

HINDUSTAN CONSTRUCTION COMPANY LIMITED, MUMBAI.

PROJECT: Bandra Worli Sea Link Project, Mumbai

Company profile

Hindustan Construction Company, one of the leaders in infrastructure construction, has built major engineering landmarks around the country for last 8 decades. This includes power plants, Bridges Roads, Dams Barrages, Tunnels, Environmental projects, Marine works etc.

Project details

The Bandra Worli Sea link project, the first of its kinds, connects the island city of Mumbai with its western suburbs. The 4 Km (approx.) bridge is an example of truly groundbreaking engineering. The 8 - line pre-cast segmental concrete bridge constructed at open sea also included a cable stay portion, tow parallel 4 line bridges of 500 meters suspended from twin towers 126 meters high. Completing the seal link approach bridges, a 16 lane state of art toll plaza and building for traffic control, weather monitoring and surveillance systems.



Electrical Equipments & Energy Conservation.

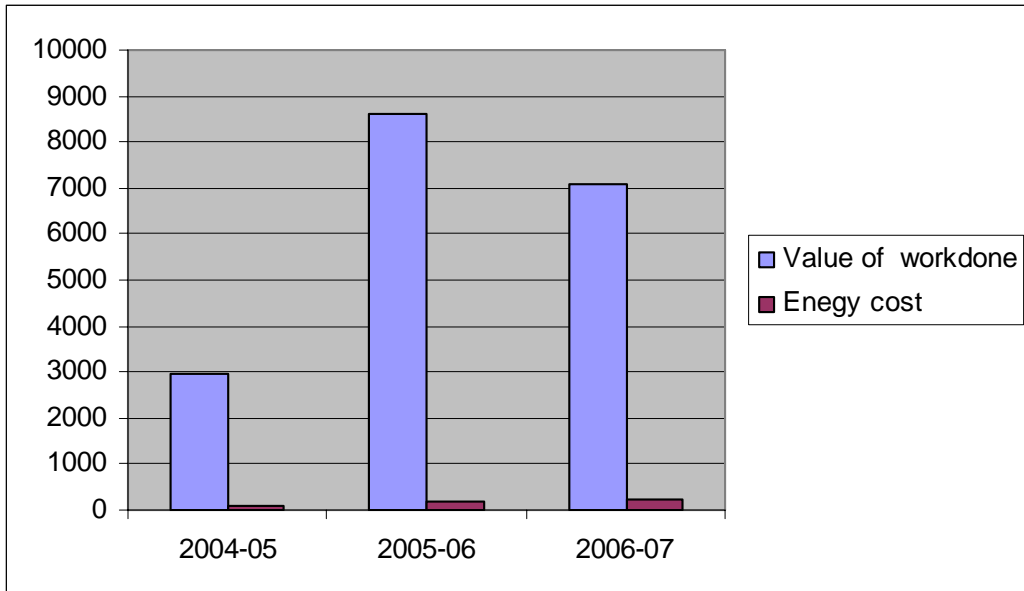
In today's competitive world of construction and fast track projects cost conscious mind is essential and all form of energy is precious. Keeping these in mind we initiated the energy conservation program. For the bridgework we are utilising GRID power for plant and equipments at on shore locations and Diesel generators are using for offshore / marine working locations. The list of major electrically operated equipments is as follows.

S.N.	Electrical Equipments	Quantity	
1	Concrete production eqpts.	Batching Plants	2
		Ice Plants	3
		Chilling Water Plant	1
2	Concrete transportation Equipments	Super Swinger	1
		Rotec Conveyor	2
		Apollo Concrete Placer	1
		Placer Boom	5
3	Cranes	Tower Cranes	7
		Gantry Cranes	4
		Lifting Frame	1
4	Bridge Erector / Launching Truss	Launching Truss	2
		Loading Installation	2
5	Jack ups	4	
6	Passenger hoist	1	
7	Electric Compressor	3	
8	Welding sets	52	
9	Dewatering Pumps	Kishor Pump	24
		Submersible pump	

We are evaluating monthly electrical energy consumption and analyzing the data with respect to standard norms. In addition to this every year we are preparing an electrical energy conservation program and implementing the same.

