



Delhi
14 May 2018

To
The Secretary
Ministry of Environment, Forest & Climate Change (MoEF&CC)
Government of India
New Delhi

Subject: ERC's suggestions on Draft Notification for Brick Kilns dated 15 March 2018 (G.S.R. 233 (E))

Dear Sir

EIA Resource and Response Centre (ERC) is a national level voluntary programme, keeping a watch on EC and FC processes. ERC regularly engages with Ministry of Environment, Forest and Climate Change (MoEF&CC) and its expert committees providing comments and suggestions on important proposals under consideration for clearances as well as on policy and law issues. Here we are sending suggestions on the Draft Notification for Brick Kilns dated 15th March, 2018 (G.S.R. 233 (E)).

Observations & Discussion

Standards should include all pollutants

The brick kiln sector is one of the most polluting sectors, especially in terms of air pollution in the country. India is the second-largest producer of bricks in the world, after China, and hence the pollution caused by the brick kiln sector is substantial¹. According to a study conducted in Budgam district in Jammu and Kashmir, the monitoring of stack emissions on an 8 hourly basis showed that all the pollutants SO_x, NO_x, and suspended particulate matter were crossing the limits prescribed by National Ambient Air Quality Standards (NAAQS) during the operational phase of brick kilns². Another pollutant released from brick kilns which is a major cause for concern is Hydrogen fluoride gas³. A [study](#) titled "Treacherous Impacts of Hydrogen

¹https://www.researchgate.net/publication/279916664_Brick_kilns_Cause_of_Atmospheric_Pollution

²<https://www.omicsonline.org/open-access/brick-kilns-cause-of-atmospheric-pollution-2375-4397.1000112.php?aid=29753>

³<https://www.protea.ltd.uk/hf-emissions-from-brickworks.html>

Fluoride around Brick Kilns: A Review”, states that fluoride emission from brick kilns is a global rising issue and acts as causative agent for various problems related to the soil, water, vegetation and ultimately the human health. The study further states that Bull’s trench brick kilns emit significant amount of hydrogen fluoride into the air as can be seen from the high concentration of the gas near the brick kiln areas of Peshawar, Pakistan.

Keeping the emission of significant amount of SO_x, NO_x, CO₂, CO and HF in mind, the proposed standards must consider these gases and limits on their emissions must accordingly be set. According to the Standards set by South Africa, Western Australia, for brick kilns limits on emission of sulphur oxides and hydrogen fluoride from brick kilns have been set, thus acknowledging the significance of their emission levels into the atmosphere. Similar standards need to be introduced for the brick kilns in India as well.

It is therefore also important to first characterise the emission from brick kilns to identify the pollutants and then come up with the standards. This draft lacks any justification behind bringing standards only for particulate matter. It is suggested that the final standard should also have standards for SO_x and HF.

PM limit of 250 mg/Nm³ should be lowered

The standardization of permitted particulate matter for all types of brick kilns at 250 mg/Nm³ is very relaxed as limit of 250 mg/Nm³ can easily be met without much effort, once the kilns are converted to zig zag or vertical shaft technology. According to a [study](#), PM emissions from zig zag technology based brick kilns can be limited to much below 250 mg/Nm³. Thus, the stricter standards of PM must be set for the newer brick kilns which would function on more environment-friendly technology.

Further, it can be seen that the emission of PM from Hybrid Hoffmann Kiln (HHK) and Tunnel kiln are much lower, as the standards proposed for PM levels from these 2 types of brick kilns has been kept at 200 mg/Nm³ and 100 mg/Nm³, respectively in Nepal⁴. Hence, instead of only focussing on zig zag and VSBKs, the conversion of the existing brick kilns into these 2 types of newer technology brick kilns must also be explored and the standards for PM must be accordingly revised to make it stricter.

Point No. 1 in Notes: All new brick kilns shall be allowed only with zig-zag or vertical method of brick making and shall comply to the new standards as stipulated in this notification.

