

DISPUTE RESOLUTION BOARD DECISION

In the matter of Dispute between:

LARSEN & TOUBRO LIMITED (L&T), Contractor

And

NATIONAL HIGH SPEED RAIL CORPORATION LIMITED Employer

In Dispute No. – 3

**ENGINEER'S DEPARTURE FROM THE CONTRACTUAL APPROVAL REGIME
GOVERNING CEMENT ASPHALT MORTAR ("CAM")**

Date: 01.10.2026

**DECISION OF THE DISPUTE BOARD
COMPRISING OF SH. S. N. AGRAWAL, CHAIRMAN,
SH. S. K. JAIN, MEMBER AND SH. M. K. GUPTA, MEMBER**

In the matter of Dispute between:

LARSEN & TOUBRO LIMITED (L&T)

Contractor

And

NATIONAL HIGH SPEED RAIL CORPORATION LIMITED Employer

Name of Work: Design, Supply, and Construction of Track and Track related Works including Testing and Commissioning on Design-Build Lump Sum Price basis for Double Line High Speed Railway between Vadodara (MAHSR Km. 393.700) and Sabarmati Depot and Workshop (MAHSR Km. 509.875) in the State of Gujarat for the Project for Construction of Mumbai Ahmedabad High Speed Rail. **[Package No. MAHSR- T-3].**

Dispute No. 03: Engineer's departure from the contractual approval regime governing Cement Asphalt Mortar ("CAM").

Reference: Email from Contractor's Counsel dated 15.07.2026.

1.0 Background:

1.1 Parties:

1.1.1 Employer: National High-Speed Rail Corporation Limited (**NHSRCL**) was incorporated on 12th February 2016 under the Companies Act, 2013 with an object to finance, construct, maintain and manage the High-Speed Rail Corridor in India. The Company has been modelled as 'Special Purpose Vehicle' in the joint sector with equity participation by Central Government through Ministry of Railways and two State Governments viz. Government of Gujarat and Government of Maharashtra.

1.1.2 Contractor: L&T Construction is a division of Larsen & Toubro (L&T) a major Indian technology, engineering, construction, manufacturing and financial services conglomerate, with global operations. L&T has customers in over 30 countries around the world. L&T is engaged in core high impact sectors for over 8 decades.

1.1.3 Engineer: The Employer appointed Consortium of Japan International Consultants Consortium (JICC), PMC and TRS as the "Engineer" to administer the Contract.

1.2 Work: The work is for “Design, Supply, and Construction of Track and Track related Works including Testing and Commissioning on Design-Build Lump Sum Price basis for Double Line High Speed Railway between Vadodara (MAHSR Km. 393.700) and Sabarmati Depot and Workshop (MAHSR Km. 509.875) in the State of Gujarat for the Project for Construction of Mumbai Ahmedabad High Speed Rail [Package No. MAHSR- T-3].”

Work involves design and construction of:

- Main Line and Loop Line Reinforced Concrete Track Bed, Reference Pin Installation, Slab Track including installation, RTPD installation, CAM injection, filling resin around RC Anchor, Rail installation, IJ installation and Rail Destressing.
- Ballasted Track including Turnouts.
- Rail Defect Detection.

1.3 Contract: The Contractor and the Employer entered into a Contract Agreement dated 10.06.2022. The Contract price is Rs. 3142 Cr. (in two currencies) and the completion period is up to 26.10.2027.

The contract is a ‘Design Build’ contract governed by FIDIC (International Federation of Consulting Engineers) Yellow Book 1999 edition i.e. ‘Conditions of Contract for Plant and Design Build for Electrical and Mechanical Works and for Building and Engineering Works Designed by the Contractor’. This consists of the GCC which has been suitably amended and modified by ‘Particular Conditions’ (“**PC**”) agreed between the Parties. In addition, Clause 2 of the Contract Agreement dated 10.06.2022 specifies the documents that form part of the Contract, apart from the Contract Agreement dated 10.06.2022 itself.

1.4 Dispute Board (DB):

Under Sub Clause 20.2 of Particular Conditions (PC) of Contract, the Parties have appointed “Dispute Board (DB) comprising of following Members:

1. Shri S.N. Agrawal, Chairman DB T-3
2. Shri Subodh Kumar Jain, Member DB T-3, and
3. Shri Mahesh Kumar Gupta, Member DB T-3.

1.5 Representation of Parties:

1.5.1 The Contractor appointed **M/s KHAITAN & CO LLP** as the authorized Legal Counsels of the Contractor for this dispute and informed the DB through email dated 11.7.2026. Advocates Mr. Sanjeev Kapoor, Mr. Dhritiman Roy and Ms. Sania Abbasi, appeared on behalf of the Contractor. Shri Akula Phanendra Kumar, Project Manager, L & T represented the Contractor.

1.5.2 The Employer appointed **M/s UNUC Legal (L.L.P.)** as their authorized Legal Counsels. Advocates Mr. Pawan Upadhyay and Mr. Rajesh Chhetri appeared on

behalf of the Employer. Mr. Harsh Kumar, CPM(Civil) Vadodara, represented the Employer.

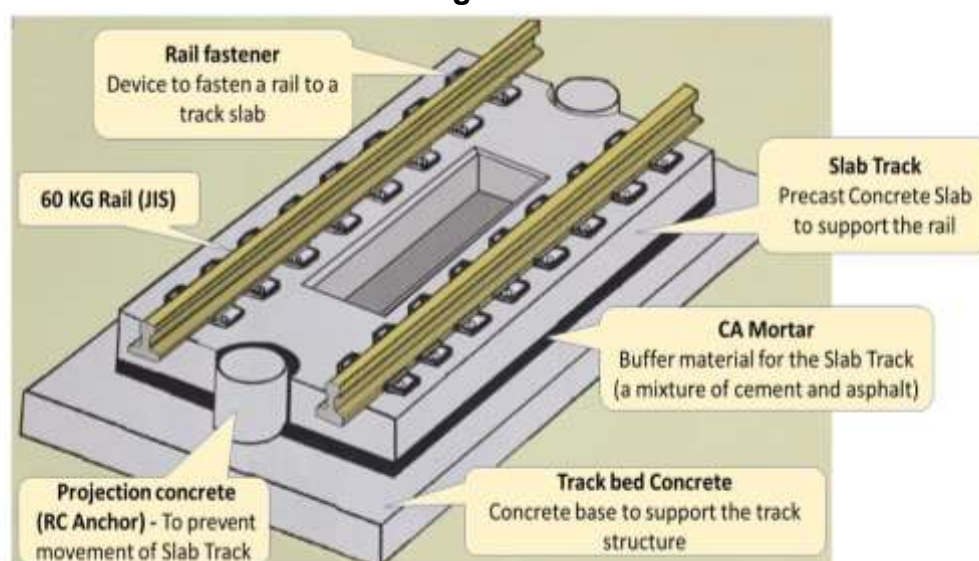
1.6 The Dispute No. 3:

1.6.1 The Counsel of the Contractor through his email dated 15.7.2026, referred the Dispute to the DB. This is about **“Engineer's departure from the contractual approval regime governing Cement Asphalt Mortar ("CAM").”**. Along with this notice, the Contractor also submitted details of the Dispute (SOC). The dispute is numbered as “Dispute No. 3”.

1.7 Brief on the Dispute and Submissions:

1.7.1 The Contractor has briefly described the reasons in its email of 15.7.2026. Present dispute concerns the Engineer's departure from the contractual approval regime governing **Cement Asphalt Mortar("CAM")** - a critical track component in the Project. The Engineer imposed requirements not expressly stipulated in the Contract, including an insistence on ‘CAM Expert endorsement’ and ‘rigid adherence to a reference composition’, which compelled the Contractor to abandon a compliant CAM design mix comprising materials sourced from approved domestic vendors (the "First Trial Mix") and instead, procure materials from other vendors, including Japanese vendors, at significantly higher cost and with consequential delay. The Contractor seeks reimbursement of additional costs incurred (and to be incurred), and an extension of time, as a direct consequence of the Engineer's conduct.

Figure-1



1.7.2 The Contractor has further stated that as of 31st December 2025, L&T had completed approximately 16% of the CAM injection work, including execution of approximately 38,461 (thirty-eight thousand four hundred sixty-one) TM (track meter)

of the CAM mixture and had already incurred **additional costs** of approximately INR 13,96,00,000 (Indian Rupees Thirteen Crore Ninety Six Lakh) and JPY 9,62,00,000 (Japanese Yen Nine Crore Sixty Two Lakh). The said additional costs are expected to continue to be incurred as the track works progress and more CAM is used for each category of slab to be laid in the Project.

1.7.3 Apart from the additional cost incurred, the Contractor also suffered loss of time. The joint trial with First Trial Mix was conducted on 18th -19th December 2023 in the presence of the Engineer and the CAM Expert. The test results demonstrated compliance with all prescribed performance parameters under the Contract. Notwithstanding this compliance, the Engineer rejected the First Trial Mix on 30th January 2024. From January 2024 to March 2025, the Engineer's rejection of the First Trial Mix, the issuance of multiple NOOs on evolving grounds, and the imposition of extra-contractual requirements (including the insistence on CAM Expert endorsement) prevented L&T from proceeding with CAM production and the associated track works. The Second Trial Mix was ultimately approved on 25th of March 2025. Accordingly, the delay period attributable to the Engineer's conduct is approximately 14 (fourteen) months: from January 2024 (when the First Trial Mix was rejected despite demonstrating compliance) to March 2025 (when the Second Trial Mix was approved). This delay was entirely beyond L&T's control and was the direct result of the Engineer's imposition of extra-contractual requirements. The Contractor has Claimed an **extension of time** for completion of the Works equivalent to the period of delay caused by the Engineer's conduct, being approximately 14 (fourteen) months or such other period as may be determined upon detailed delay analysis.

1.7.4 On 4.2. 2025, L&T submitted its Fully Detailed Claim(FDC) to the Engineer. On 25.8. 2025, the same was rejected by the Engineer. L&T notified the Engineer on 2.9. 2025 that it did not concur with the Engineer's determination and that the matter constituted a dispute to be referred to the Dispute Board under Sub-Clause 20.4 of the Contract. Therefore, the dispute no. 3 arose.

1.7.5 The Contractor submitted its Statement of Claims (SOC) on 15.7.2026 to the DB. Initial meeting of DB with the parties was held on 22.7.2026 wherein timelines for various submissions and subsequent hearings were decided and issued under PO-1/Dispute 3, dated 22.7.2026. The Employer submitted its Statement of Defence (SOD) on 14.08.2026.

1.7.6 The Employer denied all the arguments put forth by the Contractor and stated that the claim is not admissible as the Engineer has worked fully within the framework of the contract. The Employer also stated that the first trial mix prepared by the Contractor did not meet the contractual specifications and the Contractor has failed to produce any advice from the CAM Expert to confirm that the CAM Mix-1 proposed by the Contractor, meets the specifications despite major deviations adopted by the Contractor in mix preparation (ingredients and the proportion). The Employer also cited communication received by the Contractor from CAM Expert in February 2025 in which the CAM expert has clearly mentioned that "it is impossible for him to comment on

durability of proposed CAM Mix due to major changes in the composition as proposed by the Contractor". The Employer, therefore, denied the claims of additional cost and time extension put forth by the Contractor and requested DB to grant all cost and expenses of adjudication in favour of the Employer.

1.7.7 The Contractor submitted its rejoinder on 24.8.2026.

1.7.8 Contractor through letter no. MAHSR/T-3/NHSRCL/CONT/OTH/2026 /5635 dated 11.7.2026 advised that it has appointed M/s Khaitan & Co LLP, Noida, Uttar Pradesh, as its authorized Legal Counsels for representing the Contractor in connection with the CAM-related Dispute. The Employer through email dated 3.9.2026 advised that it has appointed M/s UNUC Legal (L.L.P.) as their authorized Legal Counsels.

1.7.9 With the consent of Parties, hearings in connection with the dispute were held in virtual mode. In the preliminary hearing on 22.7.26, schedule for various submissions and dates for hearing were decided. On 12.8.26, review of submissions made was done. Contractor's side made their oral submission on 27.8.26 in two sessions followed by the oral submission and presentation from Employer's side on 08.9.26. Contractor's side made their rejoinder submission and presentation on 14.9.26.

1.7.10 All the hearings were attended by the representatives of the Contractor, Employer and the Engineer. After completion of the submissions and oral hearings, DB had rounds of internal discussions. After considering the rival arguments, DB analyses the dispute and gives its decision as under:

2.0 Contractor's Argument:

2.1 As per the Contractor, the present dispute concerns the Engineer's departure from the contractual approval regime governing Cement Asphalt Mortar ("CAM") - a critical track component in the Project. CAM is a filling material consisting of cement, asphalt emulsion and other ingredients poured into a non-woven bag and inserted between the track slab and the reinforced concrete track bed for supporting the track slab and adjusting the alignment in ballast-less track (Figure-1).

2.2 The Engineer imposed requirements not expressly stipulated in the Contract, including an insistence on CAM Expert endorsement and rigid adherence to a reference composition, which compelled the Contractor to abandon a compliant CAM design mix comprising materials sourced from approved domestic vendors (the "First Trial Mix") and instead, procure materials from other vendors, including Japanese vendors, at significantly higher cost and with consequential delay. The Contractor seeks reimbursement of additional costs incurred (and to be incurred), and an extension of time, as a direct consequence of the Engineer's conduct.

2.3 Package T-3 of the Project, awarded to L&T, involves the design, supply and construction of track works for the Vadodara-Sabarmati section on a design-build

lump sum basis under the Contract. The track works are to be executed using a slab track system, a critical component of which is CAM, a filling material placed between the track slab and the reinforced concrete track bed. The Contract requires L&T to design the CAM mix, including its ingredient composition and weight ratios, and to achieve specified performance parameters. The Contract provides a recommended composition (Table 18 of the Technical Specifications) expressly stated to be "for reference" and not mandatory.