Energy consumption details

DESCRIPTION	Unit	2004-05	2005-06	2006-07
Value of workdone	Rs. Lakhs	2967	8600	7072
Connected load	kW	3606	4995	5995
Energy consumption	Lacs kWh	14.82	24.12	27.58
Energy cost	Rs. Lakhs	104.19	178.08	237.69
% Energy cons. vs workdone	%	0.50	0.28	0.39
% energy cons. vs connected load	%	0.41	0.48	0.46
% Energy cost vs workdone	%	3.51	2.07	3.36
% energy cost vs connected load	%	2.89	3.57	3.96



Energy Conservation Achievements

1. Optimizing the productivity of Concrete mixing batching plant.

The idle running of plant and equipment is the major energy wastage in a construction industry. Reduction in idle time will increase the efficiency and productivity. The following examples shows small modification at site improves the productivity and reduces the energy cost.

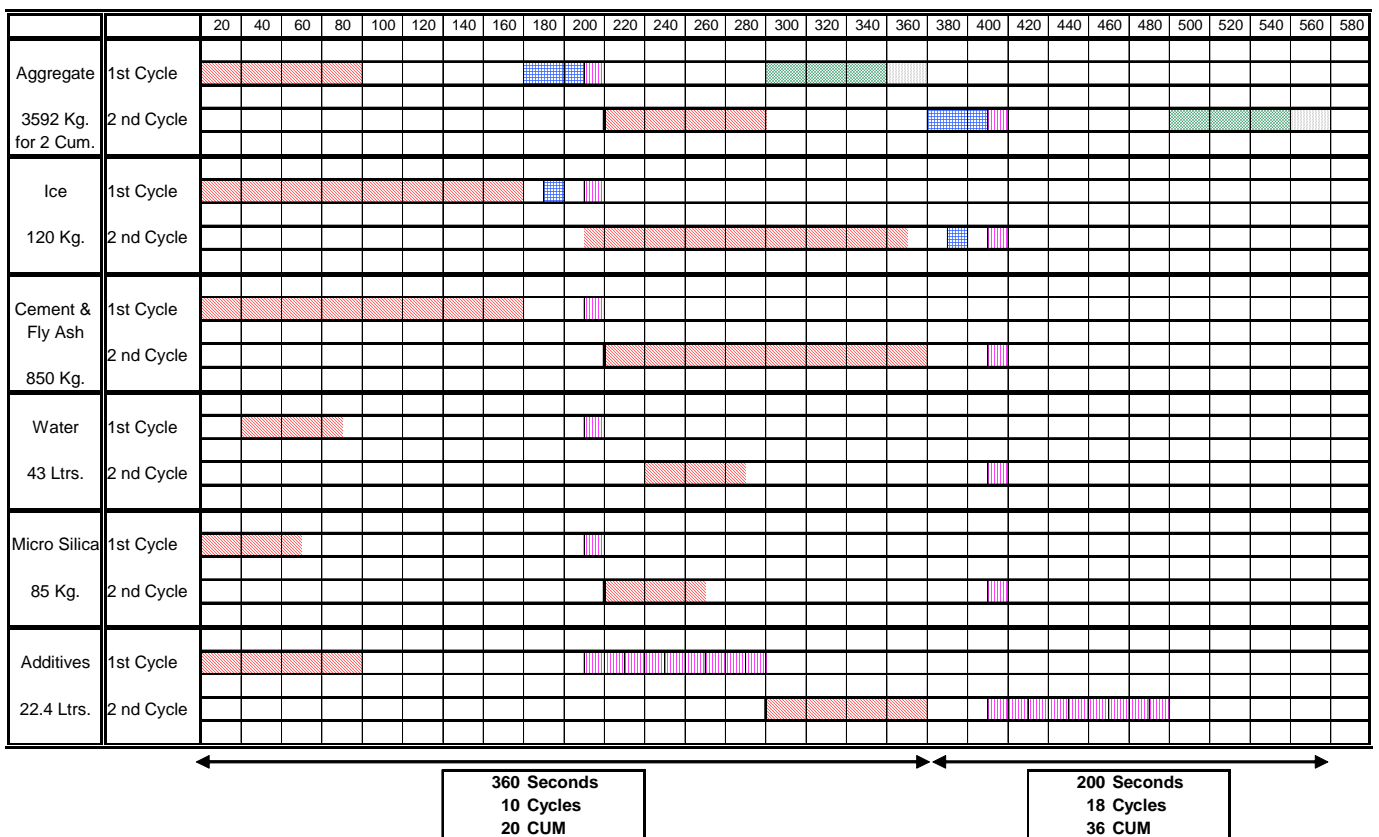
The 90 CUM batching plants at our project, initially the specific power consumption was very high and productivity was low due to the new mix design and more ingredients. Our observation and remedial action on low productivity are as under

