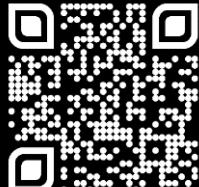


Toolkit for effective Inspections by Field Officers

Dr. Aditya Dahiya, IAS



Topics Covered

1. Complete Process of a civil work
2. Common Types of Civil Works & their inspection
3. Estimates – what should you check?
4. Practical aspects of Inspection by officers

1

**Complete Process in any
Civil Work**

Steps in any Civil Work - 1

1. Preliminary investigation is done and a rough cost estimate is prepared

2. Administrative approval of the department

3A. Detailed survey, *in cases of big infrastructure projects / highways*

3B. Designs, drawings, plans, elevations, sections etc. are prepared

Steps in any Civil Work - 2

3C. Detailed Estimate (Abstract of Qty. & Cost, specifications) prepared

4. Preparation of DNIT; Technical Sanction

5. Allotment / Release of funds

(some departments do this after step 2)

6. Tender for works are invited – *Executive Engineer*

7. Tender Opening, Negotiation, **Rate Approval** & Contract Agreement

Steps in any Civil Work - 3

8. Work Execution; Entry in Measurement Book by J.E. (or, A.E. / S.D.E.)

9. Preparation of Running Bill; *Running Bill Payment after Pre-Audit*

10. Work Completion; Inspection – 3rd Party / In-House sampling

11. JE prepares Final Bill ; Pay order by Ex. Eng. **Payment of Final Bill.**

12. Repayment of Security Amount after 12-24 months

The Critical Steps

1. Preliminary investigation is done and a rough estimate is prepared
2. **Administrative approval** of the department
3. Detailed Estimate (Abstract of Qty. & Abstract of Cost, **detailed specifications esp. of N.S. Items**); DNIT Preparation
4. **Technical sanction of D.N.I.T (Eligibility Criteria)**
5. **Allotment of funds**
6. Tender for works are invited – *Executive Engineer*
7. Tender Opening, Negotiation, **Rate Approval** & Contract Agreement
8. Work Execution; **Entry in Measurement Book by J.E.** (or, A.E./S.D.E.)
9. Preparation of Running Bill; *Running Bill Payment after Pre-Audit*
10. Work Completion; **Inspection – 3rd Party / In-House sampling**
11. JE prepares Final Bill ; **Pay order by XEN, payment released.**
12. Repayment of Security Amount (as per terms. Eg: 50% on completion of work; 50 % after 1 year; different from Performance Security)

Poll 1: Rate Approval in Developmental Works

Suppose it's February 2024, you have just finished your Phase II, and joined your state cadre. You are posted as Sub-Divisional Magistrate and have an additional charge of Administrator of the local Municipality. The Lok Sabha elections are due in April-May, and the Model Code of Conduct is about to be announced by E.C.I.

A lot of genuine developmental works are pending in your area, for want of administrative approval from Urban Local Bodies Department at state capital. Your DC / DM and the local MLA wants you to clear the many pending files, subject to ex-post facto grant of administrative approval from the State Government Department. They argue this will avoid the delay in long-drawn procedures due to M.C.C. over the next 2 months.

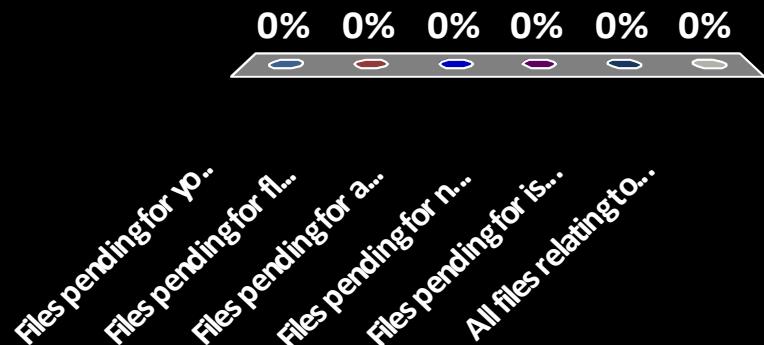
Which is one type of file you should definitely never sign? (i.e., of the options below, which one is strictly illegal? Though, others may be ill-advised & unethical too!)

Poll 1: Rate Approval in Developmental Works

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- A. Administrative approval, to be sent to State Govt.
- B. Floating of tenders.
- C. Open technical bids.
- D. Negotiation of previously opened financial bids.
- E. Work orders.
- F. All files



2

Common Types of Civil Works & their inspection

2.1

Roads

Types of Roads

Based on Materials of Construction

1. Earthen roads
2. Gravel roads
3. Water Bound Macadam (WBM) roads
4. Bituminous or Black-topped roads
5. Interlocking Paver Block (IPB) Tiles' roads
6. Concrete Roads
 - C.C. / R.C.C.
 - R.M.C.

Earthen Road



Gravel Road



W.B.M. Road



Bituminous Road



15 3'03

Cement Concrete Road



Cross-section of a Typical Road



Embankment

- **Entirely earthwork:**
 - constitutes about 40% of the total cost of a new road !
 - Should be ~ 0.6m to 1 m above the **highest flood** level.
- **Compacting** should be done with a power roller or light roller so that the density of compaction is **at least 95%** of the maximum dry density.
- Indian Road Congress (IRC) has approved the use of **fly ash** for embankments.



The diagram shows a cross-section of an embankment. It consists of a trapezoidal base representing the ground level, and a triangular top representing the embankment. The word 'Embankment' is written in bold black text at the top of the triangle, and '(Compacted earth)' is written below it in a smaller black font.

Embankment
(Compacted earth)

Preparation of Embankment

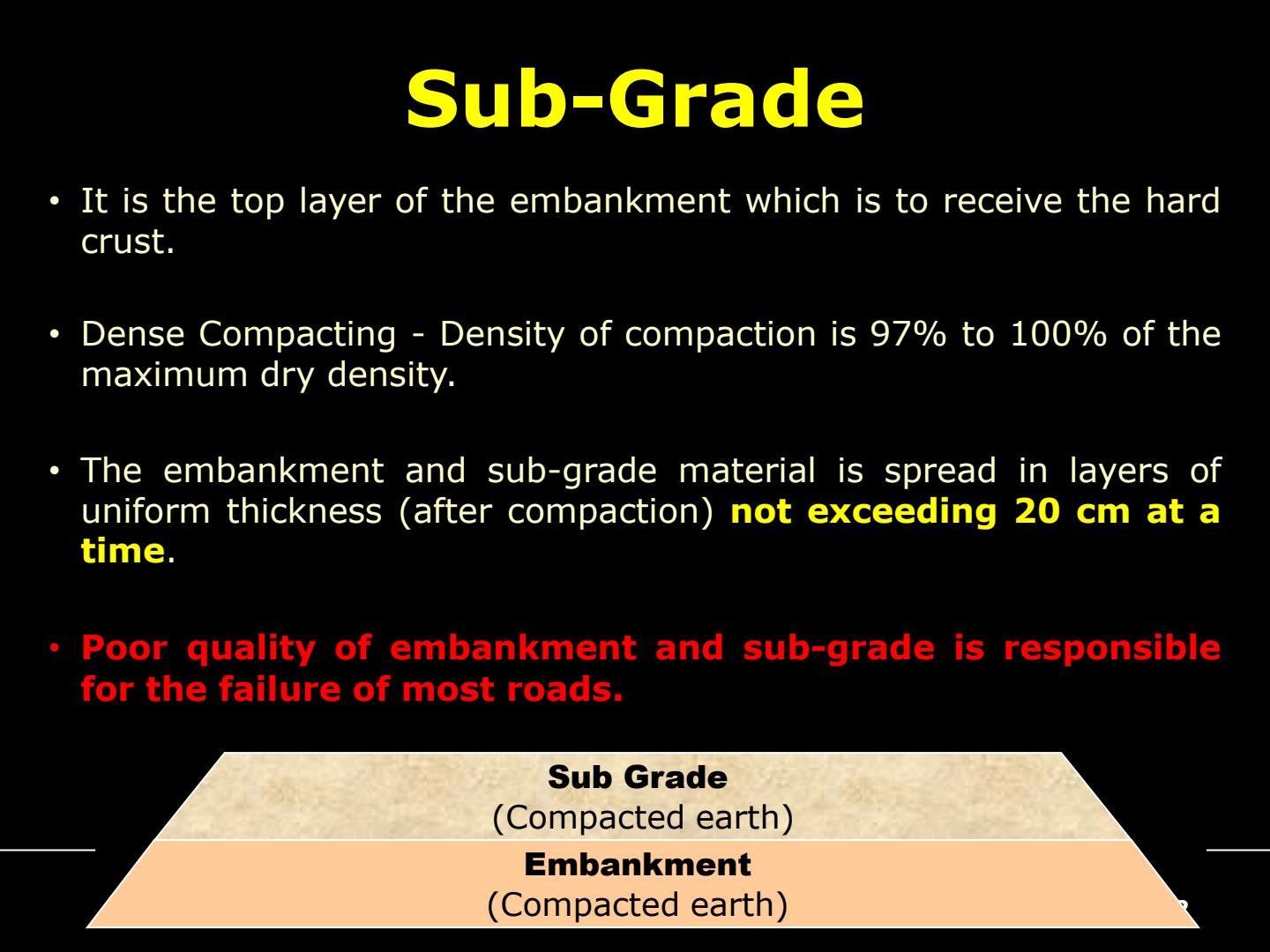


Compaction of Embankment



Sub-Grade

- It is the top layer of the embankment which is to receive the hard crust.
- Dense Compacting - Density of compaction is 97% to 100% of the maximum dry density.
- The embankment and sub-grade material is spread in layers of uniform thickness (after compaction) **not exceeding 20 cm at a time.**
- **Poor quality of embankment and sub-grade is responsible for the failure of most roads.**



The diagram illustrates a cross-section of an embankment. At the bottom is a thick orange trapezoid labeled "Embankment (Compacted earth)". Above it is a thinner, lighter brown trapezoid labeled "Sub Grade (Compacted earth)".

