NC ELECTRIC COMPANY LIMITED

The Registrar

Dated: July 14, 2015

National Electric Power Regulatory Authority
NEPRA Tower Attaturk Avenue (East),
Sector G-5/1, Islamabad.

Dear Sir

Subject: NC Electric Company Limited- Application for Generation License for approximately 46MW (Gross)

I, Shahzad Saleem, Chief Executive Officer, being the duly authorized representative of NC Electric Company Limited, by virtue of Board Resolution dated 11th July 2015, hereby apply to the National Electric Power Regulatory Authority (the "Authority") for the grant of a Generation License for coal based power generation facilities for a capacity of 46 MW pursuant to section 15 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997.

I certify that the documents-in-support attached with this application are prepared and submitted in conformity with the provisions of the National Electric Power Regulatory Authority Licensing (Application and Modification Procedure) Regulations, 1999, and undertake to abide by the terms and provisions of the above-said regulations. I further undertake and confirm that the information provided in the attached documents-in-support is true and correct to the best of my knowledge and belief.

A bank draft/ pay order in the sum of Rs. 278,944/= (Rupees two hundred seventy eight thousand nine hundred and forty four only), being the nonrefundable license application fee calculated in accordance with Schedule II to the National Electric Power Regulatory Authority Licensing (Application and Modification Procedure) Regulations, 1999, is also attached herewith.

Regards

Chief Executive Officer

NC Electric Company Limited

NC ELECTRIC COMPANY LIMITED · LHR

Registrar
Dy No. 7742
Date 15-07-15
Received alongwith Two copies of Bank draft Rs. 278,944/-

For information & n/a pl.
15.07.15

- D/Reg-I/SAR
Cpy to:
- SA (Tech)
- Dir (Lic)
- LA (Lic)
- M/F

cc: Chairman
VC/M(CA)
M(T)
M(M&E)
M(Lic)

NC ELECTRIC COMPANY LIMITED

46 MW COAL BASED POWER PLANT

Prepared By: Faisal & Partners

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1 Affidavit by the Chief Executive Officer

NC ELECTRIC COMPANY LIMITED

BEFORE THE NATIONAL ELECTRIC POWER REGUALTORY AUTHORITY

AFFIDAVIT

I, Shahzad Saleem, Chief Executive Officer, being the duly authorized representative of NC Electric Company Limited, hereby solemnly affirm and declare that thecontents of the accompanying petition/application dated, dated 11th July 2015 including all supporting documents are true and correct to the best of my knowledge and belief and thatnothing has beenconcealed.

I also affirm that all further documentation and information to be provided by me in connection with the accompanying petition shall be true to the best of my knowledge and belief.

DEPONENT

Verification

Verified on oath at Lahore on this dated 11th July 2015 that the contents of the above affidavit, are true and correct to the best of my knowledge and belief.

2

NC ELECTRIC COMPANY LIMITED

CERTIFIED TO BE TRUE COPY OF RESOLUTION DATED 11 JULY 2015

PASSED BY THE BOARD OF DIRECTORS OF NC ELECTRIC COMPANY LIMITED

Present:

1. Mr. Shahzad Saleem (Chief Executive/Director)
2. Mr. Yahya Saleem (Director)
3. Mr. Zain Shahzad (Director)

The afforested directors of the Company have passed the following resolutions in writing, through circulation.

RESOLVED THAT

"The Company shall proceed with all acts necessary to comply with the legal and regulatory requirements in relation to its business objects and activities."

FURTHER RESOLVED THAT

"Shahazad Saleem, Chief Executive Officer has been duly authorized to file (i) an application for grant of Generation License; (ii) any other clarification, submission, application, petition, or document in support thereof (iii) to make any oral or written representations on behalf of the Company;before the National Electric Power Regulatory Authority and any other body, organization, department, judicial and quasi-judicial body in relation to the aforesaid filings; and to do all other acts, deeds, things and matters as may be deemed expedient in giving effect to the aforesaid resolution."

ALSO RESOLVED THAT THE above resolutions shall remain in force until an amending resolution shall be passed by the Board of Directors and a copy thereof certified by any of the Directors, or the Corporate Secretary or Manager Corporate shall be communicated to the Authority.

31-Q, Gulberg II, Lahore - 54660, Pakistan. Tel: 92-42-35761730 Fax: 92-42-35878696 www.nishat.net

3 Copy of Pay Order for Bank Fees

Dubai Islamic Bank
Pakistan Ltd

بنك دبي الإسلامي
الباكستان المحدود

0678634

GULBERG MAIN BOULEVARD LAHORE

Date: 14-JUL-2015
PON 678634

Pay to the order of NATIONAL ELECTRIC POWER REGULARITY AUTHORITY A/C NC ELECTRIC COMPANY LIMITED

PKR 278,944.00

Pakistani Rupees Two Hundred Seventy Eight Thousand Nine Hundred Forty Four Only*****

For Dubai Islamic Bank

Mubasher Ahmed
P.A. # B-180
Attorney

Attorney

Dubai Islamic Bank
003

"0678634"013000340000061000"020"

4 Project Overview

4.1 Background

There has been an enormous increase in the demand of energy as a result of industrial development and population growth, in comparison to enhancement in energy production. Supply of energy is, therefore, far less than the actual demand, resultantly crisis has emerged.Electricity shortages caused losses to industry, in turn causing many closures. In addition, the cost of electricity has risen sharply that has left the products manufactured by companies in Pakistan as uncompetitive both in international market and local market (which is flushed with cheaper Chinese products).

NishatChunian Limited ("NCL"), being one of the leading textile manufacturing company whose main business is exporting of textile products, is facing extreme power shortage. Accordingly, NCL, through its wholly owned subsidiary, NC Electric Company Limited ("the "Applicant" or the "Company" or the "Licensee"), decided to set up and operate a 46 MW (Gross) coal fired power generating facility (the "Facility" or the "Project"). The Company is incorporated to undertake the Project.

The Company will be supplying/selling most of its generation capacity to NCL or other associated concerns and may also, subject to applicable laws, supply/sell power to bulk power consumers in its neighborhood.

4.2 Project Rationale

All above has caused NCL to establish in house generating capabilities. Since gas is not available and furnace oil prices (when the Project was envisaged and acted upon) were expensive, it was decided by NCL to set and operate the Facility on coal. Although recent reduction in price of furnace oil are competitive, the economic cycle *vis* a *vis*furnace oil tells us that the current prices will not prevail for long and increase in price is imminent. Their opinion can be vouched by the recent increasing trend for furnace oil price.

In this scenario, the production of electricity on coal is not only need of time but if utilized properly can change the economic appearance of Pakistan.

4.3 Technology and Configuration

The project is based on CFB boilers, as it provides flexibility in using different kinds of coal. The plant is designed to achieve the Thermal efficiency of 32.5%.Schedule 1 attached herewith provide complete details of the technology.However, brief list of equipment to be used in the Facility is as follows:

- 2 x 110 TPH BMCR CFB Boilers
- 1 x 46 MW condensing cum extraction Steam Turbine
- 2 x 1 Electrostatic Precipitators for Emission Control
- 6 x 1 Auxiliary transformers for auxiliary load of the plant
- Dry coal shed, coal and ash handling system
- Cooling tower to meet the requirement of cool water
- Coal required 474 Tones per day
- Steam pressure 100 bar
- Ash yard to store ash for 3 months
- Capability to blend local coal
- Water needed for cooling of the plant will obtained from underground bore well pump (2w + 1s), further the water will be recycled.

4.4 Design Standards and Codes:

Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations is NFPA850. The following standards will be followed at plant site for fire protection of various systems:

- NFPA10 for Portable Fire Extinguishers.
- NFPA11 for Low-, Medium-, and High-Expansion Foam.
- NFPA12 for Carbon Dioxide Extinguishing Systems.
- NFPA13 for Installation of Sprinkler Systems.
- NFPA14 for Installation of Standpipe and Hose Systems.
- NFPA15 for Water Spray Fixed Systems for Fire Protection.
- NFPA20 for Installation of Stationary Pumps for Fire Protection.
- NFPA72 for National Fire Alarm and Signaling.
- NFPA2001-2012Edition for Clean Agent Fire Extinguishing Systems.
- NFPA24 for Installation of Private Fire Service Mains and Their Appurtenances.

4.4.1 Main design principles:

1. The fire-fighting system of the project shall be constructed at one time according to the planned capacity; the fire-fighting water shall come from two 2500m³ raw water tanks; the water refers to bore well water.
2. The plant shall adopt an independent temporary high pressure water fire-fighting system and set up an independent fire water pump house. It shall consist of one motor-driven hydrant pump; one diesel engine-driven hydrant pump (standby) and one jockey pump in the fire water pump house. The fire water pump shall adopt two control modes: local control mode; main control room control mode; the fire pump shall be stopped in the fire pump house by professional fire-fighting personnel to prevent error operation.
3. It shall set up indoor and outdoor fire hydrant system in the whole plant and set up adequate amount of movable fire extinguishing facilities in relevant plant buildings and electrical rooms according to the "code" requirements.
4. Various fire extinguishing areas shall adopt proper automatic wet pipe sprinkler system, automatic water spray system, water curtain system, hydrant system, automatic pre action water sprinkler system, CO2 gas extinguishing system, clean agent gas extinguishing system and foam system.
5. It shall set up the fire detection, alarm and control system in the whole plant in order to monitor plant hazards and important areas, send out alarm as soon as possible and control relevant fire extinguishing facilities. The project fire detection signals shall be sent to the central control room of the plant.
6. The plant shall set up a fire station equipped with one water fire-fighting vehicle and one foam fire-fighting vehicle.

4.4.2 Ingredients of Fire Fighting System:

1. Fire water supply system
2. Hydrant system(including wet pipe riser inside the building)
3. Automatic water sprinkler system
4. Automatic water spray system
5. Water curtain system
6. Automatic pre action water sprinkler system
7. CO2 gas extinguishing system CO2
8. Clean agent gas extinguishing system
9. Foam system
10. Movable fire extinguishers
11. Fire detection, alarm and control system

4.4.3 Fire water supply and fire extinguishing facilities:

4.4.3.1 Fire water supply

The plant fire-fighting system will be newly constructed and will adopt an independent and temporary high pressure fire water supply system. The plant fire water supply system is composed of

1. The raw water reservoir
2. Auto cut-in Fire water pump
3. Pressure make up jockey pump
4. fire water supply pipeline network
5. indoor and outdoor fire hydrants and
6. Automatic water spraying /sprinkler system.

The fire water pump house has to set up two fire water pumps. The main pump is a motor-driven fire water pump and standby pump is a diesel engine-driven fire water pump. Besides, it has to set up one jockey pump as the pressure stabilization device of fire-fighting water supply system. Under normal condition, the jockey pump has to maintain the water pressure of fire-fighting water supply system (0.95Mpa, adjustable). Once the pressure of fire-fighting water supply system reduces to the setup value (0.85 Mpa, adjustable), the equipment operates automatically to guarantee the designed pressure of fire water supply system; in case of any fire accident, the jockey pump cannot guarantee the designed pressure of fire water supply system. Once the pressure of fire water supply system reduces to a certain value (0.80 Mpa, adjustable), the motor-driven fire water pump operates automatically. Once the pressure of pipeline network continues to reduce to a certain value (0.75 Mpa, adjustable), the diesel engine-driven fire water pump operates automatically to guarantee the water volume and pressure required by the fire water supply system. Two fire water outlet pipes in the fire water supply pump are connected with the fire water pipeline network in the plant; the pipeline network is collocated in a ring shape in the main plant building with suitable size. It is responsible for supplying fire water to main plant building and spraying of transformer; the pipeline network is also collocated in a ring shape in the oil tank, coal pile with suitable size. It is responsible for supplying fire-fighting foam water to the fuel tank, indoor fire-fighting water to various buildings and outdoor fire hydrant water to plant area. During normal time, the pipeline network pressure is 0.95 MPa. The main plant building, main auxiliary and affiliated buildings have to set up indoor fire hydrants; the arrangement of indoor fire hydrants has to guarantee adequate water pillar of two water guns to reach any indoor area. The distance of indoor fire hydrants does not exceed 30m; the water supply pipe of indoor fire hydrant has to adopt valves for section division. In case of damage in a certain section, at most five fire hydrants stop operation in the same floor. The water outlet pressure in the indoor fire hydrant mouth is not more than 0.69MPa; it has to set up pressure relief and stabilization fire hydrant in the place where water outlet pressure exceeds 0.69MPa. It has to set up outdoor fire hydrant in the fire-fighting ring-shaped pipeline network in the plant with an arrangement distance of no more than 91m. The ring-shaped pipe is divided into several independent sections by valves; there are at most five outdoor fire hydrants in each section. It has to set up pressure relief porous plate before the outdoor fire hydrant to prevent excessive water pressure.

All the fire Pumps/controllers/engine etc are UL listed and FM approved.

4.4.3.2 Fire water pump and fire water pit

Fire water of the plant comes from two 2500m³ raw water reservoirs (250 m³ of each for fire fighting); the water source refers to bore well water. The maximum one-time fire-fighting water volume is 410.90m³ during the fire accident. In order to guarantee the fire-fighting water, it has set up water level alarm signal and control device for the purpose of stopping other water pumps in the water pit.

It has to set up DN200 water return pipe in the water outlet pipe of fire water pump; the water return pipe is connected with the raw water reservoir for inspection and test of fire water pump. It has to set up pressure relief valve in the water return pipe: once the pipeline network pressure is 1.0MPa, the pressure relief valve is open automatically to prevent excessive water pressure of fire water supply system.

The two fire water pumps and jockey water pump will be installed in the fire water pump house. The size of pump house is about 19.2mx8.0m x7.8m.

4.4.3.3 Fire extinguishing facilities

The following important buildings or equipment have to not only consider fire hydrant system, but also set up special fire-fighting measures:

1. The high and low voltage switchgear room, DC power distribution room, electronic equipment room, central control room and engineer's room in the main plant building will be provided with gas fire extinguishing system.
2. The cable room will be provided with automatic pre action sprinkler system.
3. The main transformer will be provided with automatic water spray system.
4. The oil tank will be provided with low multiple foam system and movable cooling water system.
5. The main plant building coal bunker bay floor and coal conveyor galleries will be provided with automatic water spray system and water curtain system will be set in the entry-ext area of coal belt conveyor in the building.
6. The steam turbine packaged oil container, oil cooler, interlayer oil pipe, diesel generator, diesel engine-driven fire water pump and oil tank will be provided with automatic water spray system.
7. The steam turbine bearing will be provided with pre action sprinkler system (manual operation upon artificial confirmation).

4.4.3.4 Fire extinguishing facilities of combustion system

The combustion system is consisted of burner and coal silo.

The burner of the boiler will be provided with linear heat sensing detector and automatic water spray system, when fire alarm signal is sent to area /centralized control panel, the automatic water spray system will start by manual confirmation.

The coal silo will be provided with linear heat sensing detector, gas detector and CO2 gas fire extinguishing system. The plant has 2 coal silos; each volume is 290m^3.The maximum amount of carbon dioxide fire extinguishing agent design for single coal silo is about 1740kg. Two 2.5m^3 low pressure carbon dioxide storage tanks will be provided. When fire alarm signal is sent to the area /centralized control panel, CO2 gas fire extinguishing system will start by manual confirmation. Gas equipment are located in the main building area, with a size of about 8mx6m.

4.4.3.5 Fire extinguishing facilities of coal system

Coal pile and coal unloading equipment will be provided with outdoor hydrant, coal crusher room will be equipped with indoor hydrant.

The main plant building coal bunker bay floor and coal conveyor galleries will be provided with automatic water spray system and water curtain system will be set in the entry-exit area of coal belt conveyor in the building.

The control room, coal handling control building distribution and distribution equipment room will be provided with temperature detectors, smoke detectors and movable extinguishers.

Fire detection and alarm system coal regional control panel will be located in the coal handling control room, and connected with the main control panel.

4.4.3.6 Fire extinguishing facilities of oil system

The firefighting of oil system refers to the fire-proof and protective measures of steam turbine lubricant system, diesel generator, diesel engine-driven fire-fighting water pump and oil tank.

The steam turbine packaged oil container, oil cooler and interlayer oil pipe of steam turbine lubricant system in the main plant building will be provided with linear heat sensing detector and automatic water spay system.

The steam turbine bearing will be provided with pre action sprinkler system (manual operation upon artificial confirmation) and temperature sensing detect. Three control modes in the pre-action system will be taken: automatic control, manual control and emergency operation. Considering the importance of protected equipment, the error spraying may lead to accident; therefore it is recommended to adopt manual control mode.

The diesel generator, diesel engine-driven fire water pump and oil tank will be provided with linear heat sensing detector and automatic water spay system. In case of any fire accident, the detector works and deluge valve will be open and then water spay system will be automatically started.

The plant will newly construct one 50m³ fuel tank. It will be provided with foam system and movable cooling water system; the water of foam system and cooling water during fire accident come from the fire water pipeline network in the plant area. It has to collocate adequate amount of outdoor fire hydrants around the oil tank, set up special fixed foam fire-fighting pipes in the oil tank and set up foam gun interface in the public foam pipeline outside fire-proof dyke to extinguish scattered fire accident; set up linear temperature sensing detector around the oil tank top. Once the fire detector sends fire alarm signal to the area/centralized control panel, it has to automatically/manually start the electric control valve of burning oil tank and open the foam fire extinguishing system. At the same time, it has to open relevant cooling water pipe to cool down oil tank and avoid further aggravation.

The foam liquid has a spraying strength of 4.1 L/min.m² and spraying time of 30 minutes; the foam gun has a flow of 189 L/min and spraying time of 10 minutes; it has to select and adopt 100gal（379L） foam liquid storage cylinder (3% Fluor protein) which is collocated in the foam container room. The foam container room has a dimension of 9m□8m□4m (height). The fire-fighting cooling water has the following supply strength: burning cylinder is 1.44 L/s.m; supply time period is 4h.

4.4.4 Fire extinguishing facilities of electrical facilities

4.4.4.1 Firefighting of transformer

The main transformer will be provided with automatic water spray system; the designed spraying strength of transformer body is not less than 10.2L/minxm² and designed spraying strength of oil pit is not less than 6.1L/minxm.

The water of spray system of transformer comes from the fire water pipeline network in the main plant building. It has to set up linear temperature sensing detector in the transformer to monitor in the regional display panel and centralized control panel. Once the regional panel receives the fire alarm signal from the detector, then water spray system will be started automatically/manually.

4.4.4.2 Firefighting of cables

The cable room in the main plant building will be provided with gas fire extinguishing system, smoke sensing detector and linear temperature sensing detector. When fire alarm signal is sent to centralized control panel, the pre action sprinkler system will be started automatically/manually.

In order to prevent cable fire aggravation, the project has to adopt relevant measures such as sectional isolation, refractory isolation plate, fire-proof plugging, and partial combustion resistant cable bridge support and cable raceway; select and adopt combustion resistant cables for

important cables. It has to set up fire detector in the tunnel crossing and cable vertical well to realize automatic fire alarm.

4.4.4.3 *Fire-fighting of other electrical equipment*

The high and low voltage switchgear room, DC power distribution room, electronic equipment room, central control room and engineer's room in the main plant building will be provided with gas fire extinguishing system. The main plant building has six gas fire-fighting protection areas which is protected by the set of gas fire extinguishing system.

The name, area, height and volume (temporary) of fire-fighting protection areas in the main plant building are as follows:

The gas fire extinguishing system has three startup modes: automatic control; manual control; emergency mechanical control.

It has to set up smoke sensing detector and temperature sensing detector in the switchgear room of various buildings, send out alarm automatically according to different areas and set up movable fire extinguisher near important electrical equipment according to relevant requirements.

4.4.4.4 *Arrangement of fire extinguishers*

The fire extinguishers in the plant buildings and structures are selected in strict adherence to the Standard of Portable Fire Extinguisher (NFPA10). Generally it will adopt portable ABC dry powder fire extinguisher and trolley ABC dry powder fire extinguisher.

4.4.4.5 *Fire-fighting vehicles*

The project shall set up a fire station equipped with one water fire-fighting vehicle and one foam fire-fighting vehicle.

4.4.5 Fire alarm and control system

4.4.5.1 *Fire inspection and automatic alarm area*

The fire alarm system has to adopt the microcomputer intelligent distributed monitor system; the whole plant is divided into four monitor areas. It has to set up one main screen in the central control room and set up one regional screen in main plant building, maintenance workshop area and coal handling system. The above four control screens will be connected with various fire detectors, manual alarm buttons and control modules. It has to set up local fire detection points in the local operational panel; besides, it has to set up hardware manual operational facilities of fire-fighting linkage equipment. The main screen has colored display and printer. The monitor area is

divided as follows:

1. Main screen of central control room: central control room, electronic equipment room, engineer's room.
2. Regional screen of main plant building: high and low voltage switchgear room, storage battery room, DC power distribution room, power distribution room of electrical equipment, cable room, main tunnel of cable bridge support, vertical well, packaged oil container, oil cooler, interlayer oil pipe, steam turbine bearing and coal silo; diesel generator ,main transformer; air compress room.
3. Regional screen of maintenance workshop: maintenance workshop, diesel engine-driven fire water and oil tank.
4. Regional screen of coal handling system: coal handling control room, power distribution room, coal crusher room

4.4.5.2 Alarm and control methods

The fire alarm system includes the detector (point or linear detector, manual alarm button), regional alarm device, concentrated alarm device, fire-fighting power device and linkage signal device. The whole plant concentrated alarm device is set up in the central control room; the detection point of main plant building is directly connected with the alarm device of main plant building; the detection point of coal handling system is connected with the alarm device of coal handling area; the detection point of administrative office building is directly connected with the alarm device of administrative building. The alarm points of other auxiliary buildings outside the main plant building are directly connected with the concentrated alarm device of central control room. Various alarm points have to not only display in the area, but also send signal to the whole plant concentrated alarm device through communication method. Therefore, the whole plant fire alarm devices can immediately send out photoelectric signal in the concentrated alarm device and record the fire alarm address and time. The regional alarm device is set up in the place convenient for monitor.

After the fire alarm, the patrolling personnel has to immediately reach the fire site in principle or industrial TV monitor system has to confirm the actual condition and then manually start up relevant fire-fighting facilities for fire extinguishing. As for some places such as packaged oil container and oil pipe in the main plant building, it has to not only send out fire alarm signal, but also automatically operate water spraying or water spraying system.

It has to set up the remote startup and operation switch of fire-fighting water pump in the panel of concentrated alarm device.

The main screen can display the signal of local fire detector upon comparison and judgment and send out photoelectric alarm signal, start the fire extinguishing device according to fire-fighting

requirements, conduct linkage operation of ventilation and air conditioning equipment and relevant facilities, receive feedback signal of relevant equipment and conduct continuous automatic patrolling inspection, malfunction isolation and alarm to the detector and its circuit.
Each regional screen is connected with the main screen through general line; it has the fire detection point in the local operational panel and set up hardware manual operational facility of fire-fighting linkage equipment.

The linear temperature sensing detector of coal bunker bay of main plant building can transmit felt fire signal to relevant screen and start up the fire-fighting facilities. At the same time, the fire alarm signal can be transmitted to the fire alarm screen of coal handling area.

4.4.5.3 Automatic water sprinkler system

During normal time, the pipe after alarm valve is filled with fire-fighting water; the fire-fighting water pipe is installed with closed nozzle. In case of any fire accident, the environmental temperature increases constantly, the glass bubble of closed nozzle suffers from cracking under the fixed high temperature and closed nozzle is open to attain the water spraying and fire extinguishing effect. At this moment, the alarm valve is automatically open due to large water flow; at the same time, the water spraying alarm signal and water flow indication signal are automatically transmitted to the control panel.

4.4.5.4 Automatic pre action water sprinkler system

It can realize automatic startup or manual startup through main screen or local operational panel. It has both emergency startup device and automatic and manual selection device. They can receive and display various signals of pre-effect water spraying and fire extinguishing system: valve position monitor device of pre-effect valve and isolation valve; water flow alarm device.

4.4.5.5 Automatic water spray system

It can realize automatic startup or manual startup through main screen or local operational panel. It has both emergency startup device and automatic and manual selection device. The water spraying and fire extinguishing system of the transformer not only has the above automatic, manual, emergency startup and automatic and manual selection functions, but also realizes linkage operation with the transformer protection system. Once the fire detection system receives relevant signal of the transformer protection system to start up relevant water spraying and fire extinguishing system of transformer, it has to manually start up the water spraying and fire extinguishing system; once the fire detector operates and transformer is tripped at the same time, it has to automatically start up relevant water spraying and fire extinguishing system of transformer. At the same time, the fire detection and alarm system has to receive and display various signals of spraying and fire extinguishing system: valve position monitor device of deluge valve and isolation valve; water flow alarm device.

4.4.5.6 *Gas fire extinguishing system*

It can realize automatic startup, manual startup (press button in the gas fire extinguishing system monitor panel and centralized control panel or press button near the door of each area) or emergency startup (in the release valve of steel cylinder). Each area has two detection circuits: any circuit detector only sends out alarm; during real-time operation of detector in two circuits, the gas fire extinguishing system monitor panel and centralized control panel can start up relevant fire extinguishing system of fire-proof area, send out closing signal of relevant air conditioning equipment and fire-proof valve to the air conditioning system and receive and display the feedback signal of air conditioning system and fire-proof valve. The whole system has a startup delay device, emergency startup device and emergency stop device; besides, it has automatic and manual selection device to display the automatic and manual status of fire extinguishing system; in the alarm and spraying stage of fire extinguishing agent, the alarm controller has relevant photoelectric signal and can eliminate photoelectric signal.

4.4.5.7 *Foam system*

It can realize automatic startup and manual startup (press button in the foam fire extinguishing system local control panel and centralized control panel). There will be linear temperature sensing detector around the oil tank top and three temperature transmitters on tank; once the fire detector sends out fire alarm signal to the regional/centralized control panel, it has to automatically/manually start up the deluge valve and open the foam fire extinguishing system. At the same time, it has to open relevant cooling water pipe to cool down oil tank and avoid further aggravation.

4.4.5.8 *Emergency illumination*

DC storage battery unit has to supply power to DC emergency illumination system. It does not input during the normal operation of DC emergency illumination system; it has to conduct automatic changeover in case of malfunction in AC power source. The storage battery unit has to supply power through DC bus bar.

The emergency illumination system has to adopt emergency light with storage battery in the important places, entrance, exit and auxiliary plant building with a power supply period of not less than 1h.

4.5 Security Plan:

Adequate measures are taken to overcome any unwanted incident at site for our Chinese EPC contractor. Approximately eight (8) local police officers and 10 (Ten) private guards are appointed at site for security of our Chinese staff. This force will gradually increase with increase in number of Chinese contractors. Watch tower are under construction to ensure proper monitoring of site area. Flood lights are installed at site premises to ensure proper visibility at night.

4.6 System Studies:

Short circuit study conducted are attached as per schedule 2.

4.7 Plant Characteristics:

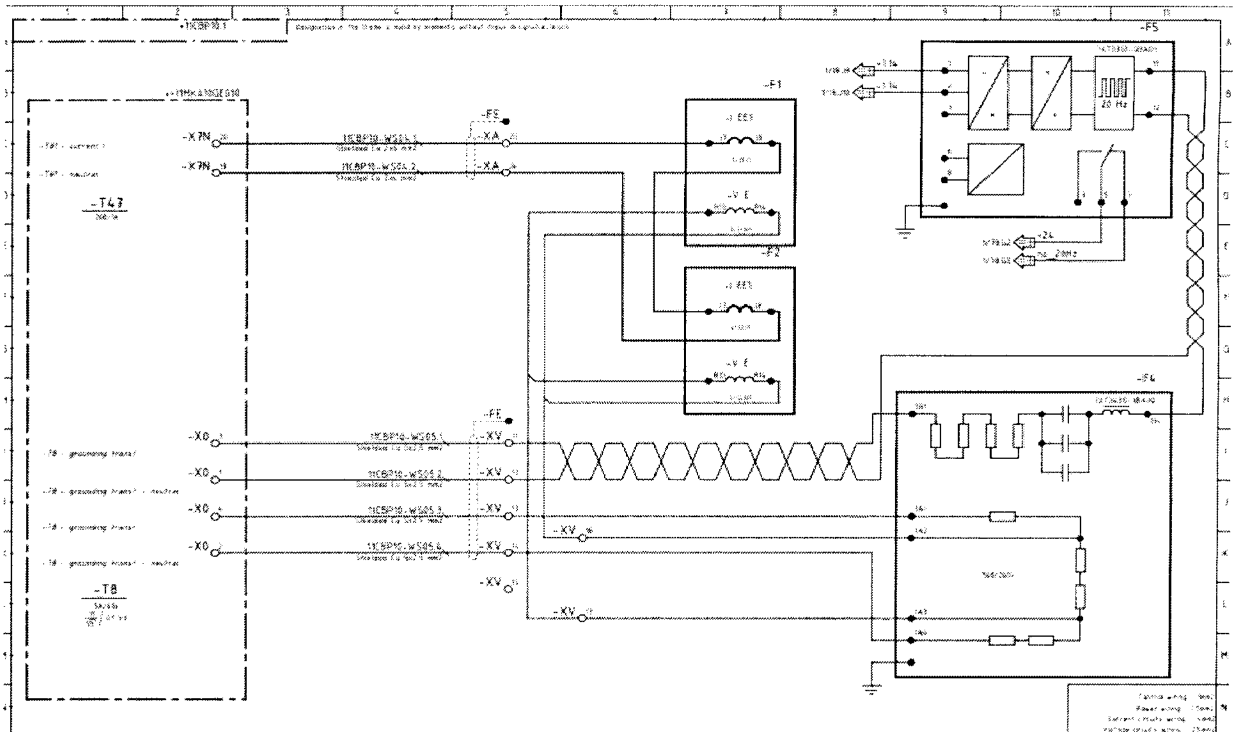
Turbine Maximum Continuous Rating (TMCR): 46 MW,
Valve Wide Open Condition (VWO): 48 MW
Generator Rating: 60 MVA,
Power Factor (P.F): 0.8
Frequency: 50 Hz.
Generation Voltage: 11 KV,
Auxiliary Consumption: 12 %

4.8 Control, metering, instrumentation and protection

- Protection diagram is attached as per Schedule 3.
- Metering system is installed in export feeders, units exported by NCEC will be recorded at the time of actual dispatch

- Turbine control panel/ Generator control panel are included in the scope of supply to ensure uninterrupted power supply.

- Generator control panel diagram is as follows:



Nishat Pakistan
GENERATOR 52 MVA

Order No.	S 42252.01
Date	02/2015
Drawn by	Ing. Zeman

SIEMENS

Object designation: Nishat PRO

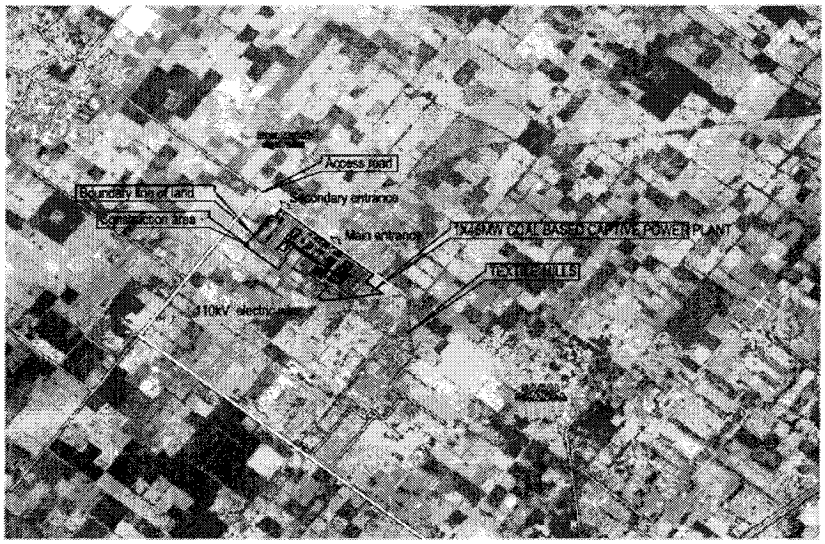
GENERATOR CONTROL PANEL 1KBP10.1

Protection -F1 -F2 current inputs - Circuit diagram

Revision		Sheet
A	01	14A

4.9 Site and Utilities

i) Plant is located at 49 km, Multan Road, Tehsil Pattoki, DistrictKasur. The water required for the plant will be obtained through bored well. Site Plan is as follows;



NOTE:
1. This diagram according to the condition to carry on the design of electronic map and the related field.

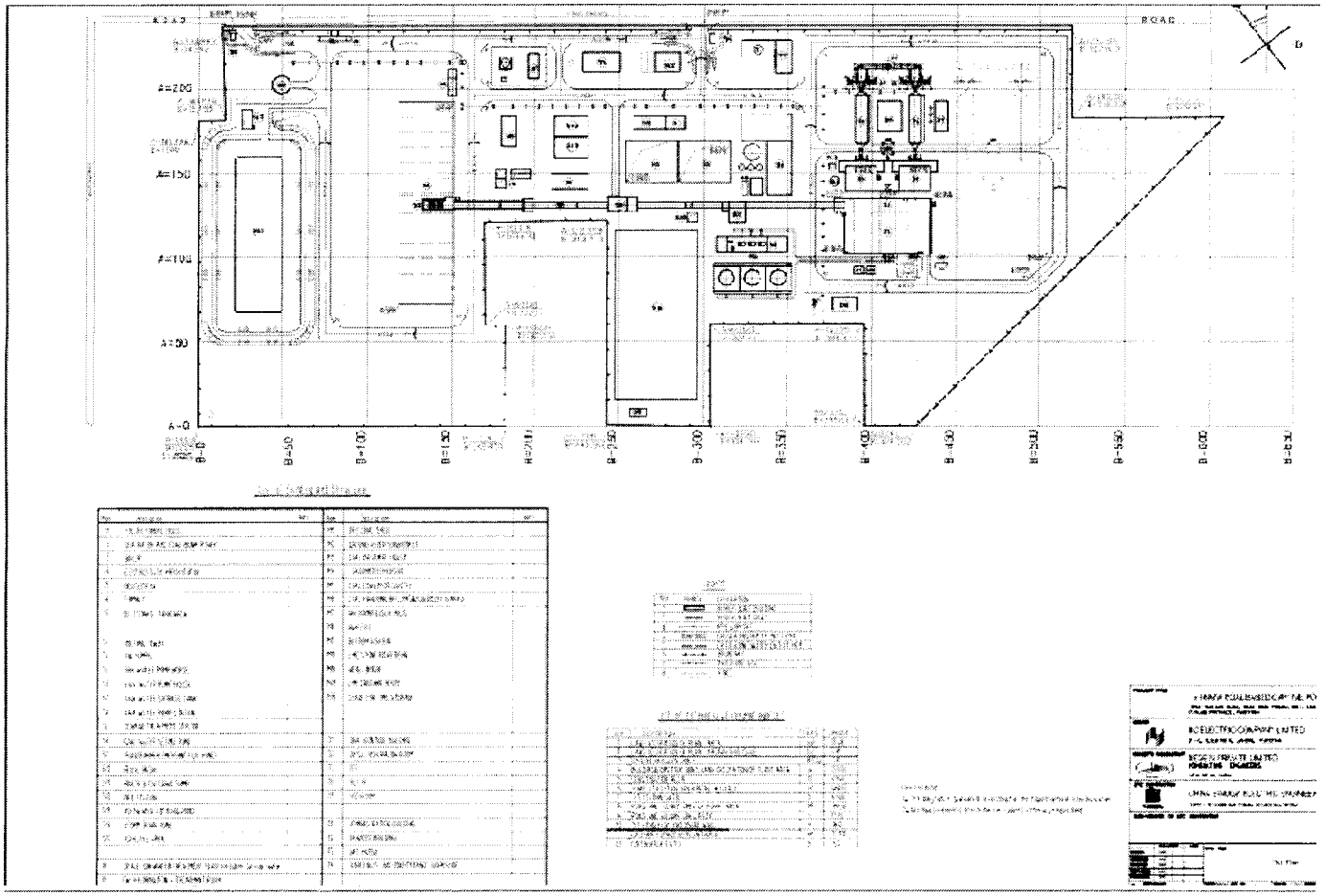
LIST OF TECHNICAL&ECONOMIC INDEXES

ITEM	DESCRIPTION	UNITS	AMOUNT	NOTE
1	LAND OCCUPATION OF SITE AREA			
1.1	LAND OCCUPATION OF PLANT AREA			
1.2	LAND OCCUPATION OFOFF-SITE ROADS AREA			
1.3	LAND OCCUPATION OFCONSTRUCTION AREA			
1.4	LAND OCCUPATION OFCONSTRUCTION THE LIVING QUARTERS			
2	THE LENGTH OF OFF-SITE ROADS			

PLANT LOCATION PLANNING

ZJ-F02241C-2-02

ii) Plot plan for our 1x46 MW coal plant:



4.10 Electric Interconnection

Out of 46 MW capacity around 5.5 MW will be consumed for auxiliary requirements of the plant, balance 40.5 MW will be available for supply to NCL and its manufacturing units and to third parties (after compliance with the applicable law).The Company is responsible for the installation, operation and maintenance of the electrical systems up to the interconnection. NCLalready has interconnection at the site and in-house transmission infrastructure through which electricity will be transmitted to it. The proposed SLD of our 46 MW coal plant is attached as per schedule 4.

4.11 Plant Utilization

Also explain how you will utilize the power;how much to NCL and its units and how much to others.

The gross capacity of the plant will be 46 MW the net capacity after taking in account the auxiliary consumption will be 40.48 MW. 29 MW will be used by different plants of NCL, balance will be sold to industries operating in the close vicinity.

Plant utilization will be as follows:

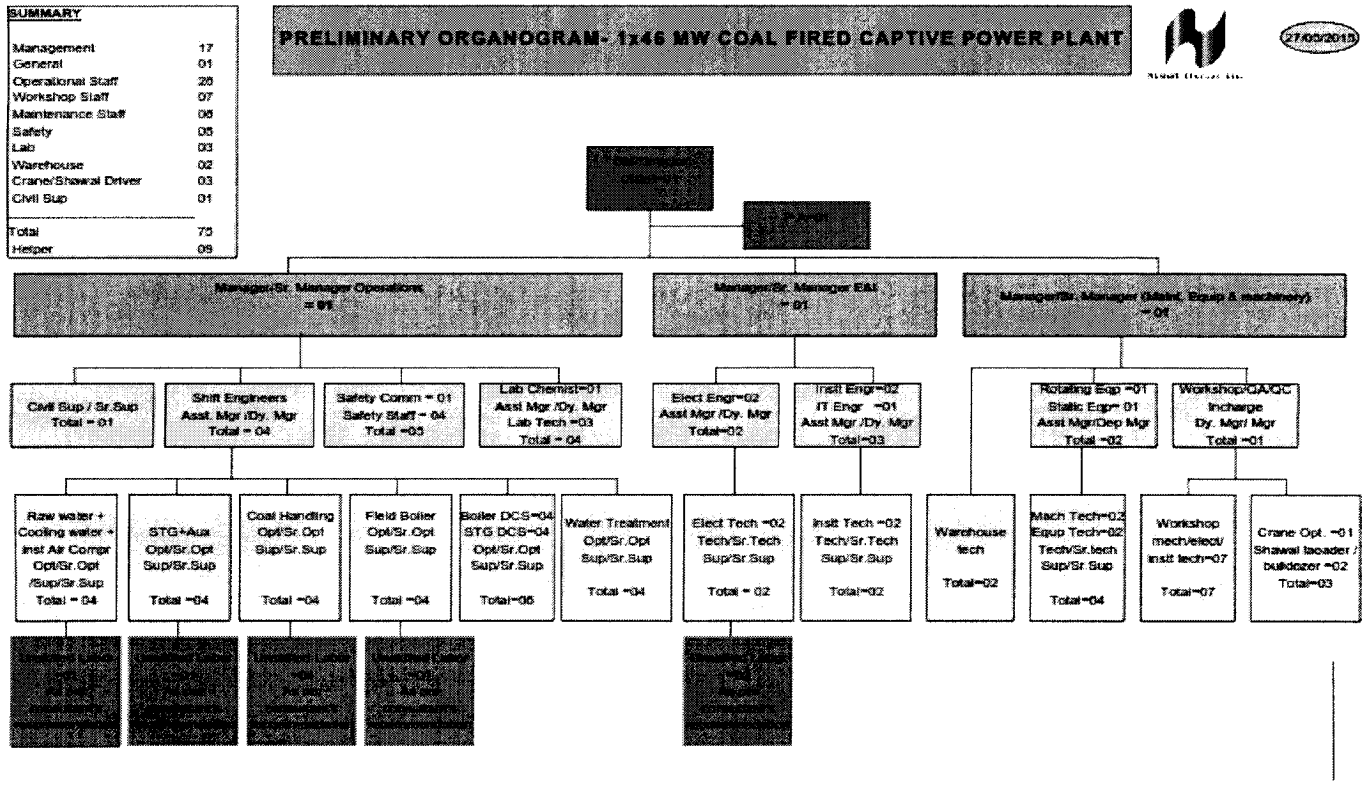
- Rated Power Generation: 46 MW
- Auxiliary Consumption: 12%
- Expected activity level: 88%
- Annual Electricity Produced:312,052 MW
- Per hour coal consumption: 20.5 Ton
- Per day coal Consumption: l470 ton

4.12 Operations and Maintenance Cost

The operation and maintenance costs mainly involve the cost of coal, its transportation and ash handling, andmanpower, maintenance manpower, administrative manpower and insurance costs.

The Company will hire suitably trained staff or appoint an experienced entity to carry out maintenance activities on theinstalled facility. Furthermore, prior to induction, the Companyprovides two (2) to three (3) months of on-site orientation training to its newly hired staffmembers. The Company also has a team of qualified engineers to plan and supervise theroutine / regular maintenance needs.

Following is the proposed manpower/organogram for O&M:



4.13 Training of Staff:

Training of staff will be provided by the EPC contractor as per agreement. This shall cover all disciplines viz, Mechanical, Electrical, C&I, & QA etc. and shall include all therelated areas like Design familiarization, training on product design featuresand product design softwares of major equipment and systems, engineering,manufacturing, erection, commissioning, training on operating features ofequipment, quality assurance and testing, plant visits and visits tomanufacturer's works, exposure to various kinds of problems which may beencountered in fabrication, manufacturing, erection, welding etc.

4.14 Coal and Ash Handling Systems

Coal will be transported to plant by self-unloading trucks, , and received at stockyard on-site. coal will be conveyed to coal bunkers via crusher house and bunker bay transfer tower. Electric plows/shovel loader/Bull dozer will be used for bunker feeding.

4.14.1 Coal Storage system

Coal storage system will be consisting of following components:-

(i) Covered coal stock yard with storage capacity of 14,000 tons (approx.), matching coal consumption for 30 days at full load.
(ii) Additionally coal could be stored in open with a further storage capacity of 14,000 tons
(ii) Two underground coal hoppers will be installed at coal storage area for two belt conveyors.
(iii) One vibrating feeder will be installed under each hopper.
(iv) Wind-break will be installed around coal yard for environmental protection.

4.14.2 Belt Conveyor System

Considering the coal consumption of [475 t/h], the design capacity of belt conveyors is [140 t/h].The width of the belt is [650mm] and speed is [1.0 m/s]. All conveyor belts will be of fire resistant plied construction type.

4.14.3 Screening and Crushing stream

Since the coal will be delivered by self-unloading trucks or rail, it will be difficult to control the size of delivered coal. Therefore, crushing system would be employed to ensure that coal lump of 50 mm and less is scaled down to less than 10 mm. There are two (2) crushers installed (1 w + 1s) to ensure constant supply of fuel for power plant. The type of coal crusher is four-teeth type crusher. Rated output of each crusher is 140 tph. :-

4.14.4 Dust suppression

Automatic sprinklers will be provided around coal stockyard for dust suppression as well as to reduce spontaneous ignition of coal stockpile.

4.14.5 Ash handling Systems

As per the coal analysis and the coal consumption, the calculated ash for boiler at B-MCR is as follows:-

Discharge Place	Design capacity of calculated Ash	Design Ash (B-MCR) t/h
Boiler calculated ash	100%	5.718
Bottom Ash	10%	0.572
Fly Ash	90%	5.146

4.14.6 Bottom Ash Handling System

The function of the furnace bottom ash handling system is to collect and extract ash from the boiler furnace bottom on a continuous basis with the boiler. The bottom ash handling system for the boiler is designed as a part of the boiler itself. The high temperature bottom ash from the boiler will be discharged through the bottom ash pipe from the boiler to the bottom ash cooler to be cooled to a safety temperature and the heat will be recovered by cooling water that will in return improve plant thermal efficiency. Bottom ashdischarged outofbottomashcoolersfor#1&#2boileristransferredbybucketchainconveyortothe bottom ashbininacollectivelymanner.Incaseoffailureonbottom ashcooler,bucketchain conveyororbucketelevator,bottomashneedstobedirectlydischargedontothegroundfromthe emergency outlet and then transported outside for disposal by men. Bottom ashconveyingsystem adoptscontinuousoperationmode,consistingof3bucketchain conveyorsand1bucketelevator.Bymeansofsuchconveyingsystem,bottom ashcomingoutof coolersisconveyedtothebottomashbinlocatedinrearofboilersforstorage.Equipmentforthe mechanicalbottom ashhandling system isdesignedbasedonthemaximumbottom ash discharging amount of boilers under BMCR condition, allowing for sufficient margin, and selectedwithcapacitynolowerthantotalmaximumcapacityofbottomashcoolers.Bucket chain conveyor under boilers has a capacity of 10t/h each and the bucket chain conveyor for transfer has a capacity of 20t/h. Onebottomashbinofsteelstructureissetupforbothboilerswithdiameter10mandcapacity.

1000t, able to accommodate bottom ash amount generated by the two boilers under BMCR conditionin7days.Atbottom ofthebottomashbinisadischargingopeningthatconnectstoadouble-shaftmixer, whichcanmixbottom ashwithwaterintowetslagwithwatercontent15-25%,hasahandling capacityof60t/h(wetslag)and isconnectedtotiptrucks.The double-shaftmixerisinstalledon theoperatingfloor4.50mofthebottom ashbin.Thereisalsoaspareoutletforfurtureuseatthe bottomash bin. Therefore, provision for both wet slag and dry bottom ash is envisioned in our design.

4.14.7 Fly Ash Handling System

Fortheflyashsysteminthisphaseofproject,dry-typeashhandlingsystemisadopted,thatis, flyashcollectedbyESPandAHPhoppersofdust precipitators isconveyedtothedryashsilo withpressurizeddense-phasepneumaticconveyingsystem. Itconsistsofthreeparts:flyash conveying system, compressed air system, and ash silo storing and unloading system. AccordingtoCodeforDesigning Ash Handling of Power Plants, it should be ensured that when boilerisunderBMCRconditionwithburningwithdesigncoal,flyashhandlingsystem can handleflyashamountgeneratedfromboilerswith a marginofover50%.Thus,capacityofeach ash handling systemis about 6t/h.

4.15 Environmental NOC and Compliance

The Company will comply with all environment laws for setting up and operation of the Facility. No Objection Certificate (NOC) for the construction phase was applied on November 6, 2014 and after fulfilling all the formalities NOC was awarded to the company on February 02, 2015. Snapshot of the NOC is as follows:

ENVIRONMENT PROTECTION DEPARTMENT
Government of the Punjab
National Hockey Stadium, Ferozepur Road, Lahore

NO. DD(EIA)/EPA/F-917(IEE)/1301/2014/139
Dated: 02/02/2015

To

Mr Shehzad Saleem,
Proponent,
M/S Nisht Chunian Electric Company LTD,
R/O 319 West Canal Link Road, House No. 1,
District Lahore.

Subject: **DECISION OF EPA PUNJAB REGARDING CONSTRUCTION OF 46 MW COAL FIRED STEAM TURBINE AT 49-KM MULTAN ROAD PHOOL NAGAR, TEHSIL PATTOKI, DISTRICT KASUR**

(Under Section 12 of the PEP Act, 1997 (amended 2012) read with IEE/EIA Regulations, 2000)

1. Description of Project: Construction of 46-MW coal fired Steam power plant over an area of 26-Acres.
2. Location of Project: The project site is located at 49-Km Multan Road, Phool Nagar, Tehsil Pattoki, District Kasur.
3. Date of submission of application: 06.11.2014.
4. After review of the Initial Environmental Examination (IEE) Report, Site Inspection Report of District Officer (Environment) and other documents, the Environmental Protection Agency, Punjab has decided to accord installing &approval for construction of the above mentioned project to safeguard the environmental issues subject to the following conditions:

i. **The proponent shall ensure compliance of National Environmental Quality Standards (NEQS).**
ii. Mitigation measures suggested in the EIA Report and Environmental Management Plan shall be strictly adhered to minimize any negative impacts on soil, groundwater, air and biological resources of the project area.
iii. Monitoring shall be carried out during the entire period of the project activities. Monitoring reports of the whole operation shall be submitted to EPA, Punjab on **monthly** basis.
iv. The proponent shall install pollution abatement equipment/treatment plant i.e. Electrostatic Precipitator, cyclone & fabric filters etc. in compatible with NEQS.
v. The proponent shall also install Mercury Control System best available in the world as per requirement of Minamata Convention ratified by Pakistan in October, 2013.
vi. The proponent shall install waste water treatment plant and shall dispose of wastewater after proper treatment.
vii. Arrangements shall be made for safe disposal of solid and hazardous waste. The solid waste shall be retained within the unit boundary / premises and shall be disposed off in an environment friendly way at a suitable disposal facility.
viii. The proponent shall ensure that strict and efficient health and safety measures are in place for protection of workers backed by a comprehensive emergency response system.
ix. The proponent shall provide proper firefighting arrangements.
x. The proponent shall take mensures for proper storage of fuel.
xi. At least 90% unskilled and to the extent possible skilled jobs shall be given to locals after providing them proper training.
xii. Compensation shall be provided to inhabitants in case of loss of agricultural land, crop, property, etc. in accordance with the rates that are agreed upon. All conflicting issues regarding compensation, etc. should be settled amicably before or during the project activities.

P.T.O

xiii. The proponent shall plant at least 30000 trees of minimum height 6-7 feet especially of indigenous species in and around the project area on available space in consultation with District Officer (Environment), within six months. The Proponent will also make necessary arrangements for the maintenance and protection of these trees.

xiv. The proponent shall appoint an Environmental Manager and shall convey the name of the Environmental Manager (having at least qualification of BS Environmental Sciences along with his complete Mailing Address and Phone Numbers).

xv. The proponent shall take effective measures for safe transportation of Fuel.

5. The proponent shall be liable for correctness and validity of the information supplied by the environmental consultant.

6. The proponent shall be liable for compliance of Sections 13, 14, 17 and 18 of IEE/EIA Regulations, 2000, regarding approval, confirmation of compliance, entry, inspections and monitoring.

7. This approval is accorded only for the installation/construction phase of the project. The proponent shall obtain approval for operation of the Project in accordance with Section 13(2)(b) and Section 18 of the IEE/EIA Regulations, 2000.

8. Any change in the approved project shall be communicated to EPA, Punjab and shall be commenced after obtaining the approval.

9. This approval shall be treated as null and void if all or any of the conditions mentioned above, is/are not complied with. This approval does not absolve the proponent of the duty to obtain any other approval or consent that may be required under any law in force and is subjudice to legal proceedings in any legal fora / court.

10. This approval shall be valid (for commencement of construction) for a period of three years from the date of issue under Section 16 of IEE / EIA Regulations, 2000.

(AMEN HANIF)
ASSISTANT DIRECTOR (EIA)
for Director General, EPA, Punjab
Ph: # (042)99232228

NO. & DATE EVEN.

A copy is forwarded for information to:

The Deputy District Officer (Environment), Phool Nagar, Pattoki w.r.t. his letter No. 915/DDOE/EPA/PN, dated: 21-08-2014. He is requested to ensure compliance of the above-mentioned conditions / measures under intimation to this office.

(AMEN HANIF)
ASSISTANT DIRECTOR (EIA)
for Director General, EPA, Punjab

4.16 Implementation Schedule

The project is expected to be completed by February 28, 2016, the detailed implementation schedule is as follows:

1 x 46 MW Coal Based CPP
of Nishat Chunian Limited, Lahore, Pakistan

No.	Contents	Period	Commence	End	12	1	2	3
1	**Design**	**334 d**	**2014年6月2日**	**2015年5月1日**				
2	**Basic Design**	**144 d**	**2014年6月2日**	**2014年10月23日**				
3	Collect Requirment of Design(Owner)	8 d	2014年6月2日	2014年6月9日				
4	Plant Plot	3 d	2014年6月10日	2014年6月12日				
5	Each part supply Requirments for the others	20 d	2014年6月13日	2014年7月2日				
6	Supply Specification of SG & STG	5 d	2014年6月10日	2014年6月14日				
7	Supply Information of Basic Design(Owner)	1 d	2014年7月2日	2014年7月2日				
8	Finish Basic Technical file & Drawings	30 d	2014年7月3日	2014年8月1日				
9	Supply Geological prospecting demand	2 d	2014年8月2日	2014年8月3日				
10	Technical files summary	3 d	2014年8月4日	2014年8月6日				
11	Check & Approve	3 d	2014年8月7日	2014年8月9日				
12	Supply Preliminary BOQ of civil works	5 d	2014年8月2日	2014年8月6日				
13	Publish, Supply to client	10 d	2014年8月7日	2014年8月16日				
14	Client/Consultants Review(Owner) 1s)	10 d	2014年8月17日	2014年8月26日				
15	Revise Technical file & Drawings	5 d	2014年8月27日	2014年8月31日				
16	Finish Basic Design	1 d	2014年9月1日	2014年9月1日	17			
17	Client/Consultants Review(Owner) 2rd	7 d	2014年9月2日	2014年9月8日				
18	Geological Prospecting	60 d	2014年8月25日	2014年10月23日				
19	**Detail Design**	**234 d**	**2014年9月10日**	**2015年5月1日**				
20	Manufactory supply Detail requirements	1 d	2014年9月10日	2014年9月10日				
21	Mechnical Part supply requirements	71 d	2014年9月11日	2014年11月20日				
22	BOP,Electric Part & I&C Part supply requirements	30 d	2014年11月21日	2014年12月20日				
23	Supply Leveling of ground Requirments	7 d	2014年10月21日	2014年10月27日				
24	**Completion of Civil Part Drawings**	**181 d**	**2014年9月21日**	**2015年3月20日**				
25	Main plant building, boiler foundation,esp fans and chimney	71 d	2014年9月21日	2014年11月30日				
26	Part of Main plant building, boiler foundation,ESP and chimney to owner for review	3 d	2014年12月1日	2014年12月3日				
27	Review by CSEEC to give final drawing	3 d	2014年12月4日	2014年12月6日				
28	Main plant equipment foundations	30 d	2014年9月21日	2014年10月20日				
29	Owner for review	3 d	2014年10月21日	2014年10月23日				
30	Review by CSEEC to give final drawing	3 d	2014年10月24日	2014年10月26日				
31	Coal handling plant civil & structural works	71 d	2014年9月21日	2014年11月30日				
32	Owner for review	3 d	2014年12月1日	2014年12月3日				
33	Review by CSEEC to give final drawing	3 d	2014年12月4日	2014年12月6日				
34	Ash handling plant civil & structural works	71 d	2014年9月21日	2014年11月30日				
35	Owner for review	3 d	2014年12月1日	2014年12月3日				
36	Review by CSEEC to give final drawing	3 d	2014年12月4日	2014年12月6日				
37	Raw Water Intake System Civil & Structural Works	71 d	2014年9月21日	2014年11月30日				
38	Owner for review	3 d	2014年12月1日	2014年12月3日				
39	Review by CSEEC to give final drawing	3 d	2014年12月4日	2014年12月6日				
40	Water system civil & structural works	71 d	2014年9月21日	2014年11月30日				
41	Owner for review	3 d	2014年12月1日	2014年12月3日				
42	Review by CSEEC to give final drawing	3 d	2014年12月4日	2014年12月6日				
43	Balance-of-Plant civil & structural works (not covered above)	90 d	2014年12月7日	2015年3月6日				
44	Owner for review	7 d	2015年3月7日	2015年3月13日				
45	Review by CSEEC to give final drawing	7 d	2015年3月14日	2015年3月20日				

1 x 46 MW Coal Based CPP
of Nishat Churian Limited, Lahore, Pakistan

No	Contents	Period	Commence	End	WBS 前置任务	后续任务	资源名称
46	SG & STG Part Drawings finish	100 d	2014年9月21日	2014年12月29日			
47	Owner for review	7 d	2014年12月30日	2015年1月5日			
48	Review by CSEEC to give final drawing	7 d	2015年1月6日	2015年1月12日			
49	Water treatment Part Drawings finish	72 d	2014年10月21日	2014年12月31日		50	
50	Owner for review	7 d	2015年1月1日	2015年1月7日	1.2.9	51	
51	Review by CSEEC to give final drawing	7 d	2015年1月8日	2015年1月14日	1.2.10		
52	Coal handling Part Drawings finish	72 d	2014年10月21日	2014年12月31日		53	
53	Owner for review	7 d	2015年1月1日	2015年1月7日	1.2.12		
54	Review by CSEEC to give final drawing	7 d	2015年1月8日	2015年1月14日			
55	Electre & I&C Part Drawings finish	72 d	2014年10月21日	2014年12月31日			
56	Owner for review	10 d	2015年1月1日	2015年1月10日			
57	Review by CSEEC to give final drawing	10 d	2015年3月3日	2015年3月12日			
58	Mechinical Part Technical Specification	60 d	2014年11月21日	2015年1月19日			
59	Coal handling Part Technical Specification	30 d	2014年11月21日	2014年12月20日			
60	Water Treatment Part Technical Specification	30 d	2014年9月21日	2014年10月20日			
61	Electric Part Technical Specification	60 d	2014年12月21日	2015年2月18日			
62	I&C Part Technical Specification	60 d	2014年12月21日	2015年2月18日			
63	Others Technical & Specification	60 d	2014年12月21日	2015年2月18日			
64	Detail Drawings Approve(Owner)	7 d	2015年4月17日	2015年4月23日			
65	Revise Detail Drawings	7 d	2015年4月24日	2015年4月30日			
66	Finish Detail Design	1 d	2015年5月1日	2015年5月1日			
67	**Site mobilisation**	**98 d**	**2014年8月25日**	**2014年11月30日**			
68	Establishment of site office	47 d	2014年10月15日	2014年11月30日			
69	Mobilization of site staff	30 d	2014年8月25日	2014年9月23日			
70	Site leveling	30 d	2014年10月1日	2014年10月30日			
71	**Equipment Procure, Manufact & Transport**	**426 d**	**2014年8月27日**	**2015年10月26日**			
72	**Invitation of bidding**	**200 d**	**2014年8月27日**	**2015年3月14日**			
73	Steam turbine	15 d	2014年8月27日	2014年9月10日		95	
74	Generator	15 d	2014年8月27日	2014年9月10日		97	
75	Boiler	15 d	2014年8月27日	2014年9月10日		99,101,103,105	
76	PD,ID,secondary Fans	15 d	2014年12月16日	2014年12月30日			
77	ESP	10 d	2014年12月21日	2014年12月30日			
78	Boiler Feeder Water Equipment	10 d	2014年12月26日	2015年1月4日			
79	Cooling Tower	10 d	2014年12月31日	2015年1月9日		113	
80	CW,ACW,Fire fighting Pump	15 d	2014年12月31日	2015年1月14日		115	
81	Water Treameat Plant	20 d	2014年12月31日	2015年1月19日		117	
82	Crusher	10 d	2014年12月31日	2015年1月9日		119	
83	Conveyor	10 d	2014年12月31日	2015年1月9日		119	
84	Fried oil system	7 d	2014年12月16日	2014年12月22日		123	
85	Ash handling equipment	10 d	2014年12月31日	2015年1月9日		125	
86	Air compressor	7 d	2014年12月16日	2014年12月22日			
87	Transformer	10 d	2015年1月6日	2015年1月15日		127	
88	11KV distribution equipment	15 d	2015年2月20日	2015年3月6日		129	
89	400V distributiion equipment	15 d	2015年2月20日	2015年3月6日		131	
90	DC system	10 d	2014年12月10日	2014年12月19日		133	
91	UPS	7 d	2014年12月10日	2014年12月16日		135	
92	DCS	15 d	2015年2月5日	2015年2月19日		137	
93	I&C other equipment	15 d	2015年2月28日	2015年3月14日		139	

1 x 46 MW Coal Based CPP
of Nishat Chunian Limited, Lahore, Pakistan

No	Contents	Period	Commence	End	WBS 前置任务	后续任务	资源名称
94	**Manufacture and Transport**	**412 d**	**2014年9月10日**	**2015年10月26日**			
95	Steam Turbine(To Karachi)	345 d	2014年9月11日	2015年8月21日	2.1.1	96	
96	Steam Turbine(From Karachi to site)	21 d	2015年8月22日	2015年9月11日	2.2.1		
97	Generator(To Karachi)	390 d	2014年9月11日	2015年10月5日	2.1.2	98	
98	Generator(From Karachi to site)	21 d	2015年10月6日	2015年10月26日	2.2.3		
99	Boiler Steel frame colume plate	181 d	2014年9月11日	2015年3月10日	2.1.3	100	
100	Boiler Steel frame colume plate(from Karachi to site)	21 d	2015年3月11日	2015年3月31日	2.2.5		
101	Boiler Steel Frame	181 d	2014年9月11日	2015年3月10日	2.1.3	102	
102	Boiler steel frame(From Karachi to site)	21 d	2015年3月11日	2015年3月31日	2.2.7		
103	Complete package of 1# boiler	211 d	2014年9月11日	2015年4月9日	2.1.3	104	
104	Complete package of 1# boiler(From Karachi to site)	21 d	2015年4月10日	2015年4月30日	2.2.9		
105	Complete package of 2# boiler	242 d	2014年9月11日	2015年5月10日	2.1.3	106	
106	Complete package of 2#boiler(From Karachi to site)	21 d	2015年5月11日	2015年5月31日	2.2.11		
107	PD,ID,secondary Fans	160 d	2014年9月10日	2015年2月16日		108	
108	PD,ID,secondary Fans(From Karachi to site)	21 d	2015年2月17日	2015年3月9日	2.2.13		
109	ESP	160 d	2014年9月10日	2015年2月16日		110	
110	ESP(From Karachi to site)	21 d	2015年2月17日	2015年3月9日	2.2.15		
111	Boiler Feeder Water Equipment	180 d	2014年9月10日	2015年3月8日		112	
112	Boiler Feeder Water Equipment(From Karachi to site)	21 d	2015年3月9日	2015年3月29日	2.2.17		
113	Cooling Tower	180 d	2015年1月10日	2015年7月8日	2.1.7	114	
114	Cooling tower(From Karachi to site)	21 d	2015年7月9日	2015年7月29日	2.2.19		
115	CW,ACW,Fire fighting Pump	120 d	2015年1月15日	2015年5月14日	2.1.8	116	
116	CW,ACW,Fire fighting Pump(From Karachi to site)	21 d	2015年5月15日	2015年6月4日	2.2.21		
117	Water Treatment Plant	160 d	2015年1月20日	2015年6月28日	2.1.9	118	
118	Water treatment plant(From Karachi to site)	21 d	2015年6月29日	2015年7月19日	2.2.23		
119	Coal handling plant with auxliary	200 d	2015年1月10日	2015年7月28日	2.1.10,2.1.11	120	
120	Coal handling plant with auxliary(From Karachi to site)	21 d	2015年7月29日	2015年8月18日	2.2.25		
121	Air compressor	120 d	2014年10月10日	2015年2月6日		122	
122	Air compressor(From Karachi to site)	21 d	2015年2月7日	2015年2月27日	2.2.27		
123	fuel oil system	120 d	2014年12月23日	2015年4月21日	2.1.12	124	
124	fuel oil system(From Karachi to site)	21 d	2015年4月22日	2015年5月12日	2.2.29		
125	Ash handling plant & auxliary	180 d	2015年1月10日	2015年7月8日	2.1.13	126	
126	Ash handling plant with auxiliary(From Karachi to site)	21 d	2015年7月9日	2015年7月29日	2.2.31		
127	Transformer	180 d	2015年1月16日	2015年7月14日	2.1.15	128	
128	Transformer(From Karachi to site)	21 d	2015年7月15日	2015年8月4日	2.2.33		
129	11KV distribution equipment	140 d	2015年3月7日	2015年7月24日	2.1.16	130	
130	11KV distribution equipment(From Karachi to site)	21 d	2015年7月25日	2015年8月14日	2.2.35		
131	400V distribution equipment	140 d	2015年3月7日	2015年7月24日	2.1.17	132	
132	400V distribution equipment(From Karachi to site)	21 d	2015年7月25日	2015年8月14日	2.2.37		
133	DC system	90 d	2014年12月20日	2015年3月19日	2.1.18	134	
134	DC system(From Karachi to site)	21 d	2015年3月20日	2015年4月9日	2.2.39		
135	UPS	90 d	2014年12月17日	2015年3月16日	2.1.19	136	
136	UPS(From Karachi to site)	21 d	2015年3月17日	2015年4月6日	2.2.41		
137	DCS	144 d	2015年2月20日	2015年7月13日	2.1.20	138	
138	DCS(From Karachi to site)	21 d	2015年7月14日	2015年8月3日	2.2.43		
139	I&C other equipment	120 d	2015年3月15日	2015年7月12日	2.1.21	140	
140	I&C other equipment(From Karachi to site)	21 d	2015年7月13日	2015年8月2日	2.2.45		
141	**Civil Work & Erection**	**471 d**	**2014年10月1日**	**2016年1月14日**			

1 x 46 MW Coal Based CPP
of Nishat Churian Limited, Lahore, Pakistan

No	Contents	Period	Commence	End	WBS 前置任务	后续任务	资源名称
142	**Civil Works**	**425 d**	**2014年10月1日**	**2015年11月29日**			
143	**Main Building**	**212 d**	**2015年1月1日**	**2015年7月31日**			
144	Open excavation	31 d	2015年1月1日	2015年1月31日		145,153	
145	Foundation of Main building	45 d	2015年2月1日	2015年3月17日	3.1.1.1	147	
146	Foundation of Turbine Generators set	90 d	2015年2月1日	2015年5月1日			
147	Upper Building	136 d	2015年3月18日	2015年7月31日	3.1.1.2		
148	**Chimney**	**201 d**	**2015年1月1日**	**2015年7月20日**			
149	Open excavation	15 d	2015年1月1日	2015年1月15日		150	
150	Foundation of Chimney	20 d	2015年1月16日	2015年2月4日	3.1.2.1	151	
151	Chimney Manufact and Erection	166 d	2015年2月5日	2015年7月20日	3.1.2.2		
152	**Boiler**	**90 d**	**2015年2月1日**	**2015年5月1日**			
153	Boiler Steel Frame Foundation	30 d	2015年2月1日	2015年3月2日	3.1.1.1	154	
154	Boiler & Auxliary Eutipment Foundation	60 d	2015年3月3日	2015年5月1日	3.1.3.1		
155	Foundation of ESP	45 d	2015年3月5日	2015年4月18日			
156	**Water treatment system**	**60 d**	**2015年3月20日**	**2015年5月18日**			
157	Water treatment plant foundation and struction	60 d	2015年3月20日	2015年5月18日			
158	Outdoor Foundation	30 d	2015年4月10日	2015年5月9日			
159	**CW system**	**60 d**	**2015年4月2日**	**2015年5月31日**			
160	Foundation of cooling tower	60 d	2015年4月2日	2015年5月31日			
161	CW pump house	60 d	2015年4月2日	2015年5月31日			
162	**Coal Handling System**	**150 d**	**2015年4月1日**	**2015年8月28日**			
163	Crush room	120 d	2015年4月1日	2015年7月29日			
164	Transfer Station	120 d	2015年4月1日	2015年7月29日			
165	Trestle	120 d	2015年5月1日	2015年8月28日			
166	**Fuel system**	**30 d**	**2015年5月1日**	**2015年5月30日**			
167	Fuel pump house	30 d	2015年5月1日	2015年5月30日			
168	Oil tank foundation	30 d	2015年5月1日	2015年5月30日			
169	Dedusting and deslag equipment founation	60 d	2015年7月1日	2015年8月29日			
170	Air compressor house	45 d	2015年4月20日	2015年6月3日			
171	Diesel generator room	90 d	2015年7月4日	2015年10月1日			
172	Administration Building	120 d	2015年4月1日	2015年7月29日			
173	Workshop & Storage	100 d	2015年4月1日	2015年7月9日			
174	Raw Water Storage & Pump house	90 d	2015年3月1日	2015年5月29日			
175	Fire Station	80 d	2015年5月1日	2015年7月19日			
176	**Infrastructure**	**425 d**	**2014年10月1日**	**2015年11月29日**			
177	In-site drainage pipe	90 d	2015年7月20日	2015年10月17日			
178	In-site road	90 d	2015年8月1日	2015年10月29日			
179	In-site greenbelt	60 d	2015年10月1日	2015年11月29日			
180	Fence	60 d	2014年10月1日	2014年11月29日			
181	**Mechanical Erection**	**379 d**	**2015年1月1日**	**2016年1月14日**			
182	**Turbine generator**	**119 d**	**2015年8月1日**	**2015年11月27日**			
183	Erection Plate of turbine	8 d	2015年10月1日	2015年10月8日		184	
184	Erection of Turbine Proper	50 d	2015年10月9日	2015年11月27日	3.2.1.1		
185	Erection Plate of Generator	8 d	2015年10月1日	2015年10月8日		186	
186	Erection of Generator Proper	15 d	2015年10月9日	2015年10月23日	3.2.1.3		
187	**Erection of Steam Turbine Porper Pipe**	**30 d**	**2015年10月19日**	**2015年11月17日**			
188	Oil circulation	30 d	2015年10月19日	2015年11月17日			
189	Condenser integration	90 d	2015年8月1日	2015年10月29日			

No	Contents	Period	Commence	End	WBS 前置任务	后续任务	资源名称
190	Installtion of auxiliary equipment and pipeline	90 d	2015年8月1日	2015年10月29日			
191	**Boiler**	**289 d**	**2015年4月1日**	**2016年1月14日**			
192	Boiler plate Erection	10 d	2015年4月1日	2015年4月10日			193
193	1#Steel frame lifting	25 d	2015年4月11日	2015年5月5日	3.2.2.1		194
194	1#Boiler proper Erection	105 d	2015年5月6日	2015年8月18日	3.2.2.2		195
195	1#Boiler hydrostatic test	2 d	2015年8月19日	2015年8月20日	3.2.2.3		
196	1#Boiler Chemical Cleaning	5 d	2015年12月23日	2015年12月27日			
197	2#Steel frame lifting	35 d	2015年6月1日	2015年7月5日			198
198	2#Boiler proper Erection	105 d	2015年7月6日	2015年10月18日	3.2.2.6		199
199	2#Boiler hydrostatic test	2 d	2015年10月19日	2015年10月20日	3.2.2.7		
200	2#Boiler Chemical Cleaning	5 d	2016年1月10日	2016年1月14日			
201	Build boiler and insulation	50 d	2015年8月20日	2015年10月8日			
202	Low temperature drying-out	7 d	2015年12月16日	2015年12月22日			
203	**Boiler auxillaries**	**20 d**	**2015年8月20日**	**2015年9月8日**			
204	Primary fan installion	20 d	2015年8月20日	2015年9月8日			
205	Secondary fan Erection	20 d	2015年8月20日	2015年9月8日			
206	Indusced fan Erection	20 d	2015年8月20日	2015年9月8日			
207	Electrostatic precipitator	150 d	2015年8月1日	2015年12月28日			
208	Raw Water System	30 d	2015年5月21日	2015年6月19日			
209	**Water system**	**121 d**	**2015年3月20日**	**2015年7月18日**			
210	Facility Erection	45 d	2015年5月20日	2015年7月3日			
211	Water tank construction	60 d	2015年3月20日	2015年5月18日			
212	Pipeline Erection	60 d	2015年5月20日	2015年7月18日			
213	**CW system**	**271 d**	**2015年1月1日**	**2015年9月28日**			
214	Mechnical ventilation cooling tower Erection	120 d	2015年6月1日	2015年9月28日			
215	CW water pump Erection	30 d	2015年5月20日	2015年6月18日			
216	Pipe Erection	90 d	2015年1月1日	2015年3月31日			
217	**Coal conveying system**	**90 d**	**2015年9月1日**	**2015年11月29日**			
218	Crush equipment Erection	90 d	2015年9月1日	2015年11月29日			
219	Belt conveyor Erection	90 d	2015年9月1日	2015年11月29日			
220	**Fuel system**	**182 d**	**2015年6月1日**	**2015年11月29日**			
221	Equipment Erection	45 d	2015年10月1日	2015年11月14日			
222	Oil tank fabrication	30 d	2015年6月1日	2015年6月30日			
223	Pipe Erection	60 d	2015年10月1日	2015年11月29日			
224	**Dedeusting and deslag system**	**49 d**	**2015年9月1日**	**2015年10月19日**			
225	Equipment Erection	30 d	2015年9月1日	2015年9月30日			
226	Pipe Erection	30 d	2015年9月20日	2015年10月19日			
227	**Air compressing system**	**60 d**	**2015年6月5日**	**2015年8月3日**			
228	Equipment Erection	30 d	2015年6月5日	2015年7月4日			229
229	Pipe Erection	30 d	2015年7月5日	2015年8月3日	3.2.10.1		
230	Diesel generator	30 d	2015年10月2日	2015年10月31日			
231	**Electric Erection**	**333 d**	**2015年1月1日**	**2015年11月29日**			
232	Transformer Erection	30 d	2015年8月1日	2015年8月30日			
233	11KV distribuction equipment Erection	20 d	2015年9月1日	2015年9月20日			
234	Generator busbar Erection	30 d	2015年9月20日	2015年10月19日			
235	400V distribution unit Erection	30 d	2015年9月1日	2015年9月30日			
236	DC system Erection	30 d	2015年9月1日	2015年9月30日			
237	UPS Erection	30 d	2015年9月1日	2015年9月30日			

No	Contents	Period	Commence	End	WBS 前置任务	后续任务	资源名称
238	Plant grounding Erection	180 d	2015年1月1日	2015年6月29日			
239	Cable Tray Erection	60 d	2015年7月1日	2015年8月29日			
240	Cable layout	90 d	2015年9月1日	2015年11月29日			
241	**I&C Erection**	**90 d**	**2015年9月1日**	**2015年11月29日**			
242	DCS cabinet Erection	30 d	2015年9月1日	2015年9月30日			
243	Local I&C cabinet Erection	30 d	2015年9月1日	2015年9月30日			
244	Local instrument & pipe Erection	90 d	2015年9月1日	2015年11月29日			
245	Cable layout	60 d	2015年9月1日	2015年10月30日			
246	**Commission**	**153 d**	**2015年11月1日**	**2016年4月1日**			
247	**Individual testing**	**40 d**	**2015年11月6日**	**2015年12月15日**			
248	Motor testing	30 d	2015年11月6日	2015年12月5日			
249	Equipment individual testing	30 d	2015年11月16日	2015年12月15日			
250	**Part commision**	**121 d**	**2015年11月1日**	**2016年2月29日**			
251	DC system	15 d	2015年11月6日	2015年11月20日			
252	UPS	10 d	2015年11月6日	2015年11月15日			
253	DCS	1 d	2015年12月1日	2015年12月1日			
254	Back Energizing from Grid	3 d	2015年11月1日	2015年11月3日			
255	Boiler feeder water system	15 d	2015年12月5日	2015年12月19日			
256	CW system	20 d	2015年11月15日	2015年12月4日			
257	Air compressor	10 d	2015年11月6日	2015年11月15日			
258	Coal handling system	30 d	2015年11月21日	2015年12月20日			
259	Fired oil system	10 d	2015年12月11日	2015年12月20日			
260	Ash handling system	10 d	2015年12月11日	2015年12月20日			
261	Limestone System	30 d	2015年11月21日	2015年12月20日			
262	DG sets	10 d	2015年12月10日	2015年12月19日			
263	Boiler cold test	15 d	2015年12月21日	2016年1月4日			
264	Steam-line blowing	8 d	2016年1月5日	2016年1月12日			
265	Whole plant start-up commision	15 d	2016年1月20日	2016年2月3日			
266	Turbine static test	11 d	2016年2月6日	2016年2月16日			
267	Synchronization of unit	1 d	2016年2月19日	2016年2月19日			
268	Reliability test(72+24)	5 d	2016年2月24日	2016年2月28日			
269	Taking over Date	1 d	2016年2月29日	2016年2月29日			
270	Finish As-built Drawings	1 d	2016年4月1日	2016年4月1日			

4.17 Capital Budget

Company is expecting a per mega watt cost of USD 1.3 million inclusive of all duties, since there is no relief in duty for power plants working in captive mode. The total project cost would come to around USD 60 million. Project will be financed at 80:20 debt equity ratio.

