

2. 3-4 pages shall be kept blank for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

3. Performa for the Piling Register shall be as under-(one page should be assigned for one pile followed by its sketch)

| Sr.No. | Pile No. | Date of Boring | Date of Casting | Concrete Grade | Datum level | Depth from Datum | Soketing in Rocks | Level of Pile bottom |
|--------|----------|----------------|-----------------|----------------|-------------|------------------|-------------------|----------------------|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |

| Cut off level | Payable Length | Liner top level | Liner bottom level | Payable length of liner | Sign. Of site engineer with date | contractor's representative with Signature, Name & Date |
|---------------|----------------|-----------------|--------------------|-------------------------|----------------------------------|---|
| (10) | (11) | (12) | (13) | (14) | (15) | (16) |

1. 1st page shall be designated for General Information mentioned as under

मध्यरेल

Central Railway



मण्डलरेल (कार्य) कार्यालय

DRM (W)'s Office,
(Division).....Location.....

CEMENT CONSUMPTION REGISTER

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.....

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative:.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer

2. On second page following notes to be recorded by SSE/Works
 "Original copy of Receipts/Challan shall be attested By SSE/Works mentioning the Name of Site where it is to be used". Photocopy of the same is to be kept on record.

3. 3-4 pages shall be kept blank for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

4. Performa for the Cement Consumption Register shall be as under-

| Sr.No. | Date of Receipt | Source of receipt | Bill/Challan No. | Manufactures Test Certificate Reference | Qty. Received (Bags) | Progressive total of Receipts (Bags) | Date of issue | Qty issued (Bags) |
|--------|-----------------|-------------------|------------------|---|----------------------|--------------------------------------|---------------|-------------------|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |

| Qty Returned at the end of the day (Bags) | Net Qty Issued (Bags) | Progressive Total of issue (Bags) | Balance at the end of the day (Bags) | Items of work for Which issued (Bags) | Sign of Rly's Engineer with Date | Sign of contractor's Rep. With Date |
|---|-----------------------|-----------------------------------|--------------------------------------|---------------------------------------|----------------------------------|-------------------------------------|
|---|-----------------------|-----------------------------------|--------------------------------------|---------------------------------------|----------------------------------|-------------------------------------|

मध्यरेल
Central Railway



मण्डलरिल (कार्य) का कार्यालय
DRM (W)'s Office,
(Division).....Location.....

REINFORCEMENT REGISTER

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.....

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative:.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer

2. On second page following notes to be recorded by SSE/Works
 "Original copy of Receipts/Challan shall be attested By SSE/Works mentioning the Name of Site where it is to be used". Photocopy of the same is to be kept on record.

3. 3-4 pages shall be kept blank for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

4. Performa for the Reinforcement Register shall be as under-

| Sr. No | Date | Location/Member | Description & Diagram of bar Including bar indication | Dia. of Bar | Spacing |
|--------|------|-----------------|---|-------------|---------|
| (1) | (2) | (3) | (4) | (5) | (6) |

| Numbers Provided | Lap length | Total length | Total weight | Reference of Material Passing Register | Sign of Rly's Engineer with Date | Sign of Contractor's Representative. with Date |
|------------------|------------|--------------|--------------|--|----------------------------------|--|
| (7) | (8) | (9) | (10) | (11) | (12) | (13) |

1. 1st page shall be designated for General Information mentioned as under

Annexure-VIII

मध्यरेल

Central Railway



मण्डल (कार्य) कार्यालय
DRM (W)'s Office,
(Division).....Location.....

STRUCTURAL STEEL REGISTER

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.....

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative:.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer

2. On second page following notes to be recorded by SSE/Works
 "Original copy of Receipts/Challan shall be attested by SSE/Works mentioning the Name of Site where it is to be used". Photocopy of the same is to be kept on record.

3. 3-4 pages shall be kept blank for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

4. Performa for the Structural Steel Register shall be as under-

| Sr.No. | Date of Receipt | Designation of Item | Source of-Receipt & Chalan No./ Bill No. | Quantity Receipt (MT) | Cum. Qty Received (MT) |
|--------|-----------------|---------------------|--|-----------------------|------------------------|
| (1) | (2) | (3) | (4) | (5) | (6) |

| Details of MTC | Details of 3 rd Party Test Report | Reference of Material passing Register | Item of work in which Consumed | Sign of Rly's Engineer with Date | Sign of Contractor's Representative. with Date |
|----------------|--|--|--------------------------------|----------------------------------|--|
| (7) | (8) | (9) | (10) | (11) | (12) |

1. 1st page shall be designated for General Information mentioned as under

Annexure-ix

मध्यरेल

Central Railway



मण्डलरिल (कार्य) का कार्यालय
DRM (W)'s Office,
(Division).....Location.....

MATERIAL PASSING REGISTER

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.....