2.4 Between June and December 2023, L&T conducted extensive internal CAM trials in consultation with Nichireki Co. Ltd. (the appointed CAM Expert) ("Nichireki" or "CAM Expert"), and developed a CAM design mix, (being referred as First Trial Mix), that satisfied all prescribed performance parameters. The First Trial Mix was tested on 18th -19th of December 2023 in the joint presence of the Employer, the Engineer and the CAM Expert. The test results demonstrated compliance with every specification laid down in the Contract, including flow time, expansion ratio, bleeding ratio, air content and compressive strength.

2.5 Despite this demonstrated compliance, on 30th of January 2024, the Engineer rejected the First Trial Mix and thereafter issued series of Notices of Objection (NOO) on **shifting and progressively expanded grounds**. These objections were, *inter alia*, based on an insistence that the CAM Expert must formally endorse or certify the trial mix, a requirement that finds no express basis in the Contract. The Contract requires only the 'deployment' of a CAM Expert to supervise trial mixing and does not require certification, endorsement or sign-off by such expert as a condition for approval.

2.6 As per the Contractor, the CAM Expert confirmed that the First Trial Mix met the regulations for **fresh properties** and compressive strength. The CAM Expert's reservations in granting endorsement of the First Trial Mix were not based on any failure to meet contractually stipulated technical specifications. Rather, it stemmed from the CAM Expert's position that, as a matter of Japanese practice, it could not endorse a mix incorporating alternatively sourced components / ingredients of CAM without extended verification of up to 36 months in a Japanese laboratory. This was a practice-based limitation, not a finding of non-compliance with the Contract. Crucially, under the Contract, it was the Engineer, and not the CAM Expert, who was vested with the authority and responsibility to approve the CAM Trial Mix. The CAM Expert was required to be deployed only to assist in mixing of the CAM, not to approve it. By insisting on the CAM Expert's sign-off or endorsement as a condition for approval, the Engineer sought to outsource its own contractual function of approval and verification, contrary to the terms of the Contract.

2.7 Faced with this deadlock, where the Engineer would not approve the First Trial Mix without CAM Expert endorsement, and the CAM Expert would not endorse a mix using Indian-sourced components, L&T was left with no reasonable alternative. Any further delay in resolving the CAM approval impasse would have had cascading consequences on the entire track works programme, potentially affecting other packages and the overall Project timeline. In these circumstances, L&T was practically

compelled to abandon the compliant First Trial Mix and instead procure CAM components from Japanese sources at substantially higher cost, so as to obtain the CAM Expert's endorsement and, through it, the Engineer's approval.

2.8 L&T accordingly conducted trials on second trial mix on 15th of January 2025 using Japanese-sourced components ("Second Trial Mix"). The Second Trial Mix was approved by the Engineer on 25th of March 2025.

2.9 Contractor submitted that the shift from approved vendors from India to constricted sourcing from Japanese vendors, was not a matter of contractual mandate, commercial choice or procurement preference – it was the direct and inevitable consequence of the Engineer's reliance on extra-contractual parameters for exercising its approval function.

2.10 On 4th of February 2025, L&T submitted its Fully Detailed Claim (FDC) to the Engineer. On 25th of August 2025, the same was rejected by the Engineer. L&T notified the Engineer on 2nd of September 2025 that it did not concur with the Engineer's determination and that the matter constituted a dispute to be referred to the Dispute Board under Sub-Clause 20.4 of the Contract.

2.11 By way of the instant claim, L&T seeks: (a) reimbursement of additional costs under Sub-Clause 20.1 arising from the compelled shift to Japanese-sourced CAM components; and (b) an extension of time under Sub-Clause 8.4, read with Sub-Clause 20.1, for the delay caused by the Engineer's administration of the approval process. The delay and additional cost were entirely beyond L&T's control and are directly attributable to the Employer's conduct through the Engineer.

2.12 The Contractor briefly describes the Contract document and relevant Contract Provisions in his SOC. The Contract is a composite document comprising multiple parts. For the purposes of the present dispute, the key contractual documents are:

- (i) The General Conditions of Contract ("GCC"): The standard FIDIC Yellow Book (1999 edition), which governs the overall relationship between the parties.
- (ii) The Particular Conditions ("PC"): These amend and supplement the GCC for this Project, including how the Engineer must exercise its authority and respond to the Contractor's submissions.
- (iii) The Employer's Requirements - Design Requirements and Criteria ("ER-DRC"): L&T's obligation to design the CAM mix is set out in this document, including the critical Clause 6.14, which gives L&T, the autonomy to determine the composition and weight ratios of CAM constituents.
- (iv) The Employer's Requirements - Technical Specifications ("ERTS"): This contains the detailed parameters for determining contractually acceptable technical properties of CAM Mix – the materials, the trial mixing process, the role of the CAM Expert, the reference composition in Table 18 and the tests that it must be subject to prior to approval.

- (v) The Employer's Requirements General Specifications ("ERGS"): This sets out the framework for how the Engineer responds to any document, design or report submitted by the Contractor for approval. The Engineer's response must fall into one of the 4 (four) categories [NOO, NONO, NONOC and NR] laid therein and each category has a defined meaning and consequence.
- (vi) The Contractor's Technical Proposal: This contains details regarding available vendors for CAM components, including responses to pre-bid queries. It forms part of the Contract and is relevant to the assessment of vendor eligibility and sourcing options.

2.13 Further, the Contractor has detailed the 'Contractual Framework Governing CAM Approval'. The key elements are as follows:

- (i) **Nature of the Contract: Design-Build:** The Contract is a design-build one. L&T bears primary responsibility for design, including fitness for purpose. L&T is "responsible for the design of the Works and shall ensure that his design is accurate and in compliance with the Contract" and that "when the Works are completed, they shall be fit for the intended objective". The Engineer's role is to review L&T's submissions and limited to ensuring their compliance with the Employer's Requirements - it is a review-based function, not a substitutionary one. **The Engineer evaluates L&T's design but does not supplant it with an independent design regime.**
- (ii) **L&T's Design Autonomy Over CAM:** Clause 6.14 of the ER-DRC expressly places primary responsibility for CAM design on L&T: *"CAM shall be used between the Track slab and RC Track Bed as Filling material. The Contractor shall Design CAM [including ingredient composition (weight ratio)] to ensure required CAM properties as prescribed under Appendix 7, Technical Specifications and relevant Specifications as per Sub-Division 01050, Technical Specifications to obtain approval of the Engineer."* This provision is critical. **It vests in L&T, the autonomy to determine the ingredient composition and weight ratios of the CAM mix**, so long as the same is compliant with the Employer's requirements and meets the technical specifications laid down in the ERTS.
- (iii) **Requirement of Prior Approval for CAM Materials:** Clause 7.1 of Subdivision 01050 of the ERTS requires that constituent CAM materials be approved by the Engineer prior to execution. This approval operates at 2 (two) levels: (i) approval of individual materials and vendors (Clause 3.17 Subdivision 01000 of the ERDRC), and (ii) approval of the integrated CAM design mix [Clause 7.7 (d.) Subdivision 01050 of the ERTS]. However, this approval authority must be exercised within contractual limits; it cannot be withheld on extraneous or noncontractual grounds. Under Clause 7.7(d), L&T is required to conduct the tests prescribed in Subdivision 01050 and submit the test results for approval by the Engineer. Where the CAM design mix meets the stipulated technical specifications and passes the tests laid down in Clause 7, the **Engineer has no contractual basis to withhold approval.**

- (iv) ***Trial Mixing and the CAM Expert Requirement - Deployment, Not Certification*** - Clause 7.3 of Subdivision 01050 of the ERTS mandates that the Contractor shall design CAM either by subcontracting the trial mixing work to firms having at least 3 (three) years of experience of Supply and Installation of CAM, as used in Shinkansen High Speed Rail, or design itself by deployment of an expert. The relevant portion of Clause 7.3 of Subdivision 01050 of the ERTS is extracted as follows:

"Contractor shall deploy either an expert from or sub-contract the trial mixing work to, firms having at least 3 years' experience of supply and installation of CAM, as used in Shinkansen HSR."

Thus, from Clause 7.3, it is evident that the Contract requires L&T to 'deploy' such an expert or firm. **It does not require certification, endorsement or sign-off by such CAM expert as a condition for approval of the CAM mix.** This distinction is central to the present dispute. The natural and ordinary meaning of word "deploy" is to engage or utilise – it connotes participation and supervision, not a power of approval or veto.

- (v) ***Table 18 Composition - Reference, Not Mandatory –***

Clause 7.3 of Subdivision 01050 of the ERTS also provides a recommended composition of quantities of CAM materials in Table 18. The heading of Table 18 itself reads: *"Composition of quantities of CAM materials (for reference)"*. This composition is expressly indicative and for reference and is not framed as a mandatory or immutable prescription. **L&T is entitled to deviate from the reference composition so long as the performance criteria are satisfied.**

- (vi) ***Limits on the Engineer's Power - The Classified Distinctions Framework –***

The distinction between an NONOC and an NOO is of critical importance to the present dispute. An NONOC allows L&T to proceed with the Works while addressing the Engineer's comments. It is the appropriate response where the issues are minor and not fundamental. An NOO, by contrast, brings work to a halt. It is a serious step that should only be taken when there is genuine, fundamental non-compliance with the Contract. If the Engineer issues an NOO on grounds that do not meet this threshold, for instance, on the basis of a deviation from a reference composition, or the absence of a signature that the Contract does not require, then the **NOO has been improperly issued**, and the consequences of the resulting delay must be borne by NHSRCL, not by L&T.

- (vii) ***Testing Framework - Flexible, Not Prescriptive-***

Appendix 7 of the ERTS (Guide for Track Design or "GTD") adopts a broad and flexible performance verification regime. CAM is classified as a "Track Component" under the GTD, and forms part of the track structure. Clause 1.1.71(4) of the GTD provides the design basis for Track Components, which includes CAM. It states that if track components have gone through the analysis and tests and also fulfilled required specifications in the past for similar design conditions, then empirically applied specifications shown in the

GTD can be used for such track components. In such cases, performance verification for Track Components is deemed to satisfy required performance. This creates a presumption in favour of the Contractor that 'performance verification for CAM has been achieved'. Moreover, the **performance verification framework does not mandate any exclusive method of verification for CAM, nor does it require additional testing beyond what the Contract prescribes.**

Further, as discussed hereinabove, Clause 7.7 of Subdivision 01050 of the ERTS prescribes the specific tests to be conducted and the objective acceptance criteria: (i) Consistency test (flow time measurement), to be tested within 60 (sixty) minutes of CAM mixing, with the standard values for Unhardened CAM prescribed in Table 19 (flow time of 16-28 seconds); (ii) Expansion ratio and Bleeding ratio test, with Table 19 prescribing expansion ratio of 1-3% and bleeding ratio of 0%; (iii) Air content test, with Table 19 prescribing air content of 8-12%; and (iv) Compressive strength test, with Table 21 prescribing standard values of 0.1 N/mm² at 1 (one) day, 0.5 N/mm² at 3 (three) days, 0.7 N/mm² at 7 (seven) days, and 1.8 N/mm² at 28 (twenty eight) days. The time and frequency of testing are prescribed in Table 20.

There is no additional contractual requirement beyond compliance with these prescribed parameters. **The Engineer cannot insist on a single method of verification or impose a heightened standard not traceable to the Contract.**

(viii) No Contractual Basis for Requiring a Second Trial Mix –

Crucially, there is no provision in the Contract that empowers the Engineer to require L&T to conduct a second trial mix where the first trial mix has demonstrably met all prescribed performance parameters. The Contract prescribes that trial mixing of CAM shall be tested as a "Type Test" - defined as "a test conducted by the manufacturer or a third party to confirm that the specifications specified in the bidding documents can be satisfied prior to mass production". Once the Type Test is successful (i.e. the prescribed specifications are satisfied), **there is no contractual basis for the Engineer to, directly or indirectly, insist on repetition using alternative materials or sources.** Any such insistence constitutes an act beyond the contractual authority of the Engineer.

(ix) Make-in-India Framework and Eligible Source Countries:

The Contract reflects the broader "Make in India" policy framework. Section V of the Contract (Eligible Source Countries of Japanese ODA Loans) specifies that only 5 (five) items are mandatorily sourced from Japan. Significantly, of the 9 (nine) components of CAM, only Polymer Emulsion is required to be procured from Japan. The pre-bid clarification dated 15th of November 2021 confirmed this position. All other CAM components, including

asphalt emulsion and anti-foaming agent, were to be sourced domestically. This confirms that the **use of domestically sourced CAM components was contemplated by the Contract.**

2.14 The Contractor submitted that, *over a period of approximately 14 (fourteen) months (January 2024 -March 2025)*, the Engineer rejected a compliant CAM design mix on **shifting and progressively expanded grounds**, ultimately imposing a requirement for CAM Expert endorsement that has no express basis in the Contract. This compelled L&T to abandon domestically sourced CAM components and instead procure materials from Japanese sources at significantly higher cost.

2.15 Chronology of various events pertaining to this dispute, is detailed by Contractor in **section -VI, FACTS LEADING UP TO THE DISPUTE**, of the SOC.