A Contract for the Supply of Equipment for the project is entered into for US$ [38.48 million] and a Contract for the Construction of the Facility is entered into for US$ [12.72 million].

4.18 Financial Plan

The company has planned to finance the project with 20% equity and 80% borrowing. 20% equity has already been injected, Financing already been secured, and disbursement from couple of banks have been made.

Charge on present and future fixed assets has been offered to secure the financing. Letter of Credit has been established with NIB Bank Limited. Projected Profit and Loss, Cash Flow and Balance Sheet is as follows:

Projected Profit & Loss
Coal Power Project
30 Years Projections

Year		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Outside Party Sales													
Customer A		254,390,400	279,829,440	307,812,384	338,593,622	372,452,985	409,698,283	450,668,111	495,734,923	545,308,415	599,839,256	659,823,182	725,805,500
Customer B		169,593,600	186,552,960	205,208,256	225,729,082	248,301,990	273,132,189	300,445,408	330,489,948	363,538,943	399,892,838	439,882,121	483,870,333
Customer C		84,796,800	93,276,480	102,604,128	112,864,541	124,150,995	136,566,094	150,222,704	165,244,974	181,769,472	199,946,419	219,941,061	241,935,167
Customer D		169,593,600	186,552,960	205,208,256	225,729,082	248,301,990	273,132,189	300,445,408	330,489,948	363,538,943	399,892,838	439,882,121	483,870,333
Customer E		295,092,864	324,602,150	357,062,365	392,768,602	432,045,462	475,250,008	522,775,009	575,052,510	632,557,761	695,813,537	765,394,891	841,934,380
		973,467,264	1,070,813,990	1,177,895,389	1,295,684,928	1,425,253,421	1,567,778,763	1,724,556,640	1,897,012,304	2,086,713,534	2,295,384,887	2,524,923,376	2,777,415,714
Sales-Group		2,459,107,200	2,705,017,920	2,975,519,712	3,273,071,683	3,600,378,852	3,960,416,737	4,356,458,410	4,792,104,251	5,271,314,677	5,798,446,144	6,378,290,759	7,016,119,834
Steam Sales		52,560,000	57,816,000	63,597,600	69,957,360	76,953,096	84,648,406	93,113,246	102,424,571	112,667,028	123,933,731	136,327,104	149,959,814
Total Sales		3,485,134,464	3,833,647,910	4,217,012,701	4,638,713,972	5,102,585,369	5,612,843,906	6,174,128,296	6,791,541,126	7,470,695,238	8,217,764,762	9,039,541,238	9,943,495,362
Costs													
Fuel Cost	PKR	1,571,437,424	1,728,581,166	1,901,439,283	2,091,583,211	2,300,741,532	2,530,815,685	2,783,897,254	3,062,286,979	3,368,515,677	3,705,367,245	4,075,903,969	4,483,494,366
Lime Expenses		1,965,929	2,162,522	2,378,774	2,616,652	2,878,317	3,166,148	3,482,763	3,831,039	4,214,143	4,635,558	5,099,114	5,609,025
Ash Removal Expenses		68,651,489	75,516,638	83,068,302	91,375,132	100,512,645	110,563,910	121,620,301	133,782,331	147,160,564	161,876,621	178,064,283	195,870,711
D & M Fixed		156,026,112	171,628,723	188,791,596	207,670,755	228,437,831	251,281,614	276,409,775	304,050,753	334,455,828	367,901,411	404,691,552	445,160,707
D & M Variable		117,019,584	128,721,542	141,593,697	155,753,066	171,328,373	188,461,210	207,307,331	228,038,064	250,841,871	275,926,058	303,518,664	333,870,530
Depreciation		278,784,000	264,844,800	251,602,560	239,022,432	227,071,310	215,717,745	204,931,858	194,685,265	184,951,002	175,703,451	166,918,279	158,572,365
Insurance Cost		55,756,800	61,332,480	67,465,728	74,212,301	81,633,531	89,796,884	98,776,572	108,654,230	119,519,653	131,471,618	144,618,780	159,080,658
Other Overheads		18,937,916	20,831,708	22,914,879	25,206,367	27,727,004	30,499,704	33,549,674	36,904,642	40,595,106	44,654,616	49,120,078	54,032,086
Exchange Loss on LTL		-	-	-	-	-	-	-	-	-	-	-	
Interest on Long Term Loan		529,618,875	439,190,516	336,838,272	220,989,858	89,865,670	(0)	(0)	(0)	(0)	(0)	-	-
Interest on Short Term Loan		39,863,238	43,849,562	48,234,518	53,057,970	58,363,767	64,200,144	70,620,158	77,682,174	85,450,391	93,995,431	103,394,974	113,734,471
Saving in Steam		-	-	-	-	-	-	-	-	-	-	-	-
		2,838,061,368	2,936,659,658	3,044,327,608	3,161,487,744	3,288,559,979	3,484,503,044	3,800,595,687	4,149,915,477	4,535,704,235	4,961,532,008	5,431,329,691	5,949,424,918
Profit/(Loss)		**647,073,096**	**896,988,252**	**1,172,685,094**	**1,477,226,228**	**1,814,025,389**	**2,128,340,862**	**2,373,532,610**	**2,641,625,649**	**2,934,991,004**	**3,256,232,754**	**3,608,211,548**	**3,994,070,444**

Projected Cashflow Statement
Coal Power Project
30 Years Projections

Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Share Capital & Liabilities												
Profit	**647,073,096**	**896,988,252**	**1,172,685,094**	**1,477,226,228**	**1,814,025,389**	**2,128,340,862**	**2,373,532,610**	**2,641,625,649**	**2,934,991,004**	**3,256,232,754**	**3,608,211,548**	**3,994,070,444**
Adjustment for Non-Cash Items												
Depreciation	278,784,000	264,844,800	251,602,560	239,022,432	227,071,310	215,717,745	204,931,858	194,685,265	184,951,002	175,703,451	166,918,279	158,572,365
	925,857,096	1,161,833,052	1,424,287,654	1,716,248,660	2,041,096,700	2,344,058,607	2,578,464,467	2,836,310,914	3,119,942,005	3,431,936,206	3,775,129,826	4,152,642,809
Working Capital Adjustment												
Stock	(146,771,864)	(14,677,186)	(16,144,905)	(17,759,396)	(19,535,335)	(21,488,869)	(23,637,755)	(26,001,531)	(28,601,684)	(31,461,853)	(34,608,038)	(38,068,842)
Debtors	(146,771,864)	(14,677,186)	(16,144,905)	(17,759,396)	(19,535,335)	(21,488,869)	(23,637,755)	(26,001,531)	(28,601,684)	(31,461,853)	(34,608,038)	(38,068,842)
STL												
	632,313,368	1,132,478,680	1,391,997,844	1,680,729,869	2,002,026,030	2,301,080,869	2,531,188,956	2,784,307,852	3,062,738,637	3,369,012,501	3,705,913,751	4,076,505,126
Loan (Repayment)/Disbursement	(685,790,563)	(776,218,922)	(878,571,166)	(994,419,580)	(1,125,543,768)	(0)	(0)	(0)	(0)	(0)	-	-
Fixed Asset Purchased	-	-	-	-	-	-	-	-	-	-	-	-
Equity Injected	-	-	-	-	-	-	-	-	-	-	-	-
Net Cash Inflow/(OutFlow)	**(53,477,195)**	**356,259,758**	**513,426,677**	**686,310,289**	**876,482,261**	**2,301,080,869**	**2,531,188,956**	**2,784,307,852**	**3,062,738,637**	**3,369,012,501**	**3,705,913,751**	**4,076,505,126**

Projected Balance Sheet
Coal Power Project
30 Years Projections

Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Share Capital & Liabilities												
Share Capital	1,115,136,000	1,115,136,000	1,115,136,000	1,115,136,000	1,115,136,000	1,115,136,000	1,115,136,000	1,115,136,000	1,115,136,000	1,115,136,000	1,115,136,000	1,115,136,000
Long Term Loan	3,774,753,437	2,998,534,515	2,119,963,349	1,125,543,768	(0)	(0)	(0)	(0)	(0)	-	-	-
Working Capital Loan												
Unappropriated Profit/(Loss)	15,794,607	912,782,859	2,085,467,953	3,562,694,181	5,376,719,570	7,505,060,432	9,878,593,041	12,520,218,690	15,455,209,694	18,711,442,449	22,319,653,996	26,313,724,440
Total	**4,905,684,044**	**5,026,453,374**	**5,320,567,301**	**5,803,373,949**	**6,491,855,570**	**8,620,196,432**	**10,993,729,041**	**13,635,354,690**	**16,570,345,694**	**19,826,578,449**	**23,434,789,996**	**27,428,860,440**
Assets												
Fixed Assets	5,296,896,000	5,032,051,200	4,780,448,640	4,541,426,208	4,314,354,898	4,098,637,153	3,893,705,295	3,699,020,030	3,514,069,029	3,338,365,577	3,171,447,299	3,012,874,934
Stock	146,771,864	161,449,050	177,593,955	195,353,351	214,888,686	236,377,555	260,015,310	286,016,841	314,618,525	346,080,378	380,688,416	418,757,257
Receivables	146,771,864	161,449,050	177,593,955	195,353,351	214,888,686	236,377,555	260,015,310	286,016,841	314,618,525	346,080,378	380,688,416	418,757,257
Cash in Hand	(684,755,684)	(328,495,927)	184,930,750	871,241,039	1,747,723,300	4,048,804,170	6,579,993,126	9,364,300,978	12,427,039,615	15,796,052,116	19,501,965,867	23,578,470,992
Total	**4,905,684,044**	**5,026,453,374**	**5,320,567,301**	**5,803,373,949**	**6,491,855,570**	**8,620,196,432**	**10,993,729,041**	**13,635,354,690**	**16,570,345,694**	**19,826,578,449**	**23,434,789,996**	**27,428,860,440**

4.19 Current Sponsors

The company is registered with the name and style of NC Electric Company Limited; it is 100% subsidiary of Nishat Chunian Limited. Nishat Chunian is a conglomerate of diversified companies, being one of the most respected and well known business groups of Pakistan having significant presence across Pakistan. The Nishat Chunian Group is considered at par with multinationals operating locally in terms of quality of its products and services & management skills. Most of their businesses are listed at stock exchanges in Pakistan. The Group has presence in following major sectors;

- Textile
- Power
- Entertainment
- Health Services
- Trading
- Distributorship

Nishat Chunian Limited is a listed Company. Started in 1990 with 14,400 spindle ring frames grown into a vertically integrated textile company diversified in weaving & home textile.Produces of award winning Bed sheets.Catering to a large number of global brands for production of their home textiles. In 2007 diversified into power business by establishing an IPP. Consolidated figures of Nishat Chunian Limited is are as follows:

	Turnover	PBT	Total Assets
USD in Millions	503.25	20.59	511.56

5 Plant/Equipment Detail

5.1 Major Plant Equipment

Following is the list of major equipment along with its vendors:

Major Equipment

Item	Vendor
Steam Turbine Generator	Siemens (Model: SST-400)
CFBC Boiler	Hangzhou Boiler Group (China)
DCS	ABB/ Honeywell/ Yokogawa/ Siemens
Boiler Feed Pumps	KSB
Cooling Tower	GEA
Air Compressor	Shanghai Ingersoll Rand

5.2 Mechanical Systems

This 1x46 MW coal power consists of flowing mechanical systems:

- IInstrument Air & Plant Air compressor system
- Coal handling system.
- Ash handling system
- Limestone crushing/handling.
- Makeup water treatment system.
- Cooling water system.
- Cooling water treatment system.
- Electrostatic precipitator (ESP) to control emission from plant.
- Emergency plant tripping system including emergency diesel generator (EDG)

5.3 Electrical Equipment

Following is the list of major electrical equipment along with its vendors:

Major Equipment

Item	Vendor
Main Alternator (Generator)	Siemens
Generator Isolation Transformer	Shandong Dachi Electric
Auxiliary Transformer	Shandong Dachi Electric
MV Switchgear	TianshuiChangcheng Switchgear Factory
DC Batteries	Sichuan Changhong Battery Co
Variable Frequency Drives	Hitachi

5.4 General Requirements

Following is the list of general requirements for the Plant;

- Export of Power to NCL
- Coal required per day: 474 ton per day
- Ash Dyke: Capacity of 3.5 months
- Water:166 m3/hr
- Particulate Matter – ESP: less than 50 mg/Nm3
- SOX Emission: 97ppm (design coal)
- Storm Drain Pond: 16,000m3 (for heavy rainfall)
- Process Steam to NCL: 180 C
- Necessary Manpower

6 Corporate Information

6.1 Certificate of Incorporation

COMPANY REGISTRATION OFFICE, LAHORE

CERTIFICATE OF INCORPORATION

[Under section 32 of the Companies Ordinance, 1984 (XLVII of 1984)]

Corporate Universal Identification No. 0087934

I hereby certify that **NC ELECTRIC COMPANY LIMITED** is this day incorporated under the Companies Ordinance, 1984 (XLVII of 1984) and that the company is **Limited By Shares**

Given under my hand at **Lahore** this **Eighteenth** day of **April**, Two **Thousand** and **Fourteen**

Fee Rs. **14,000/-**

(LIAQAT ALI DOLLA)
Additional Registrar of Companies

No. ARL/ 2348 DATED: 18/4/14

CERTIFIED TO BE TRUE COPY
24/4/14
DEPUTY REGISTRAR OF COMPANIES
COMPANY REGISTRATION OFFICE
LAHORE

6.2 Memorandum and Articles of Association

Attached as annexure 1

6.3 Form 29

PARTICULARS OF DIRECTORS AND OFFICERS, INCLUDING THE CHIEF EXECUTIVE, MANAGING AGENT, SECRETARY, CHIEF ACCOUNTANT, AUDITORS AND LEGAL ADVISERS, OR OF ANY CHANGE THEREIN

THE COMPANIES ORDINANCE 1984

[SECTION 205]

FORM 29

1 Incorporation Number: 0087934

2 Name of Company: [illegible]

3 Fee Paid (Rs.): 600.0 — Name and Branch of Bank: LAHORE, MCB - Main Market Gulberg [0183]

4 Receipt No: [illegible] — 09/09/2014

5 Mode of Payment (indicate): Bank Challan

6. Particulars*.

6.1 New Appointment/Election

Present Name in Full (a)	NIC No. or Passport No. in case of Foreign National (b)	Father / Husband Name (c)	Usual Residential Address (d)	Designation (e)	Nationality** (f)	Business Occupation*** (if any) (g)	Date of Present Appointment or Change (h)	Mode of Appointement / change / any other remarks (i)
KHADIM HUSSAIN	3220335203081	ELAHI BAKHSH	31-Q, Gulberg II, Lahore	Secretary	Pakistan		09/09/2014	Appointed
BABAR ALI KHAN	3520226340033	SADIQ ALI KHAN	685-686, Nizam Block, Allama Iqbal Town, Lahore	Chief Accountant	Pakistan		09/09/2014	Appointed

6.2 Ceasing of Officer/Retirement/Resignation

Present Name in Full (a)	NIC No. or Passport No. in case of Foreign National (b)	Father / Husband Name (c)	Usual Residential Address (d)	Designation (e)	Nationality** (f)	Business Occupation*** (if any) (g)	Date of Present Appointment or Change (h)	Mode of Appointement / change / any other remarks (i)
SAQIB RIAZ	3640291222015	RIAZ AHMED SALEEM	472-A 1, GULBERG III, LAHORE	Secretary	Pakistan		09/09/2014	Resigned
KHALID USMAN	3520135033983	MIR MUHAMMAD ALAM	HOUSE NO 48 STREET NO 4 ALFAISAL TOWN LAHORE	Chief Accountant	Pakistan		09/09/2014	Resigned

6.3 Any other change in particulars relating to columns (a) to (g) above

Present Name in Full (a)	NIC No. or Passport No. in case of Foreign National (b)	Father / Husband Name (c)	Usual Residential Address (d)	Designation (e)	Nationality** (f)	Business Occupation*** (if any) (g)	Date of Present Appointment or Change (h)	Mode of Appointement / change / any other remarks (i)

Name of Signatory: SHAHZAD SALEEM — Designation: Chief Executive

Signature of Chief Executive/Secretary: — Date (DD/MM/YYYY): 09/09/2014

Company Registration Office Lahore — Securities and Exchange Commission of Pakistan — SECP

CERTIFIED TO BE TRUE COPY
24/12/14
DEPUTY REGISTRAR OF COMPANIES
COMPANY REGISTRATION OFFICE
LAHORE

6.4 Auditors

Riaz Ahmad & Co., Chartered Accountants have been appointed as the auditors of the company; the Audit Report issued for June 30, 2014 is reproduced below.

RIAZ AHMAD & COMPANY
Chartered Accountants

AUDITORS' REPORT TO THE MEMBERS

We have audited the annexed balance sheet of **NC ELECTRIC COMPANY LIMITED** as at 30 June 2014 and the related profit and loss account, statement of comprehensive income, cash flow statement and statement of changes in equity together with the notes forming part thereof, for the period then ended and we state that we have obtained all the information and explanations which, to the best of our knowledge and belief, were necessary for the purposes of our audit.

It is the responsibility of the Company's management to establish and maintain a system of internal control, and prepare and present the above said statements in conformity with the approved accounting standards and the requirements of the Companies Ordinance, 1984. Our responsibility is to express an opinion on these statements based on our audit.

We conducted our audit in accordance with the auditing standards as applicable in Pakistan. These standards require that we plan and perform the audit to obtain reasonable assurance about whether the above said statements are free of any material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the above said statements. An audit also includes assessing the accounting policies and significant estimates made by management, as well as, evaluating the overall presentation of the above said statements. We believe that our audit provides a reasonable basis for our opinion and, after due verification, we report that:

(a) in our opinion, proper books of account have been kept by the Company as required by the Companies Ordinance, 1984;

(b) in our opinion:

i) the balance sheet and profit and loss account together with the notes thereon have been drawn up in conformity with the Companies Ordinance, 1984, and are in agreement with the books of account and are further in accordance with accounting policies consistently applied;

ii) the expenditure incurred during the period was for the purpose of the Company's business; and

iii) the business conducted, investments made and the expenditure incurred during the period were in accordance with the objects of the Company;

10-B, Saint Mary Park
Main Boulevard, Gulberg-III
Lahore 54660, Pakistan
Telephones (92-42) 3571 81 77-9
Fax (92-42) 3571 81 36
racollhr@racopk.com
www.racopk.com

(c) in our opinion and to the best of our information and according to the explanations given to us, the balance sheet, profit and loss account, statement of comprehensive income, cash flow statement and statement of changes in equity together with the notes forming part thereof conform with approved accounting standards as applicable in Pakistan, and give the information required by the Companies Ordinance 1984, in the manner so required and respectively give a true and fair view of the state of the Company's affairs as at 30 June 2014 and of the loss, its comprehensive loss, its cash flows and changes in equity for the period then ended; and

(d) in our opinion, no Zakat was deductible at source under the Zakat and Ushr Ordinance, 1980 (XVIII of 1980).

RIAZ AHMAD & COMPANY
Chartered Accountants

Name of engagement partner:
Mubashar Mehmood

Date: 26 Sep 2014

LAHORE

6.5 Legal Advisors

Faisal & Partners, Advocates and Legal Advisers are duly appointed Legal Advisor of the Company.

7 MOU with NTDC for Power Evacuation

8 Water and Soil Survey Report

Geotechnical and Soil Investigation survey was conducted by Berkley Associates; final report was received on November 27, 2014 same is attached as Annexure.2

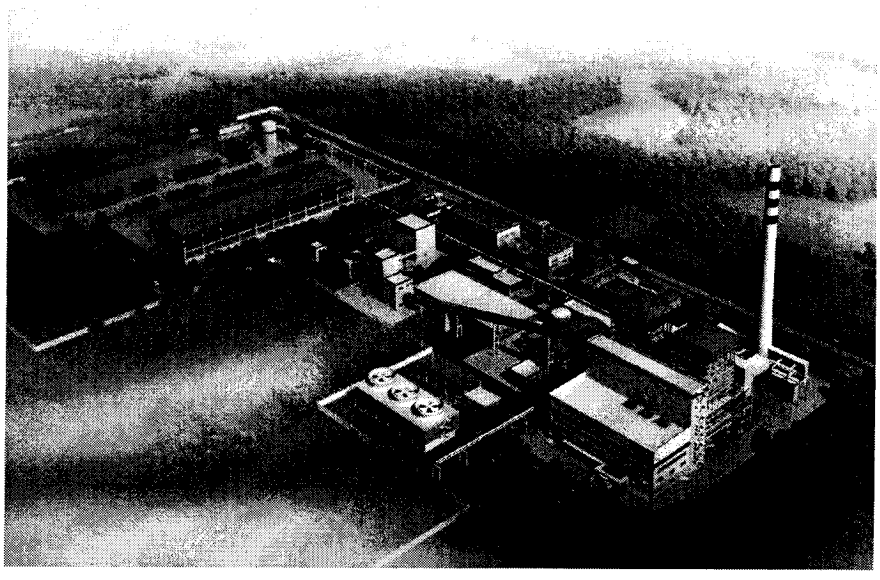
Retrieve No.	ZJ-F02241C-Q-01
Rev.	A

1×46MW COAL BASED CAPTIVE POWER PLANT

49KM-MULTAN ROAD, NEAR BHAI PHERU, DIST, KASUR,

PUNJAB PROVINCE, PAKISTAN

MAIN EQUIPMENT LIST



CHINA SINOGY ELECTRIC ENGINEERING CO., LTD.

ENGINEERING CERTIFICATE: GRADE A, CERTIFICATE NO.: A131003685

AUGUST, 2014. SHANGHAI

Retrieve No.: ZJ-F02241C-Q-01

1×40MW COAL BASED CAPTIVE POWER PLANT
49KM-MULTAN ROAD, NEAR BHAI PHERU, DIST, KASUR, PUNJAB PROVINCE, PAKISTAN

MAIN EQUIPMENT LIST

APPROVED

REVIEWED

CHECKED

PREPARED

AUGUST, 2014, SHANGHAI

1×46MW COAL BASED CAPTIVE POWER PLANT
49KM-MULTAN ROAD, NEAR BHAI PHERU, DIST, KASUR, PUNJAB PROVINCE, PAKISTAN

TABLE OF CONTENTS
FOR
VOLUME OF BASIC DESIGN

Contents

1 BOILER

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
1	Circulating Fluidized Bed Boiler	110t/h 9.81MPa 540°C	set	2	Hangzhou Boiler Group
2	Primary Air Fan	Q=37628m^3/h P=19250Pa T=27℃ MOTER POWER: 280kW 11kV 1480r/min	set	4	Include The Silencer
3	Secondary Air Fan	Q=29890m^3/h P=13250Pa T=27℃ MOTER POWER: 160kW 415V 1480r/min	set	4	Include The Silencer Variable Frequency Speed Adjusting
4	Induced Draft Fan	Q=106274m^3/h P=5970Pa T=133℃ MOTER POWER: 250kW 11kV 980r/min	set	4	Variable Frequency Speed Adjusting
5	High Pressure Fluidized Air Fan	Q=1516m^3/h 63.6KPa T=27℃ MOTER POWER: 55kW 415V	set	3	
6	Electrostatic Precipitator	186049m^3/h T=150℃ η≥99.88% RESISTANCE ≤200Pa LEAKAGE RATE <2.5%	set	2	Feida Company
7	Coal Feeder	1～17t/h	set	4	Variable Frequency Speed Adjusting
8	Coal Bunker	290m^3	set	2	
9	Elevator	2t	set	1	
10	Electric Hoist For Primary Air Fan Overhaul	3t	set	4	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
11	Electric Hoist For Induced Draft Fan Overhaul	5t	set	2	
12	Electric Hoist For Secondary Air Fan Overhaul	3t	set	4	
13	Electric Hoist For High Pressure Fluidized Air Fan Overhaul	2t	set	1	
14	Electric Hoist For Furnace Top Overhaul	2t	set	2	
15	Intermittent Blowdown Flash Tank	DP5.5 5.5m^3 ,0.5MPa	set	2	
16	Nitrogen Storage	DQ10S 150/15-2	set	2	
17	Oil Feed Pump Inlet Filter	Q=3.5m^3/h FILTER ACCURACY:150um	set	2	
18	Oil Feed Pump	Q=3.5m^3/h, H=1.27MPa P=3KW	set	2	
19	Oil Unloading Pump Inleet Filter	Q=40m^3/h FILTER ACCURACY:150um	set	2	
20	Oil Unloading Pump	Q=40m^3/h, H=0.60MPa P=22KW	set	2	
21	Oil Tank	50m^3	set	1	

2 STEAM TURBINE AND AUX EQUIPMENT

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
	Steam Turbine And Aux Equipment				
1	Steam Turbine （Include Gear Box）	Type：SST 400;HPHT、single casing、axial exhaust、rate power：46MW ; operating speed：4700r/min ;Pressure at tuibine inlet ,nomal：9.7MPa(a) ;Temperature at tuibine inlet ,nomal：535℃ inlet flow（incl.sealing steam）：180.58t/h ;Process steam：nomal pressure(outlet of pressure and temperature reducer) 1.18MPa(a);nomal temperature：190℃ nomal flow：8t/h	Set	1	Supplied by SIEMENS
1.1	Oil Tank	CAPACITY:15000L	Set	1	Matched by SIEMENS
1.2	Oil Vapour Extraction	Voltage：415V,power：0.77KW	Set	1	Matched by SIEMENS
1.3	Oil Cooler	Cooling water flow：45kg/s	Set	2	Matched by SIEMENS
1.4	Oil Fiter		Set	2	Matched by SIEMENS
1.5	Jacking Oil Pump	Power：11KW	Set	1	Matched by SIEMENS
1.6	Auxiliary Oil Pump(Ac）	Discharge flow：1875L/min;3-ph A.C motor power: 45KW, voltage :415V,Speed: 1500 rpm	Set	1	Matched by SIEMENS
1.7	Main Oil Pump	Discharge flow：1755L/min, power：37KW,speed：1500r/min	Set	1	Matched by SIEMENS
1.8	Emergency Oil Pump （Dc）	Discharge flow：575l/min 3-ph A.C motor power：6.6KW, DC motor power：110V（D.C）	Set	1	Matched by SIEMENS
1.9	Gear Unit	Max. continuous power rating：49550KW,Input speed, appr.：4700rpm；Output speed：1500rpm	Set	1	Matched by SIEMENS

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
1.1	Gland Steam Condenser		Set	1	Matched by SIEMENS
1.11	Blower Leek Steam	Motor: 415V,3-ph A.C motor power 5.5KW	Set	2	Matched by SIEMENS
2	Generator	Output at generator terminals, nomal : 46MW ,Voltage ,nomal:11kV; Air cooling; Speed :1500r/min ; Frequency: 50Hz	Set	1	Supplied by SIEMENS
2.1	Generator Air Cooler	Cooling water flow(unit set): 179t/h	Set	2	Matched by SIEMENS
3	Condenser	Circulating water flow: 7000t/h, SS304 heat exchange tube, Cooling area: 2700m^2, including the 2th temperature reducing device	Set	1	
4	Steam Jet Ejector	Combined with 1 starting ejector and 2 normal operating ejectors	Set	1	Supplied by condenser manufacturer
5.1	Lp Heater-I	Horizontal type, U-shaped, surface type, cooling area: 240m^2	Set	1	
5	Lp Heater- II	Horizontal type, U-shaped, surface type, cooling area: 320m^2	Set	1	
6	Deaerator(Headless)	Level pressure 0.588MPa, Vertical Deaerator,Spinning film type, Capability: 242t/h, Effective capacity:50m3	Set	1	
7	HP Heater-I	Vertical type, U-shaped, surface type, cooling area: 300m^2	Set	1	
8	HP Heater- II	Vertical type, U-shaped, surface type, cooling area:360m^2	Set	1	
9	Cep	Q=156t/h H:192mH_2O 134kW 415V	Set	2	
10	Bfp	Fluid coupling, motor and cooler for fluid coupling are involved; 142t/h, 1490mH2O; Motor: 1020kW, 11kV	Set	3	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
11	Rubber Ball Cleaning Device	Fresh water, include ball collector ; Rubber ball pump,Ball room etc.Ball collector: DN800	Set	1	
12	Drain Flash Tank Of Steam Turbine	Design pressure: 0.6MPa, Design temperature: 300℃, volume: 3m3	Set	1	
13	Continuous Blowdown Flash Tank	degign pressure: 1.2MPa, design temperature: 380℃, Capacity:1.5 m^3	Set	2	
14	Lube Oil Purifying Device	Centrifugal type, 253L/min.	Set	1	
15	Emergency Oil Pool	V=15m3	Set	1	
16	Blow down Pump	Q=5m3/h H=15mH2O	Set	1	
17	Temperature And Pressure Reductor (Main Steam Pipeline To Process Steam Pipeline)	Inlet Pressure 9.7(a)MPa, Temperature 540°C ;outlet Pressure 1.18MPa(a), Temperature 190℃, flow(8±2)t/h	Set	1	
18	Temperature And Pressure Reductor(Main Steam Pipeline To Aux Steam Pipeline)	Inlet Pressure 9.7(a)MPa, Temperature 535°C ;outlet Pressure~0.613MPa(a), Temperature167.2℃, flow 29.59t/h	Set	1	
19	Process Steam Desuper Heater	Inlet Pressure 1.18(a)MPa, Temperature 372.5°C(Maximum temperature) ;outlet Pressure 1.18MPa(a), Temperature 190℃, flow(8±2)t/h	Set	1	
20	Temperature And Pressure Reductor(Main Steam Pipeline To Steam Jet Ejector)	Inlet Pressure 9.7(a)MPa, Temperature 535°C	Set	1	
21	The 1th Hp By-Pass Valve	Inlet Pressure 9.7(a)MPa, Temperature 535°C(Maximum temperature) ;outlet Pressure 0.4MPa(a), Temperature 144℃, flow 74.86 t/h	Set	2	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
22	Drain Flash Tank	Capacity:1.5m3	Set	1	
23	Intermediate Storage Tank Of Process Condensate	Capacity: 40m3	Set	1	
24	Transfer Pump	Q=40t/h, H=110mH2O, Motor: 415V, 20kW	Set	2	
25	Electric Hoist	Lifting capacity:2t	Set	1	
26	Crane	Lifting capacity: 32/5t; Span: 22.5m	Set	1	

3 COAL HANDLING SYSTEM

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
—	Coal Handling				
1	Bridge-Type Grab Crane	elevating capacity 5t, span 31.5m, sling height 12m	Set	1	
2	C-1 Belt Conveyor	B=650mm, V=1.0m/s, Q=105t/h, Lh=111.75m, H= 19.72m,	Set	1	
3	C-2belt Conveyor	B=650mm, V=1.0m/s, Q=105t/h, Lh=176.45m, H= 28.26m,	Set	1	
4	Vibrating Feeder	Q=0～180t/h	Set	2	
5	Four-Toothed Roll Crusher	Q=100t/h, import<50mm, exit<10mm	Set	2	
6	Belt-Type Magnetic Separator	B=650mm	Set	1	
7	Disc Electromagnetic Iron Remover	B=650mm	Set	3	
8	Metal Detector	B=650mm	Set	1	
9	Electronic Car Weigher	SCS-100t, weighing range:0~100t,	Set	1	
10	Electronic Belt Scale	B=650mm	Set	2	
11	Cyclic Dynamic Chain Code Check Device	B=650mm	Set	1	
12	Electric Coal Plough On Both Sides	B=650mm	Set	3	
13	Electrothermal Belt Vulcanizing Machine	B=650mm	Set	1	
14	Electric 3-Way Baffle	600×600mm	Set	1	
15	Electric Single-Beam Bridge Crane	elevating capacity:5t , hoisting height:10m , N=15KW	Set	1	coal bulldozer house
16	5t Electric Hoist	hoisting height:15m、20m	Set	2	
17	2t Electric Hoist	hoisting height:15m、35m	Set	2	
18	1t Hand Hoist	hoisting height:10m	Set	4	
19	Coal Bulldozer	T-120	Set	2	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
20	Mechanical Loader	3m³	Set	2	
21	Sewage Pump	Q=30m³/h, H=40mH2O		3	
22	Water Spray Pipe W inder		set	30	
23	Coal Yard W-1 Water Sprinkler		set	5	
二	Limestone System				
1	Jaw Crusher	Q=18t/h	set	2	Limestone pulverization system
2	Bucket Elevator	Q=25t/h	Set	2	
3	Material Silo	V=40m³	Set	2	
4	Vibrator Feeder	Q=25t/h	Set	2	
5	Limestone Powder Mill	Q=7.5t/h N=75kW	Set	2	
6	Fan	FJ-75, N=75kW (For Limestone powder mill)	Set	2	
7	Cyclone Separator	FLQ-5R, N=7.5kW (For Limestone powder mill)	Set	2	
8	Buffering Silo	φ=4.0m V=40m³	Set	2	
9	Bag Filter	DMC-60	Set	2	
10	Pump	V=1.5m³	Set	5	
11	Pump Service Valve	DN200	Set	5	
12	Bellow Expansion Jo int	DN200	Set	8	
13	Wear-Resisting Double Flashboard Valve Of Incoming	DN200	Set	2	
14	Limestone Powder Silo	φ=6.0m V=100m³	Set	1	Limestone powder delivery system
15	Feed Pump	V=0.6m³	Set	2	
16	Transfer Pump	V=1.0m³	Set	2	
17	Service Valve	DN200	Set	3	
18	Bellow Expansion Joint	DN200	Set	3	
19	Wear-Resisting Double Flashboard Valve Of Incoming	DN200	Set	6	
20	Frequency Conversion	LGR-50, Q=0~2t/h	Set	2	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
	Feeding Machine				
21	Ejector	DN80	Set	2	
22	Bag Filter	DMC-60	Set	1	
23	Level Indicator	RF8000	Set	3	
24	Electric Heater	DRK-15，N=15kW	Set	1	
25	Air Collector	V=4m³	Set	2	
26	Blowing Plugging Device		Set	2	
27	Electric Single-Beam Bridge Crane	Q=5t,H=15m	Set	1	
28	Maintenance Lifting Device	Q=2t,H=15m	Set	1	

4 ASH HANDLING SYSTEM

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
—	Ash handling system				
1	air compressor	Q=26m³/min, P=0.85MPa,	Set	3	Air compressor room
2	freezer dryer	Q=26m³/min, P=0.85MPa,	Set	2	
3	Micro thermal adsorption dryer	Q=10m³/min, P=0.85MPa,	Set	1	
4	dust filter	Q=26m³/min, P=0.85MPa,	Set	2	
5	precision filter	Q=26m³/min, P=0.85MPa,		2	
6	air collector	V=6m³	set	3	
7	LX Electric suspension bridge crane	elevating capacity Q=5t, span L=5m, lifting height 6m	set	1	
8	pump	V=1.0m³	set	4	ESP/AHP area
9	pump	V=0.5m³	Set	8	
10	service valve	DN200	Set	12	
11	bellow expansion joint	DN200	Set	12	
12	Wear-resisting double flashboard valve of incoming material	DN200	Set	12	
13	Blowing plugging device		Set	3	
14	ash hopper gasification fan	N=30kW	Set	3	
15	ash hopper electric heater	N=45kW	Set	2	
16	air collector	V=2m³	Set	1	
17	air collector	V=1m³	Set	1	Ash silo area
18	ash silo gasification fan	N=30kW	Set	2	
19	ash silo electric heater	N=45kW	Set	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
20	Electric feeding valve	400x400	Set	2	
21	double-shaft mixer	Q=60t/h	Set	1	
22	Dry ash bulk machine	Q=100t/h	Set	1	
23	Manually inserted door	DN400	Set	3	
24	Pneumatic inserted door	DN400	Set	2	
25	bag filter	DMC-72	Set	1	
26	Vacuum pressure relief valve	508	Set	1	
27	manhole	¢=500mm	Set	1	
28	CDI electric hoist	elevating capacity 2t, height 12m	Set	1	
29	ash silo Lifting facilities	elevating capacity 1t, height 40m	Set	1	
二	Bottom ash handling system				
1	High temperature resistant electric ash valve	DN200	Set	4	
2	Manually inserted door	DN200	Set	2	
3	roller cold slag machine	Q=0～2t/h	Set	4	
4	#1AB chained conveyor	Q=10t/h, L=26m, H=3.0m	Set	2	
5	#2 chained conveyor	Q=20t/h, L=18m, H=6.0m	Set	1	
6	bucket elevator	Q=20t/h, H=23m	Set	1	
7	Bottom ash silo	φ=10.0m Capacity:1000t	Set	1	
8	Manually inserted door	DN400	Set	2	
9	Electric feeding valve	400x400	Set	1	
10	double-shaft mixer	Q=60t/h	Set	1	
11	Lifting facilities of top Bottom ash silo	elevating capacity 1t, height 40m	Set	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
12	Vacuum pressure relief valve of top Bottom ash silo	508	Set	1	
13	bag filter	DMC-60	Set	1	
14	High, high material level meter	RF8000	Set	2	
15	Continuous material level meter	RF8000	Set	1	
16	shaker	exciting force 0.3KN	Set	3	
17	manhole	¢=500mm	Set	1	
18	sewage pump	Q=30m^3/h, H=40mH2O	Set	1	

5 HVAC

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
A	**Turbine hall and deaerator room**				
1.	Roof ventilator	Throat width 1500mm; length 2m N=0.37kw/4.67m 415V 50HZ	Set	6	Roof of turbine hall
2.	Evaporative cooling unit	Air flow: 50000 m^3/h(estimate), pressure: 800pa, cooling capacity: 50kW, N=30KW 415V 50Hz	Set	2	4.00m of turbine hall
3.	Crossion & explosion proof axial fan	BFT35-11-No.4.5, air flow: 5881m3/h, pressure: 113Pa, α =25° ; rotational speed: 1450r/min, N=0.25KW	Set	1	Chemical dosing room
4.	Packaged air handling unit	BFP-5W, air flow: 5000m^3/h, cooling capacity: 35kW; pressure: 110Pa, N=1.1KW 415V 50HZ	Set	2	415V low voltage distribution room
5.	Axial fan	T35-11-No.4, air flow: 3920m^3/h, pressure: 88Pa, α=25°; rotational speed: 1450r/min, N=0.12KW	Set	2	415V low voltage distribution room
6.	Unitary horizontal AHU	BFP-6W, air flow: 6000m^3/h, cooling capacity: 43kW, pressure270Pa,n=1.8KW 415V 50Hz	Set	2	11KV high voltage distribution room
7.	Axial fan	T35-11-No.4, air flow: 3920m^3/h, pressure: 88Pa, α=25°; rotational speed: 1450r/min, N=0.12KW	Set	2	11KV high voltage distribution room
8.	Ceiling exhaust fan	Air flow: 720m^3/h; pressure: 180Pa, N=0.044KW	Set	3	Toilet
9.	Unitary horizontal AHU	BFP-3W, air flow: 3000m^3/h, cooling capacity: 19kW, pressure120Pa,N=0.55KW 415V 50Hz	Set	1	DC and UPS power distribution room

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
10.	Axial fan	T35-11-No.4, air flow: 3920m^3/h, pressure: 88Pa, α=25°; rotational speed: 1450r/min, N=0.12KW	Set	1	DC and UPS power distribution room
11.	Explosion proof Cabinet type split air conditioner	Cooling capacity:7.2kW; heating capacity:8.1kW, power: 2.58KW 240V 50Hz	Set	1	Battery room
12.	Explosion proof axial fan	BT35-11-No.2.8, air flow: 1346m^3/h, pressure: 44Pa, α=25°;rotational speed: 1450r/min, N=0.025KW	Set	1	Battery room
13.	Axial fan	T35-11-No.4, air flow: 3920m3/h, pressure: 88Pa, α =25° ;rotational speed: 1450r/min, N=0.12KW	Set	1	High temperature & high pressure panel room
14.	Unitary vertical AHU	BFP-2, air flow: 2000m^3/h, cooling capacity: 13kW, pressure130Pa,N=0.32KW 415V 50Hz	Set	1	Sampling & sampleanalyzer panel room
15.	Axial fan	T35-11-No.3.15, air flow: 1905m^3/h, pressure: 55Pa, α=25°;rotational speed: 1450r/min, N=0.04KW	Set	3	Cable interlayer
16.	Packaged AHU	Supply air volume: 28000m^3/h(estimate), pressure: 300Pa, cooling capacity: 135kW, electric heating: 10kW, maximum humidifying capacity: 10kg/h input power: supply fan 25KW ,humidifier 0.37KW	Set	2	8.00m HVAC room
17.	Ducted electric heater	Heat capacity: 10kW, pipe size: 1250x500mm, power: 10KW 415V 50Hz	Set	1	Control room
18.	Axial fan	T35-11-No.3.55, air flow: 2737m^3/h, pressure: 70Pa, α=25°;rotational speed:	Set	1	8.00m HVAC room

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
		1450r/min, N=0.09KW			
19.	High temperature smoke fan	HTF-No.3.5, air flow: 3500 m^3/h, pressure: 552Pa rotational speed: 2900r/min, N=1.1KW	Set	1	Control room
20.	High temperature smoke fan	HTF-No.3.5, air flow: 5500 m^3/h, pressure: 350Pa rotational speed: 2900r/min, N=1.1KW	Set	1	Electronic equipment room
21.	Explosion proof axial fan	BFT35-11-No.4.5, air flow: 5881m3/h, pressure: 113Pa, α =25° ; rotational speed: 1450r/min, N=0.25KW	Set	1	Diesel generator room
22.	Explosion proof bag dust collector	Vertical type; collection efficiency: 99.6%, air flow: 2210 m^3/h, pipeline resistance: 1000Pa;power: 2.5 KW	Set	2	Coal conveying belt layer
B	**Refrigeration station**				
23.	Semi-hermetic type water chiller	Cooling capacity:380kW(estimate), electric power: 82.7KW 415V 50Hz, chilled-water flow: 66.1 m3/h, cooling water flow:80.3 m3/h, refrigerant: R407C	Set	2	
24.	FRP cooling tower	Air flow:67200 m3/h, fan power: 4KW 415V 50Hz; water inlet and outlet temperature: 40-32℃ cooling water: 92 t/h	Set	2	
25.	Chilled water pump	KQL100/100-5.5/2, flow rate: 70 m3/h, head: 13.6m, power: 5.5 KW 415V 50Hz	Set	2	
26.	Cooling water pump	KQL 100/90-4/2, flow rate:89 m3/h, head: 10m, power: 4KW 415V 50Hz	Set	2	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
27.	Water constant-pressure equipment	NZG(P)1000, full volume 1.38m^3, regulation volume 0.5 m^3, pump flow:2.8 m^3/h, head: 20.6m , power:0.75KW	Set	1	
28.	Expansion tank	1.5 m^3	Set	1	
29.	Water collector	DN250, pressure vessel, turgor pressure 1.2MPa, carbon steel, with pressure gauge, thermometer	Set	1	
30.	Water separator	DN250, pressure vessel, turgor pressure 1.2MPa, carbon steel, with pressure gauge, thermometer	Set	1	
31.	Unitary vertical AHU	BFP-3, air flow: 3000m^3/h, cooling capacity: 19kW, pressure120Pa,N=0.55KW 415V 50Hz	Set	1	
32.	HVAC control system		Set	1	
C	**Coal crusher house**				
33.	Axial fan	T35-11-No.5.6, air flow: 7101m^3/h, pressure: 76Pa, α=25°;rotational speed: 960r/min, N=0.25KW	Set	2	
34.	Explosion proof bag dust collector	Vertical type; collection efficiency: 99.6%, air flow: 10000 m^3/h, pipeline resistance: 1000Pa; power: 17.6 KW	Set	1	
35.	Automatic spray components		Set	1	
D	**Underground coal bunker(including the underground trestle)**				
36.	Axial fan	T35-11-No.5.6, air flow: 7101m^3/h, pressure: 76Pa, α=25°;rotational speed: 960r/min, N=0.25KW	Set	4	
37.	Automatic spray components		Set	1	
E	**Coal pusher house**				

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
38.	Axial fan	T35-11-No.3.55, air flow: 2737m^3/h, pressure: 70Pa, α=25°;rotational speed: 1450r/min, N=0.09KW	Set	3	
F	**Coal control building**				
39.	Axial fan	T35-11-No.4, air flow: 4263m^3/h, pressure: 95Pa, α=30°; rotational speed: 1450r/min, N=0.18KW	Set	1	Distribution room
40.	Cabinet type split air conditioner	Cooling capacity:35kW; Air flow: 7000m^3/h, power: 14 KW 415V 50Hz	Set	1	Distribution room
41.	Axial fan	T35-11-No.3.55, air flow: 2737m^3/h, pressure: 70Pa, α=25°;rotational speed: 1450r/min, N=0.09KW	Set	1	MCC room
42.	Cabinet type split air conditioner	Cooling capacity:16kW; Air flow: 3500m^3/h, power: 4.8 KW 415V 50Hz	Set	1	MCC room
43.	Axial fan	T35-11-No.2.8, air flow: 1346m^3/h, pressure: 44Pa, α=25°;rotational speed: 1450r/min, N=0.025KW	Set	1	Control room
44.	Cabinet type split air conditioner	Cooling capacity:7.2kW; heating capacity:8.1kW, power: 2.58KW 415V 50Hz	Set	1	Control room
45.	Ceiling exhaust fan	Air flow: 720m^3/h; pressure: 180Pa, N=0.044KW	Set	2	Toilet
G	**Water treatment plant and laboratory building**				
46.	Cabinet type split air conditioner	Cooling capacity:7.2kW; heating capacity:8.1kW, power: 2.58KW 240V 50Hz	Set	2	Control room
47.	Cabinet type split air conditioner	Cooling capacity:25kW; Air flow: 6000m3/h, power: 10.4 KW 415V 50Hz	Set	1	Switchgear room
48.	Wall split air conditioner	Cooling capacity:5kW; heating capacity:5.4kW, power: 1.632KW 240V 50Hz	Set	2	Coal & oil analysis room

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
49.	Crossion & explosion proof axial fan	BFT35-11-No.3.55, air flow: 2737m^3/h, pressure: 70Pa, α=25°;rotational speed: 1450r/min, N=0.09KW	Set	1	Coal & oil analysis room
50.	Wall split air conditioner	Cooling capacity:5kW; heating capacity:5.4kW, power: 1.632KW 240V 50Hz	Set	1	Heat metering room
51.	Wall split air conditioner	Cooling capacity:5kW; heating capacity:5.4kW, power: 1.632KW 240V 50Hz	Set	1	Meteorological & pollution room
52.	Wall split air conditioner	Cooling capacity:5kW; heating capacity:5.4kW, power: 1.632KW 240V 50Hz	Set	2	Water analysis room
53.	Crossion proof axial fan	FT35-11-No.3.55, air flow: 2737m^3/h, pressure: 70Pa, α=25°;rotational speed: 1450r/min, N=0.09KW	Set	1	Water analysis room
54.	Wall split air conditioner	Cooling capacity:5kW; heating capacity:5.4kW, power: 1.632KW 240V 50Hz	Set	1	Instrument room
55.	Ceiling exhaust fan	Air flow: 720m^3/h; pressure: 180Pa, N=0.044KW	Set	4	Toilet
H	**Air compressor house, dust collector control room, transducer room**				
56.	Axial fan	BFT35-11-No.4.5, air flow: 5881m^3/h, pressure: 113Pa, α=25° ; rotational speed: 1450r/min, N=0.25KW	Set	4	air compressor house
57.	Axial fan	T35-11-No.3.55, air flow: 2737m^3/h, pressure: 70Pa, α=25°;rotational speed: 1450r/min, N=0.09KW	Set	2	Transducer room
58.	Cabinet type split air conditioner	Cooling capacity:43kW; Air flow: 8000m^3/h, power: 14.9 KW 415V 50Hz	Set	2	Transducer room
59.	Axial fan	T35-11-No.3.55, air flow: 2977m^3/h, pressure: 75Pa, α=30°;rotational speed: 1450r/min, N=0.09KW	Set	1	MCC room

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
60.	Cabinet type split air conditioner	Cooling capacity:23kW; Air flow: 4000m^3/h, power: 7.3 KW 415V 50Hz	Set	1	MCC room
61.	Axial fan	T35-11-No.2.8, air flow: 1346m^3/h, pressure: 44Pa, α=25°;rotational speed: 1450r/min, N=0.025KW	Set	1	Control room
62.	Cabinet type split air conditioner	Cooling capacity:7.2kW; heating capacity:8.1kW, power: 2.58KW 415V 50Hz	Set	1	Control room
63.	Axial fan	T35-11-No.2.8, air flow: 1346m^3/h, pressure: 44Pa, α=25°;rotational speed: 1450r/min, N=0.025KW	Set	1	HVAC room
64.	Ceiling exhaust fan	Air flow: 720m^3/h; pressure: 180Pa, N=0.044KW	Set	2	Toilet
I	**Oil pump room**				
65.	Explosion proof axial fan	BT35-11-No.3.55, air flow: 2737m^3/h, pressure: 70Pa, α=25°;rotational speed: 1450r/min, N=0.09KW	Set	4	
J	**Circulating water pump house**				
66.	Axial fan	T35-11-No.4, air flow: 3920m^3/h, pressure: 88Pa, α=25°; rotational speed: 1450r/min, N=0.12KW	Set	1	
67.	Cabinet type split air conditioner	LF14N, cooling capacity:13.8kW, power: 5.49KW 415V 50Hz	Set	1	
K	**Fire pump room**				
68.	Axial fan	T35-11-No.4, air flow: 3920m3/h, pressure: 88Pa, α=25°; rotational speed: 1450r/min, N=0.12KW	Set	1	
69.	Cabinet type split air conditioner	Cooling capacity:7.2kW; heating capacity:8.1kW, power: 2.58KW 415V 50Hz	Set	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
L	**Administration building**				
70.	Wall split air conditioner	Cooling capacity:5kW; heating capacity:5.4kW, power: 1.632KW 240V 50Hz	Set	15	
71.	Cabinet type split air conditioner	Cooling capacity:7.2kW; heating capacity:8.1kW, power: 2.58KW 240V 50Hz	Set	5	
72.	Axial fan	T35-11-No.3.55, air flow: 2737m^3/h, pressure: 70Pa, α=25°;rotational speed: 1450r/min, N=0.09KW	Set	4	
73.	Ceiling exhaust fan	Air flow: 720m^3/h; pressure: 180Pa, N=0.044KW	Set	6	
M	**Dining room**				
74.	Cabinet type split air conditioner	LF27N, cooling capacity:27.2kW, power: 12.5KW 415V 50Hz	Set	4	
75.	Wall split air conditioner	Cooling capacity:5kW; heating capacity:5.4kW, power: 1.632KW 240V 50Hz	Set	2	
76.	Axial fan	T35-11-No.4, air flow: 3920m^3/h, pressure: 88Pa, α=25°; rotational speed: 1450r/min, N=0.12KW	Set	4	
77.	Ceiling exhaust fan	Air flow: 720m^3/h; pressure: 180Pa, N=0.044KW	Set	4	
N	**Guard room**				
78.	Wall split air conditioner	Cooling capacity:5kW; heating capacity:5.4kW, power: 1.632KW 240V 50Hz	Set	1	
79.	Ceiling exhaust fan	Air flow: 720m^3/h; pressure: 180Pa, N=0.044KW	Set	1	
O	**Maintenance building**				
80.	Axial fan	T35-11-No.4, air flow: 3920m^3/h, pressure: 88Pa, α=25°; rotational speed: 1450r/min, N=0.12KW	Set	10	
81.	Ceiling exhaust fan	Air flow: 720m^3/h; pressure:	Set	2	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
		180Pa, N=0.044KW			
P	**Circulating water dosing room**				
82.	Cabinet type split air conditioner	Cooling capacity:7.2kW; heating capacity:8.1kW, power: 2.58KW 240V 50Hz	Set	1	Control room
83.	Crossion proof axial fan	BT35-11-No.4, air flow: 3920m^3/h, pressure: 88Pa, α=25°; rotational speed: 1450r/min, N=0.12KW	Set	1	Chlorine dosing room
84.	Crossion proof axial fan	BT35-11-No.4, air flow: 3920m^3/h, pressure: 88Pa, α=25°; rotational speed: 1450r/min, N=0.12KW	Set	1	Acid treatment room
Q	**Limestone crusher house**				
85.	Axial fan	FT35-11-No.4.5, air flow: 5881m^3/h, total pressure: 113Pa, α=25°;rotational speed: 1450r/min, N=0.25KW	Set	14	

6 ELECTRICAL

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY	NOTES
1	**Generator And Auxiliary Equipment**				
	Tupbo Generator	46MW,11kV,cosφ=0.8,3018A ,Xd"=13.3%,Brushless Excite	Set	1	
	Line side CT	4000/1 0.2S 20VA 4000/1 5P20/5P20 30VA	Set	1	
	Line side PT	11/√3 /0.11/√3 /0.11/30.2/3P,30VA/30VA	Set	1	
	Neutral side CT	4000/1 0.5 20VA 4000/1 0.5/5P20 20VA/30VA	Set	1	
	Neutral Earthing Transformer	11//0.11kV , 20kVA , Resistor 0.58Ω	Set	1	
	Exciter		Set	1	
	PT/Arrester Cabinet	11/√3 /0.11/√3 /0.11/3 , 0.2/3P, 30VA/30VA	Set	1	
	Segregated Phase Bus Duct	12kV,4000A,40kA/3S	m	50	
2	**Isolation Transformer And Auxiliary Equipment**				
	Generator Isolation Transformer	50/63MVA(ONAN/ONAF), 11.5±2X2.5%/11.0kV, YNd1,16%	Set		
	Air-Colled Control Box Of GIT		Set	1	
	Neutral Earthing Resistor Cabinet	CT : 100/1 ,5P20/5P20 , 10VA,Resistor:63.5Ω,100A(10S), Disconnector:200A	Set	1	
3	**HV Power Distribution Equipment**				
	HV Switchgear	KYN28,VCB,12kV,4000A,40 kA/3S	Set	1	
	HV Switchgear	KYN28,VCB,12kV,2000A,40 kA/3S, With relay protection device	Set	4	
	HV Switchgear	KYN28,VCB,12kV,1250A,40	Set	24	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY	NOTES
		kA/3S, With relay protection device			
	HV Switchgear	KYN28,VCB,12kV,3150A,40 kA/3S, With relay protection device	Set	1	
	PT Switchgear	KYN28,12kV,11/√3 /0.11/√3 /0.11/√3/0.11/3,With relay protection device	Set	2	
	Bus Bridge	12kV,3200A,40kA/3	m	22	
	Filter Cabinet	4500kVAR,11kV	Set	2	
	HV Frequency Counter	11kV，With 250 kW motor	Set	4	
4	**LV Power Distribution Equipment**				
	LV Switchgear	MNS,415V,50kA/1S 1000/800x1000，	Set	34	
	LV Switchgear	MNS,415V,50kA/1S 800/600x1000，	Set	60	
	LV Bus Bridge	415V,2500A,50kA/1S	m	13	
	LV Dry Type Transformer	1600 kVA,11±2x2.5%/0.415kV Ud=8%,Dyn11	Set	4	
	LV Dry Type Transformer	1000 kVA,11±2x2.5%/0.415kV Ud=6%,Dyn11	Set	2	
	LV Frequency Counter	415V，With 160 kW motor	Set	4	
	Local Control Box		Piece	30	
	Maintenance Power Supply Box		Piece	30	
	Channel Steel	[10	m	350	
5	**Lightning Orotection System and Earthing System**				
	Copper Bar	50x6	km	6.5	
	Copper Bar	40x4	km	7	
	Copper Rod	Φ20mm,L=2.5m	Set	160	
	CAD Weld		Set	3000	
	Steel Tube	Hot galvanizing，Φ75	m	200	
6	**Illumination System**				

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY	NOTES
	Road Lamp	AC 240V,250W	Set	85	
	Yard Lamp	AC 240V,70W,LED	Set	10	
	Double Tube Fluorescent Lamp	AC 240V,2x36W	Set	180	
	Grid Fluorescent Lamp	AC 240V,2x36W	Set	100	
	Electrodeless Lamp	AC 240V,40W	Set	50	
	Water Proof Dustproof Corrosion Proof Lighting Fixture	AC 240V,150W	Set	300	
	Water Proof Dustproof Corrosion Proof Lighting Fixture	AC 240V,70W	Set	220	
	Ceiling Light	AC 240V,400W	Set	20	
	Anti-explosion Lamp	AC 240V,150W	Set	10	
	Exit Lamp	AC 240V,3W LED	Set	100	Emergency time not less than 1 h
	Emergency Lamp	AC 240V,10W LED	Set	50	Emergency time not less than 1 h
	Waterproof And Dustproof Absorb Dome Light	AC 240V,32W	Set	100	
	Ceiling Lamp	AC 240V,32W	Set	50	
	High Intensity AOL	GZ-155A	Set	4	
	Low Intensity AOL	GZ-155B	Set	8	
	Single-phase Dark Switch	AC 240V,10A	Piece	200	
10	**Control, Measure, Signal, Relay Protection And Automatic Device**				
10.1	Generator transformer control and protection				
	AVR Cabinet	AVR	Set	1	
	Steam Turbine GT Protection Cabinet	2 nos 7UM621 Protective Devices, 1no 7VE6 Synchronizing Device and I/O Modules	Set	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY	NOTES
	Transformer protection cabinet		set	1	
10.2	Transmitter&Watt-Hour Meter Cabinet		Set	1	
10.3	UPS	Two main panels, one bypass panel, one feeder panel and two storage battery banks (special used for UPS, 400AH, 110VDC). Capacity: 40 kVA*2, Input Voltage: 415V/3ph, 415V/2ph,110V DC Output Voltage:240V/1ph	set	1	
10.4	DC System				
	DC Charger Panel	Charger rated data: 165V、100A 5 nos Charger module, 20A/charger module	set	2	
	DC Distribution Panel		set	2	
	Nickel-Cadmium Batteries bank	200AH, 110VDC 90 batteries	set	2	
	AC/DC Switch Panel		set	1	
	Portable Tank Discharge Resistance		set	1	
10.5	DC Power Source Screen	Input: 415 V, Output: 110 V, 65 Ah, 1 Set Battery, The High Frequency Switch Power Supply, Charger, Feeder Switch	set	1	
10.6	Fault Recording Cabinet		set	1	
10.7	GPS Cabinet		set	1	
10.8	Coal Microcomputer Monitoring Device	Including the microcomputer control Set, LCD, PLC cabinets, etc	set	1	
11	**Communication System In The Plant**				
11.1	Public Address System	Page and party public address system should be provided two channel communication,	set	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY	NOTES
		covered particularly over the frequency range of 500Hz to 5000Hz and dynamic range of 40 to 140 db, included 20 nos. indoor loudspeakers and 30 nos. outdoor loudspeakers, 10 nos. indoor handset stations and 15 nos. outdoor handset stations.			
11.2	Telephone System	More than 100 lines, an electronic private automatic branch exchange (EPABX) should be provided. EPABX system is provided sparate DC system and storage battery bank.	set	1	
12	**Testing Equipment**				
	Portable HV 9-Decade Resistance Box	Overall range : 1 K ohms to 1 Terra Ohms,Resolution : 1K Ohms	Set	1	
	Portable HV ac Test Set	single phase, 50-200KV/240V,	Set	1	
	Automatic Capacitance and Tan-Delta Test Set	Input : 120/240V, 50 Hz Output : 0-12KV, 100 mA (Cont.), 200mA (15 min) Extendible to 4A with resonating inductor Capacitance : 1.6 pF to 8 mF (with 100pF Std. Capacitor) Measurement with0.02% to0.05% accuracy and 0.0001 pF resolution Tan-delta : 1 x 10-6 to 9.999 with acc. 1x10-5 and 1 x 10-6 resolution Capacitive current : 0-5A Measurement Oil Test Cell : 2.5 KV(RMS), 150°C, 100 cm3, 100 pF Display : Large graphic TFT	Set	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY	NOTES
		(4-5 digit) ,backlit Test voltage, frequency, capacitance, Tan-delta Printer : Built-in Interface : RS232 C for PC			
	Portable Transformer Oil Breakdown Test Set	Test Voltage : 0-100KV (RMS) Accuracy : ±2% of reading Switch-off response : <4 mA current. Switch-off response : <1 mS time Rate of rise of : 0.1~10KV per sec. Test voltage Manual/Auto adjustable Display : Alpha numeric LCD Interface : RS 232, RS232C	Set	1	
	Portable Karl-Fischer Test Set	Titration Method : Coulometric, Karl-Fischer Display : 40 character alpha numeric backlit LCD Sample Volume : 0.1, 0.2, 0.5, 1.0, 2.0, 5.0, 10.0 ml Sp. Gr.range : 0.6 to 1.4 in 0.01 steps Moisture range : 1 ppm – 100% Measuring range : 1 µg – 10 mg water End point detection : ac polarization End point indication : Visual display/printout/acoustic beep Titration speed : 2 mg/min maxm. Maximum current : 400 mA Drift compensation :	Set	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY	NOTES
		Automatically controlled Start delay : 10 Sec. Stirrer speed : Microprocessor-controlled Accuracy : ± 3 µg to ±0.5%			
	3-phase Portable Transformer Turns Ratio & Vector Group Meter	Ratio Range : 0.75 to 10000 Ratio accuracy : ±0.1% to ±0.3% ±1 digit Measuring voltage : 63.5V to 240V Frequency range : 45-55 Hz Phase angle range : ±90 deg. Phase angle : ±0.1 deg. ±2 digit accuracy Magnetising current : <1 mA ->500mA Magnetising Current: Better than ±2% Measuring time : 5-20 sec. Display : Backlit LCD 256 x 128 pixels Interface : RS232C, printer port Accessories : Windows compatible software for control Via PC	Set	1	
	Portable Digital dc Resistance Meter	Nom. Range 0 – 2 m Ohm 0-20 m Ohm 0-200 m Ohm 0-2 Ohm 0-20 Ohm 0-200 Ohm Accuracy : A0.1% of reading over entire range Exctn. Current : upto 60A with compliance open circuit	Set	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY	NOTES
		voltage of 50V Display : 4½ digit backlit LCD Data Storage : Upto 1000 measurements Interface for remote : RS232C			
	Portable High Current Digital Micro Ohm Meter	Measurement ranges : 0.01 – 100 micro ohm 0.1 – 600 micro ohm 1.0 – 6000 micro ohm 10.0 – 60000 micro ohm 0.1 – 600 m ohm 1.0 – 6000 m ohm Resolution : 0.01 micro ohm to 1.0 m Ohm Accuracy : ±0.2% - ±0.5% Display : with 4 digit LED or LCD (backlit) Data Storage : > 300 readings Interface : RS232 Test Current : Upto 200A	Set	1	
	Portable Automatic Earth Tester	Earth resistance : 0-2K Ohms (Auto ranging) Range with 1 mΩ resolution and ±5% ±2 digit accuracy Test frequency : 100-160 Hz in 0.5 Hz steps Test current : 50 mA Maxm output voltage: <50V (RMS) Maxm. Interference : 40V peak to peak (50 Hz) Display : 3½ digit Alpha numeric LCD	Set	1	
	Portable Three Phase Universal Protective Relay Test Set		Set	1	
	Precision Digital Multimeter	Input Power : 110/220/240V AC 50 Hz DC Voltage Measurement	Piece	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY	NOTES
		Range : 3 mV to 10 KV with resolution Of 10 nV and accuracy of±12 ppm + 6 digits DC Current Measurement Range : 3 µA to 30A Resolu. : 10 pA Accu. : ±75 ppm + 10 digits Resistance Measurement : 30 meg ohm to 1 G ohms Resolu. : 10 n Ohm Accu. : ±200 ppm + 6 digits Frequency Measurement : 1 Hz to 100 K Hz Resolu. : 1Hz Accu. : ±10 ppm + 1 digit AC Voltage Measurement : 3m V to 3 KV Resolu. : 100 nV Accu. : ±0.05% + 40digits AC Current Measurement : 3 Micro Amp to 30A Resolu. : 100 pA Accu. : ±0.1% + 80 digits Capacitance Measurement : 0-300 Microfarad Resolu. : 1pF Accu. : ±0.2% + 20 digits			
	Portable Digital Frequency Meter	Ranges : 0-100 KHZ / 0-1000 Hz Resoln. : 1 KHZ / 0.1 Hz Accuracy : ±0.1% FS ±1 LSD Step Size : 10% of range Scroll Size : 0.1% of range Input : 1V to 100V p-p Output : 5V p-p Square Wave Maxm. load : 5 mA	Piece	1	
	Digital Sound Level Meter	Range 0-100dB, resoln.0.1dB,Acc.+/-1.5dB	Piece	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY	NOTES
	Digital Tachometer	Range : 0-10,000 RPM Resol. : 0.1 RPM to 1 RPM Accuracy : ±0.1% ±1 digit to ±0.15% ±1 digit Display : 5 digit LCD Optical Range : Upto minimum 300 mm	Piece	1	
	Cable Fault Locator	Input : 240V, 1 phase, 50 Hz Surge Generator : 4/8/16KV,120/240/480mA, 512W 10-20pulses per minute Pulse amplitude : 30V(single),±30V(double) Pulse width : 160 nano sec. to 2000 ns Pulse velocity : 100~ 300m/μs Impedance range : 80 ohms to 600 ohms Display : Backlit LCD Accuracy : 0.5% upto 1km 1 m from 1-10km	Set	1	
	Portable Vacuum Tester	Resolution : 0.1 KV and 0.01 mA Input : 240V AC, 50 Hz Output : 0-60 KV DC Adjustable 0-9.99 mA Adjustable Loading time : Upto 30 seconds	Set	1	
	Interfacial Tension Meter for Transformer Oil	Range : 0-90 dynes/ cm. Zero Drift : <0.1 dynes/cm in 24 Hours Resoln. : 0.05 dynes/cm Accuracy : ±0.05 dynes/cm	Set	1	
	Portable, Hand-held Thermal Imaging Camera	Temp. Range : -10 Deg.C to 1200 Deg.C Detector Type : Uncooled Focal Plane Array	Piece	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY	NOTES
		Thermal Sensitivity : 0.08°C @ 30°C Frame Route : 50 Hz Field of View : 20° x 20° Spectral Response : 8 to 14 microns Battery Operation : For atleast 2-hours			
	Portable High Voltage/Live Line Detector	Range : Upto 15 KV	Set	2	
	Clamp On Meters/Tong Testers	0-5/25A, 0-60/300/600V	Piece	3	
	Clamp On Meters/Tong Testers	0-1/5A, 0-60/300/60	Piece	3	
	Clamp On Meters/Tong Testers	0-10/30/300/1000A, 0-60/300/600V	Piece	3	
	Clamp On Meters/Tong Testers	0-20mA /200mA	Piece	1	
	Portable Phase Sequence/Continuity Indicators	Rated 100-600V, 40-60 Hz	Piece	3	
	Relay Tool Kit	i) Spring setting tool ii) Inspection mirror iii) Ring spanners iv) Box spanners v) Burnishing tool vi) Contact pressure gauge vii) Factor gauges viii) Test plugs with link plugs ix) Screw drivers x) Nose pliers xi) Scissors	Set	2	

7 INSTRUMENT & CONTROL

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
—	**Equipment**				
1	DCS(Distributed Conutrol System)	DCS includes 3200 points, and will select from ABB,	Set	1	Two boilers use 2000
2	MIS(Management Information System)		Set	1	
3	Turbine Control Cabinet		Set	1	Supplied along with
4	Vibration Monitoring System	VMS will select from Bentley Nevada 3500, Shinkawa VM7	Set	1	Including turbine and
5	PLC for Water Treatment	PLC includes 1000 points. Control system consist of PLC	Set	1	Including ultrafiltration,
6	PLC for Lime Stone Handling	PLC will select from Rockwell, ABB, Siemens, Schneider or	Set	1	Supplied along with
7	Boiler soot blowing power cabinet		Set	2	Supplied along with
8	Fire detection amplifier cabinet	System will select from Durag, Forney, Fire eye, Coen or ABB.	Set	2	Supplied along with
9	Local Control Cabinet for CW chlorination		Set	1	Supplied along with
10	Sewage Treatment System(PLC)		Set	1	Supplied along with
11	Steam and Water Sampling Analysis	PLC will select from Rockwell, ABB, Siemens, Schneider or	Set	1	Supplied along with
12	Chemical Dosing System(PLC)	PLC will select from Rockwell, ABB, Siemens, Schneider or	Set	1	Supplied along with
13	Condenser Rubber Ball Cleaning System		Set	1	Supplied along with
14	HVAC Control System(PLC)	PLC will select from Rockwell, ABB, Siemens, Schneider or	Set	1	Supplied along with
15	Industrial Wastewater Control System(PLC)	PLC will select from Rockwell, ABB, Siemens, Schneider or	Set	1	Supplied along with

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
16	Continuous Emission Monitoring System	SOx, NOx, CO analyzer will select from Codel-CEM 4000	Set	1	CEMS is common
17	CCTV(Closed Circuit Television)	Including 150 points.	Set	1	Including rotating table,
18	LVS(Large Video Screen)	Size of LVS is 65" diagonal and will select from PLANAR,	Set	2	
19	I&C 415VAC Power Supply Cabinet	800×650×2100	Set	6	
20	I&C 240AC Power Supply Cabinet	800×650×2100	Set	2	
21	Transmitter Protection Box	1000×600×1200	Set	55	
22	Standard Laboratory Equipment	Equipment will select from Tinsley(UK), Scandura(Italy),	Set	1	
23	Micro Power Supply Distribution Box	800×600×400	Set	7	
24	Small Tray	2000×100×100	Set	200	
25	Local Junction Box	Product will select from Phoneix contacts, WAGO,	Set	11	
二	**Instrument (Excluding instrument supplied**				
1	Sheathed Duplex Thermocouple	WRNK2 K Type	Piece	130	
2	Sheathed Duplex Platinum Thermal	WZPK2 Pt100	Piece	125	
3	Bimetallic Thermometer	WSS-481W Pt100	Piece	25	
4	Pressure Transmitter	Product will select from Emerson Rosemount,	Set	155	
5	Intelligent Pressure Transmitter	Product will select from Emerson Rosemount,	Set	80	
6	Pressure Switch	Product will select from Emerson Rosemount,	Piece	42	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
7	Differential Pressure Switch	Product will select from Emerson Rosemount,	Piece	20	
8	Supersonic Level Transmitter	FMU90	Set	16	
9	Radar Level Transmitter	Choose VEGA	Set	7	
10	Guided Wave Radar Level Transmitter	Choose VEGA	Set	5	
11	Turbo Flowmeter		Set	3	
12	Spring Tube Pressure Gauge	Y-150 Accuracy:1.5	Piece	30	
13	Magnetic Level Gauge	UHZ	Piece	20	
14	Standard Carrier-rings Orifice Plate		Piece	20	
15	Standard Nozzle		Piece	15	
16	Air Flowmeter	LTY-F	Set	24	
17	Zirconia Oxygen Analyzer	Product will select from Emerson, ABB, Yokogawa,	Set	4	
18	Flue Dust Emissions Analyzer	Product will select from Durag, Codel or Sintrol.	Set	2	
19	TV for Drum Water Level	WHTVQ-B	Set	2	Supplied along with
三	**Instrument for Water Treatment(Instrument**				
1	Sheathed Duplex Platinum Thermal	WZPK2 Pt100	Piece	4	
2	Bimetallic Thermometer	WSS-481W Pt100	Piece	1	
3	Pressure Transmitter	Product will select from Emerson Rosemount,	Set	19	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
4	Intelligent Pressure Transmitter	Product will select from Emerson Rosemount,	Set	25	
5	Pressure Switch	Product will select from Emerson Rosemount,	Piece	11	
6	Differential Pressure Switch	Product will select from Emerson Rosemount,	块	10	
7	Supersonic Level Transmitter	FMU90	Set	4	
8	Spring Tube Pressure Gauge	Y-150 Accuracy:1.5	Piece	95	
9	Magnetic Level Gauge	UHZ	Piece	10	
10	Standard Carrier-rings Orifice Plate		Piece	25	
11	Level Meter		Piece	6	
12	Flowmeter		Piece	9	
13	Acidimeter		Set	1	
14	Alkalimeter		Set	1	
15	Silica Analyzer	Product will select from Polymetron(France), ABB,	Set	3	
16	pH Analyzer	Product will select from Polymetron(France), ABB,	Set	6	
17	Specific Conductivity Analyzer	Product will select from Polymetron(France), ABB,	Set	14	
18	Turbidity Meter		Set	4	
19	Oxygen Analyzer	Product will select from Polymetron(France), ABB,	Set	2	

8 WATER SUPPLY AND DISCHARGE

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
1	BORE WELL PUMP	Q=100m^3/h, H=40m N=22kW	SET	3	
2	ELECTRIC HOIST	G=2T	SET	3	
3	WTP PUMP	Q=20m^3/h, H=45m, N=7.5kW	SET	3	
4	CW MAKE UP PUMP	Q=150m^3/h, H=15m, N=22kW	SET	2	
5	ELECTRIC HOIST	G=1T	SET	1	
6	IDCT	Q=4000m^3/h, N=160KW	SET	3	
7	CW PUMP	Q=3700m^3/h , H=25m , N=400kW	SET	3	
8	ACW PUMP	Q=980m^3/h, H=35m, N=132kW	SET	2	
9	PORTABLE PUMP	Q=75m^3/h, H=10m,N=4kW	SET	2	
10	SELF CLEAN STRAINER	Q=980m^3/h	SET	2	
11	PRESSURE SAND FILTER	Q=150m^3/h, φ3200	SET	2	
12	CRANE	LX, G=5T	SET	1	
13	BOILER BLOW DOWN SUMP LIFT PUMP	Q=25m^3/h, H=15m, N=4KW	SET	2	
14	RESUSE POND LIFT PUMP	Q=50m^3/h, H=50m, N=11KW	SET	2	
15	COAL WATER LIFT PUMP	Q=15m^3/h, H=50m, N=4KW	SET	2	
16	SEWAGE TREATMET EQUIOMENT	Q=2m^3/h	SET	2	
17	AERATION FAN	HC-60S,1.77m^3/min ,	SET	2	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
		0.4kgf/cm^3			
18	SEWAGE PUMP	Q=2m3/h, H=10m, N=0.55KW	SET	4	
19	SLUDGE PUMP	Q=5m^3/h, H=7m, N=0.37KW	SET	2	
20	INTERMEDIATE PUMP	Q=2m^3/h, H=15m, N=0.75KW	SET	2	
21	RESUSE PUMP	Q=10m3/h, H=10m, N=0.75KW	SET	2	
22	BACK WASH PUMP	Q=40m^3/h, H=20m, N=5.5KW	SET	2	
23	FILTER	Q=2m^3/h	SET	2	
24	OIL WATER SEPARATOR	Q=5m^3/h	SET	1	
25	OIL WATER LIFT PUMP	Q=5m^3/h, H=10m, N=1.1KW	SET	2	
26	OIL DRAIN PUMP	Q=3m^3/h, H=30m, N=1.5KW	SET	2	
27	WATER DRAIN PUMP	Q=5m^3/h, H=20m, N=1.1KW	SET	2	
28	RAIN WATER PUMP	Q=2000m^3/h , H=15m , N=110KW	SET	2	
29	RAIN WATER PUMP	Q=1000m^3/h , H=15m , N=55KW	SET	2	
30	COARSE SCREEN	2000x4000 mm	SET	1	
31	SLUICE GATE WITH HOIST	1500x1500 mm	SET	2	
32	PEDESTAL PAN		SET	30	
33	URINAL		SET	30	
34	LAVATORY		SET	20	
35	SERVICE SINK		SET	30	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
36	SERVICE/POTABLE WATER PUMP	Q=30m^3/h, H=45m, N=7.5KW	SET	2	
37	ASH WATER SETTLING POND LIFT PUMP	Q=15m^3/h, H=50m, N=4KW	SET	2	
38	SUMP WELL LIFT PUMP	Q=35m^3/h, H=20m, N=3KW	SET	2	
39	CRAWLER BULLDOZER		SET	1	
40	VIBRATORY ROLLER		SET	1	
	FIRE FIGHTING				
1	MOTOR DRIVEN FIRE PUMP	Q=4731L/min(1250gpm) , H=85m, N=110kW	SET	1	
2	DIESEL DRIVEN FIRE PUMP	Q=4731L/min(1250gpm) , H=85m, N=110kW	SET	1	
3	JOCKEY PUMP	Q=95L/min(25gpm), H=90m, N=7.5kW	SET	1	
4	CRANE	LX, G=3T	SET	1	
5	OUTDOOR HYDRANT		SET	20	
6	INDOOR HYDRANT		SET	140	
7	AUTOMATIC WATER SPRINKER SYSTEM	INCLUDING ISOLATION VALVE, ALARM VALVE,PIPES,SPRIKLER HEADS,ETC	SET	1	
8	AUTOMATIC WATER SPRAY SYSTEM	INCLUDING ISOLATION VALVE,DELUGE VALVE,PIPES,SPRAY NOZZLES,ETC	SET	16	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
9	AUTOMATIC PRE ACTION SPRINKER SYSTEM	INCLUDING ISOLATION VALVE, PRE ACTION VALVE,PIPES,SPRIKLER HEADS,ETC	SET	1	
10	INERGEN GAS FIRE EXTINGUISHING SYSTEM	INCLUDING INERT GAS STORAGE CYLINDER, VALVE,PIPES,DISHARGE NOZZLES,ETC	SET	1	
11	CO2 GAS EXTINGUISHING SYSTEM	INCLUDING CO2 GAS STORAGE CYLINDER, VALVE,PIPES,DISHARGE NOZZLES,ETC	SET	1	
12	WATER CURTAIN SYSTEM	INCLUDING ISOLATION VALVE,DELUGE VALVE,PIPES, NOZZLES,ETC	SET	4	
13	FOAM SYSTEM	INCLUDING FOAM TANK, VALVE,PIPES,ETC	SET	1	
14	DRY POWDER FIRE EXTINGUISHER		SET	200	
15	FIRE DETECTION SYSTEM AND CONTROL SYSTEM		SET	1	
16	WATER FIRE VEHICLE		SET	1	
17	FOAM FIRE VEHICLE		SET	1	