1. Aggregate batching time was high due to high moisture content in crusher dust and river sand. So for free flowing of aggregate, we provided more vibrators in the weighers.
2. The additive batching time was high due to low dosing capacity of pump and high viscosity of admixture. We replaced it with new dual way gear pump and solved both problems. And also additive feeding system shifted to mixer level
3. The sloping belt running time was more. We reduced auto stop time in software

4. The cement batching time was more. So we provided pneumatic connection & vibrator for free flow of cement.
5. Fine-tuned all setting in software and reduced the idling of plant.
6. The efficiency of fly ash feeding system was poor. Te cement screw replaced with new special purpose fly ash screw and added additional aeration system to this reduced the delay.

Process chart -Before plant modification

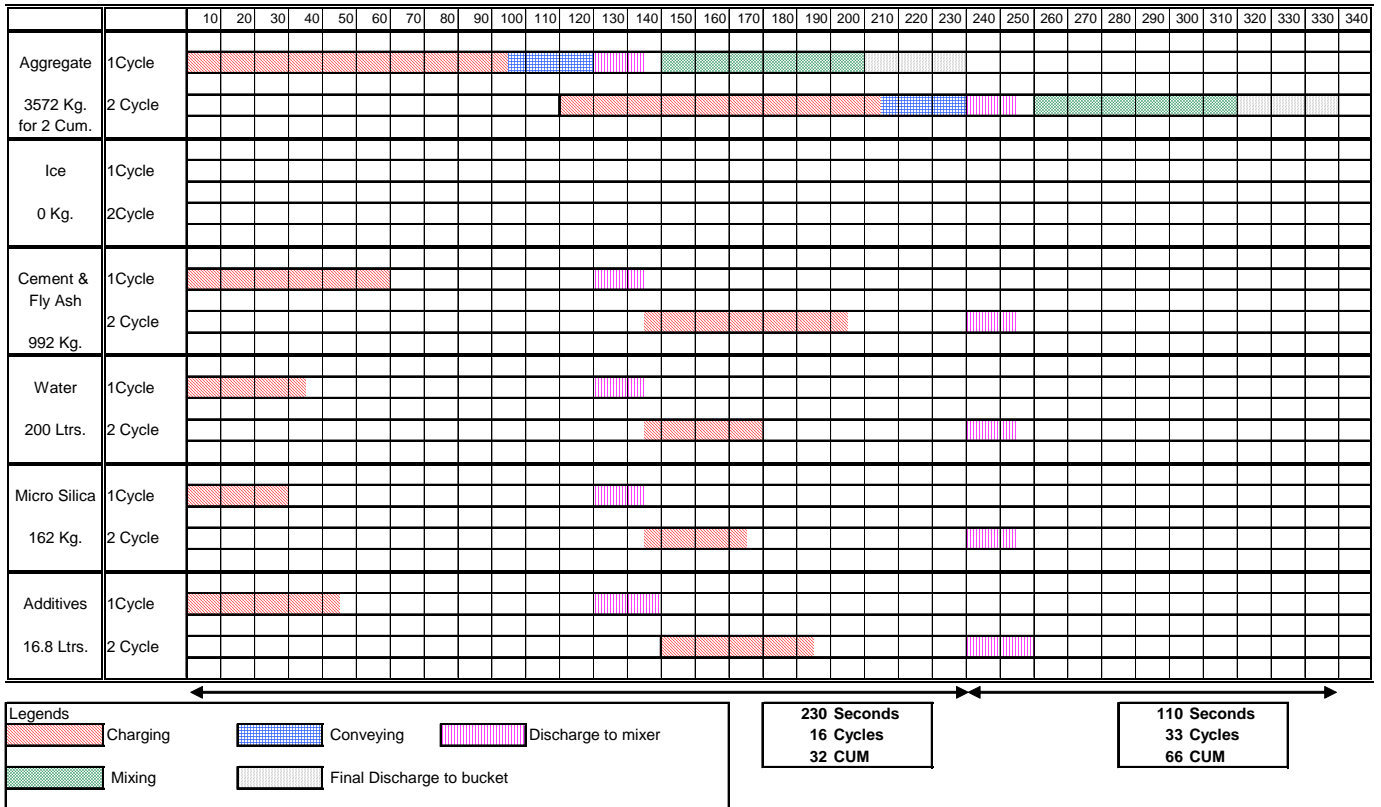
Process Chart for 2 CUM - M60 A20 Grade Concrete