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative:.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer

2. 3-4 pages shall be kept blank for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

3. Performa for the Material Passing Register shall be as under-

| Sr.No. | Type of material & Date of Receipt | Voucher No. & date | Source of receipt | Quantity Received | Name of Brand/Manufacturer |
|--------|------------------------------------|--------------------|-------------------|-------------------|----------------------------|
| (1) | (2) | (3) | (4) | (5) | (6) |

| Batch No./Heat No. | MTC with Date, Folio No. Of File & Result thereof | Permissible range of value as per normative IS Code | Test Result from 3 rd Party Lab | Approval/Rejection Remarks of ADEN | Sign of Rly's Engineer with Date | Sign of Contractor's Representative. with Date |
|--------------------|---|---|--|------------------------------------|----------------------------------|--|
| (7) | (8) | (9) | (10) | (11) | (12) | (13) |

मध्यरेल

Central Railway



मण्डलरेल (कार्य) का कार्यालय
DRM (W)'s Office,
(Division).....Location.....

CONCRETE CUBE REGISTER

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.....

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative:.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer

2. 3-4 pages shall be kept blank for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

3. Performa for the Concrete Cube Register shall be as under-

| Sr. No | Date of Casting | Structural Location | Grade of Concrete, Qty, & No. of Test required | Cube Identification No. | Weight of Cube | Proposed Date of Testing | | 7 days Compressive Strength | | | |
|--------|-----------------|---------------------|--|-------------------------|----------------|--------------------------|---------|-----------------------------|-------------------------------------|--|--|
| | | | | | | 7 Days | 28 Days | Load (KN) | Comp. Strength (N/MM ²) | Accepted Comp. Strength (N/MM ²) (Clause 15.4 of IS:456) | Avg. of accepted Comp. Strength (N/MM ²) |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |

Table to be continued.....

| 28 days Compressive Strength | | | | Acceptance of Concrete as per Clause 16 of IS: 456 | Signature | |
|------------------------------|-------------------------------------|--|--|--|-----------------------------|--------------------------|
| Load (KN) | Comp. Strength (N/MM ²) | Accepted Comp. Strength (N/MM ²) (Clause 15.4 of IS:456) | Avg. of accepted Comp. Strength (N/MM ²) | | Contractor's Representative | Railway's Representative |
| (13) | (14) | (15) | (16) | (17) | (18) | (19) |

1. 1st page shall be designated for General Information mentioned as under

Annexure-xi

मध्यरेल

Central Railway



मण्डलरिल (कार्य) का कार्यालय
DRM (W)'s Office,
(Division).....Location.....

DAILY PROGRESS/LABOUR & MACHINERY REGISTER

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.....

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative:.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer

2. 3-4 pages shall be kept blank for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

3. Performa for the Daily Progress/Labour/ Machinery Register shall be as under-

| Date | Description of Work Executed | Labour Engaged | | Machinery Mobilized |
|------|------------------------------|----------------|-----------|---------------------|
| | | Skilled | Unskilled | |
| (1) | (2) | (3) | (4) | (5) |

| Contractor Supervisor | Contractor Site Engineer | Approximate quantum of Work executed | Status of Registration of Labours in Shramik Kalyan Portal | Sign of Rly's Engineer with Date | Sign of Contractor's Representative. with Date |
|-----------------------|--------------------------|--------------------------------------|--|----------------------------------|--|
| (6) | (7) | (8) | (9) | (10) | (11) |

मध्यरेल

Central Railway



मण्डल (कार्य) का कार्यालय
DRM (W)'s Office,
(Division).....Location.....

RMC REGISTER

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.....

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative:.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer

2. 3-4 pages shall be kept blank for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

3. Performa for the Ready Mix Concrete Register shall be as under-

| Sr.No. | Date of Concreting | Location/ Structural/ Member | Estimated Quantity of Concreting | Transit Mixture No. & Qty. | Time of Loading |
|--------|--------------------|------------------------------|----------------------------------|----------------------------|-----------------|
| (1) | (2) | (3) | (4) | (5) | (6) |

| Time of arrival | Time of discharge Completion | Temperature | | Slump | | No. Of Cubes/Samples taken | Delivery Challan No. & its File Reference No. |
|-----------------|------------------------------|-------------|----------|-------|--------|----------------------------|---|
| | | Ambient | Concrete | Reqd. | Actual | | |
| (7) | (8) | (9) | (10) | | | (11) | (12) |

| Batch Report No. & its File Reference No. | Cement Content | | Type of Cement and Grade | Sign of Rly's Engineer with Date | Sign of Contractor's Representative. with Date |
|---|----------------------------|----------------------------|--------------------------|----------------------------------|--|
| | As per Approved Mix Design | As per Batch Report of RMC | | | |
| (13) | (14) | (15) | (16) | (17) | (18) |

ANNEXURE "B"

Deployment of Contractor's Technical staff

1. The Contractor shall place and keep on the works at all the times efficient and adequate competent staff to give the necessary directions to his workmen and to see that they execute their work in sound & proper manner and shall employ only such supervisors, workmen & labourers in or about the execution of any of these works as are careful and skilled in the various trades.
2. The contractor shall employ at least one qualified and competent Graduate Engineer at every worksite when cost of the work to be executed is Rs.2 Cr. or above and at least one Diploma holder Engineer where cost of the work to be executed is more than Rs.25 lakh but less than Rs.2 Cr. For large works numbers of Graduate/Diploma Engineers shall be suitably increased to ensure effective supervision of worksites. The number of engineers to be deployed by the contractor will be decided by Railway's 'Engineer' and conveyed to the contractor in writing. His decision will be final and binding on the contractor. In this contract, the contractor shall deploy following nos. of Qualified staff:
 - (a) Graduate Engineers- [----*] nos.
 - (b) Diploma holders --[----*] nos.

