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UNIDO Contract No: 05/001

UNIDO Project No: EG/CPR/99/G31

P.O. No: 16000808

Final Report

to

The United Nations Industrial Development Organization (UNIDO)

for the Contract Entitled

Provision of Services Relating to the Development of a 2500 t/d New Dry Process Line for Baojiang Cement Materials Co., Ltd. in the PEOPLE'S REPUBLIC OF CHINA

for the Project

Energy Conservation and GHG Emissions Reduction in Chinese TVEs – Phase II

Chengdu Design and Research Institute of Building Materials Industry Co., Ltd. (CDI)

December 9, 2005

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Contents

1.00 Introduction

This Report serves as the final report for the project *Service Provided for 2500t/d New-style Dry Process Product Line in Newly-built Baojiang Cement Material Corporation in China* (UNIDO Contract No.: 05/001), which is a part of the project "*Energy Saving and Greenhouse Gas Reduction & Exhaustion in Township Businesses—Phase II* (UNIDO project No.: EG/CPR/99/G31)". This Report is prepared by Chengdu Design and Research Institute of Building Material Industry Co., Ltd. (CDI) and is to be submitted to the United Nations Industrial Development Organization (UNIDO).

The Contract for *Service Provided for 2500t/d New-style Dry Process Product Line in Newly-built Baojiang Cement Material Corporation in China ("the Contract")* was signed by and between UNIDO and CDI on April 15, 2005. The Contract aims at supporting Baojiang Corporation to adopt new-style dry process rotary kiln product line, which uses blind coal as fuel. The Subcontractor Chengdu Design and Research Institute of Building Material Industry Co., Ltd. researches and develops raw material pre-heating and decomposing system, key devices of kiln system for *2500t/d New-style Dry Process Product Line for Baojiang Corporation.* CDI has accomplished all the tasks agreed in the Contract, and worked out the final report.

At present, 95% of civil works for the *2500t/d New-style Dry Process Product Line technical improvement project of Baojiang Corporation* have been completed. Devices for raw material milling system, raw material homogenization silo system, coal milling system, kiln head system and mid-kiln system have been almost finished the installation, and that for raw material preheating and decomposing system have been finished the installation. It is predicted that these systems will be built and put into use at the end of March 2006. After completion of the new lines, Baojiang will be able to produce as high as 775,000 tons of clinkers of Portland cement and the quality will also satisfy the new national standard for cement GB175-1999. The standard coal consumption for the clinkers will be 111.43kg/t.cl and the composite power consumption for clinkers production will be 60.00kWh/t. The annual sales revenue will reach RMB 152 million including a tax return as high as RMB 38.5956 million. The total smog and dust emission will be 241.37t/a, 70t/a lower than the present lines. 12,000 tce will be saved compared with the present process and 30,000 tons of CO_2 emission will be reduced with the new lines. Implementation of the Baojiang renovation project will have remarkable economic benefits for businesses and social benefits. It will effectively fill in the present local market blank of new dry-process cements. Advantages in resources will be translated into economic advantages. This will also help to promote the development of local economy, improve the capabilities of local businesses, improve the quality of local products, reduce energy consumption, minimize pollution, improve benefits and promote market competitiveness.

During the implementation of Baojiang renovation project, several enterprises, like Guangdong Guangying Cement Company, Guangdong Gaoyao Jingang Cement Company, Guangdong Gaoming Xuanjiang Cement Company and Guangdong Daming Cement Company, have conducted site visiting and study, which has obtained a good project demonstration effect. The technology of the raw material preheating and decomposing system, which has been researched and developed by CDI for Baojiang Corporation, with the estimated decomposing rate greater than 90%, and the head consumption for clinker burning no greater than 780*4.18kJ/kg. The project has a huge market potential in Guangdong Province, which is short of soft coals but abundant of blind coals.

The subcontractor commenced the sub-project of *Service provided for 2500t/d New-style Dry Process Product Line in Newly-built Baojiang Cement Material Corporation in China* from April 15, 2005. The subcontractor has received invaluable support and assistance from the Project Management Office (PMO) in Beijing, Beijing Hongyuan Energy and Environmental Protection Technology Co., Ltd. (PTPMC), and the UNIDO.

The Subcontractor undertakes three tasks in accordance with the Contract. This Report is prepared based on activities completed and results achieved from April 15 of 2005 to late November of 2005. This Report consists of:

a. A summary of the progress of the tasks against the Overall Schedule, and

b. Appendices, regarding results of tasks, and the Confirmation Letter of CDI services from Baojiang Cement Material Corporation, and the site live-action photographs.

2.00 Summary of Progress

According to the Contract and the Proposal, we undertake the tasks of

(1) Research of the properties of blind coals, in particular the physical and chemical properties, combustion properties and impacts of blind coals to be used by Baojiang,

(2) Analysis of the research results of the properties of blind coals, cold model test, tooling effect evaluation, determination of the specification of the raw material preheating and decomposition system, and development of a raw material preheating and decomposition system appropriate for Baojiang's use of blind coals as fuels.

(3) Provision of the general plan and shop drawings of equipments for raw material preheating and decomposition system to Baojiang

On April 18, 2005, Mao Shengrong and Fan Qiongzhang, respectively the Project Manager and the Project Technical Consultant of Chengdu Design and Research Institute of Building Material Industry Co., Ltd had a discussion with relevant experts from the Project Management Office (PMO) and Beijing Hongyuan Energy and Environmental Protection Technology Co., Ltd. in Beijing. CDI gave a brief on the preliminary organization and preparation for the project, including institutions for completion of the Contract and ways and methods for completion of three tasks, etc.

CDI organized following experts to complete this project. Mao Shengrong is the Project Manager, and Fan Qiongzhang is the Project Technical Consultant:

CDI Technical Center: Chen Tao, Jin Zhisheng, Sun Qiaoling

CDI Mechanical Institute: Ai Hansong, He Yunlong, Li Chenxiang, Ma Yongquan, Xiao Yong

CDI Electric Automation Institute: Xie Bo

CDI Engineering Economy Institute: Yi Mei

Expert Evaluation Panel (Non-CDI personnel): Fang Jian'an, Ge Guanjun, Li Hong

CDI Project Group has accomplished the following tasks by the end of November 2005:

2.01 Task 1: Study on the Properties of Anthracite

The project team has done the following work:

1) Test on physical and chemical features of anthracite

The Chengdu Design and Research Institute of Building Materials Industry Co., Ltd. (CDI) carefully performed industrial and chemical analysis on

three anthracites, respectively called A (provided by Mr. Guan), B (supplied by Mr. Hou), and C (from Hunan) in this Report, which are planned to be used for the 2500 t/d New Dry Process Line for Baojiang Cement Material Corporation, in order to determine water content, volatile content, ash content, fixed carbon, calorific value, and chemical composition of coal ash. See the following for main test results:

Result of Industrial Analysis on anthracite (%)

Item	Mad	Vad	Aad	FCad	St,ad	Qnet.ad/(kJ/kg)	
						Calculation	Measurement
A	2.10	6.01	18.54	73.36	0.25	26607	26437
B	2.14	6.06	16.28	75.52	0.31	27384	27478
C	1.92	6.00	22.28	69.80	0.34	25339	24618

Chemical Composition of Coal Ash (%)

LOSS	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	K_2O	Na_2O	Cl^-	Total
	51.05	27.47	9.08	6.33	2.60	1.14	1.18	1.16		100.00

The industrial analysis shows that volatile contents in the three anthracites are low, approximately 6%; ash content is lower than 22%. Therefore, the calorific value of the three anthracites are all high (>24500kJ/kg) while their sulfur contents are not high. The three anthracites are all low-sulfur coal, so they are beneficial to the new dry production.

2) Test on burning nature of the anthracite

Suspension method is adopted in burning nature tests of the three anthracites –A (provided by Mr. Guan), B (supplied by Mr. Hou), and C (from Hunan) – planned to be used in Baojiang Cement Material Corporation. Coal fines stably suspend in the thermal current for reaction. As the coal fines react, the gas components keep changing. Use the gas analyzer as online detection of the reaction process. Use computer to make dynamic compensation to the measured data, thus to obtain stable instantaneous reaction curve. The test results show: the actual burning flame temperatures of the three anthracites are all over 1920°C, which is favorable to the new dry process. The three anthracites are all difficult to burn. Their ignition temperatures are high, at 740°C~760°C and they have poor flammability. Within normal operating temperature range of the decomposing furnace, burnout takes very long time. This shall be considered in design of the furnace, to leave adequate redundancy and guarantee enough stay time.

CDI completed burning nature test on the anthracites at the end of April. For test conclusion, see Appendix A.

2.02 **Task 2: R&D of a raw material preheating and decomposing system applicable to using anthracite as fuel in accordance with actual conditions of the Project (R&D of equipment)**

1) Performance research result analysis and primary determination of specifications for the raw material preheating and decomposing system

On the basis of nature study of anthracite, through result analysis, technical investigation and process calculation, and with the experience from similar projects, CDI primarily determined specifications of the raw material preheating and decomposing system on May 5, making it ready for cold mode experiment and effect evaluation of equipments and for final determination of R&D plan.

For the specifications of raw material preheating and decomposing system primarily determined by CDI, see Appendix B.

2) Cold mode experiment and effect evaluation of equipments

According to the primarily determined specifications of raw material preheating and decomposing system, CDI made the models of cyclone preheater and decomposing furnace for cold mode test in the proportion of 1: 16. The cyclone preheater and decomposing furnace are tested under different operating conditions in terms of resistance characteristic, three-dimensional flow field, moving principle of material, and separating efficiency of cyclone preheaters at different degrees, so as to make further analysis and improvement, thus to reduce the resistance loss and save electricity consumed by burning.

Being careful with and responsible to this Project, CDI specially established an expert evaluation team and invited three famous domestic experts in the field of cement – Fang Jian'an, chief engineer of Sichuan Guang'an Building Material Group; Ge Guanjun, general manager of Lafarge Dujiangyan Cement Co. Ltd.; and Li Hong, manager of Guangdong Tapai Cement Group – to evaluate and demonstrate the primarily determined raw material preheating and decomposing system on May 12, 2005, to ensure an optimal technical plan and more effectively ensure realization and success of this Project. Minutes were taken for this evaluation and demonstration meeting.

See Appendix C for the minutes.

3) Final determination of R&D plan

With recommendations from the evaluation and demonstration meeting, CDI decided the final R&D plan on May 13, 2005 and determined specifications of the preheater and decomposing furnace, which provided all prerequisite information for the mechanical technicians to design General Plant Drawings and Shop Drawings for the raw material

preheating and decomposing system.

For final specifications of the raw material preheating and decomposing system determined by CDI, see Appendix D.

2.03 Task 3: Provide the company with General Plant Drawings and Shop Drawings for the raw material preheating and decomposing system

1) Design of General Plant Drawings draft and Shop Drawings draft

In accordance with the determined final R&D plan, Ai Hansong, He Yunlong, Li Chenxiang and Ma Yongquan, the mechanical technicians among the CDI expert team for design of the General Plant Drawings and Shop Drawings, with cooperation of Xiaoyong (a furnace technician) and Xie Bo (an electrician), completed design of General Plant Drawings draft and Shop Drawings draft such as the General Layout Plan, C1~C5 5-Stage Preheater Drawings, Decomposing Furnace Drawing, Preheater Feeding Pipe Drawings, and Feeding Cone Drawings for the Raw Material Preheating and Decomposing System on June 15. The 4 sets of drawings were posted to and accepted by Baojiang Cement Material Corporation.

The Plant Drawings of Raw Material Preheating and Decomposing System for Baojiang Cement Material Corporation: CR391.

Equipment name: CDCS-R2515 5-Stage Preheating and Decomposing System

Drawings finished in this stage: 4 pages of General Layout Plan (CR391a~CR391d), 5 pages of Preheater Feeding Pipe Drawings (CR391-1~CR391-5), 1 page of Decomposing Furnace to 5-Stage Windpipe Drawing (CR391-5), 5 pages of Preheater Drawings (CR391.01~CR391.05), 1 page of Decomposing Furnace Drawing (CR391.06), 1 page of Feeding Cone Drawing (CR391.07), together with Contents (CR391-TM), totally 18 natural pages, equaling to 25.125 pages in 1# size (594x841mm). For Drawing List, see Appendix E.

