

**RESEARCH DEVELOPMENT
&
QUALITY PROMOTION (R&B)**

ODISHA BHUBANESWAR

**QUALITY ASSURANCE PROCESS ADOPTED BY
R.D.&Q.P.(R&B), ODISHA**

Er. B.C. Majhi
Chief Engineer, R.D.&Q.P.

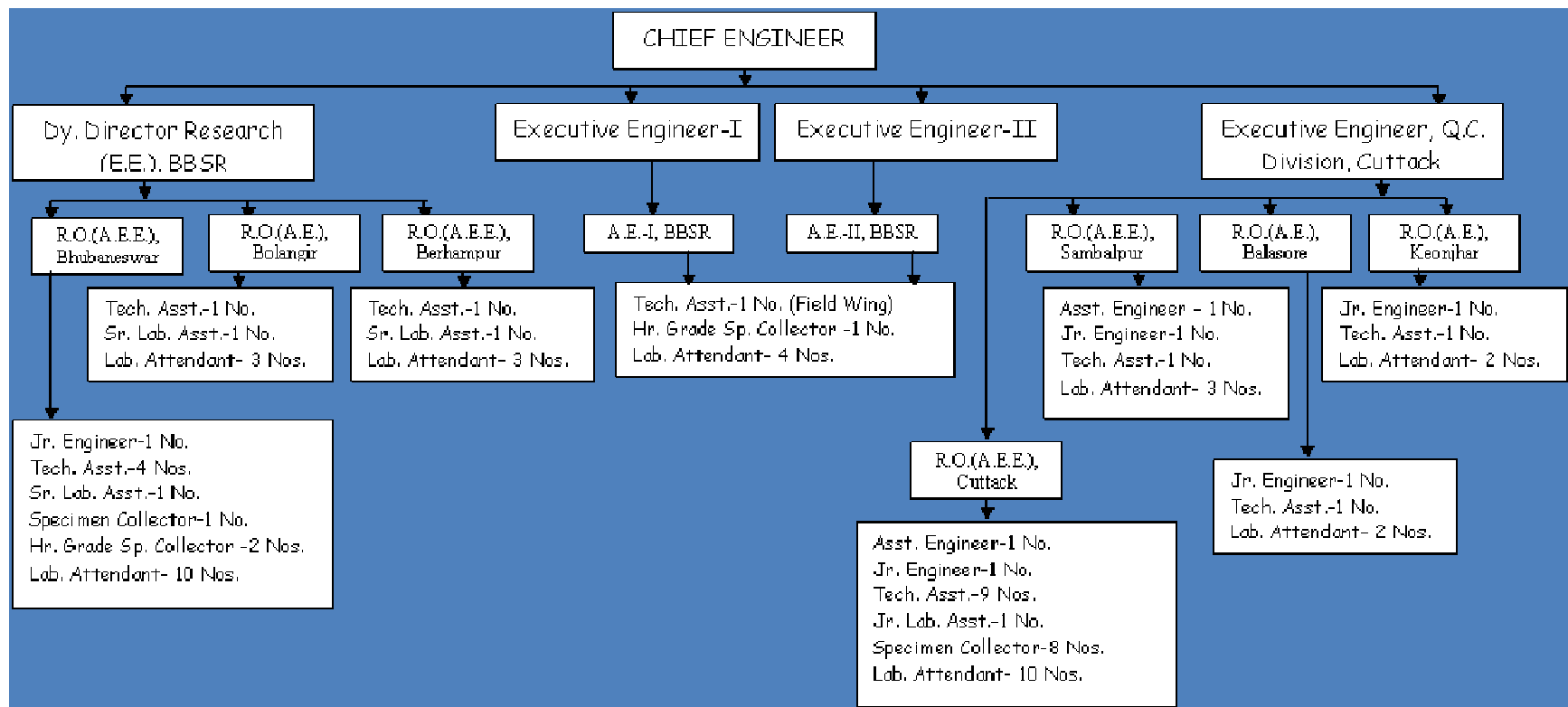
ROLES & ACTIVITIES OF R.D.&Q.P

- The prime objective of Research Development & Quality Promotion Wing is to ensure Quality Assurance of different construction work in the State of Odisha as well as imparting training to the Engineer of Works Department relating to Quality Control & Laboratory test Practices in order to achieve required quality parameters in the Field.
- Apart from the above, training programmes on specific issues like “Design & Construction of Bridges”, Retrofitting of Old Bridges and Structures, & other issues as when required relating to Civil construction projects of the Works Department are being taken up by this Wing.

Existing Laboratories under R.D.&Q.P.