2.16 Contractor(L&T) has requested the Dispute Board to:

- (i) Declare that the Engineer's conduct in rejecting the First Trial Mix and imposing the CAM Expert endorsement requirement was not in accordance with the Contract;
- (ii) Order and direct NHSRCL to pay L&T an amount of INR 13,96,00,000 (Indian Rupees Thirteen Crore Ninety-Six Lakh) and JPY 9,62,00,000 (Japanese Yen Nine Crore Sixty Two Lakh) towards reimbursement of additional / differential costs incurred by L&T till 31st of December 2025, on account of the compelled shift from domestically-sourced CAM components to Japanese sourced CAM components;
- (iii) Declare that L&T is entitled to reimbursement of additional /differential costs to be paid by NHSRCL towards the costs that L&T shall incur in sourcing CAM components from Japanese sources during the completion of the Project, the quantum of which shall be determined by multiplying the additional / differential unit cost per slab (as tabulated in this Statement of Claim) with the total number of slabs of each type laid at the completion of the Project;
- (iv) Order and grant L&T an extension of time for completion of the Works equivalent to the period of delay caused by the Engineer's conduct, being approximately 14 (fourteen) months or such other period as may be determined upon detailed delay analysis;
- (v) Order and direct NHSRCL to pay L&T the costs of and incidental to this referral to the Dispute Board;
- (vi) Order and direct NHSRCL to pay L&T interest on all amounts awarded, at the Bank Rate (fixed by RBI) plus 3% for the pre-reference, pendente lite and future interest; and
- (vii) Order and grant such further or other relief as the Dispute Board may deem fit and proper in the circumstances.

2.17 Contractor's Pleading in Rejoinder hearings:

Contractor in his Rejoinder pleading, stated following additional points apart from his arguments given in SOC:

- (i) To demonstrate active involvement of the CAM expert, Counsel of the Contractor produced two emails from CAM expert dated 4.10.2023 (relating to some change of personnel) and dated 10.10.2023 (here the CAM expert has stated that the formulation does not meet the requirements).
- (ii) When asked specifically whether there is any other written communication from the CAM expert between 10.10.2023 and 3.2.2025, Counsel of the Contractor denied and stated that the communications from CAM expert were verbal only and he witnessed the 18-19th December 2023 trials of first CAM mix (Trial Mix-1) as well as the trials of second CAM mix (Trial Mix-2) in March 2025.
- (iii) Counsel of the Contractor further submitted that as per the guidance of the CAM expert, about 63 trial mixes were tried before the finalising Trial Mix-1.
- (iv) Both Trial mixes i.e. Trial Mix-1 and Trial Mix-2, passed the required tests as per ERTS Clause 7.7 and presented comparative summary of the testing results of the two trial mixes. Engineer deliberately rejected the Trial Mix-1 to compel the Contractor to use imported (Japanese) constituents for the CAM mix.
- (v) Contractor clarified that the CAM mix used for Training and Certification (T&C) purposes was different than Trial mix-1 and this was used with the approval of the Engineer.

3.0 Employer's Defence:

Employer denied all the Contractor's allegations stating these to be factually inaccurate, contractually unfounded, and unsupported by the contemporaneous records and the applicable contractual provisions and submitted following arguments:

3.1 The Employer argued that the Contractor has based its Claim on the **erroneous premise that its First CAM Trial Mix ("First Trial Mix" or "CAM Mix - 1") was an acceptable and contractually compliant CAM composition**, which is incorrect and denied. The First Trial Mix failed to demonstrate compliance with the contractual requirements, as recorded by the Engineer vide Letter No. 0145 dated 30.01.2024, including deficiencies relating to the CAM composition, constituent materials, vendor approvals, testing and supporting documentation [Employer's Exhibit-10]. The subsequent Second CAM Trial Mix ("Second Trial Mix"), after addressing the deficiencies and with the requisite involvement of the CAM Expert, was approved by the Engineer [Employer's Exhibit-17]. The approval of the Second Trial Mix in March 2025 does not establish that the First Trial Mix was compliant or that the Contractor is entitled to any additional payment or Extension of Time. Till the time a trial mix is approved, it is erroneous to term the "next trial mix" as "Second Trial Mix".

3.2 The Contractor's assertion that the Engineer departed from the contractual approval regime governing CAM is misconceived and is expressly denied. It is submitted that, the Engineer has acted within the authority conferred upon it under

the Contract, including the General Conditions, Particular Conditions, Employer's Requirements and Technical Specifications, and exercised its contractual powers to review, verify, inspect and assess the proposed CAM Trial Mix for compliance with the Contract [Employer's Exhibit-24].

3.3 The Contract does not confer upon the Contractor any unrestricted or automatic right to approval of a proposed CAM composition merely because the Contractor has elected to use domestically sourced materials. Any such composition, together with its constituent materials, testing methodology and testing equipment, was required to demonstrate compliance with the applicable contractual and technical requirements including the prescribed performance, durability, safety and operational requirements. The burden of establishing such compliance lay squarely upon the Contractor, and unless such compliance was satisfactorily demonstrated, no contractual entitlement to approval could arise.

3.4 The Employer further stated that the allegation that the Engineer imposed additional contractual requirements, including a mandatory endorsement by the CAM Expert, is misconceived and is expressly denied. It is submitted that the Engineer did not introduce any new contractual obligation; rather, it required the Contractor to demonstrate compliance with the existing contractual requirements governing the development, testing and approval of the CAM Trial Mix, including the requisite involvement of the CAM Expert under the Contract. Given the critical function of CAM as a buffer material within the ballastless track system and the Contractor's proposed deviations from the established and proven Japanese Shinkansen CAM system, the Engineer was fully justified in requiring adequate technical substantiation of such deviations. Such verification was a legitimate exercise of the Engineer's contractual functions to satisfy itself that the proposed CAM composition and methodology would meet the applicable contractual performance and durability requirements, including those prescribed under Appendix 7, Employers Requirement, Technical Specifications [Employer's Exhibit -3].

3.6 The Employer also submitted that all the 'non-compliances' were recorded in the Engineer's first report dated 30.01.2024 [Employer's Exhibit -10]. There is no case of Notices of Objection on **shifting and progressively expanded grounds** from Engineer's side which is evident from 'Comment Resolution Sheet' enclosed with Engineer's letter dated 5.6.2024 [Employer's Exhibit -34] in which the comparative status of Engineer's Comments and Contractor's Compliance, are compiled and shown in one place.

3.7 Employer denying the Contractor's allegation that the Engineer rigidly insisted upon adherence to the reference composition is misconceived and stated that the First Trial Mix was not rejected merely on account of deviations from the reference composition; rather, the Contractor failed to satisfactorily demonstrate that the proposed deviations would meet the applicable contractual performance and durability requirements.

3.8 The Engineer's observations pointed out the significant change in CAM composition and density, absence of satisfactory technical substantiation, non-submission of the requisite CAM Expert involvement, and deficiencies in testing and supporting documentation. Accordingly, the Engineer's decision was founded on the Contractor's failure to establish contractual compliance and was not based on the geographical origin of the constituent materials or the identity of their suppliers.

3.9 The Contractor's allegation that it was compelled by the Engineer to abandon the First Trial Mix is misconceived and denied. The technical and performance requirements governing the CAM mix, including the approval criteria and compliance obligations, formed part of the Contract Documents and were available to the Contractor prior to submission of its bid. Having submitted its bid and entered into the Contract, the Contractor accepted and assumed responsibility for developing, testing and demonstrating the compliance of the CAM mix with the contractual requirements. Accordingly, any subsequent revision of the First Trial Mix, replacement of constituent materials, or procurement of materials from Japanese or other vendors was undertaken solely by the Contractor as part of its contractual obligation to achieve compliance and cannot be attributed to any post-award instruction, additional requirement, or departure from the Contract by the Engineer.

3.10 Employer stated that the Contractor has failed to identify any provision of the Contract under which the Engineer assumed responsibility for the Contractor's procurement strategy, selection of constituent materials or suppliers, product development, laboratory testing, or optimisation of the CAM Trial Mix. These matters fell within the Contractor's contractual responsibilities, and the associated risks remained with the Contractor. Accordingly, the consequences arising from the Contractor's procurement or design choices cannot be attributed to the Engineer in the absence of any instruction or act or omission on the part of the Engineer.

3.11 Consequently, any additional costs allegedly incurred through procurement of materials, engagement of different suppliers, repeated trial mixes, product development, testing, or related activities arise exclusively from the Contractor's own techno-commercial decisions and inability to establish compliance with the Contract. Such costs constitute Contractor's obligations (risk) and do not give rise to the right to any additional payment or extension of time under the Contract.

3.12 Similarly, any delay associated with redesign, material substitution, unsuccessful trial mixes, procurement from alternative suppliers, or obtaining technical support resulted directly from the Contractor's own actions or inactions and failure to timely develop and submit a compliant CAM composition capable of satisfying the contractual requirements and cannot be attributed to the Engineer or the Employer.

3.13 Employer cited following conditions of Contract relevant to CAM:

(i) "Provisions regarding Scope and Design (relevant to the Claim):

Sub-Clause 2, Sub-division 01010 Employer's Requirements (General Specifications) 'Description of Scope' states that "The work under this Contract

shall be suitable for maximum design and operating train speed of 320 Km/h" [Employer's Exhibit -1].

Sub Clause 1, "Project Profile and Background of Sub-division" 02010, "PROJECT" of the Employer's Requirements (General Specifications) states that "The Mumbai - Ahmedabad High Speed Railway (MAHSR) Project has been designated as the first HSR networks planned to be constructed in India. For this network, the Japanese system of the Shinkansen Bullet Train has been selected for its safety performance and reliability record. " [Employer's Exhibit -2].

(ii) Appendix 7: Guide for Track Design (GTD)

"General - Scope of application

The performance of track structure in MAHSR shall be verified according to this Guide. However, when the performance specified in this Guide is confirmed to be satisfied through special consideration, the optimal method not stipulated in this Guide may be adopted.

The design of track structures and track material or components to be applied to Mumbai Ahmadabad High-Speed Railway Project in India (hereinafter referred to as "MAHSR") is based on Schedule of Dimensions (hereinafter referred to as "SOD") and Track Technical Manual of Specifications and Standards (hereinafter referred to as "TTMSS"). The design regulates Guide for Track Design (hereinafter referred to as "GTD") as the GTD as an explanation of a design standard for MAHSR, extracting the contents related to MAHSR in association with the bar sentences of the Design Standards of Railway Structures (Track Structure) (hereinafter referred to as "the Standard") in Japan, which is listed in the reference book as the SS of the TTMSS.

(iii) Design fundamentals - Objective of design

The track must conform to its objectives and be economical and safe. The track structure must be designed such that the trains can travel safely and smoothly while being secured against the forces applied during construction and during operation.

(iv) Basis of design method

The design of the track structure shall be checked for achievement of the required performance during the design life. However, the requirement does not apply to track structures based on specifications (Empirically applied specification) that have been checked to meet the required performance by the method described in this GTD.

For ballastless tracks such as the slab track, the design life of 50 years is a thumb rule, assuming that maintenance will be conducted under the natural environmental conditions.

(v) Required performance and performance verification - General

In the performance verification for track structures, the required performance is defined according to the purpose of use, and appropriate verification indices are used to check the conformity to required performance. Two performance items are defined for track structures, and these are safety and serviceability Table 7-1 shows these performance items, verification indices, and actions to be considered.

Table 7-1: Required performance of track structures [Employer's Exhibit-3]

Required performance	Performance item	Verification index	Action
Safety	Running safety	Displacement	All actions that occur during the design life and their repetition Infrequent randomly occurring action with large effect
	Failure, fatigue failure	Strength, Stress	
	Public safety (ballast flying)	Wind speed, Fallen snow	
Serviceability	Ride comfort	Irregularity	

Required performance	Performance item	Verification index	Action
	Defect	Durability	Actions that occur frequently during the design life and their repetition
	Sound noise and vibration	Sound noise level, vibration level	
	Appearance	Crack width	Action levels that occur relatively frequently during the design life
	Track maintenance	Irregularity	

(vi) Sub-clause 7.1 Division 01050 'Slab Track', Employers Requirements, Technical Specifications (ERTS)

" Before execution, the approval of the Engineer shall be obtained for the constituent CAM materials. The required specifications for the CAM components are provided below" [Employer's Exhibit -4].

(vii) Sub-clause 7.3 Division 01050 'Slab Track', Employers Requirements, Technical Specifications (ERTS)

"CAM materials shall be compounded and mixed in accordance with the following provisions:

(a) Contractor shall deploy either an expert from or sub-contract the trial mixing work to, firms having at least 3 years' experience of supply and installation of CAM, as used in Shinkansen HSR. The Claimant shall test CAM as per Sub-Clause 7.7 of these Technical Specifications"

The recommended composition of quantities of CAM materials is shown in Table-18 below:

Table 18: Composition of quantities of CAM materials (for reference) (Quantities per one m3 of CAM)

Asphalt emulsion A (kg)	Polymer emulsion P (kg)	Water (kg)	Fine Aggregate (kg)	Cement (kg)	Admixture (kg)	Aluminium powder (g)	Anti-Foaming agent (g)	AE agent (kg)
441	63	63 or less	630	284	32	41	158	7.9

(b) (i) Trial Mixing of CAM shall be tested as Type Test.

And,

Contract Agreement, Vol 3 Part -1, Division 01050 'Slab Track', Clause 7, subclause 7. 7, mentions,

'(a) CAM tests and test records shall be submitted to the Engineer. The following tests and checks shall be conducted during execution'

'(d) The Claimant shall conduct each test to ensure uniform quality and submit the results for approval of the Engineer'."

3.14 The express requirement (sub-clause 7.3 (a)) demonstrates that the Contract contemplated **involvement of specialised CAM expert or to sub-contract** the work of trial mixing to a firm having at least 3 years' experience of supply and installation of CAM, as used in Shinkansen HSR.

