



# KIOCL Limited

(Formerly Kudremukh Iron Ore Company Limited)  
(A Govt. of India Enterprise)  
Panambur, Mangalore-575010

## PROJECTS DEPARTMENT

AN ISO 9001 (2008),  
ISO 14001 (2004) &  
OHSAS 18001 (2007)  
COMPANY

Telephone No. : 0824 – 2407304, 2403294, 2403292  
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Website : [www.kioclltd.com](http://www.kioclltd.com)

No.PROJ/5323

Date: 13.01.2011

### NOTICE INVITING TENDER

KIOCL Limited, Panambur, Mangalore invites sealed tenders from the experienced Contractors who have carried out similar type of work and also **having Provident Fund code number & ESI Code number issued by respective authorities** for the below mentioned work. Tender papers can be had from the office of the undersigned on all working days during the office hours till 3:00 PM on 31.01.2011 on payment of ₹ 200.00 per set in the form of D.D drawn in favour of KIOCL Limited, Panambur, Mangalore – 10 or payment in cash at KIOCL Limited, Mangalore cash counter. The cost of tender documents, in case of tender documents downloaded from website [www.kioclltd.com](http://www.kioclltd.com), should be furnished along with technical bid. The last date for submission of tender is till 3:00 PM on 01.02.2011

Tender No.	Name of the work	EMD (₹)
5323	Refractory repair works of furnace hood & windboxes of Indurating Machine of Pellet Plant, KIOCL Limited, Panambur, Mangalore.	34,000.00

Sd/-  
Deputy General Manager (Projects & PC)

Telephone : 0824- 2407304, 2043292, 2403294 e-mail: mprojects@kudreore.com Fax : 0824-2407422

AN ISO 9001:2000, ISO 14001:2004 & OHSAS 18001:2007 COMPANY

**KIOCL Limited**  
(A Govt. of India Enterprise)  
Panambur, Mangalore-575010

No.PROJ./TC/5323

Dt.: 13.01.2011

Dear Sir,

Sub: Tender for refractory repair works of furnace hood & windboxes of Indurating Machine of Pellet Plant, KIOCL Limited, Panambur, Mangalore.

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Please find enclosed herewith the tender documents for (i) Technical Bid - comprising of Invitation for tender, Proforma for technical evaluation of bidders, Instructions to tenderers & Terms & Conditions, Special Conditions, Technical Specifications, Drawings and (ii) documents for Price bid comprising of schedule of work.

**The Technical bid along with other documents shall also contain proforma for Technical evaluation, which shall be duly filled. The price bids of only technically qualified bidders shall be opened and others shall be rejected.**

KIOCL Ltd.'s decision on Technical evaluation shall be final and no correspondence shall be entertained in this regard.

Thanking you,

Yours faithfully,  
For KIOCL Limited

Sd/-  
(GAJANANA PAI T)  
Deputy General Manager (Projects & PC)

Encl: As above.

**TECHNICAL BID INDEX**

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**PRICE BID INDEX**

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**KIOCL Limited**  
(A Govt. of India Enterprise)  
PANAMBUR, MANGALORE – 10

No.PROJ/TC/5323

Dt: 13.01.2011

Dear Sir(s)

Sub: Tender for Refractory repair works of furnace hood & windboxes of Indurating Machine of Pellet Plant, KIOCL Limited, Panambur, Mangalore.

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1. Bid documents for the above work are enclosed herewith.
2. Sealed bids will be received upto 15.00 Hrs. on **01.02.2011** at the office of Contracts Section of Projects Department, KIOCL Limited, Panambur, Mangalore – 10. Bids received late are liable for rejection. The technical bids shall be opened at 3.30 PM on 01.02.2011. The price bids of techno commercially accepted offers will be opened on a specified date which will be communicated to the bidders for participation to witness the same.
3. Bidders shall abide by all the details of “Instruction to Bidders” enclosed with the tender documents. The sealed bids shall be submitted in two separate sealed covers – (1) Technical bid and (2) Price Bid and each sealed bids shall be superscribed with the respective subjects and shall be addressed to DGM (Projects & PC), KIOCL Limited, Panambur, Mangalore – 575 010.
4. The Technical Bid shall be accompanied by an Earnest Money Deposit (EMD) of ₹ 34,000.00 (Rupees thirty four thousand only) to be deposited in the form of a Demand Draft from a Scheduled Bank drawn in favour of KIOCL Ltd., Panambur, Mangalore.
5. EMD shall be adjusted to the Security Deposit in the case of successful bidder. However, the same shall be returned to the unsuccessful bidders immediately after the award of work to successful bidder.
6. Acceptance of the bid will be intimated to successful bidder through a letter enclosing the copies of the Letter of Intent (LOI) and this letter will be treated as authorization for award of work. The bidder shall sign the said copies of LOI and send to the owner within five days from the date of receipt for formal signature and issue of the same. In the event of failure on the part of the bidder to sign and return the LOI within the specified time, the EMD shall be liable to be forfeited at the sole discretion of the owner.
7. The time of completion of all works under this contract shall be ***as per clause 3 of Special Conditions***.
8. The successful bidder shall be required to execute an agreement within the time specified in the Letter of Intent.
9. The Company reserves the right to reject any or all the tenders without assigning any reason.

Thanking you,

Yours faithfully,  
for KIOCL Limited

Sd/-

Encl: Bid documents.

Deputy General Manager (Projects & PC)

## TECHNICAL BID

### PROFORMA FOR TECHNICAL EVALUATION OF BIDDERS

The agencies who are sending their letter of expression must furnish following details along with documentary evidence of their claims. However, any surrogated submission in any form will disqualify them from consideration.

#### Generic

Name of the Agency	Postal Address	Communication Address	Contact Person	Emergency contact mode/No

#### Specific

Sl. No.	Description	Document particulars
1.	Average annual financial turnover during the last three years, ending 31 <sup>st</sup> March of 2010.	Should be at least ₹ 5.10 lakhs
2.	<p>Experience of having successfully completed similar work during last seven years ending 31 December 2010.</p> <p>Similar work means refractory works carried out in Process Plants/Industries/Public sector under takings.</p> <p>Note: (i) For works carried out in Pellet Plant Unit of KIOCL Ltd., work order copies are to be enclosed. For works carried out in other place/s, work completion certificate should be furnished.</p> <p>(ii) The ongoing works will also be considered if the value of the actual work/s completed as on specified date is/are above the specified threshold value.</p>	<p>a) Three (3) similar completed works costing not less than the amount ₹ 6.80 lakhs each (rupees six lakh eighty thousand only)</p> <p style="text-align: center;">OR</p> <p>b) Two (2) similar completed works costing not less than the amount ₹ 8.50 lakhs each (rupees eight lakh fifty thousand only)</p> <p style="text-align: center;">OR</p> <p>c) One (1) similar completed work costing not less than the amount ₹ 13.60 lakhs (rupees thirteen lakh sixty thousand only)</p>

3.	Provident Fund Account No. (mandatory)	
4.	PAN No. (mandatory)	
5.	ESI No. (mandatory)	
6.	Service tax registration no., if available.	
7.	<p>Ownership of the firm; whether the firm is proprietary, partnership or company.</p> <p>In case of partnership or company, the details of partnership/company along with agreement copies and the authorised signatory on behalf of the firm should be furnished.</p>	
10.	<p>All payments shall be made on electronic mode. Contractor shall furnish the required bank details to affect the electronic mode of payment.</p> <p style="padding-left: 40px;">Name of the Bank</p> <p style="padding-left: 40px;">Branch</p> <p style="padding-left: 40px;">Type of Account (Current/Savings)</p> <p style="padding-left: 40px;">Account No.</p> <p style="padding-left: 40px;">MICR Number (9 digit No.)</p> <p style="padding-left: 40px;">Branch Code</p>	

CONTRACTOR

OWNER

**KIOCL Limited**  
(A Govt. of India Enterprise)  
PANAMBUR, MANGALORE – 10

No.PROJ/TC/5323

Date: 13.01.2011

TENDER FOR REFRACTORY REPAIR WORKS OF FURNACE HOOD & WINDBOXES OF  
INDURATING MACHINE OF PELLET PLANT, KIOCL LIMITED, PANAMBUR, MANGALORE.

