



Advancing Better **Air Quality** with Clean Construction **TOOLKIT**



Supported by:





**Advancing Better
Air Quality with
Clean Construction
TOOLKIT**

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Message



Air pollution has been amongst Delhi's most pressing problems in recent years. Toxic air is not only a massive health and environmental concern, but also takes a huge economic toll: it impedes development and affects people's welfare. Rising urbanisation, booming industrialisation, and associated anthropogenic activities are the prime reasons that lead to air pollutant emissions and poor air quality.

Delhi Pollution Control Board (DPCC), the statutory body under the Department of Environment, Govt. of India has been actively taking actions to prevent air pollution in Delhi with emphasis on major contributors like construction and demolition dust.

This toolkit is developed by the Clean Air Asia (CAA) in collaboration with DPCC, is a pioneering effort to enhance capacity building for stakeholders involved in construction activities such as Architects, Civil Engineers, Project Management Professionals, Construction Professionals, State pollution control board and local government. I envisage that this work would serve as an insightful module for all stakeholders from built environment to understand severity of dust emission and key control measures required to mitigate construction dust within micro boundaries of project site.

A handwritten signature in blue ink, appearing to read 'K S Jayachandran', written over a light blue circular stamp.

Dr. K S Jayachandran

*Member Secretary,
Delhi Pollution Control Committee*



Foreward



Air pollution is one of the major problems particularly in urban areas across India, and Delhi is no different as it has a mix of all the major sources which contribute to it. The construction and demolition (C&D) of building commercial and residential spaces and modern infrastructure to cater to the growing population is essential but results in dust emissions as a major contributor to the problem of air pollution.

Construction is the key for the growth of the infrastructure. Construction sector drives the economy. It accounts for about nine percent of India's GDP and employing more than 45 million construction workers either directly or indirectly. At the same time, C&D is the third largest contributor to particulate matter (56 percent of PM10 and 38 percent of PM2.5). Construction and road dust together, contribute towards 23, 45 and 71 percent of particulate matter in the air of Bengaluru, Delhi, and Mumbai respectively.

Government of India has several legal provisions and advisories available to control PM2.5/10 emissions at construction sites in central acts and state level rules. Acknowledging that dust from roads, construction and demolition are major contributors to pollution in Indian cities, the National Clean Air Programme (NCAP) has included action points for both preventive and mitigation measures for air pollution on account of C&D activities. Cities across India are developing Clean Air Action Plans outlining city-specific agenda items for meeting NCAP objectives. Delhi's Clean-Air Action plan too enlists the following priority actions for addressing construction dust:

Air pollution with high concentration of PM2.5/10, and dust can occur during demolition, earthworks, and construction. The extent and severity can vary substantially depending on the level of activity, the specific operations being undertaken, the weather conditions and the mitigation measures being applied.

Realizing the importance of mitigation measures and the challenges of implementing them during construction process, Delhi Pollution Control Committee (DPCC) and Clean Air Asia developed this "Advancing Better Air Quality with Clean Construction- Toolkit". The toolkit will serve as a guiding document for all stakeholders in the built environment such as architects, civil engineers, project management professionals, construction professionals, state pollution control boards and local governments.

This toolkit includes guidance on dust control measures, best practices as well as checklists for site supervisors for implementation of dust mitigation actions. Clean construction practices not only include measures for better environmental health (air, noise, soil), but also best practices for worker health and safety, reduction, and management of waste, etc. The toolkit by the Clean Air Asia is a concerted effort towards building capacity amongst building professionals and site contractors on clean construction practices.

There is sufficient evidence of requirement of clean construction practices and supporting legal and regulatory environment. It has been proven that the effects of a construction site on air quality depend to a large extent on the mitigation measures adopted. We look forward to adoption of the toolkit and integration of the requirements into the mainstream construction processes.

A handwritten signature in black ink, appearing to read 'Archana'.

Archana Walia

(India Director, Clean Air Asia)



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Abbreviation

DPCC	: Delhi Pollution Control Board
CPCB	: Central Pollution Control Board
ULB	: Urban Local Body
AQI	: Air Quality Index
PM	: Particulate Matter
NBC	: National Building Code
AQM	: Air quality management
GHG	: Greenhouse gases
NAAQS	: National Ambient Air Quality Standards
WHO	: World Health Organization
NCAP	: National Clean Air Programme



1

Air Pollution and **Construction**

Construction of new buildings is a continuous process in cities and suburbs. While building modern infrastructure to cater to the growing population is important, the process also causes many inconveniences, mainly related to air pollution. The construction sector is a diverse and vast industry with project sites ranging from single-family dwellings to multi-billion-dollar heavy engineering projects.

During construction, emissions occur at many different stages, irrespective of the size and scope of the project. Construction dust is related to the particulate matter diffusion into the atmosphere due to construction processes and this impacts human health and the areas nearby the construction site (e.g. urban infrastructure construction and renovation/retrofitting of old projects by building and demolition). More precisely, the activities of construction workers or the operation of machines emanate dust that suspends in the air, lowering the air quality. Construction activities are the major contributors to dust pollution.

Poor practices across thousands of work sites contribute to the third-largest amount of coarse pollutants - strongly related to heart disease in a 2015 study¹. The data collected from the Delhi Pollution Control Committee shows, current construction waste processing facilities allow about 2,600 tonnes of waste processing per day, but the city produces approximately 3,600 tonnes of construction waste. Along with raw materials like sand, cement, concrete and so on, used during construction, activities like excavation, cutting and drilling also contribute to pollution. Material transportation, loading/ unloading, storage in open areas, concrete and mortar making, cutting and filling, and the movement of construction equipment contribute to dust emission².

Approximately 30 per cent of air pollution is caused due to dust which emanates from construction sites³. Construction dust is related to the diffusion of particulate matter in the atmosphere due to construction processes—which impacts human health and influence the nearby areas of the construction site. Poor practices across thousands of worksites, make construction and demolition the third-largest contributor of coarse pollutants – strongly linked to heart disease.



¹ Public Health Journal, National Institute of Environmental Health Sciences, Retrieved 07 10, 2021, from <https://publichealth.jhu.edu/2015/researchers-find-link-between-air-pollution-and-heart-disease>

² Yongjie, D., Hong*, R., & Weiguang, C. (2016). Effect of Construction Dust on Urban PM2.5 Emission Characteristics: A Case Study of the Main Urban Area of Chongqing, China. Chongqing, China: Nature Environment and Pollution Technology, An International Quarterly Scientific Journal. Retrieved 08 10, 2021, from [https://neptjournal.com/upload-images/NL-57-9-\(7\)G-87.pdf](https://neptjournal.com/upload-images/NL-57-9-(7)G-87.pdf)

³ Down To Earth Blog Retrieved on 14 10, 2021, from <https://www.downtoearth.org.in/blog/air/cleaner-greener-can-architects-help-maintain-natural-correction--71675>

2

About The Toolkit

This toolkit is expected to guide participants from the built environment to understand the severity of dust emission and key control measures required to mitigate construction dust within the micro boundaries of the project site. The toolkit is expected to be used for developing capacity for clean construction among stakeholders by showcasing the government's guidelines related to clean construction, and unique ideas to reduce the contribution of PM levels for ambient air quality.

This toolkit will help users to understand the impact of construction dust on health, existing government guidelines and measures to control construction dust emission. It will also give a road map for stakeholders on a construction project for regular adherence to the dust control norms. It is designed for Architects, Civil Engineers, Project Management Professionals, Construction Professionals, State Pollution Control Boards, Local Governments and others involved in construction activity.

It contains basic information for professionals to train stakeholders associated with construction projects, in mitigation of construction dust.



3

Impact On Health

Modern construction involves various materials during construction. At any construction site, one can find metal, wood, concrete, sand, sheetrock, and plastics. Due to multiple materials used, the hazardous dust emissions from a construction site can be full of numerous particulate matters. Dust particles might be too small to see but once inhaled, it travels deep into individual's lungs, which can cause serious harm to health. The harmful effects of dust can have multiple side effects like skin irritation to lung cancer, depending on the composition and exposure to dust.

