

TYP. CROSS - SECTION OF BITUMINOUS ROAD  
(FOR GRADIENT / LONGITUDINAL SLOPE OF ROAD, REFER ARCH. / PH. DRG.)

STEPS FOR CONSTRUCTION

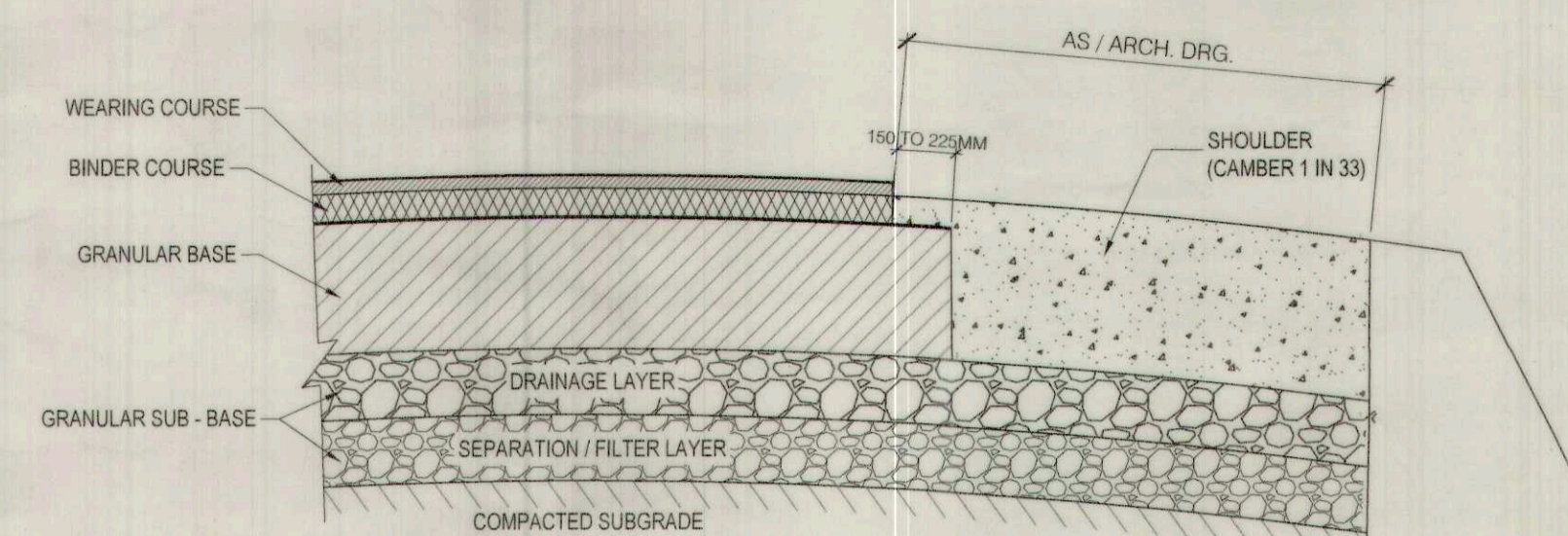
- 1 - DETERMINATION OF CBR VALUE OF SUBGRADE :-**
- 1.1 CBR VALUE OF SUBGRADE SHALL BE DETERMINED AS PER IS:2720 (PART 16) & IRC: 37-2012.
  - 1.2 TEST MUST ALWAYS BE PERFORMED ON REMOULDED SAMPLES OF SOIL IN LABORATORY.
  - 1.3 SAMPLES TO BE SOAKED IN WATER FOR 4-DAYS PRIOR TO TESTING.
  - 1.4 MINIMUM 6 TO 8 AVERAGE CBR VALUES (AVERAGE OF 3 SPECIMENS) FOR EACH SOIL TYPE ALONG THE ALIGNMENT TO BE OBTAINED & 80TH PERCENTILE OF CBR VALUES TO BE TAKEN AS DESIGN CBR.
  - 1.5 MAX. POSSIBLE VARIATION WITHIN CBR VALUES OF 3 SPECIMENS SHOULD BE  $\pm 1$  FOR 5% CBR,  $\pm 2$  FOR 5 TO 10% CBR &  $\pm 3$  FOR 11 TO 30% CBR. WHERE VARIATION IS MORE, AVERAGE CBR SHOULD BE AVERAGE OF TEST RESULTS FROM AT LEAST 6 SPECIMENS & NOT 3.
  - 1.6 REPORT OF CBR TESTS MUST BE SUBMITTED TO SDS, DCSEM PRIOR TO TAKING FURTHER ACTION.
- 2 - SUBGRADE :-**
- 2.1 DIFFERENCE BETWEEN SUBGRADE LVL. AND WATER TABLE SHALL NOT BE LESS THAN 1.0M FOR NEW ROADS AND 0.9M FOR EXISTING ROADS HAVING NO HISTORY OF BEING OVERTOPPED. IN WATER LOGGED AREAS, WHERE SUBGRADE IS WITHIN CAPILLARY ZONE, DESIGN OFFICE SHALL BE IMMEDIATELY INFORMED FOR REVISED DETAILS PRIOR TO TAKING ANY FURTHER ACTION.
  - 2.2 IN CASE OF EXPANSIVE SOILS SUCH AS BLACK COTTON SOIL, EITHER BUFFER LAYER (0.6 TO 1.0M THK.) OF NON-EXPANSIVE IMPERMEABLE SOIL OR IMPERMEABLE BLANKET COURSE (MIN. 225MM THK) COMPOSED OF COARSE / MEDIUM SAND OR NON-PLASTIC MURRUM HAVING PLASTICITY INDEX LESS THAN 5 SHALL BE PROVIDED ON SUBGRADE.
  - 2.3 SUBGRADE SHALL BE COMPACTED TO MINIMUM OF 97% OF MAX. LABORATORY DRY DENSITY ACHIEVED WITH HEAVY COMPACTION AS PER IS: 2720 (PART 8).
  - 2.4 ONE MEASUREMENT OF DENSITY (AS PER IS 2720 PART 28) SHALL BE MADE FOR EACH 500 SQM. OF COMPACTED AREA OR FOR SMALLER AREA AS DECIDED BY ENGINEER-IN-CHARGE. EACH MEASUREMENT SHALL CONSIST OF MINIMUM 5 DENSITY DETERMINATIONS & THEN THEIR AVERAGE SHALL BE TAKEN AS FIELD DENSITY ACHIEVED.
