CLEAN CONSTRUCTION FOR INDIA

OVERVIEW, LESSONS LEARNED, & OUTCOMES

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DUST POLLUTION CONTROL REQUIREMENTS
BY DELHI POLLUTION CONTROL COMMITTEE (DPCC)

1. All projects (plot area > 500 m²) for construction for civil structures to register at DPCC web portal.

2. To self-monitor the activities directed for compliance and take necessary steps for improvement.

3. The project to carry out self-audit for compliance provided on the Portal and upload self-declaration fortnightly.

4. Video fencing provision with remote connectivity of the projects (in NCR and plot > 500 sqm) is part of portal.

5. PM2.5 and PM10 sensors to be installed at the project site and linked to a live Dashboard on the Web portal.
CLEAN CONSTRUCTION TOOLKIT

Developed by Clean Air Asia (CAA) for DPCC
14 POINTS GUIDELINE

1. Dust/wind breaking wall of appropriate height
2. Installation of Anti Smog Guns
3. Green Net Scaffolding around Construction area
4. Provision of Wheel washing & Cleaning for Vehicles
5. Carriage of Vehicles carrying materials to be fully covered
6. Construction materials & debris to be stored on site & not to be spilled on public roads.
7. No loose soil, sand, C&D waste to be left uncovered.
14 POINTS GUIDELINE

8. No grinding & cutting in open areas. Wet jet to be used.

9. Unpaved surfaces and areas with loose soil to be sprinkled with water.

10. Roads leading to or at construction site to be blacktopped.

11. C&D waste to be recycled on site or sent to recycling facility.

12. All workers to be provided with dust masks.

13. Arrangement for medical help to be made on construction sites.

14. Dust mitigation measures to be displayed at construction site for public viewing.
CLEAN CONSTRUCTION TOOLKIT

Standard Clauses for Procurement and Tendering
TOOLKIT: CLAUSES FOR TENDER

- Pre-Construction & Demolition of existing infrastructure
- C&D waste storage and management
- Construction Vehicles, Equipment and Machinery
- Wheel washing
- Anti-smog Gun
- Sedimentation basin
- Construction materials storage
- Grinding and cutting inside close space
- Water sprinkled on unpaved surface and hard road surface
- Dust mitigation measure display
- Spill prevention plan
CLEAN CONSTRUCTION TOOLKIT

Standard Terms of Reference
TOOLKIT: CLAUSES FOR TENDER

- Scope
- Responsibilities
- Implementation Plan
- Monitoring & Reporting
- Timeline
- Record Keeping
- Training
## TOOLKIT: MONITORING CHECKLIST

### General

- Air Pollution Control
- Soil and Water Management
- Noise Control
- Vegetation Management

### Waste Management and Storage of Hazardous Materials

- Resource Conservation

### Emergency Preparedness and Response

- Workers Health Safety

<table>
<thead>
<tr>
<th>Environmental Protection Measure</th>
<th>Compliance check?</th>
<th>Description of Action (If required)</th>
<th>Action Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The site is generally in a tidy condition</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>The site is barricaded properly</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>All materials and equipment are contained within the project boundary</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>All works are undertaken within the project boundary</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
<tr>
<td>Designated haulage routes and access points are being used</td>
<td>☐</td>
<td>☐</td>
<td></td>
</tr>
</tbody>
</table>

### Inspected by:

- **Inspection date:**
- **Time:**
- **Location/chainage:**

### Rain in the last 24hrs (mm)?

- Weather conditions:
  - ☐ ☐ ☐ ☐ ☐
STAKEHOLDER CONSULTATION AND TRAINING OF CONSTRUCTION MANAGERS
What are the measures to control construction dust?
DUST CONTROL MEASURES

- Site Barricading
- Water spraying and Anti-smog gun
- Removal of materials from the site after finishing task.
- Removal of Asbestos materials
- Crushing of materials off-site
- Removal of biological materials