Sub Grade
(Compacted earth)

Embankment
(Compacted earth)

Preparation of Sub-Grade



Inspection of Sub-Grade (1)



Pavement (Road Crust)



- **Pavement thickness** is based on 2 factors:
 1. **Traffic Index** (TI), and
 2. **Sub-grade strength** as measured by **California Bearing Ratio** (CBR). – CBR a penetration test to evaluate mechanical strength of any surface – ground or subgrades.
- There is a graph from which you can read off pavement thickness required for given values of T.I and C.B.R.

Sub-Base

Usually 7.5 cm to 15cm thick.

Composed of

- gravel (or)
- sand-gravel mix (or)
- soil-soft aggregates mix
(brick bats, canker, laterite, etc).

Sub-Base – Gravel Spreading



Base

- Usually 15 - 20 cm thick.
- Composed of Water-Bound Macadam (WBM) layer(s).
- In WBM roads, crushed or broken stone (*commonly called 'road metal'*) is kept bonded by the action of rolling and the voids filled with filler material (e.g. gravel, *mhoorum* etc.) with the help of water.

Base – WBM Layer: Metal Collection



Base – WBM Layer: Spreading of Metal



Base – WBM Layer: Binding with Gravel



Base – WBM Layer: Watering



Base – WBM Layer: Consolidation



Base – WBM Layer Completion



Inspection of WBM Layer: Sieve Analysis



- The following procedure will be adopted for Gradation of metal used for road construction.
- 75mm metal is to be tested to pass 100 % through 90 mm sieve & 100 % retain on 65 mm sieve.
- 65 mm metal is to be tested to pass 100 % through 80 mm sieve & 100 % retain on 50 mm sieve.
- 40 mm metal is to be tested to pass 100 % through 50 mm sieve & 100 % retain on 25 mm sieve.

Sieve Analysis of Grade III Metal							
Name of the work:							
Weight of sample	:	kgs					
Location	:						
Thickness	:						mm
S.No	IS sieve designation on mm	Wt. of sample retained	Cumulative Wt. retained	% of Wt. of the metal retained	% of Wt. of metal passing observed	% of Wt. of metal passing specified	% of Wt. of metal oversize/ undersize
1	2	3	4	5	6	7	8
1	63					100	
2	53					95-100	
3	45					65-90	
4	22.4					0-10	
5	11.2					0-5	

Field Inspections up-to WBM Layer



RD 0.220 LMS

Field Inspections up-to WBM Layer



Wearing Course

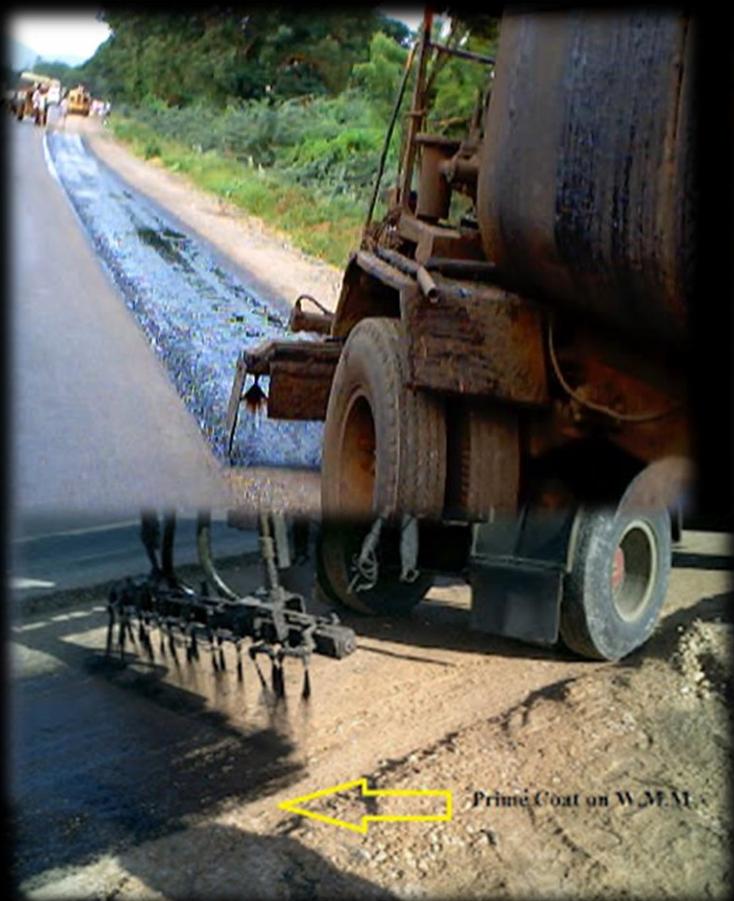
- **Bituminous (BT) / black-topped / asphalt road** – usually about 20 mm thick;
- Consists of 4 sub-layers over the Sub-Base (i.e. WBM layer):
 - i. **Prime Coat**
 - ii. **Tack Coat**
 - iii. **Premix Carpet**
 - iv. **Seal Coat.**



Prime coat

- The **purpose of the prime coat** is to **protect the WBM layer from rain and light traffic** when the blacktopping work is likely to be delayed. And, **to plug capillary voids** in the base course surface prevent migration of moisture.
- A single coat of low viscosity bituminous material (Slow setting emulsion – SS1) is applied over the WBM layer (which should be clean, dry and free from dust).
- Rate of application: 0.6 – 0.9 kg / sq.m.
- **No heating** of emulsion.

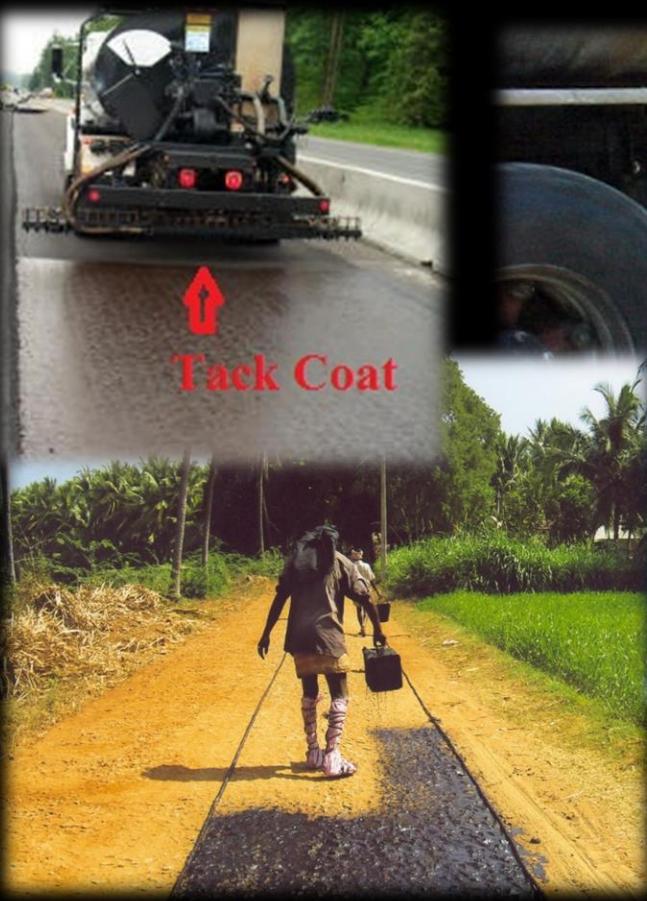
Prime Coat over WBM



Tack Coat

- Tack coat is an **adhesive** for gluing two layers together.
- A **single coat** of low viscosity bituminous material (**Rapid setting emulsion – RS 1**) is applied without heating.
- **Tack coat should be allowed sufficient time to set – usually 1 to 2 hours - before applying the next layer (Premix Carpet).**
- Rate of application: 0.25 – 0.3 kg / sq. m.
- **No traffic should be allowed.**

Application of Tack Coat



Premix Carpet with Seal Coat

- **Premix Carpet (PC)** : Hot bitumen premixed with 13.2mm -11.2mm graded metal and laid over the Tack coat.
- **Seal Coat** (6.7 mm metal) and is applied 4 to 6 hours after the laying of Premix Carpet to seal the voids.