A. INSTRUCTION TO TENDERERS

1. Tender should accompany EMD of ₹ **34,000.00** in the form of Demand Draft drawn in favour of KIOCL Limited, Panambur.
2. Tender will be received up to 3:00 P.M. on **01.02.2011**
3. Tenderers have to acquaint themselves with the conditions prevailing at site, before submitting the tenders.
4. Tenderers shall furnish their quotation in the schedule enclosed to the bid documents. Quotations should be written in both words and figures.
5. Owner/Engineer reserves the right to reject any or all tenders without assigning any reason.
6. Owner/Engineer reserves the right to award part of the work or the whole, as may be considered necessary.
7. Tenders received late are liable for rejection.
8. Tenders submitted without EMD will not be considered.

B. TERMS AND CONDITIONS

1. The work shall generally be governed by KIOCL's General Conditions of Contract (TS/B/KIOCL/QF-31/REV-1) which is available for reference in Projects Office on all working days.
2. Scope of work in this contract broadly covers the following.
  - (a) **As per schedule of work enclosed.**
3. The quantities given in the schedule of items are approximate and may vary or some of the items may not be executed. No claim by the contractor on account of variations, omissions and modifications will be entertained.
4. No escalation is admissible on any account whatsoever.

5. Mode of measurements for the work shall be as per IS-1200 latest edition unless otherwise specified for items not covered in IS-1200, CPWD standard shall be adopted.
6. Rates quoted against schedule items shall include all materials, Labour, machinery expenses and hire charges, taxes, royalties, transport, maintenance incidents, enabling works etc. based on the conditions mentioned herein. Unless otherwise specified in the tender schedule the rates for all items will be deemed to include all leads, lifts and descents in the work.
7. The work executed shall be maintained in good condition for a period of **ONE YEAR** from the date of completion including repair required if any at contractor's cost. If the contractor fails to fulfill his obligation during the maintenance period, the same shall be got done by the owner at contractor's risk and cost.
8. (a) 10% of the value of work shall be deducted and retained till the completion of maintenance period as applicable.  
(b) Initial Security Deposit of 3% of the value of work shall be adjusted immediately after the placement of order. EMD shall be adjusted against the initial Security Deposit. The balance 7% shall be recovered from each running bill. The Security Deposit shall be refunded after successful completion of maintenance period.
9. Any damage to the company's property caused by the contractor during the execution/maintenance of work, shall be charged to the contractor and the amount of damage shall be left to the sole discretion of the Engineer.
10. Statutory deduction towards all applicable taxes shall be made as per rules.
11. Royalties if any for materials applicable shall have to be paid by the contractor.
12. All safety appliances like safety belt, helmets etc. have to be provided by the contractor to all his workers and supervisors. None of the workmen without safety appliances shall be allowed to work at heights.
13. The contractor shall abide with all the provisions contained in Factories Act and Rules/Regulations/Bylaws/Orders made there under.
14. The contractor should obtain Insurance Policy to cover the risk of the labourers under Workmen Compensation Act and should be produced before starting the work.
15. Contractor should furnish the PF & ESI code numbers obtained from respective authorities along with the Technical Bid and also produce the same to the Personnel Department before commencement of the work.
16. The contractor and his workmen may avail the facilities provided in the canteen set up for the contract labour. They will not be allowed to avail the facilities set up for KIOCL Limited employees.
17. Time of completion and Liquidated Damages:

The entire work under this Contract shall be completed *as per clause 3.0 of Special Conditions*. If the contractor fails to complete the work within the stipulated completion time, the contractor shall pay to owner as liquidated damages for such default, for every day which shall elapse between the date

prescribed thereof and the actual date of completion of the scope of work, the amounts determined on the basis of the percentage of the value of the work as specified herein.

Delay of 1st 20 days ..... 0.1% per day  
Delay of next 20 days ..... 0.15% per day

subject to a maximum of 5% of the value of the work. The Owner/Engineer has the discretion to reduce or waive the Liquidated Damages.

18. Our Company comes under Factories Act, Rules, Regulations, byelaws and orders made hereunder. Hence the Contractors must abide by the same.
  - (i) No persons shall be employed without Initial Training on Safety as per vocational Training Rules.
  - (ii) Contractor must immediately after deploying the Contract Workers, get their initial Medical Examination done at Company Hospital/Company recognised Hospital. The expenditure towards Medical Examination of Contract Workers shall be borne by KIOCL Limited.
  - (iii) A supervisor with experience should be deployed to ensure that the contract workers work safely and in accordance with all the provisions of Factories Act, Rules, Regulations, Byelaws and orders made thereunder.
19. The Contractor shall be responsible for all the safety measures as per the rules in the interest of safety of all the labourers working under him. Necessary safety appliances shall be provided to all the labourers at Contractor's cost.

Wherever it is observed that the contractor has not provided safety appliances to the workers engaged by him, the Management reserves the right to issue the necessary safety appliances to his workers on cost recoverable basis.

20. The contractor shall disburse the wages to the labour on or before 7<sup>th</sup> of the following month and furnish copy of wage register, muster roll along with the bill. PF & ESI challans shall be submitted to Personnel Department on or before 25<sup>th</sup> of the following month.
21. OBLIGATIONS OF THE AGENCY/CONTRACTOR WITH REGARD TO STATUTES:

The Agency shall be solely responsible as regards salary, wages and service conditions and terms extended by the Agency to his employees/workmen and shall in that connection maintain requisite records and comply with all laws, enactment, rules and regulations and orders dealing with employment of contract labour, payment of workmen's compensation, contribution under ESI Act, 1948, if applicable, and PF/EPF Act 1952, payment of minimum wages, payment of bonus, fire and safety regulations, regulations relating to employment of female workforce, security requirements and such other and regulations as may be applicable at present made applicable hereafter. The wages prescribed by the appropriate Government under the Minimum Wages Act, 1948 and all provisions of the Contract Labour Regulation Act and Factories Act shall be complied with by the Agency. Agency shall insure all employees for accidents and third party losses and produce the policy before commencement of Contract. All employees of the Agency shall be covered under Workmen Compensation Insurance and Group Accident Insurance cover, by the Agency.

22. INDEMNIFICATION:

The Agency shall indemnify and keep indemnified the Company from and against all actions, claims, demands and/or liabilities whatsoever arising out of this agreement or consequent upon breach of any of provisions of this agreement and/or against any claim, action or demand by any of the Agency's Employees, person(s), firms, institutions under any law, rule or regulation having the force of law, including but not limited to, claims against the Company under Workmen's Compensation Act, 1923. The Employees State Insurance Act, the Employees Provident Fund Act, 1952, The Contract Labour (Abolition & Regulation) Act, 1970 and the Minimum Wages Act, 1948 and any amendments thereto.

