BHUSHAN

HALF YEARLY COMPLIANCE REPORT

for the period

October 2017 to March 2018

Environment Clearances of Jagannath Mine Void

Letter no.: Z-11013/43/2011-I-A.II (M) dated 05th Sept 2013
Letter no.: Z-11013/43/2011-I-A.II (M) dated 08th April 2015
Letter no.: Z-11013/43/2011-I-A.II (M) dated 19th April 2016
Letter no.: Z-11013/43/2011-I-A.II (M) dated 19th April 2017

BHUSHAN STEEL LIMITED

Narendrapur, Kusupanga, Meramandali, Dhenkanal, Odisha

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HALF YEARLY COMPLIANCE REPORT

October – 2017 to March – 2018

Environment Clearance of Jagannath Mine Void
Letter no.: Z-11013/43/2011-IA.II (M) dated 05th September 2013

SL	STIPULATED CONDITIONS	COMPLIANCE STATUS
i	Disposal of fly ash into the mine void shall cease operation with effect from the date of completion of one year of the date of issue of this clearance/permission.	Disposal of fly ash into mine void commenced from 15.03.2014 which was communicated to MoEF vide letter no. BSL/MoEF/BS-06/2014-03 dated 09.04.2014. One year permission shall be counted from the date of starting dumping of fly ash vide MCL letter dated 06.01.14.
ii	M/s Bhushan Steel Limited shall jointly or otherwise along with M/s NTPC and M/s NALCO within a period of one year from the date of issue of this letter, commission a study, from reputed institutes like BARC; IITs; RRL, Bhubaneswar etc. to assess the impact of fly ash disposal to the mine voids and to carry out Toxicity Characteristics Leaching Procedure (TCLP) and submit the report to the Ministry, the Central Pollution Control Board and the State Pollution Control Board. The study shall collect baseline data of fly ash to be dumped, identify characteristics in fly ash and analyze its radio activity contents.	NEERI, Nagpur has been assigned to study and assess the impact of fly ash disposal into the mine void on local environment including ground water. The final report along with findings has submitted by NEERI. The TCLP test for fly ash and bottom ash samples done by IMMT-CSIR and NEERI, Nagpur. Results are within permissible limit of USEPA. Other physic-chemical parameters are also within the permissible limits of BIS standards.
iii	The Ministry on receipt of the above said reports in consultation with the .Expert Appraisal Committee (Thermal & Coal Mining) shall further decide on allowing continuation or otherwise of mine void filling / disposal by fly ash.	First preliminary report of NEERI has been submitted to MoEF&CC vide letter no.BSL/ MoEF& CC/BS-06/2015-01 dated 09.01.2015
iv	M/s Bhushan Steel Limited shall regularly carry out monitoring of acid leaching and heavy metals in ground water in nearby mine areas and take immediate preventive action	Monthly monitoring in and around Jagannath OCP mine is being carried out for the following: • Surface Water Quality • Ground Water Quality

		• Ambient Air Quality. • Soil Quality Monthly reports are being submitted to MoEF&CC and SPCB, Odisha.
v	M/s Bhushan Steel Limited shall submit the monitoring reports of mine void water sample analysis to the Orissa State Pollution Control Board (OSPCB) and the Regional Office of the Ministry regularly and upload the results in public domain in their website	Monthly monitoring reports are being submitted regularly to SPCB, Odisha and Regional Office of the Ministry at Bhubaneswar as well as uploading on website.
vi	The Orissa State Pollution Control Board shall regularly collect mine void water samples and analyze the results and take / suggest action as required.	State Pollution Control Board, Odisha has also analyzed water samples and the results are normal. Their teams are regularly visiting the site to oversee the entire environment friendly mine void filling operation.
vii	M/s Bhushan Steel Limited shall install adequate number of piezometers, both at confined and· unconfined aquifers, around the mine void in consultation with the SPCB, Odisha.	Based on exhaustive field investigation both in confined and unconfined aquifers around the mine void and recommendation of NEERI, Nagpur, we have installed six piezometers in the area.
viii	Fly ash disposal shall be restricted to at least 1.0 m below the general ground level and clay / soil layer of 1.0 m on top of filled in dump shall be ensured.	Suitable depth of soil cover will be provided to keep the final height below the general ground level.
ix	M/s Bhushan Steel Limited shall submit within six months alternative time bound action plan for fly ash utilization with details of fly ash utilization potential of the activities proposed.	As per the available literature and prevailing practice across the industry, the most common and viable option of fly ash disposal is mine void and abandoned stone quarry filling. We are also operating three brick making units with a combined capacity of 7400 bricks / hr. Nearby fly ash bricks manufacturing units are also supplied fly ash on free of cost basis.
x	Status of implementation of the recommendation and observations made in the report submitted by the sub group of the Expert Appraisal Committee shall be implemented as applicable in their case.	Observations and recommendations of the sub group of EAC are mainly related to issues discussed during their visit to NALCO and NTPC, hence not applicable.