Construction dust is a severe health hazard to people working in the construction sector as dust contains many harmful pollutants like carcinogens and silica. Few major construction dust-related diseases affecting workers are:

- Lung Cancer
- Silicosis
- Chronic Obstructive Pulmonary Disease (COPD)
- Asthma

One can find dust all over the construction sites, as a result of different activities like excavation, cutting, drilling, material handling and demolition. Dust is an unnecessary risk to health that needs to be managed effectively on every construction site. It is not just cement dust that can cause harm; dust coming from any construction activity that is sanded, milled, sawed, or crushed can release dust⁴.

Dust from construction sites can take many different forms, and the pollutants released into the air can be made of metal, rock, wood, chemicals, and releasing particulate matter that can travel for a very long distance. Dust from these materials can travel deep into human lungs and cause silicosis, which is incurable and, on rare occasions, be deadly. In most cases, the disease will occur after few years of constant exposure to the contaminated environment. Also, it's important to note that some types of construction dust are worse than others. One of the typical dust from a construction site includes silica dust, which is generated during various activities of working with materials that contain silica, including concrete and sandstone. It is also commonly emitted through activities which include handling of glass, pottery, brick, and concrete, as well as asphalt roofing and porcelain. Inhalation of silica dust generated from these materials can cause harmful fatal illnesses like lung cancer and other serious respiratory diseases. Anyone involved in handling these materials, can be exposed to small amounts of silica particles, which can be easily inhaled. Wood dust is also another common type of dust created by construction sites. During work related to either hardwood or softwood, dust particles can be released into the air. Wood dust comes from the handling of manufactured products such as fibreboard and plywood.

For those who are exposed to construction dust regularly, as is the case for most workers in the industry, this particles settlement builds up continuously. This is why the risk from dust is high. Moreover, it takes years for the effects of dust exposure to occur, by the time it would be too late to do anything about it. COPD (Chronic Obstructive Pulmonary Disease), which includes chronic bronchitis and

⁴ World Bank, 2016. Retrieved 11 10, 20121 from <https://www.worldbank.org/en/topic/pollution>

emphysema, is a disease that decreases the size of the airways and it is incurable. Pneumoconiosis is also one of the diseases that happen to go unnoticed for years. It occurs due to continuous exposure to dust such as asbestos and silica⁵.

Construction dust also causes environmental degradation affecting the quality of water in water bodies. It also creates unsafe working conditions within project sites by decreasing visibility.

In India, there are about 3 million workers formally employed in the formal economy with potential exposure to silica dust. Further, approximately 8.5 million more work in construction and many more in the informal industries with exposure to silica dust. Thousands of these workers develop silicosis every year and die directly from it, or from secondary causes such as TB or lung cancer⁶.



⁵ RVT Group. (2017, 6 4). safeopedia/constructionindustrisk. Retrieved 7 21, 2021, from Safeopedia: <https://www.safeopedia.com/construction-dust-the-risk-to-health-and-how-to-create-a-safer-working-environment/2/4904>

⁶ NBM&CW Magazine, (2019, 4), Construction Dust Causes, Effects and Remedies. Retrieved 9 15, 2021, from: <https://www.nbmcw.com/article-report/infrastructure-construction/infra-real-estate/construction-dust-causes-effects-and-remedies.html>

4

Guidelines, Regulations & Acts

4.1 National Building Code 2016

National Building Code 2016 in chapter 11 - Approach to Sustainability, mandates the monitoring of ambient air quality during planning, design, construction, operation and maintenance of buildings, and those relating to land development, from a sustainability point of view⁷.

*Figure 1 - NBC guidelines on ambient air quality monitoring
(Source: NBC Guidelines 2016, Technical department, NBC code)*

12.4.3 Ambient Air Quality Monitoring

Depending upon the project size, location and the type of activities involved, ambient air quality in respect of suspended particulate matter (SPM), respirable particulate matter (RPM), SO₂, NO_x, and CO, shall be monitored at representative locations in the site and study area at a frequency of twice a week at each location adopting a 24 hourly schedule (8 hourly for CO). The monitoring locations shall be located on the basis of predominant wind directions, land use pattern and height of the proposed stacks. At least one station shall be located at the maximum pollution deposition area due to the proposed stacks of generators. The number of air quality monitoring locations should be at least five including one at the project site.

4.2 Construction & Demolition Waste Rules 2016

The guidelines recommend pollution mitigation measures for construction and demolition waste. Rule 10 of C&D Waste Rules 2016, envisages CPCB to frame guidelines for environmental management of C&D Waste Management⁸. It has detailed duties for waste generator, local government, service provider and their contractor with criteria for the storage facility, processing or recycling of Construction & Demolition Waste, application of C&D waste and its products. State Pollution Control Board or Pollution Control Committee is the



⁷ Bureau of Indian Standards. (2016). Bureau of Indian Standards/NationalBuildingCode. Retrieved 9 15, 2021, from Bureau of Indian Standards: <https://www.bis.gov.in/index.php/standards/technical-department/national-building-code/>

⁸ Ministry of Environment, Forest and Climate Change. (2016). Construction and Demolition Waste Management Rules, 2016. New Delhi : Gazette of India. Retrieved 08 13, 2021, from <https://cpcb.nic.in/displaypdf.php?id=d2FzdGUvQyZEX3J1bGVzXzlwMTYucGRm>

responsible body for monitoring the implementation of these C&D rules by the concerned local government and the respective authorities and for the annual report submission to the Central Pollution Control Board and the State Government or Union Territory. These rules also guide waste generators, which includes keeping the C&D waste within the premise or to get the waste deposited at a collection centre authorized by the local government or handover it to an assigned waste processing facility and ensuring that their facility is free from all kind of C&D waste littering. Every waste generator needs to follow the procedure of collection, segregation of concrete, soil and others, and storage of C&D waste generated, as guided by the concerned local government.

4.3 Guidelines for Anti-Smog Gun (ASG)

The anti-smog gun is a device that sprays atomised water into the atmosphere to reduce air pollution. Connected to a water tank and mounted on a vehicle, the device could be taken across the city to spray water to settle the dust and other suspended particles. ASG uses high-pressure water fogging with turbo airflow which creates an ultra-fine fog consisting of very fine water droplets (30–50-micron size). These tiny water droplets absorb the smallest dust particles in the air, yet fall to the ground without wetness. An ASG also called a spray gun, mist gun or water cannon, is suitable for suppressing or settling down localized dust in a work zone¹.

The Hon'ble Supreme Court order dated 25th November 2019 in the case of W.P (C) 13029 of 1985 directed CPCB to ascertain the efficacy of "Anti-Smog Gun" for pollution control in Delhi. In compliance with the same, CPCB along with the Delhi Pollution Control Committee (DPCC) conducted studies on the efficacy of anti-smog gun. Guidelines/ mechanism for using ASG in C&D sites having built-up areas of more than 20,000 sq. metres, were prepared based on earlier guidelines prepared by CPCB and subsequent interaction made with the experts and ASG manufacturers during December 2020 - January 2021. Subsequently the requirement of ASG has been enhanced proportionate to construction area by CAQM vide its direction no 69 dated 02.11.2022.



¹Synergyspray 2021, retrieved on 10 11, 2021 <https://synergyspray.com/product-category/dust-suppression-system/>

²Delhi Pollution Control Committee 2021, retrieved on 10 8 2021 ,from <https://www.dpcc.delhigovt.nic.in/uploads/news/404897de2f99bd89ee9f8d729df2bfc9.PDF>

Advisory for use of Anti-Smog Gun(s)