Process chart -After plant modification

Process Chart of SIMEM Batching Plant for 2 CUM - M50 A20 Grade Concrete (P-19 S26)

Date : 15/12/2003



Note : First batch takes 230 seconds and next batch onwards takes only 110 seconds in continuous despatch.

Savings.

	Before modification	After modification
Cycle Time	200 sec	110 Sec
Cycles / Hr.	18 cycles	33 cycles
Production/ Hr.	36 Cum / Hr.	66 Cum / Hr.
Units/ Hr.	66	41
Total working hours	2219	
Difference in power cons	146454	90979
Saving Units	55475	
Saving Rs. In lacs @ 6 Rs/unit	3.3285	

2. Optimizing the compressor utilization.

The same way in all electrical compressors, we regulated the pressure switch according to the requirement of pneumatic equipment. Also put more receivers in the line and made sure there is no leakages, so that the system will not always be loaded and the efficiency will be more.

In addition to this the output of 3 compressor interconnected each other through a receiver, Provided one additional timer to the compressor main panel to switch off the compressor when it is running idle more than 5 minutes.

	Before modification	After modification
Units/ Hr.	90	82
Total working hours	5455	
Difference in power cons	490950	447310
Saving Units	43640	
Saving Rs. In lacs @ 6 Rs/unit	2.6184	

3. Ice plant modification.

The ice plant Freon compressor was very old and obsolete model. We replaced this with new ammonia compressor. This modification reduced the specific consumption of compressor and the details are.

	Before modification	After modification
Units/ Hr.	88	72
Total working hours	4809	
Difference in power cons	423192	346248
Saving Units	76944	
Saving Rs. In lacs @ 6 Rs/unit	4.61664	

4. Offshore / Marine projects

- a. Optimum Utilisation of diesel generators
 - i. Each Marine working location is an isolated area so diesel generator are using for power requirement according to the maximum connected load. But some times the actual load is very less (like only illumination load on holidays and non working days). Instead of running higher capacity diesel generators, we connected suitable small capacity (10 / 30 kVA) through changeover switch and saved the fuel
 - ii. Instead of using a new generation at each marine working location, we laid / hanged the power cable across the pile cap at a distance of 50 meters. In this way we utilized the surplus power of diesel generator, which is only required for starting the higher capacity pumps / motors.
 - iii. Most of the DOL starters of dewatering pumps were replaced with star delta starter.