- CENTRAL LABORATORY, BHUBANESWAR.
Sachivalaya Marg, Unit-IV, Bhubaneswar
Dist: Khurda, Pin-751001
- CENTRAL LABORATORY, CUTTACK
OMP Square, P.O. Chauliganj, Cuttack
Dist: Cuttack
- ZONAL LABORATORY, BERHAMPUR,
In the campus of OFFICE OF THE S.E.
Southern Circle , (R&B), Berhampur., Dist: Ganjam
- ZONAL LABORATORY, BOLONGIR,
In the campus of OFFICE OF THE E.E.(R&B),
Bolangir Division, At/PO./ Dist. BOLANGIR
- ZONAL LABORATORY, SAMBALPUR
AT: Brooks Hills, Sambalpur, Po./Dist: Sambalpur
- ZONAL LABORATORY, BALASORE,
At- Remuna Golei, PO: Remuna, Dist: Balasore
- ZONAL LABORATORY, KEONJHAR,
At/Po. Mandua, Dist: Keonjhar.

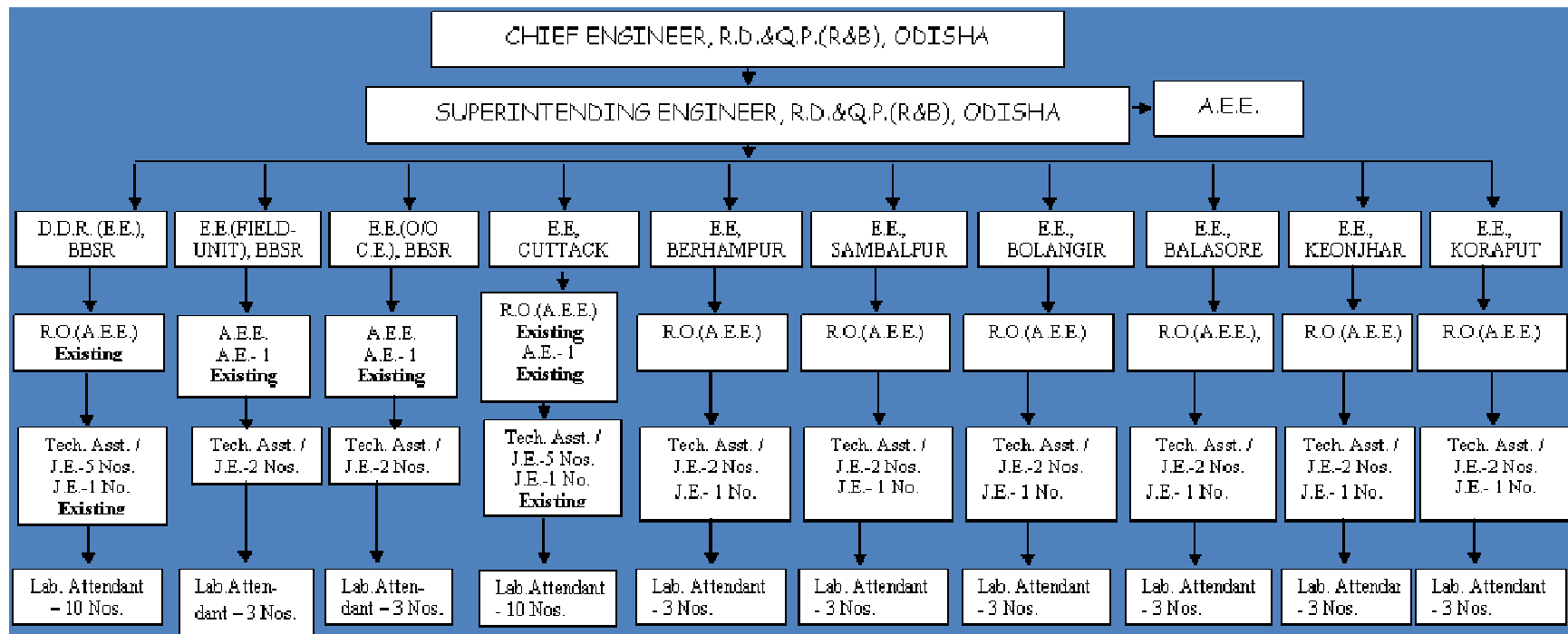
ORGANISATION STRUCTURE



NEED FOR RE-ORGANISATION

- In the present day scenario, the work load of the Works Department, Govt. of Odisha has increased many fold affecting essential requirement of Quality assurance through out the State.
- For this Govt. is taking steps to re-organise the existing structure to achieve Quality assurance of all Civil construction works of Works Department through out the State.
- It has been proposed to convert all the existing Zonal Laboratories to Central Laboratories headed by Executive Engineer and equipped with adequate modern equipments.