Issues	Guidelines															
Capacity and Nos. of ASG to be used	<ul style="list-style-type: none"> - As per direction No. 69, dated 02.11.2022 issues by CAQM, all construction and demolition project must deploy and ensure frequent and effective use of adequate nos. of anti-smog guns, in proportion to the total area of construction for the project as under: <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>S.No.</th> <th>Construction Area</th> <th>Minimum No. of Smog Guns Required</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>5000 - 10000 sqm.</td> <td>1</td> </tr> <tr> <td>2.</td> <td>10001 –15000 sqm.</td> <td>2</td> </tr> <tr> <td>3.</td> <td>15001 –20000 sqm.</td> <td>3</td> </tr> <tr> <td>4.</td> <td>Above 20000 sqm.</td> <td>4</td> </tr> </tbody> </table> <ul style="list-style-type: none"> - As per guidelines, these ASG should be capable of producing water droplets in the range of 10 μ -50μ. - One ASG having throwing distance capacity 70-100m and 01 no. of ASG having throwing distance capacity 30-50m. - This will also take care of water & power saving, stand-by machine and use during small dust generating activities. - Requirements of installations on wind-ward side and leeward side shall also be fulfilled. - These machines will cover all sorts of dust generating activities as operation of machine is around 30 minutes once in around 2-3 hours. On radiation basis, other areas of project can be covered. - For linear projects throwing distance should be as per requirement. 	S.No.	Construction Area	Minimum No. of Smog Guns Required	1.	5000 - 10000 sqm.	1	2.	10001 –15000 sqm.	2	3.	15001 –20000 sqm.	3	4.	Above 20000 sqm.	4
S.No.	Construction Area	Minimum No. of Smog Guns Required														
1.	5000 - 10000 sqm.	1														
2.	10001 –15000 sqm.	2														
3.	15001 –20000 sqm.	3														
4.	Above 20000 sqm.	4														
Source of Water	<ul style="list-style-type: none"> - Municipal Supply Water - Class A and Class B water without conventional treatment but only after disinfection so as to make water free from coliforms, viruses and bacteria (details of Class A and B are presented in “Designated Best Use Water Quality Criteria” developed by CPCB) - Use of treated sewage be avoided. 															

4.4 Guidelines by Central Pollution Control Board (CPCB)

In compliance with Rule 10 of Construction & Demolition Waste Management Rules 2016, the guidelines for environmental management of C&D waste were developed under the guidance of the committee for implementation of C&D Waste Management Rules 2016. The existing report, i.e., guidelines on dust mitigation measures in handling C&D material/ wastes by CPCB provides various measures related to dust abatement during storage, transport, demolition, handling of construction material, and C&D wastes on-site and off-site. This report includes the details on major dust generating activities, C&D waste composition, on-site dust monitoring, control measures for storage and transportation. The environmental management guidelines during various construction activities include sprinkling of water or fine spray from nozzles to suppress dust re-suspension at the site, preferably covered storage, prohibition of dry sweeping of work areas and provision of green buffer¹¹.

4.5 Dust mitigation measures by Commission for Air Quality Management (CAQM)

The Commission for Air Quality Management (CAQM) in National Capital Region and adjoining areas, Ordinance, 2020 has been promulgated and notified by the Government of India, Ministry of Law and Justice on 28th October, 2020. CAQM has issued directions covering, road dust, construction and demolition activities, open burning, stubble burning, vehicular pollution, public transport, greening and paving and industrial fuel.

The Commission for Air Quality Management (CAQM) has directed that all construction and demolition projects on a plot area equal to or greater than 500 sq. mt. in Delhi-NCR, have to mandatorily register themselves on Delhi Pollution Control Self-Assessment - web portal (as explained in chapter 5.3). The step has been taken to curb and abate air pollution levels arising from C&D activities in the National Capital Region (NCR)¹².

Directions under Section 12 of Commission for Air Quality Management in National Capital Region (NCR) and Adjoining Areas Ordinance, 2021.

- 1) An online mechanism through a web portal be put in place by the DPCC/SPCBs for monitoring of compliance of dust mitigation measures by the project proponents, within the municipal areas of NCR.
- 2) All current/ upcoming projects (on plot area equal to or greater than 500 sq. mt.) of construction and demolition for civil structures under the territorial jurisdiction of Urban Local Bodies in the NCR be required to mandatorily register at the web portal.
- 3) An exhaustive checklist, based on various guidelines on dust mitigation measures, notified/ published/ directed etc. from time to time by the authorities concerned, be consolidated and standardized for monitoring compliance of dust mitigation measures in the NCR through an online mechanism.
- 4) An illustrative/ list of dust control/ mitigation measures required to be put in place attached for appropriate inclusion in the exhaustive checklist suggested at point no.3 above.
- 5) The check-list as stated in point no.3 read with point no.4 above, be duly incorporated in the "Web Portal", to facilitate the project proponents to self-monitor / self-audit their activities on the parameters mandated / directed for the compliance and to take necessary steps, if required, to improve the status of compliance.
- 6) The project proponents are required to carry out self-audit / self-determination for dust control measures on the parameters provided on the web portal and upload a self-declaration on a fortnightly basis.

¹¹ Central Pollution Control Board. (2017). 'guidelines on environmental management of C&D waste. Delhi: Central Pollution Control Board. Retrieved 08 13, 2021, from <https://cpcb.nic.in/openpdf.php?id=UmVwb3J0RmlsZXMvNTYxXzE1MTE5MzMzNzJfbWVkaWFwaG90bzEyNjcxLnBkZg==>

¹² Commission for Air Quality Management 2021, "Guidelines on road dust and construction demolition waste Retrieved on 9 10, 2021, from <https://www.dpcc.delhigovt.nic.in/caqm>

- 7) The provision of video fencing with remote connectivity of the projects (within the municipal area of NCR and plot area equal to or greater than 500 sq. mt.) be incorporated in the web portal for monitoring purposes.
- 8) Reliable low-cost PM2.5 and PM10 sensors to be installed at the project site and linked to a cloud storage platform with a live dashboard in the web portal.
- 9) The link to the dashboard of the web portal is made available to CPCB, government agencies as well as the administrative departments of the agencies concerned, dealing with such projects.
- 10) The CPCB / DPCC/ SPCBs to carry out, scheduled visits, with prior intimation, on the construction sites for the verification of the degree of compliance and self- declaration / self-audit.
- 11) The CPCB / DPCC/ SPCBs to also carry out surprise inspections to assess the compliance of the dust control measures at such sites and for taking appropriate actions for levying environmental compensation and/ or stoppage/ closure of work.

4.6 Graded Response Action Plan (GRAP)

As directed by the Hon'ble Supreme Court's order dated December 02, 2016, the plan was prepared after several stakeholder meetings of the Environment Pollution (Prevention and Control) Authority with state government representatives and experts. The output was a plan that institutionalised various measures to be taken when the air quality level deteriorates. As such, the GRAP plan inculcate measures by local government or state government when air quality level becomes moderate/ poor, the control measures listed in this plan needs to be followed which includes a complete ban on construction activities as well, if AQI deteriorates beyond severe category¹³. The Graded Response Action Plan (GRAP) for NCR including NCT of Delhi has been comprehensively reviewed by CAQM and direction no 75 has been issued on 27.07.2023 for strict implementation of the GRAP(revised in July 2023). As per the GRAP of CAQM issued on 22nd July, 2023, the below AQI category will be followed to implement the GRAP.

Table 1- AQI Colours category

AQI Stages	AQI Category Colour scheme	AQI Range
Stage I	Poor	201-300
Stage II	Very Poor	301-400
Stage III	Severe	401-450
Stage IV	Severe +	>450

¹³ Environment Pollution (Prevention & Control) Authority. (2017). Graded Response Action Plan for Delhi & NCR. Ministry of Environment, Forest & Climate Change. Delhi : Environment Pollution (Prevention & Control) Authority. Retrieved 08 13, 2021, from https://cpcb.nic.in/uploads/final_graded_table.pdf

5

Measures to Control Construction Dust

5.1 14-point Guidelines to Reduce Dust Pollution

The Department of Environment/ DPCC Govt. of Delhi has issued 14 points guidelines for all construction sites to prevent dust pollution in the capital city of India. According to the guidelines, construction sites should be covered from all sides with wind breaking barriers. As per these guidelines read along with CAQM directives dated 02.11.22, sites that measure over 5,000 square metres construction area would have to deploy ASGs. Vehicles carrying construction materials have to be covered and cleaned, and such stuff should not fall on the road. Also, only pakki and blacktop roads are to be used for transporting such materials. A checklist for all 14 points has been attached in Annexure 3.