9 WATER TREATMENT

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
—	WATER TREATMENT PLANT				
1	MIAN EQUIPMENTS				
1)	Water treatment plant feed pump	Q=20m^3/h, H=0.45MPa P=7.5kW	Set	3	
2)	Multi-media filter	DN1600 h1=400 h2=800	Set	3	Rubber lined steel
3)	Actived Carbon Filter	DN1600 h=1200	Set	2	Rubber lined steel
4)	Filter water tank	V=50m^3	Set	1	Steel, anticorrosion
5)	Filter backwash pump	Q=75m^3/h, H=0.35MPa P=15kW	Set	2	
6)	DMF blower	Q=3m^3/min, H=0.08MPa P=11kW	Set	2	
7)	Self-washing filter	Q=20m^3/h	Set	2	
8)	UF equipment	Q=18m^3/h	Set	2	Water recovery rate:≥90%
9)	UF water tank	Q=18m^3/h, H=0.30MPa, P=5.5kW	Set	2	
10)	RO feed pump	V=50m^3	Set	1	Steel, anticorrosion
11)	UF back wash pump	Q=40m^3/h, H=0.35MPa, P=11kW	Set	2	
12)	UF back wash filter	Q=40m^3/h	Set	1	
13)	RO stage Ⅰ safety filter	Q=18m^3/h	Set	2	
14)	RO stage Ⅰ high pressure pump	Q=18m^3/h, H=1.2MPa, P=22kW	Set	2	Frequency regulation
15)	RO stage Ⅰ equipment	Q=12m^3/h	Set	2	Water recovery rate:≥75%

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
16)	RO stage II safety filter	Q=12m^3/h	Set	2	
17)	RO stage II high pressure pump	Q=12m^3/h, H=1.2MPa, P=22kW	Set	2	Frequency regulation
18)	RO stage II equipment	Q=10m^3/h	Set	2	Water recovery rate:≥85%
19)	RO II permeate water tank	V=50m^3	Set	1	Steel, anticorrosion
20)	RO water transfer pump	Q=20m^3/h, H=0.35MPa, P=5.5kW	Set	2	
21)	RO membrane flushing pump	Q=20m^3/h, H=0.35MPa, P=5.5kW	Set	2	
22)	Chemical cleaning Equipment		Set	1	Complete supplied by manufacturer
a	Chemical cleaning tank	V=3m^3	Set	1	Rubber lined steel
b	Chemical cleaning pump	Q=20m^3/h, H=0.35MPa, P=7.5kW	Set	1	
c	Chemical cleaning filter	Q=20m^3/h	Set	1	5μm
23)	Sodium hypochlorite dosing equipment		Set	1	Complete supplied by manufacturer
a	Sodium hypochlorite dosing tank	V=0.5m^3	Set	1	
b	Sodium hypochlorite dosing pump	Q=10L/h p=0.7MPa	Set	2	
c	Motor barrel pump	Q=50L/min,H=0.10MPa	Set	1	Flow material:UPVC
24)	Antiscalant dosing equipment		Set	1	Complete supplied

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
					by manufactu rer
a	Antiscalant dosing tank	V=0.5m³	Set	1	
b	Antiscalant dosing pump	Q=10L/h p=0.7MPa	Set	2	
c	Motor barrel pump	Q=50L/min,H=0.10MPa	Set	1	Flow material:S S
25)	Reducing agent dosing equipment		Set	1	Complete supplied by manufactu rer
a	Reducing agent dosing tank	V=0.5m³	Set	1	
b	Reducing agent dosing pump	Q=10L/h p=0.7MPa	Set	2	
26)	Acid dosing equipment		Set	1	Complete supplied by manufactu rer
a	Acid dosing tank	V=0.5m³	Set	1	
b	Acid dosing pump	Q=10L/h p=0.7MPa	Set	2	
27)	Caustic dosing equipment		Set	1	Complete supplied by manufactu rer
a	Caustic dosing tank	V=0.5m³	Set	1	
b	Caustic dosing tank(1)	Q=10L/h p=0.7MPa	Set	2	
c	Caustic dosing tank(2)	Q=10L/h p=0.7MPa	Set	2	
28)	Mixed-Bed Exchanger	DN800	Set	2	Rubber lined steel
29)	Resin Trap	DN80	Set	2	Rubber lined steel

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
30)	DM water storage tank	V=500m³	Set	1	Steel , anticorrosion
31)	Hot well make-up pump	Q=10m³/h, H=0.50MPa, P=5.5kW	Set	2	
32)	Boiler fill pump	Q=20m³/h, H=0.50MPa, P=7.5kW	Set	2	
33)	Safety Shower		Set	1	304
34)	Neutralizing pit	V=120m³	Set	1	Reinforced concrete,anticorrosion
35)	N-pit disposal pump	Q=50m³/h, H=0.40MPa, P=11kW	Set	2	
36)	Compressed Air Storage Tank	V=6m³	Set	2	Q345R
37)	Bulk acid storage tank	DN2000 V=10m³	Set	1	Rubber lined steel
38)	Bulk casutic storage tank	DN2000 V=10m³	Set	1	Rubber lined steel
39)	Acid measuring tank	V=0.5m³	Set	1	Rubber lined steel
40)	Caustic measuring tank	V=0.5m³	Set	1	Rubber lined steel
41)	Acid unloading pump	Q=10m³/h, H=0.1MPa, P=3kW	Set	2	
42)	Caustic unloading pump	Q=10m³/h, H=0.1MPa, P=3kW	Set	2	
43)	Casustic Ejector	Q=2.6m³/h	Set	1	316SS
44)	Acid Ejector	Q=2.6m³/h	Set	1	Rubber lined steel
45)	Acid Fog Absorber	DN500 Alkali absorption	Set	1	Rubber lined steel
2	material				
1)	Paddin				
a	Strong basic cation exchange resin	001×7MB	m³	0.6	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
b	Strong basic anion exchange resin	201×7MB	m^3	1.2	
2)	Piping				
a	Plastics lined pipe		set	1	
b	Carbon steel pipe		set	1	
c	Stainless steel		set	1	
3)	Support and hanger material	Profile steel	set	1	Q235B
4)	Anti-corrosive material				
a	Anti-corrosive paint		set	1	
5)	Valve				
a	Pneumatic valve	DN25～DN200	set	1	
b	Manual valve	DN25～DN200	set	1	
二	**CHEMICAL DOSING SYSTEM**				
1	Phosphate dosing equipment	Supply with valve/pipe/meter etc	set	1	Complete supplied by manufactu rer
a	Phosphate dosing pump	V=0.5m^3	set	2	304SS
b	Phosphate dosing tank	Q=10L/h p=12MPa	set	3	
2	Deoxidant dosing equipment	Supply with valve/pipe/meter etc	set	1	Complete supplied by manufactu rer
a	Deoxidant dosing tank	V=0.5m^3	set	2	304SS
b	Deoxidant dosing pump	Q=20L/h p=1.4MPa	set	2	
c	Motor barrel pump	Q=50L/min,H=0.10MPa	set	1	
3	Ammonia solution equipemnt	Supply with valve/pipe/meter etc	set	1	Complete supplied by manufactu

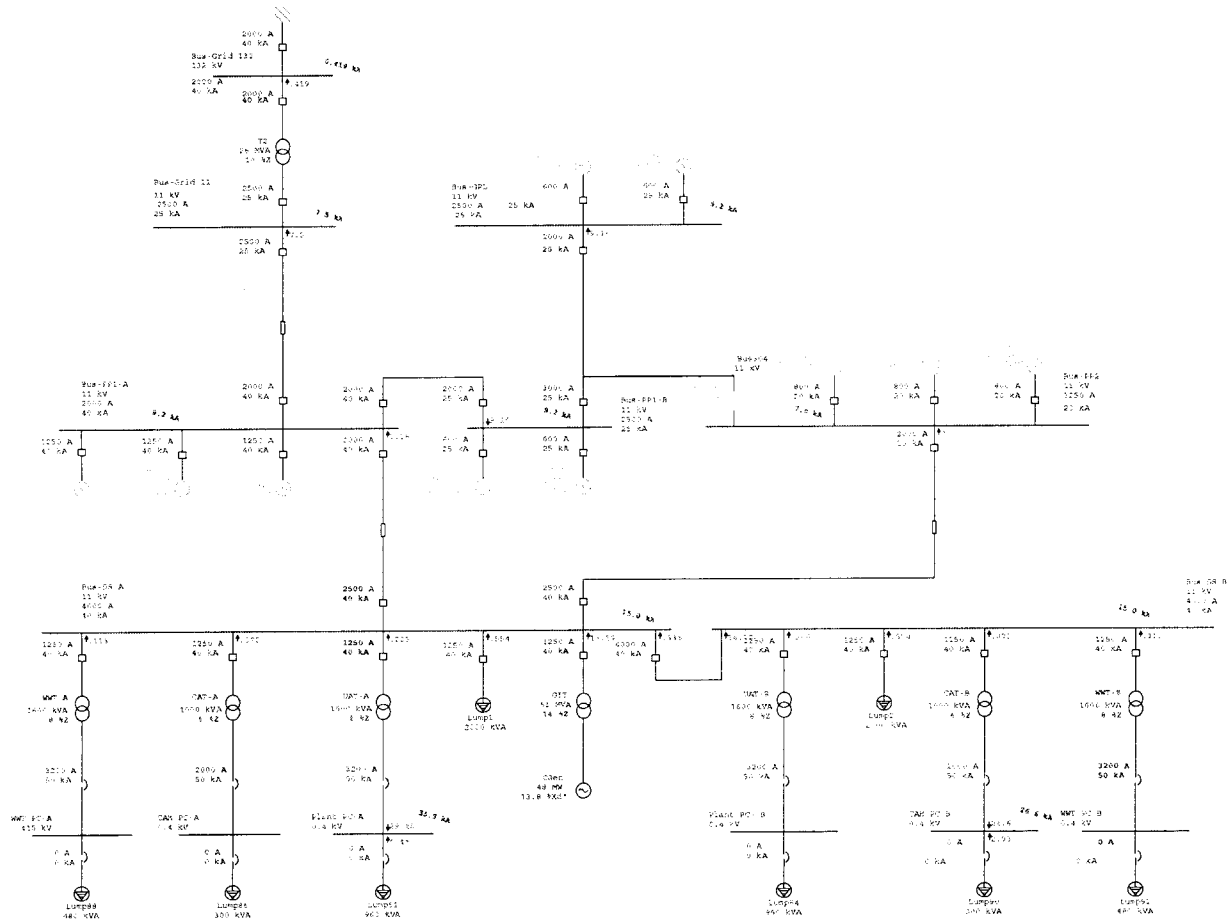
NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
					rer
a	Ammonia solution tank	V=0.5m^3	set	2	304SS
b	Ammonia dosing pump	Q=20L/h p=1.4MPa	set	2	
c	Liquid ammonia cylinder	V=40L	set	4	
4	Stainless steel pipe		set	1	
三	**Steam and water sampling analysis system**				
1)	High temperature & high pressure panel		set	1	Two bolier share one rack
2)	Instrument panel		set	1	Two bolier share one rack
3)	DM water cooling equipment		set	1	Supply with valve/pipe /meter and so on
a	DM water tank	V=2.0m^3	set	1	
b	DM water pump	Q=50m^3/h, H=0.3MPa, P=11kW	set	2	
c	Heat exchanger		set	2	
4)	Stainless steel pipe		set	1	
四	**CW dosing system**				
1	CW ACID DOSING SYSTEM		set	1	
1)	Sulphuric acid unloading pump	Q=10m^3/h, H=0.1MPa, P=3kW	set	2	Flow material:Alloy-20
2)	Sulphuric acid storage tank	V=10m^3	set	1	
3)	Sulphuric acid day tank	V=0.5m^3	set	1	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
4）	Sulphuric acid dosing pump	Q=50L/h，H=0.3MPa	set	2	Flow material:Alloy-20
2	WATER CLOAINATION		set	1	Complete supplied by manufacturer
1）	Electronic scale		set	2	
2）	Chlorination ton container	900kg	set	6	
3）	Chlorine gas filter	25kg/h	set	2	
4）	Vaccum regulator	25kg/h	set	2	
5）	Chlorinator	10kg/h	set	2	
6）	Injector	10kg/h	set	2	
7）	Water pump	Q=15m^3/h，H=0.40MPa P=7.5kW	set	2	
8）	Chlorine leakage alarm apparatus		set	1	Dual search unit
9）	Safety & supervisory equipment		set	1	
10）	Other accessories		set	1	
11）	Electrically operated monorail hoist	3t	set	1	
3	Carbon steel pipe		set	1	
4	UPVC pipe		set	1	
五	**Laboratory Equipment**				
1	Water Analysis				
1)	pH meter（Bench Top）		Set	2	
2)	pH meter（Portable）		Set	1	
3)	Conductivity meter（Bench Top）		Set	2	
4)	Conductivity meter（Portable）		Set	1	

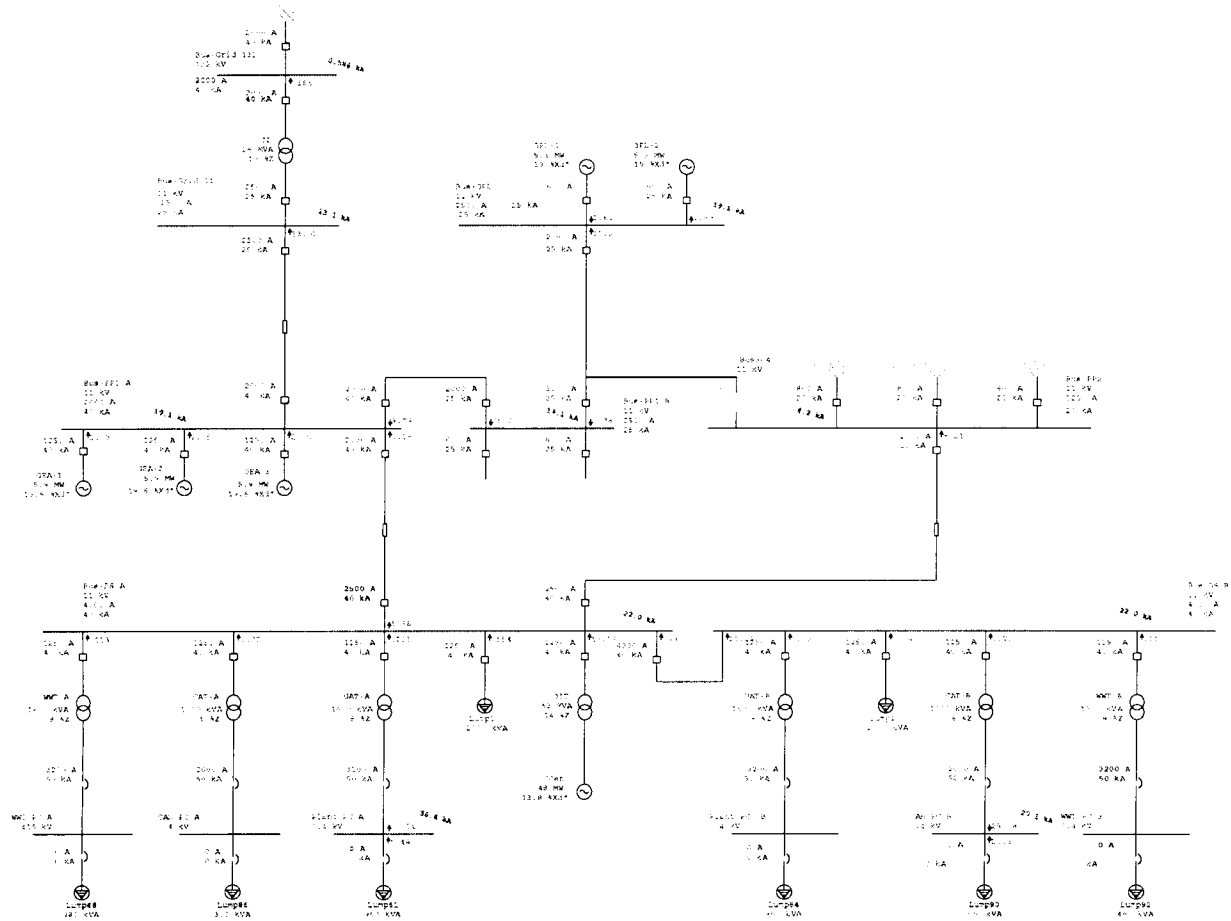
NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
5)	UV-VIS double beam spectro photometer		Set	1	
6)	Turbidity Meter		Set	1	
7)	Banlance(Electronic)		Set	2	
8)	Lab balance with weights		Set	1	
9)	COMPARATORS		Set	1	
2	Coal Analysis				
1)	Coal Analyser		Set	1	
2)	Automatic Oxygen Bomb Calorimeter		Set	1	
3)	Muffle Furnace		Set	2	
4)	Oven		Set	2	
5)	HGI measuring equipment		Set	1	
3	Oil Analysis				
1)	Red Wood Viscometer		Set	1	
2)	Automatic Flash Point Apparatus		Set	1	
3)	Dean & Stark Moisture Determination Apparatus		Set	2	
4)	Centrifuge		Set	1	
5)	Automatic K-F (Karl-Fisher)Titrimeter		Set	1	
6)	Orsat Gas Analyser		Set	1	
7)	Heating Mantle		Set	1	
4	Public equipments and facilities				
1)	Assay basin	800×500×800mm(H)	Set	3	
2)	Medicine locker	1200×480×1800mm(H)	Set	4	
3)	Double anticorrosive assay table	1800×1500×800mm(H)	Set	2	
4)	Single anticorrosive assay table	1200×750×800mm(H)	Set	34	

NO	EQUIPMENT	SPECIFICATIONS AND PARAMETERS	UNIT	QTY.	NOTES
5)	Water Basin	1500×750×800mm(H)	Set	2	
6)	Fume hood	1800×850×2400mm(H)	Set	2	

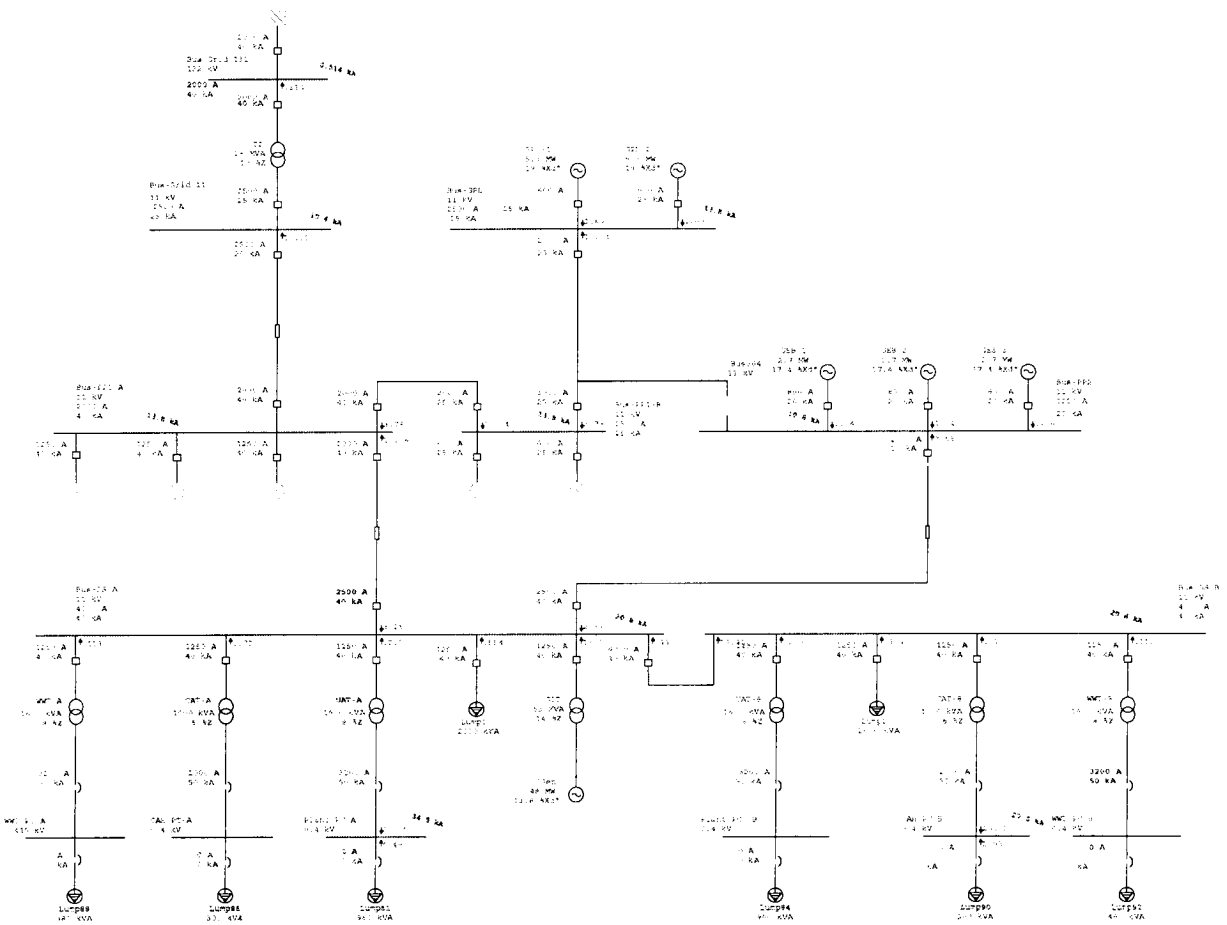
One-Line Diagram - Coal (Short-Circuit Analysis)



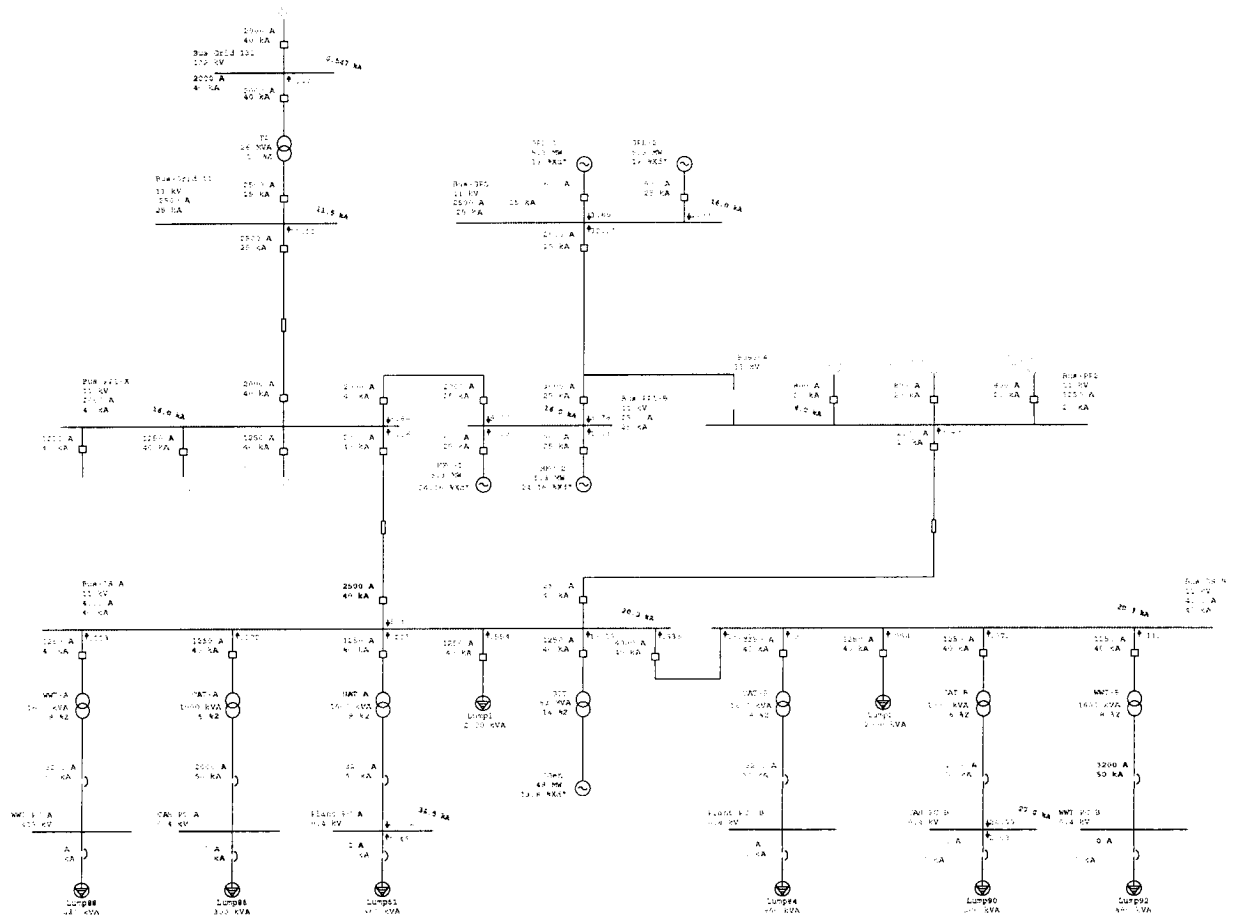
One-Line Diagram - Coal+GPL+GEA



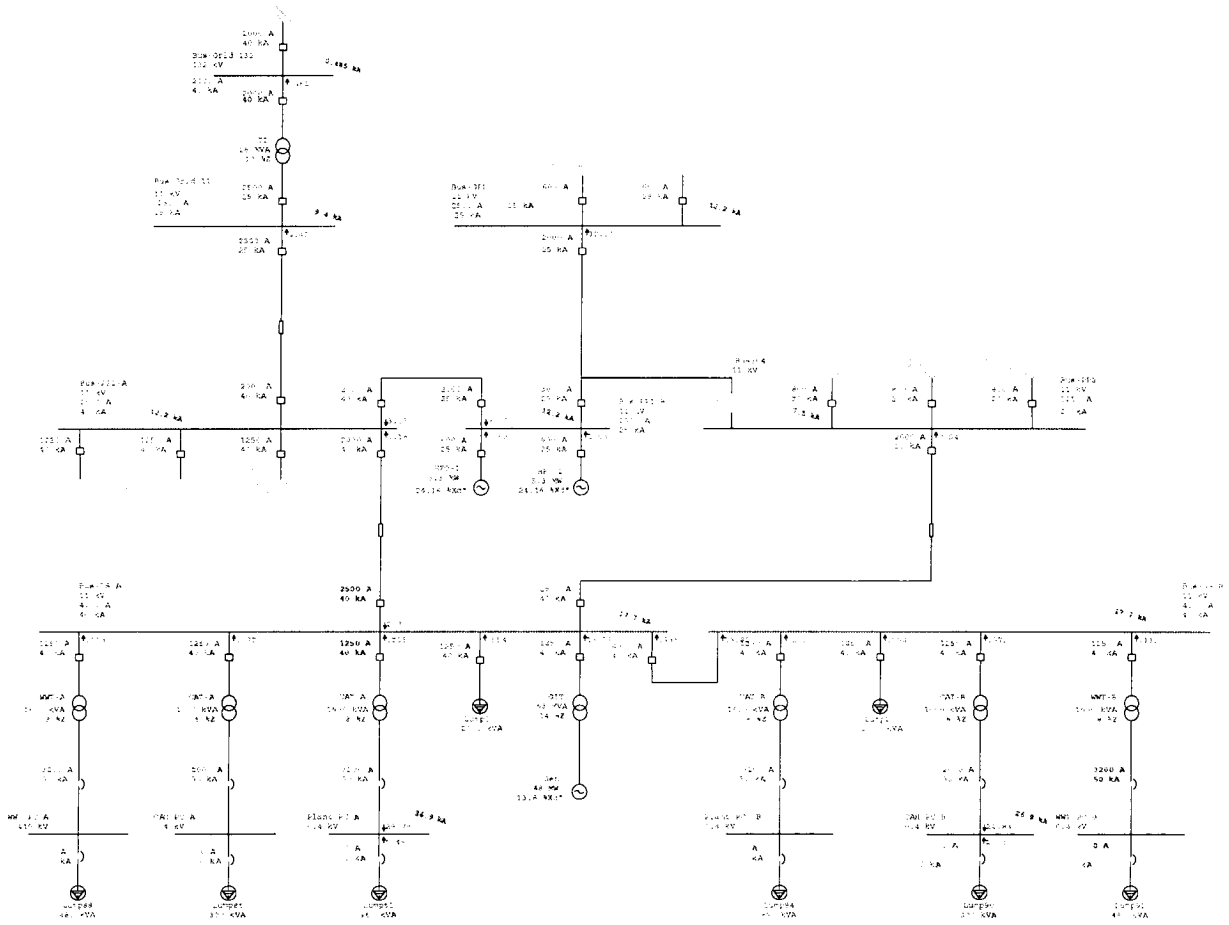
One-Line Diagram - Coal + GPL + GEB (Short-Circuit Analysis)



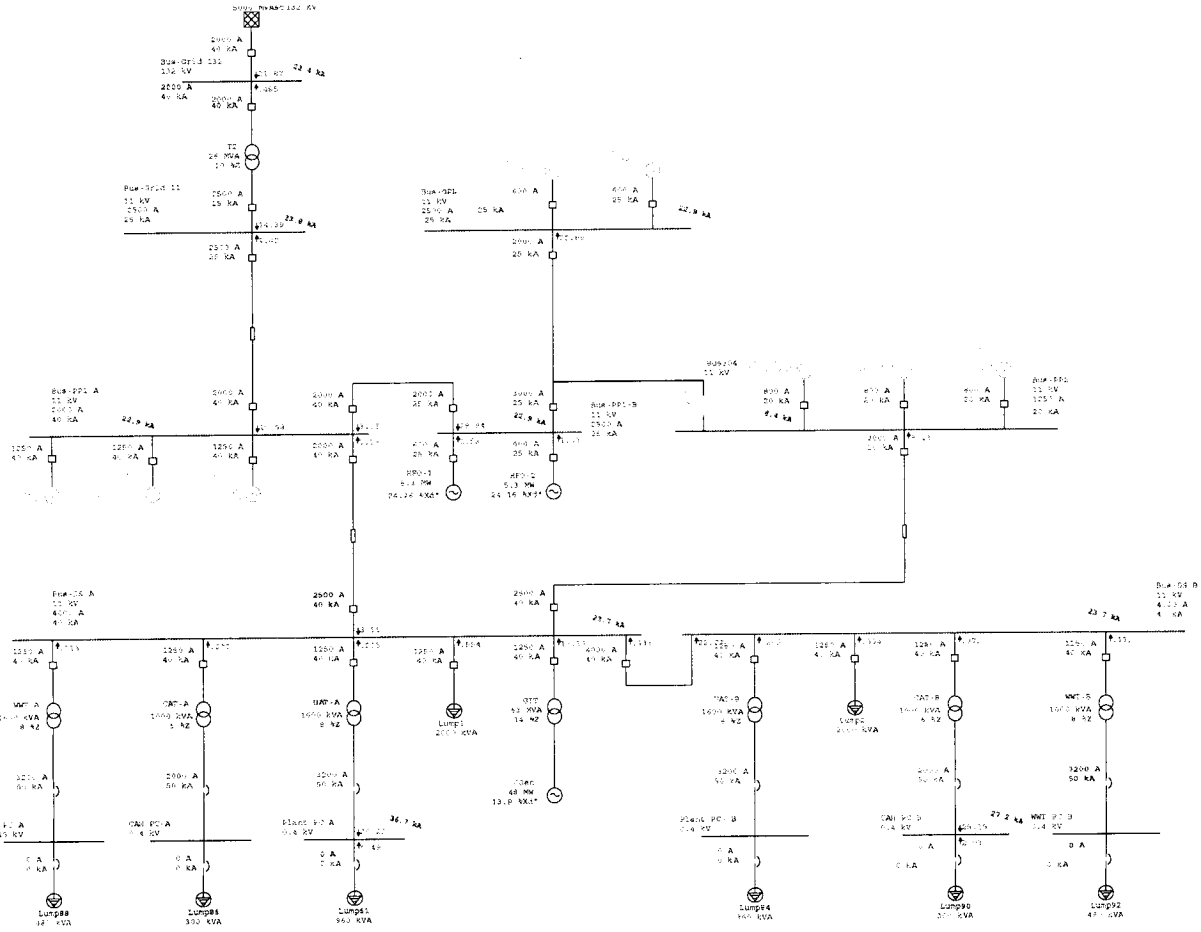
One-Line Diagram - Coal+GPL+HFO



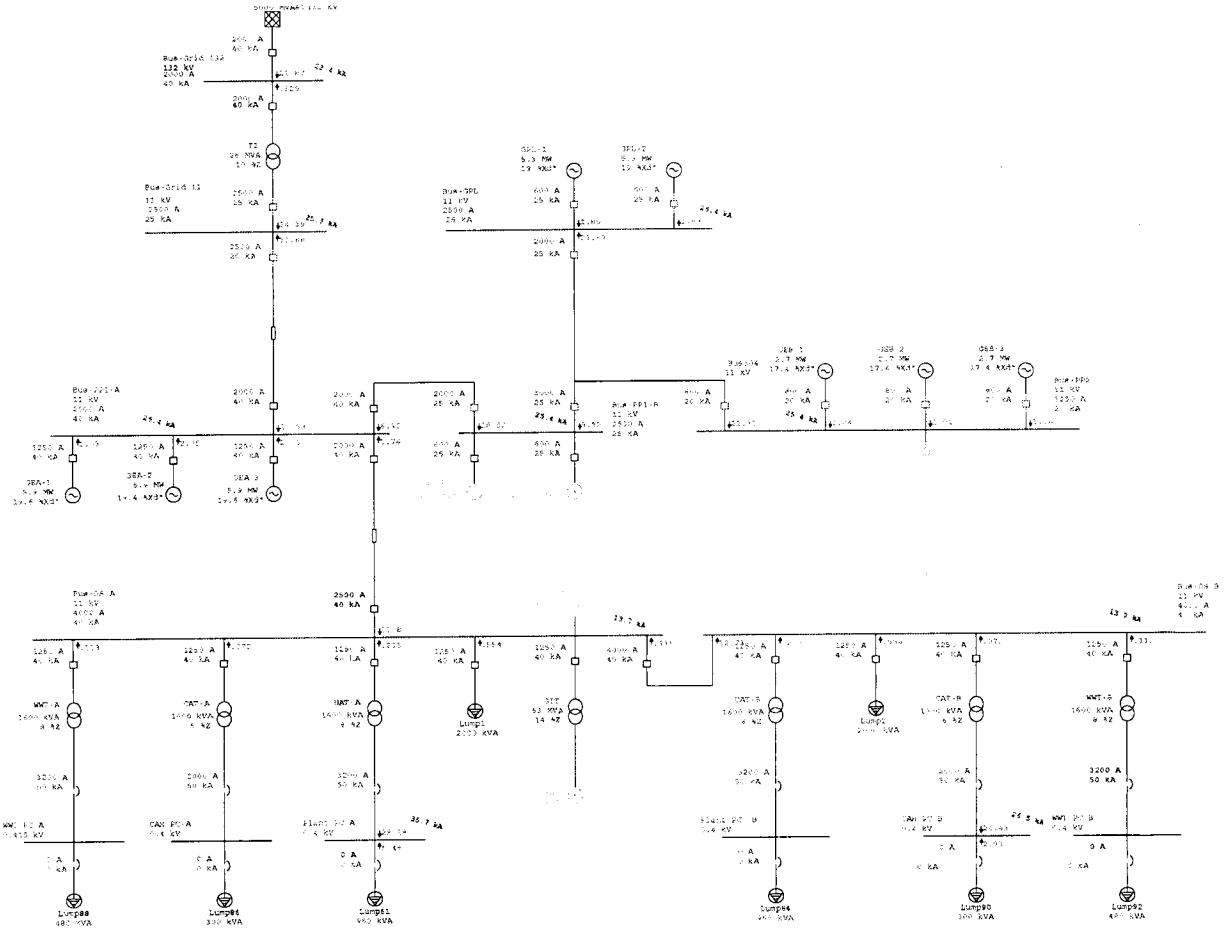
One-Line Diagram - Coal+HFO (Short-Circuit Analysis)



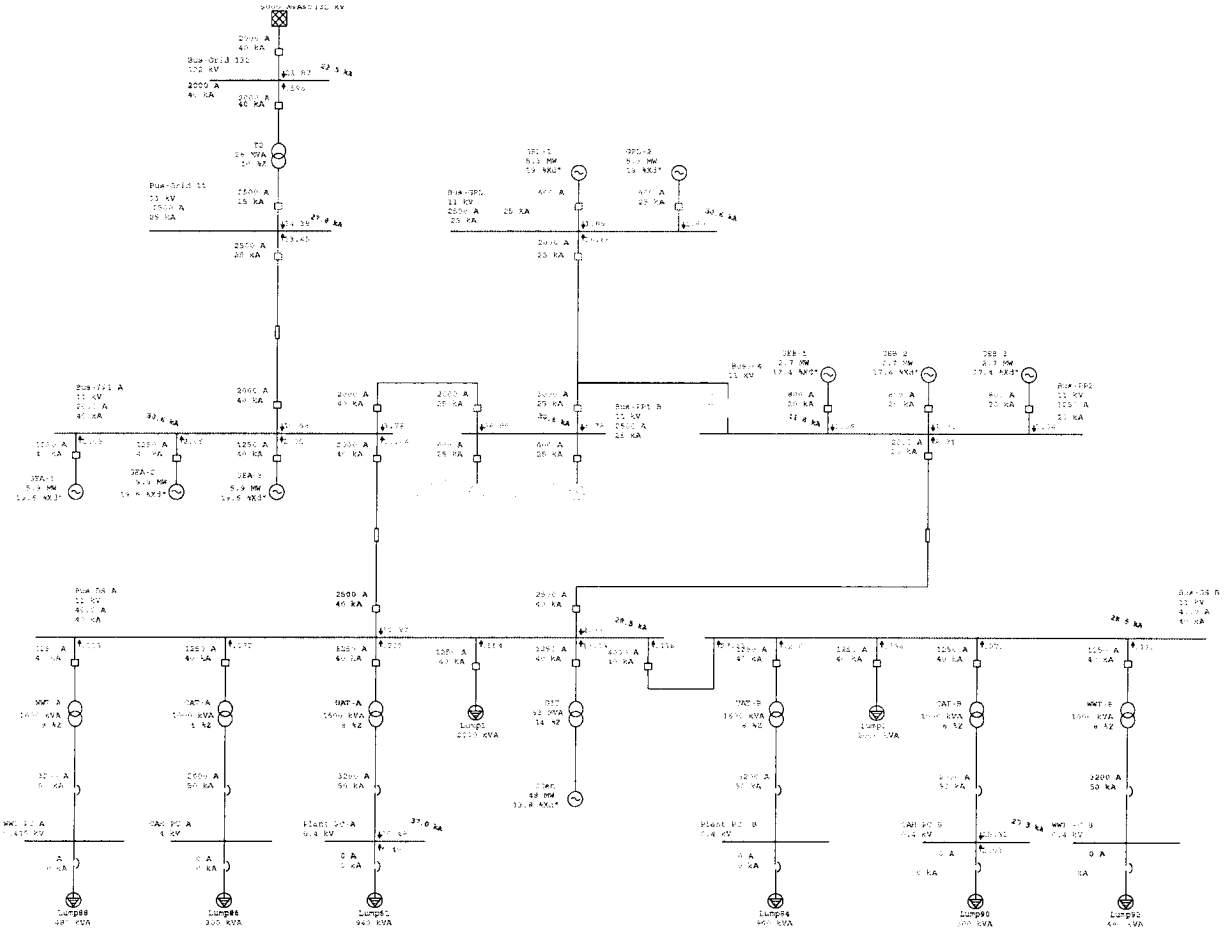
One-Line Diagram - Coal+HFO+Grid (Short-Circuit Analysis)



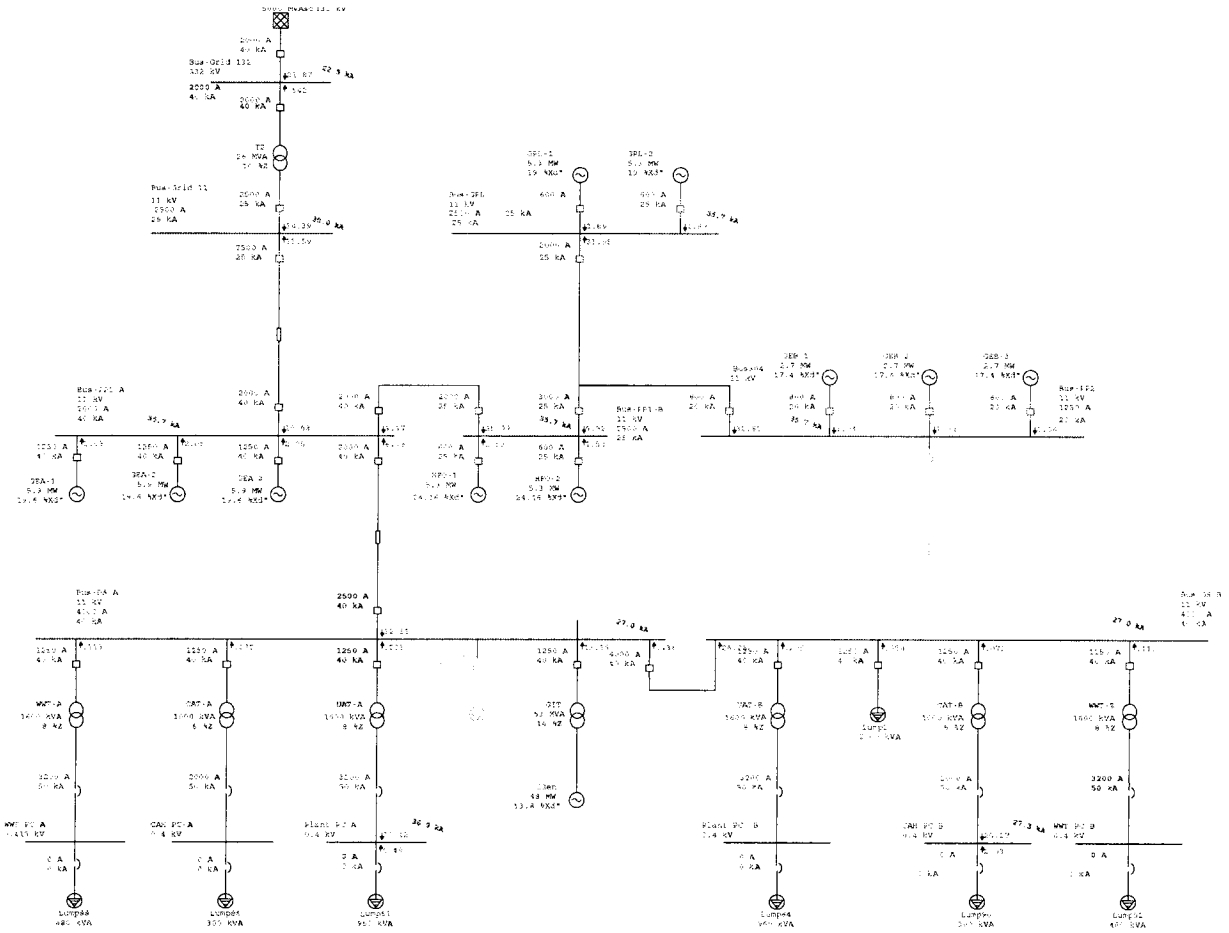
One-Line Diagram - Grid + GEA + GEB + GPL



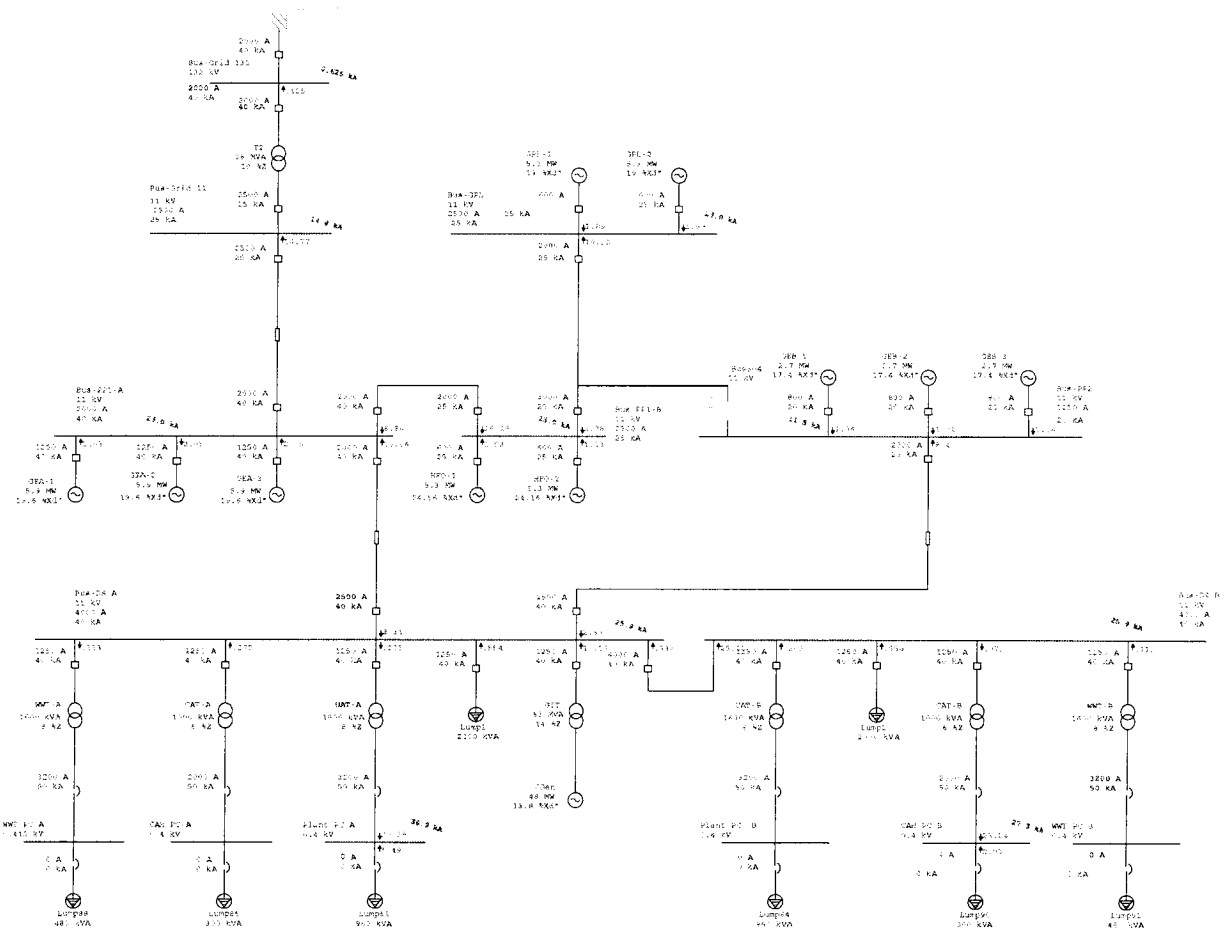
One-Line Diagram - Grid+GEA+GEB+GPL+Coal (Short-Circuit Analysis)



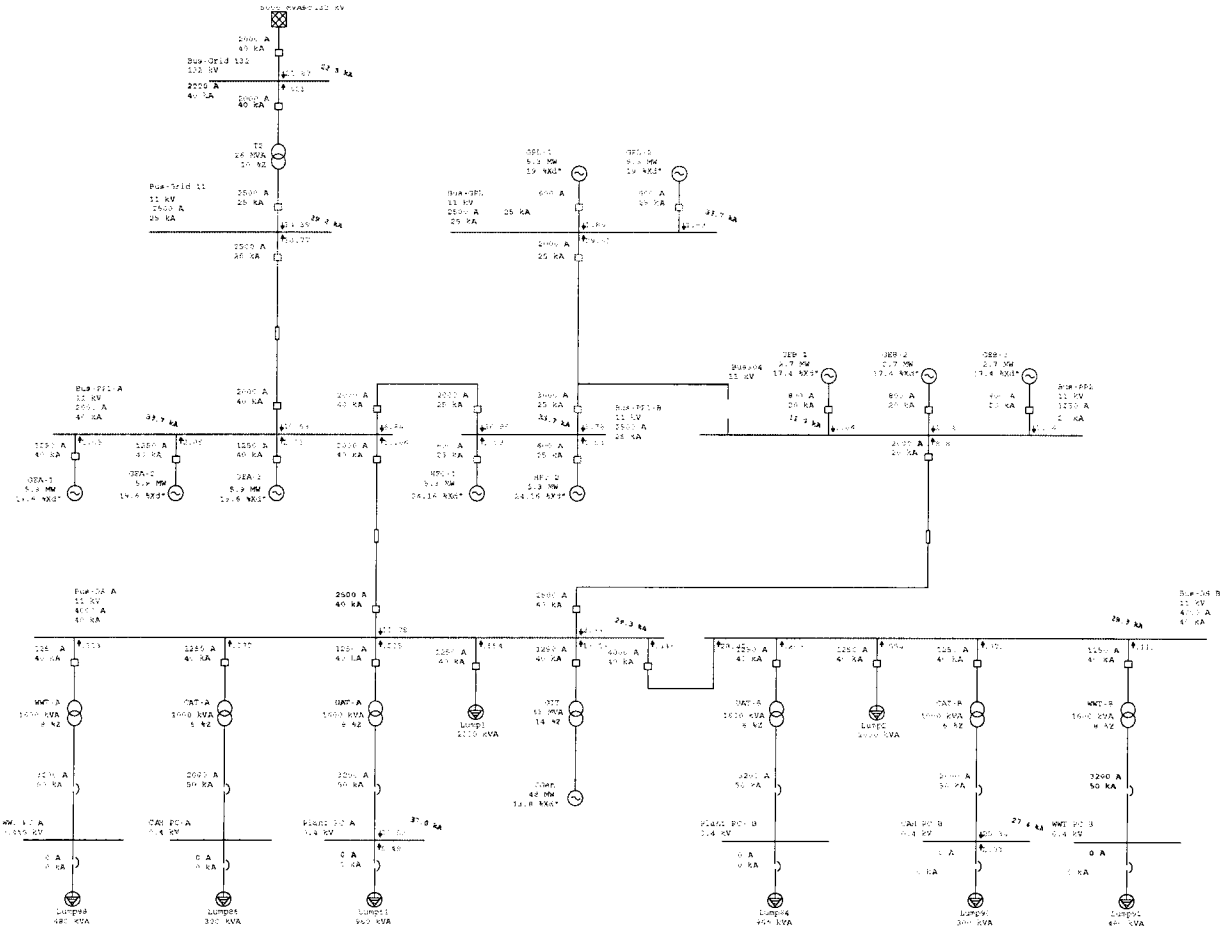
One-Line Diagram - Grid+GEA+GEB+GPL+HFO (Short-Circuit Analysis)

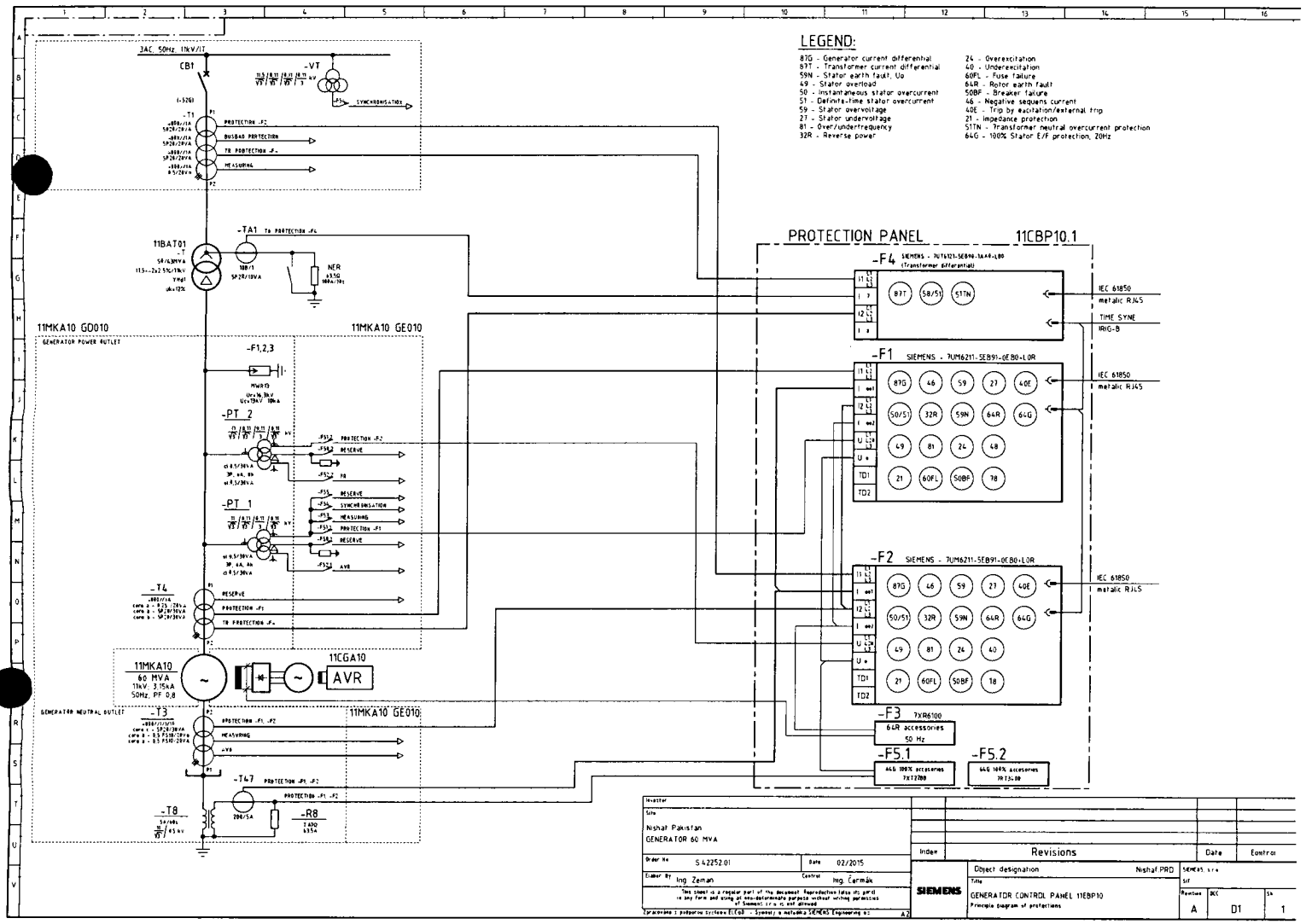


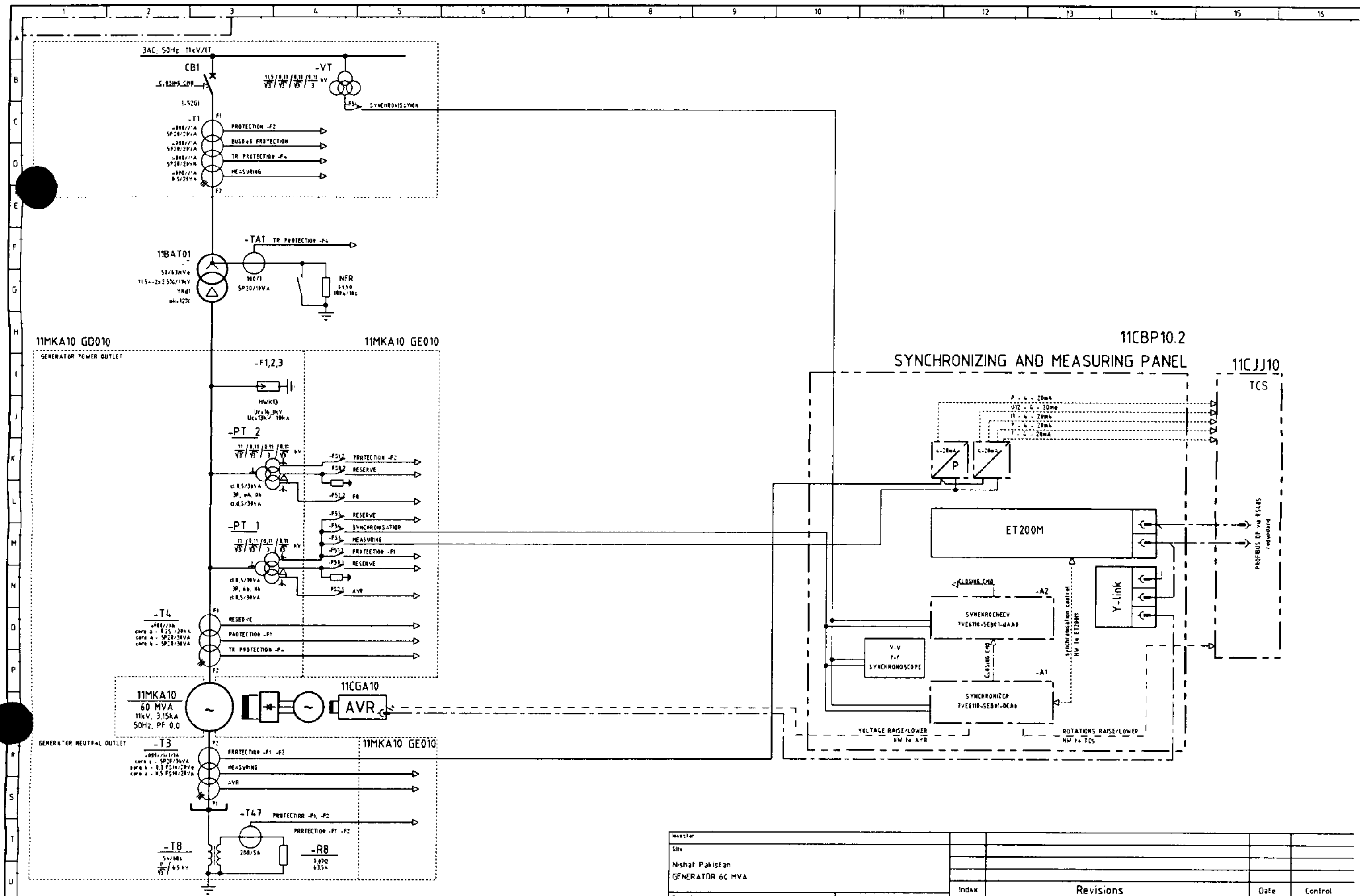
One-Line Diagram - Coal+GEA+GEB+HFO+GPL (Short-Circuit Analysis)



One-Line Diagram - Grid+GEA+GEB+GPL+HFO+Coal (Short-Circuit Analysis)




LEGEND:
87G - Generator current differential
87T - Transformer current differential
59N - Stator earth fault, Uo
49 - Stator overload
50 - instantaneous stator overcurrent
51 - Definite-time stator overcurrent
59 - Stator overvoltage
27 - Stator undervoltage
81 - Over/underfrequency
32R - Reverse power
24 - Overexcitation
40 - Underexcitation
60FL - Fuse failure
64R - Rotor earth fault
50BF - Breaker failure
46 - Negative sequens current
40E - Trip by excitation/external trip
21 - impedance protection
51TN - Transformer neutral overcurrent protection
64G - 100% Stator E/F protection, 20Hz
PROTECTION PANEL 11CBP10.1
-F4
-F1
-F2
-F3 7XR6100
64R accessories
50 Hz
-F5.1
-F5.2
IEC 61850
metalic RJ45
TIME SYNE
IRIG-B
11MKA10 GD010
11MKA10 GE010
GENERATOR POWER OUTLET
GENERATOR NEUTRAL OUTLET
11MKA10
60 MVA
11kV, 3.15kA
50Hz, PF 0.8
11CGA10
AVR
-T1
-T2
-T3
-T4
-T7
-T8
-R8
11BAT01
-TA1
-PT 1
-PT 2
-F1,2,3
Nishaf Pakistan
GENERATOR 60 MVA
Order No S 42252.01
Date 02/2015
Elaborated by Ing. Zeman
Control Ing. Čermák
Revisions
Index
Date
Control
SIEMENS
Object designation Nishaf PRD
GENERATOR CONTROL PANEL 11EBP10
Principle Diagram of protections
Revision A
Sh 1



Investor		
Site	Nishat Pakistan GENERATOR 60 MVA	
Order No 5 47252.01	Date 02/2015	
Elabor. By Ing. Zeman	Control Ing. Čermák	

Index	Revisions	Date	Control

SIEMENS

Object designation	Nishat.PRO	SIEMENS, s.r.o.
Title: GENERATOR CONTROL PANEL 11CBP10.2 Principle diagram of measuring & synchronization		SIT
Revision A	KKC D1	Sh 2

-F1 7UM6211-5EB91-0CB0+L0R (Generator - Full version)			PROTECTION TRIPPING MATRIX							
No	ANSI CODE	FUNCTION	PROTECTION	generator CB		AVR	TURBINE RAPID SHUT DOWN	SIGNALLING VIA IEC 61850	NOTE
				COIL A	COIL B	EXCITATION			
1	87G	GENERATOR DIFFERENTIAL-I diff>	7UM6211	⊜	⊜	⊜	⊜	⊜	
2	87G	GENERATOR DIFFERENTIAL-I diff>>	7UM6211	⊜	⊜	⊜	⊜	⊜	
3	46.1	NEGATIVE SEQUENCE CURRENT - WARNING	7UM6211					⊜	
4	46.2	NEGATIVE SEQUENCE CURRENT - TRIP-CURRENT STAGE	7UM6211	⊜	⊜	⊜		⊜	
5	46.3	NEGATIVE SEQUENCE CURRENT - TRIP-THERMAL STAGE	7UM6211	⊜	⊜	⊜		⊜	
6	59.1	OVERVOLTAGE PROTECTION - TRIP (LONG TIME)	7UM6211	⊜	⊜	⊜		⊜	
7	59.2	OVERVOLTAGE PROTECTION - TRIP	7UM6211	⊜	⊜	⊜		⊜	
8	27.1	UNDERVOLTAGE PROTECTION -ALARM	7UM6211					⊜	
9	27.2	UNDERVOLTAGE PROTECTION - TRIP	7UM6211	⊜	⊜	⊜		⊜	
10	51	DEFINITE-TIME STATOR OVERCURRENT - TRIP	7UM6211	⊜	⊜	⊜	⊜	⊜	
11	50	INSTANTANEOUS STATOR OVERCURRENT - TRIP	7UM6211	⊜	⊜	⊜	⊜	⊜	
12	32R.1	REVERSE POWER - TRIP	7UM6211	⊜	⊜	⊜		⊜	
13	32R.2	REVERSE POWER - LONG TIME - TRIP	7UM6211	⊜	⊜	⊜	⊜	⊜	
14			7UM6211						
15	64R.1	ROTOR EARTH FAULT PROTECTION - ALARM	7UM6211					⊜	
16	64R.2	ROTOR EARTH FAULT PROTECTION - TRIP	7UM6211	⊜	⊜	⊜	⊜	⊜	
17	49.1	STATOR OVERLOAD - ALARM	7UM6211					⊜	
18	49.2	STATOR OVERLOAD - TRIP	7UM6211	⊜	⊜	⊜		⊜	
19	81U.1	UNDERFREQUENCY 1st STAGE	7UM6211					⊜	

Site
Nishat Pakistan
GENERATOR 60 MVA

Order No: S.42252.01
Date: 02/2015
Elabor By: Ing. Zeman

Zpracováno s podporou systému ELCAD - Symboly a metodika SIEMENS Engineering a.s.

A3

SIEMENS

Object designation: Nishat PRO
Title: GENERATOR CONTROL PANEL 11CBP10.1
PROTECTION TRIPPING MATRIX

SIEMENS, s.r.o.
SIT

Revision	DCC	Sh
A	D1	3

-F1 7UM6211-5EB91-0CB0+L0R (Generator - Full version)			PROTECTION TRIPPING MATRIX								
No	ANSI CODE	FUNCTION	PROTECTION	generator CB		SUPERIOR CB	AVR EXCITATION	RAPID SHUT DOWN	SIGNALLING VIA IEC 61850	NOTE
				COIL A	COIL B					
20	81U.2	UNDERFREQUENCY 2nd STAGE	7UM6211	●	●		●		●	
21	81U.3	UNDERFREQUENCY 3rd STAGE	7UM6211	●	●		●	●	●	
22	810	OVERFREQUENCY	7UM6211						●	
23	40.1	UNDEREXCITATION - ALARM	7UM6211						●	
24	40E	LOSS OF EXCITATION	7UM6211	●	●		●		●	
25	24.1	OVEREXCITATION - ALARM	7UM6211						●	
26	24.2	OVEREXCITATION - INVERSE TIME	7UM6211	●	●		●		●	
27	24.3	OVEREXCITATION - DEFINITE TIME	7UM6211	●	●		●		●	
28	59N	STATOR EARTH FAULT Uo - TRIP	7UM6211	●	●		●	●	●	
29	50BF	FAULT OF GENERATOR CB	7UM6211	●	●	●	●	●	●	
30	60FL	FUSE FAILURE	7UM6211						●	
31	78	OUT OF STEP PROTECTION - TRIP	7UM6211	●	●		●	●	●	
32	64G	100% STATOR E/F PROTECTION, 20Hz - TRIP	7UM6211	●	●		●	●	●	
33	5.1	GENERATOR EMERGENCY STOP	7UM6211	●	●		●	●	●	
34	5.3	EXCITATION SET FAULT	7UM6211	●	●		●		●	
35	5.5	COMMON IRF PROTECTION - TRIP	7UM6211	●	●		●	●	●	
36	21.1	IMPEDANCE 1st STAGE - TRIP	7UM6211	●	●		●	●	●	
37	21.2	IMPEDANCE 2nd STAGE - TRIP	7UM6211	●	●		●	●	●	
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Site
Nishat Pakistan
GENERATOR 60 MVA

Order No. S.42252.01
Date 02/2015
Elabor By Ing. Zeman

Zpracováno s podporou systému ELCAD - Symboly a metodika SIEMENS Engineering a.s.

A3

SIEMENS

Object designation Nishat.PRO

Title
GENERATOR CONTROL PANEL 11CBP10.1
PROTECTION TRIPPING MATRIX

SIEMENS, s.r.o.
SIT

Revision	DCC	Sh
A	D1	4

-F2 7UM6211-5EB91-0CB0+L0R (Generator - Full version)			PROTECTION TRIPPING MATRIX							
No	ANSI CODE	FUNCTION	PROTECTION	generator CB		AVR	TURBINE RAPID SHUT DOWN	SIGNALLING VIA IEC 61850	NOTE
				COIL A	COIL B	EXCITATION			
1	87G	GENERATOR DIFFERENTIAL-I diff>	7UM6211	●	●	●	●	●	
2	87G	GENERATOR DIFFERENTIAL-I diff>>	7UM6211	●	●	●	●	●	
3	46.1	NEGATIVE SEQUENCE CURRENT - WARNING	7UM6211					●	
4	46.2	NEGATIVE SEQUENCE CURRENT - TRIP-CURRENT STAGE	7UM6211	●	●	●		●	
5	46.3	NEGATIVE SEQUENCE CURRENT - TRIP-THERMAL STAGE	7UM6211	●	●	●		●	
6	59.1	OVERVOLTAGE PROTECTION - TRIP (LONG TIME)	7UM6211	●	●	●		●	
7	59.2	OVERVOLTAGE PROTECTION - TRIP	7UM6211	●	●	●		●	
8	27.1	UNDERVOLTAGE PROTECTION -ALARM	7UM6211					●	
9	27.2	UNDERVOLTAGE PROTECTION - TRIP	7UM6211	●	●	●		●	
10	51	DEFINITE-TIME STATOR OVERCURRENT - TRIP	7UM6211	●	●	●	●	●	
11	50	INSTANTANEOUS STATOR OVERCURRENT - TRIP	7UM6211	●	●	●	●	●	
12	32R.1	REVERSE POWER - TRIP	7UM6211	●	●	●		●	
13	32R.2	REVERSE POWER - LONG TIME - TRIP	7UM6211	●	●	●	●	●	
14									
15	64R.1	ROTOR EARTH FAULT PROTECTION - ALARM	7UM6211					●	
16	64R.2	ROTOR EARTH FAULT PROTECTION - TRIP	7UM6211	●	●	●	●	●	
17	49.1	STATOR OVERLOAD - ALARM	7UM6211					●	
18	49.2	STATOR OVERLOAD - TRIP	7UM6211	●	●	●		●	
19	81U.1	UNDERFREQUENCY 1st STAGE	7UM6211					●	

Site
Nishat Pakistan
GENERATOR 60 MVA

Order No S.42252.01
Date 02/2015
Elabor. By Ing. Zeman

Zpracováno s podporou systému ELCAD - Symboly a metodika SIEMENS Engineering a.s.

A3

SIEMENS

Object designation Nishat.PRO
Title
GENERATOR CONTROL PANEL 11CBP10.1
PROTECTION TRIPPING MATRIX

SIEMENS, s.r.o.
SIT

Revision	DCC	Sh
A	D1	5

-F2 7UM6211-5EB91-0CB0+L0R (Generator - Full version)			PROTECTION TRIPPING MATRIX								
No	ANSI CODE	FUNCTION	PROTECTION	generator CB		SUPERIOR CB	AVR EXCITATION	RAPID SHUT DOWN	SIGNALLING VIA IEC 61850	NOTE
				COIL A	COIL B					
20	81U.2	UNDERFREQUENCY 2nd STAGE	7UM6211	●	●		●		●	
21	81U.3	UNDERFREQUENCY 3rd STAGE	7UM6211	●	●		●	●	●	
22	810	OVERFREQUENCY	7UM6211						●	
23	40.1	UNDEREXCITATION - ALARM	7UM6211						●	
24	40E	LOSS OF EXCITATION	7UM6211	●	●		●		●	
25	24.1	OVEREXCITATION - ALARM	7UM6211						●	
26	24.2	OVEREXCITATION - INVERSE TIME	7UM6211	●	●		●		●	
27	24.3	OVEREXCITATION - DEFINITE TIME	7UM6211	●	●		●		●	
28	59N	STATOR EARTH FAULT Uo - TRIP	7UM6211	●	●		●	●	●	
29	50BF	FAULT OF GENERATOR CB	7UM6211	●	●	●	●	●	●	
30	60FL	FUSE FAILURE	7UM6211						●	
31	78	OUT OF STEP PROTECTION - TRIP	7UM6211	●	●		●	●	●	
32	64G	100% STATOR E/F PROTECTION, 20Hz - TRIP	7UM6211	●	●		●	●	●	
33	5.1	GENERATOR EMERGENCY STOP	7UM6211	●	●		●	●	●	
34	5.3	EXCITATION SET FAULT	7UM6211	●	●		●		●	
35	5.5	COMMON IRF PROTECTION - TRIP	7UM6211	●	●		●	●	●	
36	21.1	IMPEDANCE 1st STAGE - TRIP	7UM6211	●	●		●	●	●	
37	21.2	IMPEDANCE 2nd STAGE - TRIP	7UM6211	●	●		●	●	●	
38										

Site
Nishat Pakistan
GENERATOR 60 MVA

Order No. S.42252.01
Date 02/2015
Elabor By Ing. Zeman

Zpracováno s podporou systému ELCAD - Symboly a metodika SIEMENS Engineering a.s. A3

SIEMENS

Object designation Nishat.PRD
Title
GENERATOR CONTROL PANEL 11CBP10.1
PROTECTION TRIPPING MATRIX

SIEMENS, s.r.o.
SIT
Revision A | DCC D1 | Sh 6

-F4 7UT6121-5EB90-1AA0+L0R (Transformer differential prtection)			PROTECTION TRIPPING MATRIX							
No	ANSI CODE	FUNCTION	PROTECTION	generator CB		AVR EXCITATION	TURBINE RAPID SHUT DOWN	SIGNALLING VIA IEC 61850	NOTE
				COIL A	COIL B				
1	87T	TRANSFORMER DIFFERENTIAL-I diff> - TRIP	7UT6121	⊜	⊜	⊜	⊜	⊜	
2	5.2	BUCHHOLZ PROTECTION - TRIP	7UT6121	⊜	⊜	⊜	⊜	⊜	
3	5.3	HIGH TEMPERATURE OF TR. WINDING - TRIP	7UT6121	⊜	⊜	⊜	⊜	⊜	
4	51	DEFINITE-TIME OVERCURRENT - TRIP	7UT6121	⊜	⊜	⊜	⊜	⊜	
5	50	INSTANTANEOUS OVERCURRENT - TRIP	7UT6121	⊜	⊜	⊜	⊜	⊜	
6	51TN	TRANSFORMER NEUTRAL OVERCURRENT PROTECTION - TRIP	7UT6121	⊜	⊜	⊜	⊜	⊜	
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									

Site
Nishat Pakistan
GENERATOR 60 MVA

Order No. S.42252.01
Date 02/2015
Elabor By Ing. Zeman

Zpracováno s podporou systému ELCAD - Symboly a metodika SIEMENS Engineering a.s.