- b. Optimum utilization of GRID power instead of DG power for marine works
 - i. Used the Grid supply for the construction works of approach bridges and bridge erection works. The launching truss at BWSLP was planned to operate on Generators. With existing recourses we provided grid supply for the erection of segments up to P – 18 (900 Meters). The attached cost comparison of the same is self-exploratory.

Total Genset running expenses

S.N.	Description	500 kVA	30 kVA	180 kVA	30 kVA
1	Running Hours per span	67	173	504	672
2	Diesel consumption per hr. (Ltr.)	22	2.5	12	2.5
3	Diesel consumption - total (Ltr.)	1474	432.5	6048	1680
4	Engine Oil Consumption (Ltr.)	40	15	40	15
5	Diesel Cost @ Rs 33/Ltr.	48642	14272.5	199584	55440
6	Engine Oil Cost @ Rs 88/Ltr.	3520	1320	3520	1320
7	Store, spare, etc (Rs)	1541	1384	7560	5376
8	Total Cost per genset (Rs)	53703	16976.5	210664	62136
	Total	70680		272800	

Total cost for grid supply

S.N.	Description				
1	Power consumption per span	4000	kwh		
2	Unit Rate	6.5	Rs.		
	Total cost of grid supply	26000	Rs.		

Cost saving

S.N.	Description				
1	Cost saved per span	44679.5	Rs.		
2	Cost saved for 36 span	16.08462	Rs. In lacs		

- ii. In the same way, after completing the bridge span erection up to P 18, we extended the Grid power for pylon tower construction works.

S N	Description	DG power	Grid power	Cost difference
1	Cost of power consumption per location for pile cap, pier and pier cap construction	272800	109200	163600
2	No of locations (P 10 N to P 16 N)	6	6	
3	Total power cost	1636800	655200	981600

5. Power factor improvement & incentives

From the day one to till date of this project, we maintained the power factor between 0.95 and 0.99. For achieving this, we interconnected the capacitor with plant and equipments and used Automatic Power factor Correction Panels at substation.

P.F	Substation	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	
2006-07	500	1.00	1.00	0.99	0.98	0.98	0.99	0.99	0.99	0.99	0.99	0.99	1.00	
	PF incentive started by MERC from Oct 06				10525	10346	11393	10158	10540	11081	15528	33548	27719	140838
	1250+630	1.00	1.00	0.98	0.98	0.99	0.99	1.00	1.00	1.00	1.00	1.00	1.00	
	PF incentive started by MERC from Oct 06				16603	24129	26797	29496	31509	38684	42741	71335	41206	322500
P.F	Substation	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	Mar-06	Apr-06	May-06	Jun-06	
2005-06	500	0.98	0.98	0.97	0.96	0.98	0.99	0.99	0.99	0.99	0.99	0.99	1.00	
	1250+630	0.99	0.99	0.99	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.99	1.00	
P.F	Substation	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05	
2004-05	500	1.00	1.00	1.00	1.00	0.90	0.95	0.99	0.99	1.00	1.00	1.00	1.00	
	1250+630	1.00	1.00	1.00	1.00	100.00	100.00	1.00	1.00	1.00	1.00	1.00	1.00	

6. General & Illumination

- a. All halogen lamps replaced with energy efficient CFL lamps / HP Sodium / metal halide lamp fittings.
- b. At office and colony, most of incandescent lamps and tube light fittings were replaced with energy efficient CFL lamps.
- c. Seasonal time switches provided for area lighting and street lighting.
- d. Transparent roof sheets were utilised at stores and fabrication shops to utilizing the daylight for illumination.
- e. Variable Frequency drive used in 150 Ton hoist winch of launching truss for hoisting operation. This reduced the capacity of required generator for starting the motor.