23. The Bids shall be valid for a period of three months from the due date of submission of the bid.

**Note : No additional condition shall be inserted in `Schedule of work`.**

CONTRACTOR

## SPECIAL CONDITIONS

### 1.00 SCOPE OF WORK

It is proposed to carryout refractory repair work on the furnace FDG 4001 in following areas.

- (i) Pre heating/Firing zone wall
- (ii) Burner ports and down comers
- (iii) Furnace curved roof
- (iv) Suspended roof-
- (v) Baffle lintel and wall over it.
- (vi) Patch work at various places inside the furnace.
- (vii) Wind Box repairs

The above mentioned locations may vary depending on Furnace condition at the time of job execution.

2.00 All the jobs proposed to be carried out shall conform to KARENA specifications/drawings/instructions of Engineer-in-charge. The drawings are enclosed for reference only. Contractor shall study the drawings thoroughly before quoting. There may be variation in location of work inside the furnace that will be known only once furnace is opened up for repair.

### 3.00 COMPLETION SCHEDULE AND LIQUIDATED DAMAGES

The entire job of relining proposed shall be carried out round the clock. The entire job mentioned above shall be completed within 25 days from starting the job.

KIOCL Limited shall give 15 days advance notice indicating the date of scheduled shut down. The contractor shall mobilise their resources for preparatory works 7 days in advance from the date of scheduled commencement of their shut down.

If the contractor fails to complete the work within the stipulated completion time, the Contractor shall pay to the Owner as liquidated damages for such default, for every day which shall elapse between the date prescribed thereof and actual date of completion of the scope of work, the amounts determined on the basis of the percentage of value of the work as specified herein.

Delay of 1st 20 days ..... 0.1% per day  
Delay of next 20 days ..... 0.15% per day

Subject to a maximum of 5% of the value of work. Owner has the discretion to reduce or waive the liquidated damages.

4.00 The work done shall be under performance guarantee for a minimum period of ONE YEAR from the date of completion of relining work. 10% of the total value of work done shall be retained till completion of the maintenance period as Security Deposit. Rectification/rework if required due to non-adherence of quality parameter shall be carried out free of cost by the contractor.

5.0 KIOCL Limited shall provide necessary power supply, drinking water and compressed air to run the equipment used for dismantling and gunniting free of cost. Power, water and compressed air shall be given at one point. Contractor has to make their own arrangements for drawing the supply from these points.

6.00 Installed quantity shall be calculated on the basis of volume converted in to tonnage by multiplying with bulk density (after casting), which would be based on the technical brochure of Refractory materials. Actual quantity for dismantling shall be measured in Sq.meters.

7.0 Consumables/spares like, refractory materials, anchors, hex mesh, welding rods, steel parts, D.A, oxygen gas cylinder etc., to be used during the shut down period shall be provided free of cost. However, there will be limitation on wastage of refractory materials. Permissible wastage limit are with respect to gross installed quantities. For Monolithic, Dense Bricks and insulation lining, it will be 10% for rebound loss, incase of gunning, shall be up to 60% only. Beyond these limits as stipulated, the same shall be back charged on actual basis. However for the purpose of payment, the actual installed quantity shall be considered.

Contractor shall arrange the transportation of the material from Stores to work site which shall also include lifting of material from 0 M. to 9.5 M. and back. After work completion all materials shall be returned back to respective storage area. All work place and connected area shall be cleaned and debris shall be shifted to a location specified by Engineer in charge, within a periphery of 1 K.M. by contractor's hired truck to the satisfaction of company. Any loss or damage during handling of the materials by the contractor, the material cost shall be recovered from them. However mobile equipments like forklift, terex may be provided by company free of cost subject to availability for loading of debris and transporting of materials to and fro store only.

8.0 Owner assesses that minimum of one qualified Engineer, 3 Supervisors, 8 Masons, 3 Carpenters, 2 Gunners are required daily for carry out this work apart from sufficient number of labours. However, contractor should make their own assessment and deploy sufficient manpower in order to complete the work within the scheduled completion time.

9.0 Following machineries in good working condition shall be arranged by the Contractor

- (i) Mixer – 1 no.
- (ii) Gunning Machine – 1 no.
- (iii) Brick cutting machine – 1 no.
- (iv) Chippers – 6 nos.
- (v) Rammers – 6 nos.
- (vi) Power driven lifting device of 2 Mt. capacity.
- (vii) Welding sets, cutting sets of sufficient quantity.
- (viii) Scaffolding materials, staging, shuttering, supports etc. for satisfactory completion of lining work.

However, the above list is not exhaustive, the tools etc., must commensurate with job requirement. KIOCL Limited has limited quantity of cutting sets, welding machines, refractory installation tools/equipments, etc. that may be given for work to contractor free of cost subject to availability.

10.00 The Contractor has to deploy adequate tools/equipment/staging materials and sufficient number of highly skilled Supervisors/Engineers, Refractory masons, operators, helpers etc., at site for effective work completion well within stipulated time frame. It is targeted to achieve maximum repair work in minimum possible time with highest possible quality standard. To ascertain this, KIOCL Limited reserves the right to turndown the personnel lacking in required skill for the work.

11.0 The Contractor shall be responsible for the safety of his workmen at work.

12.0 The rate quoted shall remain valid up to 30.06.2011.

13.0 TAXES & DUTIES: This clause shall be applicable notwithstanding any other clause related to taxes & duties mentioned elsewhere in this tender document:



## **TECHNICAL SPECIFICATIONS FOR INSTALLATION**

### **1.0 DENSE AND INSULATION REFRACTORY CONCRETES**

#### **1.01 PREPARATION**

Structural parts of hydraulic compounds will be concreted in steel or wood shuttering, Adjacent structural components such as brick walls can also be used as shuttering, Prior to the installation of the concrete, shuttering has to be treated with a shuttering oil or covered with a plastic oil.

To prevent dehydration, highly absorbent surfaces are to be sealed

Prior to the installation of the concrete, as water is extremely important for the setting process plastic foils, oiled paper and special type of coatings have proved to be suitable for this purpose.

#### **2.00 MIXING INSTRUCTIONS**

The installation times indicated on the bags refer to a material temperature between +25 deg, C. to +35 deg, C.

It has to be observed that the setting time will increase for material temperature below +25 deg. C and decrease in case of temperature above +35 deg. C.

Only use absolutely clean tool and equipment. Material must be mixed with a compulsory mixer, the required water will be added by sprinkling.

The required amount of water has to be observed and must not be in full immediately. If the compound cannot be prepared with indicated amount of water it can be increased or decreased by max 10%.

A further alteration of the water amount is not all allowed without approval of our Engineering Department. Too much or too little water will impale the stability of the concrete.

Always use the entire contents of one or several bags when mixing. Do not add parts of a bag to the mix. In case of small material requirements the entire contents of one bag will be premixed in dry condition, in such a case hand-mixing is allowed.

Only use clean water (drinking water) to prepare hydraulic setting compounds. Mixing time after addition of water is approx, 2 minutes. When deciding on the quantity to be mixed, observe the maximum preparation and installation times.

#### **INSTALLATION INSTRUCTIONS**

The installation of the concrete must be strict accordance with the construction drawings (drawings enclosed). Observation of the construction joints according to the drawing is most important with regard to the resistance to the concrete. The construction panels indicated on the construction drawing must be made quickly without any interruption.

If sound reasons will require to interrupt concreting, the construction panels shown on the drawings may be subdivided once more. Care has to be taken to get right-angled panels and that the outer limitation of such panels will always be accurately centered between to anchor rows.