Laying of Premix Carpet



Laying of Seal Coat



Completion of Bituminous Road



Pop Quiz

In ongoing works of bituminous road, suddenly, the payments have been stopped by Finance Department due to budget shortage. Funds are likely to come in few months. At which layer do you recommend the contractor to pause and wait (*if this is inevitable*) ?

(*i.e. since there are only bad options, which one is the least harmful amongst these?*)

- 1. Compacted Embankment**
- 2. Densely compacted Sub-Grade**
- 3. Prime Coat**
- 4. Tack Coat**

Camber

The slight convexity provided to the road surface to drain off the rainwater.

It depends upon the type of road & the amount of rainfall.

e.g., 3.5% for B.T roads in high rainfall areas (> 1000 mm).



Inspection of Camber - 1



Inspection of Camber - 2



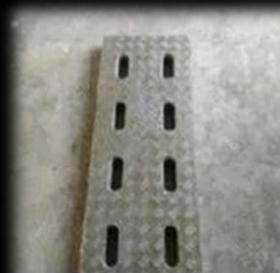
Important things in Bituminous Roads - 2

Storm Water Drains

Include as part of road estimates esp. Bituminous roads

Levels to be checked

Open vs. Closed Drains



Poll 2: Taking action on allegations in civil works

Its June 2024, and you are now well settled in your role as S.D.M. Owing to your reputation for honesty, some villagers meet you and complain about a “tar-coal” road (BM / PC) which has sagged / “caved in” at a few places near the village pond. They allege collusion of contractor and local leaders in using poor quality material. They request you to visit the site and take samples.

You call the site engineer. He accepts the shortcomings, and requests you to instead release the contractor’s long-pending payments (*due to which he has allegedly stopped the repair work*). The engineer assures that he will get all rectifications done in 3 days, if payments are released now.

Next day, villagers and the MLA reach your office with site photos which clearly show the caved-in road demanding that you order a FIR to be lodged in written. What do you do?

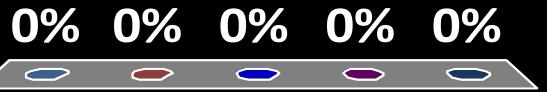
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Next day, villagers and the MLA reach your office with site photos which clearly show the caved-in road demanding that you order a FIR to be lodged in written. What do you do?

- A. Register FIR.
- B. Wait for a week!
- C. Take samples of the bitumen and road metal.
- D. Measure the thickness & compaction of embankment, sub-grade and sub-base.
- Committee of engineers from another department for sampling as per rules.
- E. Get slump test and sieve analysis conducted, along with collection of bitumen samples.



Issue written order...

Ask MLA and village...

You visit the site an...

You visit the site a...

You visit the site, a...

Cement Concrete Roads



Cement Concrete Roads

Advantages

- No potholes. **Maintenance free. Water-logging doesn't harm.**
- **Less fuel consumption** by vehicles (less by 14 – 20%).
- Especially suited for areas where there is oil/chemical spill and heavy traffic - airport tarmacs, ports, **bus stands**, bus depots, lorry depots, etc.

Disadvantages

- Digging up C.C pavement to repair utilities can pose a problem if the utility ducts are not under unpaved surface on the side.
- High Compressive Strength; but so-so in tensile strength / shearing stress. (Solution: RCC)

Cement Concrete Roads

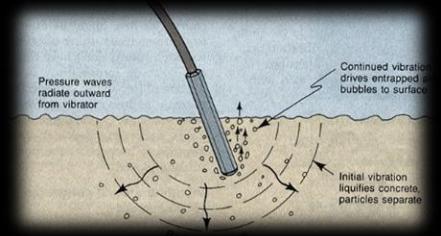
- High initial cost but 'Total Life Cycle cost' less than that of B.T roads.
- A typical C.C pavement:



Plain Cement Concrete (PCC)

- A mixture of **cement**, **sand** ('fine aggregate'), **crushed rock** ('coarse aggregate') and **water** in a definite proportion, which when allowed to cure becomes hard as stone.
 - E.g, **1:2:4 concrete** (1 part of cement, 2 parts of sand, 4 parts of crushed rock with about 30 liters of water per bag of cement) is often used in building works.
- PCC has to be **consolidated (using a concrete-vibrator)** to reduce voids and increase its density.
 - Presence of 5% voids can cause 30% loss of strength.

Consolidation (Concrete Vibration)



Example of poor quality concrete (not vibrated properly)



Plain Cement Concrete (PCC)

- PCC has to be **cured** by pouring water for about 28 days.
 - If water in the concrete is allowed to evaporate, the cement will not set properly and there will be loss in strength of the concrete.
- Strength of the concrete reaches 40% in 3 days, 65% in 7 days and 100% in 28 days.
- Concrete comes in **Grades: M10, M15, M20, M25....M70, M75, M80.**
 - The figure after **M** indicates the compressive strength in Newtons / sq. mm of a 150 mm cube of concrete after 28 days. **Higher the figure, stronger the concrete.**
- Grades M10 to M20 – **Ordinary Concrete**;
- M25 to M50 – **Standard Concrete**;
- M60 to M80 – **High Strength Concrete**.

Curing of Concrete Road



Reinforced Cement Concrete (RCC)

- PCC has high compressive strength but is weak in tension.
- Steel reinforcement is placed in PCC at suitable places to take up the tensile stresses.
- Reinforcement in the form of round bars of MS/TMT steel.

Reinforced Cement Concrete Roads



Ready Mix Concrete Roads

- **Preparation of Sub grade** – *brick bats / rodi-pathar*
- **Plain Cement Concrete**: M-10 (PCC)
- **Laying of Plastic Sheet** 125 micron
- **Provision of Dowel bars** for construction joints.
- **Laying of RMC** as per requirement: M-20, M-35 & M-40
- Making rough surface



Inspection During Laying of CC Road

1. If aggregates are segregated or **large lumps** or balls of dry concrete are present in the concrete mix, then the concrete is not homogeneous.
2. Confirm that the concrete is **vibrated immediately** after placing in its final location.
3. No **delays or interruptions** are allowed while pouring the concrete as interruption or delay would result in weak or porous planes or weak joints.
4. Confirm that there are **no early shrinkage cracks** of concrete indicating signs of rapid dehydration of fresh concrete.

Quality Inspection During Laying of CC Road

- **Concrete slump test** is an empirical test that measures workability of fresh concrete.
 - performed to check consistency of freshly made concrete.
 - indicates degree of wetness.



Quality Inspection of a CC Road

1. After one day casting, the concrete should be in such a state as to allow a **man to walk over it** without making any undulation.
2. After one day of casting, if it is struck by a **light hammer**, the indentation should not be significant.
3. The concrete after casting should not allow **water to pass through** it.

Interlocking Paver Block Street

1. Preparation of Sub grade
2. Plain / Lean Cement Concrete Bed
3. Laying of 30mm thick fine sand
4. 60/80/100 mm thick Interlocking paver block, M-35 etc. grade



Inspection of Paver-Block Tiles



DIGITAL BLOCK TESTING M/C 500 KN



Poll 3: Choosing the right type of civil work

Its August 2024, and you are well settled in your role as S.D.M. Impressed by your work, your Collector / DC / DM asks you to handle files relating to all other municipalities coming to his Office.

The Municipality of Town Y in your district sends a proposal to construct 10 local streets (each approx. 10 ft wide) in the interior of a newly carved colony for BPL families under a Govt. scheme. The Govt. has given a target of 6 months so that the streets are ready well in time before the handing over of vacant plots to the BPL families in a state level function. The Municipality Engineer has proposed CC streets, as they are long lasting and in-demand by local political leaders.

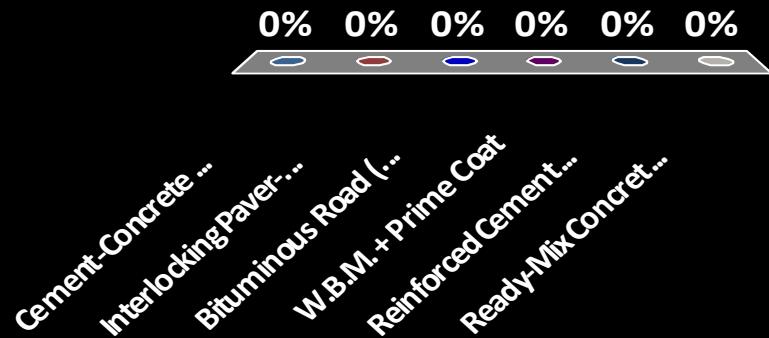
Your clerk brings file to you with request to put up to DC/DM for approval with recommendation. Which one would you recommend?