  - 2.5 IF ACHIEVED FIELD DENSITY OF SUBGRADE IS LOWER THAN 97% OF MAX. LABORATORY DRY DENSITY, IT SHALL BE LOOSENED TO DEPTH OF 500 MM, WATERED & RECOMPACTED IN 250 MM THK LAYERS TO DENSITY NOT LESS THAN 97% OF MAX. LABORATORY DRY DENSITY.
- 3 - GRANULAR SUB-BASE :-**
- 3.1 GRANULAR SUB-BASE SHALL HAVE CLOSE & COARSE GRADED MATERIALS AS PER SPECIFICATION AND MATERIAL PASSING THROUGH 425 MICRON SIEVE WHEN TESTED ACCORDING TO IS:2720 (PART-5) SHALL HAVE LIQUID LIMIT AND PLASTICITY INDEX NOT MORE THAN 25% & 6% RESPECTIVELY.
  - 3.2 SUB-BASE MATERIAL SHALL HAVE MINIMUM CBR OF 30% AT DRY DENSITY & MOISTURE CONTENT EXPECTED IN FIELD.
  - 3.3 GRANULAR SUB-BASE SHALL SATISFY FOLLOWING CRITERIA :-
    - $\frac{D_{10} \text{ OF FILTER LAYER}}{D_{10} \text{ OF SUB GRADE}} \geq 5$
    - $\frac{D_{40} \text{ OF FILTER LAYER}}{D_{40} \text{ OF SUB GRADE}} < 5$
    - $\frac{D_{60} \text{ OF FILTER LAYER}}{D_{60} \text{ OF SUB GRADE}} \leq 25$
  - 3.4  $D_{60}, D_{50}, D_{10}$  - MEANS SIZE OF SIEVE THAT ALLOWS 85%, 50%, 15% RESPECTIVELY BY WEIGHT OF MATERIAL TO PASS THROUGH IT.
  - 3.5 IF GRANULAR SUB-BASE MATERIAL IS SUCH THAT IT MAY UNDERGO CRUSHING DURING ROLLING, THEN TOP HALF OF ITS THICKNESS SHOULD BE SUBSTITUTED BY OPEN GRADED CRUSHED STONE LAYER OF LOS ANGELES ABRASION VALUE NOT EXCEEDING 40 TO ENSURE PROPER DRAINAGE.
  - 3.6 GRANULAR SUB-BASE SHALL BE SPREAD IN LAYERS UNIFORMLY SUCH THAT COMPACTED THICKNESS OF EACH LAYER SHALL NOT BE GREATER THAN 200 MM AND MOISTURE CONTENT OF EACH LAYER WHEN CHECKED AS PER IS:2770 SHALL BE WITHIN RANGE OF OMC  $\pm 1\%$  TO OMC  $-2\%$ .
  - 3.6 COMPACTION SHALL BE DONE WITH HELP OF VIBRATORY ROLLER OF 8 TO 10T STATIC WEIGHT OR HEAVY PNEUMATIC TYRED ROLLER OF 20 TO 30T WITH TYRE PRESSURE OF 0.7 NMM<sup>2</sup>
  - 3.7 ROLLING SHALL BE CONTINUED TILL DENSITY ACHIEVED IS AT LEAST 98% OF MAX. DRY DENSITY AS PER IS:2720.
- 4 - GRANULAR BASE (WATER BOUND MACADAM OR WET MIX MACADAM AS / SPEC.) :-**
- WATER BOUND MACADAM (WBM)**
- 4.1 THICKNESS OF EACH COMPACTED LAYER OF BASE COURSE SHOULD NOT BE MORE THAN 100 mm FOR 90-45 mm SIZE AGGREGATE & 75 mm FOR 63-45 mm OR 53-22.4 mm SIZE AGGREGATE.