A3

SIEMENS

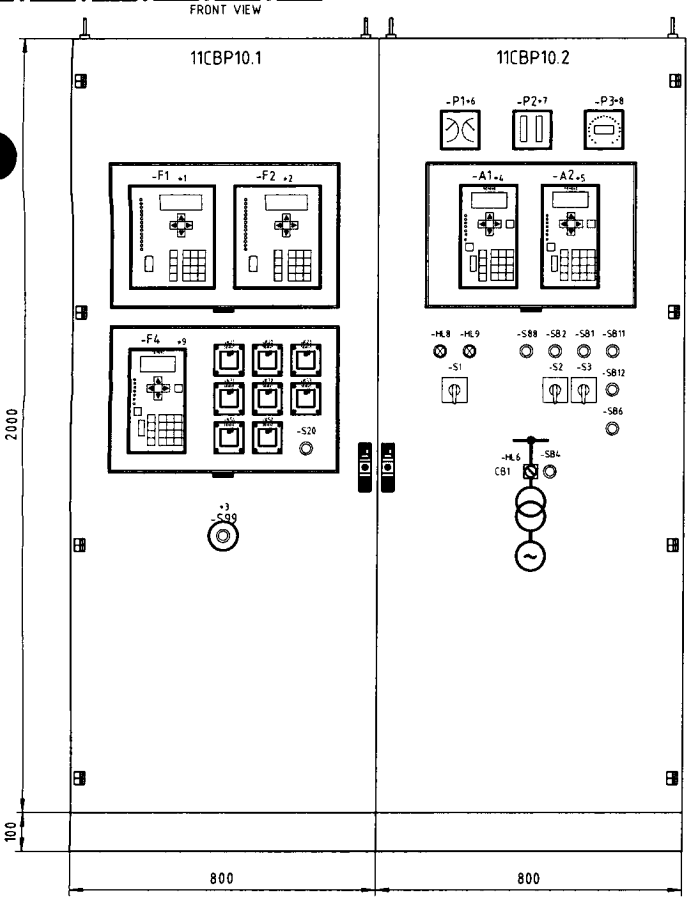
Object designation Nishat.PRO

Title
GENERATOR CONTROL PANEL 11CBP10.1
PROTECTION TRIPPING MATRIX

SIEMENS, s.r.o.
SIT

Revision	DCC	Sh
A	D1	6A

PROTECTION PANEL 11CBP10.1
SYN. & MEASURING PANEL 11CBP10.2



LABELS
*1 - GENERATOR PROTECTION -F1
*2 - GENERATOR PROTEETION -F2
*3 - TOTAL STOP
*4 - SYNCHRONIZER
*5 - SYNCHROCHECK
*6 - VOLTAGE NETWORK - GENERATOR
*7 - FREQUENCY NETWORK - GENERATOR
*8 - SYNEHROSEOPE
*9 - TRANSFORMER PROTECTION -F4

LEGEND

-F1 - GENERATOR PROTECTION 7UM6211-5EB91-0CB0+L0R
(Generator - Standard version)

-F2 - GENERATOR PROTECTION 7UM6211-5EB91-0CB0+L0R
(Generator - Standard version)

-F4 - TRANSFORMER PROTECTION 7UT6121-5EB90-1AA0+L0R

-S99 - GENERATOR EMERGENEY STOP
-S20 - RESET OF LORs
-K21 - K52 - LOEKOUT RELAYS SIEMENS 7PA23

-A1 - AUTOMATIC SYNCHRONIZER SIEMENS 7VE6110-5EB01-0CA0
-A2 - SYNCHOCHECK 7VE6110-5EB01-0AA0

-P1 - Double voltmeter
-P2 - Double frequency meter
-P3 - Synchroscope

-SB1 (-HL1) - SYNCHRONIZATION "START"
-SB2 (-HL2) - SYNEHRONIZATION "STOP"
-SB4 (-HL4) - PRESELECTION OF CIRCUIT BREAKER -EB1
-SB6 - LAMP TEST
-S1 - REMOTE / LOCAL
-HL6 - STATUS LAMP OF GCB -S2G
-S3 - EAM SWITCH "VOLTAGE MORE/LESS"
-S2 - EAM SWITCH "ROTATION SPEED MORE/LESS"
-SB11 - MANUAL SYN
-SB12 - CMD CB ON
-SB8 - DEAD BUS

-HL8 - SIG. REMOTE
-HL9 - SIG LOCAL

DIMENSION:	(2x800)x2100x600 mm
WEIGHT:	cca 500 kg
IP DEGREE:	IP 43/20
PAINTING:	RAL 7035
TYPE:	RITTAL TS8
CABLE INPUT:	BOTTOM - UNDRILLED PLATE
HEAT LOSS:	475 W
VOLTAGE SYSTEM:	2PE=110V DC/IT, Ik"<10kA 1NPE-240V AC/TN-S, Ik"<10kA

NOTE:

THE GENERATOR PROTECTION PANEL IS INDIVISIBLY CONNECTED TO THE SYNCHRONISATION AND MEASURING PANEL AND DELIVERED TOGETHER AS ONE UNIT.

Site
Nishat Pakistan
GENERATOR 60 MVA

Order No: S.42252.01
Date: 02/2015
Elabor By: Ing. Zeman

Zpracováno s podporou systému ELCAD - Symboly a metodika SIEMENS Engineering a.s.

A3

SIEMENS

Object designation: Nishat.PRO
Title: GENERATOR CONTROL PANEL 11CBP10
Dimension drawing

SIEMENS, s.r.o.
SIT

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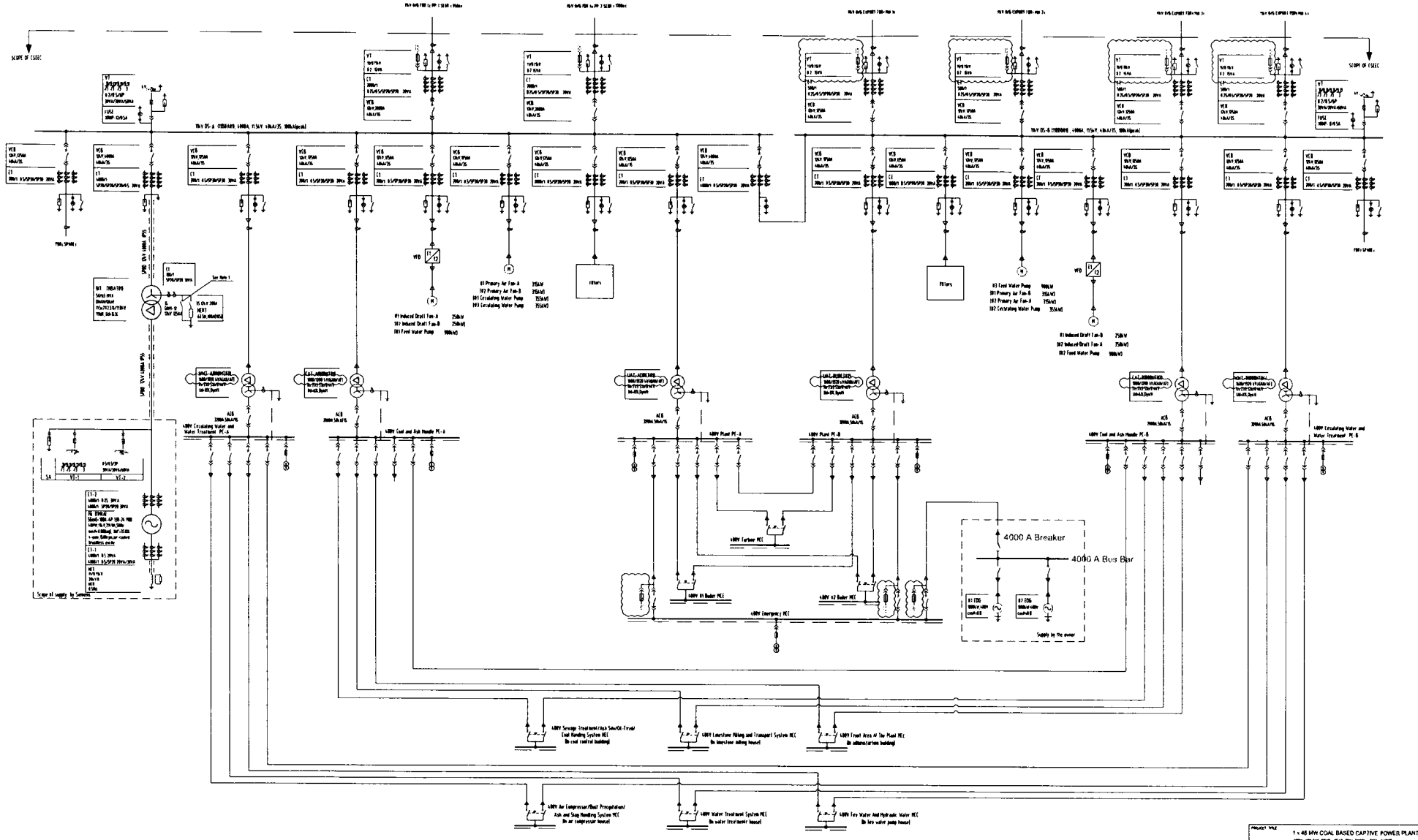


PROJECT TITLE	1 x 48 MW COAL BASED CAPTIVE POWER PLANT
OWNER	NC ELECTRIC COMPANY LIMITED
OWNER'S CONSULTANT	DESEIN PRIVATE LIMITED CIVIL & STRUCTURAL CONSULTING ENGINEERS
EPC CONTRACTOR	CHINA SINOGY ELECTRIC ENGINEERING CO., LTD.
SUB-VENDOR OF EPC CONTRACTOR	
TITLE	ELECTRICAL SINGLE LINE DIAGRAM
DRG. NO.	23-F02941C-D-02
REV.	R0
SIZE	E

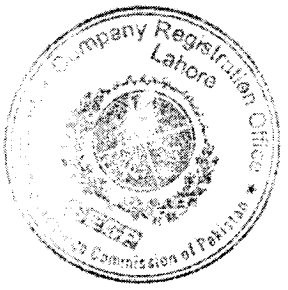
The Companies Ordinance, 1984

(Company Limited by Shares)

MEMORANDUM OF ASSOCIATION

OF

NC Electric Company Limited



I. NAME:

The name of the Company is "**NC Electric Company Limited**"

II. REGISTERED OFFICE:

The Registered Office of the Company will be situated in the Province of Punjab.

III. OBJECTS:

The objects for which the Company is established are:

1. To develop, design, construct, build, own, operate, maintain, and acquire coal powered power generation complexes and thermal, hydel, solar and wind energy projects in any part of Pakistan and to carry on the business of electricity generation, transmission and distribution in any part of Pakistan.

2. To carry on the business of electricity generation, transmission, sale and distribution of the same and to do all and everything necessary, suitable, proper, incidental or conducive to the accomplishment of this object and to do every other act or thing incidental or appurtenant to or arising out of or connected with this object.

3. To establish and maintain housing, transportation, communication and utility lines and other requisite logistic facilities for the construction, operation and maintenance of power plant(s)

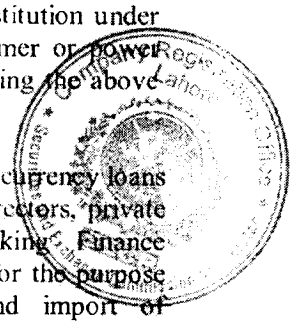
4. To obtain, subject to applicable laws, foreign equity and technical collaboration for the development, ownership, construction, operation and management of power plant(s)

5. To develop and/or transfer technology and to acquire or pass on technical know-how incidental or conducive to the attainment of its objects.

6. To enter into any arrangement or agreement to purchase power from any other power seller, whether local, foreign, private or government.

7. To provide advisory, consultancy, operations and maintenance (O & M) services, whatsoever in nature, including but not limited to operational, technical services etc. to power projects, hydel, thermal, solar, wind or otherwise.

8. To set up undertakings for electricity/power generation plants and to generate, accumulate, distribute, sell and supply electricity/power for all purposes and to sell electricity to WAPDA/NTDC (or any other Government institution under agreement with Government of Pakistan or to any other consumer or power purchaser as permitted under the law. For the purpose of achieving the above objects, the Company is authorized:-



i) To borrow or raise money by means of local and/or foreign currency loans or other financing arrangements from banks, investors, directors, private equity and financial institutions including Non-Banking Finance Companies ("**NBFC**") and other specialized institutions, for the purpose of purchase, manufacture, market, supply, export and import of machinery, development of real estates, construction activities and improvements, repair and renovations of buildings, warehouses, factories, sheds, offices, hospitals, ports, parks, clubs, entertainment and recreation areas, industrial zones, bridges, flyovers and subways, roads, highways and motorways, high rise residential and commercial complexes, residential towns, building and for the purpose of working capital or for any other purpose.

ii) To arrange money by issue of debentures, debenture stock, perpetual or otherwise convertible into shares and to mortgage, assign or charge the whole or any part of the property, rights, revenue or assets of the Company, present or future, by special assignment or to transfer or convey the same absolutely or in trust as may seem expedient and to purchase, redeem or payoff any such securities.

iii) To purchase/import raw materials, machinery, equipment and allied items required in connection thereto in any manner the company may think fit;

iv) To purchase, take on lease or in exchange, hire, apply for or otherwise acquire and hold for any interest, any rights, privileges, lands, building, easements, trademarks, patents, patent rights, copyrights, licenses, machinery, plants, stock-in-trade and any movable and immovable property of any kind necessary or convenient for the purposes of, or in connection with, the Company's business or any branch or department thereof and to use, exercise, develop, grant licences in respect of or otherwise turn to account any property, rights and information so acquired, subject to any permission required under the law.

v) To open accounts with any Bank(s) or any other financial institution(s)

and to draw, make, accept, endorse, execute, issue, negotiate and discount cheques, promissory notes, bills of exchange, bills of lading, warrants, deposit notes, debentures, letter of credit and other negotiable instruments and securities, and to withdraw money therefrom.

vi) To own, establish or have and maintain, offices, branches and agencies all over Pakistan for the purpose of the company but not to act as managing agency.

vii) To acquire by concession, grant, purchase, barter, licence either absolutely or conditionally and either solely or jointly with others any lands, buildings, machinery, plants, equipment, privileges, rights, licences, trademarks, patents, and other movable and immovable property of any description which the Company may deem necessary or which may seem to the Company capable of being turned to account, subject to any permission as required under the law.

viii) To invest surplus money of the Company in shares, stocks or securities of any company, debentures, debenture stocks or in any investments, short term and long term participation, term finance certificates or any other securities (including government securities) in such manner as may from time to time be decided as per law, without indulging NBFCs, banking business or an investment company or any other any lawful business.

ix) To guarantee the performance of contracts, agreements, obligations or discharge of any debt of the company or on behalf of any other company or person subject to the provisions of Section 195 of the Companies Ordinance, 1984 ("Ordinance") in relation to the payment of any financial facility including but not limited to loans, advances, letters of credit or other obligations through creation of any or all types of mortgages, charges, pledges, hypothecations, on execution of the usual banking documents or instruments or otherwise encumbrance on any or all of the movable and immovable properties of the company, either present or future or both and issuance of any other securities or sureties by any mean in favour of banks, NBFCs or any financial institutions and to borrow money for purpose of the company on such terms and conditions as may be considered proper.

x) To purchase, hold and get redeemed, debentures, bonds of any company, financial institution or any Government institutions;

xi) To enter into arrangements with the government or authority (supreme, municipal, local or otherwise) or any corporation, company, or persons that may seem conducive to the Company's objects or any of them and to obtain from any such government, authority, corporation, company or person any charters, contracts, rights, privileges and commission which

the Company may think desirable and to carry on and comply with any such charters, contracts, decrees, rights, privileges and concessions.

xii) To act as representatives for any person, firm or company and to undertake and perform sub-contracts, and also act in the business of the Company through or by means of agents, sub-contractors and to do all or any of the things mentioned herein in any part of the world and either alone or in collaboration with others and by or through agents, sub-contractors or otherwise.

xiii) To sell, transfer, mortgage, pledge, exchange or otherwise dispose of the whole or any part of the property or the undertaking of the Company, either together or in portions for such consideration as the Company may think fit and in particular, for shares, debenture-stock or securities of any Company purchasing the same or to any other legal entity or person, by other means, permissible under the law.

xiv) To conduct, encourage, promote, support, arrange and organize seminars, symposiums, exhibitions, fairs, conferences, lectures, demonstrations and other similar activities for promotion of sales or other business interests of any person, companies, firms, individuals, associations, local or government bodies, foreign governments, and international agencies, in Pakistan and in any part of the world for, and on behalf of, customers and for that purpose, to carry out market surveys, researches, training programs and other activities.

xv) To carry out joint venture agreements with technology suppliers, other companies or countries within the scope of the objects of the company.

xvi) To make known and give publicity to the business and products of the company by means the company may think fit.

xvii) To pay all costs, charges and expenses, if any, incidental to the promotion, formation, registration and establishment of the company;

xviii) To go in for, buy or otherwise acquire and use any patent design, copyright, license, concession, innovation, invention, trademarks, rights, privileges, real estates, plants, tools or machinery and the like in Pakistan or elsewhere, which may for the time being appear to be useful or valuable for adding to the efficiency or productivity of the Company's work or business, as permissible under the law.

xix) To establish, promote or assist in establishing or promoting and subscribe to or become a member of any other company, association or club whose objects are conducive to the objects of this Company or the establishment or promotion of which may be beneficial to the Company, as permissible

under the law.

xx) To give commission on the sale of the products and for that purpose to enter into any agreement or scheme of arrangement as the Company may deem fit and to get any employee of the Company insured against risk of accident in the course of their employment.

xxi) To establish and support or aid in the establishment and support of associations, institutions, funds and calculated to benefit the directors, employees and ex-employees of the Company, and any dependent thereof, and to grant pensions, gratuities, allowances, relief and payments in any manner calculated to benefit the persons described herein.

xxii) To apply for and obtain necessary consents, permissions and licenses from any government, state, local and other authorities for enabling the Company to carry on, initiate and further any of the Company's objects as and when required by law.

xxiii) To cause the Company to be registered or recognized in any foreign country and carry on its business activities in any part of the world.

xxiv) To amalgamate or merge with any other company having objects conducive to those of this Company.

xxv) To distribute any of the properties of the Company amongst the members in specie or in kind at the time of winding up of the company.

xxvi) To, subject to the approval of the competent authority, make, amend and modify Articles of Association and rules and regulations not inconsistent with this Memorandum of Association to provide for all matters for which provision is necessary or expedient for the purpose of giving effect to the provisions of this Memorandum of Association and the efficient conduct of its objects.

xxvii) To appoint agents, sub-agents, attorneys, consultants, and contractors or to act as agent, sub-agent, attorney, consultant, and contractor in connection with the objects of the Company but not to act as managing agents.

xxviii)To sell, improve, manage, develop, exchange, lease, mortgage, enfranchise, dispose of or otherwise deal with, all or any part of the property, assets or undertaking of the Company for such consideration as the Company may think fit and to distribute among the members in specie any property of the Company, or any proceeds of sale or disposal of any property of the Company, but so that no distribution amounting to a

reduction in capital may be made without the sanction of the Court, if required.

(xxix) To settle disputes by negotiation, reconciliation, arbitration, litigation or other means and to enter into compromise with creditors, members and any other persons in respect of any difference or dispute with them.

(xxx) To establish laboratories, research and development centers to perform such research and development as the Company may deem advisable or feasible, and to expend money on experimenting upon and testing and improving or securing any process, or processes, patent or protecting any invention or inventions which the Company may acquire or propose to acquire or deal with in furtherance of its objects.

(xxxi) To undertake and execute any trust or trusts which the Company may deem to be desirable, expedient or necessary and to act as trustees of any deeds constituting or securing any debentures, debenture stock, or other securities or obligations and to undertake and execute any other trust and also to undertake the office of executor, administrator, treasurer or registrar and to keep for any company, Government, authority or body, any register relating to any stocks, funds, shares or securities, to undertake any duties in relation to the registration of transfers, the issue of certificates or otherwise.

(xxxii) To subscribe or contribute or otherwise to assist or to guarantee money to charitable, benevolent, religious, literary, scientific, technical, national, public or any other institutions or for any exhibition or purpose.

(xxxiii) To do all such other things as may be deemed incidental or conducive to the attainment and/or furtherance of any or all of the objects.

9. It is hereby declared that:

a. It is, hereby, undertaken that the Company shall not engage in banking business or Forex, illegal brokerage, or any business of investment company or NBFC or insurance or leasing or business of managing agency or in any unlawful business and that nothing contained in the object clauses shall be so construed to entitle it to engage in such business directly or indirectly and the Company shall not launch multi-level marketing (MLM), Pyramid and Ponzi schemes.

b. Notwithstanding anything stated in any object clause, the company shall obtain such other approval or license from competent authority(s), as may be required under any law or the time being in force, to undertake a particular business.

IV. LIABILITY

The liability of the members is limited

V. CAPITAL

The authorized share capital of the Company is Rs. 1,000,000 (Rupees one Million Only) divided into 100,000 ordinary shares of Rs. 10/- (Rupees Ten) each with the power to increase or reduce the capital, to divide the shares for time being into several classes and subject to Section 90 of the Ordinance, to attach thereto such rights, privileges and conditions in such manner as many, for the time being provided by the Articles of Association of the Company. The Company further reserves to itself the right to increase authorized capital in accordance with the regulations for the time being in force, and in accordance with law.

We, the several persons whose names and addresses are subscribed, are desirous of being formed into a Company in pursuance of this Memorandum of Association, and we respectively agree to take the number of shares in the Capital of the Company as set opposite to our respective names.

Name and Surname in Full	Father's Surname in Full	Nationality with any former Nationality	Occupation	CNIC Number	Residential address in full	No. of Shares	Signature
Yahya Saleem	s/o Late Muhammad Saleem	Pakistani	Business	35201-1506068-7	House No 319, Canal Bank Road, Lahore.	1	
Mr. Zain Shahzad	s/o Shahzad Saleem	Pakistani	Business	35201-9085897-7	319, West Canal Bank Road, House No 1, Near Alfa Society, Lahore	1	
Shahzad Saleem	s/o Late Muhammad Saleem	Pakistani	Business	35201-5539629-9	319, West Canal Bank Road, House No 1, Near Alfa Society, Lahore	1	
Nishat Chunian Limited Through its nominee Saqib Riaz	Subscriber s/o Riaz Ahmed Saleem	Pakistani Pakistani	Business Service	0021135 36402-9122201-5	31-Q, Gulberg II, Lahore House No 471-A-1, Gulberg III, Lahore.	997	

Total Shares Taken: 1000 (One Thousand)

Dated this 14th day of April, 2014

Witness to the above Signatures:

Signature: _____

Full Name: National Institutional Facilitation Technologies (Pvt) Ltd

Occupation: NIFT

Full Address: 5th Floor, AWT Plaza, I.I. Chundrigar Road, Karachi.

Karachi

CERTIFIED TO BE TRUE COPY
Lahore
24/4/14
DEPUTY REGISTRAR OF COMPANIES
COMPANY REGISTRATION OFFICE
LAHORE

THE COMPANIES ORDINANCE, 1984

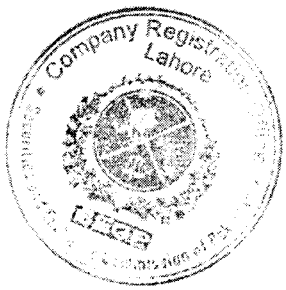
(Company Limited by Shares)

ARTICLES OF ASSOCIATION

of

NC ELECTRIC COMPANY LIMITED

PRELIMINARY



1. **TABLE "A" NOT TO APPLY**

The regulations in Table 'A' in the First Schedule to the Companies Ordinance, 1984 shall not apply to the Company except so far as the same are reproduced herein

2. **DEFINITIONS**

Unless the context or the subject matter otherwise requires, the terms used in these articles shall have the meanings set out below:

(a) **"Articles"** mean these Articles of Association as originally framed or as from time to time altered by special resolution.

(b) **"Board"** means the group of directors in a meeting duly called and constituted or, as the case may be, the directors assembled at a Board.

(c) **"Book and paper"**, "book or paper" or "books of account" mean accounts, deeds, vouchers, writings and documents, maintained on paper or computer network, floppy, diskette, magnetic cartridge tape, CD-Rom or any other computer readable media;

(d) **"Chairman"** means the Chairman of the Board of Directors of the Company;

(e) **"Chief Executive"** means an individual who subject to the control and directions of the Directors, is entrusted with the whole, or substantially the whole, of the powers of the management of the affairs of the Company and includes a Director or any other person occupying the position of a Chief Executive, by whatever name called, and whether under a contract of service or otherwise."

(f) **"Company"** means **NC Electric Company Limited**

(g) **"Commission"** means the Securities and Exchange Commission of Pakistan established under Section 3 of the Securities and Exchange Commission of Pakistan Act, 1997.

(h) **"Directors"** mean the directors of the Company including alternate directors appointed and elected from time pursuant to Companies Ordinance, 1984.

(i) "Dividend" includes cash dividend, dividend in species and bonus shares.

(j) **"In Person"** includes attendance and/or voting at a meeting, personally or by video or telephone-conference or other facility whereby all the participants of the meeting can hear and / or see each other unless expressly stated otherwise by the directors.

(k) **"Member"** means a person whose name is for the time being entered in the register of members by virtue of his holding by allotment or otherwise any share, scrip or other security which gives him a voting right in the company including an accountholder of central depository.

(l) **"Memorandum"** means the Memorandum of Association of the Company as originally framed or as from time to time altered in accordance with the Companies Ordinance, 1984.

(m) **"Month"** means calendar month according to the English calendar.

(n) **"Office"** means the registered office for the time being of the company.

(o) **"Ordinance"** means the Companies Ordinance, 1984 or any modification or re-enactment thereof for the time being in force.

(p) **"Ordinary Resolution"** means a resolution passed at a general meeting when the votes cast (whether on a show of hands or on poll, as the case may be) in favour of the resolution by members present in person or by proxy exceeds the votes if any cast against the resolution.

(q) **"Proxy"** includes an attorney duly constituted under a power of attorney.

(r) **"Record"** includes, in addition to a written or printed form, any disc, tape, sound-track, film or other device in which sounds and / or other data is embodied so as to be capable (with or without the aid of some other instrument or machine) of being reproduced there from in audible, legible or visual form.

(s) **"Register"** means, unless the context otherwise requires, the register of members to be kept pursuant to Section 147 of the Ordinance.

(t) **"Registrar"** means a Registrar, defined in Section 2 (1) (31) of the Ordinance performing the duty of registration of companies under the Ordinance.

(u) **"Regulations"** mean the rules of governance of the Company made by the board from time to time.

(v) **"Seal"** means the common or official seal of the Company.

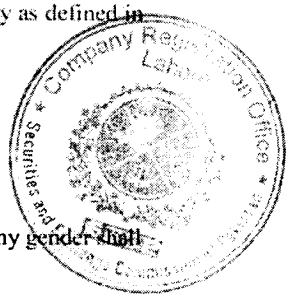
(w) **"Section"** means Section of the Ordinance.

(x) **"Share"** means share in the share capital of the company.

(y) **"Sign" and "Signature"** unless otherwise provided in these articles, include respectively lithography, printing facsimile, "advanced electronic signature" which

is capable of establishing the authenticity and integrity of an electronic document, as defined by Section 2(e) of the Electronic Transactions Ordinance, and names impressed with a rubber or other kind of stamp.

(z) **"Special Resolution"** means the special resolution of the Company as defined in Section 2 (1) (36) of the Ordinance.



INTERPRETATION

3. In these articles, unless the context otherwise requires:

(a) the singular includes the plural and vice versa and words denoting any gender shall include all genders;

(b) references to any Act, Ordinance, Legislation, Rules or regulations or any provision of the same shall be a reference to that Act, Ordinance, Legislation, rules or regulations or provisions, as amended, re-promulgated or superseded from time to time;

(c) the terms "include" or "Including" shall mean include or including without limitation;

(d) expression referring to writing shall, unless the contrary intention appears, be construed as including references to printing, lithography, photography, and other modes of representing or reproducing words in a visible form, including but not limited to, electronic transmission such as facsimile, and electronic mail or any other electronic process, as prescribed by section 3 of the Electronic Transactions Ordinance.;

(e) words importing persons shall include bodies corporate; and

(f) words importing singular number include the plural number or vice versa;

(g) words and expressions contained in these articles shall bear the same meaning as in the Ordinance.

(h) The head notes are inserted for convenience and shall not affect the construction of these Articles.

PUBIC LIMITED COMPANY

4. The Company is a public limited company within the meanings of Section 2 (1) (30) of the Companies Ordinance, 1984. The minimum subscription upon which the Directors may proceed to allotment as defined in Section 68 of the Ordinance is fixed at Rs. 500,000/-

BUSINESS

5. DIRECTORS MAY UNDERTAKE ANY BUSINESS

The business of the Company shall include the several objects expressed in its Memorandum of Association or any of them. All branches or kind of business which the

Company is either expressly or by implication authorised to undertake may be undertaken by the directors at such time or times as they shall think fit, and further may be allowed by them to be in abeyance, whether such branch or kind of business may have been actually commenced or not so long as the directors may deem it expedient not to commence or proceed with such branch or kind of business.

SHARES

6. POWER TO ISSUE SHARES OF DIFFERENT CLASSES AND KINDS

Subject to Section 90 of the Ordinance and Rules framed there under and without prejudice to any special rights previously conferred on the holders of any existing shares or class of shares, any share in the Company may be issued with different rights, restrictions and privileges, including but not limited to the following as may be approved by the Company by special resolution:

(1) different voting rights; voting rights disproportionate to the paid-up value of share held; voting rights for specific purposes only; or no voting rights at all;

(2) different rights for entitlement of dividend, right shares or bonus shares or entitlement to receive the notices and to attend the general meetings;

(3) rights and privileges for indefinite period, for a limited specified period or for such periods as may from time to time be determined by the Company; and

(4) different manner and mode of redemption, including redemption in accordance with the provisions of these articles, including but not limited to, by way of conversion into shares with such rights and privileges as determined by the Company in the manner and mode provided in these articles.

7. POWER TO ISSUE REDEEMABLE CAPITAL

Subject to the provisions of the Ordinance and any rules in that regard made under the Ordinance, the Company may issue shares which are to be redeemed or any other redeemable security, on such terms and in such manner as may be provided in the Ordinance and rules.

8. POWER TO ISSUE SHARES AT PAR, PREMIUM OR DISCOUNT

Subject to provisions of the Ordinance and these Articles, the shares in the share capital of the Company may be issued and allotted as the directors shall determine and at such times and in such manner as the directors think fit, either at par or at a premium or subject to Section 84 of the Ordinance at a discount.

9. ISSUE OF SHARES FOR CONSIDERTAION OTHERWISE THAN IN CASH

The directors may allot and issue shares in the capital of the Company as payment or part payment for any asset or property sold or transferred, or for services rendered, to the Company in the ordinary course of its business, and shares so allotted shall be issued subject to the fulfilment of requirement of Section 73 of the Ordinance and applicable rules.

10. ALLOTMENT OF SHARES

The board shall, as regards any allotment of shares, duly comply with such provisions of the Ordinance and rules as may be applicable

11. PURCHASE OF COMPANY'S SHARES

Except as permitted by the Ordinance or any other rules in that regard made under the Ordinance, no part of the funds of the Company shall be employed in the purchase of its own shares or in giving, whether directly or indirectly and whether by means of a loan, guarantee, security or otherwise, any financial assistance for the purpose of or in connection with a purchase made or to be made by any person of any shares in the Company.

12. TRUST NOT TO BE RECOGNIZED

Save as herein otherwise provided or as permitted by law, the Company shall be entitled to treat the registered holder of any share as the absolute owner thereof and accordingly shall not, except as ordered by a court of competent jurisdiction or as required by statute, be bound by or be compelled in any way to recognize (even when having notice thereof) any *benami*, equitable, contingent, future, partial or other claim or right to or interest in such share on the part of any other person.

13. WHO MAY BE REGISSTERED AS MEMBER

Shares may be registered in the name of individuals, any limited company or other corporate body but not in the name of minors. Not more than four (4) persons shall be registered as joint-holders of any share.

14. JOINT MEMBERS

If any share or shares stand in the name of two or more persons, the person first named in the register shall, as regards receipt of dividend or bonus or service of notices and all or any other matters connected with the Company except voting at the meeting and the transfer of shares, be deemed the sole holder of such shares.

15. COMMISSION FOR PLACING SHARES, ETC.

The Company may at any time pay a commission to any person for subscribing or agreeing to subscribe (whether absolutely or conditionally) for any shares or debentures or redeemable capital of the Company or producing or agreeing to procure subscriptions (whether absolute or conditional) for any shares or debentures or redeemable capital of the Company. In case any commission shall be paid the Company shall comply with the provisions of Section 82 of the Ordinance. The Company may also pay expenses on any issue of shares or debentures or redeemable capital.

CERTIFICATES

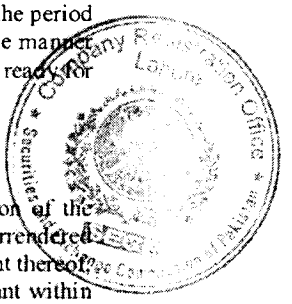
16. SHARE CERTIFICATES TO BE ISSUED UNDER SIGNATURES AND SEAL

The Certificates of title to shares and duplicate thereof shall be issued under the seal of the Company and signed by two of the directors or by one such director and the secretary provided

that such signatures may if necessary be printed lithographed or stamped subject to the approval of the directors.

17. TIME FOR ISSUE OF SHARES CERTIFICATES

The Company shall within ninety days after the allotment of any shares, debentures or debenture stock and within forty-five days after receipt by the Company of the application for transfer of any such shares, debentures or debenture stock complete and have ready for delivery the certificate of all shares, the debentures and the certificate of all debenture stock allotted or transferred, and unless sent by post or delivered to the person entitled thereto within the period aforesaid the Company shall immediately thereafter give notice to that person in the manner prescribed in these articles for the giving of notices to members that the certificate is ready for delivery.



18. ISSUE OF DUPLICATE SHARE CERTIFICATES

If a certificate of shares, debenture or debenture stock is proved to the satisfaction of the Company to have been lost or destroyed or, being defaced or mutilated or torn, is surrendered to the Company, and the Company is requested to issue a new certificate in replacement thereof, the Company shall, after making such enquiry as it may deem fit, advise the applicant within thirty days from the date of application the terms and conditions (as to indemnity and otherwise and as to payment of the actual expenses incurred on such enquiry as may be determined by the Board of Directors) on which the Company is prepared to issue a new certificate and a time for compliance therewith or of the reasons why the Company is unable to issue a new certificate, as the case may be, and in the former case if the applicant shall within the time allowed comply with the terms and conditions specified, the Company shall issue a new certificate to the applicant within forty five days from the date of application.

19. ISSUE OF CERTIFICATES TO JOINT HOLDERS

The Company shall not be bound to issue more than one certificate in respect of a share or shares held jointly by two or more persons and delivery of a certificate for a share to any one of joint holders shall be sufficient delivery to all.

TRANSFER AND TRANSMISSION

20. DIRECTORS MAY DECLINE TO REGISTER TRANFER OF SHARES

The directors shall not refuse to register the transfer of fully paid shares unless the Instrument of Transfer is defective or invalid or is not duly stamped or accompanied by the certificate of the share(s) to which it relates or otherwise there are specific restrictions on the transferability of the shares imposed by the Commission or any Court. The directors may also decline to register the instrument of transfer if it is not accompanied by a certified copy of the computerized national identity card of the transferee. If the directors refuse to register a transfer of any shares they shall, within thirty (30) days from the date on which the Instrument of Transfer was lodged with the company, send to the transferee and the transferor the notice of refusal indicating the defect or invalidity; provided that the transferee shall be entitled, after removal of such defect or invalidity, to re-lodge the Instrument of Transfer with the Company.

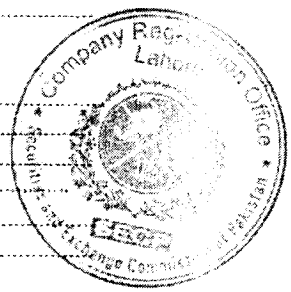
21. FORM OF TRANSFER

The Instrument of Transfer of any share shall be in writing in the usual common form, or in the following form, or as near thereto as circumstances will admit:

"I/We ..... of ..... son/daughter/wife of being a national(s) of in consideration of the sum of Rupees ..... only (Rs. .....) paid to me/us by ---------- of ..... son/daughter/wife of being a national(s) of (hereinafter called the 'said transferee(s)') do hereby transfer to the said transferee(s) share(s) numbered standing in my/our name(s) in the books of **NC ELECTRIC COMAPNYLIMITED** , to hold unto the said transferee(s) his/her/their executors, administrators and as signs, subject to the several conditions on which I/we hold the same at the time of execution hereof, and I/we the said transferee(s) do hereby agree to take the said share(s) subject to the conditions aforesaid.

As witness our hands the ..... day of .....thousand and ....."

Signed by the said transferor in the presence of	Transferor's signature ..... Transferor's occupation .....
Witness ..... Occupation ..... Address ..... CNIC #.....	Witness ..... Occupation ..... Address ..... CNIC # .....
Signed by the said transferee in the presence of	Transferee's signature ..... Transferee's occupation .....
Witness ..... Occupation ..... Address ..... CNIC #	Witness ..... Occupation ..... Address ..... CNIC # .....



22. RESTRICTION ON TRANSFERS TO MINORS OR PERSONS OF UNSOUND MIND

No transfer shall be made to a minor or person of unsound mind. Further, no transfer shall be made to an individual if the instrument of transfer is not accompanied by a certified copy of the computerized national identity card of the transferee.

23. INSTRUMENT OF TRANSFERS TO BE PRESERVED

All registered instruments of transfers shall be retained by the Company for a period of not less than 10 years, but any Instrument of Transfer which the directors may decline to register shall be returned to the person depositing the same.

24. TRANSFEROR TO REMAIN HOLDER OF SHARE(S)

The Instrument of Transfer of any share in the Company shall be duly stamped and executed both by the transferor and transferee, and the transferor shall be deemed to remain holder of the share(s) until the name of the transferee is entered in the register in respect thereof.

25. CLOSURE OF REGISTER(S)

On giving seven days previous notice by advertisement in some newspaper circulating in the areas specified in Section 151 of the Ordinance or as per requirement of the stock exchange(s)

where the shares of the Company are listed, the transfer books and register(s) may be closed during such time as the directors think fit, not exceeding in the whole forty-five (45) days in each year, but not exceeding thirty days (30) at a time.

26. NOMINATION

Any Member may make and deposit with the Company a nomination in writing specifying one or more eligible person who or each of whom, in the event of death of the Member, may be entered in the Register as the holder of such number of shares specified in the nomination for such nominee or each such nominee of which the Member remains the registered holder at the date of his death. A person shall be eligible for nomination for the purposes of this Article only if he is a spouse, parent, brother, sister, or child of the Member nominating him and applicable relationship shall be specified in the nomination in respect of each nominee. A Member may at any time by notice in writing cancel, or by making and depositing with the Company another nomination before his death vary, any nomination already made by him pursuant to this Article. In the event of the death of a Member any person nominated by him in accordance with this Article may, on written application accompanied by the relative share certificates and evidence establishing the death of the Member, request the Company to register himself in place of the deceased Member as the holder of the number of shares for which the nomination in his favour had been made and deposited with the Company and if it shall appear to the Directors that it is proper so to do, the Directors may register the nominee as the holder of those shares in place of the deceased Member.

27. PERSONS ENTITLED ON DEATH OF MEMBER

In the case of the death of a Member who was a joint holder of shares, the survivor or survivors shall be the only person recognised by the Company as having any title to his interest in the shares. If the deceased Member was a sole holder of shares, the nomine or nominees of the deceased where a nomination is effective and legal personal representatives of the deceased where no such nomination has been made and deposited with the Company, shall be the only persons recognised by the Company as having any title to his interest in the shares.

28. PERSON ENTITLED ON DEATH OR INSOLVENCY MAY ELECT TO BE REGISTERED OR TO TRANSFER

Any person becoming entitled to a share in consequence of the death or insolvency of a Member may upon such evidence being produce as may from time to time properly be required by the Directors and subject as hereinafter provided, elect either to be registered himself as the holder of the share or instead of being registered himself to make such transfer of the shares as the deceased or insolvent person could have made, but the Directors shall, in either case, have the same right to decline or suspend registration as they would have had in the case of a transfer of the shares by that Member before his death or insolvency as the case may be.

29. EFFECT OF ELECTION

If the person so becoming entitled shall elect to be registered himself, he shall deliver or send to the company a notice in writing signed by him stating that he so elects. If he shall elect to have another person registered he shall testify his election by executing to that a person a transfer of the share. All the limitations, restrictions and provisions of these Articles relating to the right to transfer and the registration of transfers of shares shall be applicable to any such notice or transfer as aforesaid as if the death or insolvency of the Member had not occurred and the notice or transfer were a notice or transfer signed by that Member.

30. RIGHT OF PERSON ENTITLED BY TRANSMISSION

A person becoming entitled to a share by reason of the death or insolvency of the holder shall be entitled to the same dividends and other advantages to which he would be entitled if he were the registered holder of the share except that he shall not before being registered as a Member in respect of the share be entitled in respect of it to exercise any right conferred by membership in relation to meetings of the Company

CAPITAL

31. INCREASE, CONSOLIDATION, SUB-DIVISION AND CANCELLATION

The Company may by ordinary resolution and subject to compliance with the requirements of Section 92 of the Ordinance

(a) increase the authorized share capital by such sum, to be divided into shares of such amount, as the resolution shall prescribe

(b) consolidate and divide its share capital into shares of larger amount than its existing shares;

(c) by sub-division of its existing shares or any of them, divide the whole or any part of its share capital into shares of smaller amount than is fixed by the Memorandum of Association;

(d) cancel any shares which, at the date of the passing of the resolution, have not been taken or agreed to be taken by any person.

32. FURTHER ISSUE OF CAPITAL

The directors may from time to time increase the issued share capital by such sum as they think fit. Except as otherwise permitted by Section 86 of the Ordinance, and subject to any special rights or privileges for the time being attached to any issued shares, all shares intended to be issued by the directors shall, before issue, be offered to the members strictly in proportion to the amount of the issued shares held by each member (Irrespective of class); provided that fractional shares shall not be offered and all fractions less than a share shall be consolidated and disposed of by the Company and the proceeds from such disposition shall be paid to such of the entitled members as may have accepted such offer. Such offer shall be made by notice specifying the number of shares offered, and limiting a time within which the offer, if not accepted, will be deemed to be declined, and after the expiration of that time, or on the receipt of an intimation from the person to whom the offer is made that he declines to accept the shares offered, the directors may dispose of the same in such manner as they think fit. In respect of each such offer of shares the directors shall comply with the provisions of Section 86 of the Ordinance.

33. NEW SHARES TO RANK WITH EXISTING CAPITAL

Except so far as otherwise provided by the conditions of issue or by these articles, any capital raised by the creation of new shares shall be considered part of the original capital and shall be subject to the provisions herein contained with reference to transfer and transmission and otherwise.

34. REDUCTION OF CAPITAL

The Company may, by special resolution, reduce its share capital in any manner, with and subject to, any incident authorized and consent required by law.

35. SHARE PREMIUM ACCOUNT

The share premium account maintained pursuant to section 83(1) of the Ordinance may, be applied by the company:

(a) in writing off the preliminary expenses of the company;

(b) in writing off the expenses of, or the commission paid or discount allowed on, any issue of shares or debentures of the company;

(c) in providing for the premium payable on the redemption to any redeemable preference shares or debentures of the company: or

(d) in paying up un-issued shares of the company to be issued as fully paid bonus shares.

VARIATION OF SHAREHOLDERS RIGHTS

36. MODIFICATION OF RIGHTS OF DIFFERENT CLASES OF SHARES

Whenever the capital is divided into different classes of shares, all or any of the rights and privileges attached to each class may, subject to the provisions of section 108 of the Ordinance, be modified, commuted, affected, abrogated or dealt with by agreement between the Company and any person purporting to contract on behalf of that class provided such agreement is (a) ratified in writing by the holders of at least three-fourths in nominal value of the issued shares of the class or (b) confirmed by a special resolution passed at an extraordinary general meeting of the holders of shares of that class and all the provisions hereinafter contained as to general meetings, shall, mutatis mutandis, apply to every such meeting.

MEETINGS

37. ANNUAL GENERAL MEETING

Except as may be allowed under Section 158(1) of the Ordinance, the Company shall hold a general meeting once at least in every calendar year within a period of four months following the close of its financial year at such time as may be determined by the directors, provided that no greater interval than fifteen months shall be allowed to elapse between two such general meetings. The Company may, for any special reason and with permission of the Commission, extend the time within which any annual general meeting, not being the first such meeting, shall be held.

38. WHERE TO HOLD ANNAUL GENERAL MEETING

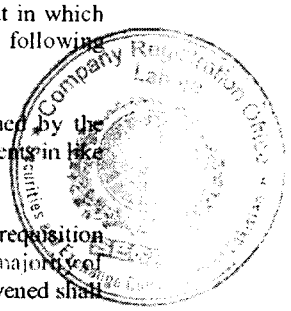
The Company shall hold its annual general meeting in the town in which the registered office is situate; provided that, it may, for any special reason and with permission of the Commission, hold the said meeting at any other place. Save as aforesaid, the Company may hold its general meeting at two (2) or more venues using any technology that gives the members as a whole a reasonable opportunity to participate in the meetings.

39. EXTRORDINARY GENERAL MEETINGS

All general meetings of the Company, other than annual general meetings, shall be called extraordinary general meetings.

40. CONVENING OF EXTRORDINARY GENERAL MEETINGS

The directors may, whenever they think fit, and they shall, on the requisition of the holders of not less than one-tenth of the issued capital of the Company, forthwith proceed to convene an extraordinary general meeting of the Company. If at any time there are not within Pakistan sufficient directors capable of acting to form a quorum, any director of the Company may call an extraordinary general meeting in the same manner as nearly as possible as that in which meetings may be called by the directors, and in the case of such requisition the following provisions shall have effect:



(i) The requisition must state the objects of the meeting and must be signed by the requisitionists and deposited at the office and may consist of several documents in like form each signed by one or more requisitionists.

(ii) If the directors do not proceed within twenty-one days from the date of the requisition being so deposited to cause a meeting to be called, the requisitionists or a majority of them in value may themselves convene the meeting, but any meeting so convened shall not be held after three months from the date of the deposit.

(iii) Any meeting convened under this article by the requisitionists shall be convened in the same manner as nearly as possible as that in which meetings are to be convened by the directors but shall be held at the office.

(iv) A requisition by joint-holders of shares must be signed by all such holders.

41. NOTICE OF MEETINGS

(1) Notice of a general meeting shall be sent in the manner hereinafter mentioned at least twenty one (21) days before the date on which the meeting is to be convened to all such persons as are under these articles or the Ordinance entitled to receive such notices from the Company and shall specify the place and the day and hour of the meeting and the nature of the business to be transacted thereat.

(2) In the case of an emergency affecting the business of the Company, an extraordinary general meeting may be convened by such shorter notice than that specified above as the Registrar may authorise.

(3) Where any special business, that is to say, business other than consideration of the accounts, balance sheet and the reports of the directors and auditors, the declaration of dividend, the appointment and fixation of the remuneration of auditors and, where the notice convening the meeting provides for the election of directors, the election of directors (all such matters being herein referred to as ordinary business) is to be transacted at a general meeting, there shall be annexed to the notice of such meeting a statement setting out all such facts as may be material for the consideration of such business including the nature and extent of the interest (whether direct or indirect) of any director, and where the item of business involves approval of any document, the time and place appointed for inspection thereof, and to the extent applicable such a statement shall be annexed to the notice also in the case of ordinary business to be transacted at the meeting.

(4) Where a resolution is intended to be proposed for consideration at a general meeting in some special or particular form, a copy thereof shall be annexed to the notice convening such meeting.

(5) If a special resolution is intended to be passed at a general meeting, the notice convening that meeting shall specify the intention to propose the resolution as a special resolution.

(6) A notice for a general meeting at which an election of directors is to take place shall state the number of directors to be elected at that meeting and the names of the retiring directors.

(7) The notice of every general meeting shall prominently specify that a proxy may be appointed who shall have the right to attend, demand or join in demanding a poll and vote on a poll and speak at the meeting in the place of the member appointing him and shall be accompanied by a form of proxy acceptable to the Company.

(8) The Company shall comply with the provisions of section 160(1) and section 50 of the Ordinance with regard to giving notices of general meetings.

42. ACCIDENTAL OMISSION TO GIVE NOTICE

The accidental omission to give any such notice to or the non-receipt of notice by, any of the members shall not invalidate the proceedings at any such meeting.

PROCEEDINGS AT GENERAL MEETINGS

43. QUORUM

No business shall be transacted at any general meeting unless a quorum of members is present at the time when the meeting proceeds to business; Not less than two (2) members present in person representing at least twenty five percent (25%) of the total voting power either of their own account or as proxies shall be a quorum.

44. CHAIRMAN OF GENERAL MEETINGS

The Chairman of the board of directors shall preside as Chairman at every general meeting of the Company, or if there is no such Chairman, or if he shall not be present in person within fifteen minutes after the time appointed for the holding of the meeting or is unwilling to act, the Chief Executive shall preside as Chairman of the meeting, or if the Chief Executive is absent or unwilling to act, any one of the directors present may be elected to be Chairman of the meeting. or if no director is present, or if all the directors present decline to take the chair, the members present in person shall choose one of their member to be Chairman of the meeting.

45. EFFECT OF QUORUM BEING NOT PRESENT

If within half-an-hour from the time appointed for the meeting, a quorum is not present, the meeting if convened upon such requisition as aforesaid shall be dissolved, but in any other case it shall stand adjourned to the same day in the next week at the same time and place, and if at such adjourned meeting a quorum is not present within half an hour from the time appointed for it, the members present being not less than Two shall be a quorum.

46. ADJOURNMENT OF MEETINGS

The Chairman may adjourn the meeting from time to time and from place to place, but no business shall be transacted at any adjourned meeting other than the business left unfinished at

the meeting from which the adjournment took place. When a meeting is adjourned for more than seven days, notice of the adjourned meeting shall be given as in the case of an original meeting. Save as aforesaid it shall not be necessary to give any notice of an adjournment or of the business to be transacted at an adjourned meeting.

47. CASTING VOTE OF CHAIRMAN

In the case of an equality of votes the Chairman shall, both on a show of hands and at the poll have a casting vote in addition to the vote or votes to which he may be entitled as a member.

48. RESOLUTION TO BE VOTED BY SHOW OF HANDS OR BY POLL

(1) At any general meeting a resolution put to the vote of the meeting shall be decided on a show of hands, unless a poll is (before or on the declaration of the result of the show of hands) demanded in accordance with paragraph (2) of this article, and unless a poll is so demanded, a declaration by the Chairman of the meeting that a resolution has, on a show of hands, been carried, or carried unanimously, or by a particular majority, or lost, and an entry to that effect in the book or electronic record of the proceeding of the Company shall be conclusive evidence of the fact, without proof of the number or proportion of the votes recorded in favour of, or against, the resolution.

(2) A Poll may be ordered to be taken by the Chairman of the meeting of his own motion, and shall be ordered to be taken by him on a demand made by the following persons:

(a) Five members having the right to vote on the resolution and present in person or by proxy; or

(b) Any member or members present in person or by proxy having not less than one-tenth of the total voting power in respect of the resolution.

49. MANNER OF TAKING POLL

If a poll is demanded, as aforesaid, it shall be taken (subject to Section 168 of the Ordinance) in such manner and at such time and place as the Chairman of the meeting directs, and either at once or after an interval or adjournment of not more than fourteen days from the day on which the poll is demanded, and the result of the poll shall be deemed to be the resolution of the meeting at which the poll was held. The demand for a poll may be withdrawn at any time by the person or persons who made the demand. In case of any dispute as to the admission or rejection of a vote, the Chairman of the meeting shall determine the same, and such determination made in good faith shall be final and conclusive. On a Poll the chairman or his nominee and representative of the members demanding the poll shall scrutinize the votes given on the Poll and the result shall be announced by the Chairman subject to provision of the Ordinance and these articles, the Chairman shall have power to regulate the manner in which a Poll shall be taken.

50. TIME FOR TAKING POLL

Any poll duly demanded on the election of a Chairman of a meeting or on a question of adjournment shall be taken forthwith at the meeting and without adjournment. A poll demanded on any other question shall be taken at such time, not being more than 14 days from the day on which the poll is demanded as the Chairman of the meeting directs.

51. MEETING TO CONTINUE

The demand of a poll shall not prevent the continuance of a meeting for the transaction of any business other than the question on which a poll has been demanded.

VOTES OF MEMBERS

52. RIGHT TO VOTE

Subject to Section 160 and any rights or restrictions for the time being attached to any class or classes of shares, every member present in person (where all the participants of a general meeting can see each other) shall have votes proportionate to the paid up value of the shares or other securities carrying voting rights held by him according to the entitlement of the class of such shares or securities, as the case may be provided that the provisions of Section 178 shall apply in the case of the election of directors.

53. VOTING BY SHOW OF HANDS, POLL AND FOR ELECTION /REMOVAL OF DIRECTORS

On a show of hands, every member present in person shall have one vote and upon a poll every member present in person or by proxy shall have one vote in respect of each share held by him. Provided always that in the case of an election or removal of a director, the provisions of Section 178 shall apply.

54. VOTING ON POLL

On a poll a member entitled to more than one vote need not, if he votes, use all his votes or cast all the votes he uses in the same way.

55. VOTING BY CORPORATIONS AND COMAPNIES

Any company or other corporation which is a member of the Company may by resolution of its directors or other governing body authorise such person as it thinks fit to act as its representative at any meeting of the Company or of any class of members of the company, and the person so authorised shall be entitled to exercise the same powers on behalf of the company or corporation which he represents as that company or corporation could exercise if it were an individual member of the Company, present in person. The production before or at the meeting of a copy of such resolution purporting to be signed by a director or the secretary of such company or corporation and certified by him as being a true copy of the resolution shall be accepted by the Company as sufficient evidence of the validity of the appointment of such representative.

56. RIGHT TO VOTE

Any person entitled under article 34 to any shares may vote at any general meeting in respect thereof in the same manner as if he were the registered holder of such shares, provided that forty-eight hours at least before the time of holding the meeting or adjourned meeting, as the case may be, at which he proposes to vote he shall satisfy the directors of his right to such shares, or the directors shall have previously admitted his right to vote at such meeting in respect thereof. If any member be a lunatic, he may vote, whether by a show of hands or at a poll, by his committee, or other legal curator and such last mentioned persons may give their votes by proxy.

57. VOTING BY JOINT HOLDERS

Where there are jointly registered holders of any share, any one of such persons may vote at any meeting either in person or by proxy in respect of such share as if he were solely entitled thereto; and if more than one of such joint-holders be present at any meeting, either in person or by proxy, that one of the said persons so present whose name stands first in the register in respect of such share shall alone be entitled to vote in respect thereof. Several executors or administrators of a deceased member in whose name any share stands shall for the purposes of this article be deemed joint holders thereof.

58. VOTE MAY BE GIVEN IN PERSON OR BY PROXY ON POLL

On a poll votes may be given either in person (including without limitation an authorized representative of a company or corporation) or by proxy.

59. OBJECTIONS ON VOTING

No objection shall be raised to the qualification of any voter except at the meeting or adjourned meeting at which the vote objected to is given or tendered, and every vote not disallowed at such meeting shall be valid for all purposes. Any such objection made in due time shall be referred to the Chairman of the meeting, whose decision shall be final and conclusive.

60. PROXY TO BE IN WRITING

The instrument appointing a proxy shall be in writing under the hand of the appointer or of his attorney duly authorised in writing or if such appointer is a corporation under its common seal or signed by an officer or an attorney duly authorised by. No person shall be appointed a proxy who is not a member of the Company.

61. INSTRUMENT APPOINTING PROXIES TO BE DEPOSITED

The instrument appointing a proxy and the power of attorney or other authority (if any) under which it is signed, or a notarially certified copy of that power or authority, shall be deposited at the office not less than forty-eight hours before the time for holding the meeting at which the person named in the instrument proposes to vote, and in default the instrument of proxy shall not be treated as valid.

62. REVOCATION OF PROXY

A vote given in accordance with the terms of an instrument appointing a proxy shall be valid notwithstanding the previous death or insanity of the principal or revocation of the instrument or transfer of the share in respect of which the vote is given, provided no intimation in writing of the death, insanity, revocation or transfer of the share shall have been received at the office before the meeting. Provided nevertheless that the Chairman of any meeting shall be entitled to require such evidence as he may in his discretion think fit of the due execution of an instrument of proxy and that the same has not been revoked.

63. FORM OF PROXY

Every instrument appointing a proxy shall, as nearly as circumstances will admit, be in the following form or in the form set out in Regulation 39 of Table A of the First Schedule to the Ordinance and shall be retained by the Company:

NC ELECTRIC COMPANY LIMITED

I, _____ of _____, being a member of NC ELECTRIC COMPANY LIMITED, hereby appoint _____ of _____ for failing him _____ of _____ or failing him _ of _____) as my proxy in my absence to attend and vote for me and on my behalf at the (Annual or Extraordinary, as the case may be) General Meeting of the Company to be held on the ___ day of _____and at any adjournment thereof.

As witness my hand this _____ day of _____.

Signed by the said
In the presence of

DIRECTORS

64. MINIMUM NUMBER OF ELECTED DIRECTORS

The Company shall have not less than three directors to be elected in a general meeting in the manner provided in Section 178 of the Companies Ordinance.

65. DIRECTORS TO FIX NUMBER OF ELECTED DIRECTORS

Subject to Article 72 and the provisions of the Ordinance, the directors shall fix the number of elected directors 35 days before the convening of the general meeting at which the directors are to be elected. The number of elected directors so fixed by the directors shall not be changed except with the prior approval of the Company in general meeting.

ALTERNATE DIRECTORS

66. APPOINTMENT OF ALTERNATE DIRECTORS

When any director intends to be, or is living outside Pakistan or otherwise he may with the approval of the directors appoint any person to be his alternate director, and such alternate director during the absence of the appointer from Pakistan, shall be entitled to receive notice of and to attend and vote at meeting of directors and shall be subject to and entitled to the provisions contained in these articles with reference to directors and may exercise and perform all such powers, directions and duties as his appointer could have exercised or performed including the power of appointing another alternate director. Such appointment shall be recorded in the directors minute book. A director may at any time by notice in writing to the Company remove an alternate director appointed by him. The alternate director shall cease to be such provided that if any director retires but is re-elected at the meeting at which such retirement took effect any appointment made by him pursuant to this article which was in force immediately prior to this retirement and re-election and which has not otherwise ceased to be effectively shall continue to operate after his re-election as if he had not so retired. All appointments and removals of alternate directors shall be effected by writing under the hand of the director making or revoking such appointment and left at the office. For the purpose of assessing a quorum, an alternate director shall be deemed to be a director. An alternate director may resign as such upon giving thirty (30) days prior notice to the board to this effect.

67. RIGHT OF ALTERNATE DIRECTORS TO RECEIVE NOTICES ETC

An alternate director shall, in the absence of a direction to the contrary in the instrument appointing him, be entitled to notice of general meetings of the Company on behalf of his appointer.

CHIEF EXECUTIVE

68. APPOINTMENT OF CHIEF EXECUTIVE

The Company shall have an office of Chief Executive which shall be filled from time to time by the directors who may appoint a director or (subject to Section 201 of the Ordinance) any other person to be the Chief Executive of the Company for a period not exceeding three years and on such terms and conditions as the directors may think fit, and such appointment shall be made within fourteen days from the date on which the office of Chief Executive falls vacant. If the Chief Executive at any time is not already a director he shall be deemed to be a director of the Company notwithstanding that the number of directors shall thereby be increased and he shall be entitled to all the rights and privileges and shall be subject to all liabilities of the office of director. Upon the expiry of his period of office, a Chief Executive shall be eligible for re-appointment. The Chief Executive may be removed from office in accordance with the provisions of Section 202 of the Ordinance notwithstanding anything contained in these articles or in any agreement between the Company and the Chief Executive.

69. REMUNERATION OF CHIEF EXECUTIVE

A Chief Executive of the Company shall receive such remuneration as the directors may determine.

70. POWERS OF CHIEF EXECUTIVE

The directors may from time to time entrust to and confer upon the Chief Executive for the time being such of the powers exercisable under these articles by the directors as they may think fit, and may confer such powers for such time, and to be exercised for such objects and purposes, and upon such terms and conditions, and with such restrictions as they think expedient; and they may confer such powers, either collaterally with, or to the exclusion of, and in substitution for all or any of the powers of the directors in that behalf; and may from time to time revoke, withdraw, alter or vary all or any of such powers. Directors may also appoint the Chief Executive as general attorney of the company and execute a power of attorney in his favour.

REMUNERATION OF DIRECTORS

71. REMUNERATION FOR EXTRA SERVICES

Any director who serves on any committee or who devotes special attention to the business of the Company, or who otherwise performs services which in the opinion of the directors are outside the scope of the ordinary duties of a director, may be paid such extra remuneration as the directors may determine from time to time. The remuneration of a director for attending meetings of the board shall from time to time be determined by the directors.

72. EXPENSES OF MEETINGS

Each director of the Company may, in addition to any remuneration receivable by him, be reimbursed his reasonable travelling and hotel expenses incurred in attending meetings of the directors.

73. DIRECTOR TO BE MEMBER

Save as provided in Section 187 (1) (h) of the Ordinance, no person shall be appointed as a director of the company unless he is a member of the company.

74. DIRECTORS MAY ACT NOTWITHSTANDING ANY VACANCY

The continuing directors may act notwithstanding any vacancy in their body so long as their number is not reduced below the number fixed by or pursuant to these articles as the necessary quorum of directors.

75. VACATION OF OFFICE OF DIRECTOR

The office of a director shall ipso facto be vacated if:

(a) he ceased to hold the share qualification, if any, necessary for his appointment; or

(b) he is found to be a unsound mind by a court of competent jurisdiction; or

(c) he is adjudged an solvent; or has applied to be adjudicated as an insolvent and his application is pending or is an un discharged insolvent; or

(d) he has been convicted by a court of law for an offence involving moral turpitude;

(e) he or any firm of which he is a partner or any private company of which he is a director without the sanction of the Company in general meeting accepts or holds any office of profit under the company other than that of a chief executive or legal or technical adviser or a banker in contravention of the provisions of section 188 (i) (c) of the Ordinance;

(f) he absents himself from three consecutive meetings of the directors or from all meetings of the directors for a continuous period of three months, whichever is the longer, without leave of absence from the board of directors; or

(g) he or any firm of which he is a partner or any private company of which he is a director accepts a loan or guarantee from the Company in contravention of section 195 of the Ordinance; or

(i) by notice in writing to the Company he resigns his office; or

(j) he is removed from office by resolution of the Company in general meeting in accordance with section 181 of the Ordinance;

(k) his appointment is withdrawn by the Authority nominating him as director;

76. INTEREST OF DIRECTORS

Subject to authorisation being given by the directors in accordance with section 196(2)(g) of the Ordinance, a director shall not be disqualified from contracting with the Company either as

vendor, purchaser or otherwise, nor shall any such contract or arrangement entered into by or on behalf of the Company with any company or partnership of or in which any director of the Company shall be a member or otherwise interested, be avoided, nor shall any such director so contracting or being such member or so interested be liable to account to the Company for any profit realised by any such contract or arrangement by reason of such director holding that office or of the fiduciary relationship so established. A director who, or whose spouse or minor child, is in any way, whether directly or indirectly, concerned or interested in any contract or arrangement or proposed contract or arrangement with the Company shall disclose the nature of such concern or interest in accordance with section 214 of the Ordinance that is to say:

(a) in the case of a contract or arrangement to be entered into, at the meeting of the directors at which the question of entering into the contract or arrangement is first taken into consideration or, if the director was not, on the date of that meeting, concerned or interested in the contract or arrangement, at the first meeting of the directors held after he becomes so concerned or interested; and

(b) in the case of any other contract or arrangement, at the first meeting of the directors held after the director becomes concerned or interested in the contract or arrangement.

77. GENERAL NOTICE OF INTEREST BY DIRECTOR

A general notice that any director of the Company is a director or a member of any other named company or is a member of any named firm and is to be regarded as interested in any subsequent transaction with such company or firm shall, as regards any such transaction, be sufficient disclosure under this article. Provided, however, that any such general notice shall expire at the end of the financial year in which it was given and may be renewed for a further period of one financial year at a time by giving fresh notice in the last month of the financial year in which it would otherwise expire.

78. DISCLOSURE TO MEMBERS OF DIRECTORS INTEREST IN APPOINTMENT OF CHIEF EXECUTIVE, DIRCTORS ETC

Whereby any contract or resolution of the directors an appointment or a variation in the terms of an existing appointment is made (whether effective immediately or in the future) of a Chief Executive, whole time director or secretary of the Company, in which appointment of any director of the Company is, or after the contract or resolution becomes, in any way, whether directly or indirectly, concerned or interested, or whereby any contract or resolution of the directors, an appointment or a variation in the terms of appointment is made (whether effective immediately or in the future) of a Chief Executive, the Company shall inform the members of such appointment or variation in the manner required by Section 218 of the Ordinance and shall comply with the requirements of that section in regard to the maintaining of such contracts and resolutions open for inspection by members at the office, the provision of certified copies thereof and extracts there from and otherwise.

79. REGISTER OF CONTRACTS AND APPOINTMENTS

In accordance with section 219, the Company shall maintain at its office a register or electronic record, in which shall be entered separately particulars of all contracts, arrangements or appointments in which the directors are interested. Such register or electronic record shall be open to inspection to the members during business hours, subject to any reasonable restriction that may be imposed by the Company in general meeting.

80. DIRECTOR MAY BECOME DIRECTOR OF ANOTHER COMAPNY

A director of the Company may be or become a director of any other company promoted by the Company or in which the Company may be interested as a vendor, shareholder or otherwise, and no such director shall be accountable for any benefits received as a director or member of such other company.

ELECTION OF DIRECTORS

81. PROCEDURE FOR ELECTION OF DIRECTORS

The number of directors determined by the directors under Section 178 shall be elected to office by the members in general meeting in the following manner, namely:

(a) a member present in person or by proxy shall have such number of votes as is equal to the product of voting shares held by him and the number of directors to be elected

(b) a member may give all his votes to a single candidate or divide them between more than one of the candidates in such manner as he may choose, and

(c) the candidate who gets the highest number of votes shall be declared elected as director and then the candidate who gets the next highest number of votes shall be so declared, and so on until the total number of directors to be elected has been so elected.

If the number of persons who offer themselves to be elected as directors is not more than the number of vacancies for which elections are being held, such persons being otherwise eligible shall be deemed to have been elected as directors from the date on which the election was proposed to be effective.

82. TENURE FOR OFFICE OF DIRECTORS

A director elected under Section 178 shall hold office for a period of three years unless he earlier resigns or becomes disqualified from being a director, or otherwise ceases to hold office.

83. ELEGIBILITY OF RETIRING DIRECTOR

A retiring director of the Company shall be eligible for re-election.

84. REMOVAL OF DIRECTORS

The Company in general meeting may remove a director from office by a resolution passed with the requisite number of votes determined in accordance with the provisions of Section 181 of the Ordinance.

85. CASUAL VACANCY

Any casual vacancy occurring among the directors may be filled up by the directors not later than ninety (90) days thereof and the person so appointed shall hold office for the remaining period of the director in whose place he is appointed provided that the directors may not fill a casual vacancy by appointing any person who has been removed from the office of a director of the Company.

86. NOTICE OF INTENTION TO BE FILED

No person including a retiring director of the Company shall be eligible for election to the office of director of the Company at any general meeting unless he has, not less than fourteen days before the date of the meeting, left at the office, a notice in writing, duly signed, signifying his candidature for the office.

87. REGISTER OF DIRECTORS AND OFFICERS

The Company shall keep at the office a register of the directors and officers, containing the particulars required by Section 205 of the Ordinance and the Company shall otherwise comply with the provisions of that Section as regards furnishing returns to the Registrar and giving inspection of the register.

PROCEEDINGS OF DIRECTORS

88. DECISION BY MAJORITY AND CASTING VOTE

The directors shall meet together for the despatch of business, adjourn and otherwise regulate their meetings and proceedings as they may think fit In accordance with the Ordinance. Questions arising at any meeting shall be decided by a majority of votes and in case of an equality of votes the Chairman shall have a second or casting vote.

89. QUORUM FOR DIRECTORS MEETINGS

The quorum necessary for the transaction of the business of the directors shall not be less two directors. An alternate director whose appointment is effective shall be counted in a quorum. In case directors qualified to vote are less than the minimum quorum, the matter should be decided in general meeting.

90. CONVENING OF DIRECTORS MEETINGS

A director may, and the secretary on the requisition of a director shall, at any time summon a meeting of the directors. Such meetings may be held using any technology consented to by all the directors, including but not limited to telephone and video conferencing. The consent may be a standing one, withdrawable by a director only within a reasonable period of time before the meeting. It shall not be necessary to give notice of a meeting of directors to any director for the time being absent from Pakistan.

91. CHAIRMAN BOARD OF DIRECTORS

The board of directors of the Company shall from time to time elect one of the directors as Chairman of the board of directors of the Company and determine the period for which he is to hold office, his role, remuneration and other terms and conditions, if any. The Chairman shall preside over all meetings of the board of directors, but if at any meeting neither the Chairman is present in person within half an hour of the time appointed for holding the same, the directors present in person may choose one of their number to be Chairman of the meeting.

92. EXCERCISE OF POWERS BY THE DIRECTORS

A meeting of the directors at which a quorum is present shall be competent to exercise all or

any of the authorities, powers and discretion by or under these articles for the time being vested in or exercisable by the directors generally.

93. DELEGATION OF POWERS

The directors may from time to time delegate of their powers to committees consisting of such members or members of their body as they think fit, and may from time to time revoke such delegation. Any committee so formed shall, in the exercise of the powers so delegated, conform to any regulations that may from time to time be imposed upon it by the directors.

94. MEETING OF COMMITTES

The meeting and proceedings of any such committee consisting of two or more members shall be governed by the provisions herein contained for regulating the meetings and proceedings of the directors, so far as the same are applicable thereto.

95. WHEN ACTS OF DIRECTORS OR COMMITTEE VALID

All acts done by any meeting of the directors or by a committee of the directors or by any person acting as a director of the Company shall, notwithstanding that is shall afterwards be discovered that there was some defect in the appointment or continuance in office of any such directors or person acting as aforesaid, or that they or any of them were disqualified or had vacated office or were not entitled to vote, be as valid as if every such person had been duly appointed or had duly continued in office and was qualified and had continued to be a director and had been entitled to be a director. Provided that nothing in this article shall be deemed to give validity to acts done by any such director after the appointment of such director has been shown to be invalid.

96. RESOLUTION BY CIRCULATION

A resolution circulated through fax or email or any form of electronic transmission to all the directors for the time being entitled to receive notice of a meeting of the directors, passed without any meeting of the directors or of a committee of directors and signed or affirmed through fax or email or any form of electronic transmission, by a majority of all directors in writing under the hands of all directors (or in their absence their alternate directors) for the time being in Pakistan, being not less than the quorum required for meetings of the directors, or as the case may be of the members of the committee, shall be valid and effectual as if it had been passed at the meeting of the directors, or as the case may be of such committee, duly called or constituted. The resolution in writing of the Company may consist of several copies of a document signed by one or more director(s) and takes effect at the date and time on which the last director, necessary for the resolution to be passed, signs a copy of the resolution; or a record of several signed electronic messages each indicating the identity of the sender, the text of the resolution and the sender's agreement or disagreement to the resolution, as the case may be and such a resolution takes effect on the date on which the last director's message, necessary for the resolution to be passed, is received.

97. REMUNERATION FOR EXTRA SERVICES

If any director of the Company, being willing, shall be called upon to perform extra services or to make any special exertions in going or residing away from his place of business for the time being for any of the purposes of the Company or in giving special attention to the business of the Company as a member of a committee of the directors, the Company may remunerate such director so doing either by a fixed sum or by a percentage of profits or otherwise as may be determined by the directors.

MINUTES

98. MINUTES OF MEETINGS

The directors shall cause minutes to be duly entered in books provided for the purpose of or as an electronic record, of,

(a) all appointments of officers;

(b) the names of the directors present in person at each meeting of the directors and of any committee of the directors;

(c) all decisions, directions and orders made by the directors and committees of the directors;

(d) all resolutions and proceedings of general meeting and of meetings of the directors and of the committees of the directors;

and any such minutes of any meeting of the directors or of any such committee or of the Company, if purporting to be signed by the Chairman of such meeting or by the Chairman of the next succeeding meeting, shall be prima facie evidence of the matter stated in such minutes.

POWER AND DUTIES OF DIRECTORS

99. DIRECTORS TO COMPLY WITH THE LAW

The directors shall duly comply with the provisions of the Ordinance, Insurance Ordinance, the Code as modified or amended or substituted from time to time and rules, regulations, guidelines framed there under.

100. DIRECTORS TO CONTROL AND MANAGE COMPANY AFFAIRS

The control of the Company shall be vested in the directors, and the business of the Company shall be managed by the directors who may exercise all such powers of the Company as are not by the Ordinance or by these articles or by a special resolution expressly directed or required to be exercised or done by the Company in general meeting.

101. POWER OF THE DIRECTORS

Without prejudice to the general powers conferred by Ordinance and to any other powers or authorities conferred by these articles on the directors, it is hereby expressly declared that the directors shall subject to the exercise in accordance with the Ordinance have the following powers, that is to say, power:

(1) To purchase or otherwise acquire for the Company any property, rights or privileges which the Company is authorised to acquire at such price and generally on such terms and conditions as they think fit, and to sell, let, exchange or otherwise dispose of absolutely or conditionally any part of the property, privileges and undertaking of the Company upon such terms and conditions, and for such consideration, as they may think fit.

(2) At their discretion to pay for any property, rights, privileges acquired by or services rendered to the Company either wholly or partially in cash or in shares (subject to the provisions of section 86 of the Ordinance) bonds, debentures or other securities of the Company. Any such bonds, debentures or other securities may be either specifically charged upon all or any part of the property of the Company or not so charged.

(3) To open account with any bank or financial institution and deposit into and withdraw money from such accounts from time to time.

(4) To make, draw, endorse, sign, accept, negotiate and give all cheques, bills of lading, drafts, orders, bills of exchange, and other promissory notes and negotiable instruments required in the business of the Company.

(5) To secure the fulfilment of any contracts, agreements or engagements entered into by the Company by mortgage or charge of all or any of the property of the Company for the time being or in such other manner as they may think fit.

(6) Subject to the provisions of the Ordinance, to appoint and at their discretion remove or suspend such agents (other than Managing Agents), managers, secretaries, officers, employees for permanent, temporary or special services as they may from time to time think fit, and to determine their powers and duties and fix their salaries or emoluments and to require security in such instances and to such amount as they think fit.

(7) To appoint any person or persons (whether incorporated or not) to accept and hold in trust for the Company any property belonging to the Company or in which it is interested or for any other purposes, and to execute and do all such deeds, documents and things as may be requisite in relation to any such trust and to provide for the remuneration of such trustee or trustees.

(8) To institute, conduct, defend, compound or abandon any legal proceedings by or against the Company or its officers or otherwise concerning the affairs of the Company and also to compound and allow time for payment or satisfaction of any debts due and of any claims or demands by or against the Company.

(9) To refer claims or demands by or against the Company to arbitration and observe and perform the awards.

(10) To make and give receipts, releases and other discharges for money payable to the Company and for the claims and demands of the Company.

(11) To determine who shall be entitled to sign on the Company's behalf bills, notes, receipts, acceptances, endorsements, cheques, releases, contracts and documents.

(12) From time to time to provide for the management of the affairs of the Company either in different parts of Pakistan or elsewhere in such manner as they think fit, and in particular to establish branch offices and to appoint any persons to be the attorneys or agents of the Company with such powers (including power to sub-delegate) and upon such terms as may be thought fit.

(13) To invest and deal with any of the moneys of the Company not immediately required for the purposes thereof upon such securities and in such manner as they may think fit, and from time to time to vary or realise such investments.

(14) From time to time to make, vary and repeal bye-laws for the regulation of the business of the Company, its employees.

(15) To enter into all such negotiations and contracts and rescind and vary all such contracts and execute and do all such acts, deeds and things in the name and on behalf of the Company as they may consider expedient for or in relation to any of the matters aforesaid or otherwise for the purposes of the Company.

(16) To establish, maintain, support and subscribe to any charitable or public object, and any institution, society, or club which may be for the benefit of the Company or its employees, or may be connected with any town or place where the Company carries on business; to give pensions, gratuities, or charitable aid to any person or persons who have served the Company or to the wives, children, or dependants of such person or persons, that may appear to the directors just or proper, whether any such person, his widow, children or dependants, have or have not a legal claim upon the Company.

(17) Subject to the provisions of section 227 of the Ordinance, before recommending any dividends, to set aside portions of the profits of the Company to form a fund to provide for such pensions, gratuities, or compensation; or to create any provident or benefit fund in such or any other manner as to the directors may seem fit.

(18) Subject to the provision of the Ordinance to accept from any member on such terms and conditions as shall be agreed a surrender of his shares or any part thereof.

(19) To make advances and loans without security or on such security as they may deem proper and as permissible under the law.

(20) To delegate all or any of the powers hereby conferred upon them to such person or persons as they may from time to time think fit subject to the provision of Section 196 of the Ordinance.

(21) To approve appointment of alternate director/directors.

POWER OF ATTORNEY

102. APPOINTMENT OF ATTORNEY

The directors may from time to time and at any time by power of attorney appoint any company, firm or person (including any director or officer of the Company) or body of persons, whether nominated directly or indirectly by the directors, to be the attorney or attorneys of the Company for such purposes and with such powers, authorities and discretions and for such period and subject to such conditions as they may think fit, and any such powers of attorney may contain such provisions for the protection and convenience of persons dealing with any such attorney to delegate all or any of the powers, authorities and discretions vested in him; and without prejudice to the generality of the foregoing any such power of attorney may authorise the attorney to institute, conduct, defend, compound or abandon any legal proceedings by or against the Company, whether generally or in any particular case.

BORROWING POWERS

103. DIRECTORS POWERS TO BORROW

(1) The directors may exercise all the powers of the company to borrow money and to mortgage or charge its undertaking, property and assets (both present and future), and to issue debentures, debenture stocks, and other securities, weather outright or as collateral security for any debt, liability or obligation of the company or of any third party

(2) In exercising the powers of the Company aforesaid the directors may, from time to time and on such terms and conditions as they think fit, raise money from banks and financial institutions and from other persons under any permitted system of financing, whether providing for payment of interest or some other form of return, and in particular the directors may raise money on the basis of the mark up on price, musharika, modaraba or any other permitted mode of financing.