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SL	STIPULATED CONDITIONS	COMPLIANCE STATUS
i	Chemical constituents of fly ash dumped in the mine void at different depths	The fly ash at disposal point has been collected and the same has been analyzed.
ii	The water quality at the bottom of the fly ash dumped void and also at different depths if, available from the depths of the fly ash dump corresponding to the levels of the unconfined, semi confined and confined aquifer levels in the area	The water quality in the mine void at various depths of the mine void has been collected using depth sampler and the samples have analyzed for the corresponding parameters.
iii	The bioaccumulation and biomagnifications of trace elements in plants (herbs, shrubs and trees) and the invertebrates and also aquatic fauna from the mine void filled with fly ash should be investigated.	The bioaccumulation and biomagnifications of trace elements has been investigated and found that there was 100% survival of the fishes during the experimental period and does not indicate any toxicity.
iv	The biota (herbs, shrubs and trees of plants and soil invertebrates and other animals) inhabiting the areas located at 500 m, 1000 m, 2000 m, 5000 m and 10,000 m from the mine void filled with fly ash should also be studied.	The biota including flora (herbs, shrubs, trees) and fauna (fishes, birds) inhabiting the areas located at 500 m, 1000 m, 2000 m, 5000 m and 10000 m from the mine void filled with fly ash has been studied.
v	Groundwater samples at different depths using piezometers should be analyzed from all the areas mentioned in item iv above.	The groundwater samples from the open wells have been collected using the depth sampler and analyzed**.** The results are found to be within the limit.
vi	The distribution pattern of unconfined, semi confined and confined aquifers in the areas located within 10 km radius of the mine void filled with fly ash should be	The distribution pattern of unconfined, semi confined and confined aquifers in the areas located within 10 km radius of the mine void have carried out and found that all the wells

	mapped and their connectivity with mine void filled with fly ash shall be investigated.	are tapping only the top unconfined aquifer.
vii	The direction of the movement of groundwater in all the three aquifers should be investigated.	The direction of the movement of groundwater in all the three aquifers has investigated.
viii	The model of solute transportation should be based on the results obtained from above mentioned studies.	The solute transport modeling has carried out and it indicates that the plumes moving approximately 800 m over a 30 year period (starting from March 2014). The movement will be significantly less for trace elements since they undergo retardation.
x	Radioactivity of fly ash samples at different depths from the mine void fly ash dump should be analyzed.	Fly ash and bottom ash has collected directly from the disposal site and analyzed for the radioactive elements at BRIT and the results are well within the limits set by the AERB guidelines.
xi	In all the above studies, the concentration of trace metals should be assessed.	The concentration of the trace metals has been assessed in groundwater samples, fly ash samples and plant samples. The results are found to be within the limit.

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Environment Clearance of Jagannath Mine Void
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SL	STIPULATED CONDITIONS	COMPLIANCE STATUS
i	An alternative plan for ash utilization	• Presently, beside ash filling in Jagannath mine void, fly ash is utilized in filling abandoned stone quarries, low lying areas, used internally in manufacturing bricks, used in road making and also given to nearby brick manufacturers with a subsidy of Rs. 150 per ton of ash as per the directive of SPCB, Odisha. • As for an alternate ash utilization plan, we will enhance utilization of ash in brick making in house and by others, in road making and filling in abandoned stone / other quarries in the area. We also have an emergency ash pond of about 5 acres inside our premises to handle critical situation. • It can also be noted that as per the literature and recommendation of the committee formed by the Hon'ble NGT, New Delhi, mine void filling and reclamation is the only viable option of fly ash utilization.
ii	Regular monitoring and review of the continuing study by NEERI etc. to ensure an objective analysis of impact which will form the basis for grant of further permission	• NEERI, Nagpur has continued the impact assessment study since May 2014 and has conducted till now regular monitoring and review to analyze the likely impact of ash filling in nearby areas.
iii	Incorporation of radioactive tracer studies for heavy metals in the study	• The Radioactive tracer study has been carried out by the Board of Radiation and Isotope Technology, BARC, Mumbai. • Report concludes very low permeability of the soil underground in the mine void region of the quarry and hence no leachate is reaching the groundwater aquifer. • Copy of the report is enclosed as **annexure-I.**