2) Design of Plant Shop Drawings and Ancillary Parts Drawings

CDI has completed design of Plant Shop Drawings and Ancillary Parts Drawings (including drawings for drilling of measuring point for electric automation) for the raw meal preheating and decomposing system on July 20th, as well as Masonry Drawings for Refractory, which have been posted to and accepted by Baojiang Cement Material Corporation for its processing, fabrication and installation.

According to our planned working schedule, the design of Plant Shop Drawings and Ancillary Parts Drawings was supposed to be finished on July 2nd. Due to plenty workload on drawing design, it was not completed until July 20th. We regret for such delay.

Drawings finished in this stage: 64 natural pages of Plant Shop Drawings and Ancillary Parts Drawings, equaling to 71.250 pages in 1# size (594x841mm); 23 natural pages of Standard Parts Drawings, equaling to 10.625 pages in 1# size (594x841mm); Installation and Operation Instruction. 41.750 pages of Masonry Drawings for Refractory in 1# size (594x841mm).

Plant Shop Drawings and Ancillary Parts Drawings are massive. Therefore, this report only provides the list of drawings.

See Appendix F for List of Plant Shop Drawings for CDCS-R2515 5-Stage Preheating and Decomposing System

See Appendix G for List of Standard Parts Drawings for CDCS-R2515 5-Stage Preheating and Decomposing System

See Appendix H for List of Installation and Operation Instruction for CDCS-R2515 5-Stage Preheating and Decomposing System

See Appendix I for List of Refractory Drawings for CDCS-R2515 5-Stage Preheating and Decomposing System

3) Compiling Final Progress Report Draft

By late July, preliminary works has almost been finished. Baojiang Cement Material Corporation is satisfied with the service provided by us. See Appendix J for details.

We have compiled a Final Progress Report Draft on progress of the whole project and performance of the Contract which has been submitted to UNIDO and PMO of the Ministry of Agriculture in Beijing for approval.

4) Project Summary, Compiling Final Report

After Baojiang Cement Material Corporation gets familiar with the Plant Shop Drawings and Ancillary Parts Drawings, the Project Management Department shall arrange a Technical Clarification at CDI which is to be carried out by Ai Hansong, He Yunlong, Li Chenxiang, Ma Yongquan, Xiao Yong and Xie Bo on August 19. For the minutes for Technical Clarification meeting, see appendix K.

Because of the financing shortage of Baojiang Corporation, the devices for raw material preheating and decomposing system have just been finished manufacture and installation at the end of November. For the site live-action photographs, see Appendix L.

After completion of the service, the Project Manager will go to PMO of the Ministry of Agriculture in Beijing for a 2-day summary presentation on November 21st.

Finally, compile and submit the final report, based on the draft of final

progress report, approved by UNIDO and PMO of the Ministry of Agriculture in Beijing.

Appendix A: Conclusion of the anthracite burning nature test

CDI made burning feature test of anthracites from three mines that were proposed by Baojiang Cement Material Corporation. The following conclusions are got from the test result:

a. It can be seen from the industrial analysis that, the volatile contents of the three anthracites are low, less than 6%; ash content is less than 22%. Therefore, the calorific value of the three anthracites are all higher (>24500kJ/kg). Besides this, their sulfur contents are not higher. The three anthracites are all low-sulfur coal, so they are beneficial to the new dry production;

b. It can be seen from the ignitability test that, the three anthracites are all difficult to burn. Their autogenous ignition temperatures are high, i.e. 740℃~760℃, and they have high ignition requirement. Therefore, a standby bituminite cabin should be added in the engineering design, so that the anthracite will not be burnt until the temperature of the bituminite rises to a certain degree, which will reduce the ignition cost.

c. From the result of burnout feature test that is done at different temperatures, it can be seen that none of the three anthracites is combustible. Their burnout rates are all obviously low at the temperature of 850℃. Their reaction accelerating region is above 1000℃.

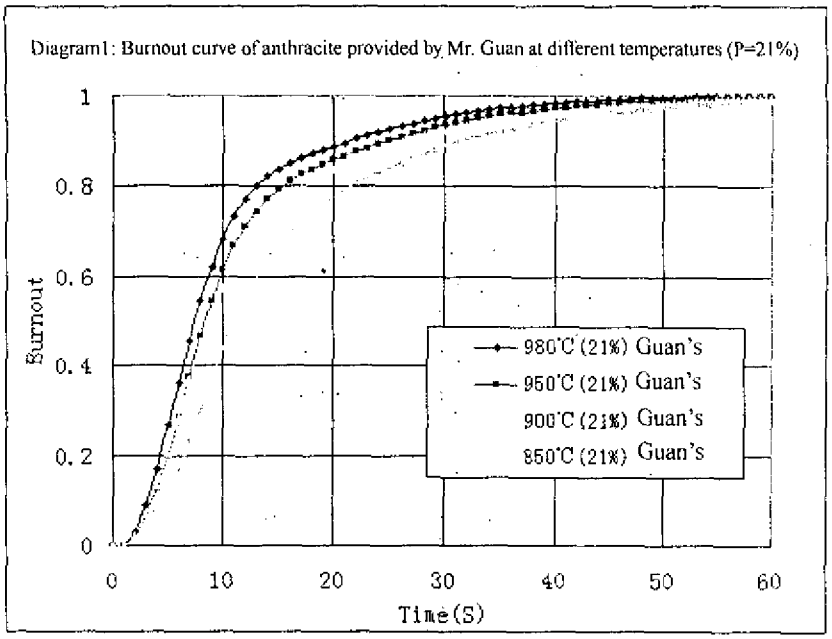
d. Calculating according to mathematical model, their average actual burning flame temperature is above 1920℃. Their burning temperature is high and can greatly satisfy the art requirements. Therefore, they have high utility value.

e. Comparing the burnout features of the three anthracites at the temperature of 850, 900, 950 and 980℃, it can be found that, the difference of reaction feature mainly lies on the dynamic features, i.e. the difference of activation energy. The activation energy of anthracite A is lowest, while that of anthracite C is highest.

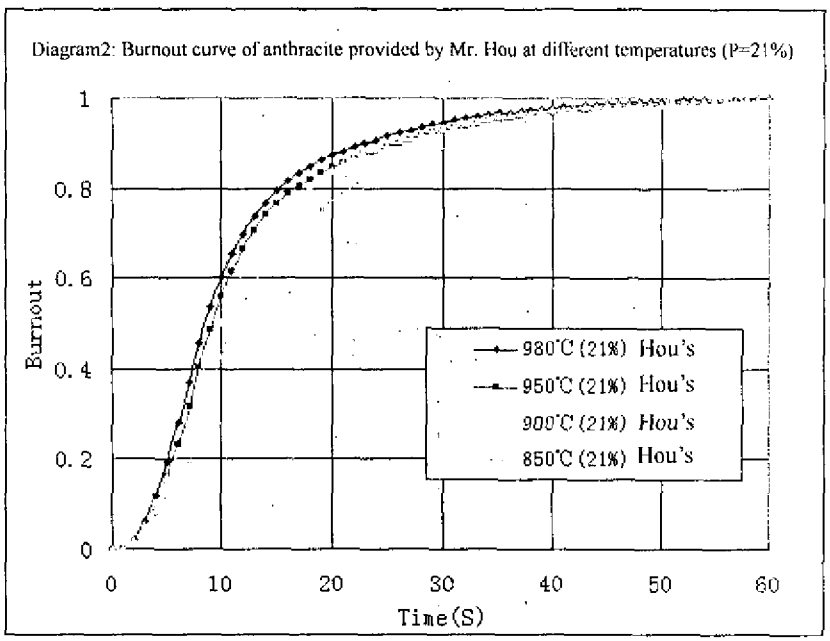
   The below four diagrams are the burning feature curves of the three anthracites at different temperatures and in pure air, and the comparison of their burnout features at 980℃ and in pure air. In the diagrams, the highest temperature has reached 980℃, the abscissa is the reaction time and the ordinates is the burnout rate.

f. Because the three anthracites are difficult to burn, their burnout time will be long in the normal operating temperature area of the decomposing furnace. Therefore, when designing the decomposing furnace, much attention must be paid to this and enough margins must be left. From the burning feature curves, it can be seen that the burnout rates of the three anthracites do not rise apparently until 980℃. This shows that the burning reaction is always at the incipient region of the dynamic burning area and does not reach the reaction-accelerating region. From the burning rate curves, it can be seen that the burnout rate increases obviously above 1000℃. However, the decomposing furnace is a fluidized bed reactor and

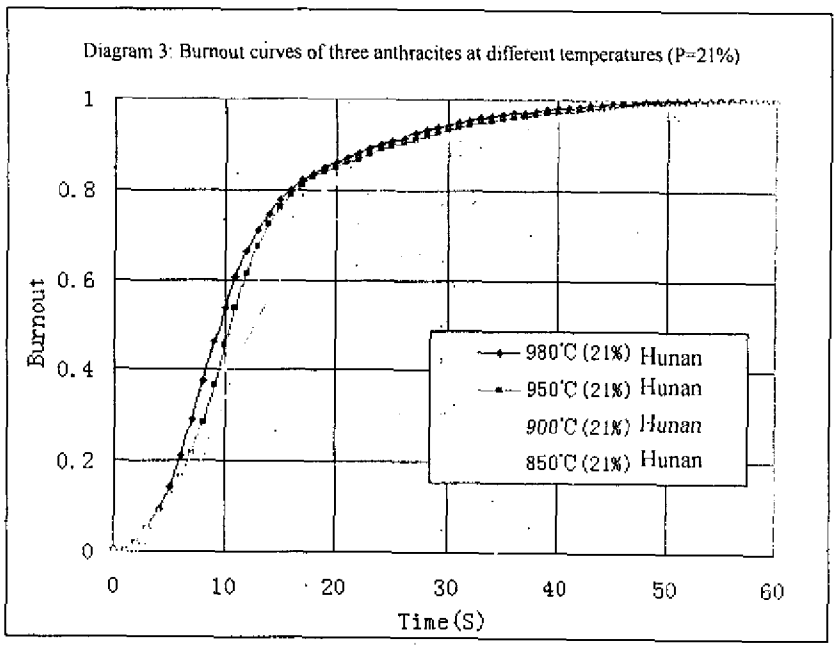
materials are in the state of fluid. Too high temperature will make the control of operation difficult and thus also unrealistic. Because the burning mechanisms of anthracites are different in the operating temperature area of the decomposing furnace and in the temperature area at the head of the kiln, that is, diffusion does not play the main role in the temperature range of the decomposing furnace, the effect is not obvious to reinforce the burning of anthracite by improving the structure of the burner. The only solution is to prolong the length of stay of anthracite in the decomposing furnace. Therefore, enough length of stay should be guaranteed when designing the decomposing furnace.