(3) In regard to the issue of securities the directors may exercise all or any of the powers of the Company arising under Sections 87 and 120 of the Ordinance and in particular the directors may issue any security as defined in Section 2(1) (34) of the Ordinance or may issue any instrument or certificate representing redeemable capital as defined in section 2(1) (30A) of the Ordinance or participatory redeemable capital as defined in section 2(1) (25) of the Ordinance.

(4) Any debentures, debenture-stock, bonds or other securities may be issued at a discount, premium or otherwise and with any special privileges as to redemption, surrender, drawing, allotment of shares, attending and voting at general meetings of the Company, appointment of directors of the Company or otherwise.

104. REGISTER OF MORGAGES AND CHARGES

The directors shall cause a proper register to be kept in accordance with the provisions of Section 135 of the Ordinance, of all mortgages and charges specifically affecting the property of the Company, and shall duly comply with the provisions of the sections of the Ordinance, namely, Sections 121 and 122 (Registration of mortgages and charges), Section 128 (Endorsement of certificates), Section 129 (Filing of prescribed particulars), Section 130 (Keeping of a copy of every instrument creating any mortgage or charge by the Company at the office) and Section 132 (Giving of intimation of the payment or satisfaction of any charge or mortgage created by the Company).

BOOKS OF ACCOUNTS

105. DIRECTORS TO KEEP BOOKS OF ACCOUNTS

The directors shall cause to be kept proper books of account as required under section 230.

106. WHERE TO KEEP BOOKS OF ACCOUNTS

The books of account shall be kept at the registered office of the company or at such other place as the directors shall think fit and shall be open to inspection by the directors during business hours.

107. INSPECTION BY MEMBERS

The directors shall from time to time determine whether and to what extent and at what time and places and under what conditions or regulations the accounts and books or papers of the company or any of them shall be open to the inspection of members not being directors, and no member (not being a director) shall have any right of inspecting any account and books or papers of the company except as conferred by law or authorised by the directors or by the company in general meeting.

108. PREPARATION OF ACCOUNTS

The directors shall as required by sections 233 and 236 cause to be prepared and to be laid before the company in general meeting such profit and loss accounts and balance sheets duly audited and reports as are referred to in those sections.

109. ACCOUNTS TO BE LAID BEFORE THE MEMBERS

A balance sheet, profit and loss account, and other reports referred to in the preceding Article shall be made out in every year and laid before the company in the annual general meeting made up to a date not more than three months before such meeting. The balance sheet and profit and loss account shall be accompanied by a report of the auditors of the company

110. ACCOUNTS AND REPORTS TO BE SENT TO MEMBERS

A copy of the balance sheet and profit and loss account and report of auditors shall, at least twenty-one days preceding the meeting, be sent to the persons entitled to receive notices of general meetings in the manner in which notices are to be given.

111. ERRORS DISCOVERED AFTER APPROVAL OF ACCOUNTS

Every account of the company when audited and approved by a general meeting shall be conclusive except as regards any errors discovered therein within three months next after the approval hereof. Whenever any such error is discovered within that period the account shall forthwith be corrected and henceforth shall be conclusive.

112. DIRECTORS TO COMPLY SECTION 230 AND 236

The directors shall in all respects comply with the provisions of sections 230 to 236.

ANNUAL RETURNS

113. FILING OF FORM A

The Company shall make the requisite annual returns in accordance with the provisions of section 156 of the Ordinance.

DIVIDENDS AND RESERVES

114. The company in general meeting may declare dividend but no dividend shall exceed the amount recommended by the board.

115. The directors may from time to time pay to the members such interim dividends as appear to the directors to be justified by the profits of the company.

116. No dividend shall be paid otherwise than out of profits of the year or any other undistributed profits. No unpaid dividend shall bear interest against the company.

117. The dividend warrants shall be sent by the company by registered post unless the shareholder entitled to receive the dividend requires otherwise.

118. With the sanction of a resolution in the general meeting, any dividend may be paid wholly or in part by the distribution of specific assets and in particular of paid-up shares or debentures of any other company or in any one or more of such ways. The directors may fix the value for distribution of such specific assets or any part thereof and may determine that cash payments shall be made to any members upon the footing of the value so fixed, in order to adjust the rights of all members, and may vest any such specific assets in trust for the members entitled to the dividend as may seem expedient to the directors.

119. The directors may, before recommending any dividend, preferential or otherwise, set aside out of the profits of the company such sums as they think proper as a reserve or reserves which shall, at the discretion of the directors, be applicable for meeting contingencies, or for equalizing dividends, or for any other purpose to which the profits of the company may be properly applied, and pending such application may, at the like discretion, either be employed in the business of the company or be invested in such investments (other than shares of the company) as the directors may, subject to the provisions of the ordinance, from time to time think fit.

120. The directors may carry forward any profits which they may think prudent not to distribute, without setting them aside as a reserve.

121. Any general meeting may resolve that any moneys, investments, or other assets forming part of the undivided profits of the company standing to the credit of any reserve or other fund or in the hands of the company and available for dividend (or representing premium received on the issue of shares and standing to the credit of the shares premium account) be capitalized and distributed amongst such of the shareholders as would be entitled to receive the same if distributed by way of dividend and in the same proportions on the footing that they become entitled hereto as capital and that all or any part of such capitalized fund be applied on behalf of such shareholders in paying up in full, any unissued shares, debentures or debenture-stock of the company which shall be distributed accordingly and that such distribution of payment shall be accepted by such shareholders in full satisfaction of their interest in the said capitalized sum.

122. A transfer of shares shall not pass the right to any dividend declared thereon before the registration of the transfer.

123. If several persons are registered as joint holders of any share, any one of them may give effectual receipt for any dividend payable on the share.

124. Notice of any dividend that may have been declared shall be given in the manner hereinafter mentioned to the persons entitled to share therein.

125. The dividend shall be paid within the period laid down in section 251.

126. All dividends unclaimed for one year after having been declared may be invested or otherwise made use of by the directors for the benefit of the company until claimed and all dividends unclaimed for three years after having been declared may be

forfeited by the directors for the benefit of the company, but the directors may annul the forfeiture wherever they may think proper.

AUDIT

127. APPOINTMENT OF AUDITORS

Auditors shall be appointed and their duties regulated in accordance with Sections 252 to 255 of the Ordinance or any statutory modification thereof for the time being in force.

SEAL

128. COMMON SEAL OF THE COMAPNY

The directors shall provide a common seal of the Company which shall not be affixed to any instrument except by the authority of a resolution of the board or by a committee of directors authorised in that behalf by the directors, and two (2) directors, or one (1) director and the secretary of the Company, shall sign every instrument to which the common seal is affixed.

129. USE OF OFFICIAL SEAL OUTSIDE PAKISTAN

The directors may provide for the use in any territory, district or place not situated in Pakistan, of an official seal which shall be a facsimile of the common seal of the Company, with the addition on its face of the name of every territory, district or place where it is to be used. The official seal shall not be affixed to any instrument except by the authority of a resolution of the board or by a committee of directors authorised in that behalf by the directors, and two (2) directors, or one (1) director and the secretary of the Company, or such other person as the directors may appoint for the purpose, shall sign every instrument to which the official seal is affixed. The provisions of section 213 shall apply to the use of the official seal.

NOTICES

130. NOTICES TO MEMBERS

Notice shall be given by the company to members and auditors of the company and other persons entitled to receive notice in accordance with section 50 and will include electronic form as may apply to the manner in which notices are to be issued, served and/or received by the company.

AMALGAMATION, DIVISION AND RECONSTRUCTION

131. MERGER, DE-MERGER AND RECONSTRUCTION OF TEH COMAPNY

Subject to and in accordance with the provisions of section 287, the Company may reconstruct, amalgamate into another Company or divide into two (2) or more companies in the process of which the whole or any part of the undertaking, property or liabilities of the Company or any other company, may be transferred to any other Company or the Company, respectively, as the case may be. Provided that any sale of the undertaking of the Company, the directors, or the liquidator on a winding up, may, if authorised by a special resolution, accept fully paid shares, debentures or securities

of any other company, whether incorporated in Pakistan or not, either then existing or to be formed, for the purchase in whole or in part of the property of the Company, and the directors (if the profits of the Company permit) or the liquidator (in a winding up) may distribute such shares or securities, or any other property of the Company amongst the members without realisation, or vest the same in trustees for them, and any special resolution may provide for the distribution or appropriation of the cash, shares or other securities, benefits or property, otherwise than in accordance with the strict legal rights of the members or contributories of the Company, and for valuation of any such securities or property at such price in such manner as the meeting may approve, and all holders of shares shall be bound to accept and shall be bound by any valuation or distribution so authorised, and waive all rights in relation thereto, save only in case the Company is proposed to be or is in the course of being wound up, such statutory rights (if any) under section 367 of the Ordinance as are incapable of being varied or excluded by these articles.

SECRECY

132. DECLARATION TO OBSERVE SECRACY

Every director, manager, adviser, auditor, trustee, member of a committee, officer, servant, agent, accountant or other person employed in the business of the Company shall, if so required by the directors before entering upon his duties, sign a declaration pledging himself to observe a strict secrecy respecting all transactions of the Company with its customers and the state of accounts with individuals and in matters relating thereto and shall by such declaration pledge himself not to reveal any of the matters which may come to his knowledge in the discharge of his duties except when required to do so by the directors or by any meeting or by any Court of law and except so far as may be necessary in order to comply with any of the provisions in these articles contained.

133. NO MEMBER TO ENTER THE PREMISES OF THE COMPANY

No member or other person (not being a director) shall be entitled to enter upon the property of the Company or to inspect or examine the Company's premises or properties of the Company without the permission of the directors for the time being or, subject to the provisions of article 122, to require discovery of or any information respecting any detail of the Company's trading or any matter which is or may be in the nature of a trade secret, mystery of trade, or secret process or of any matter whatsoever which may relate to the conduct of the business of the Company and which in the opinion of the directors it will be inexpedient in the interest of the members of the Company to communicate.

ARBITRATION

134. APPOINTMENT OF ARBITRATOR

Whenever a difference arises between the Company on the one hand and any of the members, their executors, administrators, or assignees on the other hand touching the true intent or construction or the incident or consequences of these presents, or of the status of enactment's of the legislature, or touching anything then or thereafter done, executed, omitted or suffered in pursuance of these presents or of the status of enactment's touching any breach or alleged breach or otherwise relating to the premises or to these presents, or to the status or to any of the affairs or officers of the Company, the Company by written agreement refer to arbitration in accordance with the

Arbitration Act 1940 (X of 1940) and every such difference shall be referred to the decision of an arbitrator to be appointed by the parties in difference or if they cannot agree upon a single arbitrator, to the decision of two arbitrators, one appointed by such party, or in the event of disagreement of the arbitrators, to that of an umpire appointed by arbitrators themselves. The provisions of Arbitration Act 1940 (X of 1940) shall apply to all arbitrations between the Company and persons having such difference.

135. FAILURE TO APPOINT ARBITRATOR BY ONE PARTY

If either party to the difference makes default in appointing the arbitrator for fifteen days after the other party has given to him notice to appoint the same, such other party may appoint an arbitrator to act in the place of the arbitrators of the defaulting party.

136. COST OF ARBITRATION

The costs of, or incidental to any such reference and award shall be in the discretion of the arbitrator/arbitrators or umpire as the case may be who may determine the amount there of an may award bv whom, and to whom, and in what manner the same shall be borne and paid.

WINDING UP

137. DISTRIBUTION OF ASSETS ON WINDING UP

If the Company shall be wound up and the assets available for distribution among the members, subject to the rights attached to any preference share capital, as such shall be insufficient to repay the whole of the paid-up capital, such assets shall be distributed so that as nearly as may be the losses shall be borne by the members in proportion to the capital paid up on the shares held by them respectively. And if in a winding up the assets available for distribution among the members shall be more than sufficient to repay the whole of the capital paid up at the commencement of the winding up, the excess shall be distributed amongst the members in proportion to the capital at the commencement of the winding up, paid up on the shares held by them respectively. But this article is to be without prejudice to the rights of the holders of shares issued upon special terms and conditions.

138. DISTRIBUTION OF ASSETS IN SPECIE OR KIND

If the Company shall be wound, whether voluntarily or otherwise, the liquidator may with the sanction of a special resolution divide among the members in specie or kind any part of the assets of the Company, and may with the like section vest any part of the assets of the Company in trustees upon such trusts for the benefit of the members or any of them as the liquidator with the like sanction shall think fit.

INDEMNITY

139. Every director or officer of the Company and every person employed by the Company as auditor shall be indemnified out of the funds of the Company against all liability incurred by him as such director, officer or Auditor in defending any proceedings, whether civil or criminal, in which judgement is given in his favour, or in which he is acquitted, or in connection with any application under section 488 of the Ordinance in which relief is granted to him by the Court.

We, the several persons whose names and addresses are subscribed, are desirous of being formed into a Company in pursuance of this Articles of Association, and we respectively agree to take the number of shares in the Capital of the Company as set opposite to our respective names.

Name and Surname in Full	Father's Surname in Full	Nationality with any former Nationality	Occupation	CNIC Number	Residential address in full	No. of Shares	Signature
Yahya Saleem	s/o Late Muhammad Saleem	Pakistani	Business	35201-1506068-7	House No 319, Canal Bank Road, Lahore.	1	
Zain Shahzad	s/o Shahzad Saleem	Pakistani	Business	35201-9085897-7	319, West Canal Bank Road, House No 1, Near Alfa Society, Lahore	1	
Shahzad Saleem	s/o Late Muhammad Saleem	Pakistani	Business	35201-5539629-9	319, West Canal Bank Road, House No 1, Near Alfa Society, Lahore	1	
Nishat Chunian Limited Through its nominee Saqib Riaz	Subscriber s/o Riaz Ahmed Saleem	Pakistani Pakistani	Business Service	0021135 36402-9122201-5	31-Q, Gulberg II, Lahore House No 471-A-1, Gulberg III, Lahore.	997	

Total Shares Taken: 1000 (One Thousand)

Dated this 14th day of April, 2014
Witness to the above Signatures:
Signature: _____

Full Name: National Institutional Facilitation Technologies (Pvt) Ltd

Occupation: NIFT

Full Address: 5th Floor, AWT Plaza, I.I. Chundrigar Road, Karachi.

CERTIFIED TO BE TRUE COPY
24/11/14
REGISTRAR OF COMPANIES
REGISTRATION OFFICE
LAHORE.

China Sinogy Electric Engineering Co., Ltd.

1 x 40 MW Coal based Captive Power Plant of
Nishat Chunian Ltd., Pakistan

Interim Report on Geotechnical Investigations

October 02, 2014

Doc. No. J-576-A
Rev. 00

Berkeley Associates

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1 x 40 MW Coal based Captive Power Plant of Nishat Chunian Ltd., Pakistan

00	02-10-2014	Issued to Client	MS		KA			
Rev	**Date**	**Description**	**Initials**	**Signature**	**Initials**	**Signature**	**Initials**	**Signature**
			Prepared by		**Checked by**		**Clients Approval**	

Client	**CSEEC** **China Sinogy Electric Engineering Co., Ltd.** **中机国能电力工程有限公司**	Mob: +92-320-0414687 Email: sunyan@cseec.cn
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INTERIM REPORT ON GEOTECHNICAL INVESTIGATIONS

Document No.	**J-576-A**

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1 INTRODUCTION

1.1 General

M/s China Sinogy Electric Engineering Company Limited has undertaken 1 x 40 MW Coal based Captive Power Plant of Nishat Chunian Ltd., Pakistan in EPC Mode near Bhai Pheru, Punjab-Pakistan. The site is about 49km away from the city of Lahore, 45km far from Allama Iqbal Intentional Airport, Lahore. The nearest railway station is Pattoki which is situated about 14km distance from the proposed project site, and the nearest Highway is Lahore-Multan Road. This plant is about 1250km to the Port Qasim, Karachi-Pakistan.

M/s Berkeley Associates were engaged to carry out the detailed geotechnical investigations for the proposed project site. The field work for these geotechnical investigations was initiated on September 07, 2014 and still in progress.

As per the requirement mentioned in the TOR, an interim report has to be submitted for the following three structures;

- Main Power Building
- Boiler
- Chimney/Stack

Data used for the compilation of this report has been taken under or within the vicinity of the aforementioned structures and are summarized as under;

Sr. No.	Building/Structure	Borehole Used
1	Main Power Building	BH-39, BH-02, BH-50, BH-40, BH-46, BH-51, BH-01, BH-41, BH-47 & BH-52
2	Boiler	BH-44, BH-45 & BH-49
3	Chimney/Stack	BH-42, BH-43 & BH-48

1.2 Scope of Work

Scope of Complete Geotechnical Investigations is summarized below;

- Drilling of fifty two (52) exploratory boreholes using hydraulic feed straight rotary drilling technique. Depths, coordinates and elevations of the boreholes are provided in Table 1-1.
- Performance of Standard Penetration Tests (SPTs) in all the boreholes at the specified depths along with the collection of disturbed soil samples
- Collection of undisturbed soil samples from boreholes using appropriate samplers and techniques
- Obtaining pertinent ground water table (GWT) information in the boreholes and collection of water samples
- Performance of laboratory tests on selected soil and water samples
- Submission of interim geotechnical investigations report
- Preparation of a Geotechnical Investigation Report upon completion of field and laboratory testing

1.3 Methodology

The exploratory borings were drilled using straight rotary drilling rig. The in-situ tests were performed in accordance with the relevant ASTM standards.

Soil and water samples were collected from boreholes using appropriate samplers/techniques, for identification and subsequent laboratory testing. Selected soil and water samples were subjected to various laboratory tests for evaluation of classification and strength characteristics of sub-soils.

This report has been prepared on the basis of field geotechnical investigations data and subsequent laboratory testing performed on the selected soil and water samples. An evaluation of foundation soils, foundation design parameters and load carrying capacities of pile foundations on each structural location and type of cement to be used in the construction of substructure are also provided in this report.

2 FIELD INVESTIGATIONS

2.1 General

The scope of the geotechnical studies was provided by the Client. The field investigations included the following activities;

- Drilling of exploratory boreholes
- In-situ testing in boreholes
- Soil and water sampling in boreholes

The details of the field work are discussed in this chapter.

2.2 Exploratory Boreholes

A total of eighteen (18) boreholes were drilled at the project site. Depths, coordinates and elevations of these boreholes are presented in Table 1-1. The location of all the drilled boreholes drilled during these investigations is shown on Fig. 2-1 (Appendix-A).

All these boreholes were drilled using straight rotary drilling rig and the boreholes were stabilized by circulating Bentonite mud in the boreholes. The diameter of all the boreholes was in the range of 150 mm. SPTs were performed in these boreholes at a general depth interval of 1.0m down to 5m depth and thereafter 1.5m down to maximum drilled depth i.e. 50m below EGL. Undisturbed soil samples were collected from the depth specified in the project specifications using Shelby tube/Denison samplers.

A careful record of all the materials encountered and data of SPTs conducted in each borehole was maintained in the form of field borehole logs. The field borehole logs for these structures are included in Appendix-B.

2.3 Standard Penetration Tests

For evaluating the consistency and compactness of the foundation soils, SPTs were performed in all the exploratory boreholes. These SPTs were carried out in each hole at 1.0m depth interval down to 5m depth and 1.5m

depth interval thereafter. These SPTs were conducted in accordance with the procedures described in latest version of ASTM Standard D 1586. A donut type hammer, weighing 63.5kg, has been used for the test. While performing the SPTs in boreholes, the hammer was lifted and dropped mechanically through the flywheel of drilling rig and pulley hanged to a tripod. Prior to performing each SPT, the loose material existing in the hole was properly washed/cleaned. A split spoon sampler without a liner was used for all the tests. Disturbed soil samples were obtained through the split spoon sampler. Profiles of observed SPT–N values are shown on Figs. 2-2 to 2-4 (Appendix-A).

2.4 Sampling

Disturbed and undisturbed soil samples were obtained from all the boreholes drilled during these soil investigations. Disturbed soil samples were obtained from the boreholes through split spoon sampler while performing SPTs. These samples were placed in polythene bags and preserved in wide-mouthed plastic jars. The jars were clearly labelled to indicate the project name, project code, borehole designation and depth of sample and date of test.

Undisturbed soil samples were obtained from the boreholes by using appropriate sampler from cohesive soils. These undisturbed samples were properly waxed and labelled to indicate the project name, project code, borehole/test pit designation and depth & date of sample collection.

Ground water samples were collected from all the boreholes after 24 hours of washing the boreholes with clean water. These water samples were preserved in clean water bottles. These samples were clearly labelled to indicate the project name, project code, borehole designation and date of sample collection.

All the soil and water samples were carefully transported to Berkeley Associates Soil Laboratory Facilities, Lahore for subsequent laboratory testing.

2.5 Groundwater Observations

During these investigations ground water table (GWT) was encountered in all boreholes in the range from 5.1m to 5.7m depth below existing ground level (EGL) and are mentioned in the respective borehole logs.

3 LABORATORY TESTING

For evaluation of physical and engineering characteristics of the sub-soils, selected disturbed & undisturbed soil samples and all ground water samples were tested in the laboratory. The laboratory testing was carried out at Berkeley Associates Laboratory Facility, Lahore. The following laboratory tests were performed on selected soil samples.

- Particle size distribution
- Atterberg's limits
- Specific gravity
- Bulk & Dry density
- Natural moisture content (NMC)
- Unconfined compression tests
- Direct shear tests
- Consolidation tests
- Chemical analyses of soil and water samples

A brief description of these tests is given in the following sections. A summary of laboratory test results is given in Table 3-1 (Appendix-A).

3.1 Particle Size Distribution

For classifying the subsurface soils, twenty eight (28) soil samples were subjected to sieve analyses during these studies. Some samples were further subjected to hydrometer analyses. The sieve analyses were performed in accordance with the procedures specified in ASTM D 422, with sample preparation by ASTM D 2217 (wet preparation method), Procedure B. The hydrometer analyses were carried out in accordance with procedure specified in ASTM D 422. Results of sieve and hydrometer analyses were plotted in the form of gradation curves. These curves for all the tested samples are presented in Appendix-C. The percentages of fines (passing sieve no. 200), sand and concretion fractions of the tested soil samples are also provided in Table 3-1 (Appendix-A).

3.2 Atterberg's Limits

For evaluating plasticity characteristics of cohesive soils, liquid and plastic limit tests were performed on sixteen (16) selected soil samples. The tests

were performed as specified in ASTM Designation D 4318. All the liquid limit tests were performed with at least three trials. The test results are summarized in Table 3-1 (Appendix-A). According to Casagrande's Plasticity Chart shown on Fig. 3-1 (Appendix-A), the fine-grained soil samples are classified as CL, CL-ML and ML. Two (02) samples were classified as non-plastic.

3.3 Specific Gravity

Thirteen (13) selected soil samples were tested for estimation of specific gravity. The tests were carried out in accordance with ASTM Designation D 854. The test results are provided in Table 3-1(Appendix-A).

3.4 Bulk Density

Thirteen (13) undisturbed soil samples were tested for determination of their bulk density. The test results are provided in Table 3-1 (Appendix-A).

3.5 In-situ Moisture Content

Thirteen (13) undisturbed soil samples were tested for determination of their in-situ moisture contents. The test results are provided in Table 3-1.

3.6 Unconfined Compression Tests

In order to estimate shear strength characteristics of fine grained soils, twelve (12) undisturbed soil samples were subjected to unconfined compression test. The test results are provided in Table 3-1 (Appendix-A). The laboratory test sheets are attached in Appendix-C.

3.7 Direct Shear Tests

In order to estimate shear strength characteristics of foundation soils, nine (09) soil samples were subjected to direct shear tests. The tests were carried out at in-situ condition as specified in ASTM Designation D 3080. The test results are provided in Table 3-1 (Appendix-A). The laboratory test sheets are

attached in Appendix-C.

3.8 Consolidation Tests

One (01) consolidation test was performed on selected undisturbed soil sample. The test was carried out as specified in ASTM Designation D 2435. The test result is provided in Table 3-1 (Appendix-A).

3.9 Chemical Analyses

3.9.1 Soil Samples

In order to determine the chemical characteristics of the subsoil, four (04) selected soil samples were tested for estimation of chemical composition. The results are summarized in Table 3-1 (Appendix-A).

3.9.2 Water Samples

In order to determine the chemical characteristics of the ground water, three (03) water samples were tested for estimation of chemical composition. The results are summarized in Table 3-1 (Appendix-A).

4 GEOTECHNICAL CHARACTERIZATION OF SUBSOIL

4.1 General

The geotechnical investigations carried for the project comprised field and laboratory work. The field and laboratory investigations were aimed for evaluating the engineering characteristics of the foundation soil. The subsurface conditions and engineering characteristics of the soil existing at the proposed project site are discussed in the following sections.

4.2 Topography and Geology

The topography of the project area is predominantly flat. Lithological units at this site include top layer of Silt, Silty Clay underlain by layers of Silty Sand.

4.3 Seismicity

According to Building Code of Pakistan (Seismic Provisions – 2007), issued by Government of Islamic Republic of Pakistan, Seismic Zone 2A has been assigned to Chunian. Peak ground acceleration associated with Zone 2A has been recommended to vary from 0.08g to 0.16g.

4.4 Liquefaction Potential

Laboratory testing revealed that soil present at the proposed project site have fine contents > 30% such soils are unlike to undergo liquefaction phenomenon. On this basis, as such there is no liquefaction hazard exists at the project site.

4.5 Stratigraphy

During these investigations, the subsurface was explored to a maximum depth of fifty (50) meter below EGL and the following geotechnical units have been identified;

- Top layer comprises of Silt/Silt mixed with Clay. Depth of this layer varies from 3m to 9.5m below EGL in all boreholes drilled for these structures.
- Top layer is underlained by the layer of Silty/Lean Clay having thickness ranges from 6m to 15.5m in various boreholes.
- Sandy Silt/Silt mixed with Clay layer is encountered below Silty/Lean Clay and thickness of this layer ranges from 9.5m to 18.5m below EGL.
- Final layer of Silty Sand layer is present under the layer of Silty/Lean Clay and ranges between 12.5m to maximum drilled depth

Linear subsurface profiles developed on the basis of boreholes drilled at these structural locations are shown on Figs. 4-1 to 4-3.

4.6 Groundwater Table

During these investigations ground water table (GWT) was encountered in all boreholes in the range from 5.1m to 5.7m depth below existing ground level (EGL) and are mentioned in the respective borehole logs.

4.7 Seismic Soil Profile Characterization

According to Building Code of Pakistan (Seismic Provisions – 2007), issued by Government of Islamic Republic of Pakistan, the criteria for classification of un-cemented soil profiles are to be based on;

- V_s = average shear wave velocity of the top 100ft. (30m) soil profile

or

- N = average field SPT resistance for the top 100ft. (30m) soil profile

or

- S_u = average undrained shear strength for the top 100ft. (30 m) soil profile

Keeping in view the available field SPT data of all the holes drilled at the site, the soil profile type as per Building Code of Pakistan (Seismic Provision 2007), should be taken as **S_D** (i.e. Stiff Soil Profile).

4.8 Chemical Agressivity

On the basis of concentrations of sulphates determined in the foundation soil and ground water samples, the exposure is classified as "**Not Applicable**" as explained in ACI 318M-11 Table 4.2.1. The concrete mix design should follow the recommendations of ACI 318 accordingly.

4.9 References

4.1 Youd, T. L. et al, "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils", JGGE, Oct. 2001, pp 817-833.

5 FOUNDATION DESIGN

5.1 General

Various field and laboratory tests have been carried out during these geotechnical investigations. These test results have been examined for evaluation of subsurface conditions at the project site and determination of geotechnical design parameters. Design parameters have been selected on the basis of available field test results, literature and engineering judgement.

This interim report has been prepared for the following structures;

- Main Power Building
- Boiler
- Chimney/Stack

Data used for the compilation of this report has been taken under or within the vicinity of the aforementioned structures and are summarized as under;

Sr. No.	Building/Structure	Borehole Used
1	Main Power Building	BH-39, BH-02, BH-50, BH-40, BH-46, BH-51, BH-01, BH-41, BH-47 & BH-52
2	Boiler	BH-44, BH-45 & BH-49
3	Chimney/Stack	BH-42, BH-43 & BH-48

5.2 Type of Foundations

On the basis of information provided by the Client, deep foundations has been evaluated for above mentioned structures.

5.3 Deep Foundations

5.3.1 Cast in-situ Piles

Piles are the most common type of deep foundations. The bored cast-in-situ reinforced concrete piles can be adopted for heavily loaded structures.

5.3.2 Length and Diameter

Deep foundations are recommended for heavily loaded structures. We envisage that cast-in-situ bored reinforced concrete piles of diameter 660mm shall be adequate for the structures. The allowable load carrying capacity of cast-in-situ bored piles has been determined for the provided diameter and length ranging from 15m to 30m.

5.3.3 Design Parameters

Design parameters have been selected on the basis of in-situ testing in the boreholes and available results of laboratory testing. Laboratory testing for only three (03) boreholes has been completed. Rest of the testing is underway.

For Main Power Building Area:

Sr. No.	Depth (m)	Material Type	Bulk Density (kN/m^3)	Cohesion (kPa)	Angle of Internal Friction (Deg)
1	0.0-6.5	Silt	17.5	-	28
2	6.5-12.5	Silty/Lean Clay	18	40	-
3	12.5-15.5	Sandy Silt	18	-	30
4	15.5-50	Silty Sand	18	-	32

For Boiler Area:

Sr. No.	Depth (m)	Material Type	Bulk Density (kN/m^3)	Cohesion (kPa)	Angle of Internal Friction (Deg)
1	0.0-5.1	Silt	17.5	-	29
2	5.1-9.5	Silt	18	-	29
3	9.5-12.5	Silty/Lean Clay	18	60	-
4	12.5-15.5	Sandy Silt	18	-	30
5	15.5-50	Silty Sand	18	-	32

For Chimney Area:

Sr. No.	Depth (m)	Material Type	Bulk Density (kN/m³)	Cohesion (kPa)	Angle of Internal Friction (Deg)
1	0.0-5.1	Silt	17.5	-	28
2	5.1-15.5	Silt	18	-	29
3	15.5-18.5	Silty/Lean Clay	18	50	-
4	18.5-26	Sandy Silt	18	-	30
5	26-50	Silty Sand	18	-	32

5.3.4 Allowable Load Carrying Capacity

The load carrying capacities of bored piles have been calculated according to the procedures described in Ref. 5.1. Contribution of top 1.5m soil/fill material in skin friction has been neglected. The pile capacities in compression and tension are shown on Figs. 5-1 & 5-6 (Appendix-A).

The allowable loads provided in these figure are for single pile. Appropriate group reduction factor should be applied on the basis of configuration of the pile group. The following formula given in Ref. 5.1 can be adopted to estimate pile group efficiency:

$$E_g = 1 - \theta \frac{[(n-1)m + (m-1)n]}{90mn}$$

And

$$\theta = tan^{-1}\frac{D}{S}$$

where,

m	=	no. of columns in group
n	=	no. of rows in group
s	=	centre to centre distance between adjacent piles
D	=	pile diameter

The minimum spacing between the piles in a group should be at least 2 to 3 times the pile diameter.

5.4 Construction Considerations for Foundations

Pile load tests shall be conducted on separate piles constructed outside the area of working piles. The length and diameter of the test piles should be the same as the designed working piles. The construction methodology and type of equipment used for the construction of test piles must also be same as envisaged for the working piles. The test piles shall be loaded to at least 2.5 times the theoretical design load carrying capacity of the pile or to failure.

5.5 References

5.1 Bowles, J. E., "Foundation Analysis and Design", McGraw Hill International Editions, Civil Engineering Series, 5th Edition, 1996.

6 CONCLUSIONS AND RECOMMENDATIONS

1. During these investigations, the subsurface was explored to a maximum depth of 50 m below EGL. The location of all exploratory points is shown on Fig. 2-1.

2. Various soil layers encountered at the site below the existing ground surface are described in section 4.4 and graphically represented in linear subsurface profiles shown on Figs. 4-1 to 4-3.

3. Ground water table (GWT) was encountered in all boreholes in the range from 5.1m to 5.7m depth below existing ground level (EGL) during these investigations.

4. On the basis of our evaluations, the soil profile type as per Building Code of Pakistan, (Seismic Provision 2007) can be taken as S_D (i.e. Stiff Soil Profile).

5. The overburden soils at site predominantly have fine content in excess of 30%. Such soils are not likely to undergo liquefaction. As such no liquefaction hazard exists at the site.

6. On the basis of concentrations of sulphates determined in the foundation soil and ground water samples, the exposure is classified as **"Not Applicable"** as explained in ACI 318M-11 Table 4.2.1. The concrete mix design should follow the recommendations of ACI 318 accordingly.

7. Keeping in view the available information provided by the Client, evaluations have been made for deep foundations. Deep foundations can be cast in-situ bored piles. Allowable load carrying capacities for piles in compression and tension are shown in Figs. 5-1 & 5-6.

8. Some construction considerations are discussed in section 5.7 & 5.8.

APPENDIX - A
TABLES AND FIGURES

Table 1-1. Depths, Coordinates and Elevations of Boreholes

Sr. No.	Borehole Designation	EASTING	NORTHING	ELEVATION	Depth
		(m)	(m)	(m)	(m)
1	BH-1	402686.474	3457793.991	204.6	50
2	BH-2	402714.314	3457829.378	204.6	35
3	BH-3	402634.026	3457815.014	204.53	35
4	BH-4	402430.921	3458097.023	204.75	30
5	BH-5	402378.682	3458053.599	204.75	30
6	BH-6	402341.306	3457999.601	204.93	40
7	BH-7	402465.234	3458106.012	205	30
8	BH-8	402401.339	3458035.257	204.63	30
9	BH-9	402451.443	3458072.069	204.4	40
10	BH-10	402421.365	3458019.651	204.29	30
11	BH-11	402379.669	3457967.044	204.74	40
12	BH-12	402500.309	3458025.009	204.38	40
13	BH-13	402466.281	3457981.241	204.27	30
14	BH-14	402435.83	3457942.167	204.74	40
15	BH-15	402483.127	3457971.944	204.33	40
16	BH-16	402526.401	3458004.703	204.26	30
17	BH-17	402461.858	3457921.883	204.46	30
18	BH-18	402567.355	3458012.518	204.51	30
19	BH-19	402545.321	3457982.781	204.34	30
20	BH-20	402533.052	3457956.618	204.53	40
21	BH-21	402525.444	3457938.881	204.51	30
22	BH-22	402606.419	3457968.129	204.56	30
23	BH-23	402580.127	3457943.386	204.55	40
24	BH-24	402561.276	3457930.538	204.55	30
25	BH-25	402566.704	3457906.756	204.54	40
26	BH-26	402643.531	3457949.833	204.54	30
27	BH-27	402629.028	3457910.982	204.75	40
28	BH-28	402605.879	3457889.676	204.58	40
29	BH-29	402675.044	3457914.864	204.68	30
30	BH-30	402655.014	3457891.982	204.68	30
31	BH-31	402606.434	3457847.93	204.54	35
32	BH-32	402584.072	3457822.378	204.63	50
33	BH-33	402617.151	3457828.168	204.55	50
34	BH-34	402709.932	3457910.889	204.68	40
35	BH-35	402678.659	3457873.555	204.54	40
36	BH-36	402659.006	3457848.301	204.54	30
37	BH-37	402645.035	3457838.287	204.53	30
38	BH-38	402620.512	3457793.98	204.58	35
39	BH-39	402691.283	3457847.327	204.55	50
40	BH-40	402674.611	3457825.607	204.55	35
41	BH-41	402659.151	3457800.889	204.54	35
42	BH-42	402748.691	3457873.493	204.54	50
43	BH-43	402739.841	3457869.694	204.58	50
44	BH-44	402722.801	3457866.295	204.55	35
45	BH-45	402729.493	3457848.991	204.54	35
46	BH-46	402694.35	3457810.316	204.54	50
47	BH-47	402679.658	3457784.907	204.58	35
48	BH-48	402746.515	3457863.834	204.63	35
49	BH-49	402748.04	3457846.471	204.61	35
50	BH-50	402737.365	3457811.506	204.59	50
51	BH-51	402717.992	3457791.8	204.58	35
52	BH-52	402700.29	3457768.926	204.53	35

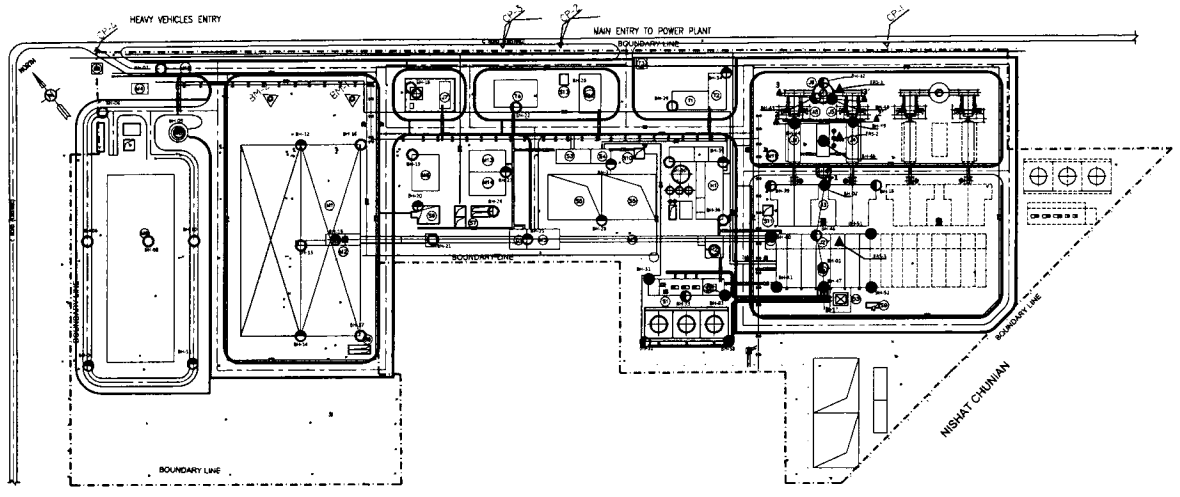
Berkeley Associates

Table 3-1 Summary of Laboratory Test Results

Project : 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan

Borehole No.	Sample No.	Depth	Grain Size Analysis			Specific Gravity	Bulk Density	N.M.C	Unconfined Compression		Liquid limit	Plastic Index	Consolidation Test			Direct shear Test		Soil Classification (USCS)	
			Gravels	Sand	Fines				qu	Strain			$a_{1\text{-}0.2}$	Es		C	Ø	Group Symbol	Group Name
		(m)	(%)	(%)	(%)	Gs	(kN/m^3)	(%)	(kPa)	%	(%)	(%)	(MPa-1)	E100-200 (MPa)	e_0	(kPa)	(°)		
BH-1	SPT-1	1.0	9.0	6.1	84.9						25.0	6.0						CL-ML	Silty Clay with Gravel
	UDS-1	2.0	0.0	1.1	98.9	2.67	18.13	15.4	68	6.4	28.0	5.0						ML	Silt
	UDS-2	4.0	0.0	3.6	96.4	2.66	18.84	15.1	41	7.9	24.0	4.0						CL-ML	Silty Clay
	UDS-3	6.5	0.0	5.0	95.0	2.68	19.47	17.2	70	7.1	27.0	7.0						CL-ML	Silty Clay
	UDS-4	9.5	0.0	3.7	96.3	2.63	19.38	16.3	70	6.4	23.0	3.0						ML	Silt
	SPT-5	11.0	0.4	50.3	49.3											15.0	28.5	SM	Silty Sand
	SPT-16	27.5	2.2	83.5	14.3											0.0	33.3	SM	Silty Sand
	SPT-21	35.0	0.0	99.2	0.8													SP	Poorly graded sand
	SPT-31	50.0	8.1	67.4	24.5											0.0	33.3	SM	Silty Sand
BH-2	SPT-2	3.0	0.0	8.3	91.7						33.0	12.0						CL	Lean Clay
	UDS-1	4.0	0.0	4.3	95.7	2.70	19.27	18.8	78	5.7	32.0	10.0						CL	Lean Clay
	UDS-2	6.0	0.0	3.7	96.3	2.63	19.26	19.3	91	6.4	22.0	3.0						ML	Silt
	UDS-3	8.0	0.0	0.7	99.3	2.72	18.97	22.7	122	6.6	38.0	14.0						CL	Lean Clay
	SPT-5	11.0	0.0	24.4	75.6											21.0	29.7	ML	Sandy Silt
	SPT-8	15.5	0.6	41.6	57.8											15.0	30.4	ML	Sandy Silt
	UDS-4	24.5	0.0	72.2	27.8	2.64					Non-Plastic		0.0858	19.52	0.6748			SM	Silty Sand
	SPT-18	32.0	4.9	84.2	10.9											0.0	32.6	SP-SM	Poorly graded sand with
BH-3	UDS-1	2.0	0.0	2.4	97.6	2.63	18.40	19.7	31	6.5	25.0	3.0						ML	Silt
	UDS-2	4.5	0.0	6.1	93.9	2.62	19.50	22.3	25	7.2	24.0	3.0						ML	Silt
	UDS-3	6.5	0.0	3.0	97.0	2.64	19.60	24.8	62	9.3	28.0	4.0						ML	Silt
	SPT-6	9.5	0.0	4.2	95.8						24.0	4.0						CL-ML	Silty Clay
	UDS-4	11.0	0.0	3.5	96.5	2.67	19.70	20.7	71	9.3	27.0	6.0						CL-ML	Silty Clay
	UDS-5	14.0	0.0	64.4	35.6	2.64	19.40	24.6	Sample collapse due to sand		Non-Plastic							SM	Silty Sand
	SPT-8	15.5	0.2	86.7	13.1											0.0	32.2	SM	Silty Sand
	SPT-15	26.0	0.2	86.7	13.1											0.0	33.3	SM	Silty Sand
	SPT-16A	27.5	1.9	36.7	61.4													ML	Sandy Silt
	SPT-16B	27.5	3.8	77.3	18.9													SM	Silty Sand
	SPT-19	32.0	0.0	91.4	8.6											0.0	33.7	SP-SM	Poorly graded sand with

FIG NO. 2-1



LOCATION OF BORE HOLES			
NOS.	EASTING	NORTHING	ELEVATION
BH-1	402691.279	3457783.631	204.40
BH-2	402717.677	3457818.977	204.60
BH-3	402639.364	3457804.748	204.53
BH-4	402430.923	3458097.000	204.75
BH-5	402280.307	3458046.020	204.75
BH-6	402539.474	3457999.868	204.23
BH-7	402471.045	3458094.029	205.00
BH-8	402407.095	3458025.380	204.62
BH-9	402457.205	3458062.103	204.40
BH-10	402427.254	3458009.740	204.29
BH-11	402386.188	3457957.224	204.74
BH-12	402395.9816	3458014.972	204.38
BH-13	402471.888	3457971.235	204.27
BH-14	402441.302	3457932.258	204.74
BH-15	402468.650	3457941.924	204.33
BH-16	402532.547	3457994.617	204.24
BH-17	402447.368	3457911.903	204.46
BH-18	402575.015	3458002.364	204.51
BH-19	402530.932	3457972.663	204.34
BH-20	402525.9054	3457948.657	204.53
BH-21	402530.983	3457928.796	204.51
BH-22	402612.207	3457937.610	204.56
BH-23	402585.682	3457932.304	204.55
BH-24	402566.802	3457920.393	204.55
BH-25	402573.26	3457895.574	204.54
BH-26	402549.290	3457939.551	204.54

LOCATION OF BORE HOLES			
NOS.	EASTING	NORTHING	ELEVATION
BH-27	402634.530	3457900.718	204.73
BH-28	402611.339	3457879.457	204.58
BH-29	402680.346	3457904.529	204.68
BH-30	402660.479	3457881.680	204.68
BH-31	402611.826	3457837.709	204.54
BH-32	402589.394	3457812.124	204.63
BH-33	402622.511	3457817.928	204.55
BH-34	402715.491	3457900.473	204.68
BH-35	402684.094	3457862.21	204.54
BH-36	402644.900	3457837.99	204.54
BH-37	402630.412	3457828.000	204.53
BH-38	402625.814	3457783.733	204.58
BH-39	402694.648	3457836.894	204.58
BH-40	402678.967	3457815.272	204.55
BH-41	402664.467	3457790.579	204.54
BH-42	402754.120	3457863.041	204.54
BH-43	402745.270	3457859.250	204.58
BH-44	402728.525	3457836.680	204.55
BH-45	402754.689	3457838.344	204.56
BH-46	402699.661	3457799.872	204.54
BH-47	402684.948	3457774.563	204.58
BH-48	402751.936	3457853.379	204.63
BH-49	402733.430	3457836.168	204.51
BH-50	402742.707	3457801.061	204.59
BH-51	402723.294	3457721.392	204.56
BH-52	402705.430	3457758.547	204.55

Legend of Boring Holes

Legend	Boring Hole Type
	Controlling Boring(50m)
	Normal Boring(35m)
	Controlling Boring(40m)
	Normal Boring(30m)
	Bench Mark
	ERS Point

PROJECT:
1 x 40 MW Coal Based Captive Power of Nishat Chunian Ltd., Pakistan

TITLE:
GEOTECHNICAL INVESTIGATIONS PLAN

DRAWN BY: MUJTABA

CHECKED BY: SHOAIB

DATE: 30-09-2014

Berkeley Associates
316-D,OFF Housing Society, Raiwind Road, Lahore
Contact: +92-42-35323312-15
Fax: +92-42-35323316
E-mail: berkeley.associates@gmail.com

JOB NO. J-576

FIG NO. 2-1

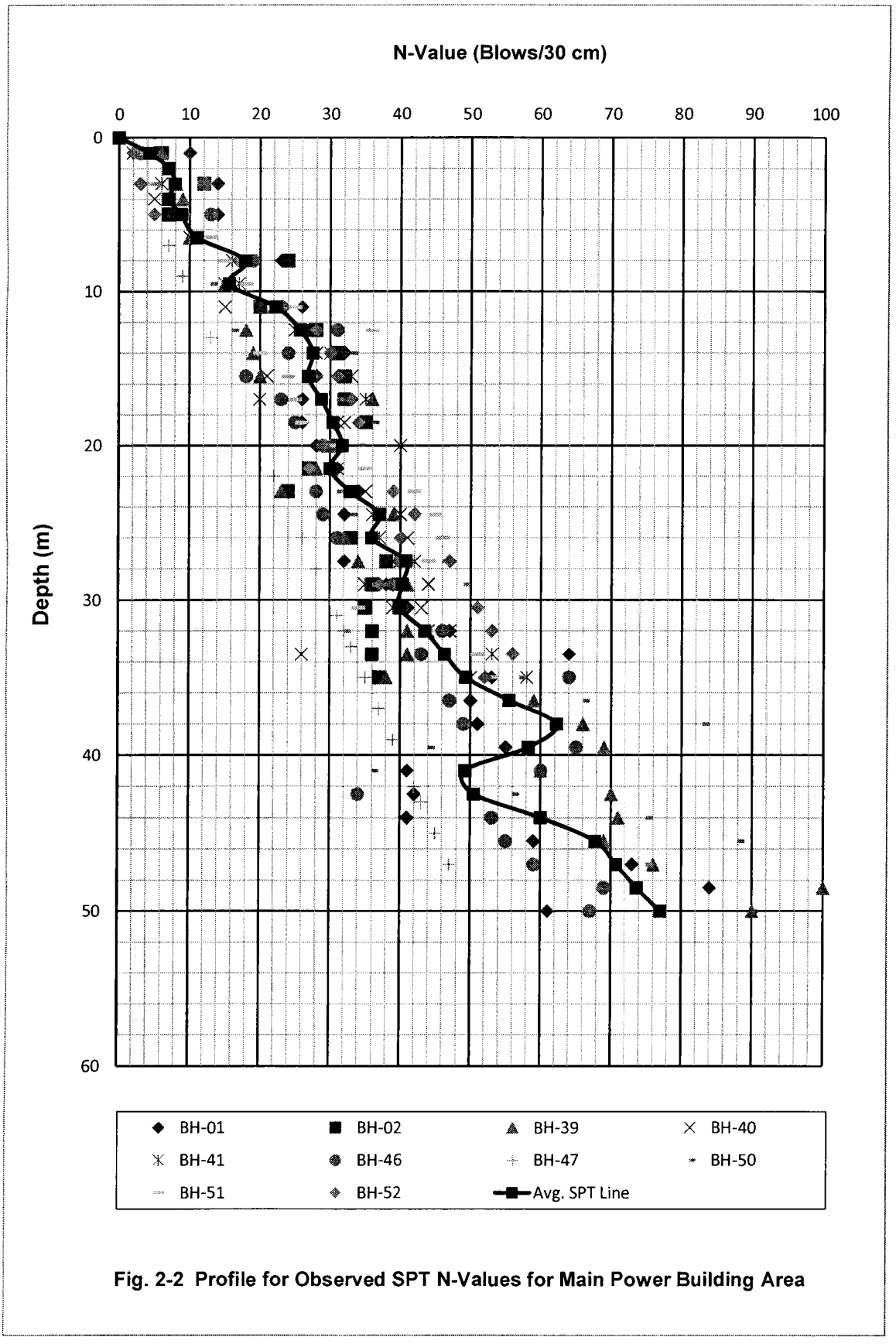


Fig. 2-2 Profile for Observed SPT N-Values for Main Power Building Area

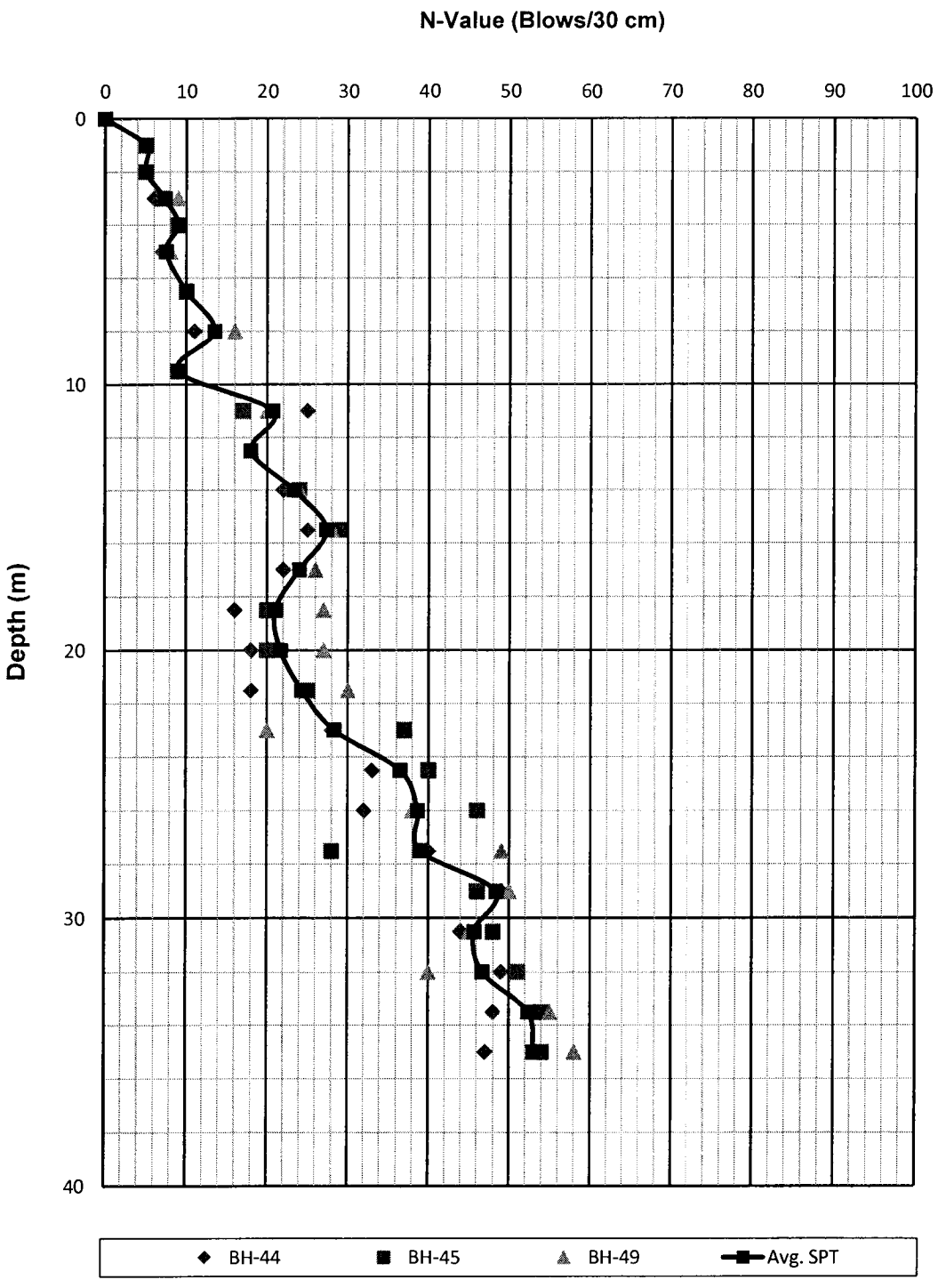


Fig. 2-3 Profile for Observed SPT N-Values for Boiler

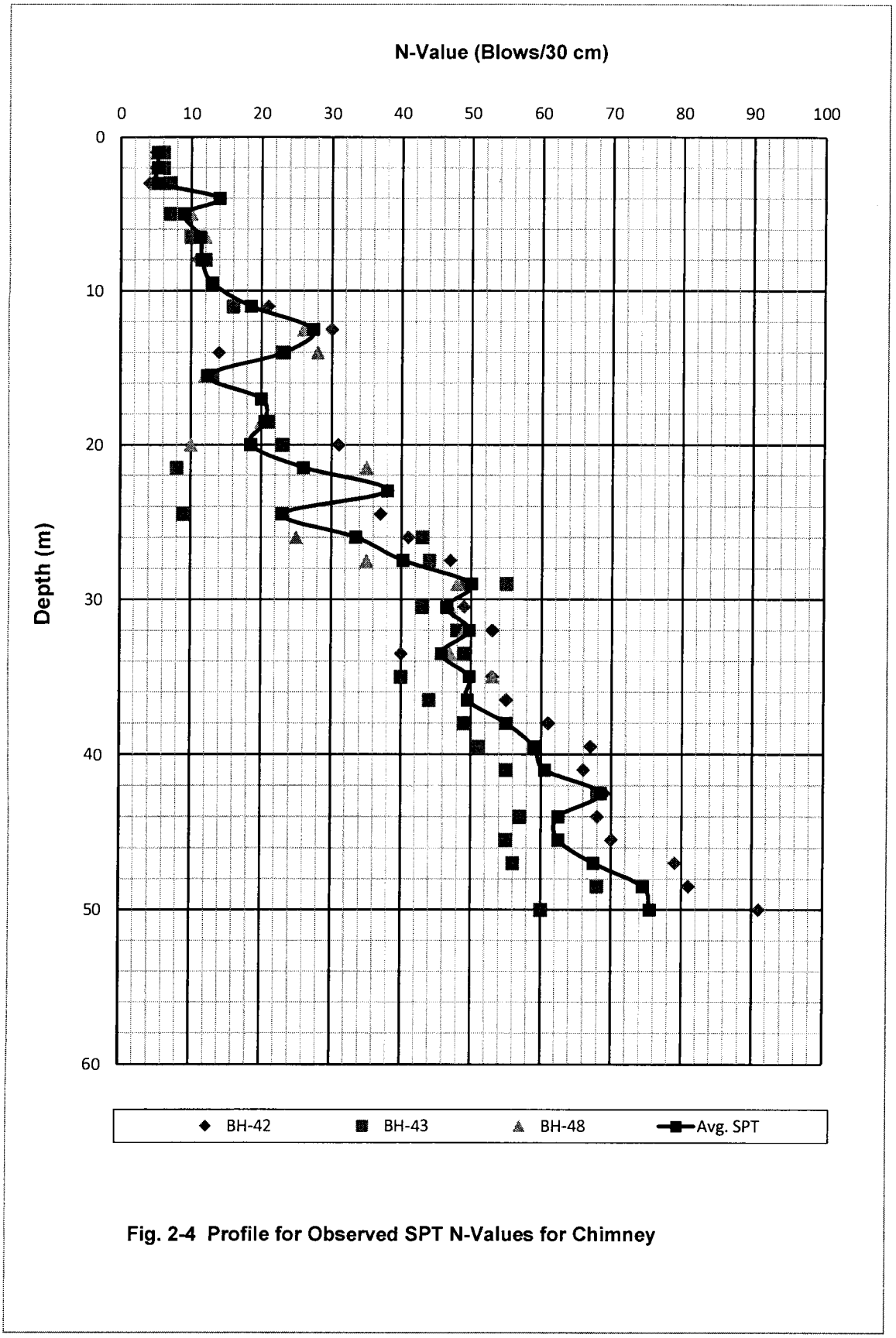


Fig. 2-4 Profile for Observed SPT N-Values for Chimney

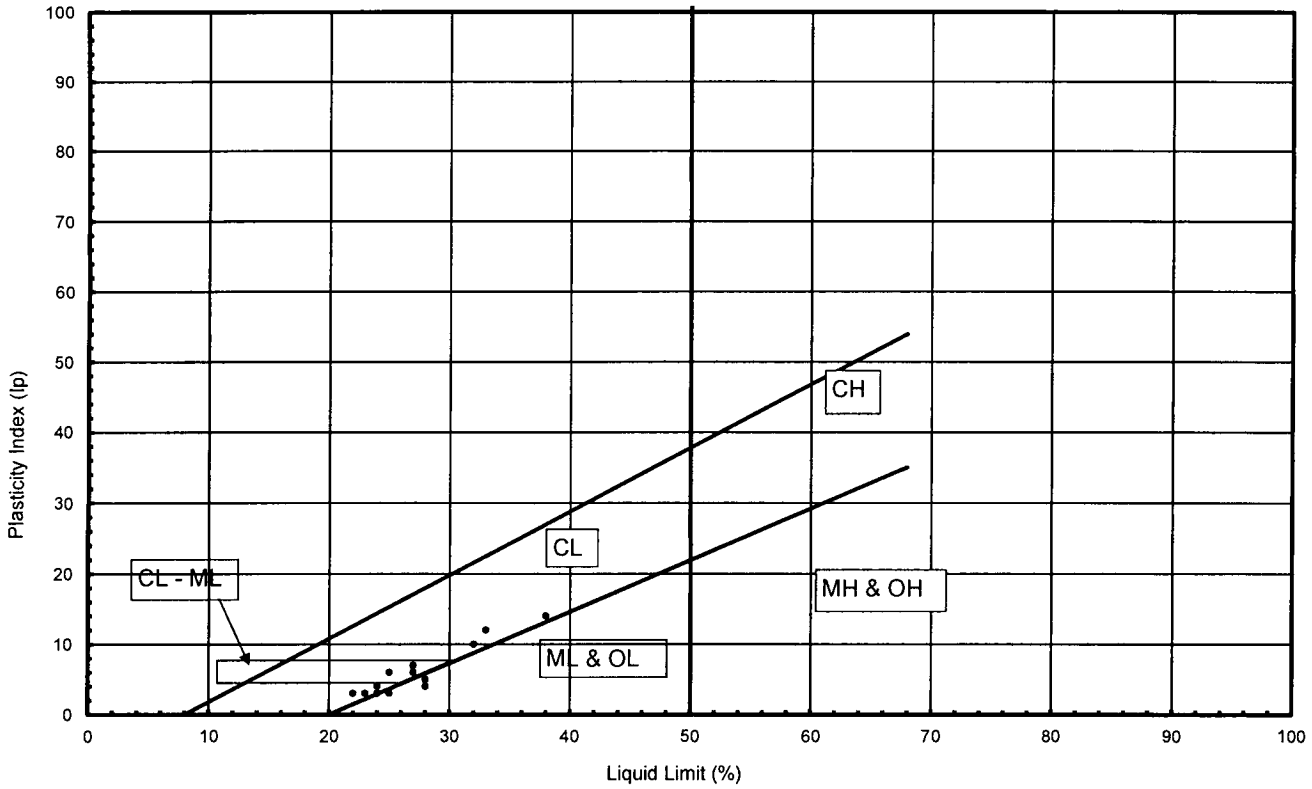
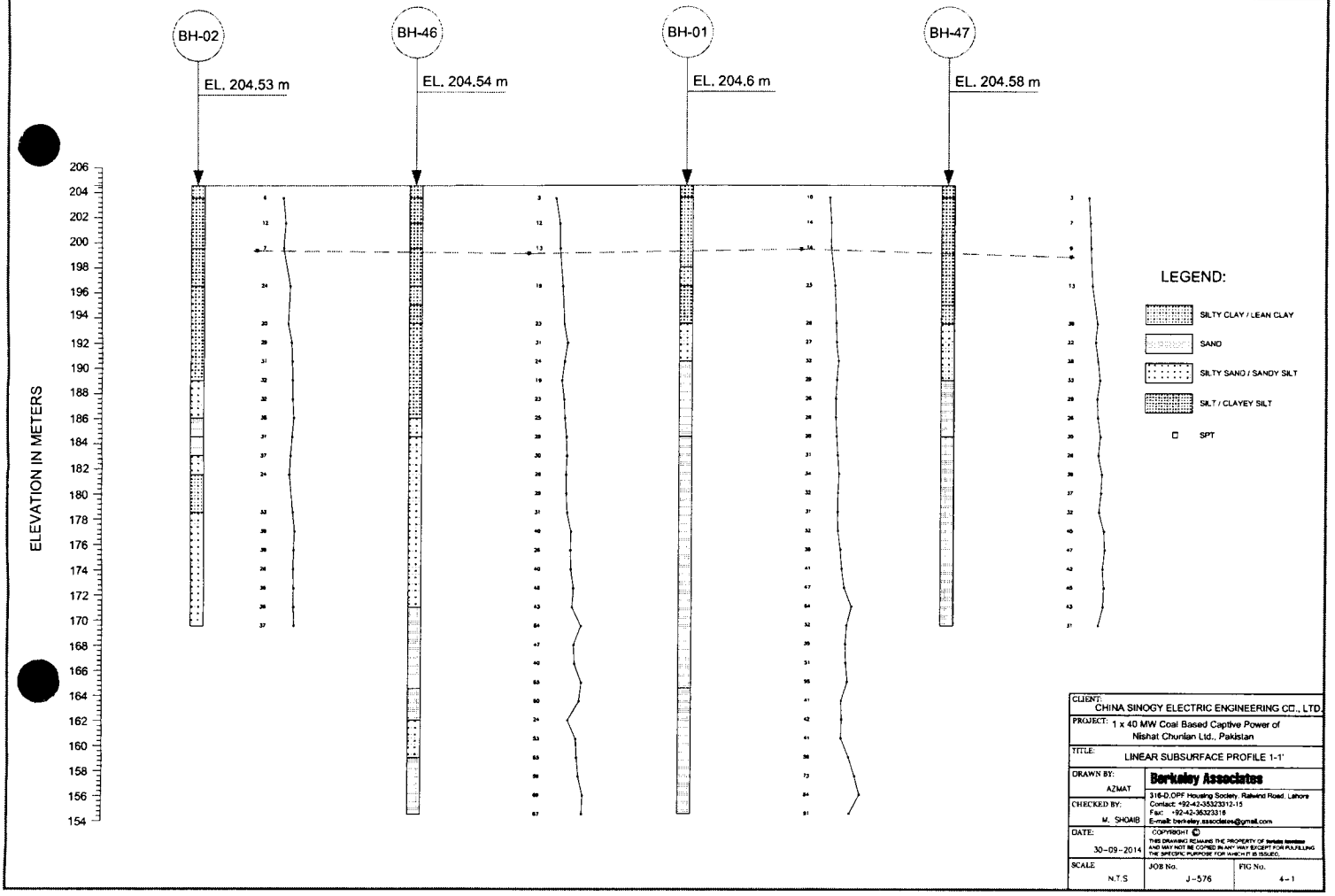


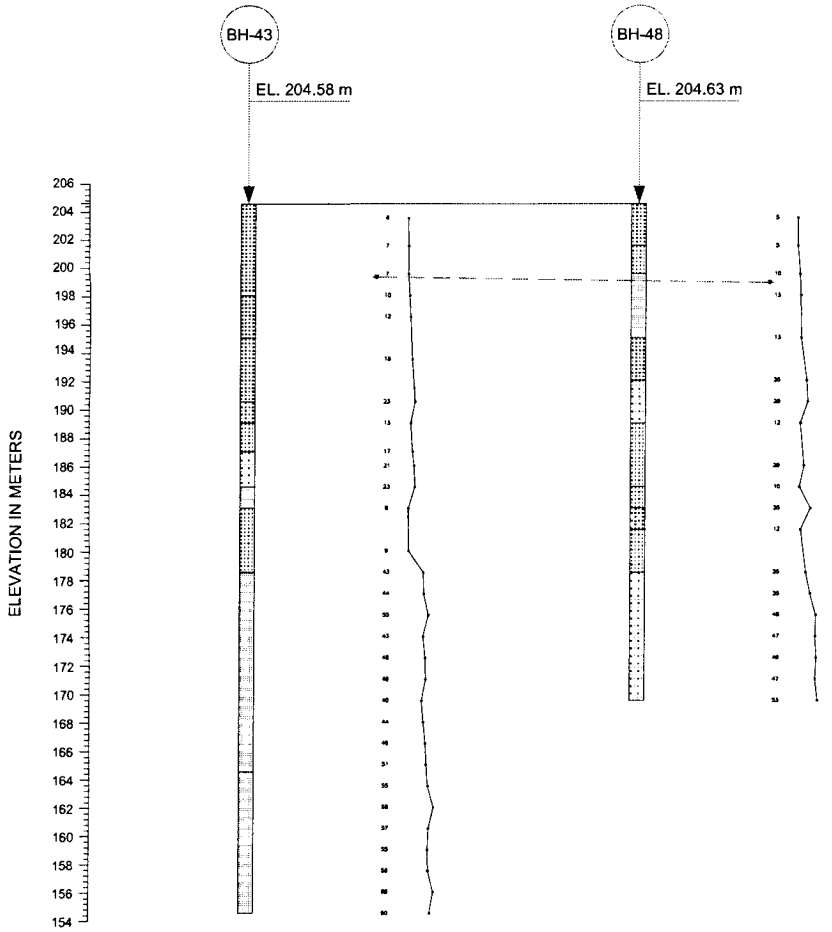
Fig. 3-1 Casagrande Plasticity Chart

FIG. 4-1



CLIENT:	CHINA SINOGY ELECTRIC ENGINEERING CO., LTD.
PROJECT:	1 x 40 MW Coal Based Captive Power of Nishat Chunian Ltd., Pakistan
TITLE:	LINEAR SUBSURFACE PROFILE 1-1'
DRAWN BY: AZMAT	Berkeley Associates
CHECKED BY: M. SHOAIB	316-D,OPF Housing Society, Raiwind Road, Lahore Contact: +92-42-35323312-15 Fax: +92-42-35323316 E-mail: berkeley.associates@gmail.com
DATE: 30-09-2014	COPYRIGHT © THIS DRAWING REMAINS THE PROPERTY OF Berkeley Associates AND MAY NOT BE COPIED IN ANY WAY EXCEPT FOR FULFILLING THE SPECIFIC PURPOSE FOR WHICH IT IS ISSUED.
SCALE: N.T.S	JOB No. J-576 / FIG No. 4-1

FIG. 4-1



LEGEND:

- SILTY CLAY / LEAN CLAY
- SAND
- SILTY SAND / SANDY SILT
- SILT / CLAYEY SILT
- SPT

CLIENT:	CHINA SINOGY ELECTRIC ENGINEERING CO., LTD.
PROJECT:	1 x 40 MW Coal Based Captive Power of Nishat Chunian Ltd., Pakistan
TITLE:	LINEAR SUBSURFACE PROFILE 2-2'
DRAWN BY: AZMAT	Berkeley Associates
CHECKED BY: M. SHOAIB	316-D, OPF Housing Society, Raiwind Road, Lahore Contact: +92-42-35323312-15 Fax: +92-42-35323316 E-mail: berkeley.associates@gmail.com
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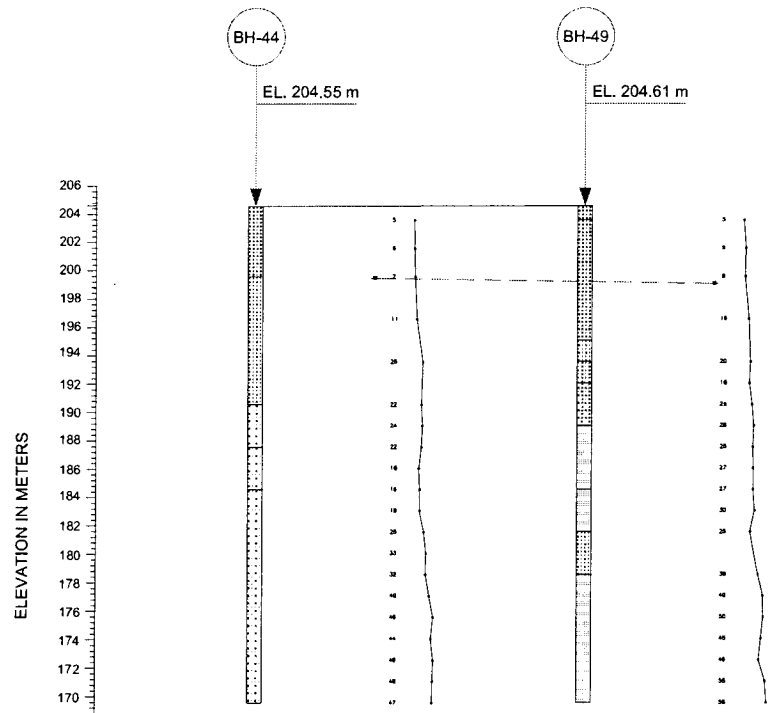
SCALE: N.T.S	JOB No.: J-576 / FIG No.: 4-2

FIG. 4-3



LEGEND:

- SILTY CLAY / LEAN CLAY
- SAND
- SILTY SAND / SANDY SILT
- SILT / CLAYEY SILT
- SPT

CLIENT:	CHINA SINOGY ELECTRIC ENGINEERING CO., LTD.
PROJECT:	1 x 40 MW Coal Based Captive Power of Nishat Chunian Ltd., Pakistan
TITLE:	LINEAR SUBSURFACE PROFILE 3-3'
DRAWN BY: AZMAT	Berkeley Associates
CHECKED BY: M. SHOAIB	316-D OPF Housing Society, Raiwind Road, Lahore Contact: +92-42-35323312-15 Fax: +92-42-35323316 E-mail: berkeley.associates@gmail.com
DATE: 30-09-2014	COPYRIGHT © THIS DRAWING REMAINS THE PROPERTY OF Berkeley Associates AND MAY NOT BE COPIED IN ANY WAY EXCEPT FOR FULFILLING THE SPECIFIC PURPOSE FOR WHICH IT IS ISSUED.
SCALE: N.T.S	JOB No.: J-576 / FIG No.: 4-3

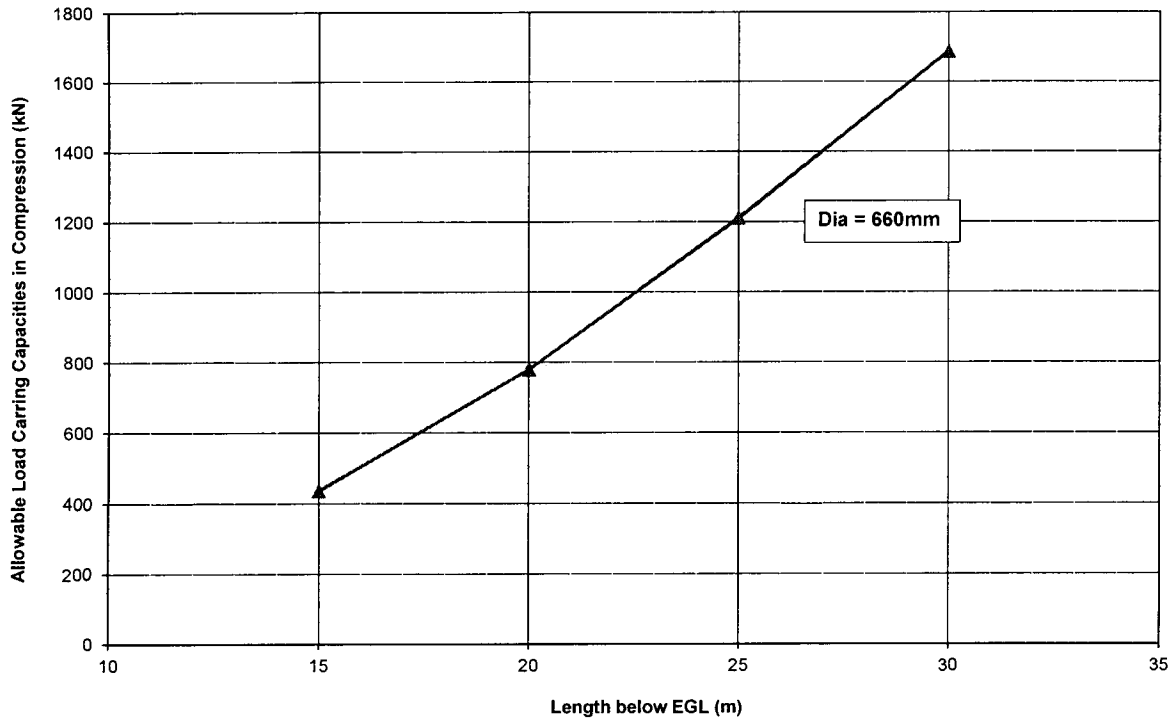


Fig. 5-1. Allowable Load Carrying Capacities of Piles in Compression for Main Power Building

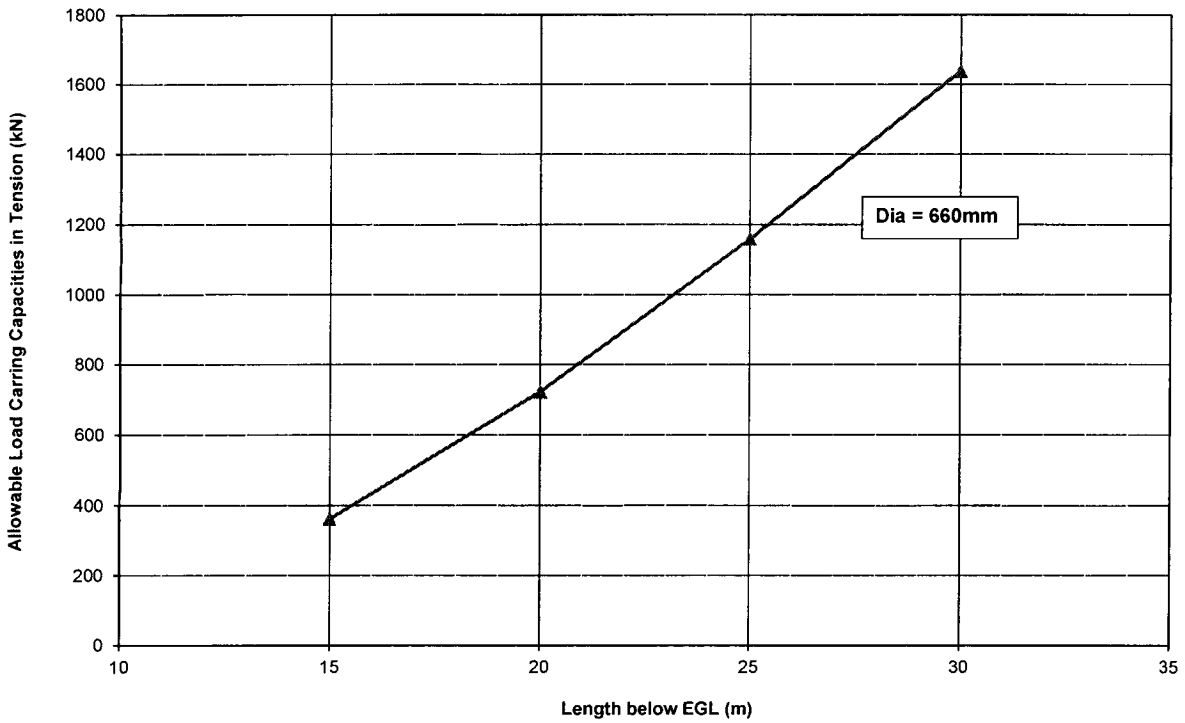


Fig. 5-2. Allowable Load Carrying Capacities of Piles in Tension for Main Power Building

