Planes de Abandono	JICA-SERNAGEOMIN Seminar
	Sem-06	Environmental Conditions and Mine Closure Planning	
Mine Pollution Control		Técnicas de Construcción para el Cierre Abandono de Faenas Mineras	JICA-SERNAGEOMIN Seminar
	Sem-07	Techniques of construction for the closure of abandoned mine works	

Annex 20 List of Textbooks for Training Courses

Area	Ref. No.	Title : Español / English	Remarks
Mine Safety and Mine Pollution Control	Sem-08	Capacitación en Prevención Riesgos Training in Risk Prevention	Seminar
Mine Pollution Control	Sem-09	Antecedentes Historicos del Control Ambiental en Japón Sector Minero no-ferroso Histry of Environmental Control of nonferrous mines in Japan	Seminar
Mine Safety and Mine Pollution Control	Sem-10	Medio Ambiente y Minería en el Sur de Chile Environment and Mining in South Chile	Seminar
Mine Safety	Sem-11	Contol de Seguridad Minera en Japón Control of Mine Safety in Japan	Seminar
Mine Safety	SI-01	Métod del ANSI para Registrar y Medir la Experiencia en Lesiones de Trabajo Formulation of Monthly Statistics of Accident : ANSI	Workshop on Formulation of Monthly Statistics of Accident
Mine Safety	SI-02	Entrenamiento para Prevención de Accidentes en Minas (KYT) Training for Prevention of Accidents in Mines	Slide and Oral Text
Mine Safety	SI-03	Equipo de Seguridad para Protección interior de mina Equipment for Mine Safety in Mine	Slide and Oral Text
Mine Safety	SI-04	Forma Correcta de Usar la Mascara para Polvo Correct Form of Use of Anti-dust Mask	Slide and Oral Text
Mine Safety	SI-05	Los días que vivió en la Mina - Para la Seguridad de la Demolición Eléctrica Safety from Electrocute	Slide and Oral Text

Annex 20 List of Textbooks for Training Courses

Area	Ref. No.	Title : Español / English	Remarks
Mine Safety	SI-06	Mantener la Seguridad para el Mañana -Conservación y el control de los cables metálicos Conservation and Control of Wire Rope	Slide and Oral Text
Mine Safety	SI-07	Protección de los Accidentes -Seguridad para el trabajo individual- Prevention of Accidents - Safety for One-man work	Slide and Oral Text
Mine Safety	SI-08	Prevención de Accidentes Causados por Desprendimientos -Mina a Cielo Abierto- Prevention of Accidents by Rock Falling	Slide and Oral Text
Mine Safety	SI-09	Procedimientos para Usar Explosivos en Minas de Carbón Procedure of Blasting in Coal Mine	Slide and Oral Text
Mine Safety	SI-10	Responsable eres Tú -Prevención contra Accidentes de Maquinarias de Rodaje para Minas- Prevention of Accidents by Rotating Machinery in Mines	Slide and Oral Text
Mine Safety	SI-11	Vamos a prevenir Accidentes Causados por la Electricidad Estatica Prevention of Accidents caused by Electrostatics	Slide and Oral Text
Mine Safety	SI-12	Inventario de Riesgos Criticos Inventory of Critical Risks	Slide and Oral Text
Mine Safety	SI-13	Elaboración y Análisis de Procedimientos de trabajo Improvement of Work Procedures	Slide and Oral Text
Mine Safety	SI-14	Confección de Procedimientos de trabajo Enforcement of Work Procedures	Slide and Oral Text

Annex 20 List of Textbooks for Training Courses

Area	Ref. No.	Title : Español / English	Remarks
Mine Safety		Gestión de Riesgos en Minería Subterránea	Slide and Oral Text
	SI-15	Risk Control in Underground Mine	
Mine Safety and Mine Pollution Control		Caracterización Ambiental Plantas pequeña Minería III Región	Study
	St-01	Characteristics of Environment of Plants of III Region	
Mine Safety and Mine Pollution Control		Plan Piloto y Capacitación - Pequeña Minería - Retortas de Amalgamación	Study
	St-02	Pilot Plan and Training - Small Scale Mining - Retort of Amalgamation	
Mine Safety and Mine Pollution Control		Diagnostico Minas Rregión de Atacamaa	Study
	St-03	Diagnosis on Mines of Atacama Region	
Mine Safety and Mine Pollution Control		Estudios de Requerimientos de Capacitación	Study
	St-04	Studies on the Requirement for Training	
Technical Transfer		Manuales de equipos Donación Japonesa	List of equipment
	TT-01	Manuals for the Equipment donated by Japan	

Annex 21 Statistics of Accident in Mining Industry of Chile

	1994	1995	1996	1997	1998*
Fatal accident	86	39	56	49	38
Hours lost	4,192	3,292	3,225	3,211	2,228
Number of workers	75,241	82,238	85,903	93,270	96,621
Total man-hours	180,839,837	187,423,940	188,681,451	227,484,816	239,936,917
Days lost	610,271	308,075	413,118	378,734	304,120
Frecuency rate	23.7	17.8	17.4	14.3	9.4
Severity rate	3,375	1,644	2,189	1,665	1,267
Fatality rate	0.48	0.21	0.30	0.22	0.16

Source : SERNAGEOMIN 1999. 3

1998* Provisional

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