

Case Study on Quantity Estimation of Construction and Demolition Waste Generated by Road Works in Davangere City

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Abstract - An The increase of C&D waste generation has raised new regulations for C&D waste prevention, including obligation to quantify the C&D waste expected to be generated during construction works. The aim of this research study is to provide a C&D waste estimation tool for road works. For this purpose two roads have been analyzed in order to estimate the volume of C&D waste likely to be generated, analyzing the category of C&D waste generated for each of the functional units considered. The paper emphasizes on the methodology presented to estimate the C&D waste can help in systematic management of the C&D waste produced in road works.

Key Words: Construction and Demolition waste, C&D waste estimation methodology.

1. INTRODUCTION:

Environment protection agency [EPA] defines C&D waste debris as the waste material produced in the process of construction, renovation or demolition of structures [both buildings and roads]. Construction are mainly left over from new construction materials like cut-offs, damaged materials, packaging waste, used materials during construction and all other typical activities on construction site. Demolition waste are mainly the collection of all construction materials from a building after removal of certain parts. Demolition waste are much larger in volume than the construction waste.

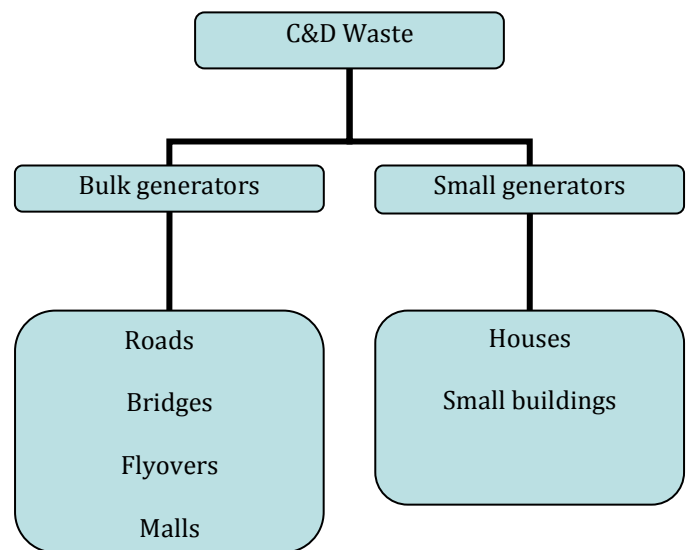
1.1 Classification of C&D waste components:

C&D waste can be classified into two components namely major components and minor components. Major components includes cement concrete, bricks, cement plaster, steel from R.C.C, stones, timber, etc. and minor components includes conduits, C.I pipes/iron pipes/plastic pipes, electrical fixtures, panels, glass, etc.

1.2 Sources of construction and demolition waste:

Generally, there are two sources of waste generation of waste materials namely bulk generators and small generators. The classification of sources is given the figure infrastructure and real estate sector are the bulk generators of waste. Construction and repairs of roads, bridges, flyovers,

etc are classified under the figure infrastructure development sector. Real estate sector consists of housing, industrial and commercial building construction and demolition of unauthorized structures.



2. METHODOLOGY:

To develop this study, two roads of Davangere city are selected they are Chowkipet road of 1025m length and Binny Company road of 508m length. These two roads of Davangere city has been analyzed to estimate the quantity of C&D waste likely to be generated.

Step followed are:

- Collected the detailed estimates of road construction projects i.e., detailed examination of Chowkipet road and Binny Company road from Davangere smart city limited office [DSCL].
- Identified the basic type of waste materials commonly found in road construction stages.
- Analyzed and designed the percentage of waste factors for different items of works, Table 2.1 shows the percentage of waste factor for construction items

Table 2.1: Percentage waste factors for construction items

Sl No.	Item of work	Percentage of waste factor
1	Construction of cement concrete pavement	8.0
2	Providing and laying heavy duty cobble stones	0.8
3	Painting line, dashes, arrows	0.8
4	Providing murrum	0.8
5	Construction of granular sub base	0.8
6	Providing and fixing precast solid C.C kerb stones	0.8
7	Supplying and laying, joining of pipes	0.2
8	Refilling available earth	0.8
9	Removal of unserviceable soil	0.8
10	R.C.C manhole cover	0.2
11	Providing and laying in position P.C.C	8.0
12	Providing and fixing M.S grill work	0.8
13	Removing and refixing stone slabs of drains	0.8
14	Providing and laying heavy duty cobble stones	0.8
15	Supplying ductile, UPVC pipes	0.2
16	Provision for shifting of cables	0.8
17	Providing and fixing PVC end caps, medium duty SFRC frame	0.8

- Calculated the construction and demolition wastes.