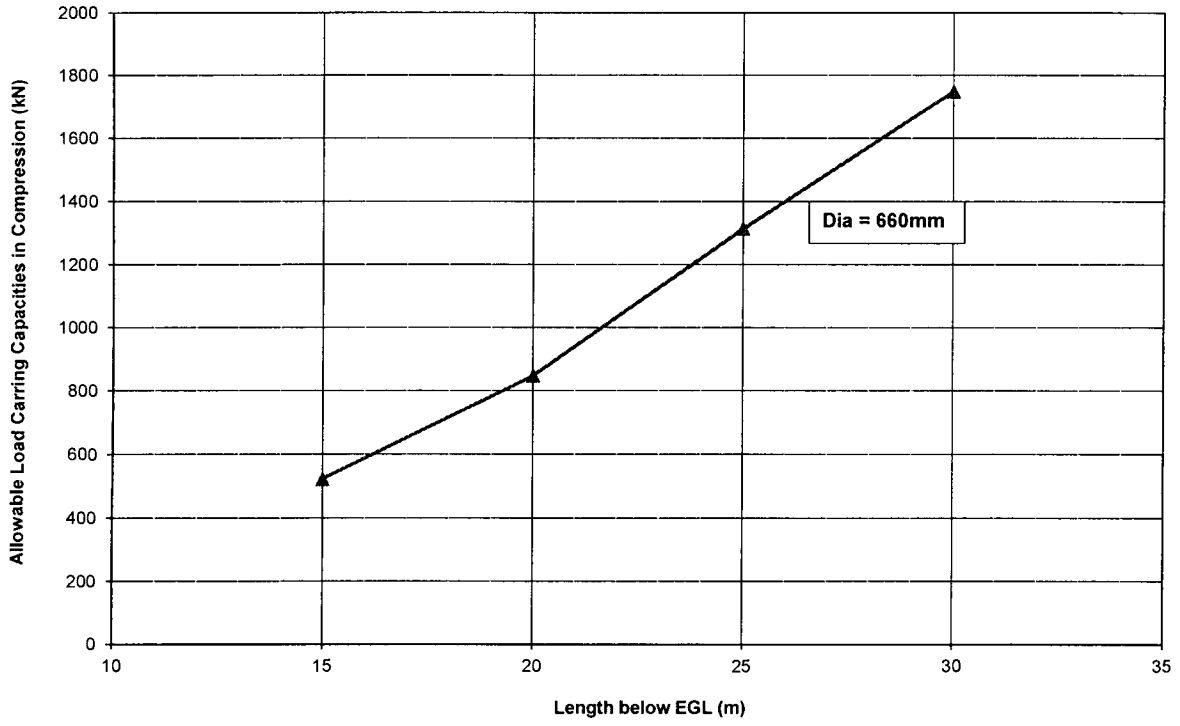


Fig. 5-3. Allowable Load Carrying Capacities of Piles in Compression for Boiler

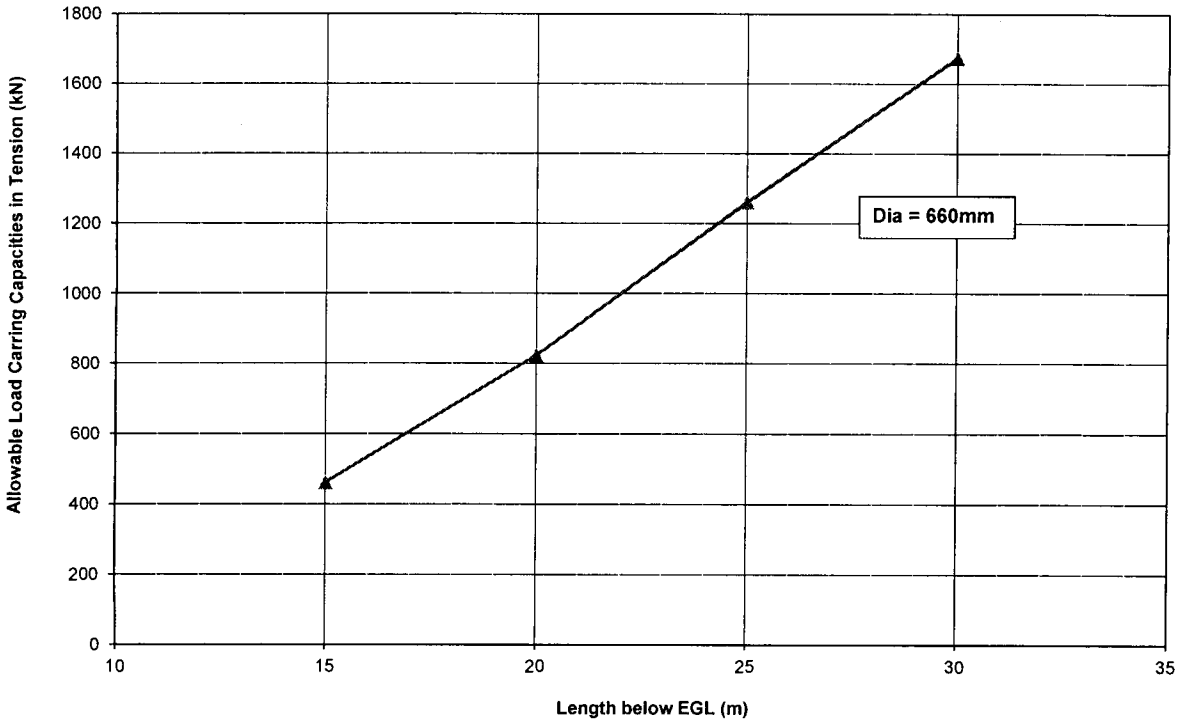


Fig. 5-4. Allowable Load Carrying Capacities of Piles in Tension for Boiler

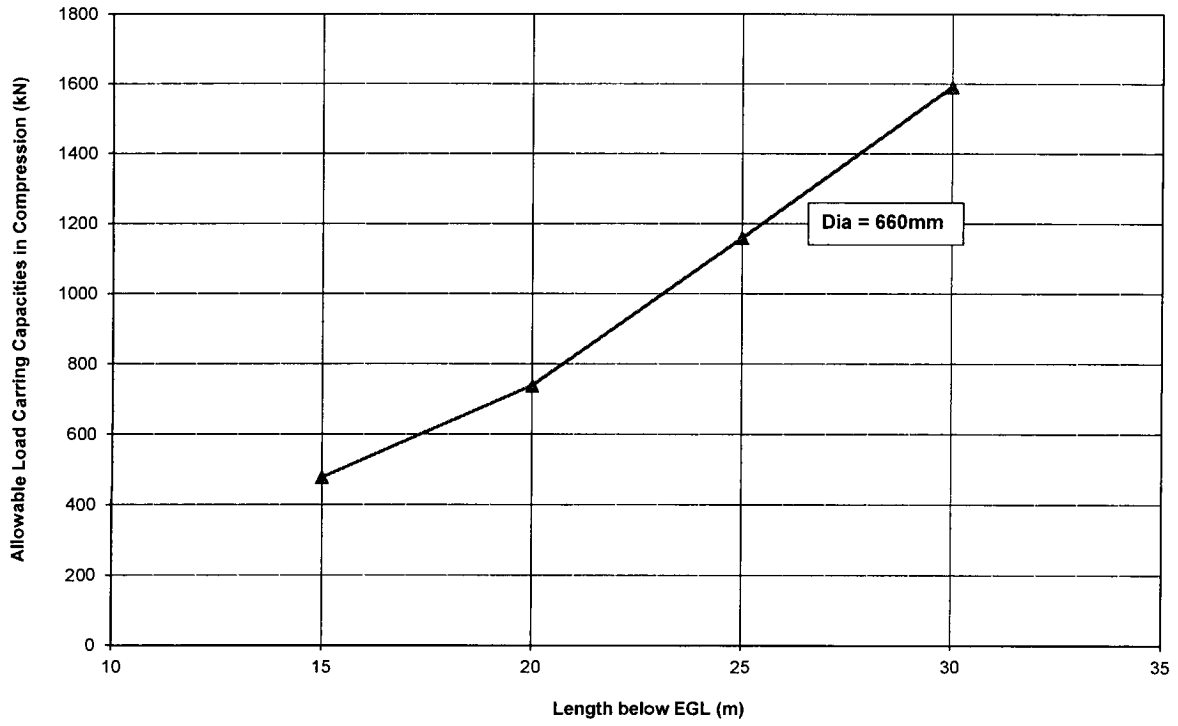


Fig. 5-5. Allowable Load Carrying Capacities of Piles in Compression for Chimney

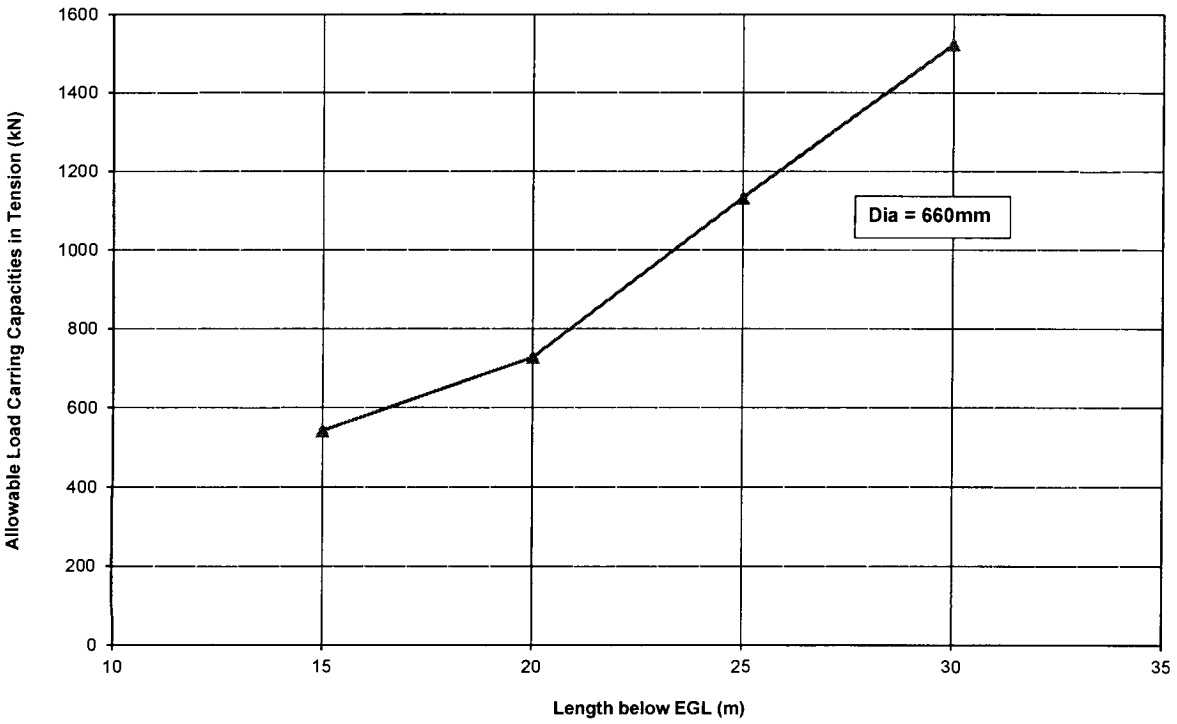


Fig. 5-6. Allowable Load Carrying Capacities of Piles in Tension for Chimney

APPENDIX – B
FIELD BOREHOLE LOGS

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE: _____
EASTING: _____ NORTHING: _____
ELEVATION: _____
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-01 SHEET 1 OF 7
DEPTH OF G.W. _____ FINAL DEPTH 50.0m
WORK STARTED ON 3-09-2014 ENDED ON 8-9-14
LOGGED BY SHAHID SALEEM CHECKED BY _____

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.0						Silty clay / clayey silt, Light brown, Dry, Trace plants & Grass roots, little concretion	OPEN PIT MATERIAL
1.0	SPT-01	3	4	6	(10)	Clayey Silt: Light brown, Stiff, Moist, Trace angular concretion, Trace fine Sand,	SL = 35cm
2.0	UDS-01					Clayey Silt: Same as above	UDS-01, SHELBY at 2.0 – 2.5m
3.0	SPT-02	4	6	8	(14)	Clayey Silt: Light brown, stiff, moist, Trace fine Sand, Sandy Content increasing toward bottom	SL = 30 cm.
4.0	UDS-02					Same as above	UDS-02, DENISON at 4.0 – 4.5m
5.0	SPT-03	4	6	8	(14)	— DO —	SL = 30 cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-01 SHEET 2 OF 7
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 50.0m
EASTING: NORTHING: WORK STARTED ON 03-09-14 ENDED ON 8-9-14
ELEVATION: LOGGED BY SHAHID CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
6.5	UDS-03					Clayey Sandy Silt: Light brown, Wet, clayey content decreasing and Sandy content increasing toward bottom	UDS-03, DENISON at 6.5-7.2m
8.0	SPT-04	6	9	14	(23)	Clayey Silt: Light brown, very stiff, Wet, Traee fine Sand	SL=33cm
9.5	UDS-04					clayey Silt. Same as above	UDS-04, DENISON at 9.5-10.0m
11.0	SPT-5	9	12	14	(26)	Silty Sand: Light brown to light grey, Medium dense, clayey contaminated, Traee mica.	SL=35cm.
12.5	SPT-6	10	12	15	(27)	— DO —	SL=20cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-01 SHEET 3 OF 7
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 50.0m
EASTING: NORTHING: WORK STARTED ON 03-09-14 ENDED ON 8-9-14
ELEVATION: LOGGED BY SHAHID CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
14.0	SPT-7	12	15	17	(32)	Fine Sand, Light grey, Dense, Fine grained, Sorted, Water Saturated, Trace mica.	SL = 40cm
15.5	SPT-8	10	13	15	(28)	— DO —	SL = 38cm
17.0	SPT-9	10	15	11	(26)	Fine Sand- Light grey, Medium dense, Fine grained, unsorted, Water saturated, Trace mica, Trace Concretion	SL = 40cm
18.5	SPT-10	11	12	14	(26)	— DO —	SL = 42 cm
20.0	SPT-11	10	13	15	(28)	— DO —	SL = 30 cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-01 SHEET 4 OF 7
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 50.0m
EASTING: NORTHING: WORK STARTED ON 03-09-14 ENDED ON 8-9-14
ELEVATION: LOGGED BY SHAHIN CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21.5	SPT-12	10	15	16	(31)	— DO —	SL = 30 cm
23.0	SPT-13	14	16	18	(34)	— DO —	SL = 26 cm
24.5	SPT-14	12	15	17	(32)	— DO —	SL = 31 cm
26.0	SPT-15	10	15	16	(31)	— DO —	SL = 30 cm
27.5	SPT-16	10	14	18	(32)	Sand: Light grey, Dense, Fine to medium grained, Poorly Sorted, Clayey	SL = 30 cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-01 SHEET 5 OF 7
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 50.0m
EASTING: NORTHING: WORK STARTED ON 03-09-14 ENDED ON 8-9-14
ELEVATION: LOGGED BY SHAHID CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						Contaminated, Compacted greyish clay at some places, Trace to little concretion, Trace mica	
29.0	SPT-17	14	17	21	(38)	Fine Sand: Light grey, Dense, Fine grained, clean water saturated, Sorted, Trace mica	SL = 31cm
30.5	SPT-18	15	18	23	(41)	—— DO ——	SL = 33cm
32.0	SPT-19	18	21	26	(47)	—— DO ——	SL = 30cm
33.5	SPT-20	20	30	34	(64)	Fine Sand: Light grey, very dense, Fine grained, clean, Sorted, Water Saturated, Trace mica.	SL = 34cm
35.0	SPT-21	16	24	29	(53)	Sand: Light grey, very dense, Fine to medium grained, clayey contaminated, Water	SL = 35cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	-	20 - 35 % Some	35 - 50 % And

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-01 SHEET 6 OF 7
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 50.0m
EASTING: NORTHING: WORK STARTED ON 03-09-14 ENDED ON 8-9-14
ELEVATION: LOGGED BY SHAHID CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
7-9-14						Saturated, Unsorted, Trace to little Concretion, Trace mica	
8-9-14 36.5	SPT-22	18	22	28	(50)	— DO —	SL = 25 cm
38.0	SPT-23	16	24	27	(51)	— DO —	SL = 29 cm
39.5	SPT-24	20	25	30	(55)	Sand, Light grey, Very dense, Fine to medium grained, Poorly Sorted, Water Saturated, Some Concretion, Trace mica.	SL = 36 cm
0	SPT-25	14	18	23	(41)	Sand: Light grey, Dense, Fine to medium, grained, Poorly sorted, Water saturated, Some Concretion, Trace mica.	SL = 26 cm
42.5	SPT-26	14	17	25	(42)	— DO —	SL = 25 cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-01 SHEET 7 OF 7
DEPTH OF G.W. FINAL DEPTH 50.0m
WORK STARTED ON 03-09-14 ENDED ON 8-09-2014
LOGGED BY SHAHID CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
44.0	SPT-27	17	20	21	(41)	— Do —	SL = 32cm
45.5	SPT-28	14	27	32	(59)	Fine Sand: Light grey, very dense, Fine grained, clean, Sorted, Water Saturated, Trace to little mica. Trace Concretion.	SL = 35cm
47.0	SPT-29	25	33	40	(73)	— DO —	SL = 36cm
48.5	SPT-30	25	35	49	(84)	— DO —	SL = 40cm
50.0	SPT-31	20	28	33	(61)	Sand: Light grey, very dense, Fine to medium grained, Unsorted, Some concretion, Trace mica.	SL = 41cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

PROJECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
LOCATION _____

JOB No. J-576
BOREHOLE NO. BH-01

1 Sr No.	2 UDS No.	3 Depth (m) From	3 To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weigit of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sampla Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
1	1	2.0	2.5	SHELBY	70.0		73.55			1704	3850 5670	27	25		50			
2	2	4.0	4.5	DENISON	69.5		73.4			1680	5662	47	44		50			
3	3	6.5	7.0	DENISON	70.1		73.45			1690	4830	43	40		50			
	4	9.5	10.0	DENISON	70.0		73.4			1700	4290	31	29		50			

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-2 SHEET 1 OF 6
DEPTH OF G.W. 4.80m FINAL DEPTH 35 METER
WORK STARTED ON 7.9.14 ENDED ON 8-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.0		/				—— /-do ——	/
1.00	SPT-1	1	3	3	(6)	MOIST Brown silty clay Trace Fine grass Roots, organice.	SL > 22cm
3.00	UDS	DENSON TUBE			—	MOIST Brown Filan clayey silt, Trace Sand.	Sample was washed (NIL)
3.00	SPT-2	4	6	6	(12)	—— do ——	
4.00	UDS-1	SHELBY TUBE			—	Brownish Grey stiff silt / clayey silt, Trace mica.	UDS-1 4.00/4.50m SL > 36cm Waxed > 32cm
						—— do ——	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace.	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-2 SHEET 2 OF 6
DEPTH OF G.W. 4.80m FINAL DEPTH 35 METER
WORK STARTED ON 7-9-14 ENDED ON 8-9-14
LOGGED BY M ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
5.00	SPT-3	3	3	4	(7)	Brown mix Grey Firm Silty clay Trace Sand.	SL = 37cm
6.5	UDS-2	DENSON TUBE			—	MOIST Brown Silt/clayey silt Trace mica	UDS-2 6.50/7.00 m SL = 35cm washed = 30cm
8.00	SPT-4	8	11	13	(24)	MOIST Brown clay Sandy Silt Trace mica,	SL = 30cm
9.50	UDS-3	DENSON TUBE			—	Top:- Brown Silt/clay Sandy silt. Bottom. Brown silt Trace Sand.	UDS-3 9.50/10.00 m SL = 37cm washed = 30cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And		

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-2
DEPTH OF G.W. 4.80m
WORK STARTED ON 7-9-14
LOGGED BY M ALI CHUGHTAI

SHEET 3 OF 6
FINAL DEPTH 35 METER
ENDED ON 8-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
11.00	SPT-5	5	9	11	20	— do —	SL=43cm
						Brownish Grey medium Dense Sandy Silt, Trace mica	
12.50	SPT-6	10	13	15	28		SL=30cm
						Grey Medium Dense Sandy Silt/Silty Fine Sand, Trace mica	
7-9-14 6.30PM	SPT-7	10	15	16	31		SL=38cm
8.AM						Brown Dense Sandy silt, Trace mica	
8-9-14	SPT-8	11	16	16	32		SL=38cm
						Grey Dense Silty Fine Sand, Trace mica	
17.00	SPT-9	10	16	16	32		SL=39cm
						— do —	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-2 SHEET 4 OF 6
DEPTH OF G.W. 4.80m FINAL DEPTH 35METER
WORK STARTED ON 8-9-14 ENDED ON 8-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
18.50	SPT-10	10	15	20	(35)	—do—	SL=33cm
20.00	SPT-11	10	15	16	(31)	Moist Dark Grey Dense Fine Sand, Trace Silt, Trace mica.	SL=37cm
21.50	SPT-12	11	12	15	(27)	Moist Grey Dense Fine Sand, Trace Silt, Trace mica.	SL=41cm
23.00	SPT-13	6	11	13	(24)	Moist to wet Grey medium Dense Silty Fine Sand, Trace mica.	SL=36cm
24.50	UDS-4	DENSON TUBE				Brownish Grey very stiff silty clay, Trace Concretion, Trace Sand.	UDS-4 24.50/25.00m SL=46.00
						Top: Brownish Grey Moist silty clay/Lean clay Bottom Sand with silt, Trace mica	waxed=43cm

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-2 SHEET 5 OF 6
STRUCTURE: DEPTH OF G.W. 4.80m FINAL DEPTH 35METER
EASTING: NORTHING: WORK STARTED ON 8-9-14 ENDED ON 8-9-14
ELEVATION: LOGGED BY M. ALI CHUGHTAI CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						——— do ———	
26.00	SPT-14	13	17	16	(33)	Grey Dense Silty Fine Sand, Trace Concretions, Trace Mica.	SL = 29cm
27.50	SPT-15	12	19	19	(38)		SL = 37cm
						Grey Dense Silty Fine Sand, Trace Mica.	
29.00	SPT-16	10	16	20	(36)		SL = 30cm
						——— do ———	
30.50	SPT-17	12	17	18	(35)		SL = 5cm
						——— do ———	
32.00	SPT-18	16	20	16	(36)		SL 35cm
						Grey Dense Silty Fine Sand, Trace Mica.	

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

Terms 0 - 10 % Trace 10 - 20 % Little 20 - 35 % Some 35 - 50 % And

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-2 SHEET 6 OF 6
DEPTH OF G.W. 4.80m FINAL DEPTH 35METER
WORK STARTED ON 8-9-14 ENDED ON 8-9-14
LOGGED BY M. ALICHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						——— do ———	
33.50	SPT-19	16	16	20	(36)	Grey Dense silty Fine Sand, Trace mica.	Sample was Slipped
35.00	SPT-20	16	17	20	(37)	Grey Dense silty Fine Sand, Mixed with Spots Pieces of siltyclay. 1" x 1" size.	
						Bottom of Bore Holes	
							WATER SAMPLE (1)

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

JECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
TION

JOB No. J-576
BOREHOLE NO. BH-2

1 Sr No.	2 UDS No.	3 Depth (m) From	To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube + Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
7/9/14 1	1	2.00	2.50	UDS	70.00	—	—	—	—	1704			(Sample was washed)					
2	1	4.00	4.50	SHELBY TUBE	70.80	68.63	73.7			1704	3570	36	32		50			
3	2	6.50	7.00	DENISON TUBE	69.9	—	—	—	—	1706	4036	35	31		50			
4	3	9.50	10.00	DENISON TUBE	70.10	—	—	—	—	1705	3770	37	30		50			
8/9/14 5	4	24.50	25.00	DENISON TUBE	70.0	—	—	—	—	1704	3570	46	43		50			

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-39
DEPTH OF G.W. 4.30m
WORK STARTED ON 20-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 1 OF 8
FINAL DEPTH 50 METER
ENDED ON 22-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
1.00	SPT-1	3	2	4	(6)	Brown moist clayey silt, mixed with grass Roots, organice.	
1.50	UDS-1 Shell by Tube					Moist Brown silty clay Firm trace Concretion, trace sand.	
3.00	SPT-2	3	4	4	(8)	moist Brown silt/clayey silt, trace sand.	UDS-1 2.00/2.50m SL=35cm Waxed: 32cm ~~SL=20cm~~
4.00	SPT-3	2	4	5	(9)	moist Brown silt, trace sand.	SL=38
5.00	UDS-2 Shell by Tube					moist Brown silty clay/clayey silt, trace sand.	UDS-2 5.00/5.50m SL=44cm Waxed, 41cm
						do	

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-39 SHEET 2 OF 8
DEPTH OF G.W. 4.30m FINAL DEPTH SOMEZER
WORK STARTED ON 21-9-14 ENDED ON 22-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21/9/14 PM 6.50	SPT-4	3	4	6	(10)	do	SL > 39cm
8.00	UDS-3	DENSON TUBE			—	Moist Brown stiff clayey silt / silty clay, Trace Sand.	UDS-3 8.0/8.50m SL > 45cm Waxed > 42cm
9.50	SPT-5	4	6	9	(15)	do	SL > 40cm
11.00	SPT-6	7	9	13	(22)	do	SL > 35cm
12.50	SPT-7	8	8	10	(18)	Moist Brown Layers by Layers, silt/clay sandy silt, Trace mica NONE Plastic to slightly plastic. Moist Brown Medium Dense Sandy Silt, Trace mica.	SL > 34cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-39 SHEET 3 OF 8
DEPTH OF G.W. FINAL DEPTH 50 METER
WORK STARTED ON 21-9-14 ENDED ON 22-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
14.00	SPT-8	8	8	11	(19)	do	SL = 12cm
						Yellowish Grey Silt / Sandy Silt, Trace Mica	
15.50	SPT-9	9	9	11	(20)		SL = 30cm
						Brown Medium Dense Sandy silt / silty Fine Sand, Trace mica.	
17.00	SPT-10	13	22	14	(36)		SL = 38cm
						17.00 / 17.30m Brownish Grey medium Dense (A) silty Fine Sand. Trace mica	
18.50	UDS-4	DENSON TUBE			—	17.30 / 17.44m Brown Silty clay, Trace Sand (B)	
	SPT-11					Moist Grey Medium Dense silty Fine Sand, Trace mica	Note: 18.50 UDS-4 taken Top & Bottom with silty Fine Sand (DISCA Bottom of UDS-4 taken SPT-11
20.00	SPT-12	13	14	16	(30)		SL = 42cm
						Moist to wet Grey Medium Dense silty Fine Sand, Trace mica	

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-39
DEPTH OF G.W.
WORK STARTED ON 21-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 4 OF 8
FINAL DEPTH 50 METER
ENDED ON 22-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21.50	SPT-13	12	14	14	(28)	do	SL = 35cm
23.00	SPT-14	12	12	11	(23)	Grey wet Medium Dense silty Fine Sand, Trace mica.	SL = 32cm
24.50	SPT-15	13	19	20	(39)	do	SL = 44cm
26.00	SPT-16	12	15	17	(32)	Moist to wet Grey Dense Fine Sand, Trace Silt, Trace mica.	SL = 40cm
27.50	SPT-17	14	17	17	(34)	Moist to wet Grey Dense Fine Sand, Trace, Silt, Trace mica	SL = 39cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And		

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-39 SHEET 5 OF 8
DEPTH OF G.W. FINAL DEPTH 50 METER
WORK STARTED ON 21-9-14 ENDED ON 22-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
27.50	SPT-17	14	17	17	(34)	Wet Grey Dense Fine Sand, Trace Silt, Trace Mica.	SL=39cm
29.00	SPT-18	10	18	23	(41)	do	SL = 40cm
30.50	SPT-19	18	20	20	(40)	do Trace Medium Sand, Trace Concretion.	SL=42cm
32.00	SPT-20	17	17	24	(41)	do	SL=36cm
33.50	SPT-21	13	22	19	(41)	do Grey Dense silty Fine Sand, Trace Mica.	SL=40cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	-	20 - 35 % Some	35 - 50 % And								

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-39 SHEET 6 OF 8
DEPTH OF G.W. FINAL DEPTH 50 METER
WORK STARTED ON 21-9-14 ENDED ON 22-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
35.a	SPT-22	14	18	20	38	do	SL = 40 cm
						Grey wet Dense Silty Fine Sand, Traces of Clay	
36-50	SPT-23	24	29	30	59		SL = 37 cm
						do	
21-9-14 38.00	SPT-24	22	30	36	66		SL = 36 cm
						do	
22-9-14 39.50	SPT-25	23	30	39	69		SL = 40 cm
						do	
41.00	SPT-26	20	26	34	60		SL = 41 cm
						Grey Very Dense silty Fine Sand, Traces of Clay	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And								

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-39
DEPTH OF G.W.
WORK STARTED ON 22-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 7 OF 8
FINAL DEPTH SOMETER
ENDED ON 22-9-14
CHECKED BY

12-54 pm

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
42.50	SPT-27	24	30	40	(70)	——— do ———	SL = 32cm
44.00	SPT-28	30	35	36	(71)	Grey Very Dense Very Fine Sand, Trace Silt, Traces mica	SL = 20cm
45.50	SPT-29	29	34	35	(69)	——— do ———	SL = 22cm
47.00	SPT-30	30	37	39	(76)	Grey Very Dense Very Fine Sand, Trace Silt, Traces mica	SL = 30cm
48.50	SPT-31	30	50/5"	REFUSAL		——— do ———	SL = 10cm
						Grey Very Dense Very Fine Sand Compacted Layers. Trace Silt, Traces mica.	

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And		

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-39 SHEET 8 OF 8
DEPTH OF G.W. FINAL DEPTH 50METER
WORK STARTED ON 22-9-14 ENDED ON 22-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
50.00	SPT-32	29	45	45	(90)	do	SL = 40cm
4.45 PM						Grey Very Dense Very Fine Sand Compacted Layers, Trace Concretion, Trace Silt, Trace mica.	
						Bottom of Bore Hole	22/9/14

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

JECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
ATION

JOB No. J-576
BOREHOLE NO. BH-39

1 Sr No:	2 UDS No.	3 Depth (m) From	3 To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
1	1	2.00	2.50	Shelby Tube	70.10	68.9	73.4	13.4	1.74	1700	3988	35	32		50			
2	2	5.00	5.50	"	69.9	68.7	73.0	12.9	1.75	1706	4868	44	41	—	50			
3	3	8.00	8.50	DENISON TUBE	70.00	—	—	—	—	1715	4866	45	42	—	50			

2/9/14

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: 402674.611 NORTHING: 3457825.607
ELEVATION: 204.55
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-40
DEPTH OF G.W.
WORK STARTED ON 20-09-14
LOGGED BY Shahid Saleem

SHEET 1 OF 5
FINAL DEPTH 35
ENDED ON 21-09-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.0							
1.0	SPT-01	2	2	2	(4)	Clayey Silt: Light brown, Soft, Moist, Less Cohesive, very low plastic, Trace fine Sand	SL = 41 cm
2.0	SPT-2	3	3	4	(7)	clayey Silt: Light brown, Firm, Moist, very less cohesive, very very low plastic, Trace fine Sand	SL = 39 cm
3.0	UDS-01					Silty Clay / Clayey Silt: Light brown, Moist, Cohesive, Low plastic, Trace fine Sand.	UDS-01 Shelby at 3.0 - 3.5 m
4.0	SPT-3	2	3	2	(5)	Clayey Silt: Light brown, Firm, Wet, Less cohesive, very low plastic Trace fine Sand	SL = 40 cm.
5.0	SPT-4	2	3	4	(7)	— DO —	SL = 41 cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: 402674.611 NORTHING: 3457825.607
ELEVATION: 204.55
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-40 SHEET 2 OF 5
DEPTH OF G.W. FINAL DEPTH 35.0m
WORK STARTED ON 20-09-14 ENDED ON
LOGGED BY Shahid Saleem CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
6.5	SPT-5	2	4	6	(10)	Silty Clay/Clayey Silt. Light brown, Stiff, Wet, Less Cohesive, Low plastic Trace fine Sand.	SL=41cm
8.0	UDS-2					Clayey Silt/Silt. Light brown, wet, very loss Cohesive, Low to Non plastic. Trace fine Sand.	UDS-02 Denison at 8.0-8.5m
9.5	SPT-6	4	6	9	(15)	Sandy Silt. Light brown to light grey, Stiff, Wet,	SL=15cm
11.0	SPT-7	6	7	8	(15)	— DO —	SL=20cm
12.5	SPT-8	10	12	14	(26)	Sandy Silt. Light grey, very stiff, Wet.	SL=30cm

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-40 SHEET 3 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35.0m
EASTING: NORTHING: WORK STARTED ON 20-09-14 ENDED ON
ELEVATION: LOGGED BY Shahid Saleem. CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
14.0	SPT-9	11	13	15	(28)	Fine Sand: Light grey, Medium dense, Fine grained, Water Saturated, clean. Well sorted,	SL = 33cm
15.5	SPT-10	10	10	11	(21)	Fine Sand: Light grey, Medium dense, Fine grained, Random clayey patches,	SL = 35cm
17.0	SPT-11	8	10	10	(20)	— DO —	SL = 38cm
18.5	SPT-12	13	14	18	(32)	Fine Sand: Light grey, Dense, Fine grained, Water Saturated, clayey Contaminated, unsorted,	SL = 34cm
20.0	SPT-13	11	17	23	(40)	Fine Sand: Light grey, Dense, Fine grained, clean. Well sorted, Saturated.	SL = 20cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-40 SHEET 4 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35.0m
EASTING: NORTHING: WORK STARTED ON 20-09-14 ENDED ON 21-09-14
ELEVATION: LOGGED BY Shahid CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21.5	SPT-14	13	14	13	(27)	Fine Sand: Light grey, Medium dense, Fine grained, Clayey Contaminated, unsorted,	SL = 30cm
23.0	SPT-15	13	15	20	(35)	Fine Sand: Light grey, Dense, Fine grained, clayey matrix, Water Saturated.	SL = 34cm Matrix = not a cement material, fills the Spacing.
24.5	SPT-16	15	18	22	(40)	Fine Sand: Light grey, Dense, Fine grained, Water Saturated, Clean, Sorted, Trace mica.	SL = 37cm
26.0	SPT-17	16	20	21	(41)	— DO —	SL = 28cm
27.5	SPT-18	14	20	20	(40)	— DO —	SL = 33cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE: _____
EASTING: _____ NORTHING: _____
ELEVATION: _____
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-40 SHEET 5 OF 5
DEPTH OF G.W. _____ FINAL DEPTH 35.0m
WORK STARTED ON 20-09-14 ENDED ON 21-09-14
LOGGED BY Shahid CHECKED BY _____

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
29.0	SPT-19	16	20	24	(44)	Fine Sand. Light grey, Dense, Fine grained, Random clayey patches, clay is light grey.	SL = 34cm
30.5	SPT-20	17	20	23	(43)	Fine Sand. Light grey, Dense, Fine grained, clean, water Saturated, Well sorted.	SL = 33cm
32.0	SPT-21	19	22	25	(47)	——— DO ———	SL = 31cm
33.5	SPT-22	21	16	11	(26)	Sand, Light grey, Medium dense, Fine to medium grained, clean, Trace to little concretion of larger size and high angular.	SL = 36cm
35.0	SPT-23	25	28	22	(50)	Sand. Light grey, Dense, Medium grained clean, Saturated, Trace concretion	SL = 30cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

PROJECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
LOCATION

JOB No. J-576
BOREHOLE NO. BH-40

1 Sr No.	2 UDS No.	3 Depth (m) From	3 To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
	1	3.0	3.5	Shelby	70.0		73.4			1700	4382	45	42		50			
	2	8.0	8.5	Denison	70.1		73.3			1710	5352	43	40		50			

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-41
SHEET 1 OF 5
STRUCTURE:
DEPTH OF G.W.
FINAL DEPTH 35.0m
EASTING: NORTHING:
WORK STARTED ON 13-09-14
ENDED ON 14-09-14
ELEVATION:
LOGGED BY SHAHID
CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.0						Silty clay / clayey Silt: Light brown, Top Surface Covered with vegetation, Trace to little Concretion	OPEN PIT MATERIAL
1.0	SPT-01	1	1	1	(2)	Silty clay / clayey Silt: Light brown, Soft, Moist. Very low plastic, Trace Concretion, Trace fine Sand.	SL = 40 cm
2.0	UDS-01					Clayey Silt: Light brown, Moist, Trace fine Sand,	UDS-01, SHELBY at 2.0 – 2.5m
3.0	SPT-02	2	3	3	(6)	Clayey Silt: Light brown, Firm, Moist, Trace fine Sand, Silty Sandy content increasing downward, Fining upward Sequence	SL = 40 cm
4.0	UDS-02					Silty Clay / Lean Clay: Light brown, Wet, Medium Plastic, Trace fine Sand.	UDS-02, SHELBY at 4.0 – 4.5m
5.0	SPT-03	2	3	4	(7)	Clayey Silt: Light brown, Firm, Wet, Trace fine Sand,	SL = 41 cm

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
	Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

Terms: 0 - 10 % Trace; 10 - 20 % Little; 20 - 35 % Some; 35 - 50 % And

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-41 SHEET 2 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35.0
EASTING: NORTHING: WORK STARTED ON 13-09-14 ENDED ON 14-09-14
ELEVATION: LOGGED BY SHAHID CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
6.5	UDS-03					Clayey Silt. Same as above SPT-3	UDS-03, SHELBY at 6.5-7.0m
8.0	SPT-4	5	7	9	(16)	Sandy Silt. Light brown, Stiff, Water Saturated	SL = 30cm.
9.5	SPT-5	5	7	10	(17)	— DO —	SL = 28cm
11.0	SPT-6	7	9	11	(20)	Silty Clay: Light brown, very stiff, Wet, Low to medium plastic, Trace concretion.	SL = 35cm
12.5	SPT-7	8	10	15	(25)	Silty Sand: Light brown to light grey, Medium dense, Water Saturated.	SL = 33cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-41 SHEET 3 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35
EASTING: NORTHING: WORK STARTED ON 13-09-14 ENDED ON 14-09-14
ELEVATION: LOGGED BY SHAHID CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						clayey contaminated,	
14.0	SPT-8	10	15	15	(30)	Fine Sand. Light grey, Dense, very fine grained, Water saturated, Well Sorted, clean, Trace mica	SL=39cm.
15.5	SPT-9	13	15	18	(33)	— Do —	SL=33cm
17.0	SPT-10	13	16	19	(35)	— Do —	SL=30cm
18.5	SPT-11	11	14	17	(31)	— Do —	SL=37cm
20.0	SPT-12	10	13	18	(31)	— Do —	SL=34cm

SPT Value Consistency	Sand Gravel	<4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	<2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-41
SHEET 4 OF 5
STRUCTURE:
DEPTH OF G.W.
FINAL DEPTH 35.0m
EASTING: NORTHING:
WORK STARTED ON 13-09-14
ENDED ON 14-09-14
ELEVATION:
LOGGED BY SHAHID
CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21.5	SPT-13	14	15	16	(31)	——DO——	SL=35cm
23.0	SPT-14	16	16	17	(33)	——DO——	SL=37cm
24.5	SPT-15	15	16	20	(36)	— DO —	SL=34cm
26.0	SPT-16	14	16	21	(37)	— DO —	SL=35cm
27.5	SPT-17	15	18	24	(42)	— DO —	SL=32cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE: _____
EASTING: _____ NORTHING: _____
ELEVATION: _____
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-41
DEPTH OF G.W. _____
WORK STARTED ON 13-09-14
LOGGED BY SHAHID

SHEET 5 OF 5
FINAL DEPTH 35.0m
ENDED ON 14-09-14
CHECKED BY _____

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
29.0	SPT-18	12	15	20	(35)	— Do —	SL = 38cm
30.5	SPT-19	16	17	22	(39)	— Do —	SL = 33cm
32.0	SPT-20	16	19	25	(44)	— Do —	SL = 38cm
33.5	SPT-21	20	25	28	(53)	Sand: Light grey, very dense, Fine to medium grained, clean, water saturated Sorted, Trace concretion	SL = 30cm
35.0	SPT-22	20	28	30	(58)	— Do —	SL = 28cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

PROJECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
LOCATION

JOB No. J-578
BOREHOLE NO. BH-41

1 Sr No.	2 UDS No.	3 Depth (m) From	To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
	1	2.0	2.5	SHELBY	69.8		73.4			1700	4514	38	35		50			
	2	4.0	4.5	"	69.9		73.4			1690	5100	46	43		50			
	3	6.5	7.0	"	70.0		73.5			1695	4756	41	38		50			

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-42
DEPTH OF G.W. 4.40m
WORK STARTED ON 15-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 1 OF 7
FINAL DEPTH 50METER
ENDED ON 16-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.00							
1.00	SPT-1	1	3	2	(5)	MOIST Brown clayey Silt, Trace Concretion, Trace mica.	SL = 35cm
2.00	UDS-1	SHELBY TUBE	—	—	—	MOIST Brown Silt/clayey Silt, Trace Concretion, Trace mica	UDS-1 2.0/2.50m SL = waxed =
3.00	SPT-2	1	1	3	(4)	—— do ——	SL = 20cm
4.00	SPT-3	3	6	8	(14)	MOIST Brown Silt Trace Sand.	SL = 38cm
5.00	UDS-2	DENSON TUBE	—			MOIST Brown stiff silty clay, Trace Sand.	UDS-2 5.00/5.50m SL = 40cm wax-ed = 37cm
						MOIST Brown clayey Silt, Trace Fine Sand, Trace mica.	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And		

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-42
DEPTH OF G.W. 4.40m
WORK STARTED ON 15-9-14 ENDED ON 16-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

SHEET 2 OF 7
FINAL DEPTH SOMETER

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						do	
6.50	SPT-4	4	5	6	(11)	Moist Brown Medium Dense Sand with Silt / Sandy silt, trace mica.	SL = 150mm
8.00	SPT-5	4	4	7	(11)	Moist Brown stiff silty clay / clayey silt,	SL = 10cm
9.50	UDS-3	Shelby Tube					UDS-3
						do	9.50/10.00 SL = 36cm Work = 35cm
11.00	SPT-6	7	11	10	(21)	Moist Brown Medium Dense Sandy, silt, Trace mica.	SL = 36cm
12.50	SPT-7	11	14	16	(30)	Moist Brownish Grey Dense silty Fine Sand, trace mica	SL = 38cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms		0 - 10 % Trace		10 - 20 % Little		20 - 35 % Some	35 - 50 % And							

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-42
DEPTH OF G.W.
WORK STARTED ON 15-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 3 OF 7
FINAL DEPTH SAMETER
ENDED ON 16-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						do	
14.00	SPT-8	3	6	8	(14)		SL=44cm
						moist Brown stiff silty clay/Lean clay, Trace Sand.	UDS-4
15.50	UDS-4	DENSON TUBE					15.50/16.00
							SL=34cm
							waxed @ 31cm
						Top: Silty clay Bottom Sand.	
17.00	SPT-9	6	8	12	(20)		SL=40cm
						wet Grey medium Dense Fine Sand, Trace Silt, Trace mica, Trace Concretion.	
18.50	SPT-10	3	7	14	(21)		
						wet Brownish Grey 18.50/18.69 Grey Brown silty clay	
						18.69/18.87 Grey Sandy Silt/Trace mica (B)	
20.00	SPT-11	13	18	13	(31)		
						moist Grey Dense silty Fine Sand 20.00/20.29 (A)	
Layer by Layer →						20.29/20.43m Reddish Brown silty clay (B)	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little		20 - 35 % Some	35 - 50 % And

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-42 SHEET 4 OF 7
DEPTH OF G.W. 4.40m FINAL DEPTH 50 METER
WORK STARTED ON 15-9-14 ENDED ON 16-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21.50	UDS-4	DENSON TUBE			—	——— do ———	Sample was washed NIL
23.00	SPT-12	14	17	21	(38)		SL > 40cm
24.50	SPT-13	15	20	17	(37)	Grey Dense Sandy Silt mixed with Spots of lean clay 2"x1 1/2", Trace Concretion, Top, Bottom, Sandy Silt, Trace Mica	SL > 35cm
26.00	SPT-14	16	20	21	(41)	Grey Dense Fine Sand Trace Silt, Trace Mica	SL = 32
27.50	SPT-15	21	26	21	(47)	——— do ——— Trace Concretion	SL = 40cm
						Grey Dense Very Fine Sand, Trace Silt, Trace Mica	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-42
DEPTH OF G.W. 4.40m
WORK STARTED ON 15-9-14
LOGGED BY M ALI CHUGHTAI

SHEET 5 OF 7
FINAL DEPTH SOMETEN
ENDED ON 16-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
29.00	SPT-16	23	27	22	(49)	——— do ———	SL=35
30.50	SPT-17	25	26	23	(49)	Grey Dense Fine Sand, Trace Silt, Trace Mica.	SL= 40cm
32.00	SPT-18	18	23	30	(53)	——— do ———	SL=43cm
33.50	SPT-19	14	20	20	(40)	Grey Dense Fine Sand, Trace Silt, Trace Mica.	SL= 40cm
35.00	SPT-20	16	23	30	(53)	Dark Grey Very Dense Fine Sand, Trace Silt, Trace Mica.	SL=37cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little -	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-42
DEPTH OF G.W. 4.40m
WORK STARTED ON 16.9.14
LOGGED BY M. ALI CHUGHTAI

SHEET 6 OF 7
FINAL DEPTH SOMETER
ENDED ON 16-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
36.50	SPT-21	22	25	30	55	do	SL > 38cm
						moist Grey Very Dense Fine Sand, Trace Silt, Trace mica.	
38.00	SPT-22	18	25	36	61		SL > 39cm
						do	
39.50	SPT-23	25	30	37	67		SL > 36cm
						do	
41.00	SPT-24	20	26	40	66		SL > 38cm
						moist Grey Very Dense Sandy Silt/ Silty Fine Sand, Trace mica	
42.50	SPT-25	20	27	42	69		SL > 42cm
						moist Grey Very Dense Fine Sand, Trace Silt, Trace mica.	

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Oense	30 - 50 Dense	> 50 V. Oense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-42 SHEET 7 OF 7
DEPTH OF G.W. 4.40 m FINAL DEPTH SOMETER
WORK STARTED ON 16-9-14 ENDED ON 16-9-14
LOGGED BY M. ALI CHAUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
44.00	SPT-26	15	30	38	(68)	do	SL=40cm
45.50	SPT-27	16	31	39	(70)	Grey Very Dense Fine Sand, Free Silt, Free Mica.	SL=35cm
47.00	SPT-28	22	39	40	(79)	do	SL=30cm
48.50	SPT-29	23	40	41	(81)	do	SL=29cm
50.00	SPT-30	27	45	46	(91)	Grey Very Dense Fine Sand, Free Silt, Free Mica.	SL=37cm
						Grey Very Dense Fine Sand, Free Silt, Free Concretion. Bottom of Bore Hole	16/9/14

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And							

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

PROJECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
LOCATION

JOB No. J-576
BOREHOLE NO. BH-42

1 Sr No.	2 UDS No.	3 Depth (m) From	3 Depth (m) To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
1	1	2.00	2.50	Shelby Tube	70.80	68.63	73.7	11.6	1.89	1700	4109	37	34		50			
4	4	9.50	10.00	do	70.45	69.55	73.4	11.40	1.2	1695	4560	36	35		50			
2	2	5.00	5.50	Denison Tube	70.00	—	—	—	—	1704	4560	40-	37		50			
3	3	15.50	16.00	Denison Tube	70.1	—	—	—	—	1718	4384	34	31		50			

16/9/14

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-43
DEPTH OF G.W. 4.30m
WORK STARTED ON 17-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 1 OF 7
FINAL DEPTH 50METER
ENDED ON 19-9-14
CHECKED BY

17-9-14
11-40 AM

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.00							
1.00	SPT-1	1	2	3	(6)	Brown moist clayey silt, Trace Concretion, Trace Sand.	SL: 40cm
						Moist Brown Firm clayey silt, Trace Concretion	UDS-1 2.00/2.50m SL: Waxed,
2.00	UDS-1	Shelby Tube			-		
						do	
3.00	SPT-2	3	3	4	(7)		SL: 22cm
						Moist Brown Firm clayey silt / silty clay Trace Sand.	UDS-2 4.00/4.50m SL: 32cm Waxed, 30cm
4.00	UDS-2	DENSON TUBE			-		
						do	
5.00	SPT-3	4	2	5	(7)		SL: 44cm
11.30 AM						Moist Brown Firm clayey silt, Trace Sand.	WATER SAMPLE (1) Nos

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-4B
DEPTH OF G.W. 4.30 m
WORK STARTED ON 17-9-14 ENDED ON 19-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

SHEET 2 OF 7
FINAL DEPTH SOMETHA

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
6.50	SPT-4	3	4	6	(10)	da	SL≥35cm
						Brown Moist Silt Trace to little Sand, Trace Mica	
8.00	SPT-5	5	5	7	(12)		SL≥32cm
						Moist Brown stiff silt/clay Sandy Silt Trace Mica.	UDS-3
9.50	UDS-3	Denison Tube					9.50/10.00m
							SL≥40cm
							~~waxed≥38c~~
						Brown clayey silt/silty clay Trace Sand.	
11.00	SPT-6	4	7	9	(16)		SL≥40cm
						Moist Brown very stiff clayey silt/silt Trace Sand	UDS-4
12.50	UDS-4	DENISON TUBE					12.50/13.00m
							SL≥29cm
							waxed≥26cm
						Brown clayey silt Top Bottom Sand.	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-43 SHEET 3 OF 7
STRUCTURE: DEPTH OF G.W. 4.30m FINAL DEPTH 50 METER
EASTING: NORTHING: WORK STARTED ON 17-9-14 ENDED ON 19-9-14
ELEVATION: LOGGED BY M. ALI CHUSHTAI CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
14.00	SPT-7	9	10	13	(23)	——— do ———	SL=40cm
						Brownish Grey Medium Dense Sandy silt / Silty Fine Sand Trace mica	
15.50	SPT-8	4	6	7	(13)		SL=39cm
						Yellowish Grey stiff silty clay Trace Sand.	Note:- 17m taken UDS-5 Top to Bottom Tube silty Fine Sand Tube was DISCARTED After Bottom of UDS 17.50m Depth SPT-9
17.50	SPT-9	5	8	9	(17)		
						Grey Medium Dense silty Fine Sand, Trace Mica	
19.50	SPT-10	6	10	11	(21)		SL=35cm
						——— do ———	
20.00	SPT-11	9	10	13	(23)		SL=26cm
						Grey Medium Dense Fine Sand, Trace silt, Trace mica.	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-43 SHEET 4 OF 7
DEPTH OF G.W. 4.30m FINAL DEPTH 50 METER
WORK STARTED ON 17-9-14 ENDED ON 19-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21.50	SPT-12	3	3	5	(8)	do	SL=43cm
						Yellowish Grey moist Stiff Silty clay Trace Sand.	UDS-5 23.00/23.50 m SL = 40cm waxed = 35cm
6.40PM 17/9/14 23.00	UDS	DENSON TUBE —					
						do	
18/9/14 24.50	SPT-13	3	4	5	(9)		SL=43cm
						Brownish Grey Stiff moist Silty clay Trace Sand.	
26.00	SPT-14	11	20	23	(43)		SL=15cm
						Grey Dense Silty Fine Sand, Trace Concretion.	
27.50	SPT-15	14	20	24	(44)		SL=43cm
						Grey Dense Silty Fine Sand, Trace Concretion, Mica.	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms		0 - 10 % Trace		10 - 20 % Little		20 - 35 % Some	35 - 50 % And							

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-43
DEPTH OF G.W. 4.3cm
WORK STARTED ON 18-9-14 ENDED ON 19-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

SUBSURFACE EXPLORATION LOG
SHEET 5 OF 7
FINAL DEPTH 50 METER

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
29.00	SPT-16	17	27	28	(55)	——— do ———	SL = 40cm
30.50	SPT-17	18	23	20	(43)	Grey Very Dense Fine Sand, Trace Silt, Trace mica.	SL = 39cm
32.00	SPT-18	18	22	26	(48)	Grey Dense Fine Sand, Trace Silt, Trace mica, Trace concretion.	SL = 43cm
33.50	SPT-19	13	21	28	(49)	Grey Dense Fine Sand, Trace Silt, Trace mica.	SL = 38cm
35.00	SPT-20	15	18	22	(40)	——— do ———	SL = 43cm
						Grey Dense Fine Sand, Trace mica, Trace Silt mixed with spots 1/4" silty clay.	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-43
DEPTH OF G.W. 4.30 m
WORK STARTED ON 18-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 6 OF 7
FINAL DEPTH SOMETER
ENDED ON 19-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
36.50	SPT-21	20	25	19	(44)	——— do ———	SL = 40cm
						Grey Dense Fine Sand, Trace Silt, Traces mica.	
38.00	SPT-22	18	22	27	(49)		SL = 42cm
						——— do ———	
39.50	SPT-23	23	25	26	(51)		SL = 43cm
						Grey ish Very Dense Fine Sand, Trace Silt, Traces mica.	
41.00	SPT-24	20	27	28	(55)		SL = 42cm
						——— do ———	
42.50	SPT-25	23	33	35	(68)		SL = 43cm
						Brownish Grey Very Dense Very Fine Sand, Trace silt, Traces mica	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-43
DEPTH OF G.W. 4.30m
WORK STARTED ON 18-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 7 OF 7
FINAL DEPTH 50 METER
ENDED ON 19-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
44.00	SPT-26	22	27	30	(57)	do	SL=42cm
						Grey Very Dense Fine Sand, Trace silt, Trace Mica	
45.50	SPT-27	20	29	26	(55)		SL=39cm
						do	
47.00	SPT-28	18	25	31	(56)	Mixed with spots of silty clay Top, Bottom Sand, Trace Mica	SL=38cm
						Grey Very Dense Fine Sand, Trace Silt Trace Mica.	
48.50	SPT-29	25	34	34	(68)		SL=37cm
						do	
50.00	SPT-30	22	30	30	(60)		SL=42cm
						Grey Very Dense Fine Sand, Trace Silt Trace Concretion, Trace Mica.	

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

PROJECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
LOCATION

JOB No. J-576
BOREHOLE NO. BH-43

1 Sr.No.	2 UDS No.	3 Depth (m) From	To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube+Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
1	1	2.00	2.50	SHELBY TUBE	70.80	68.63	73.7	11.6	1.89	1700	4196	35	33		50			
2	2	4.00	4.50	OSTERBERG TUBE	70.6	—	—	—	—	1706	4072	32	30		50			
3	3	9.50	10.00	do	70.3	—	—	—	—	1710	4936	40	38		50			
4	4	12.50	13.00	do	70.00	—	—	—	—	1704	3764	29	26		50			
5	5	23.00	23.50	do	69.9	—	—	—	—	1703	4624	40	35		50			

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

19/9/14

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-44 SHEET 1 OF 5
DEPTH OF G.W. 4.50m FINAL DEPTH 35METER
WORK STARTED ON 19-9-14 ENDED ON 20-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.00							
1.00	SPT-1	1	2	3	(5)	Brown MOIST clayey silt mixed with Fine grass Roots.	SL=34cm
2.00	UDS-1	Shelby Tube				MOIST Brown Firm clayey Silt, Trace Concretion, Trace Sand.	
3.00	SPT-2	1	3	3	(6)		UDS-1 2.0/2.50m SL=34cm Waxed, 31cm
4.00	UDS-2	Shelby Tube				MOIST Brown Firm clayey silt/silt Trace Sand.	SL=36cm UDS-2 4.00/4.50m SL=35cm Waxed=33cm
5.00	SPT-3	2	3	4	(7)		5 Layers
						MOIST Brown Firm silty clay, Trace Sand.	

SPT Value Consistency	Sand Gravel	<4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-44
DEPTH OF G.W. 4.50m
WORK STARTED ON 19-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 2 OF 5
FINAL DEPTH 35METER
ENDED ON 20-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						do	
6.50	UDS-3	DENSON TUBE					UDS-3 6.50/7.00m SL=40cm waxed=38cm
8.00	SPT-4	4	5	6	(11)	Brown moist Layer by Layer silt/clayey silt Trace Sand.	
9.50	UDS-4	DENSON TUBE					UDS-4 9.50/10.00m SL=38cm wax=35cm
						do	
11.00	SPT-5	7	12	13	(25)		SL=40cm
						Brown Very Stiff silty clay/Lean clay.	UDS-5 12.50/13.00m SL=35cm waxed=32cm
12.50	UDS-5	DENSON TUBE					
						Yellowish Grey do Top Silty clay Bottom Silt	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-44
DEPTH OF G.W. 4.50m
WORK STARTED ON 19-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 3 OF 5
FINAL DEPTH 35M BTSL
ENDED ON 20-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						do	
14.00	SPT-6	8	10	12	(22)	Brown with Grey Medium Dense Sandy Silt/ Silty Fine Sand, Trace mica.	SL=35cm
15.58	SPT-7	9	11	13	(24)		SL=33cm
						Grey Medium Dense silty Fine Sand, Trace mica.	
19/9/14 17.00	SPT-8	5	6	16	(22)		
						17.00/17.29 Brown Very Stiff lean clay (A)	
7.00PM 9 20 18.50	SPT-9	9	9	7	(16)	17.29/17.44m Grey silty Fine Sand, (B) Trace mica	SL=43cm
						Grey Medium Dense Silty Fine Sand, Trace mica.	
20.00	SPT-10	8	8	10	(18)		SL=36cm
						Grey Medium Dense silty Fine Sand, Trace mica	

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-44 SHEET 4 OF 5
DEPTH OF G.W. 4.50M FINAL DEPTH 35 METER
WORK STARTED ON 20-9-14 ENDED ON 20-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						——do——	
21.50	SPT-11	6	7	11	(18)		SL = 30cm
						21.50/21.70m Brown Stiff silty clay / Lean clay, 21.70/24.80m Grey Medium Dense Silty Fine Sand, Trace Mica	
23.00	SPT-12	12	13	15	(28)		SL = 320m
						Grey Medium Dense silty Fine Sand, Trace mica.	
24.50	SPT-13	16	16	17	(33)		SL = 29cm
						Grey Dense silty Fine Sand, Trace Concretion, Trace Mica	
26.00	SPT-14	12	14	18	(32)		SL = 35cm
						Grey Dense silty Fine Sand, Trace Mica	
27.50	SPT-15	17	19	21	(40)		SL = 42cm
						——do——	

SPT Value	Sand	< 4	4 - 10	10 - 30	30 - 50	> 50		Silt	< 2	2 - 4	4 - 8	8 - 15	15 - 30	> 30
Consistency	Gravel	V. Loose	Loose	M. Dense	Dense	V. Dense		Clay	V. Soft	Soft	Firm	Stiff	V. Stiff	Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-44
DEPTH OF G.W. 4.50 m
WORK STARTED ON 20-9-14 ENDED ON 20-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

SHEET 5 OF 5
FINAL DEPTH 35 METER

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
29.00	SPT-16	12	20	29	(49)	——— do ———	SL = 35cm
						Grey Dense silty Fine Sand, Trace Mica.	
30.50	SPT-17	16	21	23	(44)		SL = 32cm
						Grey Dense silty Fine Sand Trace to little Concretion, Trace mica	
32.00	SPT-18	14	22	27	(49)		SL = 35cm
						——— do ———	
33.50	SPT-19	16	22	26	(48)		SL = 32cm
						Grey Dense silty Fine Sand, Trace Concretion, Trace Mica.	
35.00	SPT-20	16	20	27	(47)		SL = 41cm
						Grey Dense Fine Sand, Trace Concretion, Trace silt, Trace mica.	
						Bottom of Borehole	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 Very Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms		0 - 10 % Trace		10 - 20 % Little		20 - 35 % Some		35 - 50 % And					

29/9/14

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

PROJECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
LOCATION

JOB No. J-576 BORE HOLE NO BH-44

1 Sr No.	2 UDS No.	3 Depth (m) From	To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
1	1	2.00	2.50	Shelby Tube	70.80	68.63	73.7	11.6	1.89	1654	4010	34	31		50			
2	2	4.00	4.50	do	70.44	69.55	73.4	11.4	1.2	1699	4440	35	33		50			
3	3	6.50	7.00	DENISON TUBE	70.10	—	—	—	—	1700	4615	40	38		50			
4	4	9.50	10.00	DENISON TUBE	69.4	—	—	—	—	1682	4534	38	35		50			
5	5	12.50	13.00	do	70.00	—	—	—	—	1700	4260	35	32		50			

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant:

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-45
DEPTH OF G.W. 4.40 m
WORK STARTED ON 11-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 1 OF 5
FINAL DEPTH 35 METER
ENDED ON 13-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.00							
1.00	SPT-1	1	2	3	(5)	Moist Brown Soft clayey silt, mixed with Fine grass Roots, mixed with Concretion	SL = 30cm
4.50m						Moist Brown Firm silt / clayey silt, Trace Concretion, trace Sand.	
2.00	UDS-1	Shelll By Tube			—		
						do	UDS-1 2.0/2.50m SL=35cm washed, 30cm
3.00	SPT-2	3	4	3	(7)		SL=32
						Brown moist Loose Sand with silt, Trace MICA NONE Plastic.	
4.00	SPT-3	4	5	4	(9)		SL=40cm
						Moist Brown stiff clayey silt, trace Sand,	UDS-2 5.0/5.50m SL=38cm washed=34cm
5.00	UDS-2	Shelll By Tube			—		
						do	

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-45
DEPTH OF G.W. 4.40 m
WORK STARTED ON 11-9-14
LOGGED BY M-ALI CHUGHTAI

SHEET 2 OF 5
FINAL DEPTH 35 METER
ENDED ON 13-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						——— do ———	
6.50	SPT-4	4	5	5	(10)		SL=25cm
11-9-14						Brown stiff clayey Silt, Trace Sand.	UDS-3
2:00 PM							8.00/8.50m
8.00	UDS-3	Shelby Tube			—		SL=42cm
12-9-14							Waved=40cm
						Brown clayey Silt Trace fine Sand.	
9.50	SPT-5	3	4	5	(9)		SL=35cm
						Moist Brown stiff clayey Silt/silty clay	
11.00	SPT-6	5	7	10	(17)		SL=42cm
						Moist Brown very stiff silty clay Trace Sand, Trace Concretion.	UDS-4
12.50	UDS-4	DENISON TUBE					12.50/13.00m
							SL=40cm
							Waved=38cm
						Top:- Brown moist clay Sand Silt, Trace mica	
						Bottom Sandy clay Silt Trace mica	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms		.0 - 10 % Trace		10 - 20 % Little		20 - 35 % Some	35 - 50 % And							

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-45
DEPTH OF G.W. 4.40 m
WORK STARTED ON 12-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 3 OF 5
FINAL DEPTH 35 METER
ENDED ON 15-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						—do—	
14.00	SPT-7	9	10	14	(24)		SL = 18 cm
						Brownish Grey, Medium Dense silty Fine Sand, Trace mica	
15.50	SPT-8	10	14	15	(29)		SL = 15 cm
						Brownish moist Very Stiff Lean clay Trace Concretion, Trace Sand.	UDS-5
17.00	UDS-5	Denison Tube			—		17.00/17.50 m SL = 50 cm
						Top: Brownish Lean clay Trace Sand, Bottom silty Fine Sand, Trace mica	Waxed = 45 cm
18.50	SPT-9	10	12	8	(20)		SL = 40 cm
						Grey Medium Dense silty Fine Sand, Trace mica.	
20.00	SPT-10	5	8	12	(20)		SL = 25 cm
						Grey Medium Dense silty Fine Sand, Trace Concretion, Trace mica.	

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-45
DEPTH OF G.W. 4.40 M
WORK STARTED ON 12-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 4 OF 5
FINAL DEPTH 35 METER
ENDED ON 13-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21.50	SPT-11	10	11	14	(25)	do	SL=35cm
23.00	SPT-12	15	18	19	(37)	Grey Medium Dense silty Fine Sand mixed with spots of Black & Grey silty clay size 2"x1", Trace mica.	SL=30cm
24.50	SPT-13	16	20	20	(40)	Grey Dense silty Fine Sand, Trace mica	SL=37cm
26.00	SPT-14	21	22	24	(46)	do	SL=35cm
27.50	SPT-15	8	13	15	(28)	Grey Dense Silty Fine Sand, Trace mica Trace Concretion.	SL=33cm
						wet Grey Medium Dense Fine Sand, Trace Silt, Trace mica	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH: 45
DEPTH OF G.W. 4.40m
WORK STARTED ON 13-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 5 OF 5
FINAL DEPTH 35METER
ENDED ON 13-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
29.00	SPT-16	15	22	24	(46)	do	SL: 43cm
						wet Grey Dense Fine Sand, Trace Silt, Trace Mica.	
30-50	SPT-17	16	23	25	(48)		SL: 42cm
						do	
32-00	SPT-18	20	27	24	(51)		28cm SL: 20cm
						Grey Very Dense Fine Sand, Trace Silt, Trace Mica	
33.50	SPT-19	21	28	26	(54)		SL: 20cm
						do Trace Concretion.	
35.00	SPT-20	22	29	25	(54)		SL: 35cm
						Grey Very Dense Fine Sand, Trace Silt, Trace Mica	
						Bottom of Bore Hole	

SPT Value	Sand	< 4	4 - 10	10 - 30	30 - 50	> 50	< 2	2 - 4	4 - 8	8 - 15	15 - 30	> 30
Consistency	Gravel	V. Loose	Loose	M. Dense	Dense	V. Dense	V. Soft	Soft	Firm	Stiff	V. Stiff	Hard

Terms 0 - 10 % Trace 10 - 20 % Little 20 - 35 % Some 35 - 50 % And

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

PROJECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
LOCATION

JOB No. J-576
BOREHOLE NO. BH-45

1 Sr No.	2 UDS No.	3 Depth (m) From	To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
1	1	2.00	2.50	Shelby Tube	70.45	69.55	73.4	11.40	1.2	1696	4280	35	30		50			
2	2	5.00	5.50	do	70.70	68.63	73.7	11.6	1.89	1710	4490	38	34		50			
3	3	8.00	8.50	Shelby Tube	70.45	69.55	73.4	11.40	1.2	1700	5016	42	40		50			
4	4	12.50	13.00	DENISON TUBE	70.00	—	—	—	—	1704	5116	40	38		50			
5	5	17.00	17.50	DENISON TUBE	70.00	—	—	—	—	1703	5112	50.0	45		50			
6	6	24.50	25.00	DENISON TUBE	70.00	—	—	—	—	1700	3236	30	20		-			

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-46 SHEET 1 OF 8
DEPTH OF G.W. 4.50m FINAL DEPTH 50METER
WORK STARTED ON 9-9-14 ENDED ON 11-9-14
LOGGED BY M. ALI & HUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.0							
1.00	SPT-1	1	2	1	(3)	Moist Brown, silty clay mixed with grass Roots, organice, Trace Concretion.	SL = 36cm
2.00	UDS-1	Shelby Tube			—	Moist Soft clayey Silt, Trace Concretion Trace Sand.	
3.00	SPT-2	5	6	6	(12)	Moist Brown Silt Trace Sand, Trace Mica. / clayey Silt Trace Sand Trace Concretion.	UDS-1 2.00/2.50m SL = 36cm waxed = 30cm SL = 33
4.00	UDS-2	DENSON TUBE			—	Moist Brown clay Sandy Silt / Silt	UDS-2 4.00/4.50m SL = 39cm waxed = 34cm
						Moist Brown Silt, Trace Fine Sand.	

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-46 | SHEET 2 OF 8
DEPTH OF G.W. 4.30m | FINAL DEPTH 50 METER
WORK STARTED ON 9-9-14 | ENDED ON 11-9-14
LOGGED BY M. ALI CHUGHTAI | CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						do	
5.00	SPT-4	3	6	7	(13)		SL = 37cm
						Moist Brown stiff clayey Silt, Trace Sand.	UDS-3 6.50/7.00 m SL = 50cm Waved = 46cm
6.50	UDS-3	DENSON TUBE					
						Top Moist Brown clayey silt Trace Sand, Bottom = silt, Trace Fine Sand.	
8.00	SPT-5	6	7	12	(19)		SL = 36cm
						Moist Brown very stiff silty clay, Trace Sand.	UDS-4 9.50/10.00 SL = 46cm Waved = 29%
9.50	UDS-4	DENSON TUBE					
						Moist Brown silt / clay silt Trace Fine Sand.	
11.00	SPT-6	7	11	12	(23)		SL = 30cm
						Brownish Grey Medium Dense Sandy Silt Trace Mica	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-46 SHEET 3 OF 8
DEPTH OF G.W. 4.50m FINAL DEPTH 50 METER
WORK STARTED ON 9-9-14 ENDED ON 11-9-14
LOGGED BY MIAN CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
12.50	SPT-7	10	15	16	(31)	——— do ———	SL=28cm
						Moist Brownish Grey Dense Sandy Silt, Trace mica.	
14.00	SPT-8	10	11	13	(24)		SL=35cm
						Moist Brownish Grey Medium Dense Sandy silt / Silty Fine Sand Trace mica	
15.50	SPT-9	7	8	10	(18)		SL=33cm
						——— do ———	
17.00	SPT-10	10	10	13	(23)		SL=40cm
						——— do ———	
18.50	SPT-11	10	11	14	(25)		SL=37cm
						Grey Medium Dense Silty Fine Sand, Trace mica.	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-46
DEPTH OF G.W. 4.50m
WORK STARTED ON 9-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 4 OF 8
FINAL DEPTH 50 METER
ENDED ON 11-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						——— do ———	
9-9-14 8:00 AM 20.00	SPT-12	13	14	15	(29)	Grey Medium Dense, silty Fine Sand, Trace mica.	SL = 23cm
9-9-14 21.50	SPT-13	11	15	15	(30)		SL = 24cm
						——— do ———	
23.00	SPT-14	10	13	15	(28)		SL = 42cm
						——— do ———	
24.50	SPT-15	10	13	16	(29)		SL = 43cm
						——— do ———	
26.00	SPT-16	12	15	16	(31)		SL = 36cm
						Grey Dense silty Fine Sand, Trace Concretion, Trace mica.	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-46
DEPTH OF G.W. 4.50m
WORK STARTED ON 10-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 5 OF 8
FINAL DEPTH METER
ENDED ON 11-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
27.50	SPT-17	19	19	21	(40)	—— do ——	SL=30cm
29.00	SPT-18	13	19	20	(39)	Grey Dense silty Fine Sand, Trace mica	SL=40cm
30.5	SPT-19	20	20	20	(40)	Grey Dense silty Fine Sand, Trace mica	SL=28cm.
32.0	SPT-20	24	22	24	(46)	—— do ——	SL=39cm
33.5	SPT-21	28	16	27	(43)	Grey Dense silty Fine Sand, Trace medium Sand, Trace Concretion, Trace mica.	SL=37cm
						Grey Dense Fine Sand, Trace Silt, Trace mica Trace medium Sand.	