This requirement also demonstrates that the Contract contemplated the involvement of specialised technical expertise in the development, testing and validation of the CAM mixing, beyond mere compliance with the prescribed material and testing parameters under the ERTS. The requirement for such specialised expertise assumes particular significance where the proposed CAM composition departs from the recommended composition or otherwise involves material changes requiring technical substantiation. Accordingly, the Contractor was required to utilise the CAM Expert in accordance with the Contract and to furnish appropriate technical evidence demonstrating that the proposed CAM composition satisfied the requisite contractual performance and durability requirements.

3.15 It also is clear that this responsibility (CAM trial mix) cannot be discharged solely by the Contractor i.e. without the involvement of the CAM Expert [Exhibit -4]. CAM trial-mix, therefore, cannot be accepted if, prepared or produced without the involvement/guidance of CAM expert. Modification, required, if any, in quantities of recommended composition to produce a compliant CAM mix, can be decided by CAM expert or specialised firm based on their experience in CAM used in Shinkansen.

3.16 Denying the contention of the Contractor that the CAM expert was 'deployed' (as per the dictionary meaning of the word 'deploy'), the Employer side argued that the word has to be interpreted in its "contextual meaning". Both Parties have understood the meaning of 'deployment' in contextual sense under sub-clause 7.3(a) of ERTS. The CAM expert is required to actively involve and guide the Contractor in CAM trial mix design. This is evident from the clauses 1.3, 1.4 and 1.5 of the Service Agreement entered by the Contractor with the Nichireki Co. Ltd (the CAM expert). The Contractor failed to demonstrate CAM expert's active involvement in the Trial Mix-1 design and also advice on omitting use of AE agent from the mix. In fact, copy of this Service Agreement was not provided by the Contractor to the Employer, before the SOC.

3.17 Sub-clause 7.7 Division 01050 'Slab Track', Employers Requirements, Technical Specifications (ERTS) *"CAM tests: (a) CAM tests and test records shall be submitted to the Engineer.*

The following tests and checks shall be conducted during execution:" [Exhibit -4].

3.18 Contractor's understanding on sub-clause 7.3 ERTS

The Contractor has submitted document from Nichireki Co. Ltd, confirming that they have over three years of proven experience in Japan, Shinkansen highspeed rail for supply and installation of CAM (Cement Asphalt Mortar) vide Annexure C-6 of the Contractor's SOC.

3.19 The Contractor has also submitted "Service Agreement between L& T (the Contractor) and Nichireki Co. Ltd," entered on 22nd of May 2023 vide Annexure C-7 of the Contractor's SOC (this was never submitted/provided to the Engineer/Employer before), have following provisions (relevant extract only reproduced):

"Service Agreement, Recital Clause (E),

"L& T shall conduct trial mixing of Cement Asphalt Mortar in India. Nichireki shall provide necessary technical support and supervise the Trial Mixing work carried out by L& T in India."

"1. Nichireki's Services

1.1 Nichireki shall provide Technical Guidance to L& T to prepare CAM as per the requirement of T-3 Project.

1.2 Nichireki shall dispatch Engineer with Rich Experience in preparation of CAM to L& T's designated place in India.

1.3 Nichireki's Engineer shall provide required support to L& T and supervise the CAM Trial Mixing work carried out by L& T.

1.4 Nichireki shall analyse the results of each trial mix and advise necessary modifications required for achieving the CAM parameters as per the requirement of T-3 Project.

1.5 Nichireki shall advise L& T about the specifications of all components of CAM including Asphalt Emulsion, Admixture, etc. to prepare CAM as per the requirement of T-3 Project.

1.6 Nichireki shall supply Polymer Emulsion required to carry out Trial Mixing works and will be procured and compensated by L& T". [Employer's Exhibit-6)."

3.20 These provisions demonstrate that the Contractor was aware of the contractual requirement to develop the CAM Mix under the supervision of the CAM Expert, i.e., Nichireki, necessary modifications required for achieving the CAM parameters as per the requirement of T-3 Project. Providing specifications for Asphalt Emulsion and Admixture etc. was also kept in the services to be provided by Nichireki.

3.21 However, despite such understanding, the Contractor failed to submit any contemporaneous evidence demonstrating that its internal Trial Mixes were conducted in association with, or under the supervision or guidance of, the CAM Expert. Further, no evidence of the CAM Expert's review, recommendation, verification or consent to the composition of the First Trial Mix was submitted to the Engineer despite his repeated observation and demand.

3.22 The Employer further stated that as per the monthly review meeting (**29.08.2023**) (Annexure C-8 of the Contractor's SOC), relevant part is reproduced as under [Exhibit -7]:

*"The CAM is still undergoing an internal trial test. Final confirmation is expected by the end of this month. Asphalt emulsion will be manufactured specifically for this project. **Testing is underway, including with Nichireki engineers**"*

3.23 Contractor's First Trial Mix:

Employer further stated that the Contractor did some trials to achieve CAM fulfilling the contractual requirement pertaining to CAM's properties in liquid and solid state (trials are indicated in SOC as Annexure C-57, though not shared earlier). From this, it is clear that these were carried out by the Contractor without the involvement of CAM expert i.e. not adhering to the condition of the Contract. [Exhibit -8].

3.24 Thereafter, the Contractor requested the Engineer and Employer to witness CAM trials (First Trial Mix) vide #1053 dated 12-12-2023 [Exhibit -9]. The

composition used vis-a-vis provided as Recommended (for Reference) in the Contract (as Table-18 in sub-clause 7.3, Division 01050, ERTS). [Exhibit -4] was as follows:

S. No.	CAM Component	Quantity (in kg) Used (in per 1 cum of CAM)	Quantity (in kg) Recommended (per 1 cum of CAM)
1	Asphalt Emulsion	407	441
2	Polymer Emulsion	57	63
3	Admixture	32	32
4	AE Agent	0	7.9
5	Anti-Foaming Agent	0.158	0.158
6	Aluminium Powder	0.05	0.041
7	Cement	284	284
8	Sand	630	630
9	Water	5	63 or less

The Contractor changed the composition to a large extent (8-10%) i.e. Asphalt emulsion (from 441kg to 407 kg), Polymer emulsion (from 63 kg to 57 kg), **AE agent not used (i.e. from 7.9 kg to 0)** overall nearly 7% less compared to recommended composition.

3.25 The Engineer's Assessment (Notice of Objection, 'NOO') for the First Trial Mix:

The Engineer has provided its observation vide letter 0145 dated 30-01-2024, [Exhibit -10] part contents are reproduced as under:

"The Engineer observed that the total weight of the CAM Design Mix proposed by the Contractor was approximately 7% lower than the Design Mix specified in the Technical Specifications. Such reduction had the potential to alter the density of the CAM and, consequently, its mechanical properties, including Elastic Modulus and Fatigue Strength."

The Engineer, therefore, required that the implications of the proposed change in density and consequent mechanical properties be duly ascertained at the relevant temperatures in consultation with the CAM Expert, in accordance with TS 1050.

3.26 The Engineer further observed that any change in the density and mechanical properties of the CAM could have a consequential effect on its **durability and fatigue performance** under dynamic loading over the long term. Given that the Contract contemplated a minimum 50-year design life for CAM, comparable to the other Track components, the Contractor was required to ascertain and demonstrate, in consultation with the CAM Expert and in accordance with TS 1050, that the proposed change in density and mechanical properties would not adversely affect the required design life and performance of the CAM.

3.27 The Engineer also observed that “as AE agent is not proposed to be used with design mix, while mixing large quantity of CAM in CAM injection car, not having AE agent may lead to formation of large-size air bubbles entrapped in the CAM permanently which may also cause change in many properties of CAM and **significantly reduce life of CAM.**

Contractor deployed Nichireki i.e. CAM Expert with more than three years of experience in supplying and installing the CAM used on Shinkansen HSR to test the CAM. However, the **report from CAM Expert on proposed design mix has not been submitted.**”

These Remarks/Observation regarding testing of materials and status of vendor approval is given as Annexure -1 to the Engineer’s Letter referred above [Exhibit-10].

(Please see on next page)

Vendor Approval Summary for First Trial Mix (as on 18th & 19th Dec 2023)					
CAM Component		Vendor Approval		Material Status	
		(Manufacturer)	Approval Status	Test Report	Compliance Status
1.	Asphalt Emulsion	Hindustan Colas Pvt	NOO	Submitted	Yes
2.	Polymer Emulsion	Sojitz Corporation (M/s. Nichireki.)	NONO	Submitted	Yes
3.	Admixture		Not Submitted	Not Submitted	Not Known
4.	AE Agent	CBS Chemical	NOO	Submitted	Not Known. As results as per JIS A 6204 Not submitted.
5.	Anti-Foaming Agent	OMTEX Chemical Pvt. Ltd.	NONOC	Submitted	Yes
6.	Aluminium Powder	PRAYOSHA Chem Enterprise (LOBA Chemie Pvt. Ltd)	NOO	Submitted	Not Known. As results as per Type 2 JIS K 5906 Not submitted.
7	Sand	Yagna Infrastructure & Balkrishna Enterprises	No. Not relevant to sand for CAM Mix (Proposed for RMC Mix)	Not Submitted	Not Known.
8.	Cement	M/s Aditya Cement Works (Ultratech Cement)	NONO	Submitted	Ok
9.	Water	-	-	Submitted	Ok

3.28 Thus, it evident that as on 12.12.2023, only three (3) out of the nine (9) constituent materials (Cement, Sand and Anti-Foaming Agent) had approved vendors. The remaining six (6) materials were either rejected or remained unapproved or not proposed by Contractor till 12.12.2023 i.e. the date of invitation for witnessing trials of First Trial Mix [Exhibit -10] due to noncompliance with the Contract Specifications, Technical Specifications and applicable JIS Standards.

3.29 The Employer further stated that the Contractor continued developing and finalized its CAM Design Mix using materials from unapproved vendors.

3.30 28 days strength was not provided. Samples were not taken as per the requirement (only two instead of three). [Exhibit -10].

3.31 Opinion of CAM Expert on First Trial Mix:

The Employer also submitted that the Contractor has not submitted any document, technical details, analysis report, or other supporting evidence from the CAM Expert to demonstrate compliance with the Engineer's observations communicated vide Letter No.0145. However, the Contractor subsequently obtained the CAM Expert's views/opinion on the First Trial Mix through its email dated 13th of February 2025 (though its purpose at this stage is best known to the Contractor, as the request has been made after preparation of Second Trial Mix), this is known from the Contractor's submission of Annexure-C37 of SOC (not submitted earlier to the Engineer/Employer). [Exhibit -11].

The excerpts from CAM Expert's mail dated 13.2.2025 to the Contractor are as under-

" ...the composition and manufacturers are different from the standard. Therefore, it is impossible to say whether this is acceptable without conducting performance evaluations other than the standard mentioned "

In this context, it is to be informed that various combinations of Asphalt Emulsion from India (Hincol, ITPL, etc.), AE agent from different suppliers and Polymer Emulsion from Nichireki but could not meet the specification provided in the Contract. Practice in Japan does not allow to alter any composition other than that of Water and Aluminium powder and manufacturers of CAM components.

Therefore, we apprehend that performance verification tests are required. But the details of such tests are not provided in the Contract and to prove that design life requirement is met could take approximately 36 months of rigorous testing at a proven laboratory in Japan according to the JICA/JICC follow-Up Study for Mumbai-Ahmedabad High Speed Railway Corridor, 2018.1 for NHSRCL."

3.29 Therefore, the Employer concluded from above, it is evident that the ratio(s) of ingredients provided as Recommended proportion are in some way sacrosanct, but some ingredients are required to be modified to make compliant CAM, therefore, it is provided as Reference.

3.30 Performance verification is part of the Contract as per Appendix-7 GTD. The Contractor has to perform the same, if Contractor adopts the design, other than the conditions for which the same is exempted (i.e. pre-verified) based on the use on Japanese Shinkansen. This corroborates the concerns raised by the Engineer while reviewing the First Trial Mix and later confirmed by CAM Expert also.

3.31 Contractor's Acceptance for further Trials with Use of all Materials (AE agent):

The Contractor submitted First Trial Mix without the use of AE Agent. In this regard the Contractor accepted (vide its letter #1452 sr.no. 3 [Exhibit -12]) that "Claimant acknowledges Engineer's comment and shall look into the possibility of

using AE agent for alternative design mixes." This indicates that First Trial Mix was not final from Contractor's perspective also. The Contractor, however, not submitted any Trial Mix in consideration of composition of CAM Mix with AE Agent prior to submission of Second Trial Mix.

3.32 Performance of First Trial Mix Composition during T&C:

Though, the First Trial Mix was not found acceptable and therefore, the Engineer has issued 'NOO' however, the Engineer accorded permission to use the CAM composition based on First Trial CAM for the use in Training & Certification (T&C) Services, to avoid the delay in T&C services, vide letter no.#0490 Dt. 26.04.2024 (Please refer to the Exhibit -13) and considering that preparation of CAM was not in the scope of T&C services, only quality check and procedure of CAM filling was in the scope.

Japan Railway Technical Service (JARTS), T&C Agency conducted the CAM Engineer and CAM Engineer (QC) courses captioned as T-7 and T-8 as part of its T&C services.

After every T&C course, T&C agency (JARTS) submitted reports of T&C Services to the Contractor through the Employer [Exhibit -14]. The observation related to CAM Mix are reproduced as under:

"For the T&C Services, the Instructors of the course, had highlighted under clause (5) of the T&C Report about the problems with the CAM Mix and commented some observations, such as

(i) mixing volume did not pass the quality standards for the flow time and air content.

(ii) the 28-day compressive strength did not meet the requirement"

The above also clearly indicates that the composition of First Trial mix of CAM proposed by the Contractor was not meeting the technical requirements (ERTS).