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Your clerk brings file to you with request to put up to DC/DM for approval with recommendation. Which one would you recommend?

- A. Cement-
Concrete Road
- B. Interlocking
Paver-Block Tiles
Road
- C. Bituminous Road
(Black-Top)
- D. W.B.M. + Prime
Coat
- E. Reinforced
Cement
Concrete Road
- F. Ready-Mix
Concrete Road



2.2

Buildings

Stages in Construction - Earthwork



6 10 2008

Stages in Construction – Foundation Concrete



Stages in Construction – Basement level



Plinth Beam



Stages in Construction – Sill level



Stages in Construction – Laying of Lintel



Lintel Level

- **Lintel:** horizontal member (wood, steel, but mostly RCC) placed across an opening like a door or a window to support the portion of the structure above it.



Stages in Construction – Roof level



Stages in Construction – Laying of Roof



Stages in Construction – Roof laid



Stages in Construction – Plastering completed



Stages in Construction – Colour washing completed



Stages in Construction – Completed houses



Quality of Bricks

Crushing Strength of Bricks

Class A bricks

105 Kg/Sq.cm

Class B bricks

70 Kg/Sq.cm

Class C bricks

35 Kg/Sq.cm

Minimum compressive strength of brick should be 35 kg per Sq.cm.

A



B



C



Practicalities of Brick Work

- Bricks **must be soaked in water** for 6 to 8 hours before commencing masonry work.
- **Joint thickness < 1 cm.** Vertical joints shouldn't be continuous but staggered.
- All bricks should be placed on their beds with the '**frogs' on top.**
- A **maximum of 1 meter wall height** should be constructed in a day.
- Masonry work must be '**cured' for 7 to 10 days** by adding water carefully.

Laboratory Sampling of Bricks

- 50 bricks from sample of up-to 50,000 bricks
- Randomly picked; not from a particular place
- Lab Tests
 - Water Absorption Test
 - Compression Test

Quantity of bricks

Approximate Requirement on Plinth Area Basis
for Single Storey Load bearing Residential
Building

- **Bricks** = 500 Nos. per sq.m. of Plinth areas
- **Cement** = 1.5 Bags per sq.m. of Plinth area
- **Steel Bars** = 12 kg per sq.m. of Plinth area

Quantity

- Weight of one bag of cement is 50 Kgs
- 1 ton of cement equals 20 bags

3

Estimates :

what should you check?

Components of an Estimate

1. Summary – Nature of Work and reasons for requirements
2. Location & Rough Drawing
3. Abstract of Quantity
4. Abstract of Cost
5. Annexures – Rate Analysis

Estimate

Lead and Lift

- The distance over which the material is transported (carried) for disposal is termed as **LEAD**.
 - Usually transport of materials up to a distance of 5km is included in the rates.
- **LIFT** is the depth or height over which the material is lifted.
- The measurement of lead is taken for every 50 metres and lift for every 1.5 metre.

Centage Charges

- When the PWD or any Engineering Department takes up the work, a percentage amount of 10% to 15% of the estimated cost is charged to meet the expenses of establishment, designing, planning, as Centage Charge.

Contractor Profit

- Included in some estimates of **Non-Scheduled Items**: In Haryana, generally 10 %
- In-built in **Scheduled Items**: 10% for material and 21.5 % for Labour

Checking Rates in an Estimate

- **Rates**
 - Schedule or Rates prepared by the PWD
 - eg: **(HSR + CP) + NS**
 - 1988 Haryana Schedule of Rates Items + Ceiling Premium; Non-Scheduled Items
- **Market Rate** – in N.S. Items – we should always insist on Rate Analysis
 - Quotations; Newspapers

Example of an Estimate

**C.M. Announcement made on Dated 07.06.2016
(Code No. - 10208)**

Subject: - Construction of Road by providing and laying of RMC M-20 grade and interlocking tiles from H. No. 5M-104/25 to 5L-49, NH-5 in ward No.14, Faridabad.

Est. Amount: - 56.74 Lac

No.	MRN	DESCRIPTION	Qty.	Unit	Rate	Premium	Amount
1.	54.17	Demolition of road including earthmoving, removing and stacking of all serviceable material complete in all respects as per MRN 54.16-12 to SL-49 Total quantity = 62460.00 m ³ Or 4046.72 Sqm	6006.72	100 Sqm	196.70	370%	56431.00
2.	6.1 (A)	Loading & unloading of damaged road blocks Total quantity = 41000 m ³ Or 4046.72 Sqm Taking dismantling 1.00 m ³ Total quantity = 0.10 m ³ = 606.67 Sqm Or 20000.00 Sqm	666.00	Cum	1+1/2 1	450%	7762.00
3.	8.2 (A)	Carcage of surplus damaged road blocks Total load as per MRN 8.2 (A) Total quantity = 264.00 m ³	366.00	Cum	19.00	450%	18029.00
5.	NS	Providing and laying in position separation membrane 125 mm thick impregnated plastic sheet of make EPCL Shakti or equivalent make in transparent colour over the road surface complete in all respects to the entire satisfaction of the Engineer-in-charge As per item no. 1 = 4046.72	3604.72	Sqm	12.50	-	50584.00
6.	18.12	For 1000 mm wide reinforcement for road (bar) for RCC Total width not included in the complete rate of RCC including cutting, bending, binding and placing in position complete (12mm dia bars) for 1000 mm width No. of Joints for 22" wide road Length = 4046 m 606 = 4.50m = 144 Nos 136 Nos x 1.50m = 204.00 m Or 21.54 Sqm	21.16	Qty.	917.05	500%	117329.00
		For longitudinal joint 22" (604-0.402)0.60 = 602.596 m Wt. @ 0.89 kg/mtr = 532.64 kg Or 21.54 Sqm					
7.	18.21	1000 mm wide reinforcement for RCC, road width not included in the complete rate of RCC including cutting, bending, binding and placing in position complete for joints only 1000 mm width No. of Joints for 22" wide road Length = 4046 m 606 = 4.50m = 136 Nos 136 Nos x 2.00m = 0.40m Or 21.54 Sqm	27.95	Qty.	866.45	500%	142337.00
8.	NS	R.P PVC pipe 11/4 dia 100 mm for dovetail bars Total quantity = 100 m ³ No. of Joints for 22" wide road Length = 4046 m 606 = 4.50m = 1240 Nos 1240 Nos x 0.40m = 496.00 m Or 21.54 Sqm	1674	m	12.50	-	18425.00
9.	NS	Providing and laying in position machine banchard, machine mixed cement concrete vibrators required mixed concrete (P.M.C.) As per 18.12 width reinforcement not less than 200.00 m ³ Cum vibration minimum final	708.12	Cum	2100.00	-	1481718.00