The interval between one mix to the other must be timed in such a way that the setting process of the preceding mix has not yet started. The guide value for quick setting compounds is 7 minutes and 20 minutes for normal setting compounds. Prior to continue concreting, the first concreted panels must have set to such an extent that no homogenous connection will result and that the edges of the previously concreted panels will not be damaged.

Hydraulic setting compounds are to be installed in accordance with the below- mentioned sketches. Horizontal suspended roofs and floors must be always be concreted in full height, panel by panel (see sheet 1).

If hydraulic setting compounds are to be installed from a higher level (more than 1 M) avoid free fall of the mix, as this may cause segregation. In this case installation of concrete must be made through service pipes or chutes.

To avoid air pockets or cavities in the concrete, compaction will be obtained by internal vibrators. Prior to compaction and during concreting the bed height should not exceed 500 mm. (Attention some insulating compounds are not allowed to be compacted by vibrator observe installation instructions)

Concretes, which have already started to set, can no longer be used and must be removed immediately, as it is strictly forbidden to add water in order to reach the original consistency of the concrete.

The surfaces of the concreted constructions parts should not be smoothed, but leveled by wooden slat.

The ceramic and metallic anchors must be placed in strict accordance with the drawings regarding their items and qualities. Metallic anchors, which are directly concreted, have at first to be dipped in paraffin or similar, with the exception of thin walled V and Y anchor for which the before-mentioned measure does not apply. Install ceramic anchors in such a way that the distance from their front edge to the shuttering is approx. 5 to 10 mm.

Care has to be taken that during installation all anchors are tensile stressed to ensure that they are uniformly loaded when shuttering will be removed.

#### 4.0 REMOVAL OF SHUTTERING

Depending on wall thickness. Ambient temperature and quality, shuttering can be removed after approx. 6 to 10 hours. Cantilevered construction parts such as suspended roofs; lintels and arches must remain in their shuttering for at least twice as long.

Where materials or persons will load cantilevered constructions parts, these parts must remain shuttered until completion of the work.

Finished concreted construction parts are to be protected against frost until the setting process is completed.

#### 5.0 CURING

During the setting process a more or less intense heating of the concrete can be felt, depending on the proportion of the binding agent. In such a case concrete must be cooled by sprinkling water or placing cloths until a temperature of approx. 20 to 30 deg C is reached (avoid heavy water jets as otherwise parts

of the binding agent may be flushed away from the upper layer). Cooling can be stopped in most cases after approx. 20 to 30 hours.

## 6.00 DRY AND HEATING –UP

For drying and heating-up refer to the general or special guidelines or instructions applicable for individual orders.

## 7.0 PREPARATION AND INSTALLATION INSTRUCTIONS

The special preparation and installation instructions for the individual compounds are to be observed as well.

### DENSE AND INSULATING REFRACTORY CONCRETES IN DRY GUNNING PROCEDURE

#### PREPARATION

Prior to installing the gunning compounds, loose matters have to be removed from the under–surface. In most cases a cleaning by compressed air will be sufficient.

If gunning compound is applied directly to the steel shell of a plant, loose rust had to be removed from the surface. If a metallic bright steel surface is required, sand blasting has to be carried out according to DIN or other instructions.

In case of an anticorrosive cover of the steel shell, prior sand blasting is absolutely necessary.

If gunning compound is applied directly to the anticorrosive cover, this cover has to be sufficiently, fully hardened.

In cases of highly absorbent under- surfaces to be gunned, these must be moistened possibly a few hours in advance (with the exception of some special gunning compounds.)

Highly absorbent under surface may as well as sealed by spraying a film, however, this may be executed only on instruction or with the explicit consent of our Engineering Department.

According to size and shape of the structural area, anchors have to be provided. The anchors must be selected and positioned exactly as specified on the construction drawings.

Thin anchors are to be preferred.

Prior to gunning the weld of the anchors has be checked (hammer stroke test). Care must be taken that all mobile anchors are stressed when installed.

For limiting the construction panel, panel dividers (templates) have to be provided.

## 2. PRETREATMENT OF MATERIAL AND JOB PLANNING

Gunning compounds must be pre-mixed with a compulsory mixer in dry state, and must be pre-moistened with a small amount of water added by sprinkling.

The required amount of water for moistening the compounds is approx. 2-4 weight - %. The right amount of water has to be found out at site as too much moistening will cause a blocking up of the tubes. Only in cases of small material requirements and in very special case premixing and pre-moistening does not have to be carried out:

Always use the entire contents of one or several bags when mixing. Don't add part of a bag to the mix. In case of small material requirements the entire contents of one bag will be pre-mixed in dry state, in such a case hand-mixing is allowed.

The pretreatment of the material according to the prescribed method guarantees:

- A uniform mixing of cement, the aggregates and an amount of the required water.
- A slight formation of dust at the nozzle pipes and therefore, better working conditions.
- A more trifling rebound.

### INSTALLATION INSTRUCTIONS

The installation of the gunning compound must be in strict accordance with the construction drawings. Observation of the construction joints according to the drawings is most important with regard to the resistance of the concrete. The construction panels indicated on the construction drawings must be made quickly without any interruption.

If sound reasons will require to interrupt gunning the construction panels shown on the drawings may be subdivided once more. Care has to be taken to get right- angled panels and that the outer limitation of such panels will always be accurately centered between two anchor rows and that in the smaller construction panels the total construction thickness has to be performed in one operation.

Prior to continue gunning, first gunned panels must have set to such an extent, that no homogeneous connection will result and that the edges of the previously gunned panel will not be damaged.

Hydraulic setting gunning compounds are to be installed in accordance with the below motioned sketches (See sheet 4).

The quality of the gunning concrete is on a large scale depending on the mechanical capability and the experience of the installation personnel, especially on the nozzle operator.

The nozzle operator has to control the air supply and to regulate the water feed in such a way that a plastic mix will be obtained resulting in a possible great density and trifling rebound. At the same time the mix should be so firm that after being gunned a slumping of the mix can be prevented. The nozzle operator must further take care that the degree of moisture of the pre-moistened gunning compound is not too high, in order to avoid a blocking up of the tubes.

As rule the nozzle must be operated at distance of approx. 60 to 120 mm in right-angled direction to the application surface. The nozzle operator must have enough experience in order to choose the appropriate distance between gunning nozzle and surface to be gunned.

If anchoring elements are to be gunned (i.e. Y-anchors, V-anchors, hexagon grates or structural steel mats) then the nozzle has to be closer to the application surface enabling that the area underneath the bars will be covered by gunning compound as well. An example is shown in sheet 4, explaining the right way and the wrong way of gunning structural steel mats.

While leaving the nozzle the gunning compound should form everywhere a uniform dense atomizing cone. A non-uniform atomizing cone will be obtained in case the nozzle tube is leak or the water feed irregular. The water pressure of the gunning nozzle should be heavier than the effective air pressure to make sure that the water will be intensely mixed with the dry concrete.

The air pressure should always be constant and not at all pulsating. Therefore an air tank should be interpolated between compressor and gunning machine. The necessary compressor power is depending on different factors. Recommended values can be seen on sheet.

The rebound consists of neat cement and may coarse aggregates. The amount of rebound depends on the kind of the structural part, on the air pressure, on the contents of cement, aggregates, the disposition of reinforcement as well as the thickness of the applied layer.

In the beginning of the gunning works a lot of rebound will fall off, because first of all a plastic, smooth coussinet has to be obtained. The rebound becomes much poorer and comprises more coarse aggregates change the initial mix. Therefore, the contents of cement of the gunning compound to be applied is always much higher than as the initial mix.