Construction & Demolition activity in NCT of Delhi needs to follow the dust mitigation measures prescribed below:

- 1) Dust/wind breaking walls of appropriate height around the periphery of the construction site.
- 2) Installation of Anti-Smog Gun (s)
- 3) Tarpaulin or green net on scaffolding around the area under-construction and the building.
- 4) All vehicles including carrying construction material and construction debris of any kind should be cleaned and wheels washed.
- 5) All vehicles including carrying construction material and construction debris of any kind should be fully covered and protected.
- 6) All vehicles including carrying construction material and construction debris of any kind should be stored on the site and not dumped on public roads or pavements.
- 7) No loose soil or sand or Construction & Demolition Waste or any other construction material that causes dust shall be left uncovered.
- 8) No grinding and cutting of building materials in open area. Wet jet should be used in grinding and stone cutting.
- 9) Unpaved surfaces and areas with loose soil should be adequately sprinkled with water to suppress dust.
- 10) Roads leading to or at construction sites must be paved and blacktopped i.e, metallic roads (for > 20,000 sq.mt. built up area).
- 11) Construction and demolition waste should be recycled on-site or transported to authorized recycling facility and due record of the same should be maintained.
- 12) Every worker working on construction and sited involved in loading, unloading and carriage of construction material and construction debris should be provided with dust mask to prevent inhalation of dust particle.

³commission for air quality management in national capital region and adjoining areas, GRADED RESPONSE ACTION PLAN (GRAP) FOR NCR, revised in July 2023 from <https://caqm.nic.in/WriteReadData/LINKS/Revised%20GRAP5db3b0af-f805-4578-b37c-0f93c829c6e1.pdf>

- 13) Arrangement should be provided for medical help, investigation and treatment to workers involved in the construction of building and carry of construction material and debris relating to dust emission.
- 14) Dust mitigation measures shall be displayed prominently at the construction site for easy public viewing.

In addition to above the construction/ project site is required to be registered on “Dust Pollution Control Self-Assessment” portal at <http://dustcontroldpcc.delhi.gov.in> and upload self-assessment audit fortnightly for the purpose of online remote monitoring and to take a note that prescribed dust mitigation measures are to be ensured. The site registered at the portal can be closed at later stage once construction is over.

5.2 Understanding Construction Dust

It is important to understand construction dust, and its characteristics. In many of the construction processes, mainly three types of dust gets generated due to the activities, namely:

1. Silica dust: Silica dust is generated when workers are dealing with materials containing crystalline silica, such as sand, brick, concrete, stone, rock, sandstone, and mortar.
2. Wood dust: Wood dust is created when working with softwood, hardwood, and wood-based products such as medium density fibreboard and plywood.
3. Lower toxicity dusts: Lower toxicity dust is generated when working with materials containing little-to-no silica, such as gypsum, marble and limestone.

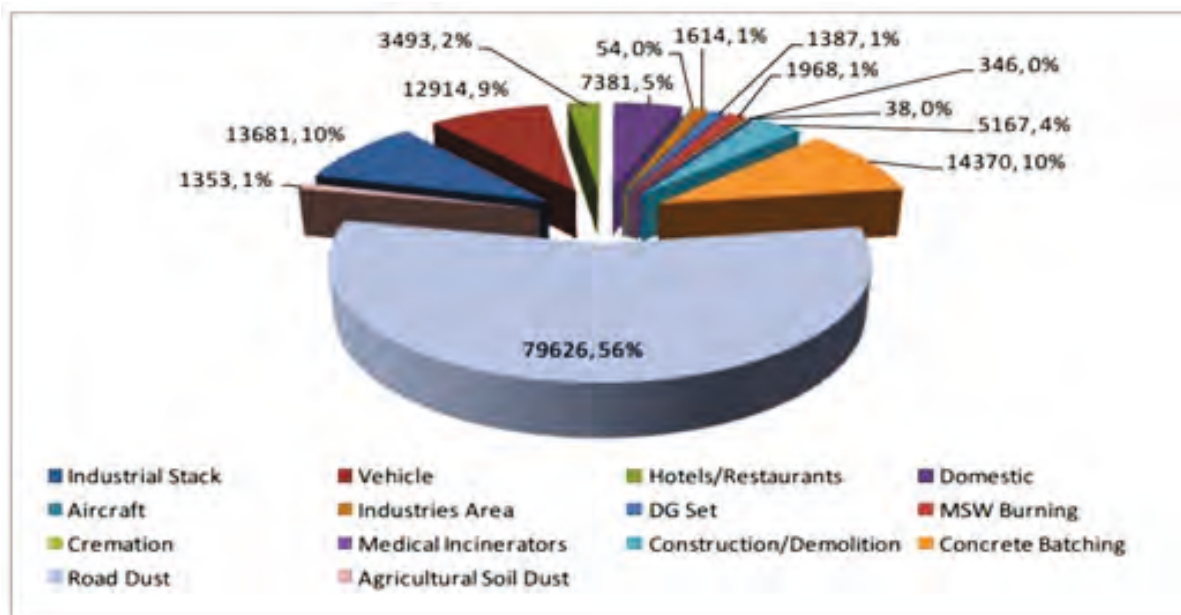
Construction activities emit various pollutants that enhance air pollution. The major pollutant emitted during construction activities is particulate matter (PM).

Particulate matter is considered as a primary pollutant in all of atmospheric air pollution. Through analysing the source of particulate matter it was observed that, dust is one of the main sources contributing to atmospheric particulate matter pollution in cities, and construction activities are the major source leading to city dust.

This means that airborne pollutants including contaminated particulate matter are spreading around (mostly carried by the wind) in the surrounding neighbourhood area (the main wind direction will influence the area most affected by air pollution around a construction site).

The main construction pollutants that spread across by wind are PM₁₀, and gases such as carbon monoxide, carbon dioxide, and nitrogen oxides. Extensive scientific studies explain that there are significant health and environmental effects associated with emissions of PM and other pollutants from construction sites. If left unattended, dust pollution from construction activities will surpassingly increase, impacting the health of labourers, workers and citizens living in the neighbourhood at these sites¹⁵.

¹⁵ Sharma, M., & Onkar, D. (2016). Comprehensive Study on Air Pollution and Green House Gases (GHGs) in Delhi. Delhi: Indian Institute of Technology Kanpur, Kanpur. Retrieved 08 23, 2021, from <https://cerca.iitd.ac.in/uploads/Reports/1576211826iitk.pdf>



PM₁₀ Emission Load of Different Sources in the City Of Delhi

Figure 2 : Different Sources of dust in Delhi¹⁶

Studies for Delhi have shown that 56% contribution of PM₁₀ come from road dust. Construction dust which comes out of micro boundaries of construction sites becomes road dust and we don't have studies to show the fraction by what construction contributes to road dust. But wherever construction is happening we see higher road dust levels in those areas.

Constraints to Effective Dust Control:

Climate:

It is very important for teams involved in construction to understand the effect of climate and windspeed on the occurrence and spreading of construction dust¹⁷. The air we breathe is constantly changing. Urban growth, land-surface modification and climate change, all spurred by an explosion in the global population, are altering the composition of our air. Those changes can dramatically affect weather and climate, and in turn our health and the ecosystem. Each of the meteorological factors plays an important role in air quality. In general, for example, the faster the wind speed, the lower is the concentration of a pollutant. When the wind blows stronger, it essentially dilutes the pollutant, allowing it to disperse and dissipate more quickly.

Soil Type:

Of seven soil types classified in India, alluvial soil in dry climate will produce more construction dust when disturbed. If we see the soil map of India the zones in alluvial soil and desert soil areas will give maximum contribution to PM_{2.5} and PM₁₀ when disturbed.