Example of an Estimate of IPB Tiles Street - Abstract of Quantity

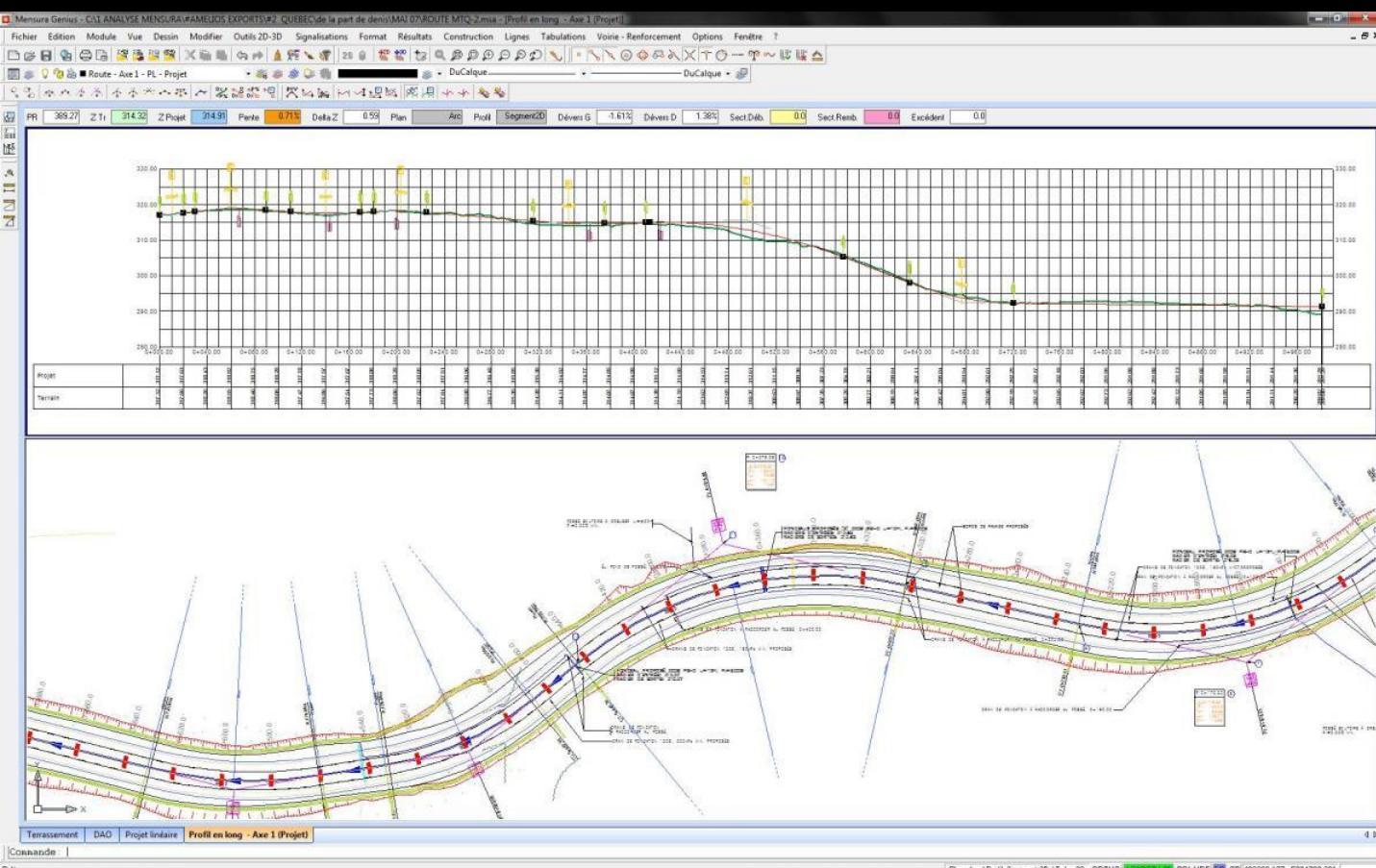
Name of work:- Providing and Fixing of 60mm and 80mm thick table vibrated Interlocking Paver Block on Berm and on Parking area from Ambedkar Chowk to N.D.R.I on Left Hand side, under Municipal Corporation Karnal.

(Abstract of Quantities) Part - A							
HSR	Description	No.	L	B	H	Area	Unit
1 --- 28.37	Dismantling of road and wearing coat, screening and stacking of old serviceable material complete in all respect. Ii) Excavation for ramps. Total length= $35' + 25' + 50' + 12' + 17' + 24' + 24' + 19' + 40' + 30' = 252'-0"$		252' -0"	10'- 0"		2520. 00 Or Sq m. 234.1 0	S ft.
2 --- 8.6d	Dismantling of C.C. 1:2:4 mix.		100' -0"	10'- 0"	0'- 6"	500.0 0 Or Cum. 14.15	Cft.
3 --- 6.6	Earth work in excavation in foundations, trenches, etc.in all kinds of soils, not exceeding 2 meters depth including dressing of bottom and sides of trenches stacking the excavated soil, clear from the edge of excavation		35'- 0"	8'- 0"		280.0 0 S ft. 280.0 S ft. 480.0 S ft. 0 S ft.	S ft.

Example of an Estimate of IPB Tiles Street – Abstract of Cost

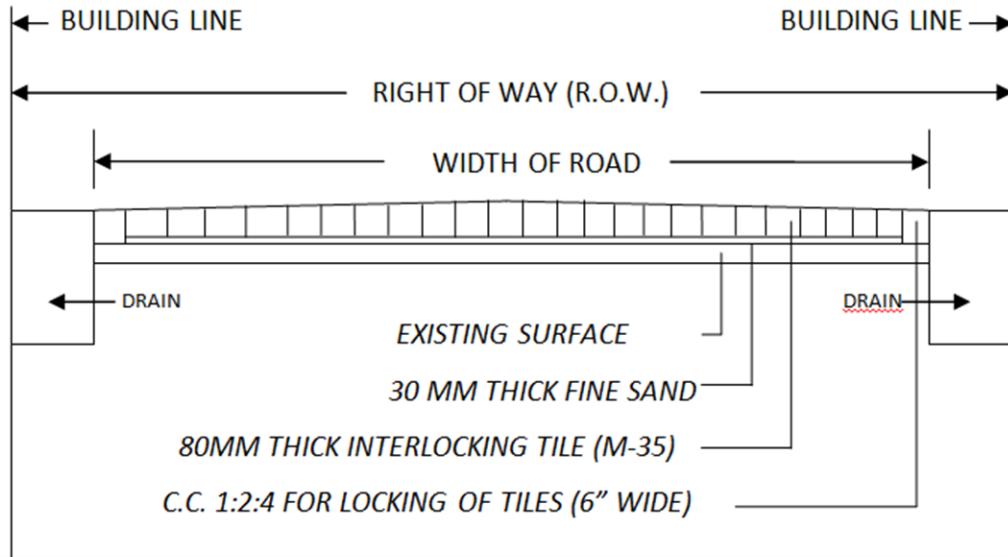
Sr. No	HSR	DESCRIPTION	Qty.	Unit	Rate	Premi um	Amount
1. 7	24.3	Dismantling of road including soling and wearing coat, screening and stacking of old serviceable material complete in all respects as per HSR 5M-104/25 to 5L-49 1x1980'x22' = 43560.00 Sqft. Or 4046.72 Sqm	4046.72	100 Sqm	296.70	370%	56431.00
2. (a)	4.1	Loading & unloading of dismantled road Malba complete as per HSR Area same as per item No. 01 = 4046.72 Sqm Taking dismantling 0.10m (Avg.) 4046.72 Sqm x 0.10m = 404.67 Cum Taking 90% of 404.67 Qty. 364.20 Cum	364.20	Cum	3+1.75 2	450%	7762.00
3. (a)	5.2	Carriage of surplus dismantled road Malba up to 5 km lead as per HSR Qty. same as per item No.02. = 364.20 Cum	364.20	Cum	19.00	450%	38059.00
5.	NS	Providing and laying in position separation membrane 125 micron thick impermeable plastic sheet of make IPCL Shavalik or equivalent make in transparent white colour over the under surface complete in all respects to the entire satisfaction of the Engineer-in-charge As per item no.1 = 4046.72	4046.72	Sqm	12.50	-	50584.00
6. 2	18.2	Cold twisted deformed (ribbed/for steel) bar for RCC works were not included in the complete rate of RCC including cutting, bending, binding and placing in position complete (12mm dia bars) for Joints only No. of Joints for 22' wide road Length = 604 m 604 ÷ 4.50m = 134 Nos. 134 Nos.x2 Nos. x 6.70m = 1795.60 Mtr. For longitudinal joint 22' (604 ÷ 0.60)x0.60 = 604.00 Mtr. = 2399.60 Mtr. Wt.@0.89kg/mtr = 2135.64 kg Or 21.36 Qtl.	21.36	QtL.	917.05	500%	117529.00

Longitudinal Section

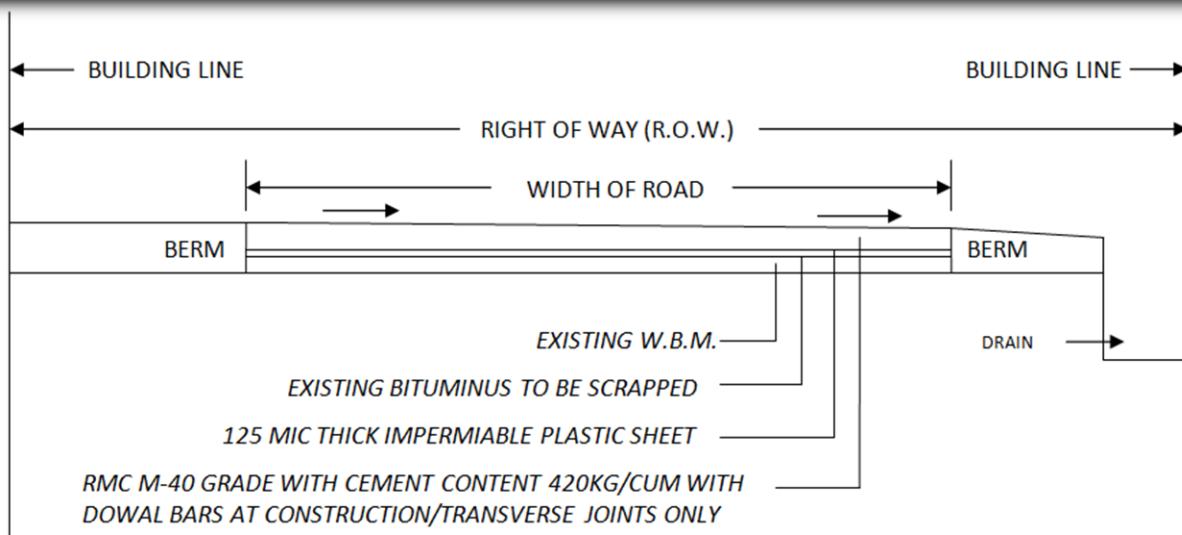


Cross Section for Roads

(Interlocking Paver Block Tiles)