The rebound must not be reused (exceptions only with regard to special compounds).

In case of faults care must be taken that voids and other deposits will be removed by mortising.

If possible, the original surface of gunning concrete should be maintained. If necessary, the surface has to be leveled resp. formed by screening (it is advisable to use intended screed plates).

## CURING

A careful curing is most important. During the setting process a more or less intense heating of the concrete can be felt, depending on the proportion of the binding agent. In such a case the surface must be treated by sprinkling water or placing wet clothes until a temperature of approx. 20 deg. 0 to 30 deg. C is reached (avoid heavy water jets as otherwise part of the binding agent may fused away from the upper layer).

The curing can be stopped in most cases after approx. 20 to 30 hours. It may as well be possible to spray a curing film. In such a case it must be considered that the sprayed surface due to its roughness is about one and a half times (1½) as big as in case of normally coated walls.

## PROTECTIVE AND SAFETY MEASURES

Apart from the accident prevention rules the special protective and safety measures for sand blasting, working with dangerous agents (danger of explosion, danger of fire, cauterization, poisonous vapors etc.) has to be strictly observed.

With regard to any kind of gunning concrete care has to be taken that sufficient aeration and deducting of the working place will be provided (wearing of protective clothes).

The rebound must be regularly removed due to the danger of overload of the scaffoldings and structural parts.

## GENERAL PREPARATION AND INSTALLATION INSTRUCTIONS FOR PLASTIC COMPOUNDS PREPARATION

Plastic compounds are ready for use, but their plasticity has to be checked prior to installation. This can mostly be done by strongly pressing the thumb on it or by hammer testing. If the compound has already begun to dry or has become crummy, it can be reworked. In general it will be sufficient to cover the compound to be installed with damp bags for some time. In obstinate cases plasticity of the material has to be recovered by crumbling the compound, by very slightly wetting and by vigorous stirring and beating with a mortar pick. It has to be considered that the material will gain in plasticity during installation. If the compound to be installed will be too damp, cracks will occur in the finished structural areas.

All surfaces to be lined must be absolutely clean. Slag's, Scale, Loose rust, rubbish, dust, lime, or gypsum mortar and chemical matters have to be removed with particular care. It is also most important that no foreign materials will be included during ramming.

As regards side walls, arches, overhanging elements, burner openings, combustion chambers and shaped parts, it will be necessary to provide for strong, rigid and not misplace able shuttering. Shutterings have to be such as not to hinder the ramming process. Shutterings will not be necessary for some special plastic compounds and /or special cases.

This will, however, be expressly mentioned in the special erection instructions.

If steel fittings protrude into the compound, they have at first to be wrapped with refractory wool or paper, or coated with paraffin or other materials, which can be easily burnt out.

## INSTALLATION

Ramming will be done in the building direction of a wall, or for arches, towards the abutment.

The compound should be rammed into place by means of pneumatic hammers with wedge- shaped steel bases, the rectangular base surface being approx. 15 to 20 sq. cm., or by means of a heavy hammer of 1 to 1.5 kgs provided with a steel head. The ramming strokes have to be directed vertically from the front side to the rear side of the wall. In order to get a good, Strong, and homogeneous bonding, each section has to be rammed 3 to max, 4 times. Ramming has to be carried out in such a way that cavities are avoided. In order to prevent the formation of layers, the surfaces of the already rammed layers should not be smoothed. But remain rough and uneven. (Elevations and cavities to be made by means of a ramming hammer).

The ramming process should be carried out without any interruption but individual and isolated structural parts should at least be rammed continuously. If an interruption is inevitable, the surface of the last layer can be covered with plastic foil or damp cloths. In the event of a longer interruption, it will be necessary to remove the last layer up to the point where the material is still plastic. The material removed may be used again after it's reworking.

For areas rammed without shuttering the wall thickness enlarges automatically depending on the height of the wall. The wall will be brought to the desired thickness by cutting the protruding material. The cut-off material can be reworked. It is extremely important not to soil the material. It is by no means allowed to bring the wall to the desired thickness by ramming against the front wall or by bias strokes. The surface of

the rammed wall must remain rough and must by no means be smoothed. At places where a shuttering has been used, the surface must be roughened after removal of the shuttering. To evacuate the steam resulting from heating up, round holes of 3 to 4 mm have to be pierced or drilled through the whole wall thickness at intervals of approx. 150mm. For vertical walls these holes have to be oblique pointing upwards.

Expansion joints, construction joints, and shrinkage cuts are to be arranged in strict accordance with the construction drawings. Shrinkage of the compound can be localized by these construction joints and shrinkage cuts which absorb the more important surface expansion. The cuts are 1 to 2 mm wide and 1/3 of the wall thickness deep for walls and 2/3 of the wall thickness deep for roofs. They should be made by hand with blunt-edged flat irons or with a pneumatic hammer.

Anchors have to be provided according to the size and shape of the construction parts. Number arrangement and type of anchors are specified on the drawings. It is very important that all anchors are in a tensile stressed condition when installed.

When using ceramic anchor bricks and shuttering, the shuttering must be so positioned that it will be 5 to 10mm in front of the front edge of all anchor bricks, still observing the construction dimensions. The front profile of these ceramic anchor bricks has to be driven into the already rammed compound by means of special wooden or metal shapes. For this purpose, one may also use anchor bricks, which have been marked in advance. By no means install these bricks as anchor bricks. Don't drive these bricks directly into the already rammed structure areas as they could be damaged or even destroyed. Such damages especially fine hair cracks which are often not visible with the naked eye, can destruct the whole construction.

Already rammed structures being however not yet dried have to be protected against frost and humidity. Suspended roofs, arches, and other overhanging elements have to be supported until putting into operation, but shuttering must not be too close. (Grate shaped shuttering).