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-46
DEPTH OF G.W. 4.50m
WORK STARTED ON 10-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 6 OF 8
FINAL DEPTH 50 METER
ENDED ON 11-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						——— do ———	
35.00	SPT-22	24	30	34	(64)	Grey Very Dense Fine to Medium Sand, Trace Silt, Trace mica, Trace Concretion.	SL 38cm
36.5	SPT-23	19	23	24	(47)		SL > 27cm
						Grey Dense Fine to Medium Sand, Trace silt, Trace concretion. Trace mica.	
38.00	SPT-24	20	24	25	(49)		SL > 30cm
						Moist to wet Grey Dense Fine Sand, Trace Silt, Trace mica.	
39.50	SPT-25	23	30	35	(65)		SL 32cm
						Moist Grey Very Dense Fine Sand, Trace Silt, Trace mica.	
41.00	SPT-26	22	28	32	(60)		SL 34cm
						——— do ———	

6:30 PM 9 10 14

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-46
DEPTH OF G.W. 4.50m
WORK STARTED ON 10-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 7 OF 8
FINAL DEPTH 50METER
ENDED ON 11-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
11/9/14 42.50	SPT-27	6	13	21	(34)	——— do ———	SL=35cm
						Moist Grey Dense silty Fine Sand, Trace mica.	
44.00	SPT-28	21	23	30	(53)		SL=39cm
						Moist to wet Grey Very Dense silty Fine Sand, Trace Concretion.	
45.50	SPT-29	18	25	30	(55)		SL=40cm
						Moist Dark Grey Very Dense Very Fine Sand, Trace Silt, Trace mica.	
47.00	SPT-30	17	26	33	(59)		SL=41cm
						——— do ———	
48.50	SPT-31	25	29	40	(69)		SL=32cm
						Moist Grey Very Dense Fine Sand Trace Medium Sand, Trace Silt, Trace mica	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And		

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-46
DEPTH OF G.W. 4.50 m
WORK STARTED ON 11-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 8 OF 8
FINAL DEPTH SOMETER
ENDED ON 11-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
12:52 pm 11/9/14 50.00	SPT-32	23	32	35	(67)	——— do ———	SL: 30cm
						Grey Very Dense Fine Sand, Trace Silt Trace	
						Bottom of Bore Hole	
						11/9/14	

SPT Value	Sand	< 4	4 - 10	10 - 30	30 - 50	> 50		Silt	< 2	2 - 4	4 - 8	8 - 15	15 - 30	> 30
Consistency	Gravel	V. Loose	Loose	M. Dense	Dense	V. Dense		Clay	V. Soft	Soft	Firm	Stiff	V. Stiff	Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

JECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
ATION

JOB No. J-576
BOREHOLE NO. BH-46

1 Sr.No.	2 UDS No.	3 Depth (m) From	To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube + Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
9/7/14 1	1	2.00	2.50	Shelby Tube	70.45	69.55	73.4	11.40	1.2	1684	3354	36	30		50			
2	2	4.00	4.50	Denson Tube	70.10	—	—	—	—	1704	3840	39	34		50			
3	3	6.5	7.00	Denson Tube	69.9	—	—	—	—	1700	5230	50	46		50			
4	4	9.50	10.00	Denson Tube	70.00	—	—	—	—	1686	3952	46	29		50			

11/9/14

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-47 SHEET 1 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35m
EASTING: NORTHING: WORK STARTED ON 11-09-2014 ENDED ON 12-09-14
ELEVATION: LOGGED BY SHAHID SALEEM CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.0						Silty Clay / Clayey Silt: Light brown, Dry, Trace grass & plants roots, Trace organic matter, Trace to little concretion	OPEN PIT MATERIAL
1.0	SPT-01	1	1	2	(3)	Clayey Silt: Light brown, Soft, Moist, Low cohesive, Trace fine sand.	SL = 40 cm
2.0	UDS-01					Clayey Silt: Light brown, Moist, Trace fine sand, Silty/Sandy content increasing toward bottom.	UDS-01, SHELBY at 2.0 – 2.5m
3.0	SPT-02	1	3	4	(7)	Clayey Silt: Light brown, Firm, Moist, Trace fine sand.	SL = 36 cm
4.0	UDS-02					Light brown, clayey silt,	UDS-02, SHELBY at 4.0 – 4.5m
5.0	SPT-03	3	3	3	(9)	Clayey Silt: Light brown, stiff, Moist Trace fine sand.	SL = 41 cm

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-47 SHEET 2 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35.0m
EASTING: NORTHING: WORK STARTED ON 11-09-14 ENDED ON 12-09-14
ELEVATION: LOGGED BY SHAHID CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
6.5	UDS-03					Light brown, Clayey Silt, Wet Trace to little fine Sand.	UDS-03, SHELBY at 6.5–7.0m
8.0	SPT-04	5	5	8	(13)	Clayey Silt: Light brown, stiff, Wet Trace to little fine Sand	SL=40 cm
9.5	UDS-04					Silty Clay/Lean clay, Light brown, Wet, Medium Plastic, Medium dry strength. Cohesive,	UDS-04, DENISON at 9.5–10.0m
11.0	SPT-5	8	12	14	(26)	Silty Sand: Light brown to light grey, Medium dense, very fine grained, Water saturated, Clayey Contaminated	SL=40cm
12.5	SPT-6	8	10	12	(22)	— DO —	SL=39cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-47 SHEET 3 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35.0m
EASTING: NORTHING: WORK STARTED ON 03-09-14 ENDED ON 12-09-14
ELEVATION: LOGGED BY SHAHID CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
14.0	SPT-7	10	13	15	(28)	— DO —	SL = 38cm
15.5	SPT-8	13	15	18	(33)	Fine Sand: Light grey, Dense, very fine grained, water saturated, Sorted, clayey contaminated, Trace mica.	SL = 35cm
17.0	SPT-9	10	12	14	(26)	— DO —	SL = 35cm
18.5	SPT-10	11	13	15	(28)	— DO —	SL = 37cm
20.0	SPT-11	14	16	19	(35)	— DO —	SL = 38cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-47
DEPTH OF G.W.
WORK STARTED ON 11-09-14
LOGGED BY

SHEET 4 OF 5
FINAL DEPTH 35 m
ENDED ON 12-09-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21.5	SPT-12	10	13	17	(39)	Sand: Light grey, Dense, Fine grained, Water saturated, unsorted, Trace concretion, Trace mica	SL = 33cm
23.0	SPT-13	13	18	21	(39)	— DO —	SL = 38cm
24.5	SPT-14	12	17	20	(37)	— DO —	SL = 33cm
26.0	SPT-15	12	14	18	(32)	— DO —	SL = 32cm
27.5	SPT-16	17	21	24	(45)	— DO —	SL = 37cm

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-47
DEPTH OF G.W.
WORK STARTED ON 11-09-14
LOGGED BY SHAHID

SHEET 5 OF 5
FINAL DEPTH 35m
ENDED ON 12-09-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
29.0	SPT-17	13	19	28	(47)	— DO —	SL = 34 cm
30.5	SPT-18	15	18	24	(42)	Sand: Light grey, Dense, Fine grained, Sorted, clean, Water Saturated, Trace mica	SL = 30 cm
32.0	SPT-19	14	20	25	(45)	— DO —	SL = 30 cm
33.5	SPT-20	15	18	25	(43)	— DO —	SL = 36 cm
35.0	SPT-21	12	14	17	(31)	— DO —	SL = 39 cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

PROJECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
LOCATION

JOB No. J-576
BOREHOLE NO. BH-47

1 Sr No.	2 UDS No.	3 Depth (m) From	3 To	4 Type of Sampler	5 inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
	1	2.0	2.5	SHELBY	70.0		73.55			1690	4870	44	41		50			
	2	4.0	4.5	〃	70.0		73.2			1680	4550	39	36		50			
	3	6.5	7.0	〃	70.15		73.4			1682	4254	35	32		50			
	4	9.5	10.0	DENISON	70.2		73.0			1724	4280	34	31		50			

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-48
DEPTH OF G.W. 4.4m
WORK STARTED ON 13.9.14
LOGGED BY M.ALI CHUGHTAI

SHEET 1 OF 5
FINAL DEPTH 35 METER
ENDED ON 14-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
1.00	SPT-1	1	2	3	(5)	Moist Brown clayey silt mixed with Concretion, Trace Sand.	SL = 320mm
2.00	UDS-1	Shelby Tube				Moist Brown clayey silt Trace Concretion, Trace Sand.	UDS-1 2.00/2.50m SL = 40cm waxed = 35cm
						——— do ———	
3.00	SPT-2	1	3	3	(5)		SL = 35"
	UDS-2	Shelby Tube				Brown moist Firm silty Clay Trace Sand.	UDS-2 4.00/4.50m SL = 390mm waxed = 34cm
5.00	SPT-3	2	5	5	(10)	Brown silt/clayey silt	SL = 40cm
						Moist Brown silt/Sand with silt none Plastic.	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-48
DEPTH OF G.W. 4.40m
WORK STARTED ON 13-9-14
LOGGED BY M. ALI CHUGHTAI

SHEET 3 OF 3
FINAL DEPTH 35 METER
ENDED ON 14-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
6.50	SPT-4	3	5	7	(12)	do moist Brown Silt / clayey silt Trace Sand	SL = 43cm
8.00	UDS-3	Shelby Tube			—		
						do	UDS-3 8.00/8.50m SL = 35c waxed = 3
9.50	SPT-5	3	6	7	(13)	moist Brown silty clay / clayey silt	SL = 43cm
11.00	UDS-4	DENSON TUBE					UDS-4 11.00/11.50m SL = 38c waxed = 35
						Brown clayey silt	
12.50	SPT-6	9	13	13	(26)		SL = 30cm
						Brown Medium Dense silt Bottom of SPT Shown 10cm Sandy Silt Trace Mica	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-48 SHEET 3 OF 5
DEPTH OF G.W. 4.40m FINAL DEPTH 35 METER
WORK STARTED ON 13-9-14 ENDED ON 14-9-14
LOGGED BY M. ALI CHUGHTAI CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
14.00	SPT-7	12	13	15	(28)	——— do ———	SL = 30cm
						Grey Medium Dense Silty Fine Sand, Trace mica.	
15.50	SPT-8	3	5	7	(12)		SL = 35cm
						Brown moist Stiff Silty Clay Trace Fine Sand.	
17.00	UDS-5	Shelby Tube			—		
						Top: Silty Clay Bottom silty Sand, Trace mica	UDS-5 17.0/17.50m SL = 29cm Worked = 28cm
13/9/14 18.50	SPT-9	11	12	8	(20)		
						18.50/18.69 Fine Sand Trace Silt Trace Concretion.	SL = 38cm
7.35pm						18.69/18.88 Brownish silty clay Trace Concretion.	
14/9/14 20.00	SPT-10	2	5	5	(10)	Yellowish Grey Stiff Silty Clay Trace Sand, Layer by Layer Bottom of Shaly Show Sand.	SL = 43cm

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-48
DEPTH OF G.W. 4.40m
WORK STARTED ON 14-9-14
LOGGED BY M-ALI CHUGHTAI

SHEET 4 OF 5
FINAL DEPTH 35 METER
ENDED ON 14-9-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						——— do ———	
21.50	SPT-11	12	17	18	(35)	Brownish Grey Dense Sandy Silt Trace mica.	SL= 43cm
23.00	SPT-12	3	5	8	(13)		SL= 45cm
						Layer by Layer Yellowish Grey Stiff Silty clay / clayey silt Trace Sand	UDS-6 24.50/25.00, SL = 30cm Wash = 20cm
24.50	UDS-6	DENSON TUBE				———	
						do	
26.00	SPT-13	7	10	15	(25)		SL=15cm
						Brownish Grey Medium Dense Sandy silt / silty Fine Sand, Trace mica	
27.50	SPT-14	15	18	17	(35)		SL= 30cm
						Grey Dense silty Fine Sand, Trace mica	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-48 SHEET 5 OF 5
STRUCTURE: DEPTH OF G.W. 4.40m FINAL DEPTH 35 METER
EASTING: NORTHING: WORK STARTED ON 14-9-14 ENDED ON 14-9-14
ELEVATION: LOGGED BY M. ALICHUGHTAI CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
29.00	SPT-15	15	21	27	(48)	do	SL=40cm
30.5	SPT-16	15	22	25	(47)	Grey Dense Sandy silt/silty Fine Sand, Trace Concretion, Trace mica	SL=42cm
32.00	SPT-17	20	22	27	(49)	Grey Dense Silty Fine Sand, Trace Mica	SL=43cm
33.50	SPT-18	20	24	23	(47)	do	SL=39cm
35.00	SPT-19	19	26	27	(53)	do	SL=20cm
						Grey Very Dense Fine Sand, Trace silt Trace Mica	
						Bottom of Bore Hole	

SPT Value	Sand	< 4	4 - 10	10 - 30	30 - 50	> 50	Silt/Clay	2 - 4	4 - 8	8 - 15	15 - 30	> 30
Consistency	Gravel	V. Loose	Loose	M. Dense	Dense	V. Dense		Soft	Firm	Stiff	V. Stiff	Hard

Terms 0 - 10 % Trace 10 - 20 % Little 20 - 35 % Some 35 - 50 % And

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

ECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd. Pakistan
TION

JOB No. J-576
BOREHOLE NO. BH-48

1 Sr No.	2 UDS No.	3 Depth (m) From	3 Depth (m) To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
1	1	2.00	2.50	SHELBY TUBE		68.5				1704	4430	40	35					
2	2	4.00	4.50	do		69.0				1702	4568	39	34					
3	3	8.00	8.50	do		70.00				1703	4000	35	31					
4	4	11.00	11.50	DENISON TUBE		70.0				1704	4754	38	35					
5	5	17.00	17.50	SHELBY TUBE		69.9				1692	4020							

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: 402748.04m NORTHING: 3457846.47m
ELEVATION: 204.61m
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-49
DEPTH OF G.W.
WORK STARTED ON 19-09-14
LOGGED BY Shahid Saleem.

SHEET 1 OF 5
FINAL DEPTH 35
ENDED ON 20-09-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.0						Silty clay/Clayey Silt: Light brown, Moist, low Plastic, cohesive, Trace Plants & grass roots, Trace concretion.	Open Pit Material.
1.0	SPT-01	2	2	3	(5)	Clayey Silt: Light brown, Moist, Firm, Less cohesive, Very low plastic, Trace fine Sand	SL = 39cm
2.0	UDS-01					Clayey Silt: Light brown, Moist, Less cohesive Very Low plastic, Trace fine Sand.	UDS-01 Shelby at 2.0-2.5m
3.0	SPT-02	5	5	4	(9)	Clayey Silt/Silt: Light brown, stiff, Moist, Non plastic, Low cohesive Trace fine Sand.	SL = 35cm
4.0	UDS-02					Clayey Silt: Light brown, Moist, Less cohesive, Low plastic, Trace fine Sand.	UDS-02 Shelby at 4.0-4.5m
5.0	SPT-03	2	3	5	(8)	Clayey Silt: Light brown, Stiff, Moist, Less cohesive Low to non plastic, Trace fine Sand,	SL = 33cm

SPT Value	Sand	< 4	4 - 10	10 - 30	30 - 50	> 50		Silt	< 2	2 - 4	4 - 8	8 - 15	15 - 30	> 30
Consistency	Gravel	V. Loose	Loose	M. Dense	Dense	V. Dense		Clay	V. Soft	Soft	Firm	Stiff	V. Stiff	Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-49
DEPTH OF G.W.
WORK STARTED ON 19-09-14
LOGGED BY Shahid Saleem

SHEET 2 OF 5
FINAL DEPTH 35.0m
ENDED ON 20-09-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
6.5	UDS-03					Clayey Silt: Light brown, Moist, Less cohesive very very Low plastic, Trace fine Sand.	UDS-03 Denison cut 6.5-7.0m
8.0	SPT-04	7	6	10	(16)	Clayey Silt/Silt: Light brown, very stiff, Wet, Non plastic, Non cohesive, Trace fine Sand,	SL=30cm.
9.5	UDS-04					Silty clay/Lean clay: Light brown, Wet, cohesive medium to highly plastic. Trace fine Sand,	UDS-04 Denison cut 9.5-10.0m
11.0	SPT-5	7	9	11	(20)	Clayey Sandy Silt: Light brown to light grey, Saturated very stiff, Trace Concretion, Sandy Content increase toward bottom	SL=39cm
12.5	SPT-6	6	8	10	(18)	Sandy Silt/Silt: Light grey, very stiff, Water saturated, Clayey Contaminated.	SL=35cm

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-49 SHEET 3 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35.0m
EASTING: NORTHING: WORK STARTED ON 19-09-14 ENDED ON 20-9-14
ELEVATION: LOGGED BY Shahid Saleem CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
14.0	SPT-7	11	12	12	(24)	— DO —	SL = 37cm
15.5	SPT-8	10	13	15	(28)	Fine Sand. Light grey, Medium dense, Fine grained, Water saturated, clean, sorted, Trace mica.	SL = 38cm
17.0	SPT-9	12	12	14	(26)	— DO —	SL = 35cm
18.5	SPT-10	14	13	14	(27)	— DO —	SL = 33cm
20.0	SPT-11	9	12	15	(27)	— DO —	

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-49 SHEET 4 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35.0
EASTING: NORTHING: WORK STARTED ON 19-09-14 ENDED ON 20-09-14
ELEVATION: LOGGED BY Shahid Saleem CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21.5	SPT-12	10	13	17	(30)	—— Do ——	SL = 38cm
23.0	SPT-13	9	10	10	(20)	Silty clay/Lean Clay; Light brown, very stiff, Wet, cohesive, Medium to high plastic,	SL = 41cm ★ Mean layers of clay/c clay which shows that these layers act as seal layer for fluid
24.5	UDS-05					Siltyclay/lean clay: Same as above	UDS-05 Denison at 24.5-25.0m
26.0	SPT-14	17	20	18	(38)	Fine Sand with concretion; Sand is light grey, Dense and fine grained, concretion is highly angular, hard clayey contaminated,	★ Cementation of fine material mak concretion under high pressure,
27.5	SPT-15	16	22	27	(49)	Fine Sand: Light grey, Dense, Fine grained, clean Saturated, unsorted, Trace concretion	SL = 33cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-49
DEPTH OF G.W.
WORK STARTED ON 19-09-14
LOGGED BY Shahid Saleem

SHEET 5 OF 5
FINAL DEPTH 35.0m
ENDED ON 20-09-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
29.0	SPT-16	15	23	27	(50)	— DO —	SL = 33cm
30.5	SPT-17	19	21	24	(45)	— DO —	SL = 35 cm.
32.0	SPT-18	18	20	20	(40)	Sand: Light grey, Dense, Fine to medium grained, clean, unsorted, Saturated. Trace concretion.	SL = 31 cm
33.5	SPT-19	22	26	29	(55)	Sand: Light grey, very dense, Fine to medium grained, Poorly sorted, Trace concretion,	SL = 34 cm ☆ Concretion is highly angular and low density.
35.0	SPT-20	23	28	30	(58)	— DO —	SL = 30 cm.

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

JECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
TION

JOB No. J-576
BOREHOLE NO. BH-49

1 Sr No.	2 UDS No.	3 Depth (m) From	3 To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weigtt of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
	1	2.0	2.5	Shelby	69.9		73.3			1670	5066	45	43		50			
	2	4.0	4.5	11	70.0		73.3			1650	4448	37	35		50			
	3	6.5	7.0	Denison	69.95		73.4			1714	5606	48	45		50			
	4	9.5	10.0	11	70.0		73.0			1680	4882	47	44		50			
	5	24.5	25.0	11	69.95		73.2			1685	4090	37	35		50			

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: 402737.365 NORTHING: 3457811.506
ELEVATION: 204.59
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-50 SHEET 1 OF 7
DEPTH OF G.W. FINAL DEPTH 50
WORK STARTED ON 17-09-14 ENDED ON 18-09-14
LOGGED BY SHAHID CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.0						Silty Clay: light brown, Moist, low Plastic, little Concretion, Trace organic matter, Trace plants & grass roots.	OPEN PIT MATERIAL
1.0	SPT-01	1	2	2	(4)	Silty Clay / Clayey Silt: light brown, soft, Moist, very low plastic, cohesive Trace organic matter, Trace concretion, Trace plants & grass roots,	SL = 40cm
2.0	UDS-01					Clayey Silt: Light brown, Moist, very low plastic, Less cohesive, Trace fine Sand,	UDS-01 Shelby at 2.0-2.5m
3.0	SPT-02	2	2	3	(5)	Clayey Silt, Light brown, Firm, Wet, less cohesive, Trace fine Sand.	SL = 41cm
4.0	UDS-02					Silty Clay: Light brown, Wet, Cohesive, Low to medium plastic	UDS-02 Shelby at 4.0-4.5m
5.0	SPT-03	3	3	5	(8)	Clayey Silt: Light brown, Firm, Wet Trace fine Sand.	SL = 35cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-50 SHEET 2 OF 7
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 50.0m
EASTING: NORTHING: WORK STARTED ON 17-04-14 ENDED ON 18-09-14
ELEVATION: LOGGED BY Shahid CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
6.5	UDS-03					Clayey Silt: Light brown, Wet, Non plastic Trace fine Sand.	UDS-03 Denison at 6.5-7.5m
8.0	SPT-4	6	8	8	(16)	Sandy Silt: Light brown to light grey, very stiff, Non plastic, Non cohesive, Water saturated,	SL=30cm
9.5	SPT-5	4	6	7	(13)	Clayey Silt: Light brown, stiff, Wet Trace fine Sand.	SL=35cm
10	UDS-04					Clayey Silt: Light brown, Wet, Non plastic, Trace fine Sand, Sandy content increasing toward bottom.	
12.5	SPT-6	8	8	8	(16)	Sandy Silt: Light brown to light grey, very stiff, water saturated,	SL=39cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-50 SHEET 3 OF 7
DEPTH OF G.W. FINAL DEPTH 50
WORK STARTED ON 17-09-14 ENDED ON 18-09-14
LOGGED BY Shahid Saleem CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						clayey contaminated,	
14.0	SPT-7	14	16	17	(33)	Sandy Silt: Light grey, Hard, Water Saturated, clayey contaminated,	SL = 32 cm
15.5	SPT-8	11	13	15	(28)	Fine Sand: Light grey, Medium dense, Water Saturated, clean, Sorted, Fine grained. Trace mica.	SL = 20cm
17.0	SPT-9	14	15	16	(31)	Fine Sand: Light grey, Dense, Fine grained, Sorted, clean, Water Saturated, Trace mica.	SL = 33cm
18.5	SPT-10	14	16	20	(36)	— DO —	SL = 35cm
20.0	SPT-11	13	15	19	(34)	— DO —	SL = 32cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

Terms 0 - 10 % Trace 10 - 20 % Little 20 - 35 % Some 35 - 50 % And

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-50 SHEET 4 OF 7
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 50
EASTING: NORTHING: WORK STARTED ON 17-09-14 ENDED ON 18-09-14
ELEVATION: LOGGED BY Shahid CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21.5	SPT-12	12	16	18	(34)	——DO——	SL=36cm
23.0	SPT-13	11	15	16	(31)	Fine Sand; Light grey, Dense, Fine grained, Interlayered greyish clay, Water saturated, clayey contaminated, Trace mica.	SL=40cm
24.5	SPT-14	13	15	18	(33)	Fine Sand, Light grey, Dense, Fine grained, Water saturated, clayey contaminated, little concretion.	SL=30cm.
26.0	SPT-15	15	16	20	(36)	—— DO ——	SL=33cm.
27.5	SPT-16	18	20	26	(46)	Fine Sand: Light grey, Dense, Fine grained, Saturated, clayey Contaminated, Trace mica	SL=30cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-50 SHEET 5 OF 7
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 50.0m
EASTING: NORTHING: WORK STARTED ON 17-09-14 ENDED ON 18-09-14
ELEVATION: LOGGED BY Shahid Saleem. CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
29.0	SPT-17	20	23	26	(49)	— DO —	SL = 28cm
30.5	SPT-18	15	16	18	(34)	Fine Sand. Light grey, Dense, Fine grained, clayey laminae* at places. Trace concretion.	SL = 35cm *Thin layers of clay
32.0	SPT-19	14	16	16	(32)	— DO —	S = 33cm
33.5	SPT-20	18	23	27	(50)	Fine Sand. Light grey, very dense, Fine grained, clean, water saturated, Well sorted, Trace mica.	S=L=36cm
35.0	SPT-21	20	26	31	(57)	— DO —	SL = 38cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-50 SHEET 6 OF 7
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 50m
EASTING: NORTHING: WORK STARTED ON 17-09-14 ENDED ON 18-09-14
ELEVATION: LOGGED BY Shahid. CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
36.5	SPT-22	22	30	36	(66)	Sand: Light grey, very dense, Fine to medium grained, clean, unsorted, Saturated, High angular trace concretion.* Trace mica	SL = 34cm * cemented fine sand i-e concretion
38.0	SPT-23	29	41	42	(83)	— DO —	SL = 33cm
39.5	SPT-24	18	20	24	(44)	Sand: Light grey, Dense, with light grey hard compacted clay,* clay is in layered form, Trace to little concretion of compacted clay.	SL = 35cm * Layers of clay are at regular interval
41.0	SPT-25	15	18	18	(36)	— DO —	SL = 31cm
42.5	SPT-26	19	24	32	(56)	— DO —	SL = 35cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms		0 - 10 % Trace		10 - 20 % Little		20 - 35 % Some	35 - 50 % And						

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-50 SHEET 7 OF 7
DEPTH OF G.W. FINAL DEPTH 50.0m
WORK STARTED ON 17-09-14 ENDED ON 18-09-14
LOGGED BY Shahid Saleem CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
44.0	SPT-27	25	35	40	(75)	Fine Sand: Light grey, very dense, Fine grained, water saturated, clayey contamination* is light grey, unsorted, Trace mica	SL=39cm. *clayey matrix
45.5	SPT-28	30	40	48	(88)	— DO —	SL=37cm.
47.0	SPT-29	30	35	40	(75)	— DO —	SL=38cm.
48.5	SPT-30	34	32	36	(68)	Sand: Light grey, very dense, Fine to medium grained, Patches of light grey hard clay* at places, Trace mica.	SL=35cm. *clay is in the layered form.
50.0	SPT-31	27	35	55	(90)	Fine Sand: Light grey, very dense, Fine grained, clayey contaminated, Sorted, Trace mica.	SL=35cm.

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

PROJECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
LOCATION

JOB No. J-576 570
BOREHOLE NO.

1 Sr No.	2 UDS No.	3 Depth (m) From	3 To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weigth of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
	1	2.0	2.5	Shelby	69.9		73.10			1686	3472	24	21		50			
	2	4.0	4.5	11	70.0		73.15			1682	4884	41	38		50			
	3	6.5	7.0	DENISON	70.0		73.10			1694	4680	39	36		50			
	4	11.0	11.5		70.10		73.25			1704	5236	44	41		50			

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-51
SHEET 1 OF 5
STRUCTURE:
DEPTH OF G.W.
FINAL DEPTH 35m
EASTING: NORTHING:
WORK STARTED ON 14-09-14
ENDED ON 15-09-14
ELEVATION:
LOGGED BY SHAHID
CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.0						Silty clay/Clayey Silt: Light brown, Moist, Low Plastic little concretion, Trace grass roots	OPEN PIT MATERIAL
1.0	SPT-01	1	1	2	(3)	Clayey Silt: Light brown, Soft, Moist, Non Cohesive Trace fine Sand.	SL= 39m
2.0	UDS-01					Clayey Silt: Light brown, Moist, Non cohesive, Trace fine Sand	UDS-01, SHELBY at 2.0-2.5m
3.0	SPT-02	1	2	2	(4)	Clayey Silt: Light brown, Soft, Wet, Non Cohesive Trace fine Sand.	SL= 40m
4.0	UDS-02					Clayey Silt: Light brown, Wet, Trace fine Sand.	UDS-02 SHELBY at 4.0-4.5m
5.0	SPT-03	3	4	5	(9)	Clayey Silt: Light brown, Stiff, Wet, Non Cohesive Trace fine Sand	SL= 35m

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-51 SHEET 2 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35
EASTING: NORTHING: WORK STARTED ON 14-09-14 ENDED ON 15-09-14
ELEVATION: LOGGED BY SHAHID CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
6.5	SPT-4	4	5	8	(13)	— Do —	SL=37cm
8.0	SPT-5	4	6	9	(15)	— Do —	SL=30cm
9.5	SPT-6	6	8	10	(18)	Clayey Silt: Light brown, very stiff, wet. Trace fine Sand.	SL=39cm.
11.0	SPT-7	10	10	15	(25)	Sandy Silt: Light brown to light grey, very stiff, wet, Trace fine Sand.	SL=35cm.
12.5	SPT-8	13	16	20	(36)	Sandy Silt: Light grey, Hard, water saturated, Trace fine Sand.	SL=40cm.

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-51 SHEET 3 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35
EASTING: NORTHING: WORK STARTED ON 14-09-14 ENDED ON 15-09-14
ELEVATION: LOGGED BY SHAHID CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
14.0	SPT-9	9	10	10	(20)	Fine Sand: Light grey, Medium dense, Fine grained, Water Saturated, Poorly Sorted, clayey contaminated, Trace mica.	SL = 40 cm.
15.5	SPT-10	8	11	13	(24)	—— DO ——	SL = 38 cm
17.0	SPT-11	9	12	13	(25)	—— DO ——	SL = 30 cm
18.5	SPT-12	10	12	14	(26)	—— DO ——	SL = 33 cm
20.0	SPT-13	11	13	17	(30)	—— DO ——	SL = 35 cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-51
SHEET 4 OF 5
STRUCTURE:
DEPTH OF G.W.
FINAL DEPTH 35m
EASTING: NORTHING:
WORK STARTED ON 14-09-14
ENDED ON 15-09-14
ELEVATION:
LOGGED BY SHAHID
CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
21.5	SPT-14	12	15	20	(35)	Fine Sand: Light grey, Dense, Fine grained, Water saturated, Sorted, cleem, Trace mica.	SL = 35cm
23.0	SPT-15	12	18	24	(42)	Sand: Light grey, Dense, Fine to medium grained, Water saturated, clayey lumps at places, Trace mica	SL = 30 cm
24.5	SPT-16	15	20	25	(45)	— DO —	SL = 31cm
26.0	SPT-17	17	21	25	(46)	— DO —	SL = 33cm
27.5	SPT-18	11	18	26	(44)	— DO —	SL = 35cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-51 SHEET 5 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35
EASTING: NORTHING: WORK STARTED ON 14-09-14 ENDED ON 15-09-14
ELEVATION: LOGGED BY SHAHID CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
29.0	SPT-19	12	16	21	(37)	— DO —	SL = 35 cm
30.5	SPT-20	12	14	20	(34)	— DO —	SL = 36 cm
32.0	SPT-21	16	20	24	(44)	— DO —	SL = 36 cm
33.5	SPT-22	17	23	28	(51)	— DO —	SL = 35 cm
35.0	SPT-23	17	22	31	(53)	— DO —	SL = 34 cm

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

JECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
ATIDN

JOB No. J-576
BOREHOLE NO. 51

1 Sr No	2 UDS No.	3 Depth (m) From	3 To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weight of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
	1	2.0	2.5	SHELBY	69.9		73.4			1702	4244	35	32		50			
	2	4.0	4.5	〃	69.9		73.3			1700	2880	15	13		50			

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-52 SHEET 1 OF 5
STRUCTURE: DEPTH OF G.W. FINAL DEPTH 35
EASTING: 402700.29 NORTHING: 3457768.926 WORK STARTED ON 15-09-14 ENDED ON 16-09-14
ELEVATION: 204.53 LOGGED BY Shahid Saleem. CHECKED BY
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
0.0							
1.0	SPT-01	1	1	1	(2)	Silty Clay/Clayey Silt: Light brown, Soft, Moist, very low plastic, Less cohesive, Trace fine sand	SL = 40cm.
2.0	UDS-01					Clayey Silt: Light brown, Moist, very low plastic, very low cohesive, Trace fine Sand.	UDS-01 SHELBY at 2.0 – 2.5m
3.0	SPT-2	1	2	1	(3)	Clayey Silt: Light brown, Soft, Less cohesive, Inlet, very low plastic, Trace fine Sand.	SL = 38cm
4.0	UDS-02					Clayey Silt: Light brown, Moist, very low Plastic, less cohesive, Trace fine sand.	UDS-02 SHELBY at 4.0 – 4.5m
5.0	SPT-03	2	3	2	(5)	Clayey Silt: Light brown, Firm, Wet, very low cohesive, very low plastic, Trace fine Sand	SL = 39cm.

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense
Terms		0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And	

Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-52
DEPTH OF G.W.
WORK STARTED ON 15-09-14
LOGGED BY Shahid Saleem

SHEET 2 OF 5
FINAL DEPTH 35
ENDED ON 16-09-14
CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
6.5	UDS-03					Clayey Silt: Light brown, Wet, very low Plastic, less cohesive, Trace fine sand.	UDS-03 SHELBY at 6.5-7.0m
8.0	SPT-04	7	7	10	(17)	Clayey Silt: Light brown, very stiff, Wet, very very low cohesive, Trace fine Sand.	SL = 39cm
9.5	UDS-04					Silty Clay / Lean Clay: Light brown, Wet, Medium to high plastic, cohesive, Trace fine Sand.	UDS-04 DENISON at 9.5-10.0m
11.0	SPT-5	9	10	13	(23)	Sandy Silt: light brown to light grey. very stiff, Water Saturated, clayey Contaminated.	SL = 40cm
12.5	SPT-6	8	14	14	(28)	—DO—	SL = 36cm

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And										

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
STRUCTURE:
EASTING: NORTHING:
ELEVATION:
TYPE OF DRILLING : Hydraulic Feed Straight Rotary Drilling

BOREHOLE NO. BH-52 SHEET 3 OF 5
DEPTH OF G.W. FINAL DEPTH 35.0m
WORK STARTED ON 15-09-14 ENDED ON 16-09-14
LOGGED BY Shahid CHECKED BY

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
14.0	SPT-7	14	14	16	(30)	Silty Sand: Light grey, Dense, Water saturated, clayey contaminated, Traee concreton, Traee mica	SL = 35cm
15.5	SPT-8	12	14	17	(31)	Fine Sand: Light grey, Dense, Fine grained, Water saturated, cleam, unsorted, Traee mica	SL = 30cm
17.0	SPT-9	12	15	18	(33)	—— DO ——	SL = 33cm
[illegible]	SPT-10	13	15	19	(34)	—— DO ——	SL = 36cm
20.0	SPT-11	11	13	16	(29)	Fine Sand: Light grey, Medium dense, Fine grained, Water saturated,	SL = 34cm

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-52
SHEET 4 OF 5
STRUCTURE:
DEPTH OF G.W.
FINAL DEPTH 35m
EASTING: NORTHING:
WORK STARTED ON 15-09-14
ENDED ON 16-09-14
ELEVATION:
LOGGED BY Shahid
CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						Clean, Sorted, Trace mica.	
21.5	SPT-12	11	12	15	(27)	— DO —	SL = 33cm
23.0	SPT-13	15	18	21	(39)	Sand. Light grey, Dense, Fine grained, Water saturated, clean, Sorted, Trace mica.	SL = 34cm.
24.5	SPT-14	15	20	22	(42)	— DO —	SL = 31cm
26.0	SPT-15	16	19	21	(40)	— DO —	SL = 36cm.
27.5	SPT-16	18	25	22	(47)	Sand. Light grey, Dense, Fine to medium grained, Water saturated, clean	SL = 39cm

SPT Value Consistency	Sand Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense		Silt Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms		0 - 10 % Trace		10 - 20 % Little		20 - 35 % Some	35 - 50 % And							

SUBSURFACE EXPLORATION LOG

PROJECT: (J-576) 1 x 40 MW Coal Based captive power plant of Nishat Chunian Ltd, Pakistan
BOREHOLE NO. BH-52
SHEET 5 OF 5
STRUCTURE:
DEPTH OF G.W.
FINAL DEPTH 35.0m
EASTING: NORTHING:
WORK STARTED ON 15-09-14
ENDED ON 16-09-14
ELEVATION:
LOGGED BY Shahid Saleem.
CHECKED BY
TYPE OF DRILLING: Hydraulic Feed Straight Rotary Drilling

DEPTH (m)	TYPE OF SAMPLE	STANDARD PENETRATION BLOWS 6"	6"	6"	OBSERVED N-VALUE (Blows/30 cm)	DESCRIPTION OF METERIAL	REMARKS
						High angular little concretion, Trace mica.	
29.0	SPT-17	15	17	20	(37)	Sand: Light grey, Dense, Fine to medium grained, Water saturated, clean, Sorted, Trace mica.	SL = 31cm
30.5	SPT-18	16	25	26	(51)	Sand: Light grey, very dense, Fine to medium grained, Water saturated clean, Sorted, Trace mica.	SL = 30cm
32.0	SPT-19	18	25	28	(53)	— DO —	SL = 32cm
33.5	SPT-20	20	26	30	(56)	Fine Sand: Light grey, very dense, Fine grained, Water saturated, clean, Poorly sorted, Trace concretion, Trace mica.	SL = 36cm
35.0	SPT-21	19	25	27	(52)	— DO —	SL = 33cm

SPT Value / Consistency	Sand / Gravel	< 4 V. Loose	4 - 10 Loose	10 - 30 M. Dense	30 - 50 Dense	> 50 V. Dense	Silt / Clay	< 2 V. Soft	2 - 4 Soft	4 - 8 Firm	8 - 15 Stiff	15 - 30 V. Stiff	> 30 Hard
Terms	0 - 10 % Trace	10 - 20 % Little	20 - 35 % Some	35 - 50 % And									

BERKELEY ASSOCIATES
(Detail of Undisturbed Samples)

PROJECT: 1 x 40 MW Coal based captive power plant of Nishat Chunian Ltd, Pakistan
LOCATION

JOB No. J-576
BOREHOLE NO. 52

1 Sr No.	2 UDS No	3 Depth (m) From	3 To	4 Type of Sampler	5 Inner Dia of Tube (mm)	6 Edge Dia of Tube (mm)	7 Outer Dia of Tube (mm)	8 Area Ratio (%) (AR)	9 Clearance Ratio (%) (CR)	10 Weigt of Tube (gm)	11 Weight of Tube +Soil (gm)	12 Lenth of Sample Recovered (cm)	13 Waxed Lenth of Sample (SW)	14 Penetration(cm) Time (Second) Pressure (PSI)	15 Total Penetration (cm)	16 Natural Moisture Content	17 Bulk Density	18 Remarks
	1	2.0	2.5	SHELBY	69.85		73.4			1702	4106	30	28	50				
	2	4.0	4.5	11	69.90		73.4			1676	5052	45	42	50				
	3	6.5	7.0	11	70.0		73.45			1710	4938	42	39	50				
	4	8.0	10.0	DENISON	70.10		73.5			1710	4902	43	40	50				

Area Ratio = $\frac{(7)^2 - (6)^2 \times 100}{(6)^2}$

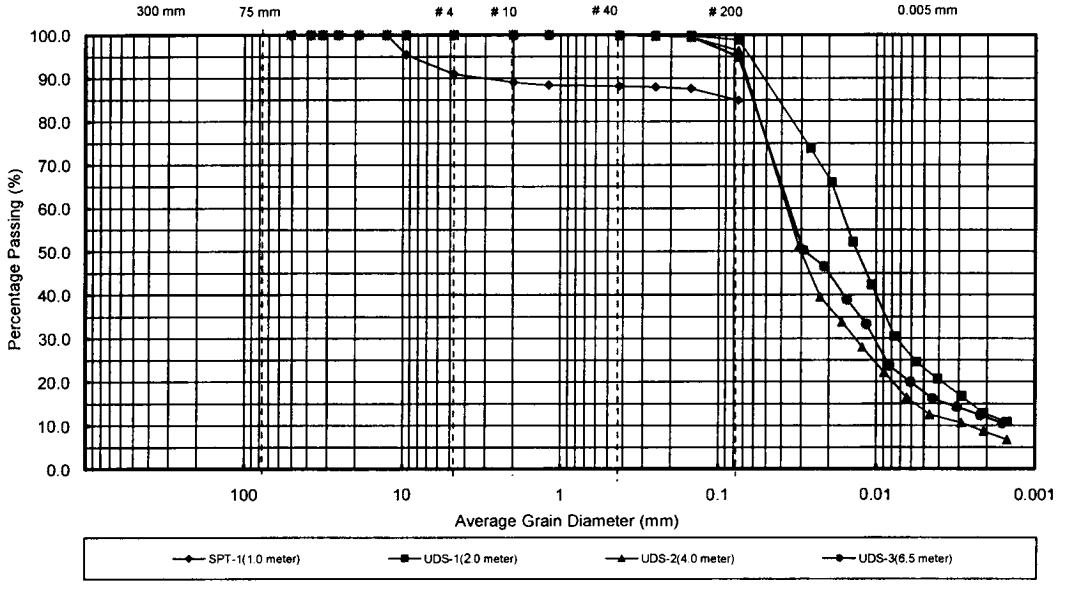
Clearance Ratio = $\frac{(5) - (6) \times 100}{(6)}$

Client / Consultant: _____

APPENDIX - C
AVAILABLE LABORATORY TEST RESULTS

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan

Borehole No. BH-1 **Lab Ref.** J-576



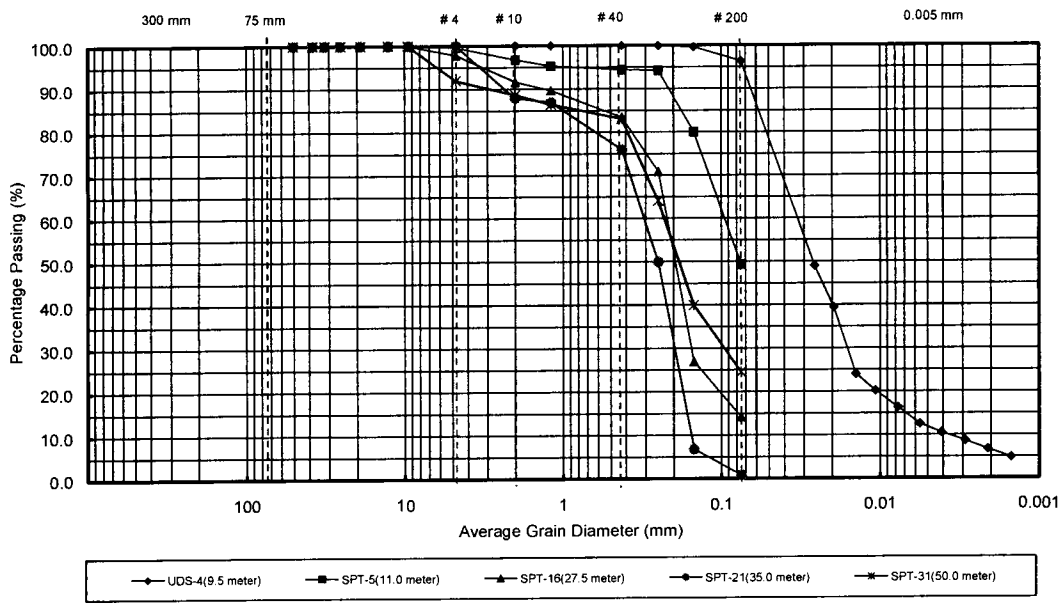
Boulders	Cobbles	Gravel	Sand			Silt	Clay
			Coarse	Medium	Fine		

Tested by:Sikandar | Checked by: Muhammad Ajmal

Berkeley Associates

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan

Borehole No. BH-1 **Lab Ref.** J-576



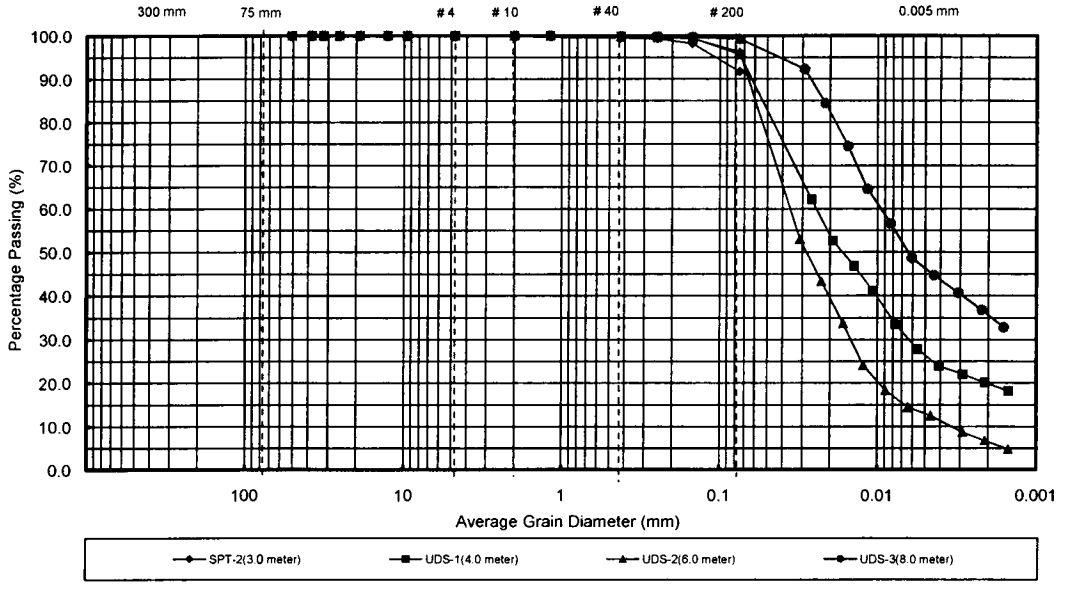
Boulders	Cobbles	Gravel	Sand			Silt	Clay
			Coarse	Medium	Fine		

Tested by:Sikandar | Checked by: Muhammad Ajmal

Berkeley Associates

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan

Borehole No. BH-2 **Lab Ref.** J-576

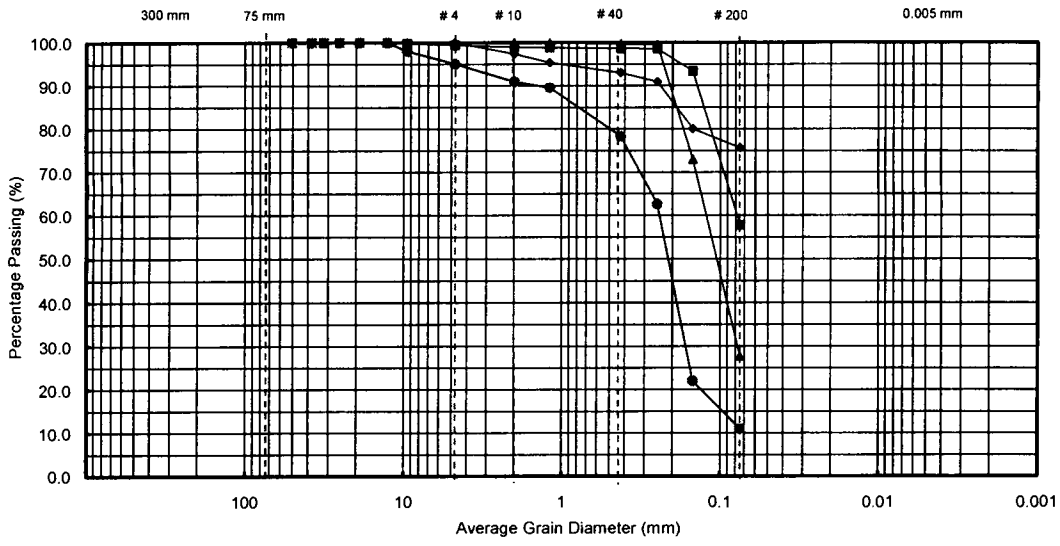


Boulders	Cobbles	Gravel	Sand			Silt	Clay
			Coarse	Medium	Fine		

Tested by:Sikandar | Checked by: Muhammad Ajmal

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan

Borehole No. BH-2 **Lab Ref.** J-576



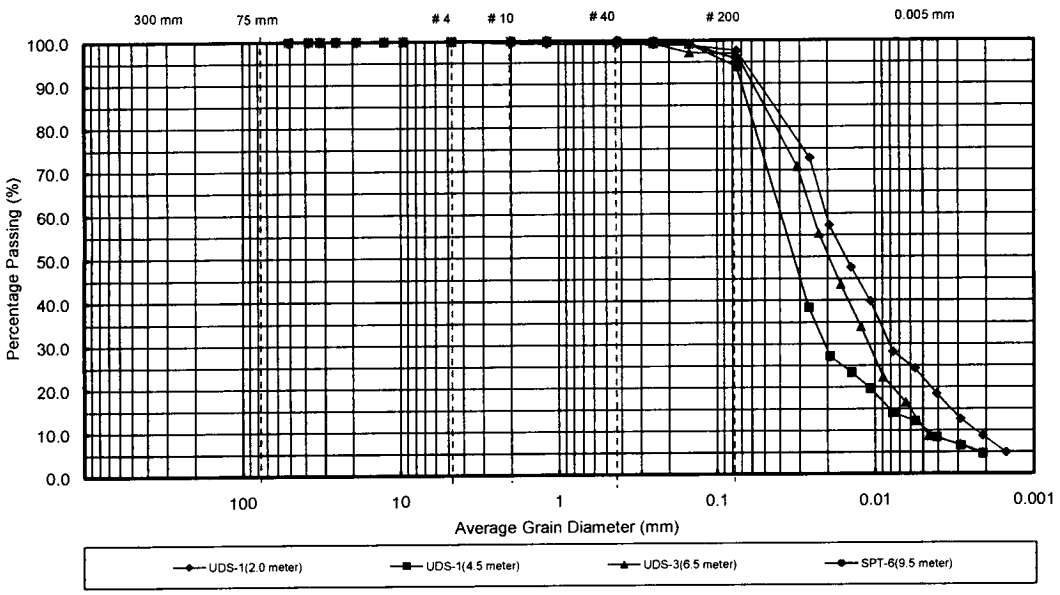
Boulders	Cobbles	Gravel	Sand			Silt	Clay
			Coarse	Medium	Fine		

Tested by:Sikandar | Checked by: Muhammad Ajmal

Berkeley Associates

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan

Borehole No. BH-3 **Lab Ref.** J-576



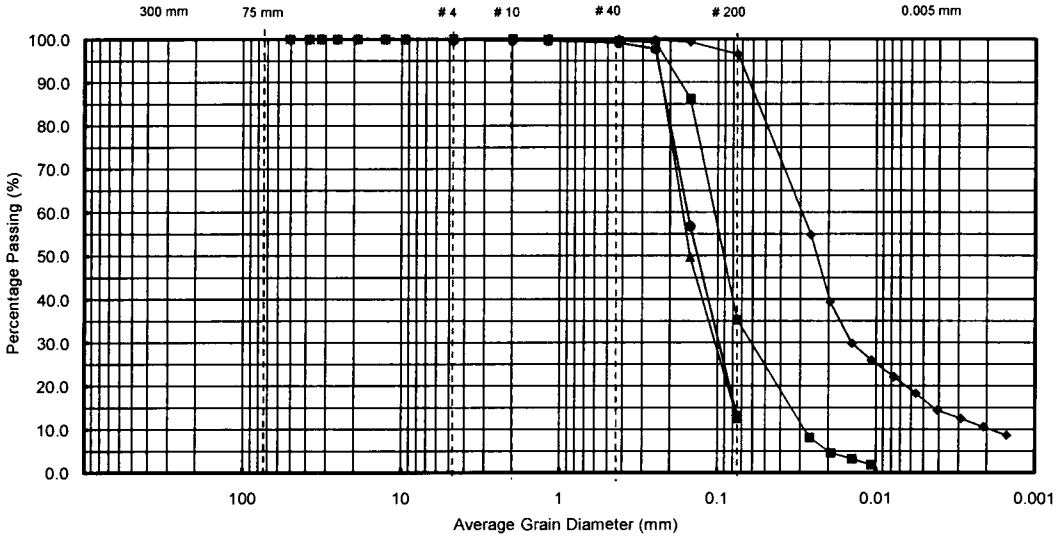
Boulders	Cobbles	Gravel	Sand			Silt	Clay
			Coarse	Medium	Fine		

Tested by:Sikandar | Checked by: Muhammad Ajmal

Berkeley Associates

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan

Borehole No. BH-3 **Lab Ref.** J-576



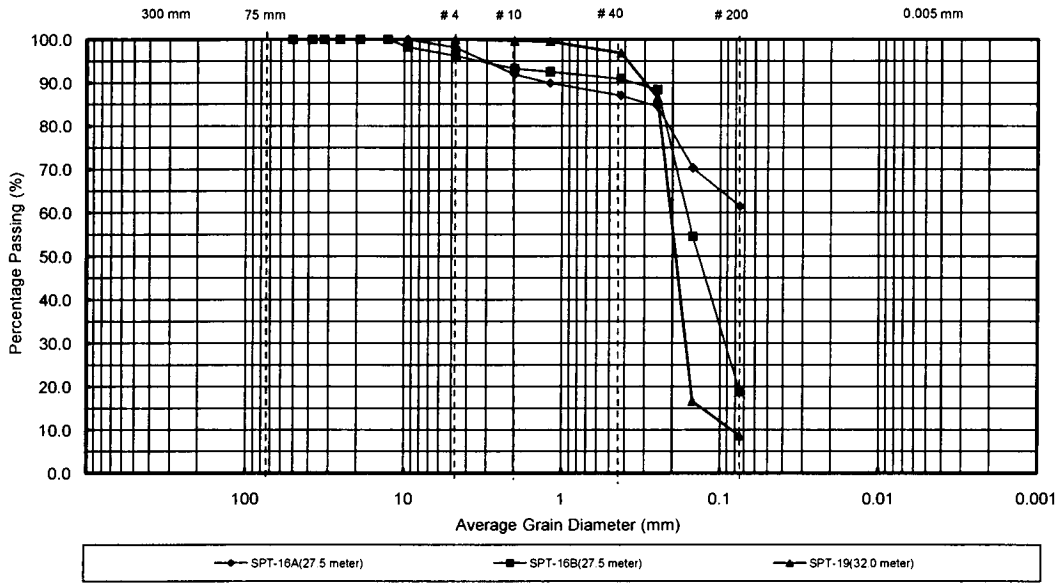
Boulders	Cobbles	Gravel	Sand			Silt	Clay
			Coarse	Medium	Fine		

Tested by:Sikandar | Checked by: Muhammad Ajmal

Berkeley Associates

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan

Borehole No. BH-3 **Lab Ref.** J-576



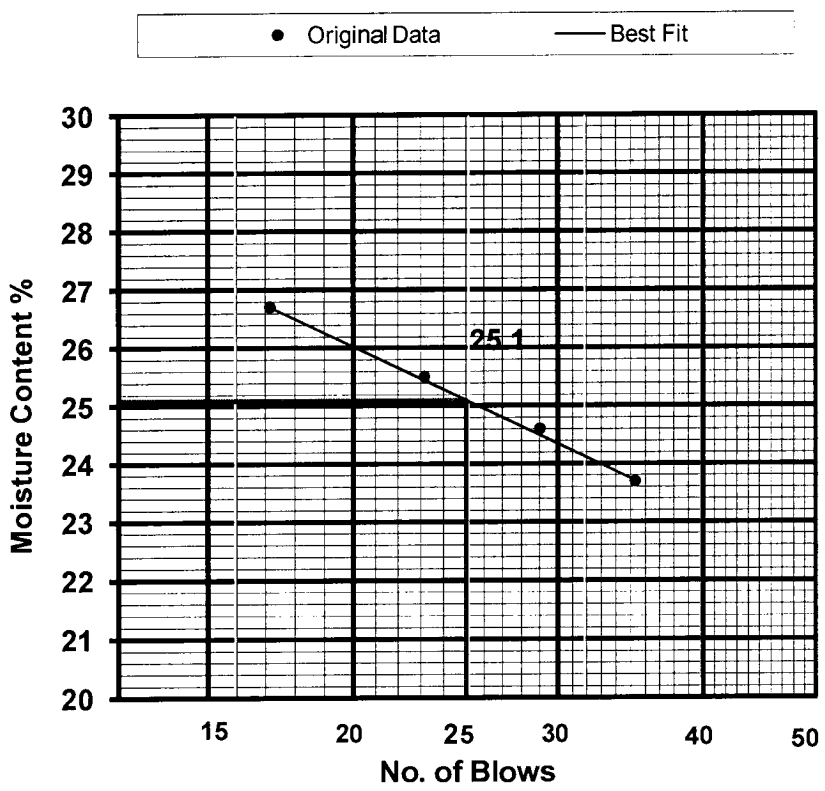
Boulders	Cobbles	Gravel	Sand			Silt	Clay
			Coarse	Medium	Fine		

Tested by:Sikandar | Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-1	**Depth:** 1.0 meter	**Sample No.** SPT-1	**Sample Type:** Disturbed

Description	Unit	Liquid Limit AASHTO T-89/ASTM D4318-00, Method"A"				Plastic Limit AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		35	29	23	17		
Dish No.		38	39	40	41	42	43
Wt. of dish+wet soil	g	16.54	19.43	17.13	17.56	14.51	15.75
Wt. of dish+dry soil	g	14.58	16.91	15.28	15.36	13.30	14.36
Wt. of dish	g	6.33	6.68	8.03	7.12	6.97	7.11
Wt. of water	g	1.96	2.52	1.85	2.20	1.21	1.39
Wt. of dry soil	g	8.25	10.23	7.25	8.24	6.33	7.25
Water content %		23.7	24.6	25.5	26.7	19.1	19.2



Liquid Limit	**25 %**
Plastic Limit	**19 %**
Plasticity Index	**6 %**

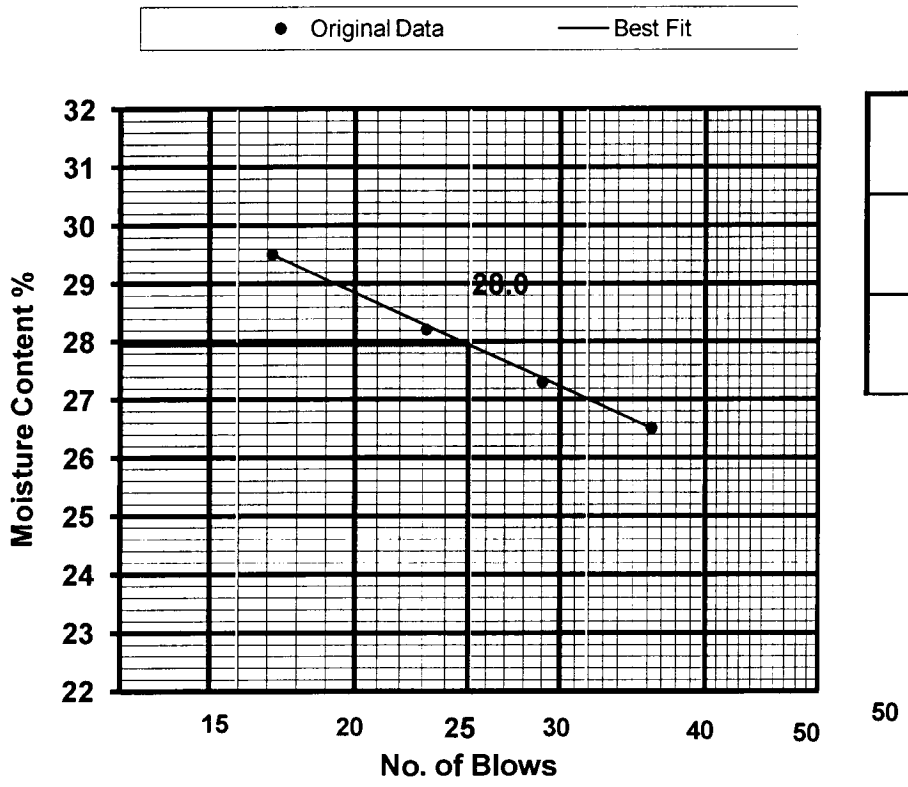
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-1	**Depth:** 2.0 meter	**Sample No.** UDS-1	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		36	29	23	17		
Dish No.		41	42	43	44	45	46
Wt. Of dish+wet soil	g	18.81	17.73	18.88	18.71	15.33	14.18
Wt. Of dish+dry soil	g	16.36	15.42	16.29	15.88	13.72	12.78
Wt. Of dish	g	7.12	6.97	7.11	6.30	6.70	6.69
Wt. Of water	g	2.45	2.31	2.59	2.83	1.61	1.40
Wt. Of dry soil	g	9.24	8.45	9.18	9.58	7.02	6.09
Water content %		26.5	27.3	28.2	29.5	22.9	23.0



Liquid Limit	**28 %**
Plastic Limit	**23 %**
Plasticity Index	**5 %**

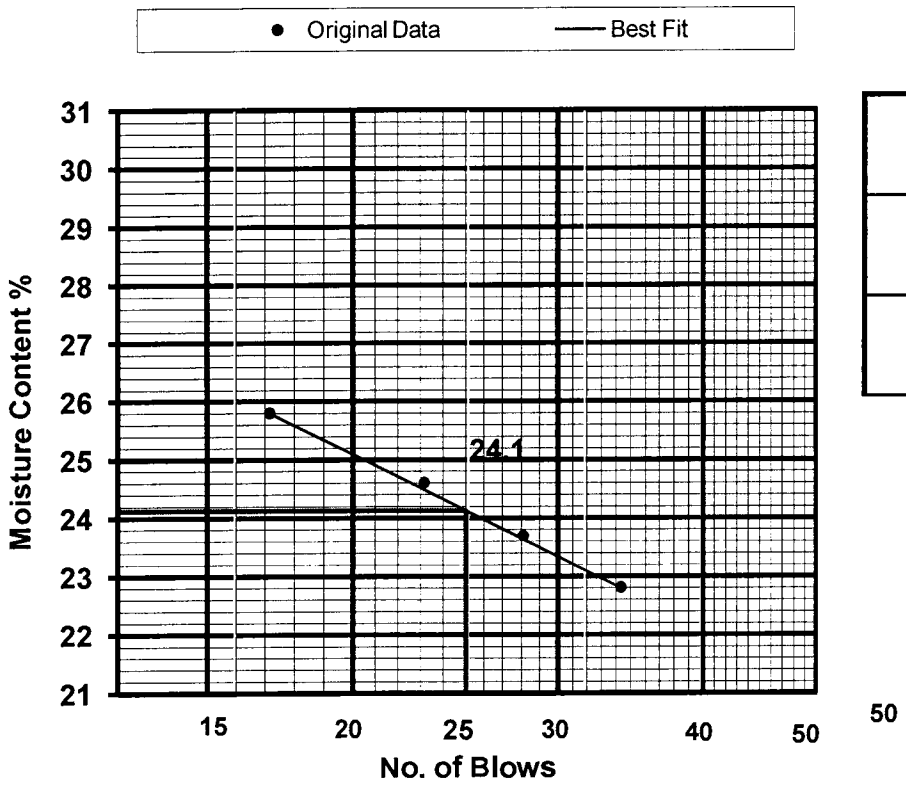
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-1	**Depth:** 4.0 meter	**Sample No.** UDS-2	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		34	28	23	17		
Dish No.		53	54	55	56	57	58
Wt. Of dish+wet soil	g	18.23	16.92	18.13	17.18	15.11	16.02
Wt. Of dish+dry soil	g	16.14	15.06	15.95	14.85	13.87	14.58
Wt. Of dish	g	6.99	7.20	7.07	5.80	7.71	7.33
Wt. Of water	g	2.09	1.86	2.18	2.33	1.24	1.44
Wt. Of dry soil	g	9.15	7.86	8.88	9.05	6.16	7.25
Water content %		22.8	23.7	24.6	25.8	20.1	19.9



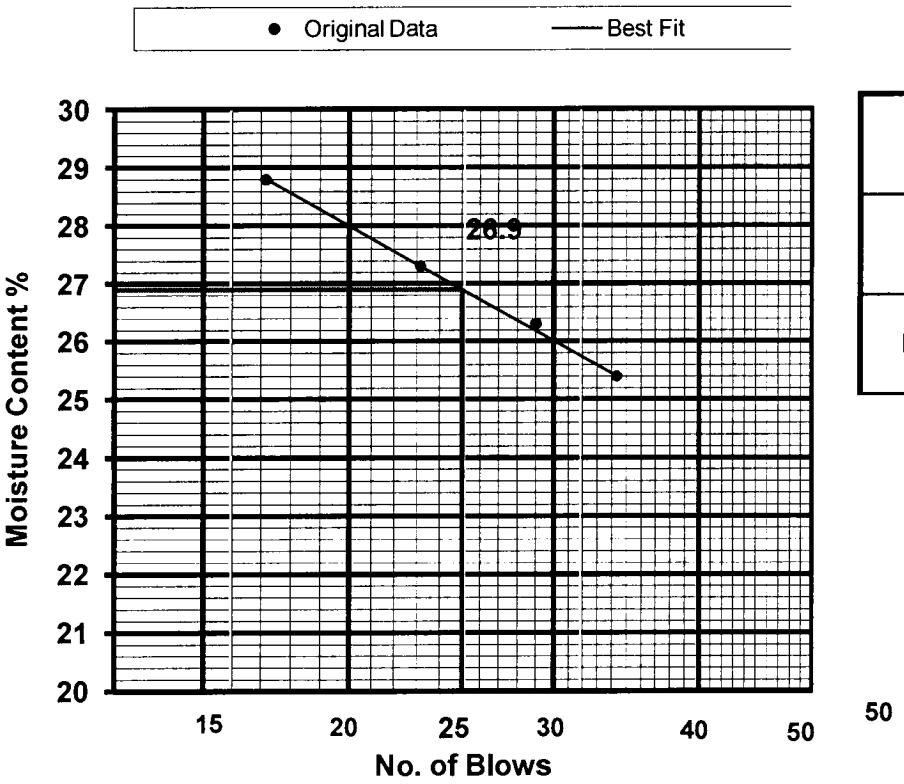
Liquid Limit	**24 %**
Plastic Limit	**20 %**
Plasticity Index	**4 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-1	**Depth:** 6.5 meter	**Sample No.** UDS-3	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		34	29	23	17		
Dish No.		6	7	8	9	10	11
Wt. Of dish+wet soil	g	23.37	24.83	23.86	24.09	20.44	23.80
Wt. Of dish+dry soil	g	20.94	22.29	21.43	21.50	18.96	22.07
Wt. Of dish	g	11.36	12.64	12.54	12.48	11.51	13.51
Wt. Of water	g	2.43	2.54	2.43	2.59	1.48	1.73
Wt. Of dry soil	g	9.58	9.65	8.89	9.02	7.45	8.56
Water content %		25.4	26.3	27.3	28.8	19.9	20.2



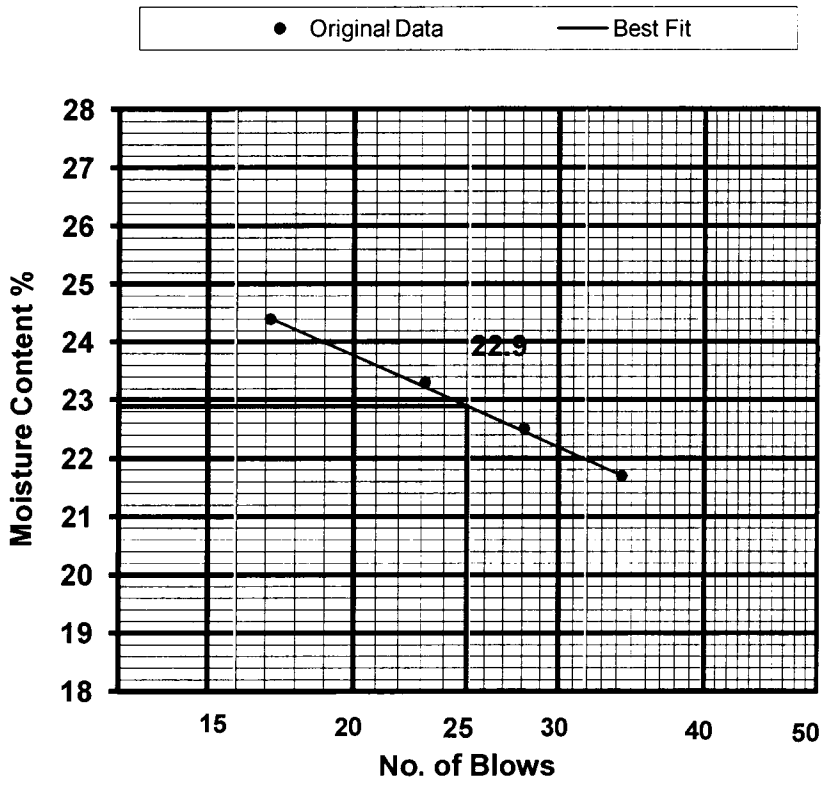
Liquid Limit	**27 %**
Plastic Limit	**20 %**
Plasticity Index	**7 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-1	**Depth:** 9.5 meter	**Sample No.** UDS-4	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		34	28	23	17		
Dish No.		19	20	21	22	23	24
Wt. of dish+wet soil	g	20.25	24.57	23.97	24.05	24.72	19.63
Wt. of dish+dry soil	g	18.15	22.26	22.00	21.96	23.39	18.36
Wt. of dish	g	8.49	12.01	13.53	13.40	16.71	12.02
Wt. of water	g	2.10	2.31	1.97	2.09	1.33	1.27
Wt. of dry soil	g	9.66	10.25	8.47	8.56	6.68	6.34
Water content %		21.7	22.5	23.3	24.4	19.9	20.1



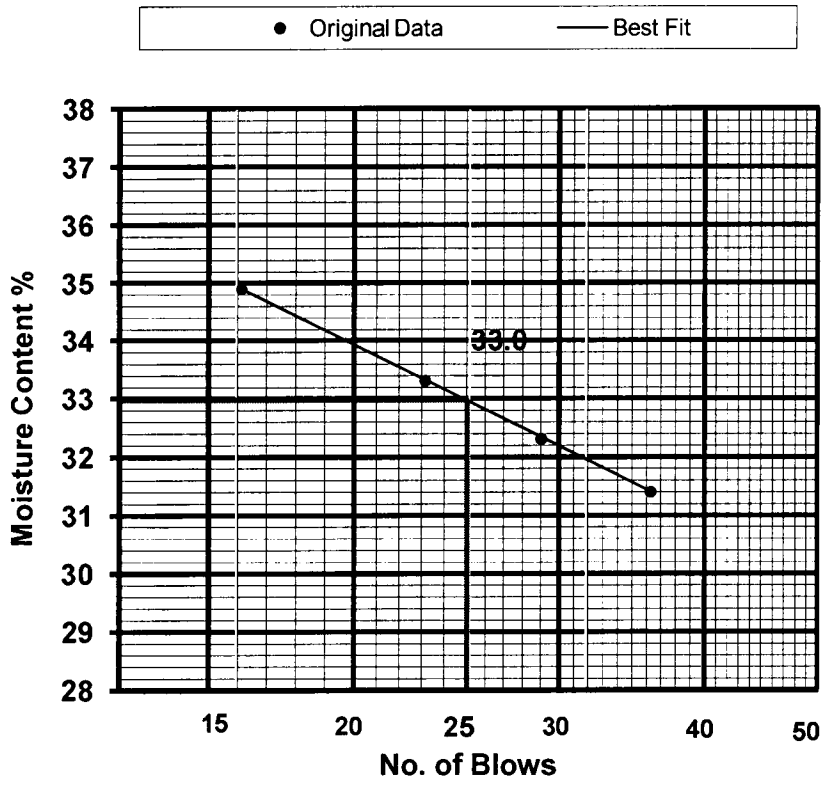
Liquid Limit	**23 %**
Plastic Limit	**20 %**
Plasticity Index	**3 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-2	**Depth:** 3.0 meter	**Sample No.** SPT-2	**Sample Type:** Disturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		36	29	23	16		
Dish No.		19	20	21	22	23	24
Wt. of dish+wet soil	g	21.96	24.76	24.96	23.50	25.85	22.10
Wt. of dish+dry soil	g	18.74	21.65	22.10	20.89	24.26	20.35
Wt. of dish	g	8.49	12.01	13.53	13.40	16.71	12.02
Wt. of water	g	3.22	3.11	2.86	2.61	1.59	1.75
Wt. of dry soil	g	10.25	9.64	8.57	7.49	7.55	8.33
Water content %		31.4	32.3	33.3	34.9	21.1	21.0



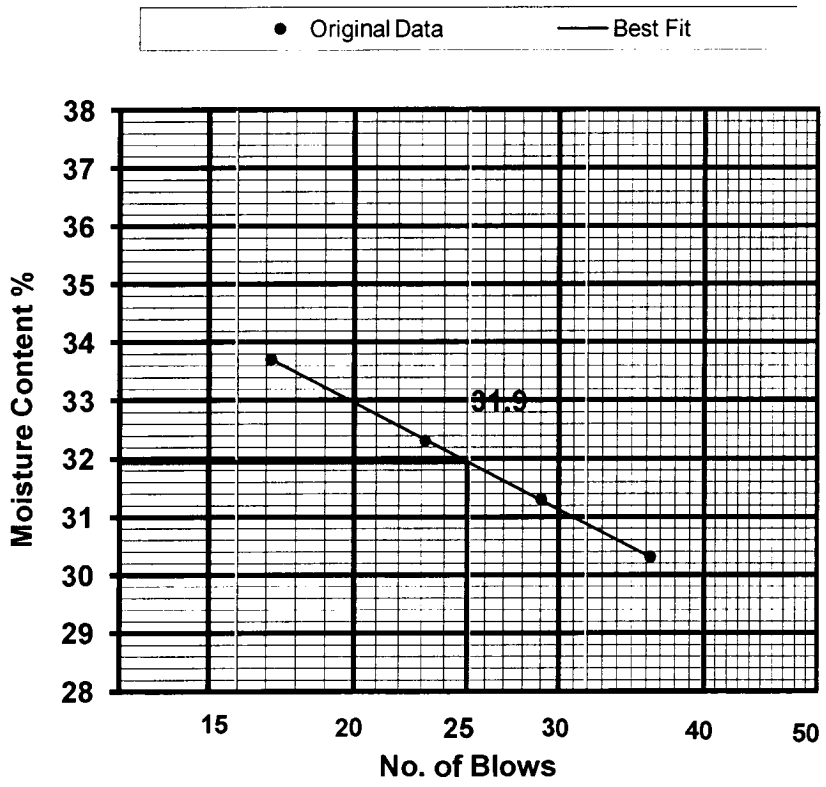
Liquid Limit	**33 %**
Plastic Limit	**21 %**
Plasticity Index	**12 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-2	**Depth:** 4.0 meter	**Sample No.** UDS-1	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		36	29	23	17		
Dish No.		38	39	40	41	42	43
Wt. of dish+wet soil	g	17.90	20.14	20.28	18.67	14.25	15.90
Wt. of dish+dry soil	g	15.21	16.93	17.29	15.76	12.93	14.32
Wt. of dish	g	6.33	6.68	8.03	7.12	6.97	7.11
Wt. of water	g	2.69	3.21	2.99	2.91	1.32	1.58
Wt. of dry soil	g	8.88	10.25	9.26	8.64	5.96	7.21
Water content %		30.3	31.3	32.3	33.7	22.2	21.9



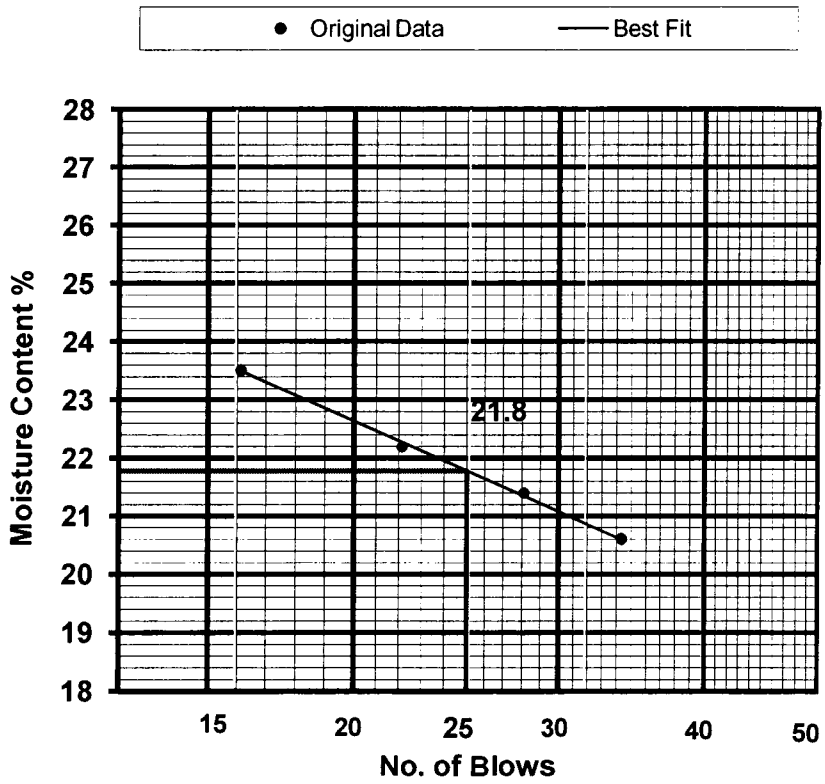
Liquid Limit	**32 %**
Plastic Limit	**22 %**
Plasticity Index	**10 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-2	**Depth:** 6.0 meter	**Sample No.** UDS-2	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		34	28	22	16		
Dish No.		56	57	58	59	60	61
Wt. of dish+wet soil	g	17.99	18.08	17.06	17.61	14.93	13.92
Wt. of dish+dry soil	g	15.91	16.25	15.29	15.40	13.50	12.65
Wt. of dish	g	5.80	7.71	7.33	6.01	5.94	6.01
Wt. of water	g	2.08	1.83	1.77	2.21	1.43	1.27
Wt. of dry soil	g	10.11	8.54	7.96	9.39	7.56	6.64
Water content %		20.6	21.4	22.2	23.5	18.9	19.1



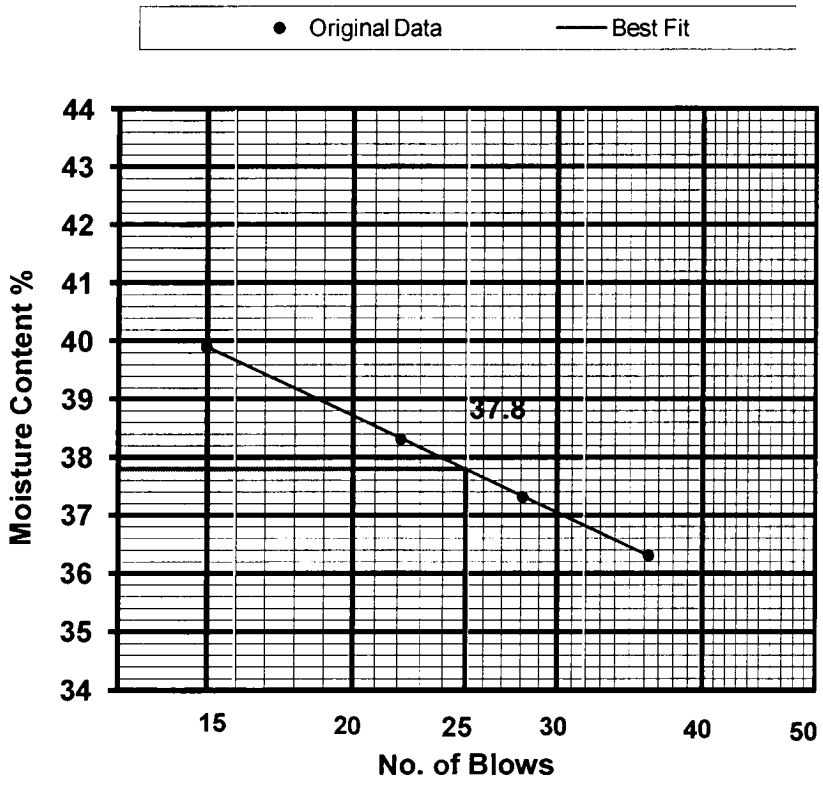
Liquid Limit	**22 %**
Plastic Limit	**19 %**
Plasticity Index	**3 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-2	**Depth:** 8.0 meter	**Sample No.** UDS-3	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		36	28	22	15		
Dish No.		19	20	21	22	23	24
Wt. of dish+wet soil	g	20.70	25.26	24.94	24.96	24.75	20.77
Wt. of dish+dry soil	g	17.45	21.66	21.78	21.66	23.18	19.07
Wt. of dish	g	8.49	12.01	13.53	13.40	16.71	12.02
Wt. of water	g	3.25	3.60	3.16	3.30	1.57	1.70
Wt. of dry soil	g	8.96	9.65	8.25	8.26	6.47	7.05
Water content %		36.3	37.3	38.3	39.9	24.2	24.1



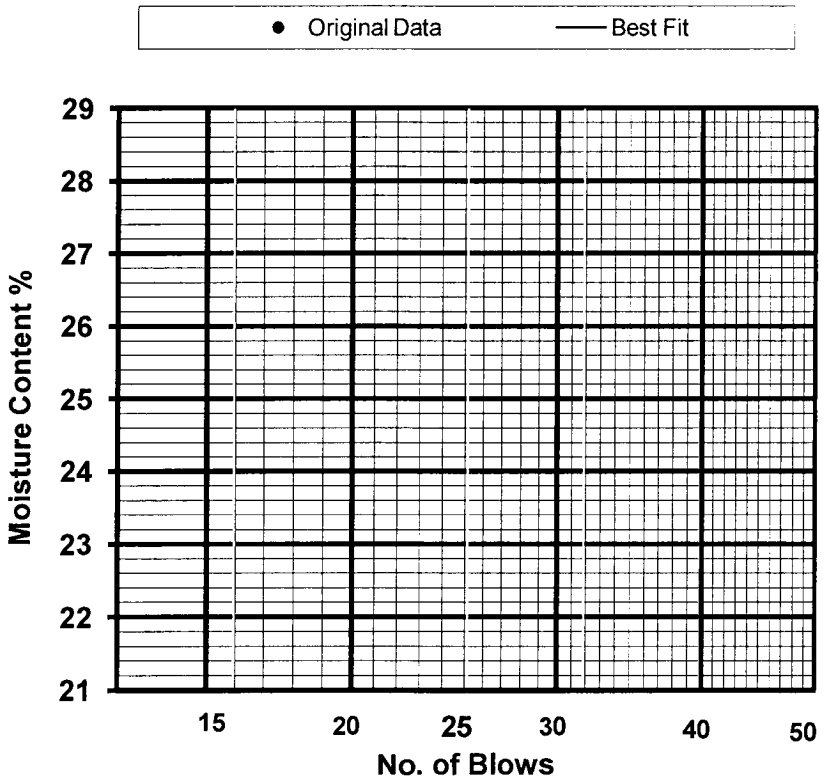
Liquid Limit	**38 %**
Plastic Limit	**24 %**
Plasticity Index	**14 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-2	**Depth:** 24.5 meter	**Sample No.** UDS-4	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		-	-	-	-		
Dish No.		-	-	-	-	-	-
Wt. of dish+wet soil	g	-	-	-	-	-	-
Wt. of dish+dry soil	g	-	-	-	-	-	-
Wt. of dish	g	-	-	-	-	-	-
Wt. of water	g	-	-	-	-	-	-
Wt. of dry soil	g	-	-	-	-	-	-
Water content %		-	-	-	-	-	-