[* Numbers to be mentioned by Railway's Engineer]
3. For non-deployment of Graduate Engineer and Diploma Engineer a penalty of Rs 40,000pm and Rs 25,000pm or part thereof respectively shall be imposed in addition to the action being taken against contractor for non-deployment as per terms & conditions of the contract.
4. The contractor will submit the CV of the Engineers and Supervisors to be deployed at the site to the 'Engineer' who(Sr.DEN/DEN) will approve it based on the qualification, experience, past record etc. of the person, prevailing site conditions and the nature of the work to be executed. A certificate will be issued by the

Contractor duly signed by him as well as by site Engineer to the effect that the site Engineer shall be deployed on the specific work only and is not deployed on any other site / project. The Contractor shall at once remove from the works any Engineer/supervisor who shall be objected to by the Engineer-in-charge. Fresh approval has to be taken for the contractor's Engineer/Supervisor in case of any change.

5. The name of the approved Engineer/s shall be reflected in the site registers/records.
6. In the event of the Engineer being of the opinion that the Contractor is not employing on the works a sufficient number of staff and workmen as is necessary for proper completion of the works within the time prescribed, the Contractor shall forthwith on receiving intimation to this effect deploy the additional number of staff and labour as specified by the Engineer within seven days of being so required and failure on the part of the Contractor to comply with such instructions will entitle the Railway to rescind the contract as per General Conditions of Contract.

CENTRAL RAILWAY



HEADQUARTERS OFFICE,
ENGINEERING BRANCH,
MUMBAI C.S.T.

No. W.187.R.A./XII/Circular

Date : 08.04.2021

Sr.DEN(Co)BB,BSL,NGP,SUR,PA

Sub: - Guiding limits of maximum cement content in concrete Mix Design for Railway structures and bridges. *PCE circular No. 208.*

In connection with the above, please find herewith a copy of PCE's Circular No.208/2021 dated- 05.04.2021, regarding guiding limits of maximum cement content in concrete Mix Design for Railway structures and bridges for information and necessary action.

It is requested to kindly ensure compliance to the guidelines issued by above quoted PCE's Circular No.208/2021 while execution of work.

3/3/21
08.04.2021
(A.K.Jain)
Dy.CE(Works)

DA: As above.

Copy to : 1. CPD/SD & CPD/BW }
2. DRM/BB,BSL,NGP,SUR & PA } For kind information please.
3. CTE,CE(PL),CBE,CE/TM,CE/TP, }
CE/RSW,CE/G,CE/Workshop }



CENTRAL RAILWAY

मध्य रेल
प्रमुख मुख्य इंजीनियर कार्यालय,
छत्रपति शिवाजी टर्मिनस,

मुम्बई - 400 001.

CENTRAL RAILWAY

Principal Chief Engineer's Office,
CHHATRAPATI SHIVAJI TERMINUS,
MUMBAI - 400 001.

PCE Circular No 208/2021

No.W.187.R.A./XII/Circular

Date: 05.04.2021

Sub: - Guiding limits of maximum cement content in concrete Mix Design for Railway structures and bridges

Concrete mix design provides an optimal mix of ingredients to provide required workability during placement and also to give hardened concrete which serves dual purpose of required strength and durability. For various grade of concrete, IRS Concrete Bridge Code:2014 and IS 456:2000 prescribe minimum cement content and maximum water-cement ratio depending upon environmental exposure condition for Railway bridge works and other civil works respectively. Above codes also prescribe maximum cement content for concrete. Owing to different dynamic and static nature of loadings for ^{Railway} bridges and buildings, these codes prescribe different values of ~~above~~ minimum & maximum cement contents.

In contracts, where item of concrete work is to be executed under USSOR, quantity of cement used in concrete is to be paid as an extra item as per Special Notes to Sr. No. 5 of Chapter 3 & 4 of USSOR-2011. Field Engineers are expected to perform due diligence in approval of concrete-mix design to achieve economy in cement content. Few instances have been reported where mix design have been finalized with higher w/c ratio and consequently higher cement content. On the contrary, in composite NS items of concrete, where cement is not to be paid separately, the cement content has been observed to be optimized to bare minimum.