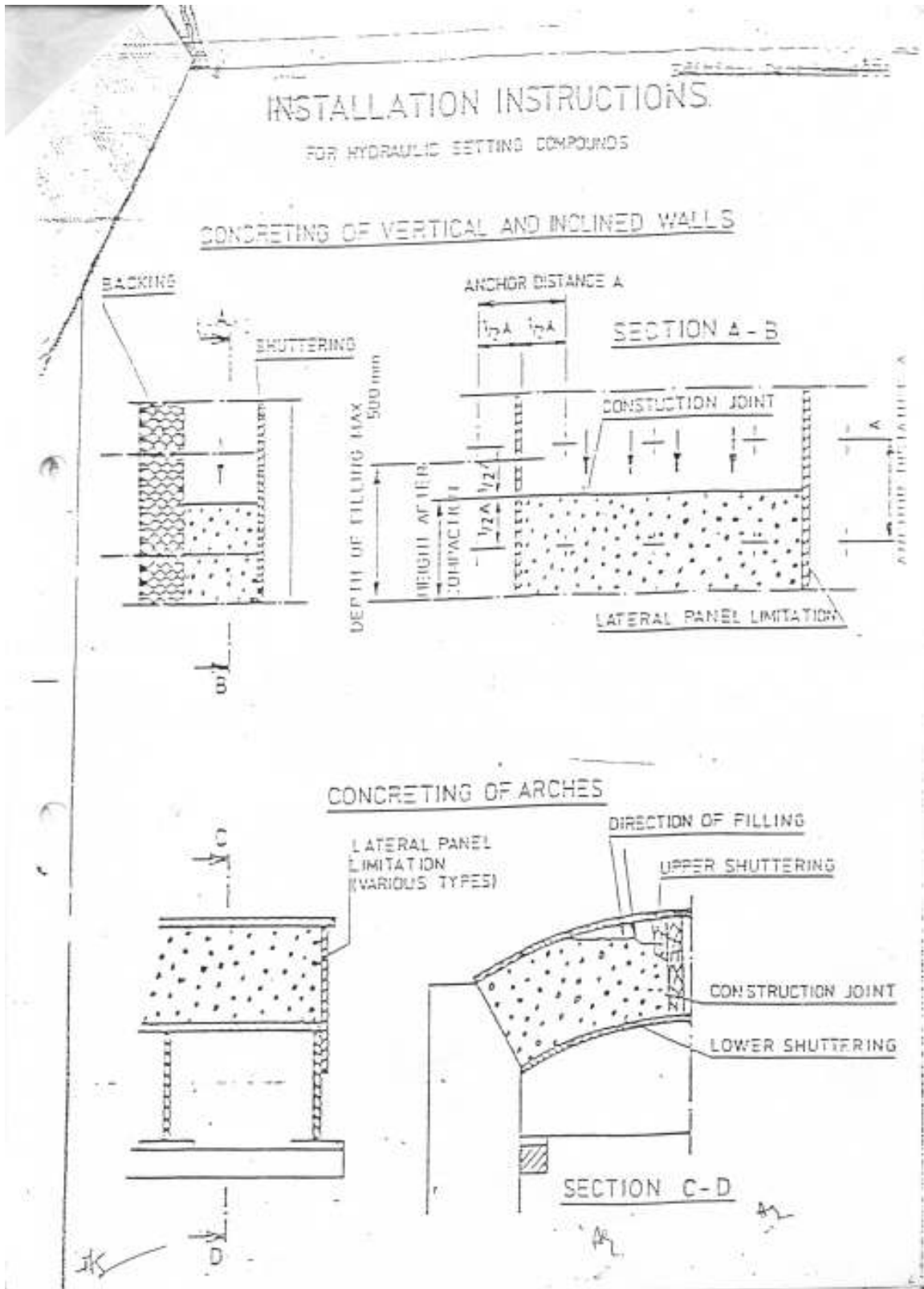
#### PREPARATION AND INSTALLATION INSTRUCTIONS

The Special preparation and installation instructions for the individual compound are to be observed as well.

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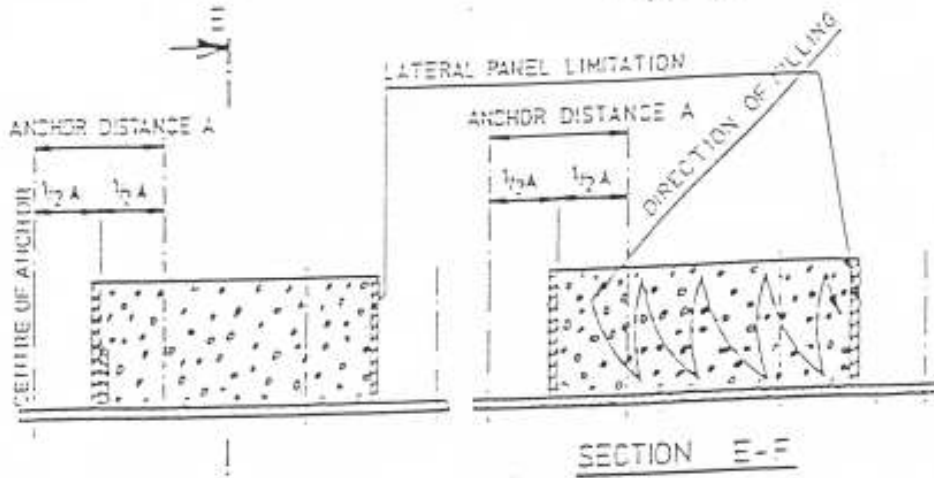
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# DRAWINGS



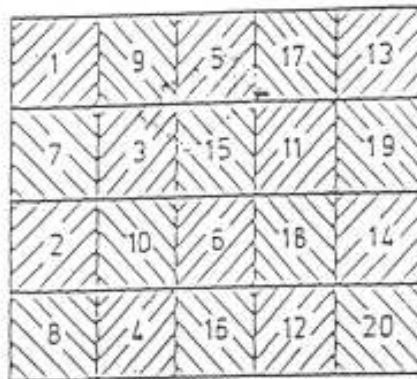
# INSTALLATION INSTRUCTIONS

FOR HYDRAULIC SETTING COMPOUNDS



## CONCRETING OF FLOORS AND ROOFS

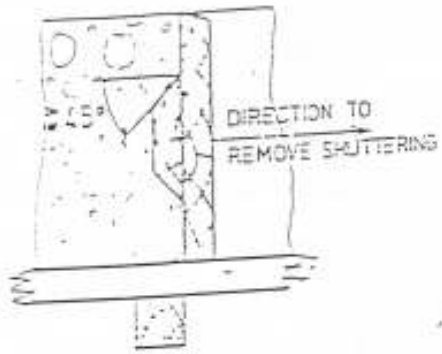
(ANCHORS AND FLOOR SHUTTERINGS SHOWN HERE ARE VERY OFTEN NOT APPLICABLE FOR FLOORS)



DIAGRAMMATIC ARRANGEMENT AND ERECTION SEQUENCE OF CHECKERED CONSTRUCTION PANELS FOR SUSPENDED ROOFS AND FLOORS

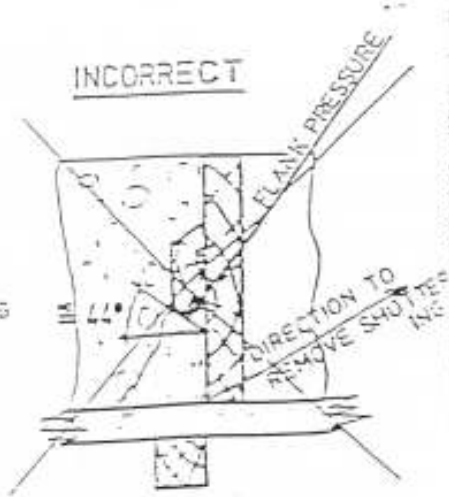
# REMOVAL OF A DOUBLE SHUTTERING

CORRECT



IF SHUTTERING IS REMOVED AS SHOWN ABOVE, STRUCTURE WILL NOT BE DAMAGED

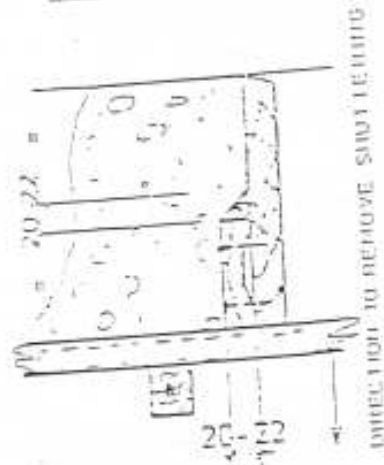
INCORRECT



IF SHUTTERING IS REMOVED AS SHOWN ABOVE, CRACKS MAY OCCUR IN THE STRUCTURE DUE TO TILTING OF THE SHUTTERING.