  - 4.2 3-WHEELED POWER ROLLERS OF 8 TO 10T OR TANDEM / VIBRATORY ROLLERS OF 8 & 10T STATIC WEIGHT SHOULD BE USED FOR ROLLING BASE COURSE.
- WET MIX MACADAM (WMM)**
- 4.3 WMM OF GRADED STONE AGGREGATES (USING 53 MM DOWN AGGREGATES AS / SPEC.) SHALL BE PREPARED IN MIXING PLANT HAVING PROVISION FOR CONTROLLED ADDITION OF WATER.
  - 4.4 OPTIMUM MOISTURE FOR MIXING SHALL BE DETERMINED AS PER IS:2720 (PART 8) AFTER REPLACING AGGREGATE FRACTION RETAINED ON 22.4 MM SIEVE WITH MATERIAL OF 4.75 MM TO 22.4 MM SIZE.
  - 4.5 IMMEDIATELY AFTER MIXING, AGGREGATES SHALL BE SPREAD UNIFORMLY AND EVENLY ON THE PREPARED SUB-BASE IN 2 LAYERS (EACH 125 MM THK.) USING MECHANICAL PAVER FINISHER.
  - 4.6 VIBRATORY ROLLER OR PNEUMATIC TYRED ROLLER HAVING MINIMUM WEIGHT OF 10T SHOULD BE USED FOR COMPACTION & SPEED OF ROLLER SHALL NOT EXCEED 5 KM / HR. FURTHER, ROLLING SHALL BE CONTINUED TILL DENSITY ACHIEVED IS AT LEAST 98% OF MAX. DRY DENSITY DETERMINED AS PER IS:2720 (PART 8).
- 5 - PRIME COAT OVER GRANULAR BASE :-**
- 5.1 PRIME COAT CONSIST OF APPLICATION OF SINGLE COAT OF LOW VISCOSITY LIQUID BITUMINOUS MATERIAL AS PER SPECIFICATION OVER THE POROUS GRANULAR SURFACE PRIOR TO BITUMINOUS TREATMENT.
- 6 - BINDER COURSE ( DENSE BITUMINOUS MACADAM):-**
- 6.1 GRADE OF PAVING BITUMEN TO BE USED SHALL BE VG 30 WITH 0.5 TO 0.6% HIGHER BITUMEN CONTENT. w.r.t. SEMI-DENSE BITUMINOUS CONCRETE.
  - 6.2 ROLLING SHALL BE DONE WITH 8-10T SMOOTH WHEELED TANDEM ROLLER OR 12-15T PNEUMATIC TYRED ROLLER.
  - 6.3 COMPACTION SHALL NOT BE LESS THAN 98% LABORATORY MARSHALL DENSITY.
- 7 - WEARING COURSE (BITUMINOUS CONCRETE / SEMI-DENSE BITUMINOUS CONCRETE) :-**
- 7.1 SURFACE SHALL BE SWEEPED FREE FROM DUST WITH AIR COMPRESSOR.
  - 7.2 TACK COAT SHALL BE DONE IF DSM SURFACE WAS OLD FOR QUITE SOME TIME.
  - 7.3 GRADE OF PAVING BITUMEN TO BE USED SHALL BE VG 30.
  - 7.4 GOOD BOND BETWEEN AGGREGATE & BITUMEN TO BE ENSURED BY USING LIME OR ANTI-STRIPPING COMPOUND AS PER SPECIFICATION PARTICULARLY IN WET AREA.
  - 7.5 ROLLING SHALL BE DONE WITH 8-10T SMOOTH WHEELED TANDEM ROLLER OR 12-15T PNEUMATIC TYRED ROLLER.