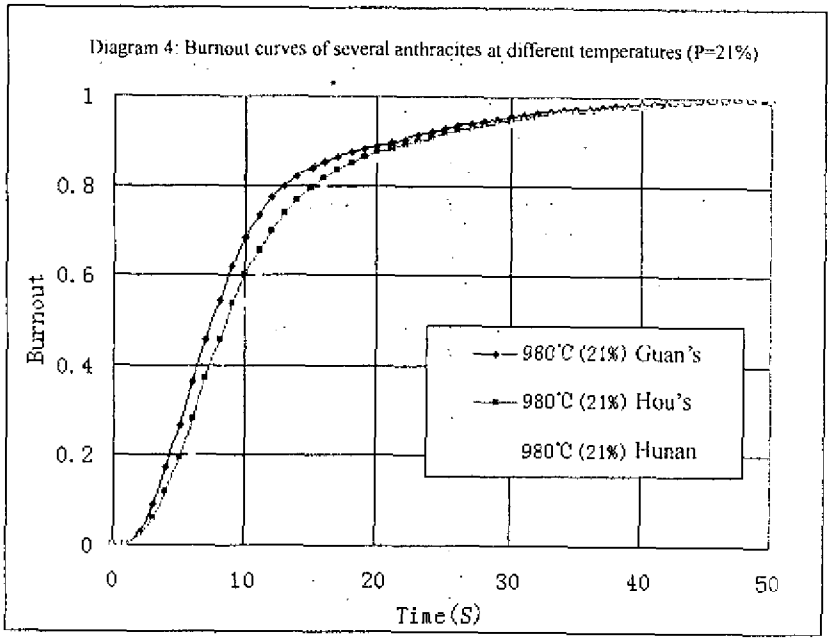
Anthracite A: Mr. Guan's Coal



Anthracite B: Mr. Hou's Coal



Anthracite C: Mr. Coal from Hunan



Anthracite A, B & C

Appendix B: Basic specification of preheating and decomposing system

The Basic specification of preheating and decomposing system determined by CDI is shown as follows:

a. Factors for preheater

Sizes for preheater (clearance)

Item / level	Diameter of cylinder D	Width of entrance a	Height of entrance b	Height of straight cylinder c	Diameter of inner cylinder d	Angle of cone	Height of inner cylinder f	Central distance of entrance g
C5	6640	2500	4400	3200	3900	70/60°	2200	3674.7
C4	6640	2420	4400	2200	3900	70/60°	2000	3714.7
C3	6140	2400	4160	2010	3680	70/60°	1870	3478.1
C2	6140	2260	4060	2480	3680	70/60°	2560	3548.1
2-C1	4220	1380	2760	6120	2110	70°	3260	2621.8

Item / Level	Diameter of blanking entrance h	Distance of cochlea center I	Diameter of connecting conduit j	Height of straight section of entrance k	Radius of Center □ R1	Radius of Center □ R2	Radius of Center □ R3	Location of feed-in point L
C5	800	470	3560	2487.6	3320	3790	4454.7	≥2000
C4	800	470	3440	2487.6	3320	3790	4454.7	≥2000
C3	800	471	3400	2243.5	3070	3541	4207.1	≥2000
C2	800	471	3180	2143.5	3070	3541	4207.1	≥2000
2-C1	600	352	2110	1327.7	2110	2462	2959.8	≥2000

Note: the value of "k" can be got from calculation for other values.

b. Factors for decomposing furnace

SB、SC volume: 209.54m^3;

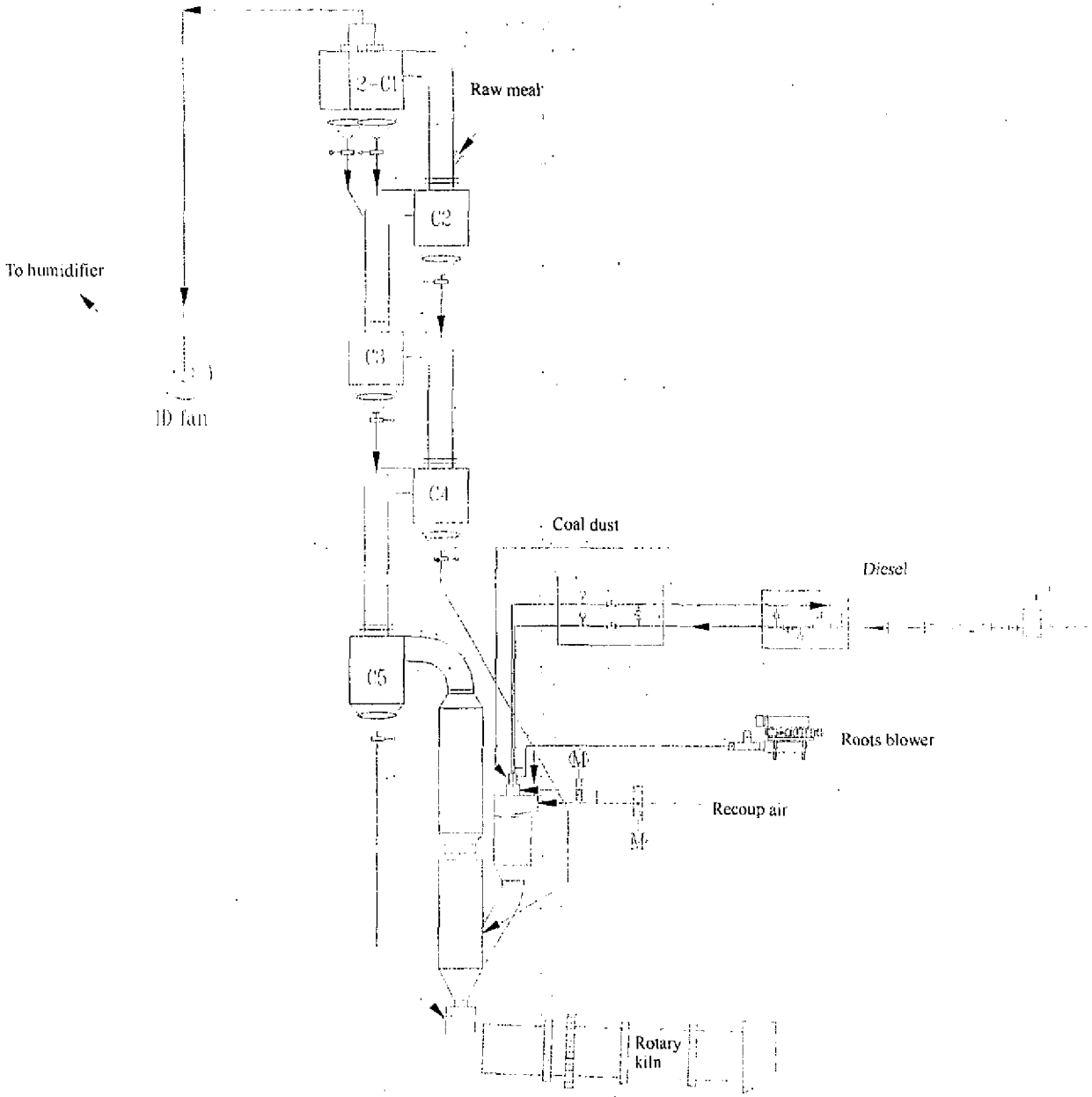
MC volume: 717.33m^3;

Volume of outlet conduit of decomposing furnace: 288.30m^3;

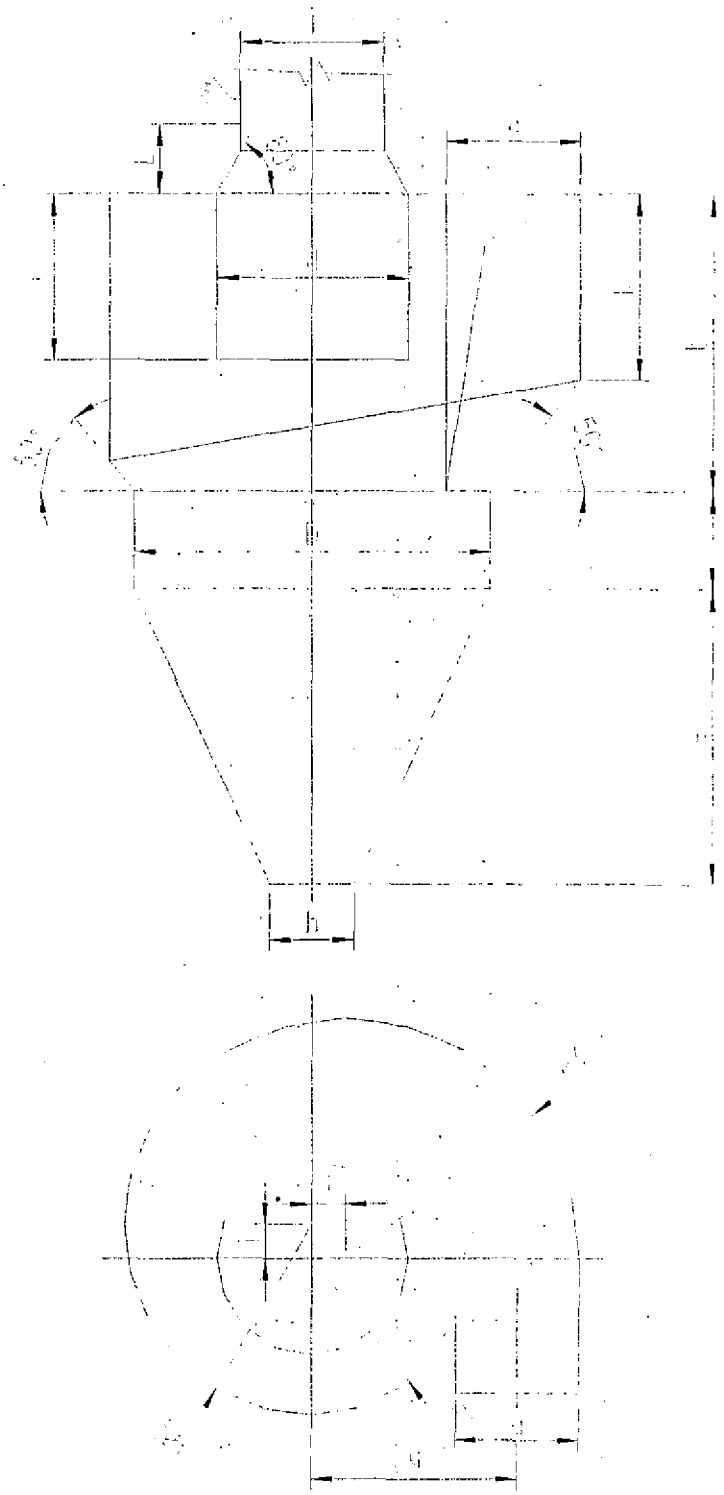
Total volume: 1215.17m^3;

Total length of stay for gas: 7.94s;

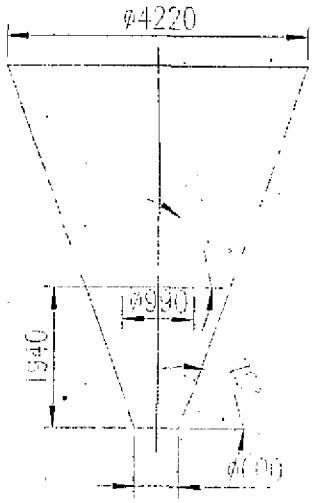
Total length of stay for material: 35.07s.



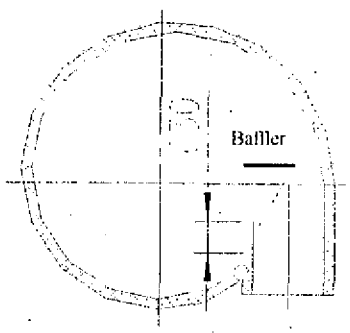
Flow Chart of Raw Material Preheating and Predecomposing System



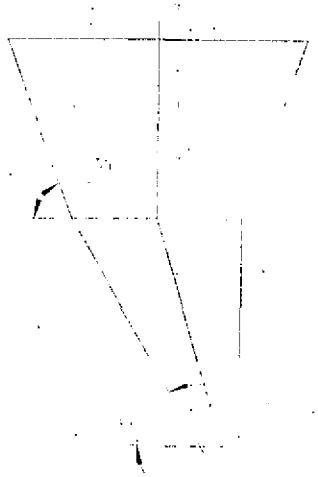
Outside Drawing of Preheater .