¹⁶ IIT Kanpur, (2014), Retrieved 8 10, 2021, from IIT Kanpur - <http://www.downtoearth.org.in/coverage/delhi-air-pollution-56180>

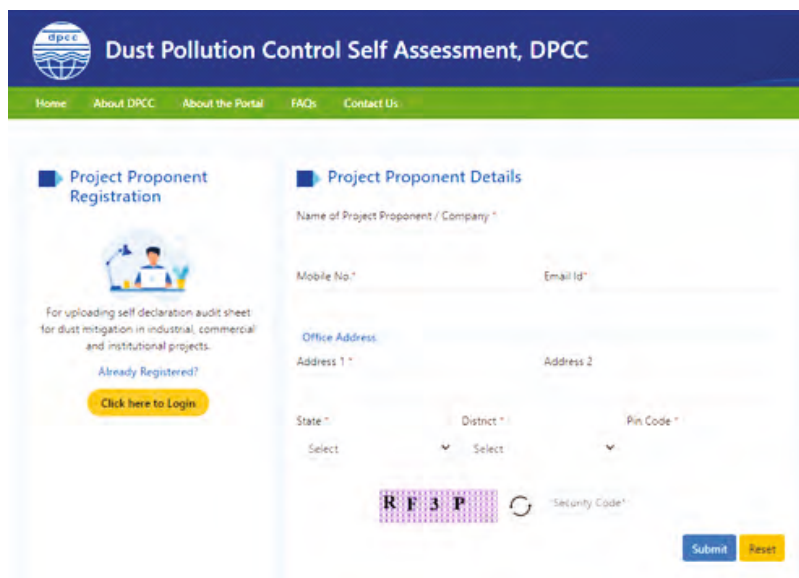
¹⁷ MapsofIndia. (2020). MapsofIndia/soilmaps. Retrieved 8 27, 2021, from MapsofIndia: <https://www.mapsofindia.com/maps/india/soilsofindia.htm>

5.3 Dust Pollution Control Self-Assessment Portal, DPCC

In pursuance of the Commission for Air Quality Management (CAQM) in the National Capital Region, DPCC has initiated the self-declaration of Dust Control Audit by dust generating projects like buildings, infrastructure area development, industrial constructions etc. This portal has been developed with the vision to institutionalize the self-monitoring regime for control of air pollution in NCT of Delhi. The self-declaration of Dust Control Audit will be uploaded by all the current/upcoming construction and demolition projects on plot area equal to or greater than 500 sq. mt. The objective of this audit is to motivate the project proponents control dust pollution by self-auditing and to ensure improvements through periodical audits.

Key highlights of self-assessment portal are:

- All construction sites of 500 sq. mt. and above to register in the web portal, standardized checklist
- Installation of ASG, spraying of water mists and dust suppressants, dust screens at construction sites, ensuring transportation of waste through covered vehicles etc.
- Project proponents to carry out self-audits/ upload self-declaration fortnightly.
- Provision of video fencing with remote connectivity to the web portal.
- Reliable low cost PM2.5 and PM10 sensors at project site.
- CPCB/ DPCC to carry out scheduled visits with prior intimation for verification of compliance. Levying environmental compensation/ directing stoppage of work¹⁸.



The screenshot displays the DPCC portal interface. At the top, there is a blue header with the DPCC logo and the text 'Dust Pollution Control Self Assessment, DPCC'. Below the header is a green navigation bar with links for 'Home', 'About DPCC', 'About the Portal', 'FAQs', and 'Contact Us'. The main content area is divided into two columns. The left column is titled 'Project Proponent Registration' and includes a sub-header, an illustration of a person at a computer, and a text box explaining the purpose of the portal. It features a yellow 'Click here to Login' button. The right column is titled 'Project Proponent Details' and contains a registration form with the following fields: 'Name of Project Proponent / Company *', 'Mobile No.*', 'Email Id*', 'Office Address' (with 'Address 1 *' and 'Address 2' sub-fields), 'State *' (dropdown), 'District *' (dropdown), 'Pin Code *' (dropdown), and 'Security Code*' (with a CAPTCHA image showing 'RF3P'). At the bottom right of the form are 'Submit' and 'Reset' buttons.

*Figure 3 - Dust Pollution Control Self-Assessment Portal
Source: DPCC Self-Assessment portal*

¹⁸ Delhi Pollution Control Committee Self-Assessment Portal, retrieved on 8th October 2021 from <https://dustcontroldpcc.delhi.gov.in/Developer/Home>

5.4 Dust Control Measures

5.4.1 Measures during demolition

Dust generated during demolition processes can often have a significant effect on neighbourhood areas. If dust spreads into areas beyond the construction site, as it might happen in unfavourable wind conditions, necessary steps need to be taken to assess the risk and to devise efficient measures. Demolition activities generate significant dust and also causes re-suspension of dust inside the construction site¹⁹.

Soft stripping is considered as an effective way of screening dust and preventing dispersion. Water suppression helps to damp down dust and other debris that could generate dust. Asbestos and biological debris need to be removed from the site as soon as possible, before the demolition activities are conducted on the site. Raised barricade along the perimeter depending on the types of adjoining areas, dust barrier, selective mechanism for handling material or wastes helps in better dust management at the construction site.



Figure 4- Demolition

¹⁹ Kukadia, V., Upton, S., & Hall, D. (2003). Control of dust from construction and demolition activities. BRE Bookshop. Retrieved 05 15, 2021, from <https://www.rbkc.gov.uk/pdf/Document%2012%20-%20BRE%20-%20Control%20of%20Dust%20from%20Construction%20&%20Demolition%20Activities.pdf>

Table 2- Control measures for demolition

Activity/ Source	Control measures
Debris during demolition	Construction site should be screened with appropriate screens or sheets as directed by CPCB/ NGT/ PCB at least 3m height or 1/3rd of the building height and maximum up to 10m
Before and during demolition	ASG machines made compulsory (for $\geq 5,000$ sq. mt. construction area) Water/ chemical suppressant spraying should be carried out before and during demolition
Dropping materials to ground level	Enclose chutes and skips will help in reducing dust emissions. Sufficient water spraying needs to be carried out to increase the moisture content
Removal of materials from the site	Materials should be removed from the site right after finishing the task. Prolonged storage of construction debris on-site or exposure to the wind should be avoided
Crushing of material for reuse, transportation or disposal	Activities like crushing should be sited as far away as possible from sensitive receptors
Asbestos	Asbestos needs to be removed before demolition.
Biological materials	Biological material should be removed before demolition Care should be taken so that the material does not become airborne, but is sufficiently contained



5.4.2 Measures during material handling

Material handling includes loading/ unloading of material to dumpers or trucks, using hydraulic breakers for breaking large size rocks, grizzlies, etc. Regular mechanical maintenance is required for all the material handling equipment to cut down fumes and noise.

To reduce dust emission, safe practices needs to be adopted during the construction operations. All the operations in the quarry area for grading the quarry run material should be placed with an efficient dust control system²⁰.



Figure 5 - Material Handling

Table 3- Control measures for material handling

Activity/ Source	Control measures
Material handling operations	Always keep the number of handling operations to a minimum by ensuring that dusty material isn't moved or handled unnecessarily
Handling areas	Keep clean and free from dust
Vehicle loading	Use material handling methods that reduce the generation of airborne dust
Reduce dust generation by using water Removal of materials from the site	Materials need to be removed from the site as soon as it is practical. Prolonged storage of construction debris on-site or exposure to wind should be avoided
Dust dispersing over the site boundary	Use static sprinklers, bowsers, handheld hoses and other watering methods, as necessary
Chutes, skips and conveyor transfer points	Drop heights should be kept to a minimum and enclosed wherever possible Reduce dust generation with water
Transport of fine powdery materials	Vehicle must be fully covered and protected

²⁰ Ministry of Environment & Water United Arab Emirates. (2010). Regulatory guidelines for planning, operation and implementation of environmental control for quarries and crushers in the United Arab Emirates. Dubai. Retrieved 07 22, 2021, from https://www.moccae.gov.ae/content/documents/QUARRY_GUIDELINES_English.pdf

5.4.3 Measures during material storage

At many places, wind blowing away dust from unprotected storage is one of the major dust source at construction site. Stockpiles are supposed to be covered with a green plastic mesh which sometimes gets damaged by the wind and sunlight, thereby reducing its effectiveness to reduce dust. Long-term stockpiles must be avoided or covered with sheets having a thick cover for a more stable stockpile. It is capable of withstanding against wind conditions and sunlight, making it more durable.



Figure 6: Material storage

There are various other control measures explained in the table 4, which provides guidance for various activities and sources²¹.