SCHEDULE OF BITUMINOUS ROAD (FOR CUMULATIVE TRAFFIC OF 5 MILLION STANDARD AXLES DURING SERVICE LIFE OF ROAD)

4-DAYS SOAKED DESIGN CBR VALUE OF SUB-GRADE	ROAD THICKNESS (MM)				TOTAL THICKNESS T
	GRANULAR SUB-BASE I1	GRANULAR BASE I2	BINDER COURSE I3	WEARING COURSE I4	
3%	335	250	60	25	670
4%	285	250	60	25	620
5%	250	250	55	25	580
6%	210	250	50	25	535
7%	180	250	50	25	505
8 TO 10%	150	250	50	25	475
15%	150	250	40	25	465

NOTE :-

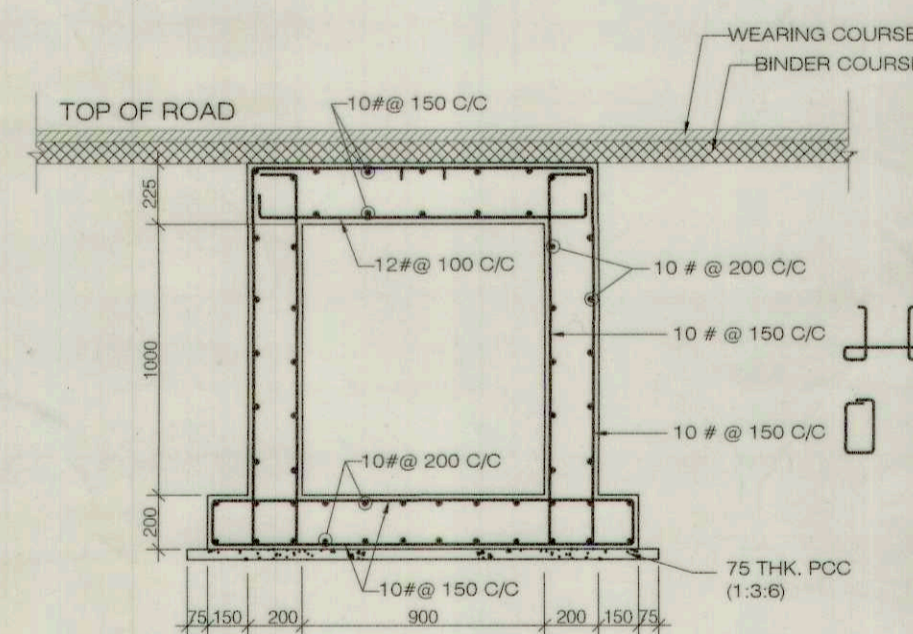
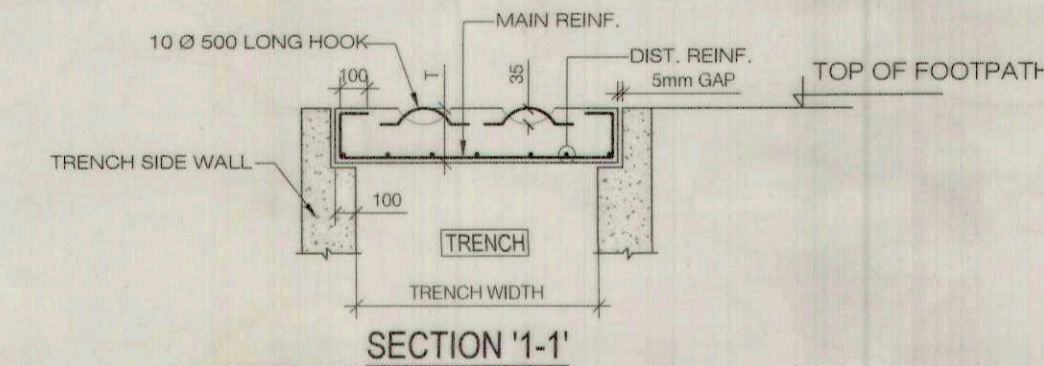
1. IF DETERMINED CBR VALUE LIES BETWEEN ABOVE MENTIONED VALUES, ADOPT ROAD THICKNESS CORRESPONDING TO LOWER CBR VALUE.
2. IF CBR VALUE DETERMINED IS LESS THAN 3% OR MORE THAN 15%, DESIGN OFFICE SHALL BE IMMEDIATELY INFORMED FOR REVISED DETAILS PRIOR TO TAKING ANY FURTHER ACTION.