The proposed standards in the Draft Notification clearly states that the conversion of the existing brick kilns to only zig zag and vertical shaft (VSBK) technology based brick kilns would be allowed and promoted. While zig zag and VSBK are certainly most feasible for the small brick investors in the country, for the comparatively bigger investors other cleaner brick making technologies like Hybrid Hoffman Brick

⁴<http://doenv.gov.np/files/download/Report%20Brick%20Kiln%20%20Emission.pdf>

Kilns (HHK) and Tunnel Kilns needs to be explored and promoted too⁵. The success of HHK can be seen from its establishment in Bangladesh, as suggested by a [World Bank report](#). Thus, the proposed standards should not be limited to just zig zag and VSBK, but conversion to HHK and tunnel kilns must also be mentioned in the Standards.

Point No. 2 in Note: The existing brick kilns which are not following zig zag or vertical method of brick making shall be converted so as to adopt zig zag or vertical method within a period of one year in case of kilns located near non-attainment cities and two year for other both kilns. Further, in cases where CPCB/SPCB/PPC has separately laid down timelines for conversion, such orders shall prevail.

A conversation with an industry expert Dr. Sameer Maithel from [Greentech Knowledge Solutions Pvt. Ltd.](#) (GKSPL), revealed that typically construction of a kiln requires 2 months of time and the construction should be done by a trained mason. Considering that around 50,000 FCBTKs exist in the country, simple mathematics shows that around 5000 trained masons will be required to undertake the task of converting all the kilns within one year (non-attainment cities) and two years for other areas.

It must be mentioned here that the masons need to be highly skilled and trained accordingly in order to carry out the conversion efficiently. Thus, to ensure timely and effective conversion (which results in kilns with lower air pollution), the notification should direct the State Governments/ State Skill Development Missions/ SPCBs to conduct training of masons.

Further, the operation of the newer technology based brick kilns would require trained manpower for operation. Some of the technologies like Vertical Shaft Brick Kilns (VSBK) would require more skills to operate and a better clay preparation and green moulding process than the existing technologies like Bull's Trench Kilns⁶. Thus, the need for a labour force with increased skill sets becomes apparent. Thus, the labour force involved in the existing brick kilns need to be adequately trained to work in the newer technologies. Thus, to ensure timely and effective conversion, the notification should direct the State Governments/ State Skill Development Missions/ SPCBs to conduct training of masons.

Point No. 8 in Note: $PM \text{ (normalized)} = PM \text{ (measured)} \times 4\% / \text{measured CO, in\% Stack height (in metre)}$ shall also be calculated by formula $H=14Q^{0.3}$ (where Q is SO₂ emission rate in kg/hr), and the maximum of two shall apply.

- a) The formula by which the stack height has been calculated is wrong. It should be $H=14Q^{0.3}$

⁵<https://www.tandfonline.com/doi/abs/10.1080/19443994.2015.1012335>

⁶http://www.gkspl.in/reports/energy_efficiency/brick_by_brick.pdf

- b) The more the sulphur content of the coal, the more will be the sulphur dioxide emission⁷. Considering this fact, brick kilns which use coal with high sulphur content should ideally have higher stacks in order to ensure dilution of the pollutants. The minimum stack height given in the standard would have been calculated for a particular SO₂ emissions rate. This emission rate (or the corresponding Sulphur content in the fuel-mix) should be mentioned. So that it should be clear that what is the SO₂ emission cut-off rate, beyond which this formula is applicable. Also, it is unclear as to who will monitor the sulphur dioxide emissions from the stack of the brick kilns (especially when there is no standard put in place for SO₂) based on which the stack height is calculated.

Standards should include elaborate ‘siting guidelines’

Fertile topsoil has a significant amount of loam and clay and is hence considered to be the best raw material for bricks⁸. The removal of the fertile topsoil for brick-making ensures that the agricultural land in the vicinity of the brick kilns and from where the topsoil is extracted, are rendered completely useless to meet the needs of the brick kilns. In a [study](#) conducted to assess the effect of brick kilns in the vicinity of 17 villages, it was revealed that most of the brick kilns were located in the middle of the villages’ paddy fields and only about 34% (121 out of 355 villagers) of the total population of the villages were directly employed in the brick kilns. The farmers located in the vicinity of the brick kilns blamed the kilns for loss of productivity in their once fertile lands.

A [study](#) titled “Effect of brick kiln emissions on commonly used vegetables of Kashmir Valley” reveals that the emissions from brick kilns and mining of good quality fertile agricultural topsoil are the main reasons for the deterioration of important consumable vegetables, which could lead to chaos in the food security of the area in concern besides a threat to local people in terms of health if proper pollution control devices or the replacement of brick kilns are not put in place with new technology.