Cross Section for Roads (Concrete Road)



Inspecting an Estimate - 1

S. No.	General Guidelines/ Documents / Annexures
A	General Documents to be submitted with estimates:
1.	Work is marked on <u>plan of the town/on Satellite view image</u> where the site of work and surrounding streets are clearly highlighted
2.	<u>Current Photographs</u> of the site showing the present status of the proposed work are attached
3.	Estimates have been given <u>code number</u> (name of MC/ serial number of estimate /date) before submitting for sanction. o/o CE/SE/Head Draftsman
4.	Work is certified to be located in <u>approved/ authorized colonies/ public land</u> only. No portion of work is located in unapproved colonies.
5.	For <u>Non-schedule items</u> , proper supporting documents are attached for justification of their rates with supporting quotation (Rate Analysis)
6.	Items taken on the basis of <u>HSR/Schedule of Rates bear the item number</u> (as per HSR) and full description of items as per HSR

Inspecting an Estimate - 2

S. No.	In case of roads/street estimate
1	Certification on Roads Levels <i>(i.e. no road is proposed at higher level than the abutting streets and existing level of the road is being maintained).</i> <i>In case it becomes necessary to raise the road from existing level then brief note of explanation be attached with estimates.</i>
2	Year of Construction / last repairs (if any) of the road street
3	Adequate drainage system exists/does not exist at the site. Requisite Provision has been made in the estimate.
4	In case of cement concrete pavements , <ul style="list-style-type: none">• Precast CC blocks have been provided at regular intervals• Interlocking tiles have been provided on either side of the road to facilitate the residents who are seek public utility services• Provision of longitudinal and transverse joints• No CC road is proposed to be constructed where civic amenities have not yet been provided and houses up to 90% have been constructed on plots.
5	Initial Certification of the level of Ground (In case earth filling proposed in the estimate)

Examples of Estimates

NAME OF WORK : - CONSTRUCTION OF MASTIC ASPHALT ROAD FROM GAURI SHANKAR CONFECTIONARY TO BHAGWARIA GAS AGENCY CHOWK, GAUSHALA ROAD, IN WARD NO. 14, M.C. KARNAL

ABSTRACT OF QUANTITY								
Sr. No.	HSR. No.	Description	No.	L	B	H	Qty.	Unit
				AREA IN FEET				
A		Total Covered Area :-	1	3000.00	23.00		69000.00	Sft
							OR	
1	N S	Providing and Laying TACK COAT 50KG/100M2 INCLUDING COST OF BITUMEN VG-50		Same area as per Total Covered Area			6410.10	Sqm
2	N S	Providing and Laying TACK COAT 30KG/100M2 INCLUDING COST OF BITUMEN VG-30		Same area as per Total Covered Area			6410.10	Sqm
3	N S	Providing and laying 25 mm thick mastic asphalt wearing course with paving grade bitumen VG-40 grade meeting the requirements given in table 500-29. prepared by using mastic cooker and laid to required level and slope after cleaning the surface.including providing antiskid surface with bitumen procoated fine grained hard stone chipping of 13.2 mm nominal size at the rate of 0.005 cum per 10 sqm and at an approximate spacing of 10 cm center to center in both direction. pressed into surfe when the temperatur if surface not les than 100° C protruding 1mm to 4 mm over mastic surface. all complete as per clause 515. (MoRT&H No. 5.14)		Same area as per Total Covered Area			6410.10	Sqm
				Same area as per Total Covered Area			6410.10	Sqm

Why - Two Tack Coats - ?
 ✓ ✓

Sukha Singh
 J.E. X

Examples of Estimates

NAME OF WORK : - CONSTRUCTION OF MASTIC ASPHALT ROAD FROM GAURI SHANKAR CONFECTIONARY TO BHAGWARIA GAS AGENCY CHOWK, GAUSHALA ROAD, IN WARD NO. 14, M.C. KARNAL							
ABSTRACT OF COST							
Sr. No.	HSR No.	Description	Qty.	Unit	Rate	C.P.	Amount
1	N.S	Providing and Laying TACK COAT 30KG/100M2 INCLUDING COST OF BITUMEN VG-30	6410.10	Sqm	11.85		75959.69
2	N.S	Providing and laying 25 mm thick mastic asphalt wearing course with paving grade bitumen VG-40 grade meeting the requirements given in table 500-29. prepared by using mastic cooker and laid to required level and slope after cleaning the surface,including providing antiskid surface with bitumen procoated fine grained hard stone chipping of 13.2 mm nominal size at the rate of 0.005 cum per 10 sqm and at an approximate spacing of 10 cm center to center in both direction, pressed into surface when the temperatur if surface not les than 100° C protruding 1mm to 4 mm over mastic surface, all complete as per clause 515. (MoRT&H No. 5.14)	6410.10	Sqm	530.26		3399019.63
							TOTAL 3474979.31
ADD 1.50% Contigency Charges and Third Party Inspection Charges.							52124.69
							GRAND TOTAL 3527104.00
							SAY IN RS. 35.27 LACS


 Sukha Singh
 J.E. X 104

Examples of Estimates

Prices of Bitumen

• Table from January 16, 2018

Bitumen	Grades		
	VG-10	VG-30	VG-40
BITUMEN (BULKED)			
PORT BLAIR(Mumbai)	27700	28500	
KOCHI		28500	
KOYALI	27700	28500	29080
MATHURA	27100	28200	28980
PANIPAT	27400	28200	28980
HALDIA	27000	27800	28380
CHENNAI	27800	28600	29380
BARAUNI	28030	28830	29410
BITUMEN (PACKED)			
KOCHI		31600	
KOYALI	30800	31600	
MATHURA	30500	31300	
PANIPAT	30500	31300	
HALDIA	30100	30900	
CHENNAI	30900	31700	

Note:
(1) The above prices are in Rs. Per MT
(2) The above prices are exclusive of GST.

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Mahender Singh
Executive Engineer


L.C. RAGHAV
Asstt. Engineer-IV

L.E. RAJUHAW
Asstt. Engineer-IV

Sukha Singh
Sukha Singh
J.E. X

E. X

Analysis of Rate		
Providing and Laying TACK COAT 30KG/100M2 INCLUDING COST OF BITUMEN VG-30 Rate. as on		
<u>16.01.2018</u>		
Sr.No.	Description of item	Rate
1	Supply of 0.03 MT Bitument VG-30 @ 36438.90 PMT	1093.17
2	Labour Rate as per HSR 24.27 = $32.50 \times 30 / 50 = 19.50 + 370\% = 91.65 / 100\text{Sqm}$	91.65
	Grand Total :-	1184.82
	Rate per Sqm :-	11.85


Sukha Singh 30/11/18
J.E. X

XEN
M. Singh (20/01/18) Asstt Engineer-IV
Executive Engineer

Tender Document

Tender Document

1. Preamble
2. Notice inviting Tenders
3. Instructions to bidders
4. Format for submission
5. Enclosures with bid
6. Agreement Format
7. Condition of Contract
8. Specifications (Technical and Financial)
9. Bill of Quantities
10. Drawings

Example of a Tender – Public Notice

Tender Notice						
Municipal Corporation Faridabad Notice Inviting Tender						
Sr. No	Name of Items	Estimated Amount (Rs.)	EMD to be deposited by Bidder (Rs.)	Tender Document Fee & Service Fee (Rs.)	Tender Document Download and Bid Preparation/Submission	
					Start Date	Expiry Date
1	Repair of roads by patch work in Neelam Bata Road (Apposite Patel Pump and Auto Market) in Ward No.12, NIT Fundabad	215308/-	4500	300+1000 - 1300/-	28/04/2016 Time 19.00 PM	28/04/2016 Time 19.00 PM

Any resident of MCF who has a stake in any of these works and wishes to be a member of the Citizen Supervisory Committee to be set up by the MCF for supervision of the execution of works on the ground, may submit their willingness giving name, address, academic qualification, professional experience and contact phone number to the undersigned by 08.05.2016.