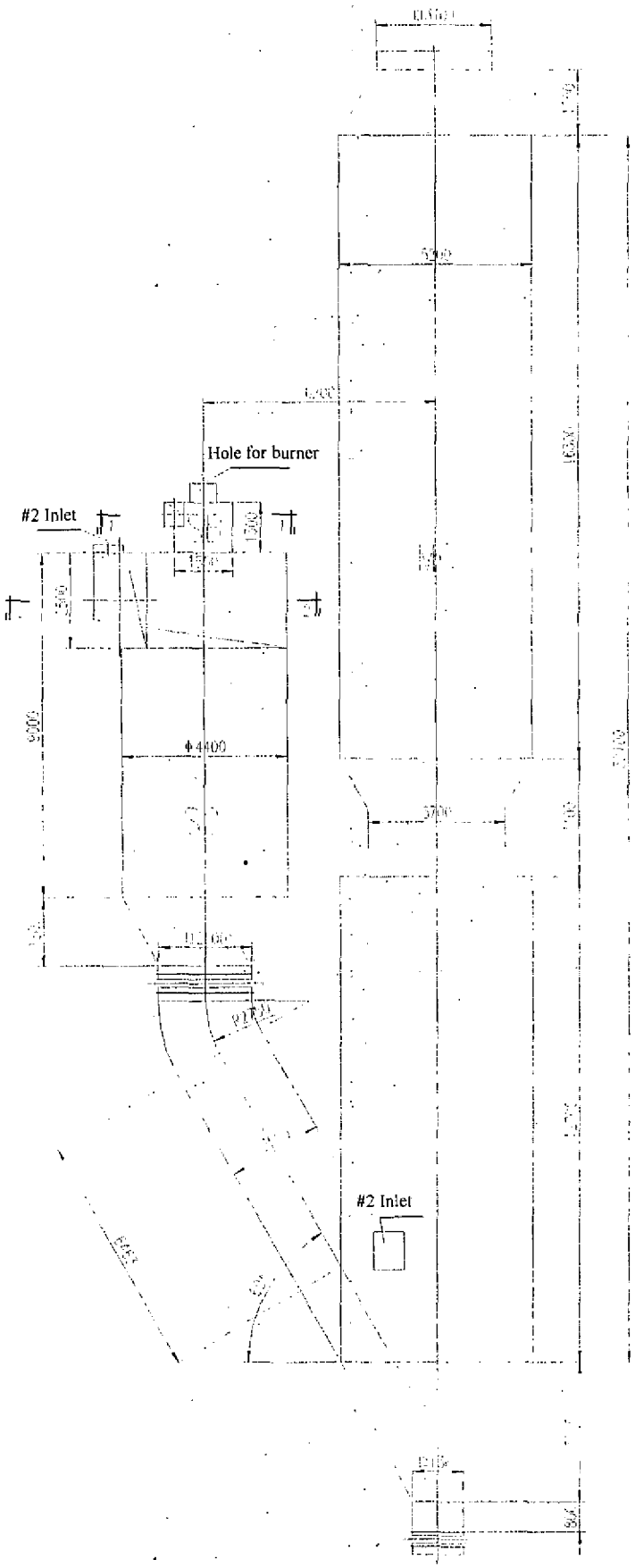
C1 Size of Reflecting Cone



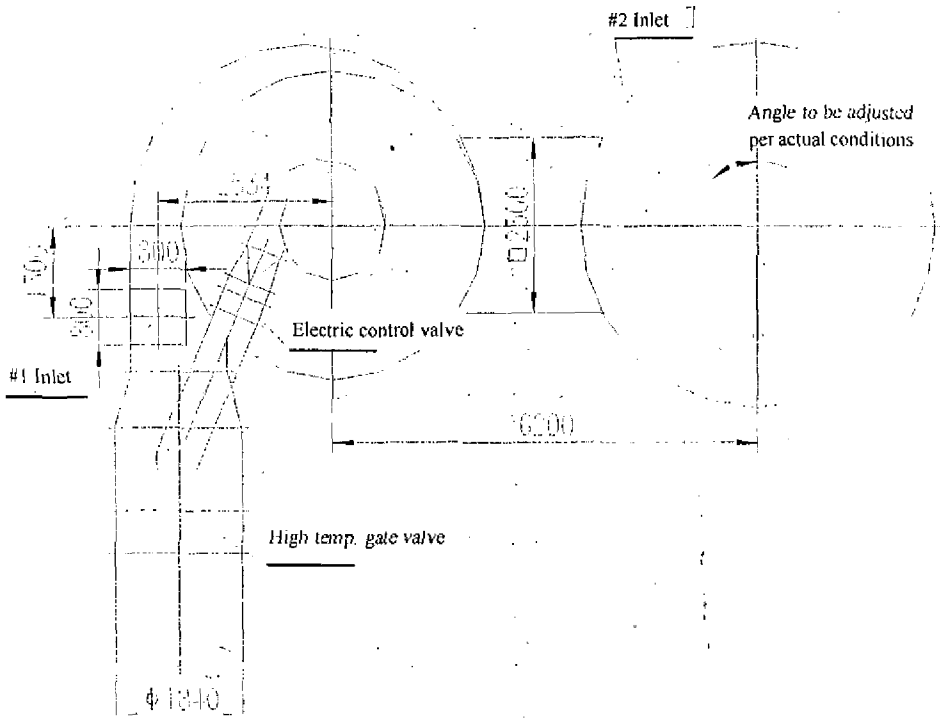
C1 Arrangement Graph of Guide Plate



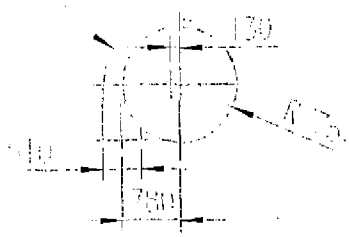
C1 Sketch Map of Oblique Cone



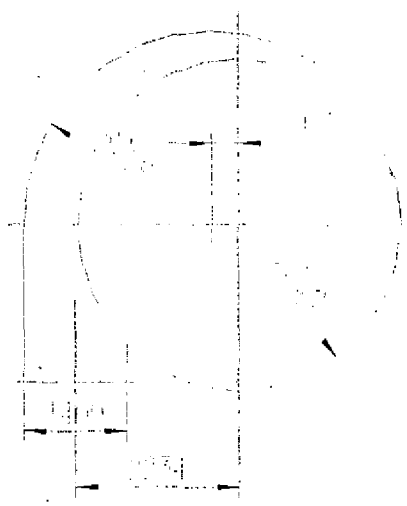
Specification Diagram of decamping furnace



Layout Chart



1—1 Section



2—2 Section

Appendix C: Minutes of Evaluation and Argumentation Meeting

Minutes of the Meeting

Location: CDI, Chengdu

Date: May 12, 2005

Attendance:

Evaluation experts:

Fang Jian'an, chief engineer of Sichuan Guang'an Building Material Group

Ge Guanjun, general manager of Dujiangyan Faraji Cement Co. Ltd.

Li Hong, director of Production Department in Guangdong Ta Brand Cement Group

Baojiang Cement Material Corporation: Liu Guangsheng, factory director

CDI: Mao Shengrong

Fan Qiongzhang

Chen Tao

Jin Zhisheng

Ai Hansong

He Yunlong

Li Chenxiang

Ma Yongquan

Subject of the meeting: Evaluating preheating and decomposing system for Baojiang Cement Material Corporation

Mr. Mao Shengrong, the project manager of the party that undertakes the contract, made a speech on the research procedure of the raw material preheating and predecomposing system and itsprimary result and introduced the specifics of the system with AUTOCAD.

That was followed by statements and discussions, which included ideas and suggestions for designing the equipment. Many of the suggestions are deserved for further consideration of the contractor. Agreements are achieved on the following aspects:

1. Evaluated and argued the perfection, performance reliability, diffusion degree of raw material and suitability to anthracite of raw material preheating and predecomposing system put forward by CDI. It is agreed that the system

resistance feature, three dimensional flow field, material moving principle, standing time ratio of material and gas, and separating efficiency of cyclone preheater at all levels are ideal and can be used as design basis of the equipment.

2. It is suggested to change the separation angle between the connecting pipe of SC and MC of CDCR decomposing furnace and the horizontal direction from 60°to 50°. While maintaining the top height of SC, the SC can extend about 2.2m downward to prolong the length of stay for material.

3. It is suggested to design a 250mm long horizontal pipe above the end of the connecting pipe of SC and MC, in order to change the direction of wind at the place and reduce the resistance for wind when it changes direction from upward to downward.

4. It is suggested to change the square tube at the exit of MC to round tube, with the premise that the air speed inside the outlet conduit of MC almost does not change.

5. Try to make C_4 raw material to move along the wall when entering the cyclone room, so as to form the central high temperature zone in the cyclone room and make it easy for coal dust to ignite.

6. Since agglomeration are easy to occur at the sloping bottom of the connection pipe between cyclone room and spurting room, it is suggested to set three air cannons at the bottom of the connecting pipe. The placement of air cannon is similar to the smoke room at the end of the kiln. At the same time, material-poking holes are set at both sides of the connecting pipe.

7. After adjustment, the furnace capacity of the decomposing furnace (including the pipe) should be 1259.67m^3, the length of stay for gas should be 8.29s, and the length of stay for material should be 36.86s. The furnace can ensure that decomposing rate is larger than 90%, and the head consumption for clinker burning is no larger than 780*4.18kJ/kg.

Appendix D: Final Specification of Raw Material Preheating and Decomposing System

After evaluation and argumentation, the final specification of raw material preheating and decomposing system determined by CDI is shown as follows:

a. Factors for preheater

Sizes for Preheater (clearance)

Item / level	Diameter of cylinder D	Width of entrance a	Height of entrance b	Height of straight cylinder c	Diameter of inner cylinder d	Angle of cone	Height of inner cylinder f	Central distance of entrance g
C5	6640	2500	4400	3200	3900	70/60°	2200	3674.7
C4	6640	2420	4400	2200	3900	70/60°	2000	3714.7
C3	6140	2400	4160	2010	3680	70/60°	1870	3478.1
C2	6140	2260	4060	2480	3680	70/60°	2560	3548.1
2-C1	4220	1380	2760	6120	2110	70°	3260	2621.8

Item / Level	Diameter of blanking entrance h	Distance of cochlea center I	Diameter of connecting conduit j	Height of straight section of entrance k	Radius of Center R1	Radius of Center R2	Radius of Center R3	Location of feed-in point L
C5	800	470	3560	2487.6	3320	3790	4454.7	≥2000
C4	800	470	3440	2487.6	3320	3790	4454.7	≥2000
C3	800	471	3400	2243.5	3070	3541	4207.1	≥2000
C2	800	471	3180	2143.5	3070	3541	4207.1	≥2000
2-C1	600	352	2110	1327.7	2110	2462	2959.8	≥2000

Note: the value of "k" can be got from calculation of other values.

b. Factors for decomposing furnace

SB、SC volume: 230.37m^3;

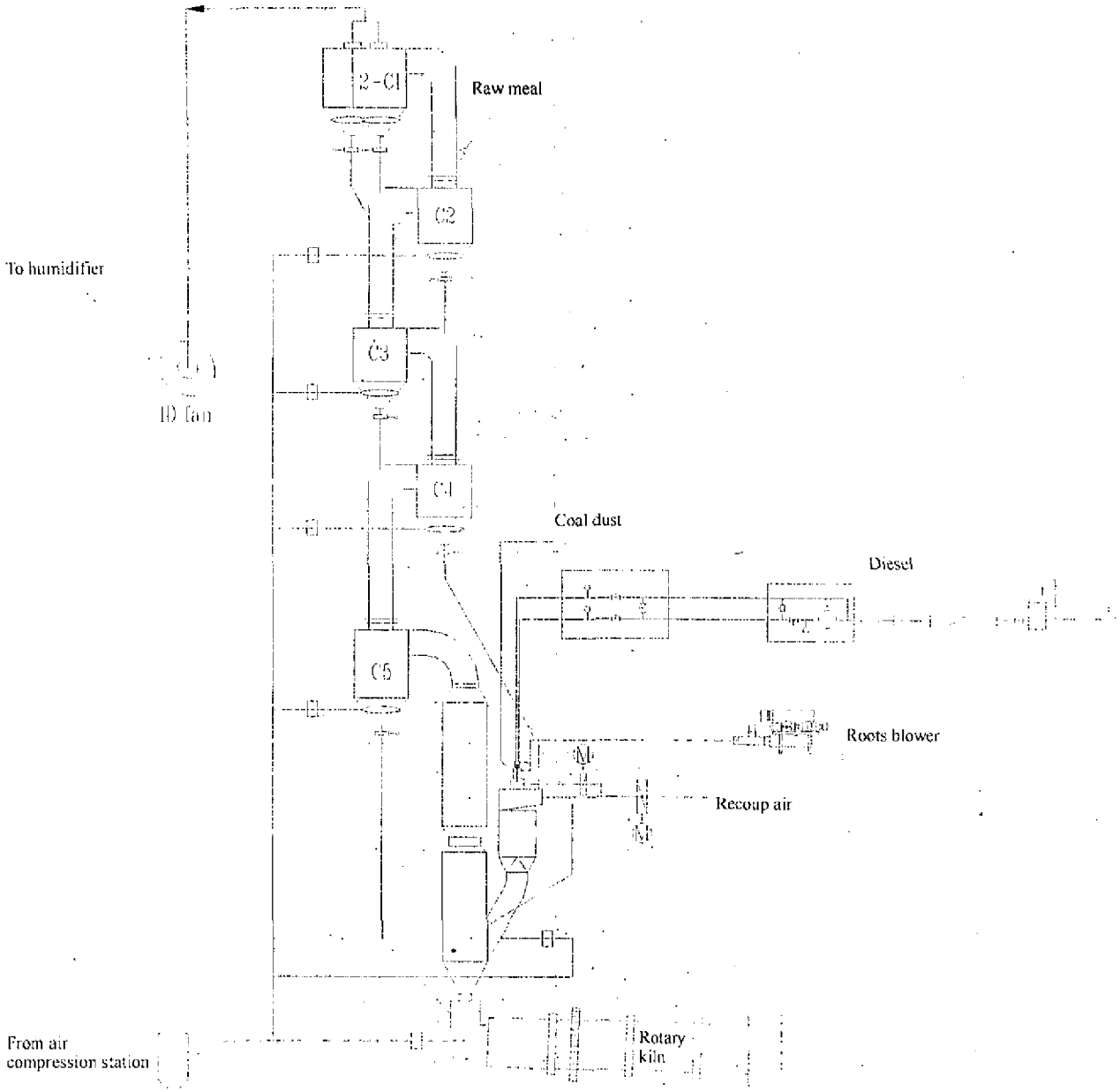
MC volume: 740.66m^3;