TYP. JUNCTION DETAIL OF ROAD & SHOULDER

SCHEDULE OF REMOVABLE COVER OVER RCC TRENCH / BRICK CHAMBER

LOADING	SLAB THICKNESS T	REINFORCEMENT	
		MAIN REINF.	DIST. REINF.
VEHICLE MOVEMENT	200 MM.	12 # @ 100 C / C	10 # @ 150 C / C
PEDESTRIAN MOVEMENT	80 MM.	10 # @ 150 C / C	8 # @ 150 C / C



TYP. SECTION OF RCC TRENCH @ 250M C/C ACROSS ROAD WIDTH TO FACILITATE PASSING OF UTILITIES AT LATER STAGE  
(FOR LOCATION OF TRENCH, REFER ARCH. / PH / E&M DRG.)

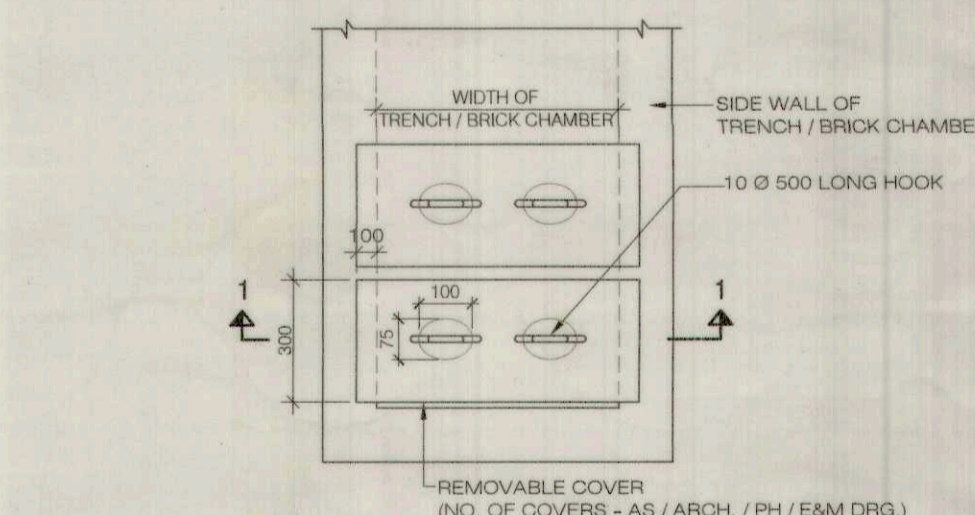
1. SPACING & SIZE OF RCC TRENCH TO BE CONFIRMED FROM ARCH / PH / E&M SECTION PRIOR TO EXECUTION.
2. RCC WORK FOR TRENCH SHALL BE OF M30 GRADE.
3. REINF. USED SHALL BE TMT BARS OF GRADE Fe500 / Fe550D
4. LAP LENGTH = 50D, WHERE 'D' IS DIAMETER OF SMALLER LAPPING BAR
5. NOMINAL COVER OF CONCRETE TO REINF. = 45 MM ( WALLS & ROOF SLAB ) = 30 MM (REMOVABLE COVER)