1. Tender will be opened on 29/04/2016
2. The detail tender notice and Tender Document can be seen on website: <https://harvanseprocurement.gov.in> and downloaded online from the Portal: <https://harvanseprocurement.gov.in> by the Firms / Individual registered on the Portal.
3. Possession of Digital Signature Certificate (DSC) and registration of the contractors on the portal i.e. <http://harvanseprocurement.gov.in> is a pre-requisite for e-tendering. Kindly contact o/o Nextender (India) Pvt. Ltd., O/O Municipal Corporation Faridabad, Contact at e-mail address Chandigarh@nextenders.com
4. For any other queries, please contact Executive Engineer, Div-II, Municipal Corporation Faridabad phone no. 9711005708.
For further details and e-tendering schedule, visit website <https://harvanseprocurement.gov.in/>
5. As the Bids are to be submitted online and are required to be encrypted and digitally signed, the Bidders are advised to obtain Digital Signature Certificate (DSC) at the earliest. For obtaining Digital Certificate, the Bidders should follow point No. 3 under "Annexure-A - Conditions of e-tendering".

Executive Engineer (Div-II)
Municipal Corporation, Faridabad
For-Commissioner

IMPORTANT THINGS

1. Name of Items
2. Estimated Amount (Rs.)
3. EMD to be deposited by Bidder (Rs.)
4. Tender Document Fee & Service Fee (Rs.)
5. Tender Document Download and Bid Preparation/Submission
6. Start Date
7. Expiry Date
8. Contact Details

Example of a Tender – D.N.I.T

Corporation Faridabad



E- Tender Cum community participation Notice

For Procurement of Civil/Mechanical/Electrical Works under Local Competitive Bidding Procedure.

Name of Work: - Providing of 4" dia (100mm) D.I. water supply pipe line (K-7) in various streets of NH -1 'B' Khokka Market, Faridabad (W - 12)

Estimated

Cost: - 215308/-

DEATIL NOTICE INVITING TENDER

e-Tender is invited for purchase of below mentioned items in single stage two cover system i.e. Request for Pre-Qualification/Technical Bid (online Bid under PQQ/ Technical Envelope) and Request for Financial Bid (comprising of price bid Proposal under online available Commercial Envelope):-

Sr. No	Name of Items	EMD to be deposited by Bidder (in Rs.)	Tender Document Fee & eService Fee (Rs.)	Start Date & Time of Bid Preparation & Submission	Expiry Date & Time of Bid Preparation & Submission
1.	Providing of 4" dia (100mm) D.I. water supply pipe line (K-7) in various streets of NH -1 'B' Khokka Market, Faridabad (W - 12)	4300	300+1000 =1300	20/04/2016 Time 19:01PM	28/04/2016 Time 19:00 PM

Under this process, the Pre-qualification/ Technical online bid Application as well as online Price Bid shall be invited at single stage under two covers i.e. PQQ/Technical & Commercial Envelope.

Example of a Tender – Bid Format

For Scheduled Items

S. No	Name of Work	DNIT Amount	Rate to be quoted by the agency in Percentage (%)	Total Amount
1	Providing of 4" dia (100mm) D.I. water supply pipe line (K-7) in various streets of NH -1 'B' Khokka Market, Faridabad (W - 12)	64833		

For N.S. Items

Sr. No.	Description	Qty	Unit	Rate to be quoted by the agency	Total Amount
1	Supply of D.I./ C.I. specials:-				
	Socket bend 4"	96	Kg		
	Tee 4"x4"x4"	780	Kg		
	Tee 6"x6"x4"	47	Kg		
	Flange socket 4"	32	Kg		
	Collar 4"	221	Kg		
	End cap C.I. 4"	48	Kg		
	Tail piece 6"dia	46	Kg		
	Tail piece 4"dia	28	Kg		
2	Supply of lead for caulked joints 4" & 6"dia	279.6	kg		
3	Supply of yarn for caulked Joints 4"&6"dia	22.72	kg		
4	Labour cost for making connection with existing main water supply line complete as site requirement	1	Job		

Administrative Issues - 1

- Competent Authority for **NEGOTIATION**
 - *Issues: Experience; Delegation; Committee !*
- Delegating powers of **RATE APPROVAL ?**

Peculiar Financial Issue of Few Municipal Bodies

- 100% budget provision is necessary before inviting tenders if the works under the non-plan scheme are to be taken up
- Actual Practice: Checked before issuing work order

Administrative Issues - 2

- **Revised Estimate**
 - When the original sanctioned estimate is exceeded or likely to exceed by more than 5% -10%
 - When there are material deviations from the original proposal.
 - Always Ask for **Comparative Statement** of items
- **Re-tendering: An absolute discretion ?**
 - Reasons:
 - Single Bid?; **Faulty Tender Document**; Failed Negotiation; Non-Responsive Bids (incomplete)
 - Change in the nature of an allotted but **Not-Started** work
 - Decision to re-tender: Risks
 - Whether Financial Bids already opened ?
 - Time-loss; Higher rates next time

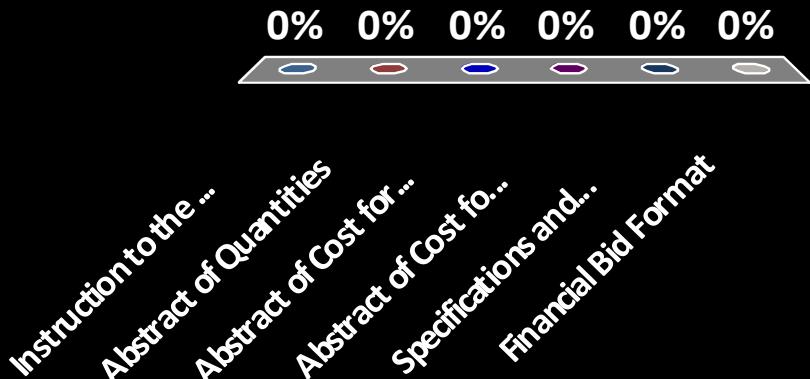
Poll 4: The Tender Document

Which, according to you, should NOT be a part of the tender document to be uploaded online / published in the newspaper by your organization?

Poll 4: The Tender Document

Which, according to you, should NOT be a part of the tender document to be uploaded online / published in the newspaper by your organization?

- A. Instruction to the bidders
- B. Abstract of Quantities
- C. Abstract of Cost for Scheduled Items
- D. Abstract of Cost for Non-Scheduled Items
- E. Specifications and Detailed Drawings
- F. Financial Bid Format



4

Practical Aspects of Inspection by officers

4.1

Inspection & Sampling of a Road Work

Sampling of Bituminous Roads



Sampling of Road Layers - 1

APPARATUS

1. Measuring Tape / Thickness Gauge
2. A shovel
3. Suitable small canvas sheets.
4. A hand brush.
5. Suitable containers for samples such as
 1. strong canvas bags or plastic bags for unstabilized layers, and
 2. suitable tins or plastic containers with airtight lids for stabilized layers.



Sampling of Road Layers - 2

**Anecdote: change of sample*

- **Videography**
- Signatures and **attendance**
- Using a pick and shovel, dig a **sqaure hole** (0.5 m X 0.5 m; or whatever size) in the layer which is to be sampled.
- The hole should be large enough to yield the required **sample size**.
- The material should be **loosened carefully** so that material from the underlying layer is not accidentally loosened and mixed in with the required material.

Sampling of Road Layers - 3

- All the loosened material should be placed on a canvas sheet. It should then be quartered so that each container is filled with representative sample of the material.
- The loosened material must be placed in suitable containers.
 - two to three large containers
- Labelling of sample containers
 - Signatures of Contractor, JE/SDE/XEN
 - Lac seal
- Selection of Laboratory
- Advance payment to Laboratory

Sampling of Concrete Roads

- **APPARATUS**

- A **power drill** capable of drilling out cores at right angles to the surface equipped with a diamond bit 150 or 100 mm in diameter, a core barrel at least 300 mm long and a water supply under pressure to cool the bit
- A **hand-held power saw** equipped with a high-speed carborundum, diamond or similar blade approximately 300 mm in diameter.

- **Drilled out sample size:**

- A minimum diameter of 100 mm is recommended
- For the **test of the compressive strength** of concrete, the standard length of the cores is twice the diameter, which, in turn, should be four times the maximum coarse aggregate size.



Sampling of Concrete Roads



The Max Load at which
Concrete Specimen
collapsed is noted

Sampling of Road Layers - 4

REPORTING

The samples must be sent to the laboratory under cover of a properly composed report and data form

1. Name of the project.
2. Name of the sampler.
3. Date of sampling.
4. Exact Locations of Sampling
5. Depth of the layer.
6. Sample number and/or mark.
7. Number and type of container, and the numbers with which the containers are marked.
8. How sampled are being sent. (by train, bus or special transport, the information about the consignment should be given in a covering letter)

4.2

Inspection of Building Works

Practically inspecting Quality of Bricks on the site

- **Visual Test:** Good bricks should be well burnt and of uniform size and color. **Golden Red Colour.**
- **Sound Test:** Striking of two bricks together should produce a **metallic ringing sound.**
- **Scratch Test:** The brick's surface should be so hard that can't be scratched by the fingernails.
- **Drop Test:** It should **not break** if dropped from **1 m** above ground level.
- **Soak Test:** It should not absorb moisture of more than 15-20% by weight, when soaked in water. E.g., a good brick of 2 kg shouldn't weigh more than 2.3 to 2.4 kg if immersed in water for 24 hours.