Higher cement content, apart from being uneconomical, causes thermal shrinkage cracks and also adversely impacts environment. Instead of increasing w/c ratio, higher workability of concrete can be achieved by using suitable admixtures thereby keeping w/c ratio on lower side, so as to get concrete of adequate strength with reduced requirement of cement. Durable, impervious and high-performance concrete can be obtained through proper selection of ingredients, mix proportioning and using water reducing property of Super Plasticizers. USSOR items for RCC, provides for use of suitable admixture in mix-design.

In order to rationalize the cement in concrete mix design, based on the best construction practices adopted in the field, following guiding limits for Maximum cement content are hereby prescribed in concrete mixes of different grades, separately for Railway bridges and other structures:

Table 1

Guiding limits of Maximum Cement Content in Concrete Mix for works of ROB/RUB/FOB/Subways /Water ways Railway Bridges: -

| Concrete Mix Grade | M 15 | M 20 | M25 | M 30 | M 35 | M 40 | M 45 & above |
|---------------------------------|------|------|-----|------|------|------|--------------|
| Maximum Cement Content (kg/cum) | 315 | 350 | 380 | 410 | 440 | 475 | 500 |

Table 2

Guiding limits of Maximum Cement Content in Concrete Mix for works of Building/PF Shelter Foundation etc:-

| Concrete Mix Grade | M 15 | M 20 | M25 | M 30 | M 35 | M 40 & above |
|---------------------------------|------|------|-----|------|------|--------------|
| Maximum Cement Content (kg/cum) | 300 | 330 | 360 | 390 | 420 | 450 |

Special Notes:

1. Mix Design shall be got done either from the reputed Govt. Engineering Degree Colleges or from the NABL approved Engineering Test Laboratories as per IS: 10262 and it shall be critically checked wrt. provisions of CBC or IS:456 as applicable.
2. All concrete mix designs shall be approved at level of Engineer-in-charge i.e. sectional DEN/Sr DEN/Dy CE.
3. While designing the concrete mix, the environment to which concrete may be exposed during its working life shall be judiciously decided. Very severe and Extreme exposure conditions shall be used with caution. The level of severity shall not be unreasonably high e.g. for RUB may not warrant Very severe or Extreme exposure conditions. While approving mix design, Engineer-in-charge shall apply due diligence to this aspect.
4. Depending upon exposure conditions, minimum grade of concrete, minimum Cement content and max w/c ratio in the Mix Design shall be applicable as per CBC or IS:456 as applicable. A summary of the codal provisions is given in Annexure in Table 3 and Table 4 for ready reference.

Annexure

Table 3

Minimum Grade of Concrete Mix, Minimum Cement Content and Maximum W/C in concrete for works of ROB/RUB/FOB/Subways /Water ways Railway Bridges as stipulated in IRS: CBC 2014.

| Environmental Exposure | Parameters | For Structural members of PSC and Important Bridges | | | For Structural members of Other Bridges and Sub-structure | | CBC:2014 Reference Clause |
|------------------------|------------------------------------|---|------|------|---|------|---------------------------|
| | Structural Member | PCC | RCC | PSC | PCC | RCC | |
| Moderate | Minimum Grade | M-25 | M-30 | M-35 | M-15 | M-20 | Table 4(b), Cl. 5.4.4 |
| | Minimum Cement(kg/m ³) | 240 | 300 | 400 | 240 | 300 | Table 4(c), Cl. 5.4.5 |
| | W/C (Maximum) | 0.50 | 0.45 | 0.40 | 0.50 | 0.45 | Table 4(a), Cl. 5.4.3 |
| Severe | Minimum Grade | M-30 | M-35 | M-40 | M-20 | M-25 | Table 4(b), Cl. 5.4.4 |
| | Minimum Cement(kg/m ³) | 250 | 350 | 430 | 250 | 350 | Table 4(c), Cl. 5.4.5 |
| | W/C (Maximum) | 0.45 | 0.40 | 0.40 | 0.45 | 0.40 | Table 4(a), Cl. 5.4.3 |
| Extreme | Minimum Grade | M-35 | M-40 | M-45 | M-25 | M-30 | Table 4(b), Cl. 5.4.4 |
| | Minimum Cement(kg/m ³) | 300 | 400 | 440 | 300 | 400 | Table 4(c), Cl. 5.4.5 |
| | W/C (Maximum) | 0.40 | 0.35 | 0.35 | 0.40 | 0.35 | Table 4(a), Cl. 5.4.3 |

Max cement content- 500kg/cum [Cl 5.4.5] Pl refer Table 1 for guiding limits

5. *Maximum Cement Content for different grades of concrete has been given in Tables 1 & 2 above but every efforts must be made to reduce the cement content by trying different proportioning of constituent materials and use of permitted plasticizers.*
6. *Payment for cement shall be made as per the quantity approved in Mix Design.*

The Guiding limits mentioned in Table 1 & Table 2 above for Maximum cement contents are prescribed for strict compliance. In case, it is not feasible to design the concrete mix with above limits, then the mix design shall be referred to HQ along with material test reports and mix design calculations for its review and approval.