Volume of outlet conduit of decomposing furnace: 288.64m^3;

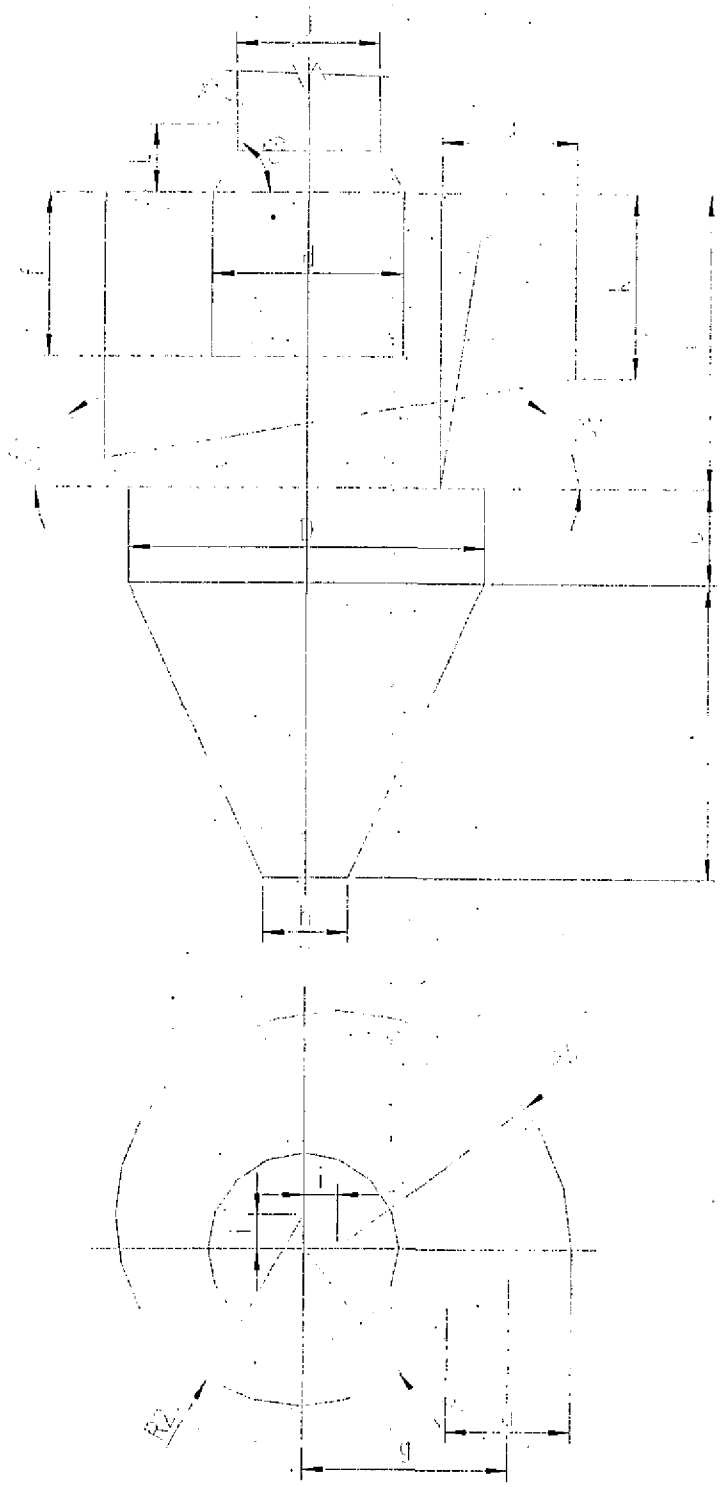
Total volume: 1259.67m^3;

Total length of stay for gas: 8.29s;

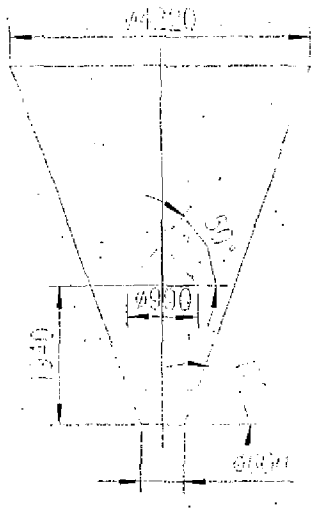
Total length of stay for material: 36.86s.



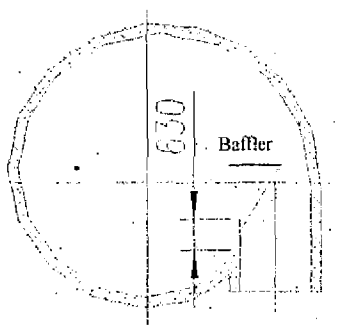
Flow Chart of Raw Material Preheating and Predecomposing System



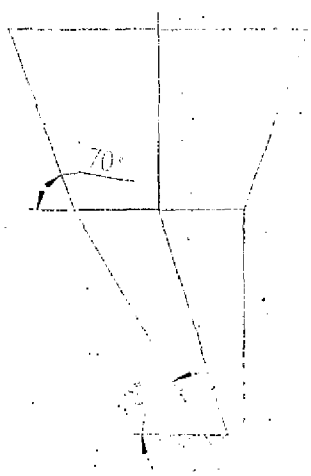
Outside drawing of preheater



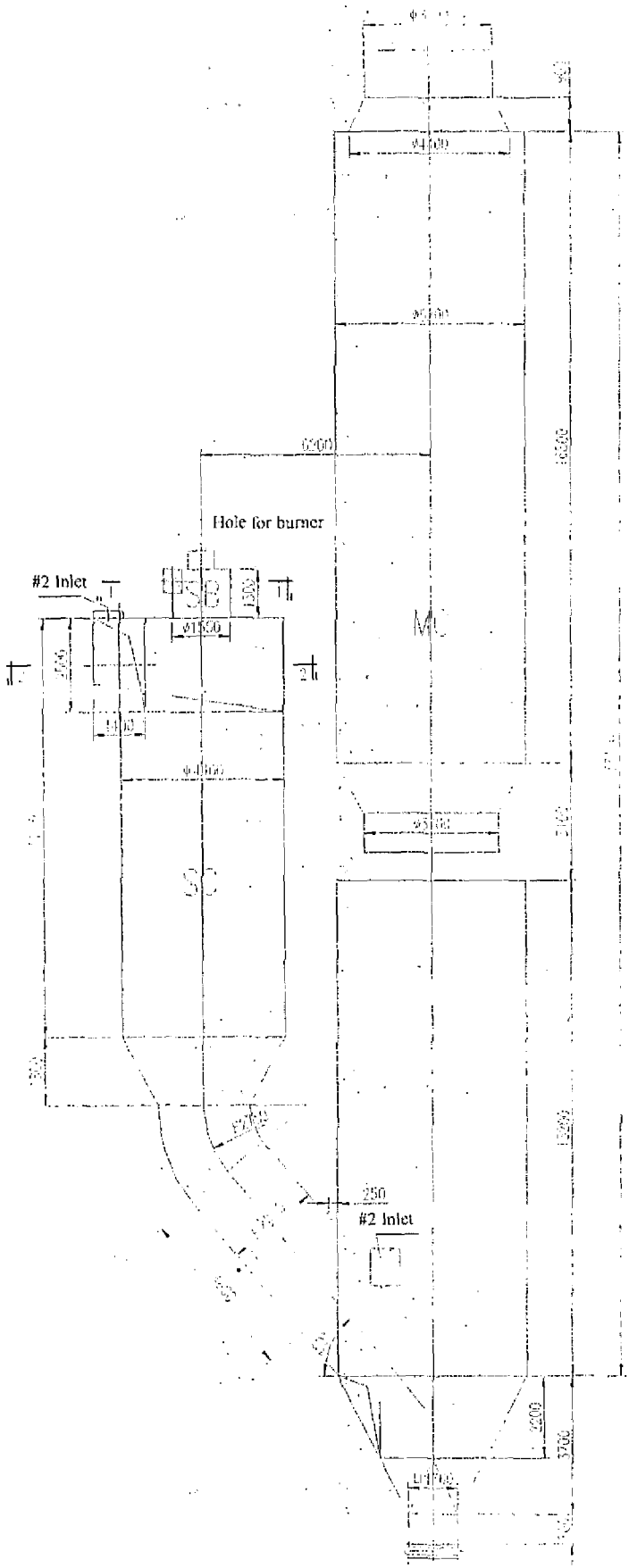
C1 . Size of reflecting cone



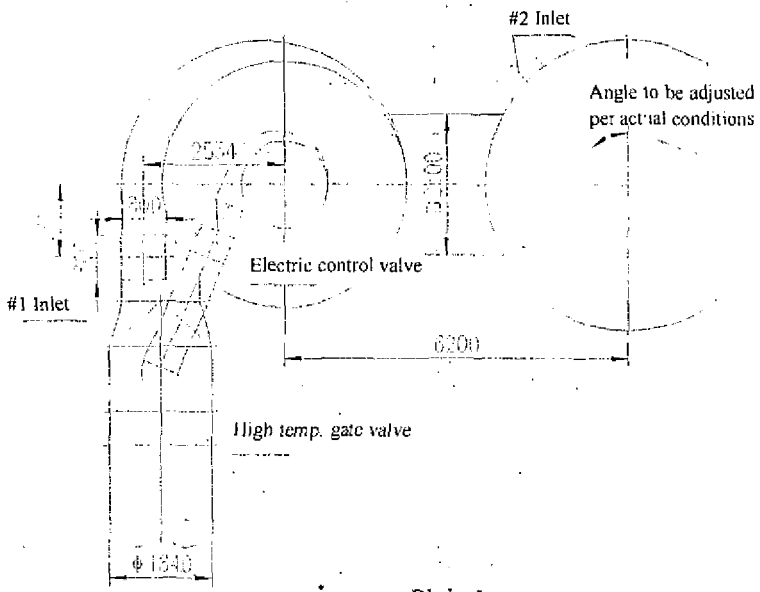
C1 Arrangement graph of guide plate



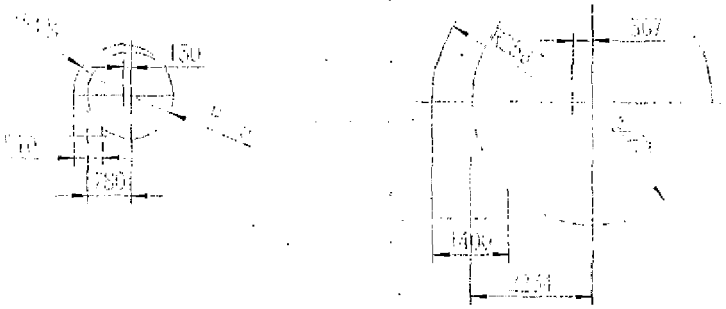
C1 Sketch map of oblique cone



Specification Diagram of Decomposing Furnace



Plain Layout



1-1 Section

2-2 Section

Note:

1. The plain relative places of preburning room and decomposing room can revolve.
2. The third wind entrance of preburning room can revolve.
3. 2# material feeding entrance of decomposing room can revolve.
4. The size of the hole of burner is determined after the equipment is ordered.
5. The change of above places should be discussed with art professionals
6. The present height of 1.3m for the preburning room can be appropriately increased by mechanical professionals.