iv	Submission of the final report of the study comprising of the following:	• NEERI, Nagpur has been assigned to study the impact assessment of fly ash filling in Jagannath mine void no. 4 of MCL. • Copy of final report is enclosed as **annexure-II.**
a	Particle size distribution of fly ash.	• Details of particle size distribution of fly ash are enclosed in Table no. 4.1 on page no. 90 of the above NEERI report. • It indicated that about 90% of the ash particles are in the size range of 0-100 µm which lead to very low permeability.
b	Analysis of ash being used for back filling wrt heavy metal.	• Details of heavy metal analysis in fly ash being used for back filling are enclosed in Table no. 4.12.1 on page no. 92 of the above NEERI report. • Heavy metal analysis in ash indicates that all metals analyzed are within the permissible limits of BIS standards in all the samples.
c	TCLP values and water elute test data at different times for different coal characteristics.	• Details of TCLP values and water elute test data at different times for different coal characteristics are enclosed in Table no. 4.9.1and 4.12.1on page no. 87 and 92 of the above NEERI report. • Leaching of trace elements from fly ash and bottom ash is very (less than 1% for different trace elements). • Leaching of trace elements from the ash matrix decreases with time as illustrated in the water elution test. • It indicate that fly ash and bottom ash are non hazardous in nature as per RCRA guidelines.
d	Trace metal analysis of As, Hg and Pb at different places for various samples.	• Details of trace metal analysis of As, Hg and Pb of ground water of the area are enclosed in Table no. 4.3.1 – 4.3.3 on page no. 68-70 of the above NEERI report. • All these trace metals are reported to be within the permissible limits of BIS standards.
e	Mine pit water sample analysis data for various periods particularly for trace metals.	• Details of mine pit water sample analysis data for various periods particularly for trace metals are enclosed on page no. 79 -

		82 of the above NEERI report. • It indicates no increase in the concentration of trace elements with time.
f	Data from piezometers well etc. which is in the upstream directions of ground water flow.	• Details of data from piezometers wells of upstream direction are enclosed on page no. 95-100 of the above NEERI report. • Lithology of the piezometers wells of upstream direction for various range of depth indicate presence of mainly sand stone.
g	Location, distance and direction of the wells from where the samples are taken and the mine pit.	• Details of location, distance and direction of the wells from where the samples are taken and the mine pit are enclosed on page no. 25 - 29 of the above NEERI report. • Two piezometers wells in upstream and five piezometers wells in downstream direction have been installed to monitor groundwater characteristics in various seasons.
h	Periodic analysis of underground aquifers for heavy metals (leachate from backfilled ash, if any) at a few selected points based on aquifer movement. The reference point may be taken when these were determined first time.	• Details of periodic analysis of underground aquifers for various heavy metals in different seasons are enclosed in Table no. 4.3.1 – 4.3.3 on page no. 68 – 70 of the above NEERI report. • The solute transport modeling indicates that plumes movement in the underground aquifers will be significantly less for trace elements since they undergo retardation.
i	Based on data generated and its analysis, the study should clearly establish whether or not the ash backfilling in mine voids be permitted further or not. If yes, then what are the precautions and what regular monitoring has to be done	• ***In the final study report NEERI concluded that:*** • TCLP tests for fly ash and bottom ash reveal that ash is non hazardous substance in nature. • Water extraction test indicate that leaching of trace metal from fly ash and bottom ash is very less (less than 1%). • Water elution test indicate that trace metal leaching decreases with time. • Radio nuclides indicate that activity is below the limits set by the AERB guidelines. • Flow and solute transport model reveal

		that plumes (for conservative elements) will travel considerably less, about 700 meters in 30 years time. • The movement will be considerably less for trace elements which undergo retardation. • Trace element concentration in various plant species found to be within limits. • Bioassay tests indicate no mortality in test samples. • Backfilling of mine void through fly ash has no adverse impact on environment. • ***NEERI also recommended that:*** • Ash disposal may be allowed to continue further. • Long term EC renewal may be accorded to plan impact assessment study accordingly. • Quarterly monitoring of pH and trace metals in mine pit water. • Pre and post monsoon monitoring of piezometers for trace elements (As, Hg, Pb).