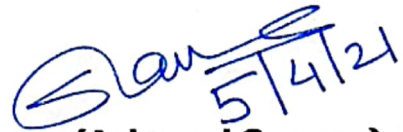

(Ashwani Saxena)
PCE/C Rly

Table 4

Minimum Grade of Concrete Mix, Minimum Cement Content and Maximum W/C in concrete for works of Building/PF Shelter Foundation etc as stipulated in IS 456:2000

| Environmental Exposure | Parameters | Structural Member | | IS 456: 2000 Reference Clause |
|------------------------|------------------------------------|-------------------|------|-------------------------------|
| | | PCC | RCC | |
| Mild | Minimum Grade | M-15 | M-20 | Table 5, Cl. 6.1.2 |
| | Minimum Cement(kg/m ³) | 220 | 300 | Table 5, Cl. 8.2.4.1 |
| | W/C(Maximum) | 0.60 | 0.55 | Table 5, Cl. 8.2.4.1 |
| Moderate | Minimum Grade | M-15 | M-25 | Table 5, Cl. 6.1.2 |
| | Minimum Cement(kg/m ³) | 240 | 300 | Table 5, Cl. 8.2.4.1 |
| | W/C(Maximum) | 0.60 | 0.50 | Table 5, Cl. 8.2.4.1 |
| Severe | Minimum Grade | M-20 | M-30 | Table 5, Cl. 6.1.2 |
| | Minimum Cement(kg/m ³) | 250 | 320 | Table 5, Cl. 8.2.4.1 |
| | W/C(Maximum) | 0.50 | 0.45 | Table 5, Cl. 8.2.4.1 |
| Very Severe | Minimum Grade | M-20 | M-35 | Table 5, Cl. 6.1.2 |
| | Minimum Cement(kg/m ³) | 260 | 340 | Table 5, Cl. 8.2.4.1 |
| | W/C(Maximum) | 0.45 | 0.45 | Table 5, Cl. 8.2.4.1 |
| Extreme | Minimum Grade | M-25 | M-40 | Table 5, Cl. 6.1.2 |
| | Minimum Cement(kg/m ³) | 280 | 360 | Table 5, Cl. 8.2.4.1 |
| | W/C(Maximum) | 0.40 | 0.40 | Table 5, Cl. 8.2.4.1 |

Max cement content- 450kg/cum [Cl 8.2.4.2] Pl refer Table 2 for guiding limits



CENTRAL RAILWAY

No.W.187.R.A./XII/Circular

मध्य रेल
प्रमुख मुख्य इंजीनियर कार्यालय,
छत्रपति शिवाजी टर्मिनस,
मुम्बई - 400 001.
CENTRAL RAILWAY
Principal Chief Engineer's Office,
CHHATRAPATI SHIVAJI TERMINUS,
MUMBAI - 400 001.
Date: 04.02.2021

PCE's Circular No. 207 of 2021

Sub: - Ensuring quality of work and maintaining site records in works contracts.

Ensuring good quality of works in the field is prime responsibility of Engineer in charge of work. Various tools and aids are available to the field Engineers in the form of specifications, contract conditions, various fields and laboratory tests etc. In spite of these, many a times, the quality of works is found not up to the mark due to not implementation of the enabling provisions in the contract or improper framing of contract conditions related to the quality.

It is also noticed that proper site records are not maintained for the implementation of conditions of contract and execution of the work as per specifications. Maintaining proper records at construction site is an important prerequisite for effective performance of contract. It helps in project management by way of objectively monitoring progress of works, correct measurements and timely payments, ensuring quality in works as well as also safety of workers at worksites. It also promotes healthy work environment highlighting the type of hindrance to works, their duration and timely corrective actions wherever needed, rational extension of time, record of instructions given by the Engineer to contractor. It also helps in proactive vigilance and fair settlements of disputes at later stage by getting clear insight about what actually happened in the past.

Keeping the above objectives in view, various registers along with its formats to be maintained at worksites and enforcing conditions are given in Annexure 'A'. The registers should be got printed by the divisions and each page should be machine numbered. It shall be ensured that the registers are always kept undated in the field. While processing bills of contractor, a certificate shall be given by Rly's supervisor that all prescribed registers have been maintained and records are kept up to date. The certificate shall be signed by the contractor in token of his acceptance of records in registers. All the registers duly completed and signed by contractor's Engineer and Railway's supervisors should be sent to divisional office at the time of passing of first on account bill as well as with the final bill. The Engineer in charge can further call the registers during passing of other on account bills also if he so desires. The certificate shall also mention that items or materials for which payment is proposed are meeting the specifications passed the requisite tests and records thereof have been duly maintained and there

are no instructions pending for compliance. ADEN shall test check records and then countersign the certificate and submit the same to sectional DEN/Sr.DEN along with measurement books for passing the bills.