Abstract of saving

Sr. No.	Description	Year of implen.	Total savings in Lacs	Investment in Lacs
1	Optimising the utilisation of batching plant	2004 -05	3.33	2.50
2	Optimising the utilisation of Elect. Compressors	2004 -05	2.62	1.00
3	Modification in Iceplant - Changing the Compressor	2004 -05	4.62	18.00
4	Optimum utilisation of DG set for 3 Pile cap location (by handing cable)	2004-05	32.65	6.00
5	Replacement of halogen lamps (1000 watts) with HPSV metal halide (400 watts).	2004-05	13.60	11.20
6	Saving - by using Grid power instead of DG sets in Launching Truss	2005 -06	16.08	3.00
7	Saving by using Grid power instead of DG sets for marine works	2005 -06	9.82	1.50
8	Diesel generators small generator used for illumination - Marine works	2005 -06	16.80	0.00
9	Power factor incentives (PF incentive started by MERC from Oct 06)	2006-07	4.63	2.50
	TOTAL		104.15	45.70

Future plan for energy conservations

- a. Lighting transformer to be promoted for future projects
- b. The construction of the office or quarters / colony should be with respect to the weather conditions. For example the prefabricated house in a hot place will increase the usage of Air conditioner / cooler and in turn the cost of it for a project period will be very high as compared to the initial savings.
- c. Usage of energy saving time switches for air conditioner will reduce the power consumption.
- d. Automatic water pump controllers will avoid the dry running of pumps. This will improve the energy savings and reduce the breakdowns Solar panels for street lightings and heaters to be introduced in the future projects

Safety, Health and Environments at HCC Bandra Worli Sea Link Project

Safety Management

- a. Organizational objectives are clubbed with OH&S objectives during the planning stages.
- b. Before executing the job the hazards are identified & safety control measures are decided by doing Job Hazard Analysis (JHA) & Risk Assessment (RA).
- c. Chalked out safe working procedures are communicated down the line on daily basis by conducting toolbox meetings.
- d. Workplaces are checked & reviewed for maintaining safe working conditions.
- e. Engineering control measures are taken prior to executing the actual task or jobs.
- f. Safety violations are noticed & communicated to line management for minimizing the number of unsafe acts.
- g. Good house keeping is maintained throughout the duration while executing the work.
- h. Periodical On target safety audits & inspections carried out jointly by safety department & execution or service department.
- i. Safety induction & Training programmes are executed before engaging the employees or workforce.
- j. Thoroughly all serious accidents, first aid cases near miss accident & accidents & incidents are investigated for identification of probable root causes for taking CAPA to avoid the reoccurrence of accidents

Occupational Health Policy.

- a. We do have an OH & S policy and have adequate and appropriate resources to implement the policy and also to achieve continual improvement in its OH & S performance
- b. Policy commitments are displayed & communicated at the site entrance for employees, sub-contractor, supplier & visitors.
- c. During Safety induction & daily toolbox meeting each & every employee including sub-contractor workers are made aware of the Policy commitment

Innovations & improved the Health & Safety performance

- a. Shifting of Gas Cylinder Storage Area from Steel Yard to Jetty.
- b. Ant slippery platform provided as a walkway for access to boat on jetty.
- c. Detachable Railings at Jetty.
- d. Construction of a Safety Stores below Deck for storing Safety appliances.
- e. Construction of hall for conducting Safety Trainings, Inductions, and Health Campaign programmes, Exhibition etc.

Following efforts have been made to build & maintain Safety culture at workplaces: -

- a. Daily Toolbox Meetings, Safety Inductions, Personal Counseling.
- b. Safety Rewards & Promotions.
- c. Health Check-up & Health Awareness Programme.
- d. Outdoor & Indoor Training Programme.
- e. Safety Cautionary Boards, Warnings & Instructions, Traffic Barricades & detachable railing etc.
- f. Provision of personal saving devices.
- g. Provision of fire extinguishers & first aid boxes.
- h. Periodical Safety Audits & Mock Drill Exercises.