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SL	STIPULATED CONDITIONS	COMPLIANCE STATUS
i	A pilot project shall be explored for implementation for Cenosphere extraction from fly ash and manufacturing of by-products in consultation with organization like CSIR, ISM (IIT) Dhanbad.	We have contacted the IMMT-CSIR, Bhubaneswar and discussed the issue with them. Details are being worked out and final outcome will be communicated shortly.
ii	As recommended by NEERI, Ash characterization, hydro-geological studies, leachability of trace metals, monitoring of trace elements in the supernatant, pH of the water and the piezometers on a quarterly basis and reports shall be submitted to the Ministry and its Regional office annually.	NEERI, Nagpur has been assigned to study the ash characterization, hydro-geological studies, leachability of trace metals, monitoring of trace elements in the supernatant water and the piezometers on a quarterly basis. Annual report shall be submitted to the Ministry and its Regional Office.
iii	Radio tracer studies shall be continued once in six months and the findings of the study shall be submitted to the Ministry and its Regional Office annually.	Radio tracer studies will be done by the Board of Radiation and Isotope Technology, BARC, Mumbai. Annual report shall be submitted to the Ministry and its Regional Office.
iv	Bioaccumulation and bio-magnification tests shall be conducted on surrounding flora and fauna (tree leaves, vegetation, crop yields and cattle population etc.) during pre-monsoon and post monsoon to find out any trace metals escaped through groundwater or runoff.	NEERRI, Nagpur has been assigned to study the bioaccumulation and bio-magnification on surrounding flora and fauna (tree leaves, vegetation, crop yields and cattle population etc.) with special emphasis on heavy metal.
v	Surface runoff and supernatant water, in any case shall not be let into surroundings. It shall be collected by providing adequate drains around the mine. As proposed the supernatant water along with surface runoff shall be treated and re-used for ash mixing and plant operations. Surface and groundwater quality along with existing piezometers wells shall be monitored quarterly and the reports shall be submitted to the Ministry annually.	It is a huge exhausted mine pit where runoff from the surrounding areas get accumulated during rainy season. This accumulated mine water is being used for slurry making and ultimately finds its way into the pit with slurry without any chance of going out. Surface and groundwater quality in the area along with existing piezometers wells is being regularly monitored by NEERI, Nagpur. Annual report shall be submitted to the Ministry and its Regional Office

vi	After the mine void reaches its full capacity, 30 cm sweet soil lining and proper compacting be provided on the top to avoid any wash off during monsoon. Reclamation activities along with greenbelt development shall be carried out in consultation with M/s MCL in accordance with approved Mine Closure Plan.	Once mine void reaches its full capacity, 30 cm sweet soil lining will be provided with proper leveling and compaction on the top to avoid any wash off during monsoon. Reclamation activities along with greenbelt development shall be carried out using local species in consultation with M/s MCL.
vii	Only decanted water from mine, make up water from treated effluents such as cooling tower blowdown and treated sewage water shall be used for making ash slurry.	Only mine water is being used for making ash slurry.
viii	Mercury in fly ash shall be periodically monitored by Inductively Coupled Plasma Mass Spectrometry (ICP-MS).	Mercury in fly ash is being periodically monitored by NEERI, Nagpur.
ix	Details of month wise quantity of fly ash disposed and water consumption along with nature of water shall be submitted to the Ministry.	Till now 446535 ton of fly ash has been filled in the Jagannath OCP.
x	Half-yearly compliance report for all the stipulated conditions in this permission shall be submitted to the Ministry and its Regional Office.	Last half yearly compliance report for stipulated conditions was submitted on 13th November 2017.
xi	The fly ash utilization shall be in compliance with Fly Ash Notification and its amendments issued from time to time by the Ministry.	Fly ash utilization is being complied as per the Fly Ash Notification and its amendments.
xii	Third party evaluation/Environment Audit shall be conducted annually for reviewing the compliance conditions stipulated in the clearances along with the baseline data / studies to be carried out during the period of temporary permission.	Annual review including the base line data and findings of the studies conducted including compliance to the stipulated conditions will be submitted by NEERI, Nagpur.
xiii	Compliance of EC / amendment conditions, Environment (Protection) Act, 1986, Rules and MoEF&CC Notifications issued time to time shall be done by an Environment Officer to be nominated by the project head of the Company who shall be responsible for implementation and necessary compliance.	Head of Environment Management Department is nominated for implementation and necessary compliance of MoEF&CC guidelines.