The quality of work also depends upon proper technical supervision by technically proficient staff of the contractor. Contract should have provision for deploying on the works, at all the times, efficient and adequate competent Engineer and Supervisor to execute the work as per specifications. The number of Engineers and Supervisors to be deployed by the contractor should be decided based on the size, nature & requirement of the work. The number of Technical staff to be deployed shall be specified in the tender document itself. Special contract conditions for deployment of Engineer/supervisors are given in Annexure 'B'.

Safety of running traffic at work site and safety of workman is another important area to be taken care of during the execution of works. All the employees of the contractor working at site shall be provided with suitable personal protective gears to ensure their safety at worksites. Suitable conditions in this regard may be added in the Tender Documents in addition to the other existing conditions with regard to safety of traffic & workmen at worksites.

It is important to carry out testing of material being used so as to ensure that it complies to lay down specifications. The testing of material should be done through NABL accredited labs or from reputed Engineering colleges. The contractor will also set up site laboratory for testing of materials as per the requirement and as provided at special conditions of contract in the Contract Agreement. The Material Test Reports (MTC) needs to be properly scrutinized for conformity to the specifications, accepted by the competent authority and are properly preserved.

All concerned shall ensure strict compliance of above instructions. These special conditions of contracts given in Annexure A & B shall be incorporated in all tenders for works contract called hence forth.

DA: - As above


(Ashwani Saxena)
Principal Chief Engineer

Construction site records

In order to maintain accurate records of performance of contract, the Railway's representative will maintain the following registers at site:

- i. **Site Order Register** – This register shall be for issuing work related instructions to the Contractor by Engineer or his Representatives. Verbal orders/instructions are confirmed by the SSE/ADEN in writing in the register. Contractor shall promptly acknowledge orders given therein and comply with them within a reasonable time. Contractor shall also record the compliance in above register. Railways representative shall report such issues that have not been complied by the Contractor in a reasonable time frame to his higherups for its early remedy. Reply to the inspecting officers regarding compliance, needs to be communicated by the Contractor promptly. Contractor may also record his grievance, if any, in above register, which the Railway shall try to settle promptly. **Proforma for the register is attached as Annexure-i.**
- ii. **Hindrance register-** This register shall be maintained to record all hindrances encountered during execution of works in the contract. It shall indicate Nature of hindrance, Date of start of hindrance, Date of Removal of hindrance, Period of hindrance, Items of work that could not be executed because of this hindrance, impact of hinderance on overall delay etc. Hindrance register will form basis for grant of extension to the contractor with or without penalty. **Proforma for the register is attached as Annexure-ii.**
- iii. **Drawings issue register-** All records of issue of drawings viz. General Arrangement, Architectural, Structural, Plumbing, Sanitary etc to the contractor by the dep'tt. shall be maintained in this register. If the contract warrants submission of drawings by the contractor such as those for temporary works, structural designs & drawings in Design & Built contract, as built/completion drawings etc, it shall also be entered into the register. This register will also form a basis for analysing delay in execution of works by either party to the contract. All drawings shall be always kept at site in a separate folder for ready reference. **Performa for the register is attached as Annexure-iii.**
- iv. **Technical Register-** This register will show technical details at site of work indicating layout of work, foundation works, variation in structural dimensions from drawings, any technical details necessary for verification of measurements, hidden works etc. This register is also meant for recording details of "Approved Method Statement" for major important activities that requires thorough detailing to ensure quality & safety of the work being executed. **Performa for the register is attached as Annexure-iv.**
- v. **Piling register-** A separate piling register indicating details of pile load test, location, size, depth of pile, strata encountered, time of start and end of boring, time of start and end of concreting, depth of socketing etc may be maintained. For small qty, piling details may be entered into Technical Register. **Performa for the register is attached as Annexure-v.**
- vi. **Tools & Plants Register-** This register shall give details of tools and plants, equipment and machinery etc available at site duly indicating their condition and usage, date-wise.
- vii. **Cement Register -** This register will be maintained to record daily receipt and consumption of the cement duly indicating the balance quantity. The quantum of the work done for the cement

issued on a particular date will also be maintained. MTC and reference of Material Passing Register shall also be maintained in this register. Performa for the register is attached as Annexure-vi.