Table 4- Control measures for storage

Activity/ Source	Control measures
Bulk cement/fine aggregate material storage	Delivered by tanker or vehicle covered with a sheet Stored in covered space
Accidental spillages when filling	Methods and equipment for cleaning must be in place. If necessary, include the use of audible and visual alarm systems.
Fine, dry materials (less than ~3 mm in particle size)	Store inside buildings or cover with adequate protection from the wind e.g. by using sheeting.
Storage location	Store materials or stockpiles away from the site boundary and sensitive receptors wherever possible e.g., residential, commercial and educational buildings, places of public access or other features, such as watercourses.
Storage/Stockpiles protecting from wind erosion	Where possible, ensure stockpiles are kept enclosed or covered under sheeting. Dust generation from dusty materials can be reduced by using suitable and sufficient water sprays, wind barriers (protective fences) of similar size and height to the stockpile may be used.
Cleaning up	Clean up using wet handling methods

²¹ Greater London Authority. (2006). The control of dust and emissions from construction and demolition . London: Greater London Authority. Retrieved 7 3, 2021, from <https://www.rbkc.gov.uk/idoxWAM/doc/Other-1543502.pdf?extension=.pdf&id=1543502&location=Volume2&contentType=application/pdf&pageCount=1>

5.4.4 Measures during Operations (Cutting, Drilling & Sawing)

When materials such as concrete slabs/ bricks are cut with a power tool without using any extraction or suppression method, it will generate dust which could harm the worker. Water or chemical as a suppressant reduces the amount of dust generated and can stop the occurrence of a statutory nuisance.

Conveyors and skips must be completely covered and, if necessary, completely enclosed to ensure that dust does not escape. Similarly, drop heights must be minimised to control the fall of materials and increase moisture content by water spray which will reduce dust generation.



Figure 7: Operations

Table 5- Control measures for operations

Activity/ Source	Control measures
Cutting, grinding, drilling, sawing, trimming, planning, sanding	<p>The following measures should be in place at all sites to comply with best practices: pre-wash work surfaces, screen-off work areas, and sweeping away</p> <p>Spraying water, preferably from a water-efficient spray pump, over the material as it is being cut greatly reduces the amount of dust generated</p> <p>Local exhaust ventilation should be used where possible for better health of workers</p>
Façade cleaning	<p>Silica-free material should be used for abrasive cleaning since the inhalation of silica dust is harmful.</p> <p>Wet processes should be used wherever possible. These introduce water into the air/grit stream, greatly reducing the dust hazard to both building occupiers and the general public.</p>
Painting and decorating	<p>Vacuum cleaning should be used wherever possible.</p> <p>Sanding and cutting machinery should be fitted with dust suppression or collection equipment.</p>
Fitting out – plastering, rendering, decorative finishing, furniture fitting	<p>Cutting and sanding machinery should be fitted with dust suppression/collection equipment</p> <p>Vacuum cleaning should be used whenever possible.</p>
Cleaning processes	<p>Dry sweeping should be avoided and only carried out with vacuum extraction methods attached.</p> <p>Washing and damping down should be carried out whenever necessary</p>

5.4.5 Measures during C&D Waste management

The Construction and Demolition (C&D) Waste Management Rules 2016, applies to every waste generated from construction, demolition, and repair of any civil structure of individual or organization or authority generating construction waste such as building materials and debris.

Under Rule 4 of the C&D Waste Management Rules, the segregation of waste must be categorised into four streams:

1. Concrete
2. Soil
3. Steel, wood and plastics
4. Bricks and mortar wastes

All areas for storing C&D waste/ construction material must be demarcated and preferably barricaded, particularly those materials that have the potential to be dust borne. Dedicated storage for timber, from which workers can re-use supplies; store any materials away from sensitive locations in fenced off areas. Recycled material and recycle any materials needs to be used on site, rather than disposing, to help reduce dust generation. Concrete batching plants whether at project site or offsite should be barricaded and covered so that dust is contained within the plant.



Figure 8: C&D Waste

Table 6- Control measures for waste management

Activity/ Source	Control measures
C&D activities	<p>Use of ASG sand dust suppressant</p> <p>Proper implementation of guideline on dust mitigation measures</p> <p>Self-assessment through DPCC C&D Self Audit Web Portal</p>
Storage	<p>All areas for storing C&D wastes /construction material needs to be demarcated and preferably barricaded particularly those materials that have potential to be dust borne.</p> <p>Prohibiting open storage of C&D material and enforcement</p> <p>Contractors /builders /sellers /related stakeholders prohibited from storing /dumping C&D wastes /construction material on roads as it obstructs traffic flow.</p> <p>Store any materials away from sensitive receptors in covered areas. Water sprinkling /fine spray from nozzles to suppress dust re-suspension at site</p>
Loading/unloading	<p>Areas where loading /unloading (fugitive dust) activities to be demarcated and located should be in such a way that dust dispersal is minimized</p>
Reuse/Recycle	<p>Label all waste storage areas and skips, detailing the type of waste;</p> <p>Use recycled materials and recycle any materials used on site rather than disposing of them which includes timber, aggregates, soil, tarmac, bricks, masonry, concrete and glass.</p>
Deposition of construction waste	<p>Every C&D waste generator must keep the construction and demolition waste within the premise or get the waste deposited at collection centre provided by local government or handover it to the authorised C&D waste processing facilities of construction and demolition waste; and ensure that there is no littering or deposition of waste.</p>

5.4.6 Measures during Vehicle movement, routes & emission from vehicle

During dry and windy weather conditions, dust and mud from roads and haulage routes inside construction site can generate dust through movement of vehicles, both on and outside the site. Relevant control measures must be taken to minimise this problem based on the guidance given below in Table 7. Many of the techniques listed below include washing and damping down of surfaces, but it is important to note that in this process, the run-off water becomes a possible source of water pollution.



Figure 9: Vehicle movement

Table 7- Control measures for vehicle movement, routes & emissions

Activity/ Source	Control measures
Construction and maintenance of unsurfaced roads & Speed of vehicles	<p>Keep roads/ ways in compacted condition using static sprinklers, commercially available additives/ suppressants</p> <p>All vehicles should be fully covered and protected</p> <p>Slow movement of vehicles generates less dust, introduce speed limits</p>
Walkways and surfaces	Clean regularly using wet methods and not dry sweeping
Vehicle waiting areas and hard standings	<p>Regularly inspect and keep clean by brushing or vacuum sweeping</p> <p>Sprinkle water regularly to maintain surface moisture if needed.</p>

Road cleaning	Frequency of cleaning routes/ways will depend on site size, location and operation timings. However, road cleaning should be carried out on a daily basis (working day) or more frequently if required.
Vehicle and wheel washing	All vehicles & wheel should be washed down before exiting the site
Vehicle idling	The construction site should be managed so that vehicles do not have to wait to park safely. However, if vehicles have to wait they should not idle.
Maintenance/PSU	Engines and exhaust systems should be well maintained so that exhaust emissions do not breach statutory emission limits.
Exhaust direction	Vehicle exhausts should be directed in such a way that it doesn't create significant dust. Preferably direction should be upwards to avoid road dust being re-suspended to the air.
Location of plant and equipment	Plant and equipment should be operated away from the sensitive receptors near to the site.
Exhaust heights	Exhausts needs to be positioned at a sufficient height to ensure adequate local dispersal of emissions.

5.5 Capacity Building of Project Teams

It is very important for everyone involved in a construction project to acquire inclusive skills and knowledge related to clean construction practices. The following three stages are proposed for training of work staff

- Informative Stage: Messages to control construction dust as visuals should be placed at site for sharing the message. Company policy for air quality management during construction should be prescribed.
- Training Stage: Training staffs on good practices as mentioned above by means of workshops or security drills.
- Link to Key Responsibility Areas (KRA): It should be mentioned in KRA for supervisory staff.

5.6 Planning for Air Quality Management during Design Phase

Project time schedule is a good reference document for tracking the construction activity and time schedule of the construction project. A construction dust mitigation time schedule should be made along with project schedule during design phase of project.



Figure 10- Dust Control Planning

5.7 Personal Protective Equipment

The idea is that all the employees working at the construction site have minimum exposure to the dust. This is possible to a great extent when a PPE is worn by all. Filtering respirators and anti-dust masks can offer immense protection from harmful particles and polluted air. Wearing safety goggles is another way to protect against the irritants, as they create a protection around the eyes.



5.8 Green infrastructure

Site operators are encouraged to install green walls, screens and more vegetation around construction site to minimise the impact of dust and pollution, and also to enhance the local environment during construction.