Inspection of Formwork - 1



Inspection of Formwork - 2



Formwork – Costly & Important

- **Forms or moulds or shutters** are the temporary casings in which concrete is placed, so that it will have the desired shape or outline when hardened.
- Once the concrete has set, the forms are removed; this is called '**stripping**'.
- Columns, floors, roofs, walls, stairs, beams, arches, etc all require suitable forms.
- Cost of formwork is about **30 to 40% of the cost** of ordinary buildings. About 50 to 60% for dams, bridges, etc.

Inspection of Steel Quality

Some basic Field Tests for Assessing Steel Quality

- Measuring **weight per meter** of steel bar.
- Measuring **pitch per twist**: For a twisted bar, the distance between each twist can be measured at site. The *pitch should lie between 8 to 12 times diameter* of the bar.



4.3 Practicalities

- **Planning the Visit**
 - Pre-schedule
 - Get complete file – AA, TS, Estimate, Work Order / Agreement etc.
- **Whom to take along?**
 - Officials – JE, SDE,
 - PRO ?
- **What to take along?**
 - Instrumentation – Measuring Tape, Calipers, Chisel, Hammer, Toolkit

Practicalities

- Read documentation before inspection
- Take photography / videography along
- Inspect w.r.t. Estimate
- Prefer physical tests in starting
- Then examine the layers / composition physically



Checking the M.B.

11/12/2016
P.M. 2.23 PM

Municipal Corporation, Faridabad
MEASUREMENT BOOK

029

Date	Particulars	Number	Length	Breadth	Depth	Content of area	Reference to lost measurement
1	2	3	4	5	6	7	8
7.	Mild Steel Reinforcement						
	TMB P-24		6477.30				
	TMB P-24		886.1				
	@ ₹ 866.65/- + 5% of ₹ 681.30/-					₹ 316516.35	
8.	SPN/PC Pipe 1479						
	T.M.B P-81		33.62.50				
			1188.00				
	@ ₹ 13/-		745.00.50			₹ 59156.50	
9.	Slab Rmc M-35 grade cement content not less than 40% by weight						
	TMB P-24		2237.13				
	TMB P-24		29.20				

@ ₹ 4800/-
13/6/1990/01

10. Extra for making length by 1000.

TMB P-22	10372.48 m ²
TMB P-27	1607.96 m ²
	12080.39 m ²

@ ₹ 5/-
60407.90
13795040.70

Deductions

Bricklay 107. ₹ 1379504.00

Cement 5254. ₹ 724840

T-Ba 17. ₹ 137950

Labour 14. ₹ 137950

Ad. charge ₹ 11574074 9176000

(5365000 + 6209074)

Net Pay - 2239396.81

Add. Expenses + 239400.00

Net Pay ₹ 22353297.71

Certified that measurements are per Part 3/Spec. of Act

S. D. SHARMA
22/01/16
Assistant Engineer
MCF

J. S. SHARMA
Junior Engineer (MCF)

Checking the Contractor Bill

Point 6-II

FORM DFB-25
P.W. RUNNING BILL-C
[See DFR-2.7]

C.B. Vr. No.....

Point No-6-IV

- Ist & Running Bill**
1. Name of Contractor / Agency: Sh. Manish Kumar Contractor.
 2. Chargeable Estimate : 42.09Lacs
 3. Name of work : Construction of 08 No. Public toilet in ward No.15 in the jurisdiction of Division no -III at various Locations and all other work Contingent there to
 4. Agreement No..... Work Order No: EE-III/MCG/2016/0035 Date: 29.02.2016
 5. Authority : Municipal Corporation Gurgaon
 6. Date of Commencement :
 7. Date of Completion:

Bill prepared & measurement made on:
by Sh. Kirschen JE & recorded
MB No. 1052 Page No. 011-022.

1. ACCOUNT OF WORK DONE :

Restricted Amount	Lacs
Rate-% Below	
Time Limit upto	
Extended upto	
Vide	

Sr. No.	Item No.	Descriptions	Qty	Unit	Rate	Total Amount
1.	6.6(d)	Earth work in excavation foundation , trenches etc in all kinds of soil , not exceeding 2 metres depth including dressing of bottom and side of trenches stacking the excavated soil clear from the excavation and as per HSR.	102.83	100/ Cum	11.08+370% (14.53)	5481.00
2.	10.28.	Cement concrete 1:8:16 with stone aggregate 40mm nominal size in foundation and plinth	16.65	Cum	420+450% (2.8667)	4698.00
3.	11.24	First class brick work laid in cement stone, dust (from crusher) mortar 1:4 in foundation and plinth part etc	35.43	Cum	427.70+450% (1060.74)	103619.00
4.	10.114	Damp proof course 40 mm thick of cement, concrete 1:2:4 with stone aggregate 20mm nominal size with 2 coats of bitumen 20/30 penetration at 1.65 Kg. Per Sqm. laid hot and sanded.	23.33	Sqm	35.05+450% (4.937)	3836.00
5.	11.53	11.43 cm thick brick wall laid in cement stone dust (from crusher) mortar 1: 4 in super structure	90.23	Cum	57.25+600% (32.22)	36222.00
6.	11.28	First class brickwork laid in cement, stone dust (from crusher) mortar 1:5 in first storey upto 4 Mtrs. above plinth levels.	32.01	Cum	448.70+600% (100.54)	100540.00
7.	18.22	Cold twisted deformed (ribbed/ tor steel) bars for RCC works where not included in the complete rates of RCC including bending and binding and placing complete fixed in position complete.	3.06	Qty.	917.05+500% (1683.78)	16727.00
8.	10.81+10 .95(a)	Cement concrete 1:2:4 with aggregate 20mm nominal size for reinforced concrete work in shelves excluding steel reinforcement but including centering and shuttering laid in position complete in all respects.	4.84	Cum	1034.60+450% (27541.00)	27570.00
9.	18.22	Cold twisted deformed (ribbed/ tor steel) bars for RCC works where not included in	6.58	Qty.	917.05+500% (22260.00)	22260.00

10.	10.82+10.95	the complete rates of RCC including bending and binding and placing complete fixed in position complete.			8.10	Cum	1094.80+450% (5699.00)	5699.00
		Cement concrete 1:2:4 with stone aggregate 20mm nominal size for reinforced concrete work in slabs with inclination not exceeding 25 degree with horizontal, excluding steel reinforcement but including centering and shuttering, laid in position, complete in all respects						
		a) Extra over item no. 10.79 to 10.94, if 1.1-1.5 m/s is used, instead of 1:2:4.						
11.	13.13	Terracing consisting of 22.86cm x 3.81cm laid over 87.50mm mud filling on a layer of 25mm sand plaster and an other layer of mud mortar and laying the tiles, including two coats of bitumen laid hot at 1.65 Kg Per Sqm. on top of RCC slab including grouting with cement sand mortar 1:3 and top surface to be left clean etc.	66.92	Sqm	52.95+600%	24804.00		
12.	18.34(b)	Pressed steel sheet framed(chowkatis), consisting of 2mm thick steel sheet of the specified section, including iron lugs(hold fasts), iron hinges, conforming to P.W.D specifications, including bolts for fixing stops, locknotch, provision for receiving towerbolts, and finished with one coats of ready mixed painted red lead non-setting primer, of approved quality, fixed in position including the cost of cement concrete 1:3:6 for filling in the frame and cement concrete 1:3:6 for lugs complete. (B) Door and window of frame size 76mm x 38mm with 35mm wide single rebate.	148.95	mtr	58.60+500%	52370.00		
		Total					490885.00	497695.00
		D/d 5% Security					24544.75	24884.75
		D/d 5.25% Sale Tax					25771.00	26126.99
		D/d 1% income tax					490.95	4976.95
		D/d 1% Labour cess					490.95	4976.95
		Total					430752.00	436727.00

1. Certified that work has been done as per PWD specification.

J.E.
Rishi

A.E.
A.E.

Executive Engineer -
Signature

B/w Checked Re. 490885.00
B/w to be paid Re. 430752.00
CAG
AO
SO
27/12/16

Practicalities

- Then check raw material at site
- If needed, Sampling for Chemical analysis
- Proper follow-up of sampling
- If needed take your P.R.O / avoid crowds
- Talk to the masons for the actual truth



Practicalities

- If ok, avoid verdict declaration on site
- If not ok, reject on file on site
- Never reject for vague quality reasons, be specific
- Avoid rejecting full work, make deductions for shortcomings



Site Visit – Practical Tips (1)



Site Visit – Practical Tips (2)



Thank You



<https://tinyurl.com/lbnsaa-24nov>