- vii. **Reinforcing Steel Register** - This register will record the details of reinforcements and its location of use in structural members. MTC and reference of Material Passing Register shall also be maintained in this register. Performa for the register is attached as Annexure-vii.
- ix. **Structural steel Register**- This register will record the details of structural steel and its location of use in structural members. MTC and reference of Material Passing Register shall also be maintained in this register. Performa for the register is attached as Annexure-viii.
- x. **Material Passing & Testing Register** - This register will show material brought at site, passed, rejected etc. with quantity, brand, specifications & test results etc in a tabular format. The records of sieve analysis of coarse & fine aggregates, impact or abrasion tests etc, admixture test etc shall also be maintained in this register or Material passing & testing register. The documents related to material passing shall be maintained in a separate folder for ready reference. Performa for the register is attached as Annexure-ix.
- xi. **Concrete Cube register**- All mix design shall have approval of sectional DEN/Sr DEN. The cube register shall maintain records of cube casting and testing for 7 days and 28 days strength. Locations from where samples are taken shall be specifically mentioned. For concrete brought through RMC, samples shall be collected in presence of Engineer's representative and additional records of plant/source, transit mixtures, challan, time of travel, batching record, slump etc shall also be maintained in RMC Register. Source of RMC Plant shall have prior approval of sectional DEN/Sr DEN. Performa for the register is attached as Annexure-x.
- xii. **Labour Register/Daily Progress Register/Machinery Register** - This register will be maintained to show daily strength of labour in different categories employed by the Contractor, machinery mobilized & description of work executed. Details of Contractor's Supervisor and Engineer shall also be maintained in it. It will also record category wise no. of labours engaged on the execution of work. Performa for the register is attached as Annexure-xi.
- xiii. **Programme Register** - This register shall contain planning and progress of work in the form of Bar charts and/or PERT chart etc. The planning of work submitted by the contractor shall have approval of sectional DEN/Sr DEN. The planning shall be periodically reviewed and revised program or catchup program shall be submitted by Contractor for completion of works.
- xiv. **Daily Progress Register**- Daily progress register shall indicate daily progress of work done by the Contractor. It shall be got signed at least once in three days from Engineer in token of acceptance. Performa for the register is attached as Annexure-xi.
- xv. **Ready Mix Concrete Register**- Ready mix Concrete Register shall contain information regarding Name of Structure, detail of Transit Mixer, its loading, arrival at Site & Time of discharge completion, Slump, Ambient time concrete Temperature and reference of delivery Challan No. & batch Report No. Cement content as per approved mix design and as per Received batch report No. Shall also be maintained. Performa for the register is attached as Annexure-xii.
- xvi. **Log Book of events** - All events are required to be chronologically logged in this book, date-wise and shift-wise.

- xvii. **QAP Compliance register-** For all important works valuing more than Rs 15 crore, a "Quality Assurance Manual" covering Quality System, Inspection & Testing, Method statements for important items of works, Document & Data control, Quality Training etc shall be prepared before starting the work. The above manual shall be prepared by Contractor by employing professionals in the field and submitted to Engineer for his approval. The implementation and compliance of check points shall be maintained in QAP compliance register.
- xviii. **SHE compliance Register-** For all important works valuing more than Rs 15 crore, a "Safety, Health and Environment (SHE) Manual" covering measures and practices to ensure safety of employees and workers, safety of worksites, Hazard Identification & Risk assessment (HIRA), Safety Training, Occupational health systems for well-being of employees in the workplace, Environment protection, Pollution control and mitigation measures, compliance of related Acts/Laws etc shall be prepared before starting the work. The above manual shall be prepared by Contractor by employing professionals in the field and submitted to Engineer for his approval. The implementation and compliance of important check points shall be maintained in SHE compliance register.
- xix. **Schedule/Paid/Deviation Qty register-** This register shall indicate Quantities in schedule, paid bill-wise, deviation/variation etc in a tabular form in the register to examine progress of work and also timely forecast of likely variations.
- (a) Any other registers considered necessary by the Railway Engineer, shall also be maintained at site. Sectional DEN/Sr. DEN shall decide type of registers to be maintained at site at the time of commencement of work and approve them in writing.
- (b) Depending upon enormity and importance of project, some of above registers may be merged to reduce handling of large number of registers.
- (d) While processing bills of contractor, a certificate shall be given by Rly's Supervisor that all prescribed registers have been maintained to the standard and records are Up to Date. All the registers duly completed and signed by Contractor's Engineer and Railway Supervisors should be sent to divisional office at the time of passing of first on account bill as well as with the final bill. The certificate shall also mention that items or materials for which payment are proposed are meeting the specifications and records thereof have been duly maintained and there are no instructions pending for compliance.
- (c) The certificate shall be signed by the Contractor in token of his acceptance of Records of Registers. Sectional ADEN shall test check records and then countersign the certificate and submit the same to Sectional DEN/Sr. DEN along with Measurement Books for passing the bills. Sectional DEN/Sr. DEN should periodically visit the sites and may call for these records, for their scrutiny and comments.
- (d) Hindrance Register should invariably be sent along with the application for extension of time of completion of the work for the competent authority to take a decision.
- (e) All Registers, Proforma charts, etc. will be the property of the Railway.
- (f) All registers should indicate on first page, Name of Work, Name of Agency, CA No., Completion period, Date of commencement, Schedule date of completion, Extended date, if any, Contract value, Revised Contract value, Name of Rly's supervisor, Name of Contractor's Supervisor/Engineer, if any. The registers should be preferably machine numbered. Few pages (3-4) should be left in the beginning for the inspection remarks of higher up officers.