3. CALCULATIONS:

- For each quantity, item of work and percentage waste factor is multiplied using table1 of percentage waste factor for construction items to estimate the quantity of construction waste.
- Demolition waste quantity is calculated by available data.
- The summation of construction and demolition waste gives the quantity of C&D waste.

For example,

Table 3.1: Detailed estimation of road

Sl No.	Description of item	Unit	Quantity
1	Dismantling of existing cement concrete pavement	M ³	789.25
2	Earthwork excavation	M ³	20209.25
3	Providing and laying in position of P.C.C	M ³	11.33
4	Supplying HDPE pipes	M ³	1584

Table 3.2: Calculated construction and demolition waste quantity by using detailed estimation and percentage waste factor table

Sl No.	Description of item	Unit	Quantity	Percentage waste factor	Construction waste quantity [CWQ]	Demolition waste quantity [DWQ]
1	Dismantling of existing cement concrete pavement	M ³	789.25	-	-	789.25
2	Earthwork excavation	M ³	2029.25	-	-	2029.25
3	Providing and laying in position P.C.C	M ³	11.33	8	0.9064	-
4	Supplying HDPE pipes	M ³	1584	0.2	3.168	-
Total =					4.0774 M ³	2818.5 M ³

- Total C&D waste quantity = Construction waste quantity + Demolition waste quantity
 = 4.0774+2818.5
 = 2822.57 M³

4. RESULT:

Table 4.1: C&D waste quantity for Chowkipet road

Sl No.	Description of item	Unit	Quantity	C&D waste quantity
1	Smart roads: Dismantling of cement concrete pavement, earthwork excavation, compaction, painting, marking, etc.	M ³	19181.28	2948.89
2	Storm water drain pipes	M ³	166290.90	14363.22
3	Road gullies	M ³	2.8802	0.51857
4	Road inspection chambers	M ³	4712.447	2504.45
5	Water supply	M ³	9499.511	1655.55
6	Sewerage collection system	M ³	5129.41	1505.72
7	Gas pipe	M ³	4116.0	2020.2
Total C&D waste generated by Chowkipet road =				12098.54

Table 4.2: C&D waste quantity for Binny Company road

Sl No.	Description of item	Unit	Quantity	C&D waste quantity
1	Smart roads: Dismantling of cement concrete pavement, earthwork excavation, compaction, painting, marking, etc.	M ³	14365.67	1840.06
2	Storm water drain pipes	M ³	3630.16	1420.293
3	Road gullies	M ³	2246.496	32.043
4	Road inspection chambers	M ³	1408.23	238.714
5	Water supply	M ³	3653.83	1164.116
6	Sewerage collection system	M ³	3267.28	903.74
7	Gas pipe	M ³	31.386	12.67
Total C&D waste generated by Binny Company road =				5611.636

5. CONCLUSIONS:

This report presents estimated waste materials and concrete products produced by road works. The general legislation, local liability and research projects related to waste materials are outlined in this report. The waste materials includes are cement, concrete, duty cobble stones, murrum, kerb stones, bricks, unserviceable soil, pipes, manhole covers, TMT / MS bar reinforcement, MS grill work, cables, PVC end caps, CI steps, paint, sand, aggregates.

Managing the waste from its generation to recycling process to the further reuse or decision to landfill it comes under C&D waste management. This has various methods to be handled with respect to the cases.

Most common strategy that is being used for waste management follows the methods of reducing, reusing and recycling.

- **Reduce:** Reducing waste during a construction project involves careful planning. Construction materials come in standard sizes, so design our project with these dimensions in mind, it can greatly cut down on excess that gets thrown away.
- **Reuse:** Reusing waste may be the most important part of the cycle, because this is where we have the most opportunities to assuage our green conscience.
- **Recycle:** Recycling waste is the last of three R's, because it is the least desirable for several reasons. Not all materials can be recycled but of course,

recycling is preferable to using landfills. Roof shingles can be recycled into asphalt pavement, dry wall scraps can be recycled into textured wall sprays, agricultural products

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