3.33 Preparation of Second Trial Mix:

Employer submitted that on 13th of January 2025, the Contractor invited the Employer/Engineer to witness the Second Trial Mix (Annexure C-47 of SOC) and [Exhibit-15 of SOD]. Subsequently, the Contractor submitted the Second Trial Mix Report **duly endorsed by the CAM Expert on 06 March 2025** (Annexure C-51 of SOC) and [Exhibit -16 of SOD]. Upon review, the Engineer issued NONO, on 25 March 2025 [Exhibit -17]. The constituent used in mix-1 and mix-2 vs. recommended proportions, are as under-

S.No.	CAM Component	Quantity in kg (per 1 cum of CAM) recommended	Quantity in kg (per 1 cum of CAM) Used 1 st Test	Quantity in kg (per 1 cum of CAM) used in 2 nd Test
1	Asphalt Emulsion	441	407	441
2	Polymer Emulsion	63	57	63
3	Admixture	32	32	32
4	AE Agent	7.9	0	7.9
5	Anti-Foaming Agent	0.158	0.158	0.158
6	Aluminium Powder	0.041	0.05	0.082
7	Cement	284	284	284
8	Sand	630	630	626
9	Water	63 or less	5	19

From above, it can be seen that adopted quantities of materials in Second Trial Mix for most components are similar to Recommended quantities (Table-18).

3.34 Make in India framework for Domestic Sourced Material:

Regarding Make in India policy, Employer stated that in accordance with the Section - V (Eligible Source countries for Japanese ODA Loan) Vol-6, only the Polymer Emulsion is required to be procured from Japan, and same is also confirmed by the Employer during the pre-bid clarification on dated 15th of November 2021 [Exhibit -19]. Whilst the remaining constituent materials like Aluminium Powder, Asphalt Emulsion, Cement, Admixture, Anti-Foaming Agent and Air Entraining Agent were permitted to be procured from eligible domestic sources, subject to compliance with the Contract.

The Engineer never instructed the Contractor to procure the CAM composition material from Japan or restricted the domestic sourced materials, at any time. The Contractor has not submitted any evidence to support its allegation.

3.35 Contractor's Inaction after First Trial Mix and Resultant Delay:

Regarding the delay in finalization of CAM, the Employer submitted that following the unsuccessful First Trial Mix, the Contractor failed to undertake timely corrective action. Although, by its response dated 26 February 2024 [Exhibit -12], the Contractor indicated that it would explore incorporating AE Agent, no revised mix trial was submitted thereafter. The Contractor also failed to address, the quality and mixing-volume concerns raised in (JARTS) T&C services [Exhibit -14].

3.36 The Second Trial Mix was completed on 15th of January 2025 [Exhibit - 15 and 16] under the CAM Expert's guidance, whereas the Contractor sought the Expert's endorsement of the First Trial Mix only on 8th of February 2025 [Exhibit -11],

demonstrating that the required expert review should have been undertaken contemporaneously rather than retrospectively.

3.37 The delay between the First and Second Trial Mix is therefore, attributable to the Contractor's failure to rectify the identified technical deficiencies [Exhibit-10] and establish compliance under Clause 7 (ERTS) [Exhibit -4]. Accordingly, the delay of 12-14 month between the First and Second Trial Mix is attributable to the Contractor's delay and does not constitute Employer's delay.

3.38 The Contractor's assertion to characterise the CAM Expert's reservations as merely a matter of "Japanese practice" is incorrect, unsupported and contradictory by the contemporaneous records. The CAM Expert did endorse the Contractor's Second Trial Mix. The reason for not endorsing the first trial mix is also stated by the CAM expert in his 13.2.2025 communication as "altered composition". The CAM expert has clearly stated that "Although the results meet the regulations for **fresh properties** and compressive strength..... Therefore, it is **impossible to say whether this is acceptable without conducting performance evaluations.....**". Therefore, the **durability of CAM mix** was not cleared by the CAM expert.

3.39 In view of above submissions, the Employer pleaded that any resultant delay, additional costs, time implications, and all associated liabilities are solely attributable to the Contractor. The Employer bears no responsibility for any consequences arising from the Contractor's actions or omissions.

3.40 Employer further prayed DB, to:

- (i) Dismiss Dispute No.3 in its entirety, declare that the Contractor has no entitlement to additional payment or extension of time,
- (ii) Reject the Contractor's claim for reimbursement of additional/ differential costs (incurred till 2025), of INR 13,96,00,000 (Indian Rupees Thirteen Crore Ninety Six Lakh) and JPY 9,62,00,000 (Japanese Yen Nine Crore Sixty-Two Lakh), as well as any claim for future additional or differential costs on this account,
- (iii) Reject extension of time for completion of the Works on this account,
- (iv) Order and direct Contractor to pay all costs and expenses of Adjudication, including but not limited to the fees and disbursements of the Ld. DB and the Employer's Counsel's/Consultant's fees and associated expenses along with the costs and expenses incurred in connection with and preparation for the conduct of proceedings together with interest on such costs, as applicable.

4. Important Correspondence cited by Parties in connection with Dispute No.-3:

4.1 Contractor cited following correspondence (important ones):

- (i) L&T's letter dated 15 December 2022, seeking vendor approval for Nichireki for the supply of polymer emulsion, [ANNEXURE C-4].

- (ii) Engineer's Response Sheet dated 14 February 2023, whereby L&T received an NONO for appointment of Nichireki as a vendor for polymer emulsion [ANNEXURE C-5].
- (iii) Nichireki's certificate dated 17.4.2023, confirming its expertise in CAM works for high-speed rail projects, satisfying the requirement under Clause 7.3(a) of the ERTS [ANNEXURE C-6].
- (iv) Service Agreement dated 22 May 2023 executed between L&T and Nichireki [ANNEXURE C-7].
- (vi) Copy of the minutes of the Monthly Review Meeting held on 29 August 2023 and 27 September 2023, recording that CAM mixing and testing was underway in consultation with Nichireki engineers [ANNEXURES C-8 and C-9].
- (vii) L&T's dated 12 December 2023 for witnessing of the First Trial Mix [ANNEXURE C-30].
- (viii) Detailed Trial Mix Plan dated 16 December 2023 [ANNEXURE C-31].
- (ix) Engineer's Letter dated 18 December 2023, appointing its representatives for witnessing the CAM trial mix [ANNEXURE C-32].
- (x) L&T on 10 January 2024, submitted the CAM Trial Mix Inspection Report ("First Trial Mix Report") [ANNEXURE C-33].
- (xi) Engineer's Response Sheet dated 30 January 2024, whereby L&T received an NOO for the First Trial Mix, [ANNEXURE C-34].
- (xii) Comment Resolution Sheet dated 26 February 2024 submitted by L&T to the Engineer in relation to the First Trial Mix, [ANNEXURE C-35].
- (xiii) Communication issued by the Engineer on 19 March 2024, along with the revised Comment Resolution Sheet, [ANNEXURE C-36].
- (xiv) Copy of the email trail exchanged with the CAM Expert in 13 February 2025 [ANNEXURE C-37].
- (xv) Minutes of the Monthly Review Meeting held on 28 May 2024, [ANNEXURE C-38].
- (xvi) Communication dated 5 June 2024 issued by the Engineer to L&T providing further comments/ objections to the First Trial Mix, [ANNEXURE C-39].
- (xvii) L&T's response dated 15 June 2024 to the Engineer, [ANNEXURE C-40].
- (xviii) Communication dated 11 July 2024 issued by the Engineer rejecting L&T's plea [ANNEXURE C-41].
- (xix) Minutes of the Monthly Review Meeting held on 30 July 2024, [ANNEXURE C-42].
- (xx) L&T's Notice of Delay dated 22 August 2024 [ANNEXURE C-43].
- (xxi) Communication dated 10 September 2024 received from the Engineer rejecting L&T's Notice of Delay [ANNEXURE C-44].
- (xxii) L&T's invitation dated 13 January 2025 for witnessing of the Second Trial Mix [ANNEXURE C-47].
- (xxiii) Second Trial Mix Report dated 6 March 2025 submitted by L&T [ANNEXURE C-51].

- (xxiv) Engineer issued an NONO for the Second Trial Mix, dated 25 March 2025 [ANNEXURE C-52].
- (xxv) Fully Detailed Claim raised by L&T on 4 February 2025 [ANNEXURE C-53].
- (xxvi) Letter from dated 27 March 2025 seeking clarifications in relation to L&T's FDC [ANNEXURE C-54].
- (xxvii) L&T's reply dated 30 April 2025 to the Engineer along with the revised FDC [ANNEXURE C-55].
- (xxviii) Further queries raised by Engineer on 3.6.2025 on revised FDC [ANNEXURE C-56].
- (xxix) L&T's reply dated 8 August 2025 [ANNEXURE C-57].
- (xxx) Communication dated 25 August 2025 from Engineer rejecting L&T's FDC [ANNEXURE C-58].
- (xxxi) L&T's letter to the Engineer disputing the rejection of the FDC [ANNEXURE C-59].

4.2 Employer cited following additional correspondence:

- (i) The approval of the Second Trial Mix [Contractor's exhibit ANNEXURE C-34 and Employer's Exhibit-10].
- (ii) Engineer's letter no.#0490 Dt. 26.04.2024, according permission to use the CAM composition based on First Trial CAM for the use in Training & Certification (T&C) Services, to avoid the delay in T&C services [Exhibit -13].
- (iii) Report of T&C agency (JARTS) to the Contractor through the Employer [Exhibit -14].

5. Engineer's Determination on the Claim/dispute:

5.1 The Engineer's Assessment (Notice of Objection, 'NOO') for the First Trial Mix:

5.1.1 The Engineer has provided its observation vide letter 0145 dated 30-01-2024, [Exhibit -10 of Employer and Exhibit Annexure C-34 of the Contractor] part contents are reproduced as under:

'The Engineer observed that the total weight of the CAM Design Mix proposed by the Claimant was approximately 7% lower than the Design Mix specified in the Technical Specifications. Such reduction had the potential to alter the density of the CAM and, consequently, its mechanical properties, including Elastic Modulus and Fatigue Strength. The Engineer, therefore, required that the implications of the proposed change in density and consequent mechanical properties be duly ascertained at the relevant temperatures in consultation with the CAM Expert, in accordance with TS-1050.'

The Attachment 1 "COMMENT RESOLUTION SHEET" to this letter of Engineer gives in detail the Engineer's observations on various deficiencies/deviations.

Other important observations of the Engineer are detailed in paragraphs 3.25 to 3.27 above. The Contractor sought the Expert's endorsement of the First Trial Mix only on 8th of February 2025.

5.2 Engineer's Assessment of 2nd Trial Mix:

The Second Trial Mix was completed on 15th of January 2025 [Exhibit -15 and 16] under the CAM Expert's guidance. The trial report was jointly endorsed by the CAM expert also. Upon review, the Engineer issued NONO, on 25th of March 2025 [Exhibit -17].

5.3 Engineer's Assessment on Fully Detailed Claim (FDC) under Dispute No.3:

The Contractor submitted his Fully Detailed Claim on 4th of February 2025 (ANNEXURE C-53) indicating Overall Claim including profit (excluding cess & taxes) as JPY 37.50Cr + INR Rs. 70.86 Cr. Engineer through its letter dated 27 March 2025 sought clarifications on this FDC (ANNEXURE C-54). L&T through its letter dated 30.4.2025 (ANNEXURE C-55), submitted its reply and modified its Overall Claim including profit (excluding cess & taxes) as JPY 28.93 Cr + INR Rs. 78.22 Cr. The Engineer replied to this letter on 03.06. 2025 (ANNEXURE C-56) stating that:

"The Engineer has observed that the information provided by the Contractor remains incomplete without any supporting documents, thus unsubstantiated and therefore still inadequate to enable the Engineer to assess the Contractor's claim for any entitlement under the Contract.

The Engineer's further remarks, along with the proposed action required from the Contractor, are accordingly enclosed herewith as Annexure-1. The Contractor is requested to address all the Engineer's remarks therein in detail on a pointwise basis."

5.4 This was replied by the Contractor through its letter dated 08.08.2025 (ANNEXURE C-57). Considering this and previous submissions of the Contractor, the Engineer 'Rejected' the Claim and recorded "...the *Engineer concludes that the Contractor has failed to substantiate its claim. As the matters raised fall within the Contractor's contractual obligations and Scope of Work, and as the Contractor has failed to submit any material evidence substantiating its position, the Engineer hereby 'Rejects' the Contractor's FDC in this regard.*"

5.5 The observations of the Engineer and compliance recorded by the Contractor are compiled and furnished as annexure to various correspondents exchanged between the Contractor and the Engineer (Comment Resolution Sheet). Final one is available in Contractor's submission (Annexure C-40) and Employer's submission [Exhibit-34].

6. DB's Analysis of Rival Submissions made by the Parties:

6.1 The basic dispute has arisen on account of non-approval of the first CAM mix (Cam mix-1) by the Engineer. First, the key elements of Contractual provisions as stated by the Contractor (Para 2.13 above), are analysed. For each of these key elements, Employer's remarks followed by DB's opinion, are as under:

(i) Nature of the Contract: Design-Build:

Contractor's Argument:

The Contract is a design-build one. L&T bears primary responsibility for design, including fitness for purpose. L&T is *"responsible for the design of the Works and shall ensure that his design is accurate and in compliance with the Contract"* and that *"when the Works are completed, they shall be fit for the intended objective"*. The Engineer's role is to review L&T's submissions and limited to ensuring their compliance with the Employer's requirements - it is a review-based function, not a substitutionary one. The Engineer evaluates L&T's design but does not supplant it with an independent design regime.