Public Safety Initiatives: -

- a. It is ensured that briefing of site safety instructions & guidelines is done before entering into site premises for visitors, educational tours & VIP site visits.
- b. Entry of unauthorized person is restricted by the security deployed at site.
- c. Provided Speed breaker outside the main entrance of main office for general public.
- d. Provided cautionary signage board at main entrance location of main office, steel yard & site entrance.

Identification of Hazards and Assessment and Control Measures.

Classification of Work activities is categorized in two different ways: -

- a. Routine Activities- Bar Bending, Reinforcement, Shuttering & Formwork, Concreting, Curing, Lifting & Shifting of segments, Erection of span & Gluing Operation, Pre-Stressing & Post-Tensioning, Fabrication of shutters, Off-Shore activities like pile driving & drilling, Reinforcement, Concreting, Construction of Cofferdam with Platforms, De-Watering, Tremie seal concrete, Pile cap
- b. Reinforcement, Formwork & Concrete, Construction of Pier Cap followed by Reinforcement, Formwork & Concreting.
- c. Non-Routine Activities- Fabrication of Cofferdam, Lifters, Marine Vessels, Erection of Launching Girders, Cranes, Maintenance of Equipments, Mobilization & De-Mobilization.

Health Care System

All the employees are being covered under health insurance policy as per company's policy and workmen compensation scheme.

1. Hospital/Health Insurance Coverage

We are having full-fledged 3 First Aid Centers well equipped with an ambulance (with stretcher, Oxygen cylinder, First Aid Box etc.) Refrigerator, Sterilizer, Patient-bed, Blood Pressure Apparatus, Saline's Stand and all required medicines (including anti snake venom) are in kept First Aid Centre.

Our First Aid Centre is headed by a Registered Doctor Mrs. Shaileja Singh (M.B.B.S, MD) and assisted by a senior Compounder with one Dresser in day shift and similarly in night shift.

We are also having mediclaim facility for the entire staff & we are attached to 2 major hospitals nearby Gurunanak Hospital & Lilavati Hospital both located in Bandra.

2. Records of Health Checkup

We have maintained following records with respect to health check up.

- Pre-employment medical check up for the employees.
- Medical test of all mess workers/canteen workers.
- Eye test for all Cranes/equipment operators and drivers.
- HIV testing as a part of Aids Awareness.

3. Evaluation of factors leading to musculo skeletal disorders & psycho-social hazards: -

- To avoid musculo skeletal disorder we are educating our workforce for safe lifting & handling of materials.
- Maximum material is lifted & shifted with the help of machinery & equipment.
- More than 2 people are involved in lifting the load, which is more than 55 kg.
- Manual pulling & pushing are avoided in pre-tensioning & post-tensioning activities during span erection.
- Economical factors are considered while selecting & usage of hand tools & power tools.
- Safe design ladders are used for keeping the access & egress in the location.
- Resting platforms are provided on every work locations at height.
- Periodical rest intervals are given & manpower is rotated in handling of ice in batching plant.

4. Following work related injuries or illness are recorded: -

- Abrasive cut injuries, Crush injuries, Fractures, Burn injuries, Eye injuries, Scratch injuries, Disorders, Sprain injuries.

5. Injuries involved restriction of work

- At the time of recruitment when the person is medically fit to carry out certain work, the assignment is given to the person with respect to his skills & education. In case of restricted work the cases are verified either by contacting the medical officer in person or through telephonic discussion. The appropriate work assignment is then given to the worker.
- In case of injured person, if he is restricted to carry out or perform certain activity he is assigned to other than restricted work based on remarks given by medical officer. Almost in all cases the light work job such as receiving & inspection of materials, sorting of components, recording of data, taking inventory & other similar paper work is given to minimize his stress & workload.
- The initially assigned work is given to the person only after verification of medical fitness certificate certified by company's medical officer.