RE-ORGANISATION CHART



PRESENT QUALITY NETWORK

- In addition to the existing 7 Laboratories of R.D.&Q.P. Govt. in Works Department has also introduced 3rd party Quality Monitoring System in all the Districts of the State to monitor Quality parameters in different construction works.
- Also well equipped private testing Laboratories have been authorised by the Department spreading all over the State to strengthen the Quality Network of the Department.

FUNCTIONING OF R.D.&Q.P.

- Pre activity prior to execution of the work.
- During Execution of the work.
- Post activity.
- 3rd party Quality Monitoring.
- Independent Quality Control Tests & Random checking of different works.
- Quality assurance on Vigilance complaints.
- Capacity Building.

PRE-ACTIVITY

- Materials required for Civil construction work as per provision in the DPR are submitted by different field Engineers to the R.D.&Q.P. Laboratories for testing. The major tests detailed below are conducted in the Laboratories and findings/results issued to the requisitioning authority in order to enable them for further necessary action/step forward.

TESTS CONDUCTED IN THE LABORATORIES

MATERIAL WING

CEMENT

- Standard Consistency
- Initial & Final setting time
- Compressive strength (3 days, 7 days & 28 days)

AGGREGATES: (FINE & COARSE)

- Sieve Analysis.
- Bulk Density
- Los-angles Abrasion
- Impact value
- Flakiness Index
- Elongation Index
- Specific Gravity
- Water absorption
- Soundness
- Bulkage of sand

CONCRETE

- Compressive strength of concrete cubes
- Design mix of different grade
- Slump Test competing factor
- Workability of concrete
- Flexural strength of concrete/ tiles
- Non-Destructive test of concrete using Rebound hammer
- Non Destructive Test of concrete using ultrasonic pulse velocity apparatus.

BRICKS

- Shape & Size
- Water Absorption
- Compressive Strength
- Efflorescence Test

FLY ASH BRICKS

- Water Absorption
- Compressive Strength

REINFORCEMENT STEEL RODS

- Size & Weight
- Tensile Strength
- Bend & Rebend Test
- Shear Test.

BRIDGE BEARINGS

- Vertical Compression Load Test

TILES

- Water Absorption
- Flexural Strength

SOIL WING

FOR SUBGRADE SOIL/ EMBANKMENT

- Grain size analysis.
- Proctor compaction (Both light & heavy)
- California Bearing Ratio (CBR)
- Differential Free swell (DFS)
- Liquid Limit (L.L.) & Plastic Limit (P.L.)

FOR SUB BASE / ADMIXTURE

- Grain size Analysis.
- Proctor compaction (Both light & heavy)
- California Bearing Ratio (CBR)
- Differential Free swell (DFS)
- Liquid Limit (L.L.) & Plastic Limit (P.L.)

FOR WET MIX MACADAM (W.M.M.)

- Grain size Analysis.
- Proctor compaction (Both light & heavy)
- California Bearing Ratio (CBR)
- Differential Free swell (DFS)
- Liquid Limit (L.L.) & Plastic Limit (P.L.)
- Abrasion value.
- Water Absorption
- Flakiness & Elongation Indices.

FOR FOUNDATION SOIL (BRIDGE & BUILDING)

- Shear Test with Bulk density
- Grain size Analysis.
- Field moisture content.
- Liquid limit & plastic limit
- Differential free swell Index.
- Specific Gravity.

CHEMICAL WING

- Suitability of water for concrete work.
- Suitability of sand for concrete work.
- Determination of cement content of hardened Portland cement concrete and cement mortar.

BITUMEN WING

- Mix design for Bituminous, (BM) Semi-dense Bituminous concrete (SDBC), Dense Bituminous Macadam (DBM), Bituminous Concrete (BC), etc.
- Penetration test for Bitumen & CRMB (Penetration Grade)
- Softening point determination for Bitumen & CRMB.
- Ductility test for Bitumen
- Specific Gravity test for Bitumen
- Bitumen content determination for all samples collected submitted from pavement works
- Grading of all Aggregates
- Elastic recovery test for CRMB

STEPS BEING TAKEN FOR PROCUREMENT OF NEW EQUIPMENTS

- ABSOLUTE VISCOSITY TESTING EQUIPMENTS FOR VISCOSITY GRADE PAVING BITUMEN AS PER IS:1206-Pt-II & Pt-III.
- EQUIPMENTS FOR TESTING BITUMEN EMULSION (CATIONIC TYPE) AS PER IS:8887-1978.
- HIGH POWER CORE CUTTER SET WITH GENERATOR.
- LASER RANGE FINDER.
- SMALL LABORATORY MOBILE UNITS EQUIPPED WITH MODERN EQUIPMENTS.