- (g) Registers as mentioned above will be maintained by the Engineer's Representative and shall be seen & signed regularly by the Contractor or his authorised Representative for compliance of instructions recorded therein for satisfactory completion of work.
- (h) One hard bound copy of the contract agreement and supplementary agreements, if any shall always be maintained at site for ready reference.
- (i) Copies of Geotechnical reports shall always be maintained at site for ready reference. All level books & survey records shall be duly preserved and maintained.
- (j) Once a month, for all works, colour photographs indicating various stages of execution of work shall be taken and developed by the Contractor at his own cost and same will be submitted to Railway in soft and hard copies and shall be the property of Railways.
- (k) The Contractor for his own purposes, may also maintain accurate records, plans and charts showing the dates and progress of all main operations and the Engineer and his representative shall have access to this information all the times. Records of tests made shall be handed over to the Engineer's representative after carrying out the tests.



1. 1st page shall be designated for General Information mentioned as under.

मध्यरेल

Central Railway



मण्डलरिल (कार्य) कार्यालय

DRM (W)'s Office,
(Division).....Location.....

SITE ORDER BOOK

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.....

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer

2. 3-4 pages shall be kept for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

3. Performa for the Site Order Book shall be as under.

| Sr. No. | Date | Instruction issued on the inspection of work with Signature & Designation | Contractor/Contractor's representative acknowledgment with Signature Name & Date | Compliance report by contractor's representative with Signature, Name & Date | Final remarks of the Railway Engineer with Signature, Designation & Date |
|---------|------|---|--|--|--|
| | | | | | |

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मध्यरेल

Central Railway



मण्डल (कार्य) का कार्यालय
DRM (W)'s Office,
(Division).....Location.....

HINDRANCE REGISTER

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer

2. 3-4 pages shall be kept for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

3. Performa for the Hindrance Register shall be as under.

| Sr. No. | Nature of Hindrance | Date of occurrence | Date of clearance | Period | Over Lapping Period if Any | Weightage of Hindrance | Net Effective days of Hindrance | Remarks & References | Sign. Of site engineer with date | contractor's representative with Signature, Name & Date |
|---------|---------------------|--------------------|-------------------|--------|----------------------------|------------------------|---------------------------------|----------------------|----------------------------------|---|
| | | | | | | | | | | |

मध्यरेल

Central Railway



मण्डलरेल (कार्य) का कार्यालय
DRM (W)'s Office,
(Division).....Location.....

DRAWING ISSUE REGISTER

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.....

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative:.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer

2. 3-4 pages shall be kept for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

3. Performa for the Hindrance Register shall be as under.

| Sr. No. | Nature of Hindrance | Date of occurrence | Date of clearance | Period | Over Lapping Period if Any | Weightage of Hindrance | Net Effective days of Hindrance | Remarks & References | Sign. Of site engineer with date | contractor's representative with Signature, Name & Date |
|---------|---------------------|--------------------|-------------------|--------|----------------------------|------------------------|---------------------------------|----------------------|----------------------------------|---|
| | | | | | | | | | | |

2. 3-4 pages shall be kept blank for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

3. Performa for the Drawing - issue Register shall be as under-

| Sr. No. | Drwg. No. & Revision No. If Any | Details of Drwg. | Date of issue to the Contractor | Acknowledgement of Contractor/Remarks | Signature of Railway Engineer |
|---------|---------------------------------|------------------|---------------------------------|---------------------------------------|-------------------------------|
| | | | | | |



1st page shall be designated for General Information mentioned as under

मध्यरेल

Central Railway



मण्डल (कार्य) कार्यालय

DRM (W)'s Office,
(Division).....Location.....

TECHNICAL REGISTER

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.....

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative:.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer

2. 3-4 pages shall be kept blank for remarks of higher inspecting officers having format as under.

| Sr. No. | Date | Inspecting officers Name & Designation | Remarks | Initials |
|---------|------|--|---------|----------|
| | | | | |

3. Performa for the Technical Register shall be as under-

| Sr.No. | Date | PARTICULARS (PERTAINING TO WORK-SITE) (SKETCH/DIAGRAMS/NOTE/INSTRUCTION/ REF Drawings...Etc) | APPROVALS/COMMENTS/ REMARKS OF (ENGINEER INCHARGE) | Contractor's Representative with Signature, Name & Date |
|--------|------|---|---|---|
| | | | | |



1. 1st page shall be designated for General Information mentioned as under

मध्यरेल

Central Railway



मण्डल (कार्य) का कार्यालय

DRM (W)'s Office,
(Division).....Location.....

PILING REGISTER

Register issued on:

Name of work:.....

Letter of Acceptance:.....

Contract Agreement No.....

Value of Work:.....

Revised Value of Work:.....

Date of Completion:.....

Extended date of Completion:.....

No. of Machine Numbered Pages:.....

Railways Officials

Senior Section Engineer.....Contact No.....

Asst. Divisional Engineer.....Contact No.....

Sr. Divisional Engineer.....Contact No.....

Divisional Engineer.....Contact No.....

Contractor's Officials:

Contractor's Authorised Representative:.....Contact No.....

Contract's Engineer.....Contact No.....

Signature of SSE/Works

Signature of Contractor's
Authorised Representative/Engineer