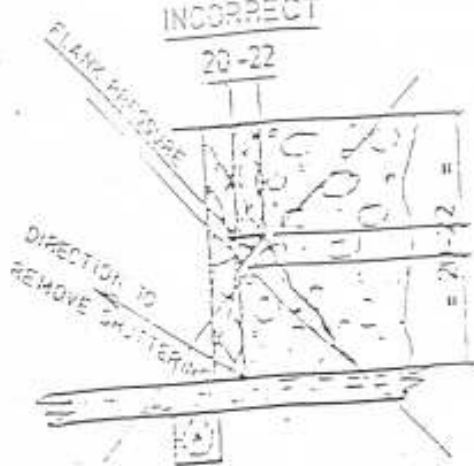
# EXECUTION OF A STAGGERED JOINT ON A SHUTTERING

CORRECT



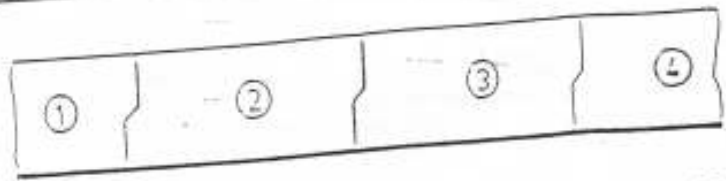
IF SHUTTERING IS REMOVED AS SHOWN ABOVE, STRUCTURE WILL NOT BE DAMAGED.

INCORRECT

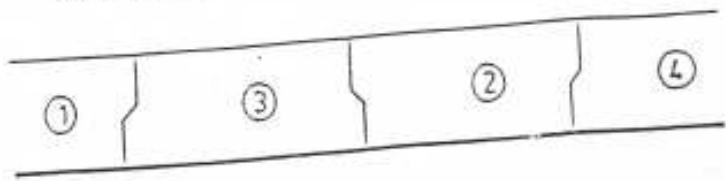


IF SHUTTERING IS REMOVED AS SHOWN ABOVE, TRACKS MAY OCCUR IN THE STRUCTURE DUE TO TILTING OF THE SHUTTERING.

## INSTALLATION SEQUENCE



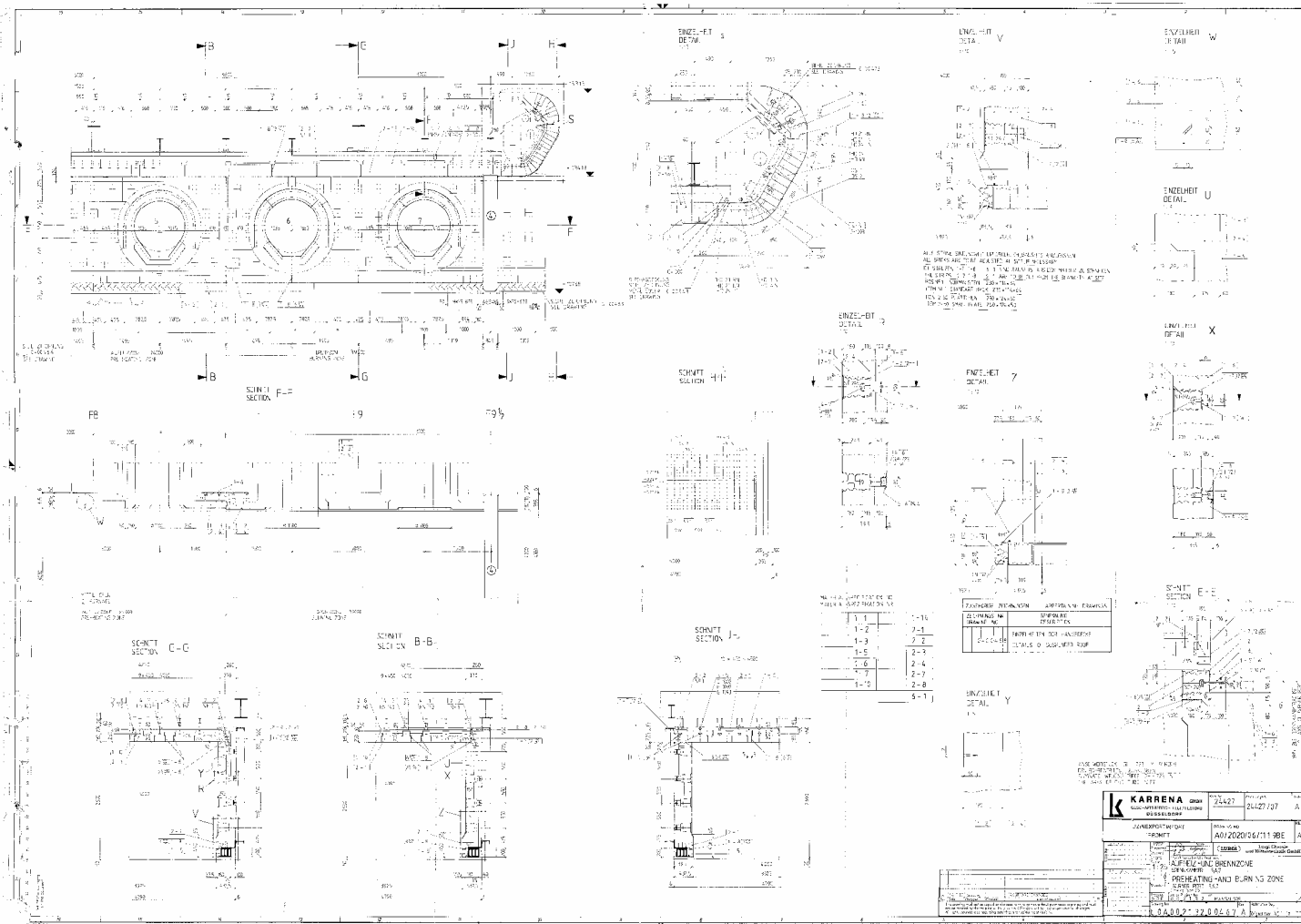
PROPOSAL 1 IN THIS CASE CONCRETING AND/OR GUNNING WILL BE MADE WHEN THE PRECEDING PANEL HAS ALREADY HARDENED.



PROPOSAL 2 IN THIS CASE PANELS WILL BE MADE ALTERNATELY AS SHOWN ON THE SKETCH.