5.9 Maintaining the site

The way construction site is maintained can have a significant impact on the control of dust and emissions. Following are some measures that can be used to maintain a site efficiently in order to reduce emissions from a development site:

1. Machinery and dust generating activities must be away from the receptors.
2. Create a physical distance and/ or barrier between dust/ emission generating activities and receptors.
3. Install solid screens or barriers around dust generating activities. These should be at least as high as any stockpiles onsite; cover or seed stockpiles to prevent wind whipping; and remove loose materials as soon as possible.
4. Site operators should install green walls, screens and other vegetation to minimise the impact of dust and pollution and also to improve the local environment during construction.
5. Developers should keep their construction sites in good order. Measures to consider include: the site or construction area should prevent runoff. Runoff and mud should be avoided as it can lead to dust once dry as well as polluting local waterways and sewers.
6. Hoardings, fencing, barriers and scaffolding should be regularly cleaned using wet methods, where possible to prevent re-suspension of particulate.
7. Spillages can occur with a wide range of liquid and materials, including those which are hazardous. Regularly inspect the site area for spillages; have spillage kits readily available; clean spillages using agreed wet handling methods; vacuum or sweep regularly to prevent the build-up of fine waste dust material, which has spilled on the site and is designated as waste that is no longer fit for use.

6

Good Practices

6.1 Dust management best practices for construction site in Dubai

Environment Control & Monitoring

All the quarries and crushers need to install at least one stationary air quality monitor for pollution measurement. The data will be provided to the local competent authority and to the technical division of Ministry of Environment & Water every 3 months. Competent authorities from the Ministry of Environment & Water and local inspectors visit the quarry and crusher sites to assess and monitor the emissions on a regular basis²².



Figure 11- Dust suppression through water spraying



Figure 12- Drilling in covered area

Barriers Around Dust Generating Activities

Some dust generating activities are carried out in a permanent location by stationary equipment, which allows the use of temporary barriers as an effective way of isolation to mitigate the spread of dust.



Figure 12- Drilling in covered area



²² Kukadia, V., Upton, S., & Hall, D. (2003). Control of dust from construction and demolition activities. BRE Bookshop. Retrieved 05 15, 2021, from <https://www.rbkc.gov.uk/pdf/Document%2012%20-%20BRE%20-%20Control%20of%20Dust%20from%20Construction%20&%20Demolition%20Activities.pdf>

Water Spraying of Site for Dust Suppression

Non-paved hauling roads and open areas on construction sites are dust sources, especially on windy days. A traditional mitigation measure is to spray water on these areas several times a day via tankers or any other suitable way. Treated Sewage Effluent (TSE) is used instead of potable water in all the stadiums. TSE water is pre-treated through chlorination in the tanker and quality tests are performed regularly to ensure the water meets the sanitary standards.



Figure 13- Water spraying

6.2 The control of dust and emissions from construction in London



Figure 14- Control measures during demolition activity

Water spray during demolition or damp downhaul routes both within and outside the site helps reducing dust generation. This is particularly important for sites close to residential properties or other sensitive receptors. Wherever possible the source of water should be made sustainable to maximise the use and re-use of the resource. For example, water produced from dewatering can be used on-site²³.

²³ Yongjie, D., Hong*, R., & Weiguang, C. (2016). Effect of Construction Dust on Urban PM2.5 Emission Characteristics: A Case Study of the Main Urban Area of Chongqing, China. Chongqing, China: Nature Environment and Pollution Technology, An International Quarterly Scientific Journal. Retrieved 08 10, 2021, from [https://neptjournal.com/upload-images/NL-57-9-\(7\)G-87.pdf](https://neptjournal.com/upload-images/NL-57-9-(7)G-87.pdf)



- Several studies show a positive impact of vegetation around the construction site. Site operators are encouraged to install green walls, screens and other vegetation to minimise the impact of dust and pollution, and also to improve the local environment during construction.
- Provide effective vehicle cleaning and specific wheel-washing facilities at all exits; with hosepipes, adequate water supply and pressure and mechanical wheel spinners or brushes.
- Erect fences or use windbreaks such as trees, hedges and earth-banks of similar height and size to the stockpile to act as wind barriers and keep these clean using agreed wet methods. The planting has made a big impact visually and has had plenty of positive feedback from passers-by.

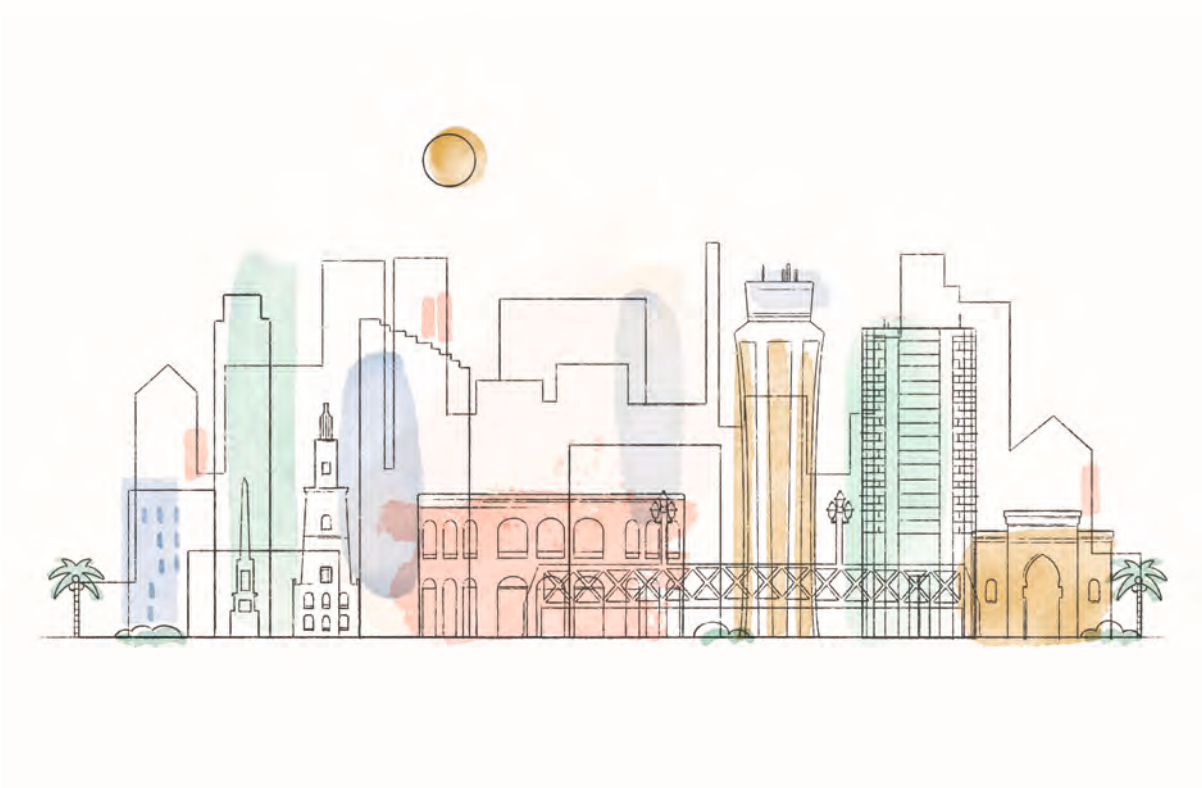
7

Conclusion

During construction, emissions occur at many different stages irrespective of the size and scope of the project. Construction dust is related to the diffusion of particulate matter in the atmosphere due to construction site and activities—which impacts human health and influences the nearby areas of the construction site. Construction sites can be a major source of air pollution if not managed and controlled properly, and can have an adverse impact on health and the local atmosphere.

This study has developed a framework to control and reduce dust emissions at construction sites through various control measures. In the results of this study, various control measures are capable of contributing to reduce dust emission. This document intends to assist with the control of dust pollution from construction sites.

Control measures for dust reduction are proposed for specific activities and sources, such as the movement of vehicles, green wall and vegetation around construction site, and materials handling and storage (cutting, grinding, grouting, grit blasting, concrete batching and pouring). The document also advises on pre-project planning, implementation and site management, together with checklists for use by the industry.