REFERENCE CODES

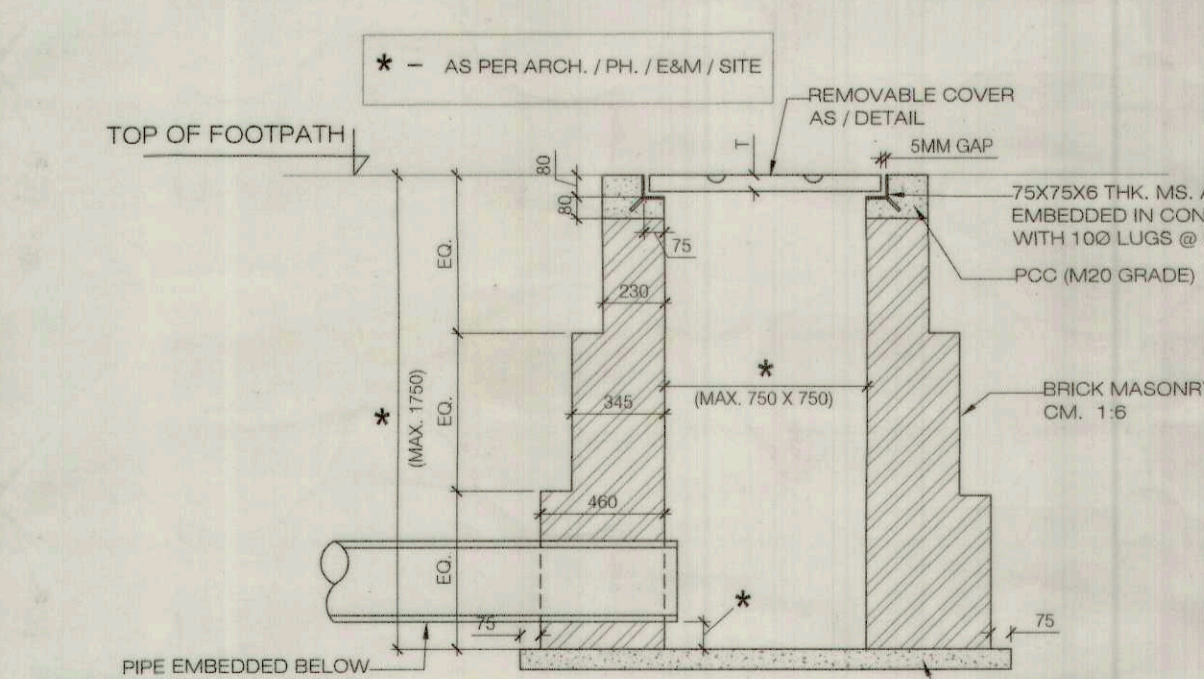
1. CONSTRUCTION OF BITUMINOUS ROAD SHALL BE CONFORMING TO IRC:37-2012 & MORT&H SPECIFICATION - 2013 (5TH REV).
2. FOR \* QUALITY CONTROL IN ROAD WORK \*, REFER IRC:SP-11-2003 & MORT&H SPECIFICATION.
3. FOR \*GUIDELINES OF WET MIX MACADAM\*, REFER IRC:109-2015 AND FOR \* STANDARD SPECIFICATION & CODE OF PRACTICE FOR WATER BOUND MACADAM \*, REFER IRC:19-2005.
4. FOR \* STANDARD SPECIFICATION & CODE OF PRACTICE FOR PRIME & TACK COAT \*, REFER IRC:16-2008.
5. FOR \* SPECIFICATION FOR DENSE BITUMINOUS MACADAM & SEMI-DENSE BITUMINOUS CONCRETE \*, REFER IRC:111-2009.
6. FOR \* SPECIFICATION FOR PAVING BITUMEN \*, REFER IS:73-2013.
7. FOR \* GEOMETRIC DESIGN STANDARDS FOR URBAN ROADS IN PLAINS \*, REFER IRC:86-LATEST REVISION.