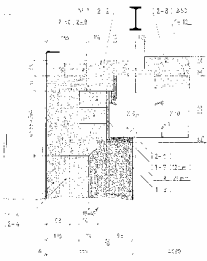




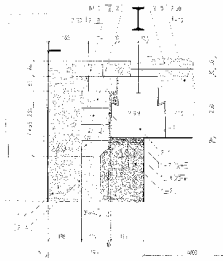


LATERA: BRICKWORK TO SUSPENDED ROOF  
 LATĖRE: AMARĂRIJĂ ÎNDE ÎNĂLȚĂRIE

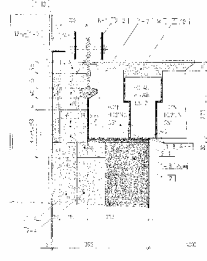
PRE-CASTING ZONE  
 A.1/HEIZZONE



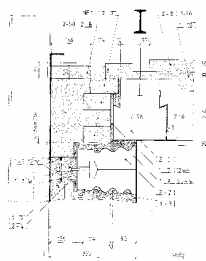
HINGE ZONE  
 ÎNDE ÎNȚĂRIE



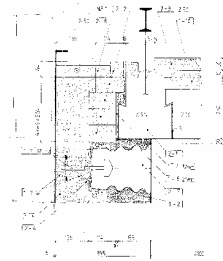
FRINGE ZONE  
 ÎNDE ÎNȚĂRIE



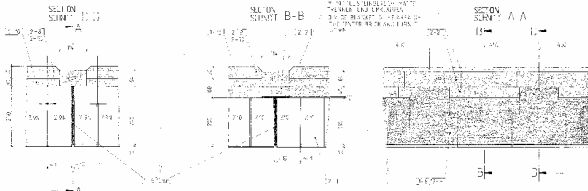
PRE-CASTING ZONE  
 A.2/HEIZZONE



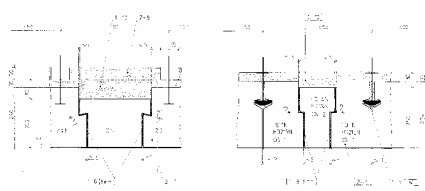
FRINGE ZONE  
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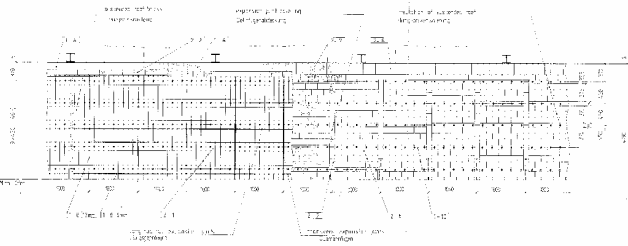
TRANSVERSE EXPANSION JOINTS (SUSPENDED ROOF)  
 ÎNDE ÎNȚĂRIE



LONGITUDINAL EXPANSION JOINTS (SUSPENDED ROOF)  
 ÎNDE ÎNȚĂRIE



PLAN VIEW OF SUSPENDED ROOF  
 ÎNDE ÎNȚĂRIE



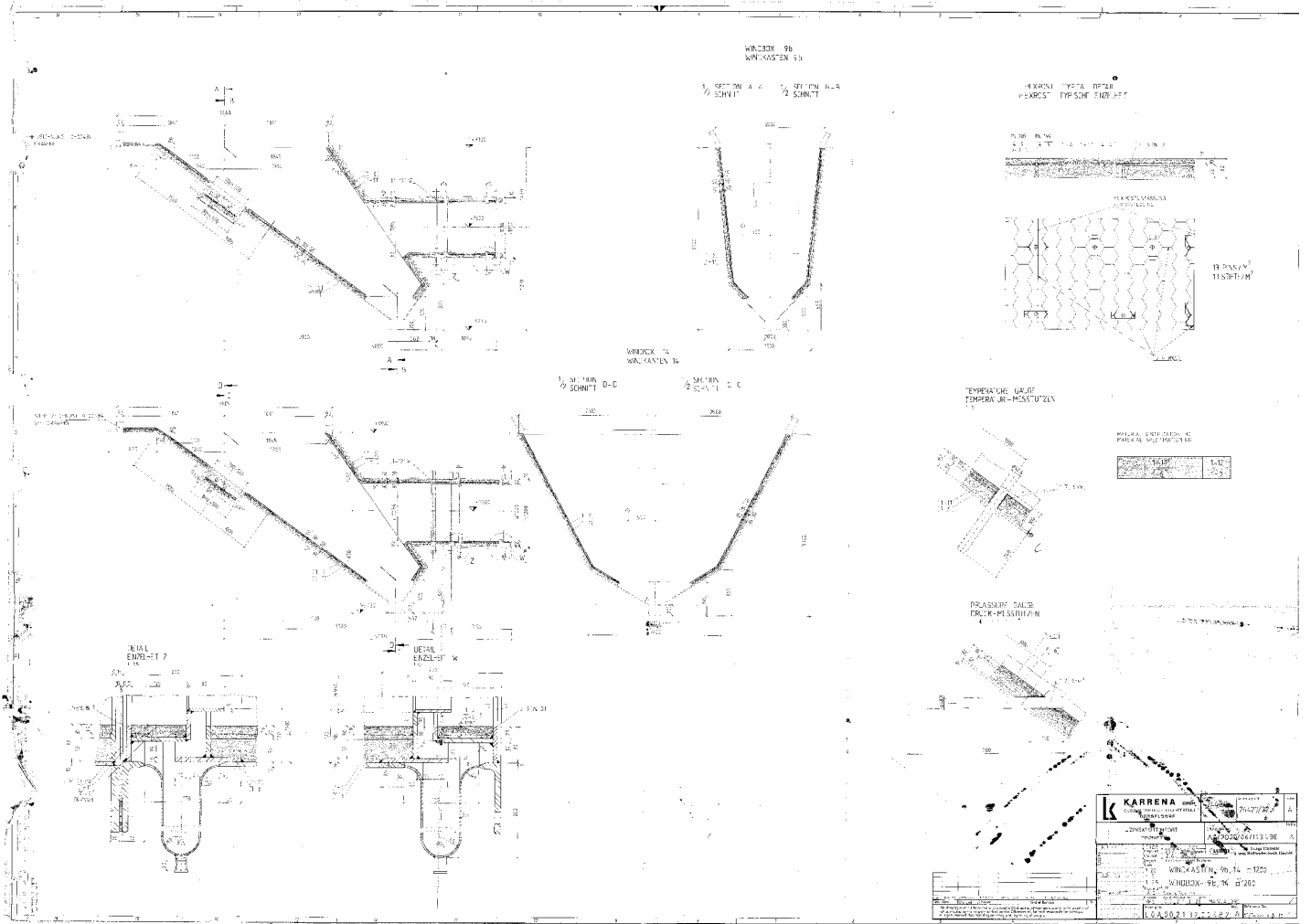
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ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE  
 SPECIFICATIONS AND STANDARDS OF THE  
 LOCAL AUTHORITIES AND THE  
 INTERNATIONAL STANDARDS.  
 THE CONTRACTOR SHALL BE RESPONSIBLE FOR  
 OBTAINING ALL NECESSARY PERMITS AND  
 APPROVALS FROM THE LOCAL AUTHORITIES.  
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 APPROVALS FROM THE LOCAL AUTHORITIES.

<b>KARRENA</b>	2022	2022/02
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(UN PRICED)

SCHEDULE OF WORK

Sl. No.	Description of the job	Unit	Qty	Rate (₹)	Amount(₹)
1.	<b>Labour charges only</b> for relining of Indurating Machine furnace including dismantling, cleaning surface preparation, ramming, casting, bricking, welding of anchors, gunning etc., as per drawing and instructions of Engineer-in-charge.				
a)	Refractory monolithics	MT	110		
b)	Dense Bricks and Mortar.	MT	25		
c)	Insulating lining.	MT	28		
d)	Gunning of refractory	MT	23		
e)	Dismantling of aged out refractory including removal of debris, shifting and transportation within a lead of 2 KM.	Sq.M.	460		
f)	Replacement of Mother shell plate (job includes cutting, dressing and re-welding of damaged shell plate. However refractory done at that location shall be measured as per item no. 1 a), b), c) and d) of above as the case may be).	Sq.M.	10		
g)	Hex mesh fixing	Sq.M	150		
				Service Tax (if applicable)	
				Total	

(Total in words: Rupees:

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CONTRACTOR  
Address:

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OWNER

PRICE BIDSCHEDULE OF WORK

Sl. No.	Description of the job	Unit	Qty	Rate (₹)	Amount(₹)
1.	<b>Labour charges only</b> for relining of Indurating Machine furnace including dismantling, cleaning surface preparation, ramming, casting, bricking, welding of anchors, gunning etc., as per drawing and instructions of Engineer-in-charge.				
a)	Refractory monolithics	MT	110		
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c)	Insulating lining.	MT	28		
d)	Gunning of refractory	MT	23		
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g)	Hex mesh fixing	Sq.M	150		
				Service Tax (if applicable)	
				Total	

(Total in words: Rupees:

CONTRACTOR

Address:

OWNER