Annexure

Annexure 1:

Checklist for Implementation of Dust Mitigation actions at Construction & Demolition Sites

Date: _____	Location of Construction Site: _____
Name of Site Supervisor: _____	Builder/ Contractor: _____
Area of construction site: _____	Start time: _____ AM/ PM Closing time: _____ AM/PM
Project Description: _____	

Sr. No.	Activity	Response
1.	Height of dust/ wind breaking walls	_____ metres/ ft.
2.	Anti- Smog Gun (s) installed	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable
3.	If Yes, when it was switched on? when it was switched off?	Time: _____ Time: _____
4.	Tarpaulin/ green net used around the area	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable
5.	Vehicles carrying construction material/ debris Cleaned Wheels Washed Fully covered	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable
6.	Where the construction material is stored?	<input type="checkbox"/> Outside the site <input type="checkbox"/> Covered inside the site <input type="checkbox"/> Uncovered inside the site <input type="checkbox"/> On the road <input type="checkbox"/> On the pavement
7.	Collection/ storage of demolition waste	<input type="checkbox"/> Outside the site <input type="checkbox"/> Covered inside the site <input type="checkbox"/> Uncovered inside the site <input type="checkbox"/> On the road <input type="checkbox"/> On the pavement

8.	Place of grinding and cutting of building material	<input type="checkbox"/> Open area in front of building <input type="checkbox"/> Closed area inside the building <input type="checkbox"/> A defined area inside the site <input type="checkbox"/> Not applicable
9.	Grinding & stone cutting	<input type="checkbox"/> Wet jets used <input type="checkbox"/> No wet jets used <input type="checkbox"/> Not Applicable
10.	Are there unpaved surfaces/ areas with loose soil	<input type="checkbox"/> Yes <input type="checkbox"/> No
11.	Water sprinkled on the unpaved surfaces?	<input type="checkbox"/> Yes <input type="checkbox"/> No
12.	Roads leading to / at construction sites	<input type="checkbox"/> Metallic roads <input type="checkbox"/> Cemented roads <input type="checkbox"/> Paved and blacktopped <input type="checkbox"/> Not applicable
13.	Management of construction & demolition waste	<input type="checkbox"/> Recycled on-site <input type="checkbox"/> Time of recycling: _____ <input type="checkbox"/> Transported to authorized recycling facility <input type="checkbox"/> facility Name of Facility: _____ _____ Time: _____
14.	No. of workers on the site (Involved in loading, unloading, and carriage of construction material/ debris)	
15.	Health safety of workers	<input type="checkbox"/> Mask provided <input type="checkbox"/> Mask not provided <input type="checkbox"/> Provided but not wearing <input type="checkbox"/> Covered with cloth/ handkerchief
16.	Medical help for workers	<input type="checkbox"/> Available on site <input type="checkbox"/> Nearby hospital <input type="checkbox"/> Available on call <input type="checkbox"/> Not readily available
17.	Dust mitigation measure display	<input type="checkbox"/> On entry gate <input type="checkbox"/> at every 100 mtrs. <input type="checkbox"/> At every 200 mtrs. <input type="checkbox"/> Not displayed yet Any other location: _____

Checklist for Dust Mitigation Actions at Construction Site.

Senior Management

Member: Project Leader

Action Plan:

- Kick off meeting for dust mitigation plans during construction at onset of project planning
- Creating dust mitigation schedule
- Planning for purchase of anti-smog gun, fogging machines and relevant T&P
- Holding monthly training programs on construction dust control
- Reward the workers for exemplary results

Date: _____	Location of Construction Site:
Name of Senior Management Person: _____	Builder/ Contractor:
Area of construction site: _____	Start time: _____ AM/ PM Closing time: _____ AM/PM
Project Description:	

Sr. No.	Activity	Response
1	Meeting for Dust mitigation Plans during construction at onset of project planning	<input type="checkbox"/> Once in a week <input type="checkbox"/> Once in a month <input type="checkbox"/> No meetings for dust mitigation plan
2	Creating dust mitigation schedule	<input type="checkbox"/> Dust mitigation schedule available <input type="checkbox"/> Schedule not prepared <input type="checkbox"/> Not applicable
3	Procurement of anti-smog gun	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable
4	Training Programs on Construction Dust Control	<input type="checkbox"/> Every week <input type="checkbox"/> Every month <input type="checkbox"/> Not Applicable <input type="checkbox"/> Yes <input type="checkbox"/> No

PROJECT TEAM

Member: Senior Project Manager

Action Plan:

- Create a team at site and delegate responsibility for clean construction.
- Put displays at project regarding dust controls during construction
- Create monthly program for dust mitigation with reference to activities planned at site
- Lookout for innovative ideas for the project.
- Hold training programs and weekly review
- Reward the workers for exemplary results

Date: _____	Location of Construction Site:
Name of project team member: _____	Builder/ Contractor:
Area of construction site: _____	Start time: _____ AM/ PM Closing time: _____ AM/PM
Project Description:	

Sr. No.	Activity	Response
1.	Create a team at site and assign responsibility for clean construction	<input type="checkbox"/> Team has been formed <input type="checkbox"/> No assigned person/team <input type="checkbox"/> Not applicable
2.	Put Displays at Project regarding Dust Controls during Construction	<input type="checkbox"/> Measures for dust control are displayed <input type="checkbox"/> Measures not displayed <input type="checkbox"/> Not applicable
3.	Monthly Training Program for Dust Mitigation with reference to activities planned at site	<input type="checkbox"/> Program has been planned <input type="checkbox"/> No training program <input type="checkbox"/> Not applicable
4.	Reward the workers for exemplary results	<input type="checkbox"/> Every month <input type="checkbox"/> Not Applicable

PROJECT WORK FORCE

Member: Site personnel

Action Plan:

- Review of Clean Practices in Daily Project Meetings
- Include Discussions/Instructions for workers on Clean Construction in Security Drills
- Understand and follow the procedures as mandated for construction dust mitigation when the activity is happening.
- Daily Progress Reports (DPR) issued should have a note on what has been done on that day.

Date: _____	Location of Construction Site:
Name of site engineer: _____	Builder/ Contractor:
Area of construction site: _____	Start time: _____ AM/ PM Closing time: _____ AM/PM
Project Description:	

Sr. No.	Activity	Response
1.	Review of Clean Practices in Daily Project Meetings	<input type="checkbox"/> Practices reviewed every day <input type="checkbox"/> Practices not reviewed <input type="checkbox"/> Not applicable
2.	Include Discussions/Instructions for workers on Clean Construction in Security Drills	<input type="checkbox"/> Included <input type="checkbox"/> Not included <input type="checkbox"/> Not applicable
3.	Daily Progress Reports (DPR) issued should have a note on what has been done on that day	<input type="checkbox"/> Daily Progress report created with dust mitigation activity <input type="checkbox"/> Do not have daily report of dust mitigation actions <input type="checkbox"/> Not applicable

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About Clean Air Asia

Established in 2001 by the Asian Development Bank, the World Bank, and USAID, we are registered as an international non-governmental organization that leads the regional mission for better air quality and healthier, more livable cities in Asia. We aim to reduce air pollution and greenhouse gas emissions in 1000+ cities in Asia through policies and programs that cover air quality, transport, industrial emissions, and energy use. We work with ministries (energy, urban development, environment, health, and transport), cities in Asia, the private sector and development agencies to provide leadership and technical knowledge for Air Quality Management. Our headquarter is based in Manila and has offices in Beijing and New Delhi.

Our work in India involves engaging with Indian cities for better air quality management (AQM). This aligns with the overall CAA work program on broad air quality management (AQM) interventions. Our expertise lies in providing scientific inputs to city governments for better air quality management, sustainable transport, low emissions urban development and education/communication for clean air in India. The focus of our work in India is in cities with high impact potential, as well as potential for leveraging wider change.

We are supporting Indian cities in improving air quality management through capacity building and direct support to preparing air action plans. We have also launched the Clean Air Knowledge Network (CAKN), (www.allaboutair.in), a forum that connects AQ experts and practitioners from across India and city officials with an objective to promote knowledge-sharing across cities on AQ issues and share best practices. A major component of our India Program is education for better air quality. Our Youth Clean Air Network (YCAN) is volunteer program in which youth can passionately work together for better air quality.

In the past, the India team has worked on green freight and sustainable mobility projects, conducting walkability studies in Indian Cities, developing the Walkability app, the National Bus Fuel Efficiency Framework, the Green Trucks Toolkit for India, and an online freight brokerage platform.







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