Control measures for demolition
Measures during C&D storage and removal

- ASG sand dust suppressant
- Demarcation of CW areas
- Demarcation of loading/unloading activities
- Prohibiting open C&D stores
- Water sprinkling/fine spray from nozzles
- Label all waste storage areas
- Reuse/Recycle of materials
- Centralized C&D Waste storage
Measures during material handling

- Material handling operations
- Clean and dust free handling areas
- Vehicle loading measures
- Reduce dust generation by using water removal of materials from the site.
- Water sprinkling at site
- Minimum drop height from chutes, skips and conveyors vehicles.
Measures during Materials Storage

- Covered Materials storage
  - Bulk Cement
  - Fine Aggregate

- Measures for Accidental spillage when filling

- Location of Materials Storage

- Protection of stockpiles from wind erosion

- Wet handling methods for cleaning
DUST CONTROL MEASURES

• Silica free materials for Façade cleaning

• Local Exhaust ventilation

• Spraying water over cut/grinded materials

• Vacuum cleaning for painting and decorating

• Dust suppression/collection equipment fitted in sanding & cutting machinery.

• Avoid dry sweeping during cleaning process
DUST CONTROL MEASURES

Measures during vehicle movement and emission

- Water Sprinkling on site
- Wheel Washing facility at materials entrance and exit
- Slow movement and speed limits to vehicles
- Vehicle idling to be avoided
- Exhaust direction away from working areas
- Exhaust height shall be at least 3m
- Statutory emission limits should be maintained
Case Studies and Examples of Clean Construction Practices
SITE BARRICADING/ WIND BREAK WALL
USE OF ANTI SMOG GUN
### ANTI-SMOG GUNS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Built-up Area</th>
<th>No of Anti–Smog Gun Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5,000 - 10,000 sqm</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>10,000 – 15,000 sqm</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>15,000 - 20,000 sqm</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Above 20,000 sqm</td>
<td>Minimum 4</td>
</tr>
</tbody>
</table>

- Suggested number of Anti-Smog Guns to be installed based on project size
  As per CAQM direction dated 02/11/2022
- ASG water spray distance to be in range of 20-50 meter to suppress the dust.
- Avoid the use of treated sewage water in Anti-Smog Guns
WATER SPRINKLING ON SITE
WATER SPRINKLING AT SITE
WHEEL WASHING
STACK HEIGHT OF DIESEL GENERATION SETS
COVERED VEHICLES
Covering vehicles carrying dusty goods and assigning a speed limit
COVERED CONSTRUCTION AREA
COVERED BUILDING DURING CONSTRUCTION
WET JET CUTTING
STORM WATER MANAGEMENT

- Sedimentation Pit
- Channel

- Water collecting pit #1
- Water collecting pit #2
- Water collecting pit #3
Construction Waste Management
Provide a site logistics plan highlighting the below categories and it should be pasted on site:

1. Site barricading
2. Main entry/exit – with wheel washing facility
3. Truck movt. Path with arrows
4. Site office
5. Drainage channel and sedimentation tank. Temporary drainage layout.
6. Topsoil storage
7. Construction material storage yard
8. Construction waste storage yard
9. Labour resting area, drinking water area and toilets
10. All measures for Air pollution prevention
Assign a designated storage yard with tag for different construction materials.
MATERIAL STORAGE ON SITE
COVERED DEBRIS YARD
Segregate all waste at source to avoid contamination and dispose of the waste in order to divert it from landfill by recycling or reuse on site.