Appendix E: Drawings for CDCS-R2515 5-Stage Preheating & Pre-decomposition System

CDI	**Chengdu Design and Research Institute of Building Material Industry Co., Ltd.**				
Approval	Ma Yongquan	Compilation	Li Chenxiang	Date	2005.06
Description	CDCS-R2515 5-Stage Preheating & Pre-Decomposition System				
Phase	Shop Drawing	Drawing No.	CR391-TM	Version	

No.	Drawing No.	Drawing Name	Edition	Equal to number of 1# drawing pages: 25.125	Remark
1	CR391-TM	Drawings contents		0.125	
2	CR391a	General drawing I		2	1: 100
3	CR391b	General drawing II		2	1: 100
4	CR391c	General drawing III		1.375	1: 100
5	CR391d	General drawing IV		1.375	1: 100
6	CR391-1	CNC2511laying off pipe		1	1:50
7	CR391-2	CNC2512laying off pipe		1	1:30
8	CR391-3	CNC2513laying off pipe		1	1: 30
9	CR391-4	CNC2514laying off pipe		2	
10	CR391-5	CNC2515laying off pipe		2	
11	CR391-6	Decomposition furnace to 5-Stage air duct		2	
12	CR391.01	CNC2511preheating equipment		1.25	
13	CR391.02	CNC2512preheating equipment		1	
14	CR391.03	CNC2513preheating equipment		1	
15	CR391.04	CNC2514preheating equipment		1	
16	CR391.05	CNC2515preheating equipment		1	
17	CR391.06	L251 decomposition furnace		2	
18	CR391.07	Laying off cone		2	
19				25.125	
20					
21	Total:	Natural number of drawing pages: 18			
22		Equal to number of 1# drawing pages: 25.125			
23					

Appendix F: Shop Drawings for CDCS-R2515 5-Stage Preheating & Pre-decomposition System

	Chengdu Design and Research Institute of Building Material Industry Co., Ltd.				
Approval	Ma Yongquan	Compilation	Li Chenxiang	Date	2005.07
Description	CDCS-R2515 5-Stage Preheating & Pre-Decomposition System				
Phase	Shop Drawring	Drawing No.	CR391 YD - TM	Version	B

No.	Drawing No.	Drawing Name	Version	Equal to number of 1# drawing pages	Remark
1	CR391 YD -TM	Drawings contents	B	0.375	Previous version: A
2	CR391 YD a	General drawing I	B	2	Previous version: A
3	CR391 YD b	General drawing II	B	1.375	Previous version: A
4	CR391 YD c	General drawing III	B	1.375	Previous version: A
5	CR391 YD d	General drawing IV	B	2	Previous version: 0
6	CR391-1	CNC2511laying off pipe		1	
7	CR391-2	CNC2512laying off pipe		1	
8	CR391-3	CNC2513laying off pipe		1	
9	CR391-4	CNC2514laying off pipe	E	2	Previous version: A
10	CR391 YD -5	CNC2515laying off pipe	B	2	Previous version: 0
11	CR391-6	Decomposition furnace to 5-grade air duct		2	
12	CR391-7	pressure pipe ring		1	
13	CR391.01	CNC2511preheater		1.25	
14	CR391.01-1	CNC2511Scroll case		2	
15	CR391.01-2	CNC2511Cone		1.25	
16	CR391.01-3	CNC2511Straight section of air duct		1	
17	CR391.01-4	CNC2511Elbow		1.5	
18	CR391.01-5	CNC2511 Reducer		0.5	
19	CR391.01-6	CNC2511 Inner tube		1	
20	CR391.01-7	CNC2511 Inner tube connector		0.25	
21	CR391.02	CNC2512 Preheater		1	
22	CR391.02-1	CNC2512 Scroll case		1.25	
23	CR391.02-2	CNC2512 Cone		2	
24	CR391.02-3	CNC2512 Elbow		1.25	

25	CR391.02-4	CNC2512 Air duct		1	
26	CR391.03	CNC2513 Preheater	D	1	Previous version: 0
27	CR391.03-1	CNC2513S scroll case		1.25	
28	CR391.03-2	CNC2513 Cone	D	2	Previous version: 0
29	CR391.03-3	CNC2513 Elbow		1.25	
30	CR391.03-4	CNC2513 Air duct		1	
31	CR391.04	CNC2514 Preheater		1	
32	CR391.04-1	CNC2514 Scroll case		2	
33	CR391.04-2	CNC2514 Cone		2	
34	CR391.04-3	CNC2514 Elbow		1.25	
35	CR391.04-4	CNC2514 Air duct		1	
36	CR391.05	CNC2515 Preheater		1	
37	CR391.05-1	CNC2515 Scroll case		2	
38	CR391.05-2	CNC2515 Cone		2	
39	CR391.06	L251 Decomposition furnace	E	2	Previous version: A
40	CR391.06-1	L251 Mixing chamber	E	2	Previous version: A
41	CR391.06-2	L251Pre-combustion chamber	A	0.5	
42	CR391.06-3	L251 De-composition chamber	A	2	
43	CR391.06-4	L251 Rising flue		0.25	
44	CR391 YD .07	Laying off Cone	B	2	Previous version: 0
45	CR391 YD .07-1	Shell	B	2	Previous version: 0
46	CR391 YD .07-2	Support frame	B	1	Previous version: 0
47	CR391.08	Installation drawings for temperature/pressure tube	E	0.5	Previous version: 0
48	CR391.08-1	Temperature/pressure tube	E	0.5	Previous version: 0
49	CR391.09	1000×1000 distribution valve		2	
50	CR391.09-01	Valve body		2	
51	CR391.09-02	Valve lead		0.25	
52	CR391.09-03	Side cover		0.25	
53	CR391.09-04	End cover		0.25	
54	CR391.09-05	Spindle		0.25	
55	CR391.09-06	Valve frame		0.5	
56	CR391.09-07	Ring		0.125	
57	CR391.09-08	Connecting rod(1)		0.25	
58	CR391.09-09	Gland		0.125	
59	CR391.09-10	Guide plate		0.5	
60	CR391.09-11	Connecting rod(2)		0.25	
61	CR391.09-12	Support frame		0.5	
62	CR391 YD -TMR	Reused drawing contents	B	0.125	Previous version: 0
		Equal to number of 1# drawing pages:		71.25	

	Total:	Natural number of drawing pages: 64			

Appendix G: Drawings of Standard Parts for CDCS-R2515 5-Stage Preheating & Pre-decomposition System

	Chengdu Design and Research Institute of Building Material Industry Co., Ltd.				
Duplication Approval	Ma Yongquan	Duplication	Li Chenxiang	Date	2005.07
Description	CDCS-R2515 5-Stage Preheating & Pre-decomposition System				
Phase	Shop Drawing	Drawing No.	CR391YD-TMR	Version	B

No.	Drawing No.	Drawing Name	Version	Equal to number of 1# drawing pages	Remark
1	CR247.07-1	Laying off tongue		0.5	
2	CR230.06-3	Dispenser		0.5	
3	CR111.09.02	Deashing door		0.5	
4	CR111.09.02-1	Lug		0.125	
5	CR111.09.02-2	Deashing hole		0.25	
6	CR111.09.02-3	Deashing hole cover		0.5	
7	CR111.09.02-4	Pressure bar		0.125	
8	CR111.09.02-5	Round steel		0.125	
9	CR218.01.01	600×600 Inspection door		0.5	
10	CR218.01.01-1	Door frame		1	
11	CR218.01.01-2	Door sheet		1	
12	CR218.01.01-3	Locking bed		0.25	
13	CR218.01.01-4	Handle		0.25	
14	CR218.01.01-5	Base		0.5	
15	CR218.01.01-6	Base Connector		0.25	
16	CR218.01.01-7	Hinge plate		0.5	
17	CR218.01.01-8	Hinge bolt		0.5	
18	CR218.01.01-9	Pin		0.25	
19	CR149.01.02	Stir hole cover		0.5	
20	CR149.01.02-1	Control rod		0.25	
21	CR149.01.02-2	Erecting frame		0.25	
22	CR149.01.02-3	Armed lever		0.25	
23	CR149.01.02-4	door closure		0.25	
				9.125	
	Total	Natural number of drawing pages: 23			
		Equal to number of 1# drawing pages: 10.625			

CDCS-R2515

5-Stage Preheating & Pre-Decomposition System

Installation & User Manual

Drawing No.: CR391

Approved by: Ai Hansong

Checked by: He Yunlong

Prepared by: Li Chengxiang, Ma Yongquan

Chengdu Design and Research Institute of Building Material Industry Co., Ltd.

July 2005

Contents

1 Functions

The preheating and pre-decomposition system is among key equipments of the rotary kiln system. Exhaust gas from the rotary kiln enters the preheating and pre-decomposition system for preheating, and raw materials are decomposed in the furnace quickly. This minimizes decomposition of raw meals in the rotary kiln and drastically raises the single-unit production capacity of the rotary kiln.

Raw meals are fed into the air duct of C2-C1 cyclone and blended with hot air flow, then along with rising air flow into the C1 cyclone. After being preheated in the C1 cyclone, materials drop down into the air duct of C3-C2 cyclone, the into C2 cyclone along with rising air flow for preheating. After being preheated in the C2 cyclone, materials drop down into the air duct of C4-C3 cyclone, the into C3 cyclone along with rising air flow for preheating. After being preheated and decomposed in the C3 cyclone, materials drop down into the air duct of C4-C3cyclone, the into C3 cyclone along with rising air flow for preheating. After being preheated in the C3 cyclone, materials drop down into the air duct of C5-C4 cyclone, the into the distribution valve of the laying-off pipe in C4 cyclone. Some materials are distributed by the valve into the SC chamber to blend with tertiary air and be heated by the burner. After being preheated and decomposed, materials leave the SC chamber for MC chamber. Other materials are distributed directly into the MC chamber to join the first batches and blend with kiln-end air flow, then via air duct into C5 cyclone for decomposition, and then proceed into the rotary kiln via the laying-off cone.

This machine is used for Yingde Baojiang 2500t/d new dry-process cement production line.