In 2013, mango orchards in 10 villages under Nawabganjupa Zila of Dinajpur district got severely affected due to the poisonous gases being released from the brick kilns located in close vicinity⁹. The poisonous gas may be assumed to be hydrogen fluoride which is one of the chief pollutants released from the brick kilns, as mentioned above, and adversely impacts the mango orchards in the vicinity of the kilns.

Thus, it is clear from the above-mentioned studies and examples that brick kilns have severe negative impacts on the surrounding agricultural fields and fruit orchards. The need for proper siting criteria guidelines becomes apparent when such incidences are brought to light. It must be mentioned here that apart from a few States like [Uttar Pradesh](#), Bihar and several of the other States have siting criteria

⁷<http://www.environment.gov.au/protection/publications/factsheet-sulfur-dioxide-so2>

⁸<http://shodhganga.inflibnet.ac.in/bitstream/10603/152177/4/13.%20chapter-5.pdf>

⁹<https://www.thedailystar.net/news/four-brick-kilns-close-to-orchards-spoil-mangoes>

guideline for the setting up of brick kilns. The proposed Standards must include the need for formulation of a proper National document for siting criteria of brick kilns in the final Notification. Such a document would also ensure that eco-sensitivity of an area is considered before a brick kiln is established.

Point no. 11 in Note: Brick kilns should be established at a minimum distance of 0.8 km from habitation and fruit orchards. State Boards may make siting criteria stringent considering proximity to habitation, population density, water bodies, sensitive receptors, etc.

There is no scientific basis for setting the permitted distance of the brick kilns from habitation and fruit orchards at 800 m. Further, the required distance of 800 m is mandated to be maintained by the brick kilns which would be established in the future. No measures have been mentioned to be taken by the already existing brick kilns to ensure that their emissions do not affect the population which might be settled at close vicinity of the existing brick kilns.

Standards should outline cleaner alternative fuels

Point No. 4: All brick kilns shall use only approved fuel such as coal, fire wood and/or agricultural residues.

The basis for approval given to coal, fire wood and agricultural residue is questionable as the burning of these materials as fuel would have severe detrimental impacts on the environment, especially on the air quality of the region. The burning of fire wood in the brick kilns would result in the release of pollutants like Wood fine particulates, nitrogen oxides, sulphur oxides, carbon monoxide, volatile organic compounds, dioxins, and furans¹⁰. Further, the promotion of use of fire wood in the brick kilns would further encourage deforestation. In Bangladesh, as a step towards conservation of forests, the use of fire wood in brick kilns is prohibited under the Brick Burning (Control) (Amendment) Act, 2001¹¹. A similar step for forest conservation should be included in the proposed standards, instead of allowing fire wood as fuel.

While the burning of agricultural residues is banned, especially in the Northern States of Punjab and Haryana, the same residue is being allowed to be burnt as a source of fuel in the proposed standards given in the Draft Notification for the brick kilns. In the absence of proper APCDs to control the emission of SO₂ and NO_x which are emitted from the residues¹², the permitted burning of agricultural crop residues would have the same effect as the open burning of the residues in terms of the pollutants emit. This would nullify the impact of ban imposed on the burning of crop residues on the farmers of North India.

¹⁰<https://www.des.nh.gov/organization/commissioner/pip/factsheets/ard/documents/ard-36.pdf>

¹¹https://www.researchgate.net/publication/283732074_Forest_conservation_in_Bangladesh_Legal_measures_and_policy_support_in_relation_to_landscapes_and_land_use_issues

¹²http://aaqr.org/files/article/619/40_AAQR-13-01-OA-0031_422-430.pdf

Considering the significant environmental emissions from the coal, fire wood and agricultural residues, it is surprising that the new standards have not considered alternate sources of fuels which would be more environment-friendly, like bio ethanol, which has several advantages including the reduction of greenhouse gas emissions¹³. Keeping in mind India's commitment to reduce its greenhouse gas emissions in the Paris Agreement, such alternative sources of fuels for one of the most polluting sectors of the country needs to be thoroughly researched.