Provide designated waste yard for each type of construction waste.
<table>
<thead>
<tr>
<th>Diverted/Recycled Material description</th>
<th>Diversion/recycling Hauler or Location</th>
<th>Quantity of waste (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubble</td>
<td>Excavated rubble dumped adjacent site for the reuse and reused the same for filling and plum concrete</td>
<td>34560</td>
</tr>
<tr>
<td>Concrete</td>
<td>Reused for backfilling.</td>
<td>2400</td>
</tr>
<tr>
<td>Steel</td>
<td>Sent for recycling.</td>
<td>1356.25</td>
</tr>
<tr>
<td>Masonry</td>
<td>Reused for backfilling.</td>
<td>600</td>
</tr>
<tr>
<td>Gypsum</td>
<td>Reused for backfilling.</td>
<td>13.5</td>
</tr>
<tr>
<td>Granite</td>
<td>Reused for backfilling.</td>
<td>303.75</td>
</tr>
<tr>
<td>Kotta stone</td>
<td>Reused for backfilling.</td>
<td>112.5</td>
</tr>
<tr>
<td>Ceramic tile, floor and clado tile</td>
<td>Reused for backfilling.</td>
<td>41.5</td>
</tr>
<tr>
<td>Non-toughened glass (KT + CLEAR)</td>
<td>Sent for recycling.</td>
<td>174</td>
</tr>
<tr>
<td>Aluminum louvers</td>
<td>Sent for recycling.</td>
<td>1.84</td>
</tr>
<tr>
<td>Aluminum frame work</td>
<td>Sent for recycling.</td>
<td>273</td>
</tr>
<tr>
<td>Paint cans</td>
<td>Sent for recycling.</td>
<td>1.63</td>
</tr>
<tr>
<td>Paint cans, packaging material: cardboard</td>
<td>Sent for recycling.</td>
<td>1631.10</td>
</tr>
<tr>
<td>Paint cans</td>
<td>Sent to factory for reuse</td>
<td>1.63</td>
</tr>
<tr>
<td>Kabrip roofing</td>
<td>Sent for recycling.</td>
<td>3.75</td>
</tr>
<tr>
<td>Wood</td>
<td>Sent for recycling.</td>
<td>534</td>
</tr>
<tr>
<td>Electric cables</td>
<td>Sent for recycling.</td>
<td>662</td>
</tr>
</tbody>
</table>

Total Construction waste diverted from Landfill: 46118.32(tons)

<table>
<thead>
<tr>
<th>Landfill Material</th>
<th>Landfill Hauler Location</th>
<th>Quantity (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toughened glass</td>
<td>landfill</td>
<td>3.48</td>
</tr>
<tr>
<td>Gypsum</td>
<td>landfill</td>
<td>6019</td>
</tr>
<tr>
<td>Wood</td>
<td>landfill</td>
<td>320.4</td>
</tr>
<tr>
<td>Miscellaneous Garbage</td>
<td>landfill</td>
<td>1742</td>
</tr>
</tbody>
</table>

Total Construction waste sent to Landfill: 12071.48(tons)

Total Construction Waste: 55203.70 (tons)

Percentage of waste diverted from landfill: 81.73% (1019)
HEALTH & SAFETY OF WORKERS
WORKERS SAFETY, SANITATION AND HEALTH
Basic PPE is mandatory to access the Site.

PPE set up model is at site for safety awareness to workers.

Task Specific PPE
WORKERS SAFETY KITS

Provision of safety gears:
• Helmet
• Jacket
• Masks
• Boots
• Gloves
• Safety harness

Use of caution tape, safety nets
Installation of safety signage’s
SAFETY SIGNAGES FOR WORKERS
SAFETY PRECAUTIONS FOR WORKERS

Scaffolding with platforms for easy and safe access by workers

Safe passage for workers at site during construction

Safety Net for Workers at the site during construction
FIRST AID MEDICAL FACILITY
Provision of clean drinking water on site, for the workers
Provision of adequate toilets and hygiene for site workers.
WORKERS LIVING PLACE AND SANITATION

- **Exhaust Fans**
- **Kitchen Arrangement**
- **Sewage Treatment Plant**
• The toolkit has been added to the DPCC guidelines

• The checklist is being added to the online monitoring and reporting system

• The Standard Clauses for Procurement and Tendering and the Standard Terms of Reference are being incorporated in public procurement (construction tenders)

Thank You