Employer's Reply:

The Contents of Paragraph 26 of the Contractor's SOC is admitted to the extent that the Contract is a Design-Build Contract and that the Contractor bears primary responsibility for the design of the Works, including ensuring that the completed Works are fit for their intended purpose (320 km/h train operation). However, the remaining contents of this paragraph are denied to the extent they suggest that the Engineer's role was limited to a purely administrative or procedural review or that the Engineer was precluded from exercising independent technical judgment in determining compliance with the Contract. Engineer is assigned with the responsibility of granting various approvals or not approving certain things if they do not comply with the provisions of the contract.

DB Opinion:

The contract is a Design-Build Contract, and the role of the Engineer is very clearly defined in various relevant paragraphs of Conditions of Contract.

(ii) L&T's Design Autonomy Over CAM:

Contractor's Argument:

Clause 6.14 of the ER-DRC expressly places primary responsibility for CAM design on L&T:

"CAM shall be used between the Track slab and RC Track Bed as filling material. The contractor shall design CAM [including ingredient composition (weight ratio)] to ensure required CAM properties as prescribed under Appendix 7, Technical Specifications and relevant Specifications as per Sub-Division 01050, Technical Specifications to obtain approval of the Engineer."

This provision is critical. It vests in L&T the autonomy to determine the ingredient composition and weight ratios of the CAM mix, so long as the same is compliant with the Employer's requirements and meets the technical specifications laid down in the ERTS. L&T's obligation is to achieve the prescribed performance parameters, not to replicate any particular composition.

Employer's Reply:

The Contents of Paragraph 28 of the Contractor's SOC are admitted only to the extent that Clause 6.14 of Sub-Division 01030 of ER-DRC places responsibility upon the Contractor for the design of the CAM system. It does not give complete autonomy to the Contractor to change the composition without valid explanation and advice from the CAM Expert.

DB Opinion:

DB agrees with the views of the Employer. The contract conditions applicable to CAM mix **do not provide** complete autonomy to the Contractor to change the composition without valid explanation and advice from the CAM Expert. The relevant contract conditions are discussed in subsequent paragraphs.

(iii) Requirement of Prior Approval for CAM Materials:**Contractor's Argument:**

Clause 7.1 of Subdivision 01050 of the ERTS requires that constituent CAM materials be approved by the Engineer prior to execution. This approval operates at 2 (two) levels: (i) approval of individual materials and vendors (Clause 3.17 Subdivision 01000 of the ERDRC); and (ii) approval of the integrated CAM design mix [Clause 7.7 (d.) Subdivision 01050 of the ERTS]. However, this approval authority must be exercised within contractual limits; it cannot be withheld on extraneous or noncontractual grounds. Crucially, under Clause 7.7(d), L&T is required to conduct the tests prescribed in Subdivision 01050 and submit the test results for approval by the Engineer. Where the CAM design mix meets the stipulated technical specifications and passes the tests laid down in Clause 7, the Engineer has no contractual basis to withhold approval.

Employer's Reply:

Whilst it is admitted that the Contract requires prior approval for the constituents of CAM and approval of the integrated CAM Mix, the Contractor's assertion that approval was contingent solely upon successful completion of the prescribed physical tests only is contrary to the Condition of Contract of clause 7.1 subdivision 1050 of TS.

The Contractor was required to demonstrate comprehensive compliance with all applicable contractual requirements, including approval of constituent materials, conformity with the Technical Specifications, satisfactory Trial Mix, and complete technical substantiation establishing the suitability of the proposed CAM mix.

The contemporaneous records demonstrate that the First Trial Mix was not compliant to contractual conditions, on review of the same the Engineer's issued Notice of Objection (NOO) vide its Letter No. 0145 dated 30 January 2024.

DB Opinion:

FIDIC Yellow Book (1999 Edition) Clause 4.9 under '*4 The Contractor*', stipulates:
"4.9 Quality Assurance

The Contractor shall institute a quality assurance system to demonstrate compliance with the requirements of the Contract. The system shall be in accordance with the details stated in the Contract. The Engineer shall be entitled to audit any aspect of the system.

*Details of all procedures and compliance documents shall be submitted to the Engineer for information before each design and execution stage is commenced. When any document of a technical nature is issued to the Engineer, evidence of the prior approval by the Contractor himself shall be apparent on the document itself. Compliance with the quality assurance system shall not relieve the **Contractor of any of his duties, obligations or responsibilities under the Contract.**" (emphasis supplied).*

Various conditions of the contract: stipulate where all Engineer's approval is required (e.g., approval of the ingredients, approval of the mix design, etc.).

The engineer is entitled to audit any aspect of the system before each design and execution stage. The quality assurance system shall not relieve the Contractor of any of his duties, obligations, and responsibilities under the contract."

**Section VI-2 Employer's Requirements (Design Requirements and Criteria):
01000 Track Design Works:01010 Design Responsibility of Track Works; 2.
Track Works Scope and General Provisions-**

"2.8 All Contractor's submissions shall meet Contract requirements including those mentioned in the Technical Specifications, General Specifications and Condition of Contract. It shall also include the additional information as required by the Engineer including other interfacing Contractors.

2.9 The Engineer shall review the Contractor's submissions to check the validity, obligations and intended purpose(s) of the Design Works and its compliance with Employer's Requirements."

Therefore, both the FIDIC Conditions and Conditions of this Contract entails Engineer's audit on all the submissions made by the Contractor.

(iv) Trial Mixing and the CAM Expert Requirement - Deployment, Not Certification:

Contractor's Argument:

Clause 7.3 of Subdivision 01050 of the ERTS mandates that "Contractor shall deploy either an expert from or sub-contract the trial mixing work to, firms having at least 3 years' experience of supply and installation of CAM, as used in Shinkansen HSR."

From a bare perusal of Clause 7.3, it is evident that the Contract requires L&T to deploy such an expert or firm. It does not require certification, endorsement or sign-off by such CAM expert as a condition for approval of the CAM mix. This distinction is central to the present dispute. The natural and ordinary meaning of "deploy" is to engage or utilise – it connotes participation and supervision, not a power of approval or veto.

Employer's Reply:

The Contractor's quote from Clause 7.3 is incomplete and fails to acknowledge the contractual objective of that provision. The requirement is to ensure that Trial Mixing of the CAM mix are undertaken under the guidance and technical supervision of a specialist possessing required experience in the supply and installation of CAM for Shinkansen High-Speed Railway.

The Contractor has failed to establish that it complied with this contractual obligation during the First Trial Mix. The contemporaneous records do not demonstrate that the CAM Expert supervised/involved in the First CAM Trial Mix.

DB Opinion:

Clause 7 stipulates- **Clause 7. Cement Asphalt Mortar Injection**

“7.1 Before execution, the approval of the Engineer shall be obtained for the constituent CAM materials. The required specifications for the CAM components are provided below.”

“There are 9 (nine) constituents are specified. Each of the constituent has definite function in the CAM Mix design. Specifications of each of the constituent are mentioned in this Clause 7.1. The standard CAM input sequence to the mixer is also shown in Figure 14 and Figure 15 under the Clause 7.4 where also AE agent is conspicuously mentioned.

The CAM Mix is a Track work designed based on Empirically applied specifications.”

Appendix 7: Guide for Track Design (GTD) : General: Clause 5 & 6 stipulates

“... When verifying performance of track structures based on empirical rules, judgments must be made under the supervision of experienced engineer with responsibility. The empirical method refers not only to the personal experience of the engineer, but to the method practiced in long-time experience of the Railway operation and long historical experience in the track area.

(6) Empirically applied specification can be designed as specification based upon verified long term proven empirical methods by Railway organisation in Japan. Empirically applied specification shall be prioritised, if possible, because historically in Japan its performance was satisfying without any defects.”

Therefore, the interpretation of the word ‘deploy’ as presented by the Contractor is grossly incomplete. It has to be interpreted as per the contextual meaning. The actual understanding of the term ‘deployment’ in reference to this Contract is very clear to the Contractor also as is evident from the Service Agreement drawn by the Contractor with the CAM expert (**Nichireki's Services**) (ANNEXURE- C 7), which stipulates that:

“L&T shall conduct trial mixing of Cement Asphalt Mortar in India. Nichireki shall provide necessary technical support and supervise the Trial Mixing work carried out by L&T in India.”

“1. Nichireki's Services

1.1 Nichireki shall provide Technical Guidance to L&T to prepare CAM as per the requirement of T-3 Project.

1.2 Nichireki shall dispatch Engineer with Rich Experience in preparation of CAM to L&T's designated place in India.

1.3 Nichireki's Engineer shall provide required support to L&T and supervise the CAM Trial Mixing work carried out by L&T.

1.4 Nichireki shall analyse the results of each trial mix and advise necessary modifications required for achieving the CAM parameters as per the requirement of T-3 Project.

1.5 Nichireki shall advise L&T about the specifications of all components of CAM including Asphalt Emulsion, Admixture, etc. to prepare CAM as per the requirement of T-3 Project."

Responsibilities and role of CAM Expert is clearly defined in clauses 1.3, 1.4 & 1.5 of this Service Agreement. On the Employer's observation that the CAM expert was not actively involved in the CAM design, the Contractor side, during oral submission of their SOC, presented invoices from the CAM. The study of the invoices revealed that they merely provide the proof of availability of CAM expert in India. However, the same do not provide any evidence of CAM expert's active involvement in CAM Mix Design. The contractor side also stated during the oral submission that most of the advice from the CAM expert were 'verbal'. An experienced contractor like L&T will never rely on verbal communication when it comes to highly technical advice. The Contractor could not produce any documentary evidence of advice from the CAM expert on the ingredients' choice and the weight proportions adopted in CAM mix-1 except for an email from CAM expert dated 10.10.2023 (page 119-122 of rejoinder presentation) which reads as follows: "*Dear Ponmani San,*

I would like to address the matter concerning the finalization of the design.

In Japan, it is imperative to conclude one formulation within various temperature ranges to meet the required standards.

Specifically, for this project it is crucial that we determine the formulation simultaneously at three different temperatures—20 °C, 27 °C, and 40 °C.

Without achieving consensus on these temperature conditions, we cannot reach a conclusive formulation.

Based on the data received Regarding the use of ITPL at 27 °C, the 28-day strength test result was 1.77.

*Unfortunately, this outcome indicates that the formulation **does not meet the requirement.***

Over the past three months, Mr. Kotaki has diligently provided guidance and shared his valuable experience on the formulation.

If the future approach involves a trial-and-error process, we must question whether Mr Hirose is really wanted during that process." (emphasis supplied)

This communication indicates that the design proposed at that point of time, was not cleared by the CAM expert. Understandably, this was the time when CAM mix trials were in progress, so it is not necessary that a trial may succeed. Contents of last para in above communication is also interesting and important as it points-out to the concern expressed by Nichireki. However, the Contractor could not produce any similar communication from the CAM expert where he confirmed that Trial Mix-1 was 'successful' and meeting the contractual requirements.

It is therefore considered by DB as 'non-compliance' of GTD, ERTS and provisions of Contractor's own Service Agreement with the CAM expert.

(v) Table 18 Composition - Reference, Not Mandatory:

Contractor's Argument:

Clause 7.3 of Subdivision 01050 of the ERTS also provides a recommended composition of quantities of CAM materials in Table 18.

The heading of Table 18 itself reads: "*Composition of quantities of CAM materials (for reference)*".

This composition is expressly indicative and for reference, and is not framed as a mandatory or immutable prescription. L&T is entitled to deviate from the reference composition so long as the performance criteria are satisfied.

Employer's Reply:

The description "for Reference" cannot be interpreted in isolation so as to permit unrestricted departure from the "Recommended CAM composition" as mentioned in the 7.3 (a) above the Table -18. The Contract requires that any alternative composition satisfy all applicable contractual requirements.

Whilst the Contract did not mandate strict replication of the Reference composition contained in Table 18, deviation therefrom remained subject to the conformance to the Conditions of the Contract.

The contemporaneous records establish that the Contractor altered most constituents of the CAM composition and to a large extent without substantiating the conformance to the Conditions of the Contract.

DB Opinion:

Clause 7.1 gives details of the constituents of CAM materials along with their specifications. There are nine (9) constituents listed. Clause 7.3 stipulates that CAM materials shall be compounded and mixed in accordance with the following provisions:

(a) Contractor shall deploy either an expert from or sub-contract the trial mixing work to, firms having at least 3 years' experience of supply and installation of CAM, as used in Shinkansen HSR. The Contractor shall test CAM as per Sub-Clause 7.7 of these Technical Specifications.

Clause 7.4 gives the standard CAM input sequence to the mixer and is also shown in Figure 14 and Figure 15 under this Clause 7.4. Here also, AE agent is conspicuously mentioned.