Use of hollow bricks should be part of the standards

A [study](#) titled "Brick by Brick: The Herculean Task of Cleaning up the Asian Brick Industry", explores the benefits of using hollow bricks in buildings instead of solid bricks. A good hollow brick does the same work as a solid brick but saves significant amount of energy in air conditioning when used in buildings, by virtue of its greater insulation property. The study further reveals that upto 40% of the 180 million tons of CO₂ emitted by the Asian brick industry could be saved just by switching to more efficient kilns such as the VSBK, but further energy savings could be made from introducing hollow bricks. This not only reduce directly the energy used for firing (a lower mass of clay to be fired) but also through better insulation of walls made of hollow bricks, reduce the energy required for heating and cooling of buildings. This aspect is relevant, as in urban areas of Asia the share of air-conditioned buildings is increasing very quickly. Thus, promotion of the use of hollow bricks should be mentioned in the proposed standards.

APCDs should be prescribed

The need for installation of wet scrubbers in the stack of brick kilns to remove the sulphur dioxide emission¹⁴ into the atmosphere along with the other waste gases and pollutants has not been mandated in the Standards. In the absence of proper air pollution control devices (APCDs), the sulphur dioxide produced due to the burning of high-sulphur coals would be directly emitted into the atmosphere and have various detrimental impacts on the health of the workers in the kilns¹⁵.

¹³https://www.researchgate.net/publication/283732074_Forest_conservation_in_Bangladesh_Legal_measures_and_policy_support_in_relation_to_landscapes_and_land_use_issues

¹⁴<https://nepis.epa.gov/Exe/ZyNET.exe/910065EK.TXT?ZyActionD=ZyDocument&Client=EPA&Index=Prior+to+1976&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C70thru75%5CTxt%5C00000008%5C910065EK.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL>

¹⁵<https://businessimpactenvironment.wordpress.com/2011/10/03/environmental-pollution-from-brick-making-operations-and-their-effect-on-workers/>

Thickness of kiln walls should be prescribed

The thickness of the wall of a brick kiln plays a crucial role in energy consumption of a brick kiln. According to a [study](#), the temperature inside a kiln is higher than the ambient temperature due to which heat loss from the walls of the kilns is a major concern. About 35 per cent of the total heat is lost through the kiln surfaces, 15 per cent from the top and the rest from the sides and the bottom. The study also compares 18 inch thick and 5 inch thick wall designs of kilns and concludes that brick owners can save around Rs. 2,000 a day by ensuring better insulation and opting for a thicker wall. Thus, the brick owners would save about Rs. 60000 by increasing the thickness of the kiln walls in India, where about 92% of the rural households still survive on a maximum income of less than Rs. 10000 per month¹⁶. Thus, thicker walls would play a significant role in uplifting the economy of the local people.

Apart from the economic benefit, thicker kiln walls would also ensure significant reduction of carbon dioxide from the reduced coal consumption¹⁷. The levels of sulphur dioxide emissions would also be reduced as a result of this. Thus, there is a need to specify standards for thickness of the brick kiln walls which should have been introduced in the Draft Notification. The same must be specified in the final Notification.

Suggestion

- New brick kilns should be prescribed stricter standards for particulate matter.
- Standards should not be limited to conversion to zig zag and VSBK, but conversion to cleaner HHK and tunnel kilns also.
- Standards should include limits of SO_x, NO_x, CO₂, CO and HF as well as has been done by several countries.
- The formula for calculating the stack height should be $H=14Q^{0.3}$
- Elaborate and justifiable 'siting' guidelines should be part of the standard. Phasing out of old brick kilns not meeting the guidelines should be part of the standard.
- Coal, fire wood and agricultural residues have significant environmental emissions and cannot be allowed as fuel for brick kiln. Experts should be engaged to advise on the alternate fuels which should be prescribed.
- Standards should promote use of hollow bricks.
- APCDs e.g. wet scrubber should be prescribed in standards.
- Standard on thickness of kiln walls should be prescribed.

¹⁶<https://timesofindia.indiatimes.com/india/92-rural-homes-run-on-less-than-Rs-10000-per-month/articleshow/47931716.cms>

¹⁷<http://shaktifoundation.in/wp-content/uploads/2018/01/Zig-Zag-Kilns-A-Design-Manual-English-2017-1.pdf>

We are sure, MoEF&CC would consider and acknowledge the issues raised and suggestions made, and let us know of the action taken. Thanks, with regards

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