Liquid Limit	-
Plastic Limit	Non-Plastic
Plasticity Index	-

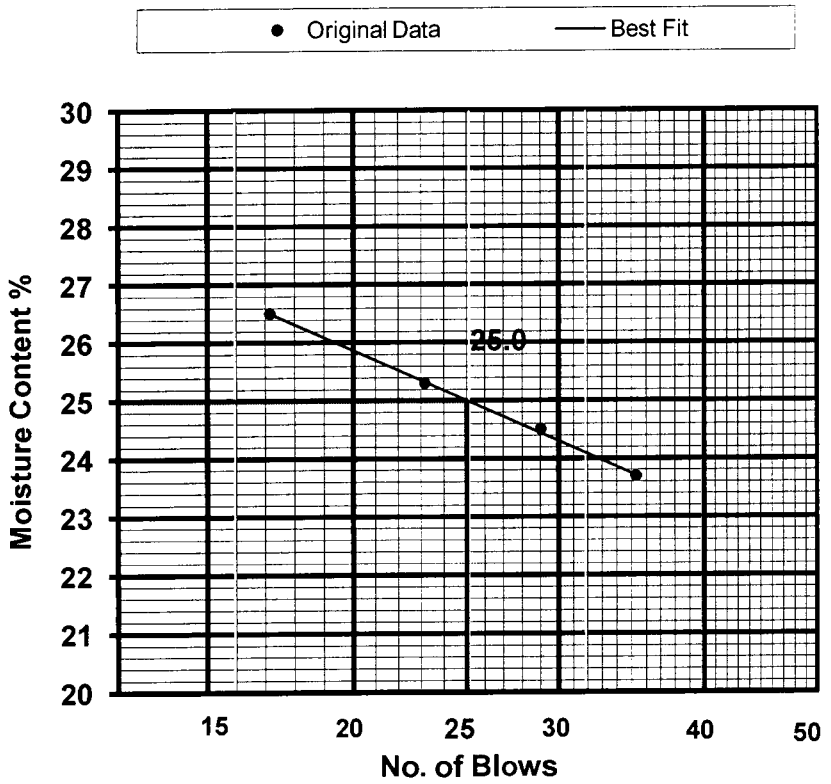
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-3	**Depth:** 2.0 meter	**Sample No.** UDS-1	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		35	29	23	17		
Dish No.		1	2	3	4	5	28
Wt. of dish+wet soil	g	26.79	25.77	22.96	22.63	23.07	21.83
Wt. of dish+dry soil	g	24.36	23.45	20.75	20.30	21.42	20.54
Wt. of dish	g	14.11	13.99	12.02	11.52	14.00	14.69
Wt. of water	g	2.43	2.32	2.21	2.33	1.65	1.29
Wt. of dry soil	g	10.25	9.46	8.73	8.78	7.42	5.85
Water content %		23.7	24.5	25.3	26.5	22.2	22.1



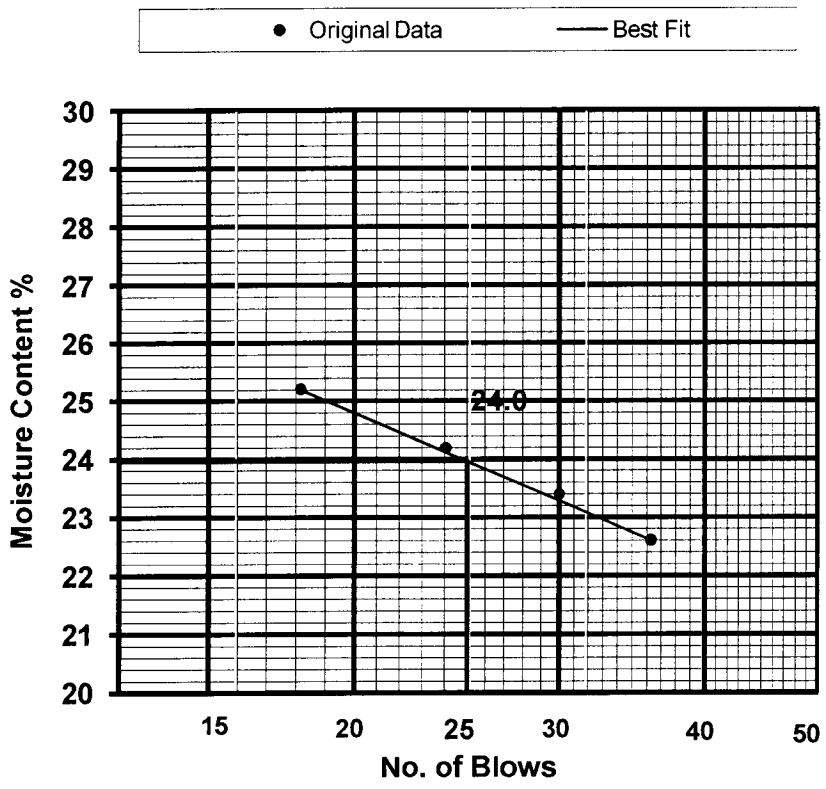
Liquid Limit	**25 %**
Plastic Limit	**22 %**
Plasticity Index	**3 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-3	**Depth:** 4.5 meter	**Sample No.** UDS-2	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		36	30	24	18		
Dish No.		29	30	31	32	33	34
Wt. Of dish+wet soil	g	23.74	26.65	20.51	23.23	17.76	19.92
Wt. Of dish+dry soil	g	21.58	24.43	18.39	20.90	16.61	18.53
Wt. Of dish	g	12.00	14.95	9.65	11.67	11.12	11.90
Wt. Of water	g	2.16	2.22	2.12	2.33	1.15	1.39
Wt. Of dry soil	g	9.58	9.48	8.74	9.23	5.49	6.63
Water content %		22.6	23.4	24.2	25.2	20.9	21.0



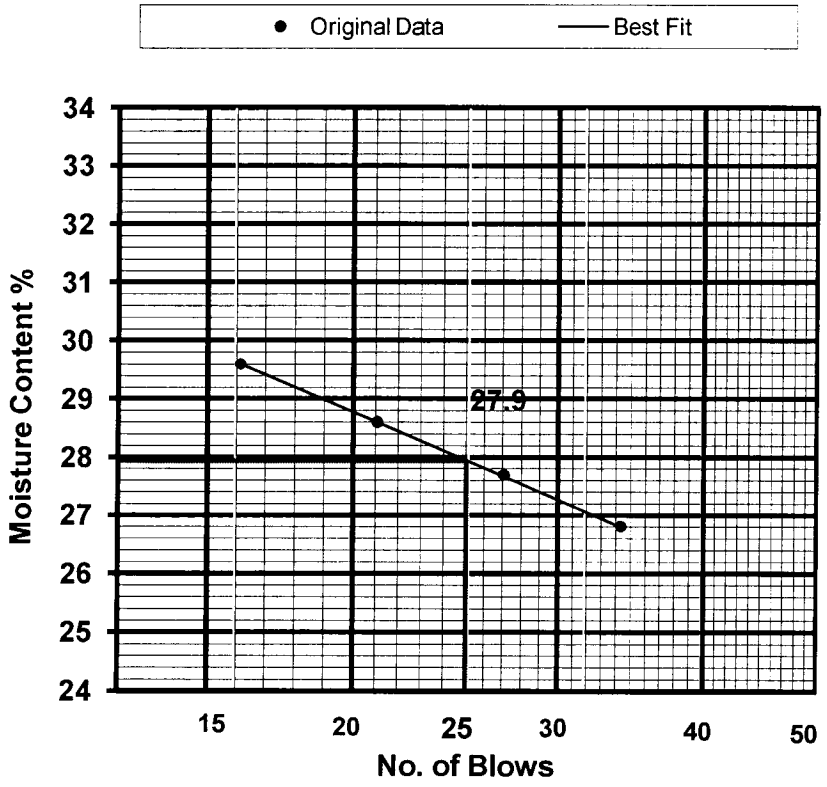
Liquid Limit	**24 %**
Plastic Limit	**21 %**
Plasticity Index	**3 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-3	**Depth:** 6.5 meter	**Sample No.** UDS-3	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		34	27	21	16		
Dish No.		30	31	32	33	34	35
Wt. of dish+wet soil	g	26.50	22.56	22.28	20.74	19.75	21.03
Wt. of dish+dry soil	g	24.06	19.76	19.92	18.54	18.22	19.59
Wt. of dish	g	14.95	9.65	11.67	11.12	11.90	13.62
Wt. of water	g	2.44	2.80	2.36	2.20	1.53	1.44
Wt. of dry soil	g	9.11	10.11	8.25	7.42	6.32	5.97
Water content %		26.8	27.7	28.6	29.6	24.1	24.2



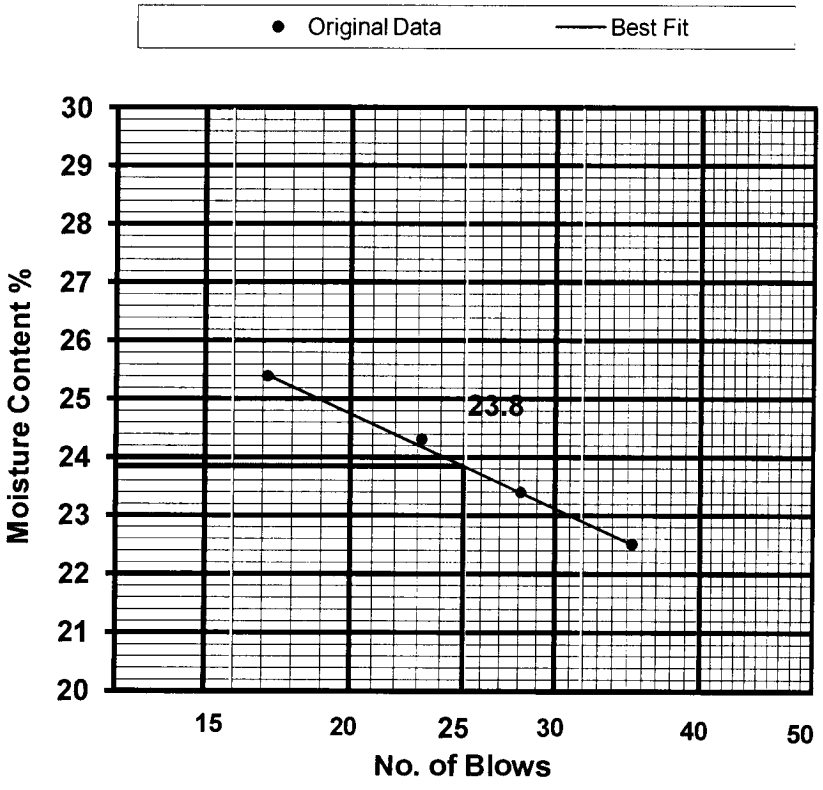
Liquid Limit	**28 %**
Plastic Limit	**24 %**
Plasticity Index	**4 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-3	**Depth:** 9.5 meter	**Sample No.** SPT-6	**Sample Type**: Disturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		35	28	23	17		
Dish No.		1	2	3	4	5	28
Wt. of dish+wet soil	g	24.17	25.79	24.76	23.66	21.60	21.77
Wt. of dish+dry soil	g	22.32	23.55	22.27	21.20	20.33	20.58
Wt. of dish	g	14.11	13.99	12.02	11.52	14.00	14.69
Wt. of water	g	1.85	2.24	2.49	2.46	1.27	1.19
Wt. of dry soil	g	8.21	9.56	10.25	9.68	6.33	5.89
Water content %		22.5	23.4	24.3	25.4	20.1	20.2



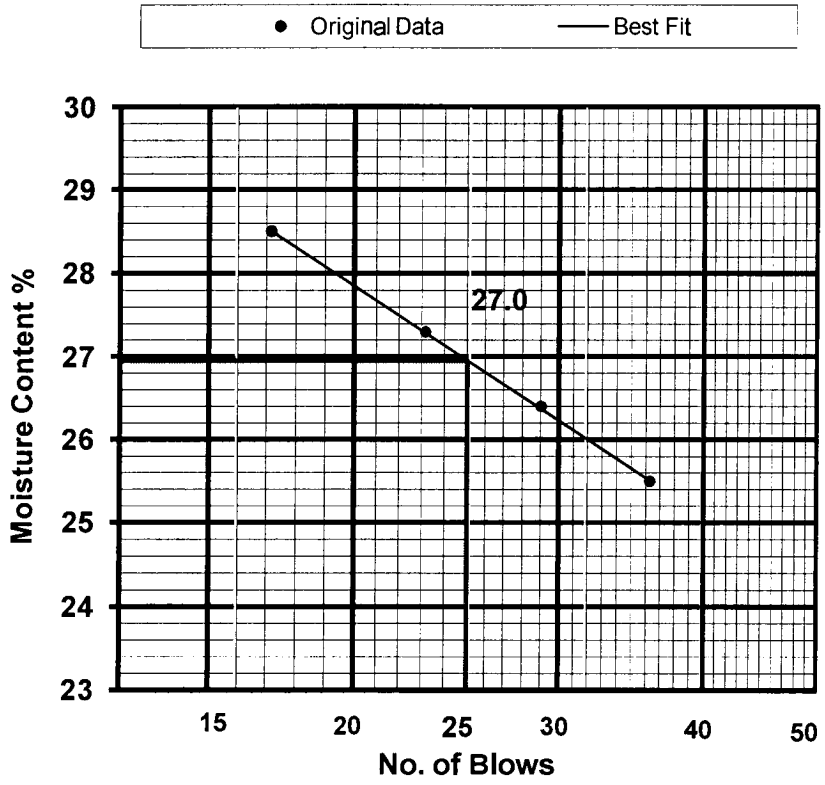
Liquid Limit	**24 %**
Plastic Limit	**20 %**
Plasticity Index	**4 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Standard Test Methods for Liquid Limit,Plastic Limit, and Plasticity Index of Soils

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan			
			Date: 19-09-2014
Borehole No.BH-3	**Depth:** 11.0 meter	**Sample No.** UDS-4	**Sample Type**: Undisturbed

		Liquid Limit				Plastic Limit	
Description	Unit	AASHTO T-89/ASTM D4318-00, Method"A"				AASHTO T-90	
Trial #		1	2	3	4	1	2
No. of blows		36	29	23	17		
Dish No.		36	37	38	39	40	41
Wt. Of dish+wet soil	g	22.52	18.65	16.78	16.95	14.34	15.16
Wt. Of dish+dry soil	g	20.42	16.25	14.54	14.67	13.24	13.75
Wt. Of dish	g	12.20	7.14	6.33	6.68	8.03	7.12
Wt. Of water	g	2.10	2.40	2.24	2.28	1.10	1.41
Wt. Of dry soil	g	8.22	9.11	8.21	7.99	5.21	6.63
Water content %		25.5	26.4	27.3	28.5	21.1	21.3



Liquid Limit	**27 %**
Plastic Limit	**21 %**
Plasticity Index	**6 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Quick Consolidation

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan

BH/TP No.	Sample No.	Depth (meter)	Reading						e0	e100	e200	$a_{1-0.2}$ a100-200 (MPa-1)	Es E100-200 (MPa)
			1 hour 50	1 hour 100	1 hour 200	400-1hour	400-24 hour						
BH-2	UDS-4	24.50	8.9	18.3	31.0	45.1	46.2	1.02439	0.6748	0.6624	0.653817	0.0858	19.52

Test by: Sikandar Hayat	Checked by:Muhammad Ajmal	

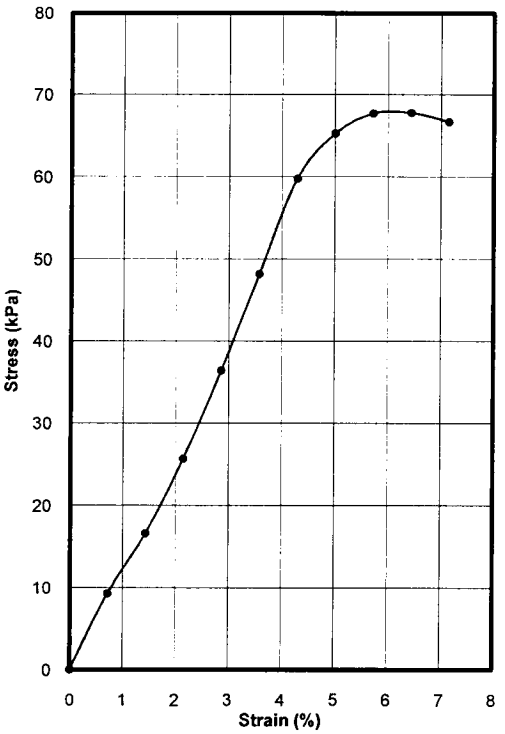
Berkeley Associates

Unconfined Compression Test

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 1	**Sample No.** UDS- 1	**Depth:** 2 meter
LC for deformation gauge 0.010 mm		
Load Factor = 0.245 kg per division for 0.002 mm Least count gauge		

Length	= 14 cm		Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	= 7.00 cm		Bulk Density	= 18.13	kN/m^3
Weight	= 996 g		N M C	= 15.40	%
Volume	= 539 cm^3		Dry Density	= 15.71	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
0	0	0.000	38.500	0.000
100	15	0.714	38.777	9.297
200	27	1.429	39.058	16.615
300	42	2.143	39.343	25.658
400	60	2.857	39.632	36.386
500	80	3.571	39.926	48.158
600	100	4.286	40.224	59.752
700	110	5.000	40.526	65.237
800	115	5.714	40.833	67.689
900	116	6.429	41.145	67.760
1000	115	7.143	41.462	66.663



Unconfined Compressive Strength=	**68 kPa**	**Strain = 6.4 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

Unconfined Compression Test

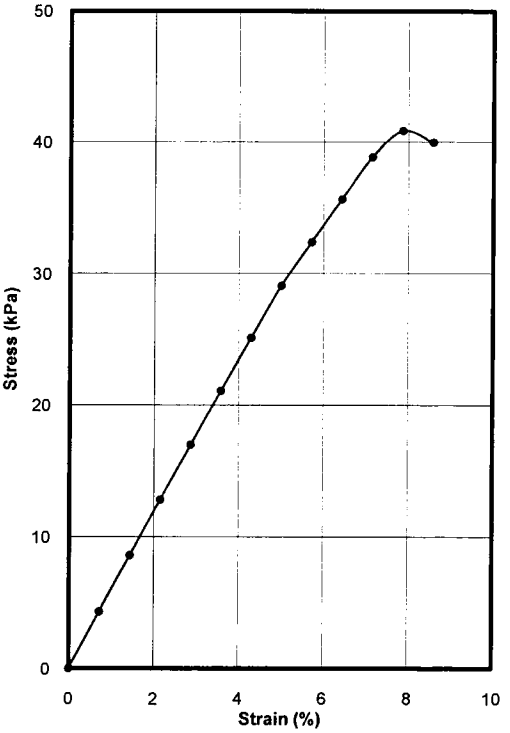
Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 1	**Sample No.** UDS- 2	**Depth:** 4.0 meter

LC for deformation gauge 0.010 mm

Load Factor = 0.245 kg per division for 0.002 mm Least count gauge

Length	= 14 cm		Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	= 7.00 cm		Bulk Density	= 18.84	kN/m^3
Weight	= 1035 g		N M C	= 15.09	%
Volume	= 539 cm^3		Dry Density	= 16.37	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
0	0	0.000	38.500	0.000
100	7	0.714	38.777	4.339
200	14	1.429	39.058	8.615
300	21	2.143	39.343	12.829
400	28	2.857	39.632	16.980
500	35	3.571	39.926	21.069
600	42	4.286	40.224	25.096
700	49	5.000	40.526	29.060
800	55	5.714	40.833	32.373
900	61	6.429	41.145	35.633
1000	67	7.143	41.462	38.839
1100	71	7.857	41.783	40.841
1200	70	8.571	42.109	39.953



Unconfined Compressive Strength=	**41 kPa**	**Strain = 7.9 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

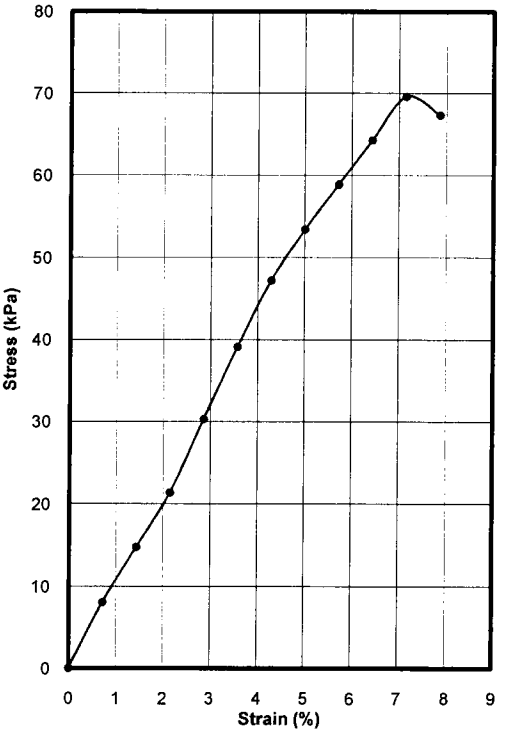
Berkeley Associates

Unconfined Compression Test

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 1	**Sample No.** UDS- 3	**Depth:** 6.5 meter
LC for deformation gauge 0.010 mm		
Load Factor = 0.245 kg per division for 0.002 mm Least count gauge		

Length	=	14 cm	Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	=	7.00 cm	Bulk Density	= 19.47	kN/m^3
Weight	=	1070 g	N M C	= 17.20	%
Volume	=	539 cm^3	Dry Density	= 16.62	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
0	0	0.000	38.500	0.000
100	13	0.714	38.777	8.058
200	24	1.429	39.058	14.769
300	35	2.143	39.343	21.381
400	50	2.857	39.632	30.322
500	65	3.571	39.926	39.129
600	79	4.286	40.224	47.204
700	90	5.000	40.526	53.375
800	100	5.714	40.833	58.860
900	110	6.429	41.145	64.256
1000	120	7.143	41.462	69.562
1100	117	7.857	41.783	67.301



Unconfined Compressive Strength=	**70 kPa**	**Strain = 7.1 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

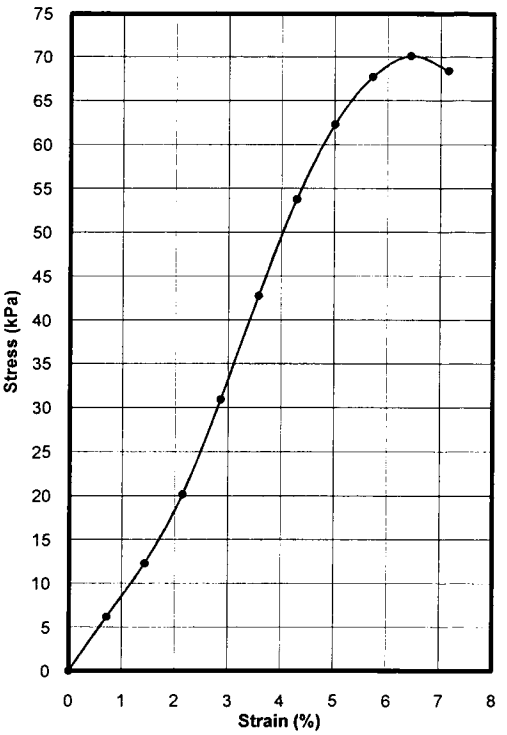
Berkeley Associates

Unconfined Compression Test

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 1	**Sample No.** UDS- 4	**Depth:** 9.5 meter
LC for deformation gauge 0.010 mm		
Load Factor = 0.245 kg per division for 0.002 mm Least count gauge		

Length	=	14 cm	Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	=	7.00 cm	Bulk Density	= 19.38	kN/m^3
Weight	=	1065 g	N M C	= 18.73	%
Volume	=	539 cm^3	Dry Density	= 16.33	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
0	0	0.000	38.500	0.000
100	10	0.714	38.777	6.198
200	20	1.429	39.058	12.307
300	33	2.143	39.343	20.160
400	51	2.857	39.632	30.928
500	71	3.571	39.926	42.740
600	90	4.286	40.224	53.777
700	105	5.000	40.526	62.271
800	115	5.714	40.833	67.689
900	120	6.429	41.145	70.097
1000	118	7.143	41.462	68.402



Unconfined Compressive Strength=	**70 kPa**	**Strain = 6.4 %**

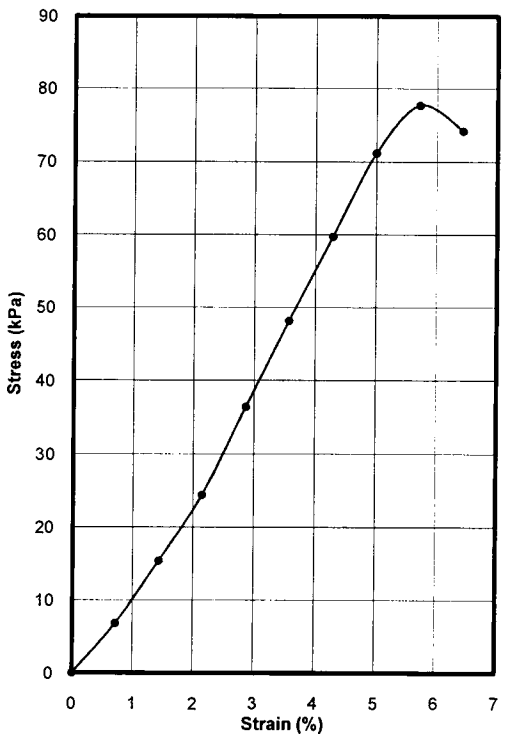
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Unconfined Compression Test

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 2	**Sample No.** UDS- 1	**Depth:** 4.0 meter
LC for deformation gauge 0.010 mm		
Load Factor = 0.245 kg per division for 0.002 mm Least count gauge		

Length	= 14 cm		Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	= 7.00 cm		Bulk Density	= 19.27	kN/m^3
Weight	= 1059 g		N M C	= 18.83	%
Volume	= 539 cm^3		Dry Density	= 16.22	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
0	0	0.000	38.500	0.000
100	11	0.714	38.777	6.818
200	25	1.429	39.058	15.384
300	40	2.143	39.343	24.436
400	60	2.857	39.632	36.386
500	80	3.571	39.926	48.158
600	100	4.286	40.224	59.752
700	120	5.000	40.526	71.167
800	132	5.714	40.833	77.695
900	127	6.429	41.145	74.186



Unconfined Compressive Strength=	**78 kPa**	**Strain = 5.7 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

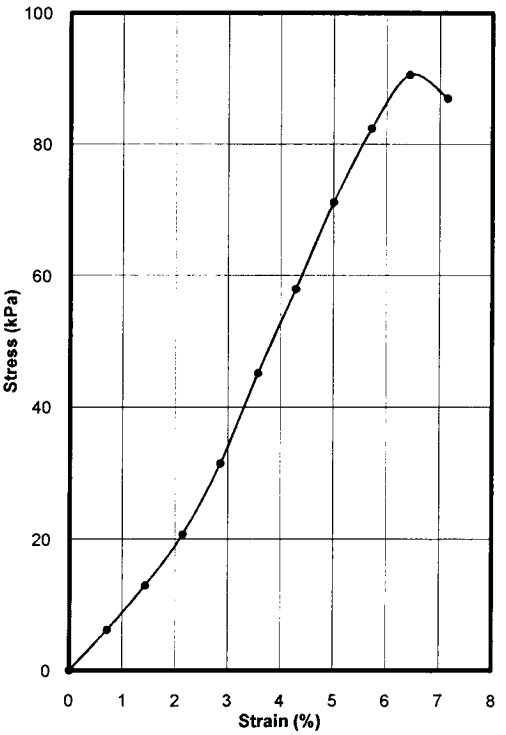
Berkeley Associates

Unconfined Compression Test

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 2	**Sample No.** UDS- 2	**Depth:** 6.5 meter
LC for deformation gauge 0.010 mm		
Load Factor = 0.245 kg per division for 0.002 mm Least count gauge		

Length	=	14 cm	Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	=	7.00 cm	Bulk Density	= 19.26	kN/m^3
Weight	=	1058 g	N M C	= 19.34	%
Volume	=	539 cm^3	Dry Density	= 16.14	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
0	0	0.000	38.500	0.000
100	10	0.714	38.777	6.198
200	21	1.429	39.058	12.922
300	34	2.143	39.343	20.770
400	52	2.857	39.632	31.535
500	75	3.571	39.926	45.148
600	97	4.286	40.224	57.959
700	120	5.000	40.526	71.167
800	140	5.714	40.833	82.404
900	155	6.429	41.145	90.542
1000	150	7.143	41.462	86.952



Unconfined Compressive Strength=	**91 kPa**	**Strain = 6.4 %**

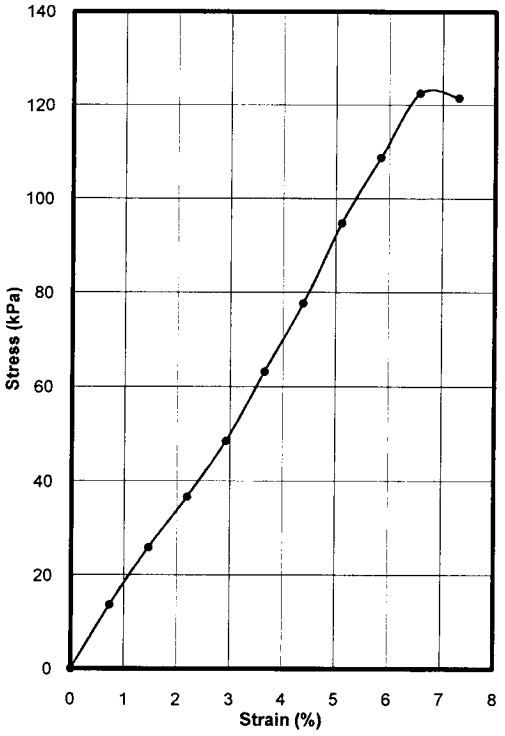
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Unconfined Compression Test

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 2	**Sample No.** UDS- 3	**Depth:** 9.5 meter
LC for deformation gauge 0.010 mm		
Load Factor = 0.245 kg per division for 0.002 mm Least count gauge		

Length	= 13.7 cm		Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	= 7.00 cm		Bulk Density	= 18.97	kN/m^3
Weight	= 1020 g		N M C	= 22.68	%
Volume	= 527.45 cm^3		Dry Density	= 15.46	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
0	0	0.000	38.500	0.000
100	22	0.730	38.783	13.634
200	42	1.460	39.070	25.837
300	60	2.190	39.362	36.636
400	80	2.920	39.658	48.484
500	105	3.650	39.958	63.156
600	130	4.380	40.263	77.601
700	160	5.109	40.573	94.780
800	185	5.839	40.888	108.746
900	210	6.569	41.207	122.485
1000	210	7.299	41.531	121.528



Unconfined Compressive Strength=	**122 kPa**	**Strain = 6.6 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

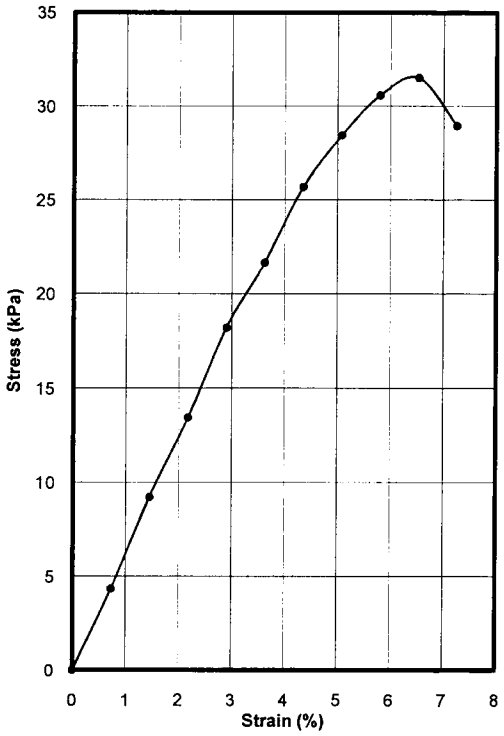
Berkeley Associates

Unconfined Compression Test

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 3	**Sample No.** UDS- 1	**Depth:** 2.0 meter
LC for deformation gauge 0.010 mm		
Load Factor = 0.245 kg per division for 0.002 mm Least count gauge		

Length	=	13.8 cm	Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	=	7.00 cm	Bulk Density	= 18.37	kN/m^3
Weight	=	995 g	N M C	= 19.67	%
Volume	=	531.3 cm^3	Dry Density	= 15.35	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
0	0	0.000	38.500	0.000
100	7	0.725	38.781	4.338
200	15	1.449	39.066	9.228
300	22	2.174	39.356	13.435
400	30	2.899	39.649	18.185
500	36	3.623	39.947	21.660
600	43	4.348	40.250	25.677
700	48	5.072	40.557	28.445
800	52	5.797	40.869	30.580
900	54	6.522	41.186	31.512
1000	50	7.246	41.508	28.952



Unconfined Compressive Strength=	**31 kPa**	**Strain = 6.5 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

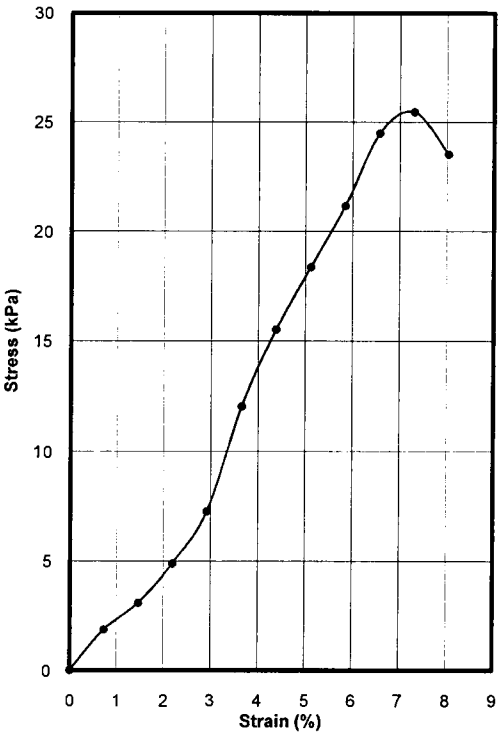
Berkeley Associates

Unconfined Compression Test

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 3	**Sample No.** UDS- 2	**Depth:** 4.5 meter
LC for deformation gauge 0.010 mm		
Load Factor = 0.245 kg per division for 0.002 mm Least count gauge		

Length	=	13.7 cm	Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	=	7.00 cm	Bulk Density	= 19.55	kN/m^3
Weight	=	1051 g	N M C	= 22.34	%
Volume	=	527.45 cm^3	Dry Density	= 15.98	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
0	0	0.000	38.500	0.000
100	3	0.730	38.783	1.859
200	5	1.460	39.070	3.076
300	8	2.190	39.362	4.885
400	12	2.920	39.658	7.273
500	20	3.650	39.958	12.030
600	26	4.380	40.263	15.520
700	31	5.109	40.573	18.364
800	36	5.839	40.888	21.161
900	42	6.569	41.207	24.497
1000	44	7.299	41.531	25.463
1100	41	8.029	41.861	23.540



Unconfined Compressive Strength=	**25 kPa**	**Strain = 7.3 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

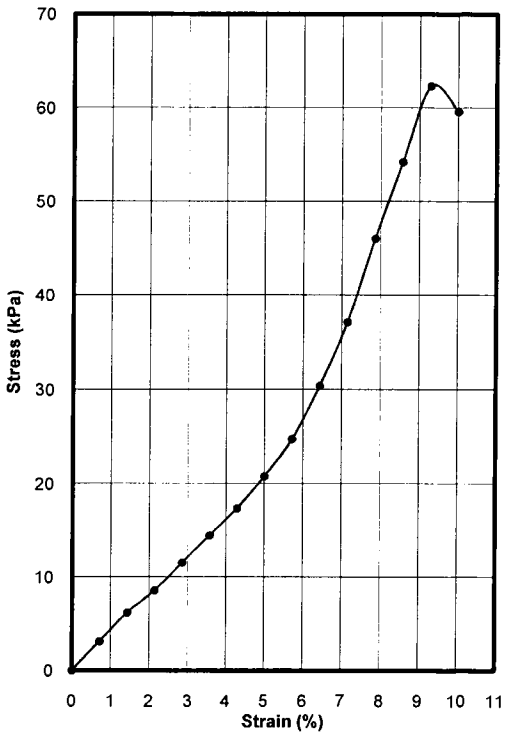
Berkeley Associates

Unconfined Compression Test

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 3	**Sample No.** UDS- 3	**Depth:** 6.5 meter
LC for deformation gauge 0.010 mm		
Load Factor = 0.245 kg per division for 0.002 mm Least count gauge		

Length	= 14 cm		Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	= 7.00 cm		Bulk Density	= 19.58	kN/m^3
Weight	= 1076 g		N M C	= 24.84	%
Volume	= 539 cm^3		Dry Density	= 15.69	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
0	0	0.000	38.500	0.000
100	5	0.714	38.777	3.099
200	10	1.429	39.058	6.154
300	14	2.143	39.343	8.553
400	19	2.857	39.632	11.522
500	24	3.571	39.926	14.447
600	29	4.286	40.224	17.328
700	35	5.000	40.526	20.757
800	42	5.714	40.833	24.721
900	52	6.429	41.145	30.375
1000	64	7.143	41.462	37.100
1100	80	7.857	41.783	46.018
1200	95	8.571	42.109	54.223
1300	110	9.286	42.441	62.294
1400	106	10.000	42.778	59.556



Unconfined Compressive Strength=	**62 kPa**	**Strain = 9.3 %**

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

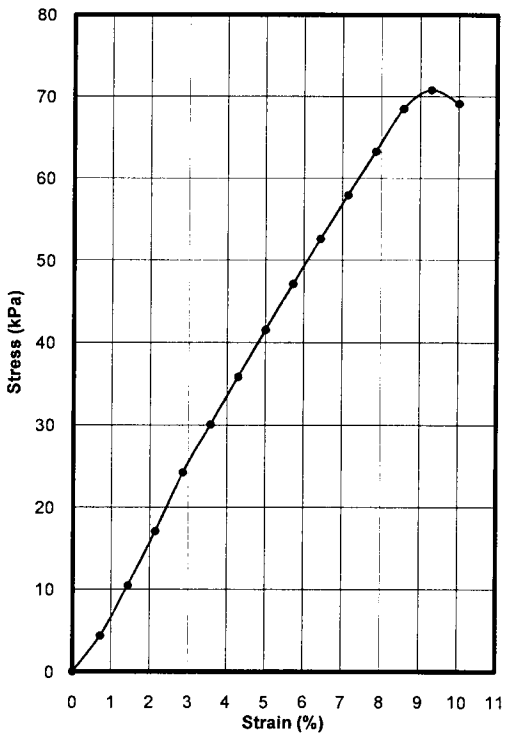
Berkeley Associates

Unconfined Compression Test

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 3	**Sample No.** UDS- 4	**Depth:** 11.0 meter
LC for deformation gauge 0.010 mm		
Load Factor = 0.245 kg per division for 0.002 mm Least count gauge		

Length	=	14 cm	Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	=	7.00 cm	Bulk Density	= 19.66	kN/m^3
Weight	=	1080 g	N M C	= 20.69	%
Volume	=	539 cm^3	Dry Density	= 16.29	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
0	0	0.000	38.500	0.000
100	7	0.714	38.777	4.339
200	17	1.429	39.058	10.461
300	28	2.143	39.343	17.105
400	40	2.857	39.632	24.257
500	50	3.571	39.926	30.099
600	60	4.286	40.224	35.851
700	70	5.000	40.526	41.514
800	80	5.714	40.833	47.088
900	90	6.429	41.145	52.573
1000	100	7.143	41.462	57.968
1100	110	7.857	41.783	63.275
1200	120	8.571	42.109	68.492
1300	125	9.286	42.441	70.788
1400	123	10.000	42.778	69.107



Unconfined Compressive Strength=	**71 kPa**	**Strain = 9.3 %**

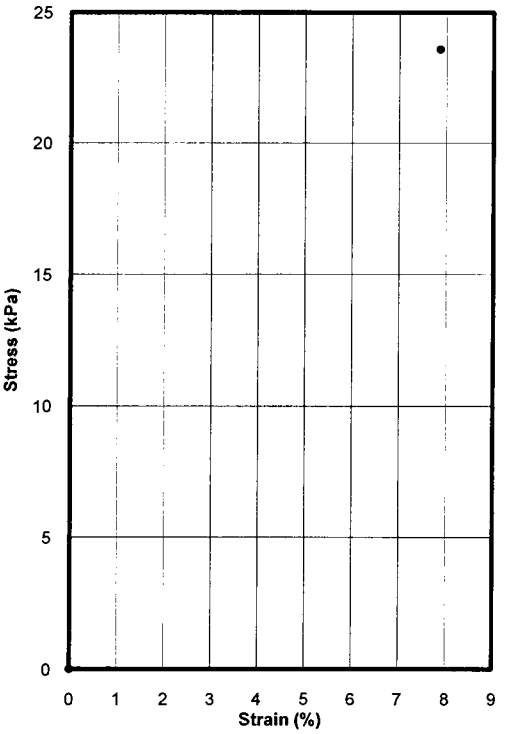
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Unconfined Compression Test

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Ref. No. J 576	**Date**: 19-04-2014
Borehole No. BH - 3	**Sample No.** UDS- 5	**Depth:** 14.0 meter
LC for deformation gauge 0.010 mm		
Load Factor = 0.245 kg per division for 0.002 mm Least count gauge		

Length	=	14 cm	Area(Avg.)	= 38.50	cm^2
Dia(Avg.)	=	7.00 cm	Bulk Density	= 19.40	kN/m^3
Weight	=	1066 g	N M C	= 24.57	%
Volume	=	539 cm^3	Dry Density	= 15.57	kN/m^3

Def. Gauge	Load Gauge	Strain (%)	Corre. Area (Cm^2)	Stress kPa
Sample collapse in lab due to sand				



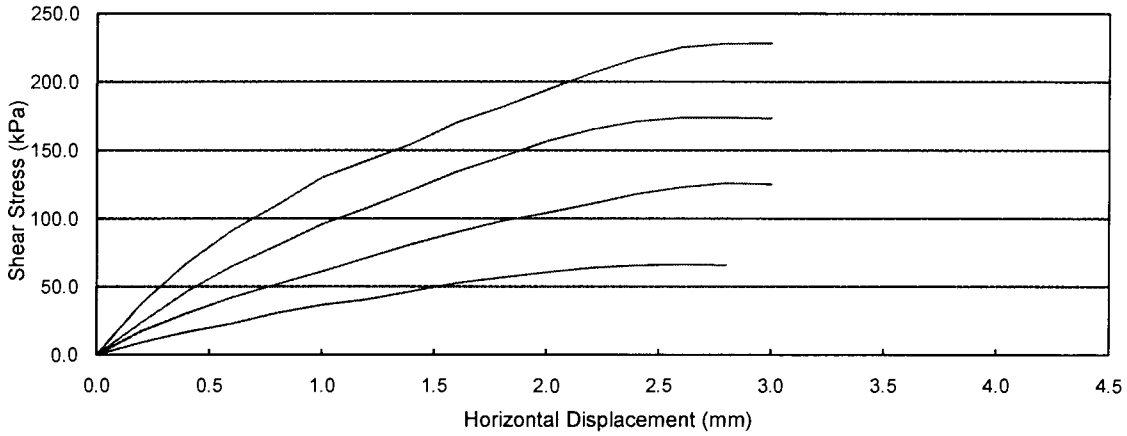
Unconfined Compressive Strength=	

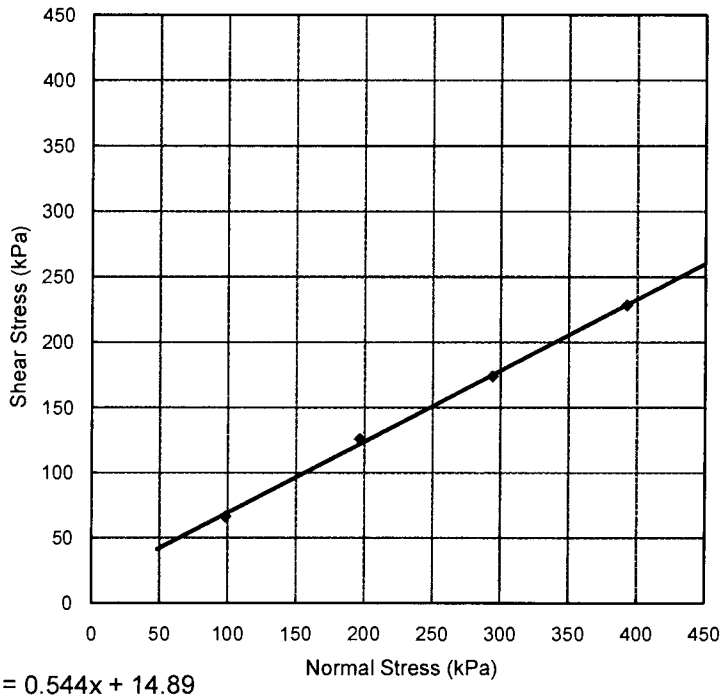
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

DIRECT SHEAR TEST

Project : 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Sample Type: Disturbed	Test Condition Soaked
Borehole No. BH-1	Sample No. SPT-5	Depth: 11.0 meter





y = 0.544x + 14.89

LINEAR REGRESSION

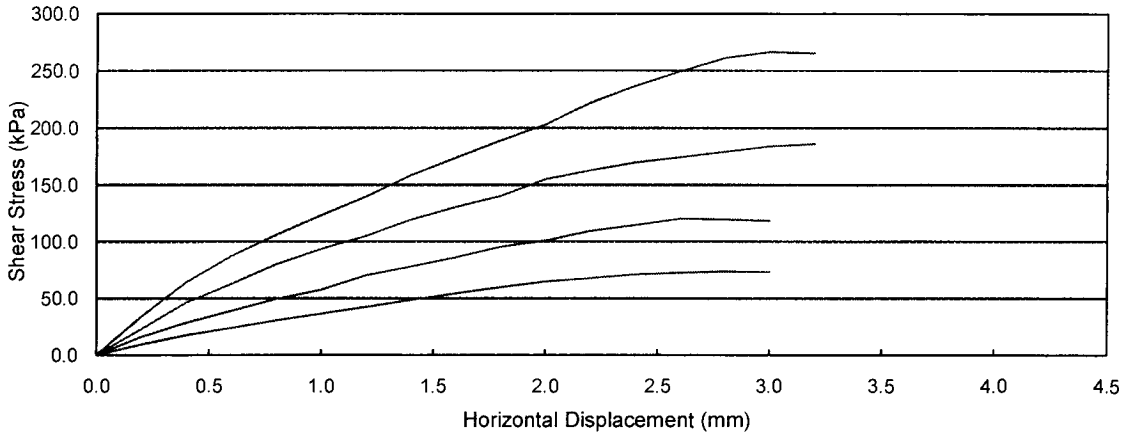
Angle of Internal Friction	=	28.5 Degrees
Cohesion	=	15.0 kPa

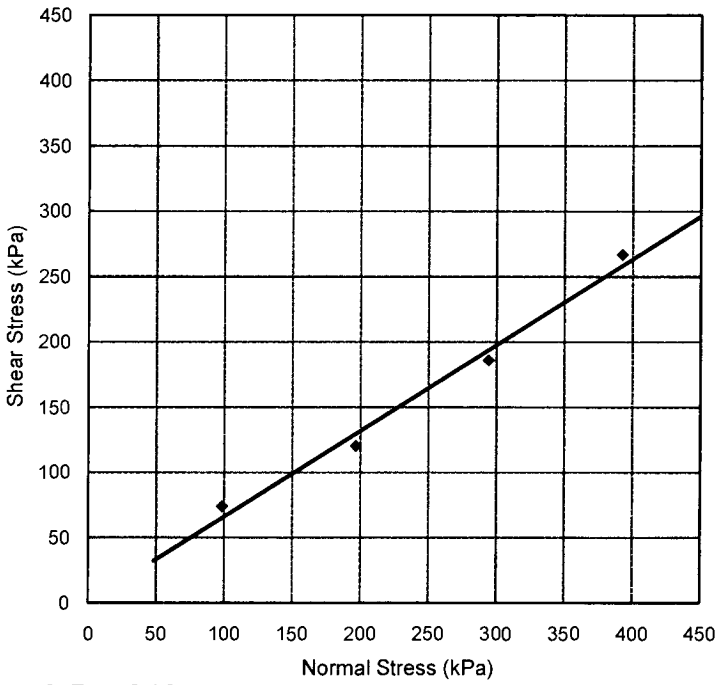
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

DIRECT SHEAR TEST

Project : 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Sample Type: Disturbed	Test Condition Soaked
Borehole No. BH-1	Sample No. SPT-16	Depth: 27.5 meter





y = 0.657x + 0.265

LINEAR REGRESSION

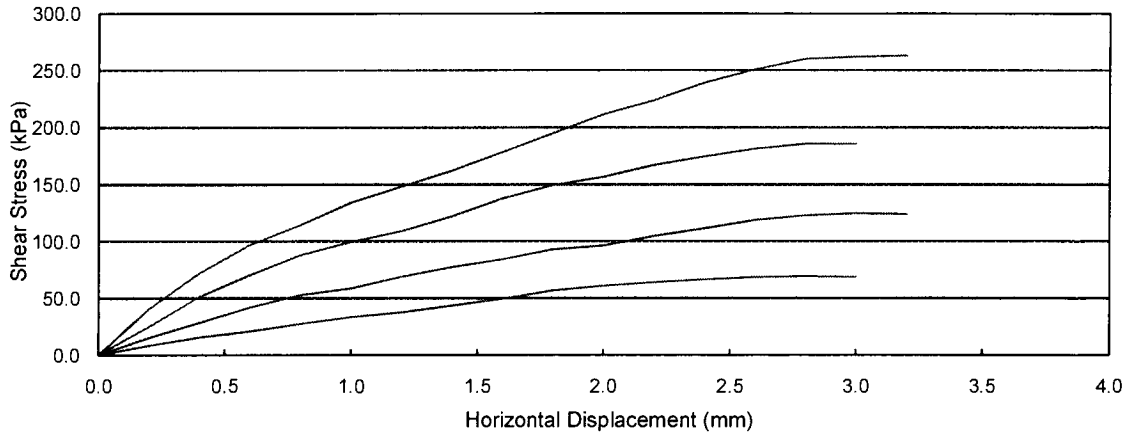
Angle of Internal Friction = 33.3 Degrees
Cohesion = 0.0 kPa

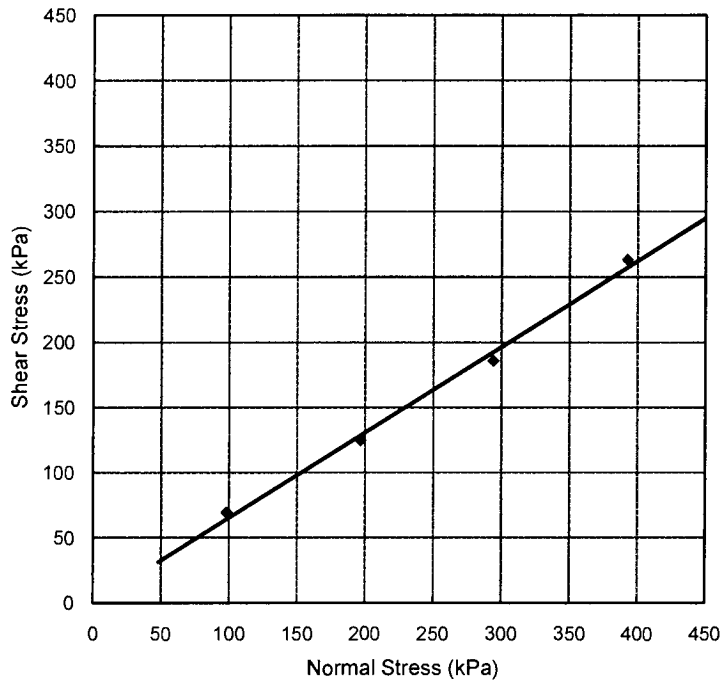
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

DIRECT SHEAR TEST

Project : 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Sample Type: Disturbed	Test Condition Soaked
Borehole No. BH-1	Sample No. SPT-31	Depth: 50.0 meter





y = 0.656x - 0.569

LINEAR REGRESSION

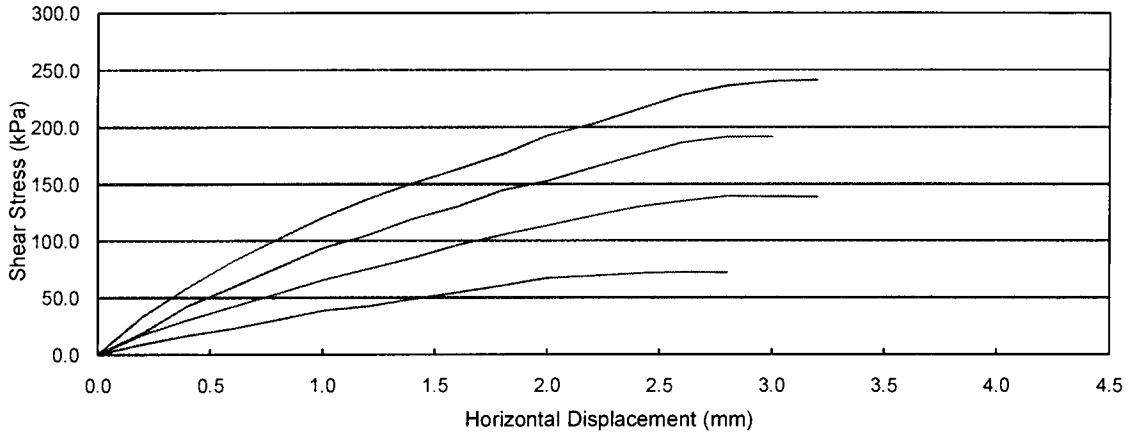
Angle of Internal Friction	=	33.3 Degrees
Cohesion	=	0.0 kPa

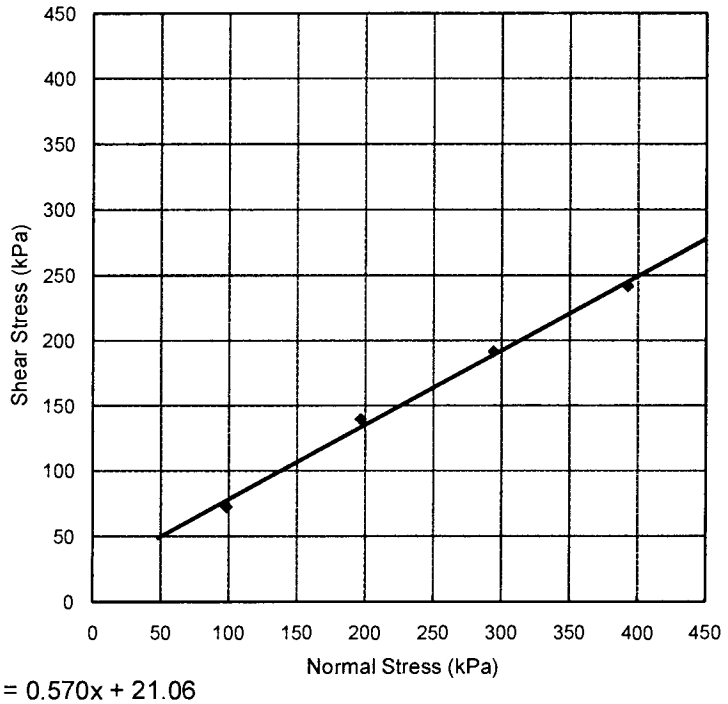
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

DIRECT SHEAR TEST

Project : 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Sample Type: Disturbed	Test Condition Soaked
Borehole No. BH-2	Sample No. SPT-5	Depth: 11.0 meter





y = 0.570x + 21.06

LINEAR REGRESSION

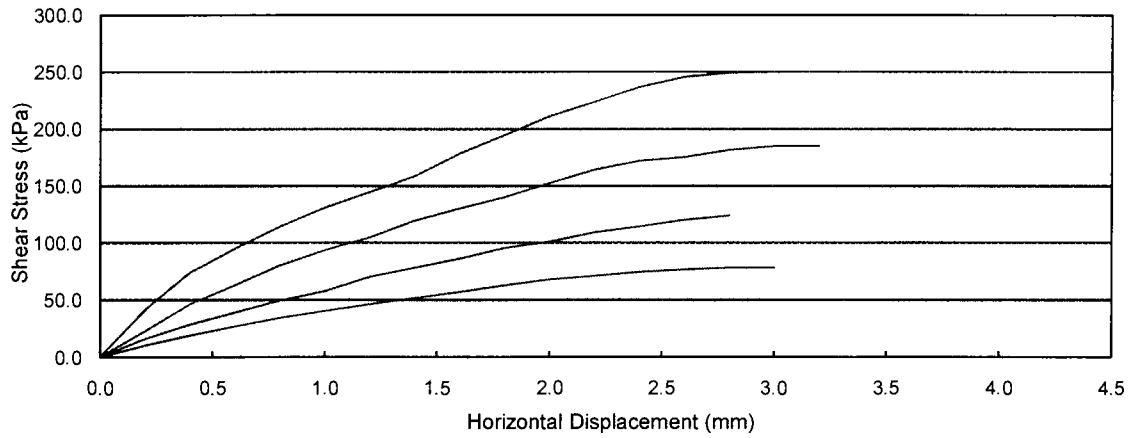
Angle of Internal Friction = 29.7 Degrees
Cohesion = 21.0 kPa

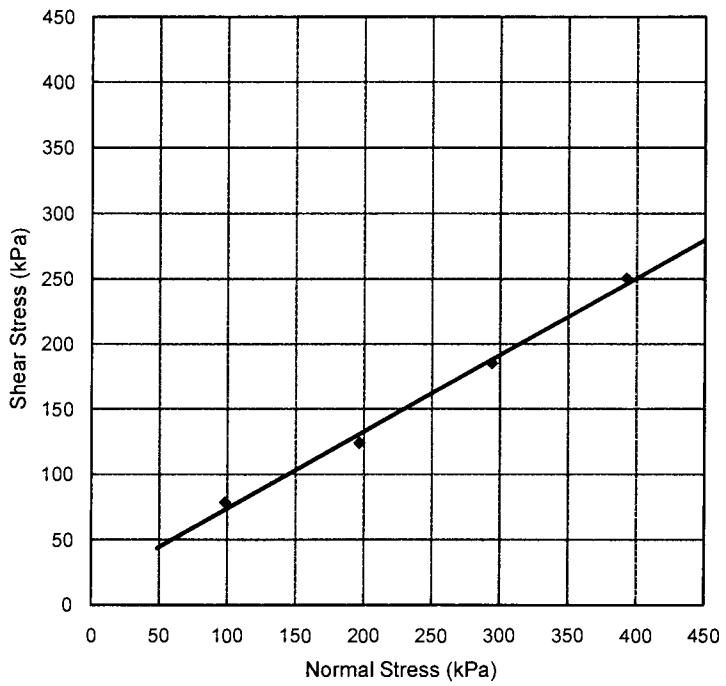
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

DIRECT SHEAR TEST

Project : 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Sample Type: Disturbed	Test Condition Soaked
Borehole No. BH-2	Sample No. SPT-8	Depth: 15.5 meter





y = 0.588x + 14.74

LINEAR REGRESSION

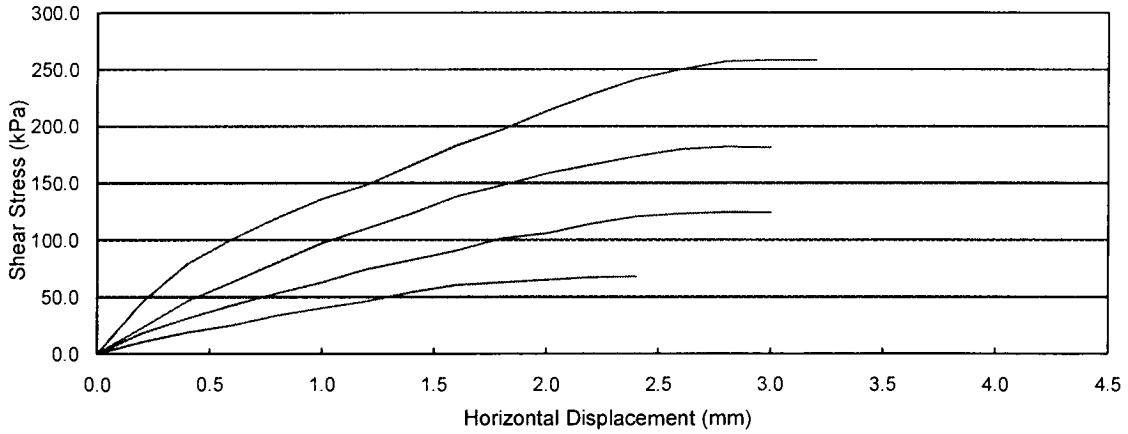
Angle of Internal Friction = 30.4 Degrees
Cohesion = 15.0 kPa

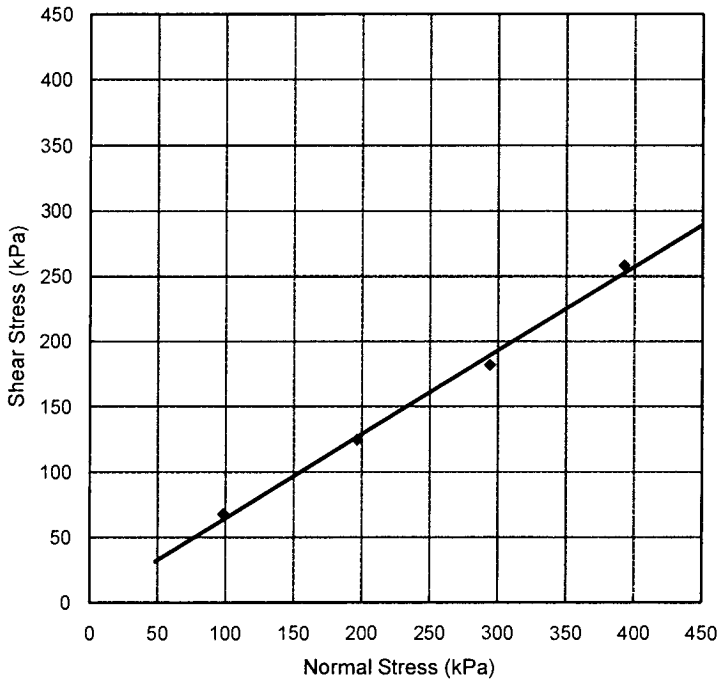
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

DIRECT SHEAR TEST

Project : 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Sample Type: Disturbed	Test Condition Soaked
Borehole No. BH-2	Sample No. SPT-18	Depth: 32.0 meter





y = 0.641x + 0.341

LINEAR REGRESSION

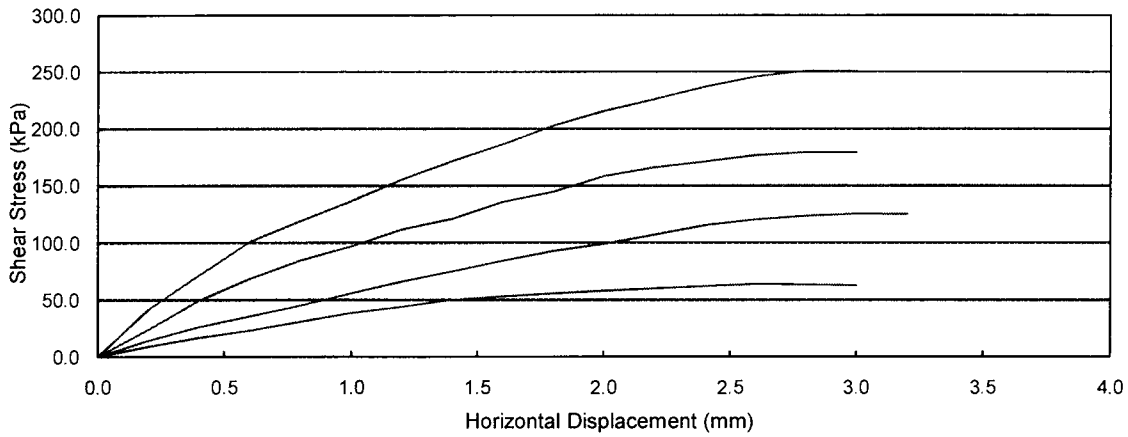
Angle of Internal Friction = 32.6 Degrees
Cohesion = 0.0 kPa

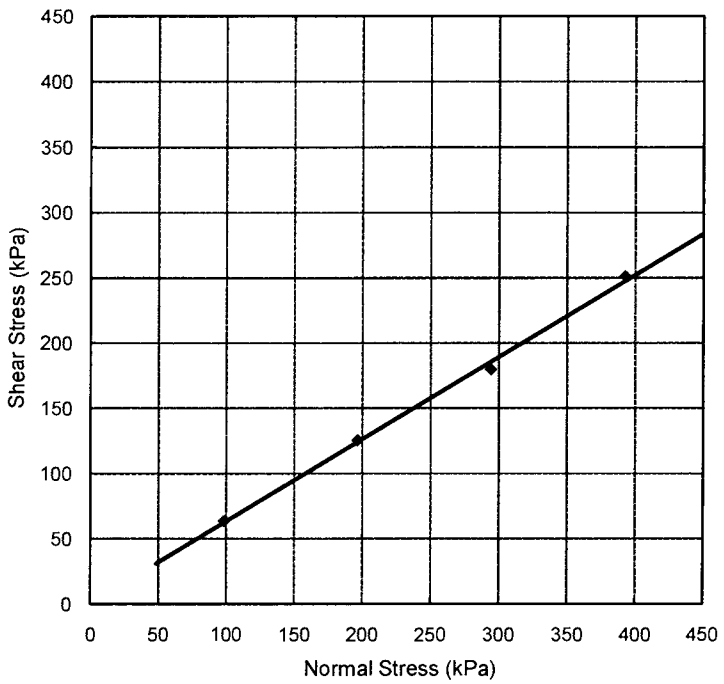
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

DIRECT SHEAR TEST

Project : 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Sample Type: Disturbed	Test Condition Soaked
Borehole No. BH-3	Sample No. SPT-8	Depth: 15.5 meter





y = 0.629x + 0.336

LINEAR REGRESSION

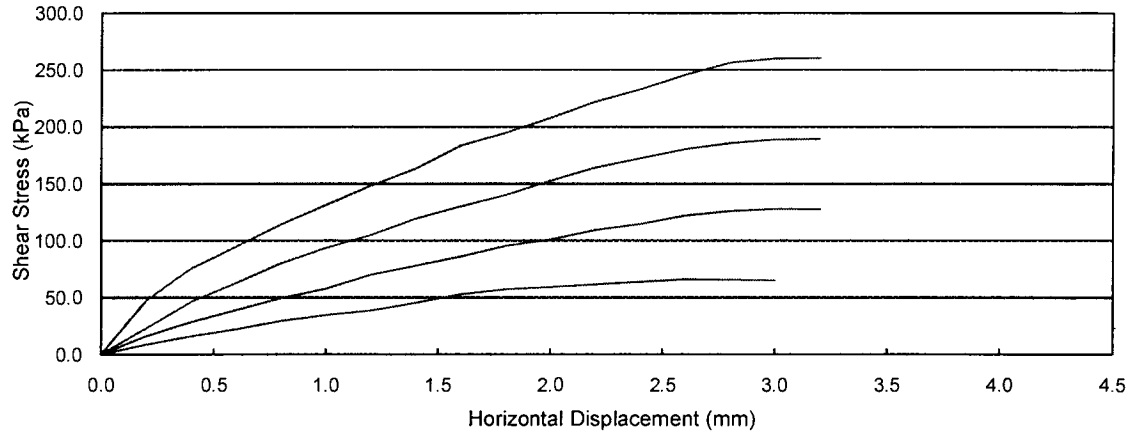
Angle of Internal Friction = 32.2 Degrees
Cohesion = 0.0 kPa

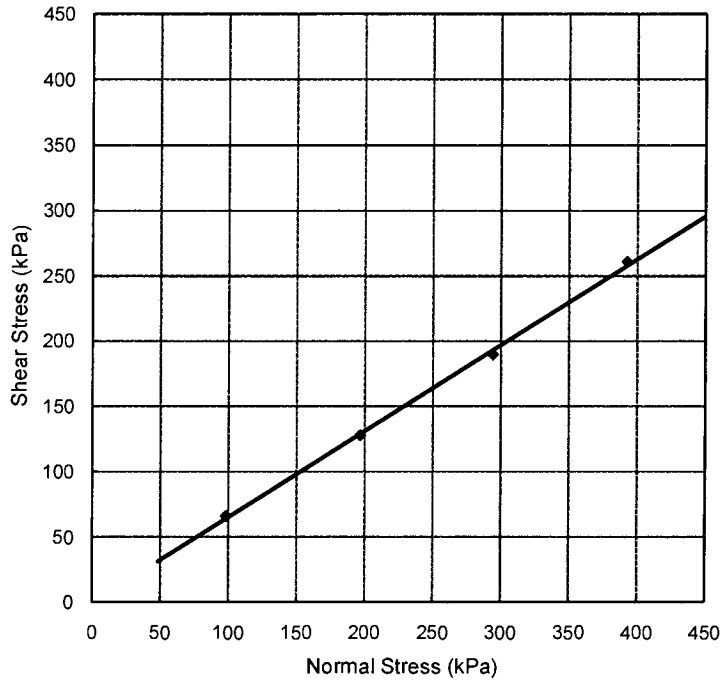
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

DIRECT SHEAR TEST

Project : 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Sample Type: Disturbed	Test Condition Soaked
Borehole No. BH-3	Sample No. SPT-15	Depth: 26.0 meter





y = 0.658x - 0.849

LINEAR REGRESSION

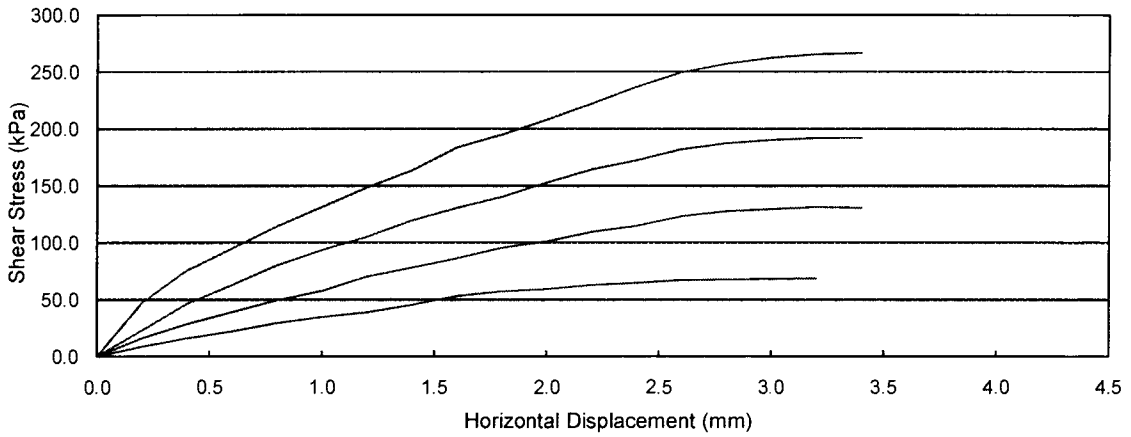
Angle of Internal Friction = 33.3 Degrees
Cohesion = 0.0 kPa

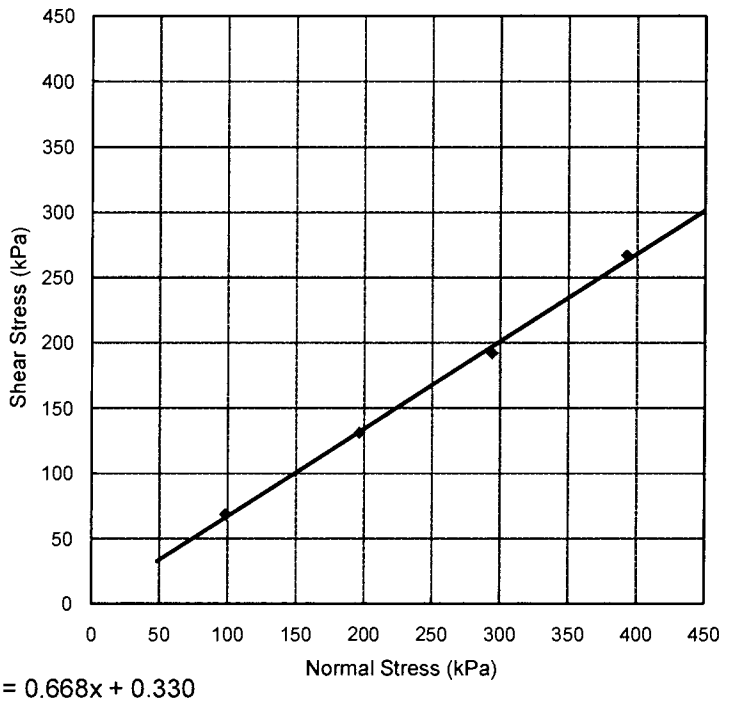
Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

DIRECT SHEAR TEST

Project : 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan		
	Sample Type: Disturbed	Test Condition Soaked
Borehole No. BH-3	Sample No. SPT-19	Depth: 32.0 meter





y = 0.668x + 0.330

LINEAR REGRESSION

Angle of Internal Friction = 33.7 Degrees
Cohesion = 0.0 kPa

Tested by: Sikandar Hayat	Checked by: Muhammad Ajmal

Berkeley Associates

Summary of Chemical Test Results on Water samples

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan

Date: 22-09-2014

Borehole No.	Sample No.	Depth (m)	Sulphate Content (ppm)	Chloride Content (ppm)	Total Dissolve Solids (ppm)	pH Value
BH-1	WS-1	-	70	32	670	7.2
BH-2	WS-1	-	55	30	610	7.2
BH-3	WS-1	-	65	40	650	7.3

Tested by:	Checked by:
Sikandar Hayat	Muhammad Ajmal

Berkeley Associates

Summary of Chemical Test Results on Soil samples

Project: 1 x 40 MW Coal Based Captive Power Plant of Nishat Chunian Ltd. Pakistan

Date: 22-09-2014

Borehole No.	Sample No.	Depth (m)	Sulphate Content (%)	Chloride Content (%)	Organic Matter (%)
BH-1	UDS-1	2.0	0.04	0.03	0.55
BH-2	UDS-2	6.0	0.02	0.03	0.25
BH-3	UDS-3	6.5	0.01	0.02	0.25
BH-48	UDS-2	4.0	0.01	0.02	0.20

Tested by:	Checked by:
Sikandar Hayat	Muhammad Ajmal

RAW WATER ANALYSIS

S. No.	Description	Unit55	Parameter			
			#2	#6	Weaver	Design
1	Physical characteristics					
	pH at 25^{0}C	-	7.62	7.68	7.72	7.8
	Turbidity	NTU	1.1	1	1.2	1.5
	Conductivity	µs /cm	830	821	821	980
	Total Dissolved solids	ppm	510	495	495	685
	Total Suspended Solids	ppm	NIL	NIL	NIL	NIL
2	Cations					
	Calcium Hardness	ppm as CaCO3	156	154	156	156
	Magnesium Hardness	ppm as CaCO3	96	96	96	96
	Sodium + Potassium	ppm as CaCO3	234.62	223.57	219.46	234.9
	Iron	ppm as CaCO3	0.13	0.08	0.09	0.1
	Total Cations		486.75	473.65	471.55	487
3	Anions					
	M-alkalinity	ppm as CaCO3	174	164	164	174
	Chlorides	ppm as CaCO3	88	86	86	88
	Sulphate	ppm as CaCO3	224.75	223.65	221.55	225
	Nitrate	ppm as CaCO3	Trace	Trace	Trace	Trace
	Total Anions		486.75	473.65	471.55	487
4	Total Hardness	ppm as CaCO3	252	250	252	252
5	P-alkalinity	ppm as CaCO3	Nil	NIL	NIL	NIL
6	Dissolved Silica	ppm as SiO2	3.35	3.0	3.1	3.5
7	Colloidal Silica	ppm as SiO2	NIL	NIL	NIL	NIL