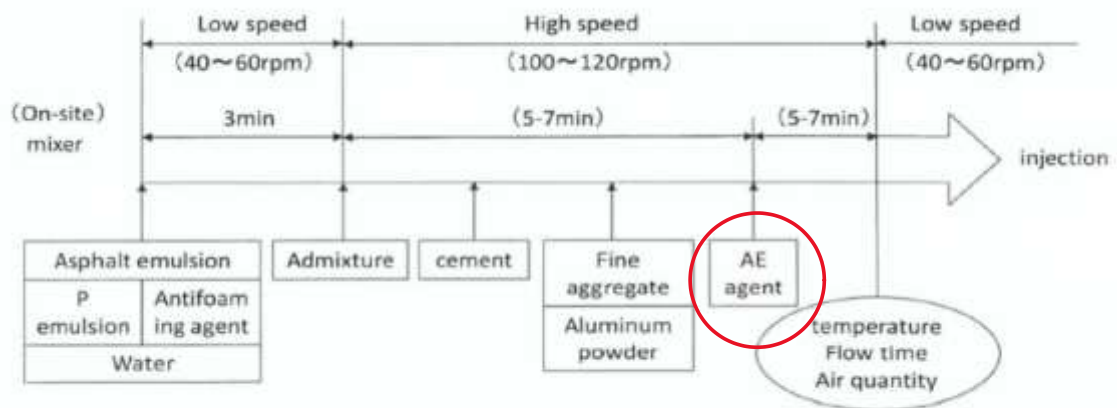


Figure 14: Work flow in the case of direct and gravity injection of CAM

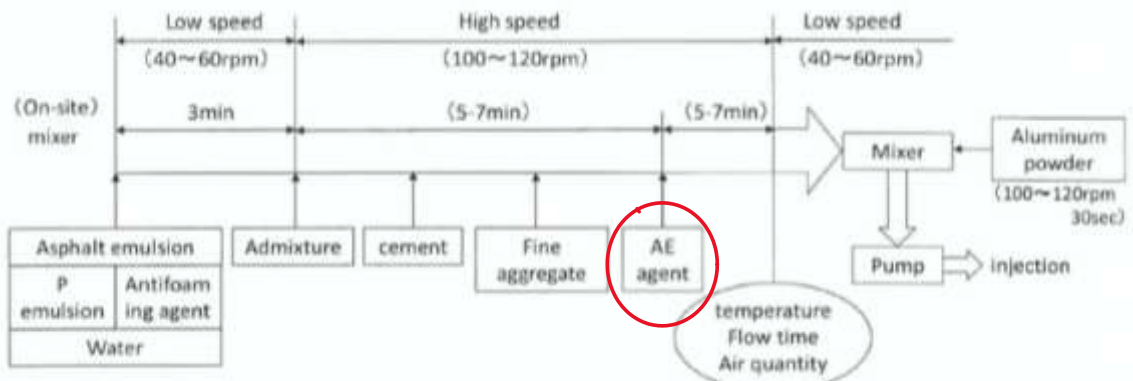


Figure 15: Work flow in the case of pump injection of CAM

From the above, it is evident that all the nine ingredients are compulsory and the Contractor has freedom to the extent of choosing the source and weight proportion of individual ingredients subject to achieving the specifications. Each ingredient has a specific role to play in the CAM mix design.

The situation is quite similar to concrete mix design used commonly. In the present contract also, Appendix 6 (pdf page 345 of Contractor's submission) gives various ingredients of the concrete like cement, coarse aggregate, fine aggregate, water, reinforcement, and admixtures. Applicable specifications are also included in the Appendix for each of the ingredients. Type of admixture to be added depends on use of the concrete i.e. If the concreting is to be done in a narrow space, then add mixture for better flowability (free flow concrete) is required to be added. Similarly, if the concrete is to be done for a deep pile, the admixture to be added should be such that it controls separation of various ingredients of concrete. So, while designing the concrete mix, the ingredients are to be chosen as per the list of ingredients and conforming to specified specifications. The mix designer can only change/ manipulate the weight proportions and source to achieve the desired strength and other qualities of the concrete from safety and durability considerations.

The purpose of giving approximate weight of individual ingredient is to guide the bidders in preparation of their price bid.

In CAM mix, the AE agent, also has a definite role to play and has been taken as a standard ingredient out of the long experience of Japanese Railways who are a pioneer in Cement Asphalt Mortar.

As per some of the available literature on internet, Key Roles of AE Agent in Fresh Concrete are-

- **Improves Workability:** Tiny air bubbles act like microscopic ball bearings or lubricants, reducing internal friction between aggregate and cement particles.
- **Reduces Bleeding and Segregation:** Increases the cohesion of the mix, preventing heavy aggregate particles from settling and stopping water from bleeding to the surface, and
- **Lowers Water Demand:** Better mobility allows the concrete to be placed and compacted easily with less mixing water.

In the Hardened Concrete, Key roles of AE Agent are-

- **Enhances Freeze-Thaw Resistance:** Provides empty microscopic chambers that relieve internal hydraulic pressure when trapped water freezes and expands, preventing cracking and surface scaling.
- **Improves Impermeability:** Discontinues capillary channels and pores, which slows down water and chemical penetration.
- **Increases Scaling Resistance:** Protects against de-icing salts used during winter conditions.

The provisions of GTD and ERTS are also very specific and any change in the ingredients of CAM mix, is to be done under the guidance and supervision of the CAM Expert. However, the Contractor has failed to produce any documentary evidence of the advice from the CAM expert for not using an AE agent without compromising of durability.

DB therefore, is of the opinion that all 9 ingredients of the CAM mix are mandatory and the Contractor cannot change the composition without proper advice from a technical expert (CAM expert).

(vi) Limits on the Engineer's Power - The Classified Distinctions Framework:

Contractor's Argument:

Subdivision 03020 of the ERGS establishes a structured system of "Classified Distinctions" governing the Engineer's responses to L& T's submissions. The Engineer may respond in one of the following 4 (four) ways: NONO, NONOC, NOO and NR.

The distinction between an NONOC and an NOO is of critical importance to the present dispute. An NONOC allows L&T to proceed with the Works while addressing the Engineer's comments. It is the appropriate response where the issues are minor and not fundamental. An NOO, by contrast, brings work to a

halt. It is a serious step that should only be taken when there is genuine, fundamental non-compliance with the Contract. If the Engineer issues an NOO on grounds that do not meet this threshold, for instance, on the basis of a deviation from a reference composition, or the absence of a signature that the Contract does not require, then the NOO has been improperly issued, and the consequences of the resulting delay must be borne by NHSRCL, not by L&T.

Employer's Reply:

The Contents of Paragraph 34 of the Contractor's SOC are incomplete. The Full explanation of various responses of Engineer, are mentioned in para 3.34 of SOD. The Sub-division 03020 of the ERGS explicitly states that *"For the avoidance of doubt, any change or additional work arising out of or becoming necessary due to any errors, omissions, discrepancies, or non-compliances on the part of the Contractor in the preparation, submission or resubmissions of Contractor's Documents shall not constitute a Variation."* [Exhibit-28].

DB Opinion:

The Engineer's response is clearly mentioned under **Section VI-I Employer's Requirements (General Specifications); Sub-division 03020; Para 3** (pdf page 1010). No further elaboration is required

(vii) Testing Framework - Flexible, Not Prescriptive:

Contractor's Argument:

Appendix 7 of the ERTS (Guide for Track Design or "GTD") adopts a broad and flexible performance verification regime.

Importantly, CAM is classified as a "Track Component" under the GTD, and forms part of the track structure. Clause 1.1.71(4) of the GTD provides the design basis for Track Components, which includes CAM.

It states that if track components have gone through the analysis and tests and also **fulfilled required specifications in the past for similar design conditions, then empirically applied specifications shown in the GTD can be used for such track components. In such cases, performance verification for Track Components is deemed to satisfy required performance.** This creates a presumption in favour of the Contractor that performance verification for CAM has been achieved.

Moreover, the performance verification framework does not mandate any exclusive method of verification for CAM, nor does it require additional testing beyond what the Contract prescribes.

Significantly, Clause 1.1.72 of the GTD provides that "Track components" for the purposes of performance verification applies only to Rail, Rail joint, Rail weld, Rail fastener and sleeper. CAM is not included in this enumerated list. Consequently, no specific performance verification method has been prescribed for CAM under Clauses 1.1.72 to 1.1.118 of the GTD. Since CAM is nonetheless a Track Component that has fulfilled the specifications set out in the Contract (including Subdivision 01050 of the ERTS), there is a presumption in favour of performance verification having been achieved by virtue of Clause 1.1.71(4).

Clause 7.7 of Subdivision 01050 of the ERTS prescribes the specific tests to be conducted and the objective acceptance criteria.

Therefore, the Contract provides a comprehensive, self-contained mechanism for assessing the suitability of CAM through testing. Once the prescribed tests under Clause 7.7 are conducted and the results satisfy the standard values in Tables 19 and 21, the CAM mix qualifies under the Contract. There is no additional contractual requirement beyond compliance with these prescribed parameters.

Employer's Reply:

The Contents of Paragraph 40 of the Contractor's SOC are admitted only to the extent that CAM forms part of the track structure and is one of the Track Components. However, the Contractor's interpretation of Clauses 1.1.71 and 1.1.72 of the GTD is selective, erroneous and contrary to the Contract when read as a whole.

Contrary to what is purported by the Contractor, the fact that CAM is not expressly identified amongst the Track Components referred to under Clauses 1.1.72 to 1.1.118 does not automatically give rise to any contractual presumption that Performance Verification is either unnecessary or deemed to have been automatically achieved. Clause 1.1.72 cannot be construed in isolation so as to negate the express provisions of Clause 1.1.71(4), Appendix 7, the Employer's Requirements and the ERTS, all of which collectively govern the design, testing and approval.

The contemporaneous Project records demonstrate that the First Trial Mix did not constitute a design under similar conditions. The Contractor materially altered the composition of the CAM by changing the quantities of Asphalt, Polymer, Water and Aluminium Powder and by completely omitting the AE Agent. These modifications resulted in an approximate 7% reduction in CAM density and materially affected the design basis, thereby precluding any reliance upon Clause 1.1.71(4) to dispense with or deem Performance Verification to have been achieved. The CAM expert has also clarified it further in his observation.

DB Opinion:

DB agrees with the argument of the Employer. The Contractor has majorly deviated from the design under similar conditions i.e. the Composition mentioned in Table-18 of Clause 7.3 of Subdivision 01050 of the ERTS. One of the ingredients i.e. AE Agent is totally omitted. Therefore, reliance of the Contractor on **empirically applied specifications and proven design** is misplaced. Please refer to the highlighted portion under Contractor's argument.

The CAM Expert also, has expressed the same concern in his communication of 13.02.2025 with the Contractor. The CAM Expert in his email has stated that "Although the results meet the regulations for **fresh properties** and compressive strength, the composition and manufacturers are different from the standard.

Therefore, it is impossible to say whether this is acceptable without conducting performance evaluations other than the standard mentioned below." (emphasis added).

He further stated that “In this context, it is to be informed that various combinations of Asphalt Emulsion from India (Hincol, ITPL, etc.), AE agent from different suppliers and Polymer Emulsion from Nichireki but could not meet the specification provided in the Contract.

However, by changing the formulation provided as reference in the contract and on use of Polymer from Nichireki and Asphalt Emulsion from Hincol without any AE agent the parameters mentioned in the Contract were achieved.

Practice in Japan does not allow to alter any composition other than that of Water and Aluminium powder and manufacturers of CAM components.

Therefore, **we apprehend that performance verification tests are required.** But the details of such tests are not provided in the Contract and to **prove that design life requirement is met could take approximately 36 months of rigorous testing at a proven laboratory in Japan** according to the JICA/JICC’s follow-Up Study for Mumbai- Ahmedabad High Speed Railway Corridor, 2018.1 for NHSRCL.”(emphasis added.)

It is therefore clear that even the CAM expert was unable to say whether the proposed CAM mix (CAM Mix-1) is acceptable without conducting a performance evaluation. The CAM expert has further mentioned that performance verification tests could take approximately 36 months of rigorous testing at a proven laboratory in Japan.

As per Contract Conditions, the performance verification is deemed to be achieved only when there is no change in the composition which is tried and tested over a period of time in a similar system. Here, the reference system prescribed under the Contract, is that of Japanese Railways.

(viii) No Contractual Basis for Requiring a Second Trial Mix:

Contractor’s Argument:

There is no provision in the Contract that empowers the Engineer to require L&T to conduct a second trial mix where the first trial mix has demonstrably met all prescribed performance parameters.

The Contract prescribes that trial mixing of CAM shall be tested as a "Type Test" - defined as *"a test conducted by the manufacturer or a third party to confirm that the specifications specified in the bidding documents can be satisfied prior to mass production"*. Once the Type Test is successful (i.e. the prescribed specifications are satisfied), there is no contractual basis for the Engineer to, directly or indirectly, insist on repetition using alternative materials or sources. Any such insistence constitutes an act beyond the contractual authority of the Engineer.

Employer’s Reply:

The Employer completely denied this argument of the Contractor and stated that the Contractor’s allegation proceeds on the erroneous assumption that the First Trial Mix successfully satisfied all contractual requirements and therefore constituted a successful Type Test under the Contract. This assumption is totally incorrect.

The contemporaneous records establish that the First Trial Mix was not compliant to the contractual requirements. As such, the Contractor's assertion that the Engineer acted beyond its contractual authority or improperly compelled the Contractor to undertake a Second Trial Mix is factually incorrect, contractually untenable and is expressly denied.

DB Opinion:

DB finds that the Engineer gave his NOO response on the first trial mix at the first instance itself giving his detailed observations. As per the laid down procedure, it is for the Contractor to comply with the observations of the Engineer and resubmit his submission. From the various communications exchanged between the Engineer and the Contractor, DB observes that (i) initially the Contractor responded that he will consider use of AE agent in subsequent trial mixes, and (ii) after 14 months exchange of communications (without commenting on trial with AE agent), it was the Contractor's choice to prepare a fresh CAM mix design (CAM Mix-2) with inclusion of AE agent. It is also noted that this time the results were witnessed and signed by the CAM Expert, which was not done by him on CAM mix-1 design for reasons mentioned in CAM Expert's communication of 15.2.2025.

(ix) Make-in-India Framework and Eligible Source Countries:

Contractor's Argument:

The Contract reflects the broader "Make in India" policy framework. Section V of the Contract (Eligible Source Countries of Japanese ODA Loans) specifies that only 5 (five) items are mandatorily sourced from Japan. Significantly, of the 9 (nine) components of CAM, only Polymer Emulsion is required to be procured from Japan. The pre-bid clarification dated 15 November 2021 confirmed this position. All other CAM components, including asphalt emulsion and anti-foaming agent, were to be sourced domestically. This confirms that the use of domestically-sourced CAM components was contemplated by the Contract.