ROLE OF FIELD WING

- Field Density Determination for G.S.B, W.M.M. & Sub Grade Works.
- Plate & Pile Load Test (without loading arrangement)
- Collection of Core Sample (Both Bituminous & Concrete) for determination of thickness).
- Sieve Analysis in the Field
- Bitumen Content Determination in Field.
- Collection of D.S. & U.D.S. samples from pavements & foundations respectively.
- Field moisture content determination for pavement works.
- Determination of Field CBR.
- Benkelman Beam Deflection Test.

DURING EXECUTION

SUB-GRADE & EMBANKMENT

- Determination of Field Dry Density (FDD) to evaluate the degree of Compaction of Sub-grade & Embankment.

Observations for Discussion

- Variation in Field Dry Density (FDD) due to Improper sampling i.e. (prior to the execution and during execution).
- OMC condition in widened portion of the road not maintained due to Road side standing water, Seepage flow, Highly Clayey and Black Cotton Soil, Use of soil from agricultural land which contains organic and deleterious materials, Non using of soil from approved quarry, Earthen drain not provided prior to execution, etc.

- Soil Stabilisation is not taken up at places where adverse condition of soil exists.
- Minimum 97% of Maximum Dry Density (MDD) is required to assure the quality of Sub-grade.

SUB-BASE

- Determination Field Dry Density (FDD) , which should be 98% of Maximum Dry Density (MDD).
- Grading of materials used.
- Field CBR, LL, PL & PI value.
- The result of above tests are compared with the recommendation of Design-mix as well as with the MORTH Specification.

Findings (In case of Moorum Sub-base)

If the Field CBR does not satisfy the MORTH Specification along with LL & PI, then this layer is to be removed and fresh layer may be laid in conformity with stipulated IRC Specification.

To ensure the quality of Granular Sub-base, the Degree of Compaction must be 98% and LL & PI value not more than 25% and 6% respectively.

The Field CBR for GSB-III (Close & Coarse graded) – 20%.

The Field CBR for GSB-II – 25%.

The Field CBR for GSB-I – 30%.

BASE COURSE (WMM)

- The Field Dry Density (FDD) of the base course i.e. WMM layer should be 98% of the Laboratory Maximum Dry Density (MDD).
- Grading of the Compacted materials must satisfy Impact, Abrasion, Flakiness, Elongation, PI value of the finer materials which is less than 6% as per MORTH Specification.

If the above test will not satisfy the requirement as per MORTH Specification, the same may be removed and re-laid with proper Specification.

Base(Bituminous Surface)

Type of works generally adopted in road work

- i. BM (Bituminous Macadam)
- ii. DBM (Dense Bituminous Macadam).
- iii. SDBC (Semi- Dense Bituminous Concrete) & BC.

The coarse graded aggregates, fine aggregates and paving Bitumen are collected from the Plant site for Laboratory test. At the time of execution the mix materials of BM, SDBC, BC, DBM, etc. are collected and tested in the Laboratory. The test results of the Laboratory will be compared with the MORTH Specification and Result of Design mix.

Bitumen Content, Base Thickness by Core Cutting Method, density test are conducted to ensure the quantity of the Bituminous Base Coarse and Wearing Coat.

POST ACTIVITY

- Non Destructive test like Rebound Hammer test, Pulse Velocity Test on finished surfaces are conducted to ascertain the strength and quality.
- Destructive test like Core Cutting of the Concrete and BT surfaces are conducted to confirm the quality.

THIRD PARTY QUALITY MONITORING

- The third party Quality Monitoring Personnel are appointed by the Govt. in Works Department to ensure the quality of all the works, which are monitored through this Wing. The adverse comment, if any given by the QMP are monitored by this Wing.

VIGILANCE COMPLAINTS

- Complaints on quality of work received from the Public, Vigilance and from any other source are attended and checked by this Wing and after necessary enquiring reports are submitted to the Govt. of Odisha for needful action.

INDEPENDENT QUALITY TESTS & RANDOM CHECKING

- Regular independent Quality Control tests & Random checking of different works are conducted by the team of Engineers of this Wing to ensure quality of the work.

CAPACITY BUILDING

- This is the 1st Workshop of the series, which will provide platform for sharing best practices in implementation of Quality Assurance parameters and its implementation on the Projects and to ensure durability of the assets created by Odisha Works Department (OWD), which will become valuable assets for the County.

THANKS