2 Technical Performance

2.1. Main specifications

2.1.1 Preheater

2.1.1.1 C1:

Inner Diameter: Φ4500mm

Quantity: 2

2.1.1.2 C2:

Inner Diameter: Φ6500mm

Quantity: 1

2.1.1.3 C3:

Inner Diameter: Φ6500mm

Quantity:

2.1.1.4 C4:

Inner Diameter: Φ7100mm

Quantity: 1

2.1.1.5 C5:

Inner Diameter: Φ7100mm

Quantity: 1

2.1.2 Gas Piping

2.1.2.1 C2~C1Air duct:

Inner Diameter: Φ3460mm

Quantity: 1

2.1.2.2 C3~C2Air duct:

Inner Diameter: Φ3760mm

Quantity: 1

2.1.2.3 C4~C3Air duct:

Inner Diameter: Φ3800mm

Quantity: 1

2.1.2.4 C5~C4Air duct:

Inner Diameter: Φ4020mm

Quantity: 1

2.1.2.5 CDC Furnace~C5 Air duct:

Inner Diameter: Φ3960mm

Quantity: 1

2.1.3 Laying off pipe:

2.1.3.1 C1Laying off pipe:

Inner Diameter: Φ800mm

Quantity: 2

2.1.3.2 C2Laying off pipe:

Inner Diameter: Φ1000mm

Quantity: 1

2.1.3.3 C3Laying off pipe:

Inner Diameter: Φ1000mm

Quantity: 1

2.1.3.4 C4Laying off pipe:

Inner Diameter: Φ1000mm

Quantity: 1

2.1.3.5 C5Laying off pipe:

Inner Diameter: Φ1000mm

Quantity: 1

2.1.4 Expansion Joint

2.1.4.1 Φ3960 expansion joint:

Length: 600mm

Quantity: 1

2.1.4.2 Φ1860 expansion joint:

Length: 600 mm

Quantity: 1

2.1.4.3 Φ800 expansion joint:

Length: 600 mm

Quantity: 2

2.1.4.4 Φ1000 expansion joint:

Length: 600mm

Quantity: 7

2.1.4.5 Φ1160 expansion joint:

Length: 500 mm

Quantity: 1

2.1.5 Decomposition Furnace

Spec.: Inner diameter Φ4900/Φ5700mm

Quantity: 1

2.1.6 Kiln-end Laying-off Cone:

Quantity: 1

2.1.7 Flap Valve:

Φ800 Single flap valve: Quantity: 2

Φ1000 Single flap valve: Quantity: 5

2.1.8 Dispenser Box

Φ800 Dispenser box (60°): Quantity: 2

Φ1000 Dispenser box (60°): Quantity: 4

2.1.9 Distribution Valve

Quantity: 1

2.1.10 Coal injection Device of Decomposition Furnace:

Quantity: 1

2.2 Technical Description

CDCS-R2515 5-Stage Preheating & Pre-Decomposition System

2.2.1 Furnace Mode: CDC-R251 decomposition furnace

2.2.2 *Kiln Mode: Φ4.0×60 m*

2.2.3 Refractory Thickness

2.2.3.1 Refractory thickness of C1, C2: 140mm

2.2.3.2 Refractory thickness of C2, C3: 180mm

2.2.3.3 Refractory thickness of C4, C5: 230mm

2.2.3.4 C2~C1Air duct: 140mm

2.2.3.5	C3~C2 air duct, C4~C3 Air duct:	180mm
2.2.3.6	C5~C4 air duct, CDC furnace~C5 Wind pip:	230mm
2.2.3.7	CDC, rising flue:	250mm
2.2.3.8	Laying off pipe of preheaters:	100mm

3 Characteristics of Construction

3.1 aracteristics of Construction of CDC-R251 Decomposition Furnace

RSP decomposition furnace consists of swirl decomposition chamber and mixing chamber. The swirl decomposition chamber is separately arranged and connected to the mixing chamber at its bottom. The mixing chamber is connected to the flue duct via its neck. The tertiary air enters the swirl decomposition chamber at tangent direction. The kiln gas doesn't enter the decomposition chamber and comes into the mixing chamber directly to be blended with air from the decomposition chamber. Materials are entrained in the tertiary air, fed into the decomposition chamber from the entrance of the tertiary air at the top of swirl decomposition chamber. Fuels are fed into the swirl decomposition chamber from its top.

3.2 Characteristics & Advantages of Construction of Cyclone Preheater

3.2.1 The cyclone proper takes the form of three-center 270° wrap angle and eccentric scroll case. Air flows into the cyclone smoothly and materials slide down the wall spirally under the inertial and centrifugal force. It minimizes resistance loss and fosters separation efficiency.

3.2.2 Reflection cone and guide plate are arranged in the C1 cone and scroll case to enhance dust collection efficiency and drive down resistance loss.

3.2.3 C2 - C5 have inner tubes of large diameters and with shallow insertion. Under the premise of ensuring dust collection efficiency, backlash shall be reduced to minimize resistance loss. The inner tube takes the form of Hanging-type squamous heat-resistant cast steel strips, easy for fabrication, installation and replacement with long service life.

3.2.4 The cone is designed to be oblique to eliminate second splash of materials at the bottom of the cone due to deflection of air flow.

3.2.5 Cutting angle pentagon is used to optimize dimension and shape of the air inlet to avoid clash between inlet air and return flow, thereby reducing resistance loss.

3.2.6 The outlet is arranged to be a reducer in order to maintain a proper clearance between the laying off point and the top of cyclone. It is a good way to avoid short pass of materials in the case of low air flow rate, and in return improve dispersedness and heat exchange.

3.2.7 A proper air speed is maintained at the outlet of cyclone, so as to strike the balance between high efficiency and low resistance.

3.2.8 The flap valve of preheater system employs remote-end idler stand for support, provide reduced thermal deformation and good sealing. The valve plate features lightness and flexibility that enables smoother

material flow in the pipe and thus reduce jamming.

3.2.9 Dispenser box of the preheater system takes a new construction. The box has a valve plate of fixed insertion depth and angle, which provides quick dispersion of materials and full exchange of heat. It also prevents the materials from entering the next cyclone in the case of low air speed.

4 Instructions for Installation

Workers shall be familiar with relevant drawings and technical documents (especially requirements stipulated in CR391a) and be familiar with construction of equipment and relevant technical requirements before installation. Installation processes, methods, and construction organization plan and installation plan shall be determined according to actual conditions. Installation shall be carefully carried out to accomplish works efficiently with high quality.

4.1 Precautions before Installation

Before installation, all components and parts shall be stored at places free from severe weather conditions. Although equipment sets are well packaged before shipment, the packages have certain period for service life. If equipment sets tare to be stored for a long time under severe weather conditions, performance of equipment may be affected. It is required that all components and parts shall be kept at favorable places under satisfactory management.

4.2 Makings on Parts

As the preheater, which is to be assembled by welding at site, is shipped in separate packages, all positions to be jointed or connected shall be marked with mating signs or drawing numbers for easy identification on components and parts. If applicable, it is recommended to categorize components and parts of preheater according to their positions or installation procedures.

4.3 *Positioning of Preheater*

Foundation shall be finished before installation of preheater. The parts of preheater are positioned according to the references set by the cold work conditions of rotary kiln. Always remember this rule. Elevations shall be correctly determined to avoid excessive use of wedge plates, which may cause interference between parts and support frames.

4.4 *Installation Procedure*

The preheater shall be installed in the following rule: from bottom up, first larger parts and later smaller ones, and layer by layer. That is, after the feed cone is in place, install the calciner or preheater in place; then install air duct between the 2 stages of preheater or that between the calciner and CNC2515 preheater; and lastly, install all stages of feed duct of preheater.

4.5 Test Assembly at Manufacturer's Factory

A test assembly of the preheated shall be carried out with all the parts to verify if all parts can be assembled without any problem. During

assembly, all positions for connection or joints shall be marked on part and competent to identification at the site. If the test assembly is successful, disassemble all adjustment checking plates and tooling into separate packages for shipment.

4.6 Packaging and Reinforcing

Reinforcing measures shall be taken in packaging of parts for the preheaters so as to avoid deformation during transportation.

4.7 Cautions in Installation

4.7.1 For installation of the preheaters, the installation company is recommended to build a small steel or concrete level platform for assembling parts of the preheaters, considering the capacity of his lifting equipment and situation of preheater installation.

4.7.2 The bearing support must be installed at the same time of installing the preheaters; otherwise preheater parts will deform and result in change of dimension of preheater parts.

4.7.3 The position and direction of major parts of the preheaters must be correct, which may facilitate connection of air pipes in various preheaters chambers and that of air pipes and feeding pipes of various preheaters.

4.7.4 Heat expansion compensation of the precalciner, various preheaters and air pipes between shall be made by reserved lifting of covers of various preheaters. See General Drawing CR391a for reserved lifting height and diagram. Therefore, the compensation must be check to see whether it meets the requirements during installation of the precalciner, various preheaters and air pipes between.

4.7.5 After installation of various preheaters, precalciner, air pipes in various preheaters chambers, air pipes from the precalciner to CNC2515 preheater chamber, the bases are not allowed to be welded with the floor.

4.7.6 The airtightness of the connector of the preheater system whether connected by bolts or by welding must be ensured

4.7.7 During installation of the feeding pipes of various preheaters, connect the feeding pipe, flap valve, expansion joint and rotary gate with flanges, then locate them by spot welding or bolts, dismantle the feeding pipe, flap valve, expansion joint and rotary gate after check without error, then connect and weld the flanges as per the drawings after construction of castable materials.

4.7.8 For installation of the flap valve, the valve plate shall wave flexibly.

4.79 During installation of the expansion joints, neither the positioning bolts

shall be dismantled nor shall the length of expansion joints be adjusted for installation of the feeding pipes. Special attention shall be paid to the directions of expansion joints.

4.8 Inspection Prior to Operation

After all installation works is finished, the followings shall be inspected prior to operation of the preheaters:

4.8.1 Check whether all tools, moulds and various cushion plates used in installation of preheaters and masonry of refractory have been dismantled.

4.8.2 Ensure no foreign matters in or around the preheater system, especially flammables.

4.8.3 Check whether equipment such as flap valve and rotary valve can move or operate normally.

4.8.4 After installation of flap valves, the valve plates are in the state of closing. The weight position shall be adjusted and fixed according to the demand in site production. After materials are fed into the preheater system, the weight position must be adjusted and fixed again to meet the requirement on airlock.

4.8.5 Check the tightness of all inspection door, manhole door and material poking hole after the refractory becomes dry.

4.8.6 Check whether compressed air is supplied where it is needed.

4.8.8 Check whether the circulating blowing and blocking pipes and measuring point interfaces for pressure and temperature are blocked by foreign matters.

4.8.8 All expansion joints shall be free of blockage.

4.9 Installation of Coal-injection Equipment for Precalciner

CR391a。There is one set of coal-injection equipment for precalciner. The installation position is at the precalciner cone. See General Drawing CR391a for details.

5 List of Spare Components and Parts

Following spare components and parts are for reference at the time of model selection.

5.1 Flap Valve:

5.1.1 Flap valve materials: ZG40Cr25Ni20; ZG35Cr26Ni12; 1Cr18Ni9Ti。

5.2 Distribution Box:

5.2.1 Distributing plate materials: ZG40Cr25Ni20; ZG35Cr26Ni12; 1Cr18Ni9Ti.

5.3 Immersion Tube:

5.3.1 1st stage immersion tube Materials: 20g

5.3.2 2nd and 3rd stage immersion tube Materials: ZG35Cr26Ni12

5.3.3 4th and 5th stage immersion tube Materials: ZG40Cr25Ni20

Appendix I: Drawings of Refractory for CDCS-R2515 5-Stage Preheating & Pre-Decomposition System

	Chengdu Design and Research Institute of Building Material Industry Co., Ltd.				
Approval	He Yunlong	Compilation	Xiao Yong	Date	2005.07
Project	2500t/d New-style Dry Process Product Line in Newly-built Baojiang Cement Material Corporation				
Sub-project	Refractory				
Phase	Execution	Drawing No.	0338S-44N-TM	Version	

No.	Drawing No.	Drawing Name	Version	Equal to number of 1# drawing pages	Remark
1	0338S-44N-TM	List of drawings		0.375	In 3 pages
2	0338S-44N-1/1	Refractory system		0.5	
3	0338S-44N-01-1/39	1st stage cyclone scroll		0.75	
4	0338S-44N-01-2/39	1st stage tube and cone		1.25	
5	0338S-44N-01-3/39	1st stage tube air chimney bend		0.5	
6	0338S-44N-01-4/39	1st stage tube air chimney straight section		0.5	
7	0338S-44N-01-5/39	1st stage tube feed duct		0.5	
8	0338S-44N-01-6/39	2nd stage cyclone scroll		0.5	
9	0338S-44N-01-7/39	2nd stage tube and cone		1.25	
10	0338S-44N-01-8/39	2nd stage tube air chimney bend		0.5	
11	0338S-44N-01-9/39	2nd stage tube air chimney straight section		0.5	
12	0338S-44N-01-10/39	2nd stage tube feed duct		1	
13	0338S-44N-01-11/39	3rd stage cyclone scroll		0.5	
14	0338S-44N-01-12/39	3rd stage tube and cone		1.25	
15	0338S-44N-01-13/39	3rd stage tube air chimney bend		0.5	
16	0338S-44N-01-14/39	3rd stage tube air chimney straight section		0.5	
17	0338S-44N-01-15/39	3rd stage tube feed duct		1	
18	0338S-44N-01-16/39	4th stage cyclone scroll		0.5	
19	0338S-44N-01-17/39	4th stage tube and cone		1.25	
20	0338S-44N-01-18/39	4th stage tube air chimney bend		0.5	
21	0338S-44N-01-19/39	4th stage tube air chimney straight section		0.5	
22	0338S-44N-01-20/39	4th stage tube feed duct		2	
23	0338S-44N-01-21/39	5th stage cyclone scroll		0.5	
24	0338S-44N-01-22/39	5th stage tube and cone		1.25	
25	0338S-44N-01-23/39	5th stage tube feed duct		2	
26	0338S-44N-01-24/39	Calcining chamber		1	
27	0338S-44N-01-25/39	Blending chamber		1	
28	0338S-44N-01-26/39	Pre-combustion chamber		1	
29	0338S-44N-01-27/39	Uptake flue		0.75	
30	0338S-44N-01-28/39	Air duct from precalciner to 5th stage tube		1	
31	0338S-44N-01-29/39	Feed cone		1	