FOR LAYOUT, WIDTH & GEOMETRIC DETAILS OF ROAD, DRAIN & RETAINING WALL REFER ARCH.PH. DRG.

1. FOR RCC DETAIL OF CANTILEVER RETAINING WALL, REFER DRG. NO. CED/STD/710
2. FOR RCC DETAIL OF STORM WATER DRAIN, REFER DRG. NO. CED/01/5629



TYP. PLAN OF REMOVABLE COVER OVER RCC TRENCH / BRICK CHAMBER AT EXTREME ENDS  
(HUME PIPE OF ADEQUATE SIZE & LENGTH SHALL BE PROVIDED IN WALLS OF RCC TRENCH & BRICK CHAMBER AT EXTREME ENDS FOR DRAINAGE OF RAIN WATER ENTERING TROUGH GAPS IN REMOVABLE COVER AT TOP)



TYP. SECTION OF BRICK CHAMBER AT EXTREME ENDS OF PIPES EMBEDDED BELOW ROAD FOR PASSING OF UTILITIES

NOTE:-

CONCRETE PIPES OF INTERNAL DIAMETER 300 MM @ 50 M c/c TO BE EMBEDDED 500 MM BELOW BOTTOM OF ROAD THICKNESS ACROSS THE ROAD WIDTH SO AS TO FACILITATE PASSING OF UTILITIES AT THE LATER STAGE. MATERIAL, DIAMETER, LOCATION, SPACING & EMBEDMENT DEPTH OF PIPES TO BE CONFIRMED FROM ARCH./PH. / E&M SECTION PRIOR TO EXECUTION

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETRES (MM) UNLESS NOTED OTHERWISE. NO DIMENSION SHALL BE SCALED OFF. ONLY WRITTEN DIMENSIONS TO BE FOLLOWED.

LEGEND:-

- MORT&H - MINISTRY OF ROAD TRANSPORT & HIGHWAYS
- IRC - INDIAN ROADS CONGRESS
- CBR - CALIFORNIA BEARING RATIO
- OMC - OPTIMUM MOISTURE CONTENT

CLEARANCE TO BE OBTAINED FROM ALL CONCERNED SECTIONS PRIOR TO TAKING ANY FURTHER ACTION

GOOD FOR CONSTRUCTION DRG.

REV. NO.	DESCRIPTION	INITIAL	DATE
R3	GRADE OF STEEL CHANGED FROM Fe 500 TO Fe 550 / Fe 550D AND CORRESPONDING DETAILS CHANGED.	M. SHARMA	05-01-24
R2	WET MIX MACADAM (WMM) ADDED AS GRANULAR BASE	PANDA	12-02-18
R1	TYP. SECTION OF RCC TRENCH & BRICK CHAMBER ADDED TO FACILITATE PASSING OF UTILITIES	SAINI	04-05-17

REVISIONS

GOVT. OF INDIA  
DIRECTORATE OF CONSTRUCTION SERVICES AND ESTATE MANAGEMENT  
STRUCTURAL DESIGN SECTION  
VIKRAM SARABHAI BHAVAN, ANUSHAKTI NAGAR, MUMBAI - 400054

DRN. BY	ANAK	TITLE
DRG. CHKD.	S. K. SAINI	STANDARD DRAWING OF BITUMINOUS ROAD
DESIGN BY	S. K. SAINI	
DESIGN CHKD.	R. SHARMA	
APPROVED	R. SHARMA	
SCALE	1:100	
DATE	06/09/2014	DRG. NO.- CED / STD / 7402

REV. R3