32	0338S-44N-01-30/39	φ800 distribution box		0.5	
33	0338S-44N-01-31/39	φ800 flap valve		1.25	
34	0338S-44N-01-32/39	φ1000 distribution box		0.5	
35	0338S-44N-01-33/39	φ1000 flap valve		1.25	
36	0338S-44N-01-34/39	Flap valve		0.5	
37	0338S-44N-01-35/39	Fabrication and Installation of bolts		0.5	
38	0338S-44N-01-36/39	Physical and Chemical Properties of refractory		0.5	
39	0338S-44N-01-37/39	P brick pattern		0.125	
40	0338S-44N-01-38/39	C brick pattern		0.125	
41	0338S-44N-01-39/39	S brick pattern		0.125	
42	0338S-44N-02-1/4	φ4x60m refractory construction of rotary kiln		1	
43	0338S-44N-02-2/4	Refractory construction of kiln hood		2	
44	0338S-44N-02-3/4	Refractory construction of kiln wicket		1	
45	0338S-44N-02-4/4	φ4×60m brick pattern of rotary kiln lining		0.5	
46	0338S-44N-03-1/1	Refractory construction of inlet chute from kiln hood to grate cooler		1	
47	0338S-44N-04-1/1	Refractory construction for grate cooler		2.25	
48	0338S-44N-05-1/1	Refractory construction for tertiary air duct		1.5	
49	0338S-44N-06-1/1	Refractory construction for air duct from grate cooler to cyclone dust collector		0.5	
50		List of refractory purchase		0.5	
51		List of bolt purchase		0.5	
		Total		41.75	

Appendix J: Verification Letter of Baojiang Cement Material Corporation

Guangdong Province, Yingde Baojiang Cement Materials Co. Ltd.

Add: Yingde Shihuipu Tel: (0763) 2601168 Fax: 2601163 Post code: 513046

Verification letter

Chengdu Design & Research Institute of Building Materials Industry Co. Ltd.,

During your execution of "Contract of Servicing for Development of a 2500t/d New Dry Process Line for Baojiang Cement Materials Co. Ltd." (*UNIDO project No. EG/CPR/99/G31*, P.O. 16000808), we confirm that following technical documents have been received:

1. "Report for burning performance test of anthracite" in 4 Chinese copies, receiving date: May 5, 2005.

2. "Initial size for preheating & precalcining system for raw meal" in 4 Chinese copies, receiving date: May 9, 2005.

3. "Minutes of meeting for approval and examination" in 4 Chinese copies, receiving date: May 13, 2005.

4. "Final size for preheating & precalcining system for raw meal" in 4 Chinese copies, receiving date: May 13, 2005.

5. Assembling drawings and draft drawings for equipment manufacture for CDCS-R2515 Five-stage preheating & precalcining system in 4 Chinese copies, receiving date: June 20, 2005.

6. Working drawings for equipment manufacture for CDCS-R2515 Five-stage preheating & precalcining system in 4 Chinese copies, receiving date: July 24, 2005.

7. Working drawings for standard components for CDCS-R2515 Five-stage preheating & precalcining system in 4 Chinese copies, receiving date: July 24, 2005.

8. Erection and operation instruction for CDCS-R2515 Five-stage preheating & precalcining system in 4 Chinese copies, receiving date: July 24, 2005.

9. Refractory materials manufacture drawings for CDCS-R2515 Five-stage preheating & precalcining system in 4 Chinese copies, receiving date: July 24, 2005.

Above documents can fully meet our requirement for equipment manufacture, assembling and operation. Thank you very much for your sincere service!

Best regards,

President Liu Guanshen,
Guangdong Province, Yingde Baojiang Cement Materials Co. Ltd.
July 26, 2005

Appendix K: Minute of Technical Clarification Meeting

Minutes of the Meeting

Place: CDI, Chengdu

Date: August 19, 2005

Attendees:

Baojiang Corporation: Liu Guansheng Plant manager

Chengdu Jixin Company (manufacturing enterprise of preheater and decomposing furnace):

Jiang Jinran Deputy general manager

Zou Wen Deputy general manager

Zhou Tinghua Technical director

Sichuan Jiangyou Nanfang Company (installation enterprise of preheater and decomposing furnace)

Li Xianchuan General manager

Ma Yongbing Project manager

CDI: Mao Shengrong

Fan Qiongzhang

Ai Hansong

He Yunlong

Li Chenxiang

Ma Yongquan

Xiao Yong

Xie Bo

Subject of the meeting: Technical Clarification on the shop drawings for the preheating and decomposing system of Baojiang Cement Material Corporation

Mr. Ai Hansong, the mechanical designer of the party that undertakes the contract, made a speech on the design procedure of shop drawings for the devices of raw material preheating and decomposing system, and introduced the specifics of the key parts of the system with AUTOCAD.

That was followed by speaking and discussion, which included ideas and suggestion for device manufacture and installation. Agreements are achieved on the following aspects:

1. After getting familiar with the drawings, all think the drawings are completed, clear, properly-designed, and can be taken as the basis of device manufacture and installation;

2. During the manufacture process, the replacement of material, when needed, shall obtain the approval of CDI;

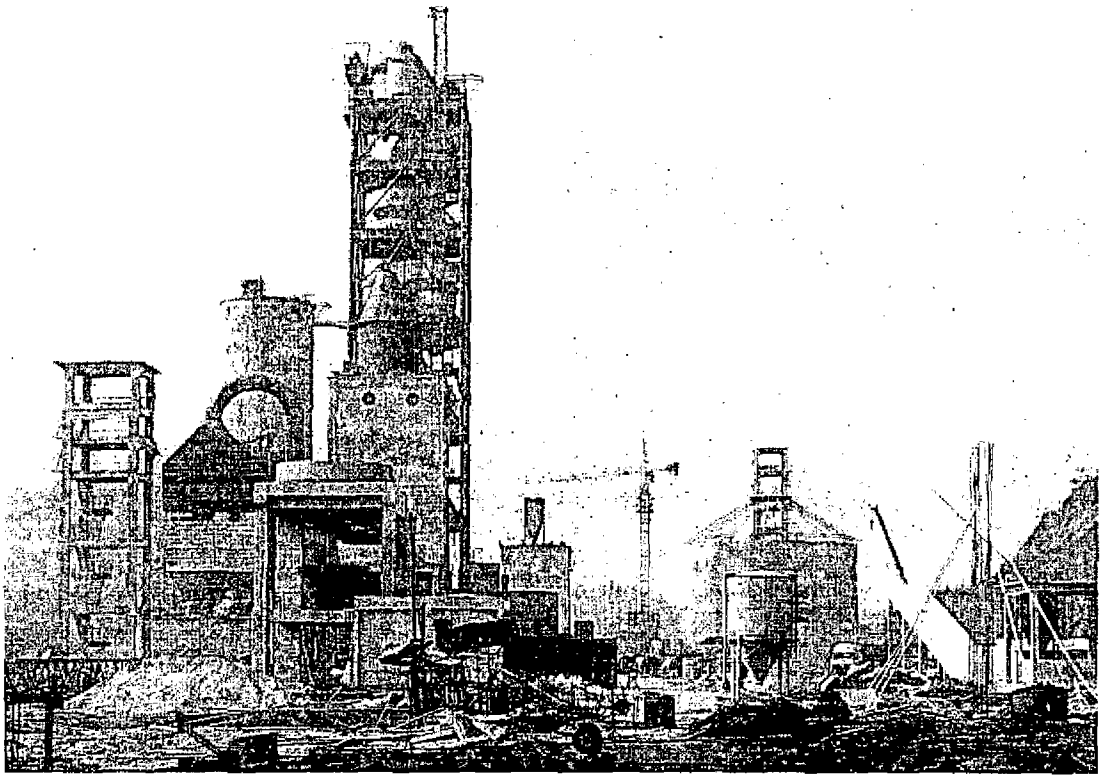
3. The temperature and pressure hole on the preheater and decomposing furnace shall be constructed before the laying of refractory material;

4. The preinstallation of Windpipe and laying-off pipe shall be conducted before refractory the laying of refractory material;

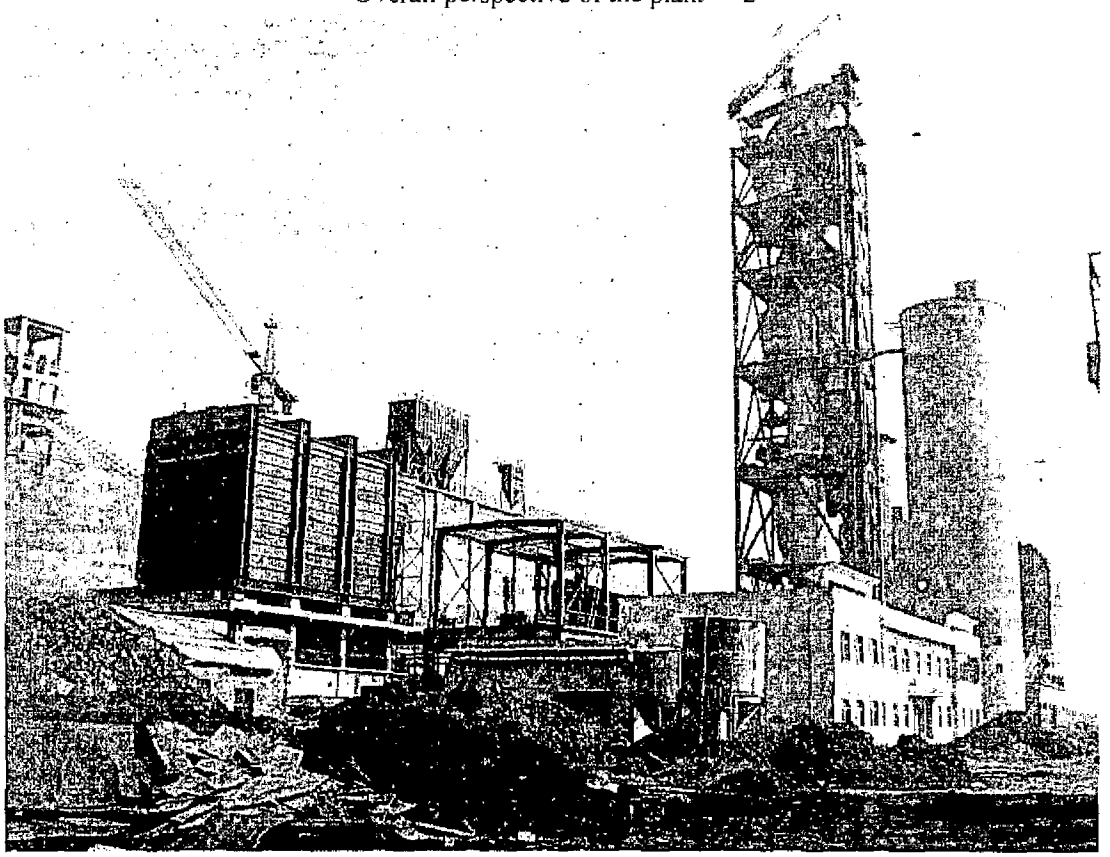
5. Three-layer asphalt shall be applied on the stubs before the laying of refractory material, to meet the requirements of thermal expansion.

Appendix L: Site Live-action Photograph

Overall perspective of the plant 1



Overall perspective of the plant 2



Preheater and decomposing furnace