Employer's Reply:

The Contents of Paragraph 44 of the Contractor's SOC are admitted only to the extent that the Contract, including Section V (Eligible Source Countries of Japanese ODA Loans), specifies the items required to be procured from Japan and that, amongst the constituent materials of CAM, only Polymer Emulsion was required to be sourced from Japan, whilst the remaining eight constituent materials were permitted to be procured from eligible domestic sources, subject to compliance with the Contract. It is further admitted that the pre-bid clarification dated 15 November 2021 confirmed the applicable sourcing requirements. Save as expressly admitted, the remaining contents are denied.

The Contractor's interpretation that the Contract contemplated the unrestricted use of domestically sourced CAM components without complying Contractual Requirements, is erroneous and is expressly denied.

The Contractor's reliance upon the sourcing provisions to suggest that the Engineer was obliged to approve the First Trial Mix irrespective of the technical

suitability, approval status or demonstrated performance of the domestically sourced materials is misconceived and is expressly denied.

DB Opinion:

DB observes that the provisions of the contract are very clear. Out of the nine ingredients constituting the CAM mix, only one ingredient, Asphalt Emulsion, is to be sourced from Japan. The remaining eight ingredients can be domestically sourced provided they meet the required specifications and give the required CAM mix. Engineer has also not insisted upon the Contractor to source various ingredients from Japan. It appears that the Contractor, after failing in his trials with various combinations of ingredients sourced domestically and from Japan, finally was not left with any other choice but to change the CAM mix design.

6.2 DB noted that the main argument/objection of the Contractor is on Engineer's rejection of Trial Mix-1 which are presented in Contractor's SOC and rejoinder. Even at the cost of some repetition, DB feels it as appropriate to analysis various arguments presented by the Contractor against Engineer's rejection of Trial Mix-1:

6.2.1 The Contractor presented following arguments against Engineer's rejection of Trial Mix-1:

1. (Para 59 of SOC) - At no point during this period did the Engineer raise any objection to L&T's approach to CAM design, the sourcing of materials or the involvement of the CAM Expert.
(Para 62 of SOC) - On 10 January 2024, L&T submitted the CAM Trial Mix Inspection Report ("First Trial Mix Report"). The First Trial Mix complied with each of the specifications provided in Subdivision 01050 of the ERTS. The First Trial Mix Report also clearly recorded that the CAM Expert witnessed the First Trial Mix and that " ... through multiple trials, suitable composition has been established, and acceptance properties have been ascertained."
2. (Para 84 of SOC) - On 25 March 2025, the Engineer approved the Second Trial Mix. Crucially, the quantities of the CAM components in the Second Trial Mix also differed from the composition specified in Table 18 of Subdivision 01050 of the ERTS. The principal difference between the 2 (two) mixes
3. (Para 8 of Rejoinder submission) - It is submitted that Clause 7.7 of the ERTS provides the self-contained and exhaustive testing mechanism for CAM approval. It specifies the tests to be conducted, the parameters to be achieved and the process for submission to the Engineer. As evident from the table above and the findings recorded in the First Trial Mix Report dated 10 January 2024, the First Trial Mix met all of these parameters. The Respondent has not identified a single prescribed performance parameter that the First Trial Mix failed to achieve.
4. (Para 33 of Rejoinder submission) – "... The Respondent now seeks to rely on the fact that various CAM components were at the NOO stage at the time of the

First Trial Mix. This contention is misconceived. It is submitted that under Clause 7.1 of Subdivision 01050 of the ERTS, constituent CAM materials are required to be approved by the Engineer "before execution", that is, prior to actual application in Track structure **and not as a precondition for trial mix testing.**"

5. (Para 6 of SOC) - Despite this demonstrated compliance, on 30 January 2024, the Engineer rejected the First Trial Mix and thereafter issued a series of Notices of Objection on shifting and progressively expanded grounds. These objections were, inter alia, based on an insistence that the CAM Expert must formally endorse or certify the trial mix, a requirement that finds no express basis in the Contract. The Contract requires only the deployment of a CAM Expert to supervise trial mixing and does not require certification, endorsement or sign-off by such expert as a condition for approval.
6. Engineer rejected the Trial Mix-1 on the grounds of deviations in the composition of CAM mix and non-approval of the constituents. However, he passed the Trial Mix-2 which also had deviations apparently because in Trial Mix-2, many constituents from Japan were used (Para 37 of Rejoinder submission and slides 11-13 of Rejoinder PPT). Both Trial Mixes passed every prescribed parameter. The only difference was the SOURCE of components — domestic v. Japanese.
7. Insistence of Engineer for endorsement/counter signature of the CAM expert on Trial Mix testing report which is not mandated in the contract conditions.
8. Regarding not using AE agent in Trial mix-1, Contractor stated that he conducted internal trials (63 nos.) with various combinations. Initially AE agent was also included. However, trial results indicated that the required parameters could not be achieved with the use of the AE agent and when the AI agent was not used, the required parameters were achieved. In the rejoinder PPT presentation made by the Contractor, the internal trial results were summarized and presented in slides 24 to 29. Therefore, the Contractor went ahead with CAM mix-1 design without the use of an AE agent.

6.2.2 DB's analysis and comments:

1. Engineer is supposed to give his observations when a formal submission is made by the Contractor. Prior to the request for trials of CAM mix -1 on 16.12.2023 (ANNEXURE C-31), in various monthly meetings, the Contractor had been stating that the CAM mix design is under development. Therefore, the question of Engineer's giving his objections/observations does not arise. On 12.12.2023 (ANNEXURE C-30), Contractor wrote "Contractor requests the witness of CAM trial mix on 18th and 19th Dec '2023 by Employer and Engineer at Larsen & Toubro Construction Research & Testing Center (LTCRTC), Chennai" and submitted its detailed CAM mix design on 16.12.2023. In response, the Engineer replied on 18.12.2023 nominating Employer's

personnel and Engineer's personnel. In this letter itself, the Engineer also recorded "*It is noted that some materials are in NOO status for material approval and the risk of conducting test kneading at this stage must be borne by the Contractor*". Joint trials were conducted on 19-20th December 2023.

Therefore, it is evident that the Engineer had given his observation w.r.t. pending approvals before the trials and at appropriate stage when formal request was made by the Contractor for trials.

2. Contractor's assertion that "the First Trial mix complied with each of the specifications provided in Subdivision 01050 of the ERTS", is also inappropriate and misplaced. Contractor has made his assertion based on the tests conducted as per Clause 7.7 of the ERTS (point no. 5 above). At the same time, in response of non-approval stage of various mix components (point no. 4 above), The Contractor's argument is that these 'prior approvals' of Engineer are required 'before execution', that is, prior to actual application in Track structure and not as a precondition for 'trial mix testing'.

Therefore, as per the Contractor's own understanding also, the 'trial mix testing' stage is different than 'actual execution'. The test parameters referred by the Contractor to justify that Trial mix-1 was fully compliant as per Clause 7.7 of the ERTS, is misplaced because the Clause 7.7 of ERTS specifies "(a) CAM tests and test records shall be submitted to the Engineer. The following tests and checks shall be **conducted during execution**". The Clause 7.7 of ERTS specifies the tests 'before execution' and not for 'Trial Mix Testing' which evident from timing and frequency of these tests mentioned in Clause 7.7(b)(i) (pdf page 251 of Contractor's document).

The CAM expert in his communication of 13.02.2025 also confirmed that though the trial mix test results meet the regulations for **fresh properties**, it is **impossible for him to comment on 'durability'** i.e. to prove that **design life requirement is met**, without conducting extensive trials at a proven laboratory in Japan, as the formulation provided as reference has been changed. Therefore, the CAM expert was also **not sure** of the required durability during design life of CAM mix-1 because of changed formulation.

3. Now the question before the DB is then what testing criteria is thus applicable to 'Trial Mix Testing'? The answer lies in the provisions mentioned under 'Appendix – 7: GTD', (pdf page 389) which are briefly discussed as under:

"Design fundamentals:

Basis of design method

The design of the track structure shall be checked for achievement of the required performance during the design life. However, the requirement does not apply to track structures based on specifications (Empirically applied specification) that have been checked to meet the required performance by the method described in this GTD.

Required performance and performance verification

General

In the performance verification for track structures, the required performance is defined according to the purpose of use, and appropriate verification indices are used to check the conformity to required performance.

Two performance items are defined for track structures, and these are safety and serviceability....

1.1.61 *The following performance items exist for safety.*

*(1) Running safety: The term refers to the capacity to allow the train to travel safely by suppressing track displacement and deformation under some threshold, under all regular actions imaginable **during the design life.***

Principles of performance verification

(1) The performance verification of track structures shall be conducted using a highly reliable method.

*(4) For track structures based on the specification stipulated in "3.6 Empirically applied specification", performance verification can be **assumed to be conducted by the use of the specification.***

*(5) As a general use, the limit state design method will be used in the performance verifications for the track structures. Methods based on experiments and on-site tests, as well as methods using empirical rules may also be used. However, when verifying performance of track structures based on experiments and on-site tests, forces and uncertainties of the material and track components must be considered. **When verifying performance of track structures based on empirical rules, judgments must be made under the supervision of experienced engineer with responsibility.** The empirical method refers not only to the personal experience of the engineer, but to the method practiced in long-time experience of the Railway operation and long historical experience in the track area.*

*(6) **Empirically applied specification can be designed as specification based upon verified long term proven empirical methods by Railway organisation in Japan.** Empirically applied specification shall be prioritised, if possible, because historically in Japan its performance was satisfying without any defects.*

(7) As the track is a simple structure consisting of a combination of track components, more rationality can often be achieved when the design is simplified, rather than designing in detail, even for specifications tuned for safety when designing the track structure.

*(8) For **structures which adopt empirically applied specifications, performance verification can be assumed to be completed.** In empirically applied specifications, the estimated required performance is already verified through experiments or analysis illustrated in this GTD. In case either the empirically applied specification is indicated, or not indicated, more stringent design conditions shall be used for performance verification.*

- (9) ***Design based upon empirically applied specification, which is similar to empirically applied specification, can be treated as verified.***

Track components

General

1.1.71 Design basis of track components:

Basically, track components shall be designed according to the following.

- (4) ***If track components have gone through the analysis and tests and also fulfilled required specifications in the past for similar design conditions, then empirically applied specifications or empirically applied Specification shown in this GTD can be used for track components. Performance verification for track components are deemed to satisfy required performance.***” (emphasis supplied)

Therefore, from the provisions of GTD, it is very clear that in case Track components using **empirically applied specifications**, the track components are **deemed to satisfy required performance**. For CAM mix, empirically applied specifications are given, indicating constituents (9 nos.), their specifications, and approximate weight proportion. If major deviation is made from these performance specifications without expert's advice/guidance, then performance verification becomes necessary.

As indicated above it is also mentioned that when verifying the performance of track structures based on empirical rules, **judgments must be made under the supervision of an experienced engineer with responsibility**. This gives the genesis of Clause 7.3 of ERTS: (pdf page 248) “*CAM materials shall be compounded and mixed in accordance with the following provisions:*

(a) Contractor shall deploy either an expert from or sub-contract the trial mixing work to, firms having at least 3 years' experience of supply and installation of CAM, as used in Shinkansen HSR. The Contractor shall test CAM as per Sub-Clause 7.7 of these Technical Specifications.

The recommended composition of quantities of CAM materials is shown in Table 18 below.”

Since in Trial Mix-1, major deviation from empirically applied specifications, was made (by omitting AE agent), the CAM expert did not sign the Trial Report of 'Trial Mix-1' and when in the subsequent trial (Trial Mix -2), the empirically applied specifications were followed, the CAM expert did counter signed the report. The 'NOO' of the Engineer on Trial Mix-1 report, is therefore in accordance with the Contract provisions of GTD.

The CAM expert also confirmed this view in his communication of 13.2.2025 (ANNEXURE C-37) with Contractor wherein CAM expert mentioned that “*Although the results meet the regulations for **fresh properties** and compressive strength, the **composition** and manufacturers are **different from the standard**. Therefore, it is impossible to say whether this is acceptable*

without conducting performance evaluations other than the standard mentioned below.”

4. Regarding the insistence of the Engineer of counter signing/ endorsement/ certifying the CAM mix-1 by the CAM expert, is in order looking to the deviation from empirically applied specifications. The Engineer's observation stated with 'report from CAM expert' (30.1.2024) and ultimately culminated in to 'Recommendation/ verification of CAM mix proposed by L & T by CAM expert is the minimum requirement for the approval by the Engineer.' Engineer further suggested that 'The Contractor shall consult the CAM expert and obtain the signature/recommendation for the proposed design mix'. This firmness in Engineer's observation has arisen out of incomplete or inappropriate compliance submitted by the Contractor giving an inappropriate/incorrect explanation of contract conditions.
5. Regarding the Contractor's argument that CAM mix-1 was rejected and CAM mix-2 was approved, though both were complying with the same test and both had deviations from Table 18 of ERTS: Clause 7.3, it is observed that in CAM mix-2 all the constituents as specified were used, with the deviation in weight of aluminium powder, sand and water which is permitted as per the opinion given by the CAM expert in his communication of 13.2.2025. Therefore, as CAM Trial mix-2 is following the empirically applied specifications, it is 'deemed to satisfy required performance'. And therefore, the action of the Engineer approving Trial mix-2 of CAM, is considered to be **in order** by the DB.
6. The allegation of the Contractor on the Engineer that he purposely rejected Trial mix-1 to compel the Contractor to use Japanese-sourced material is also found to be baseless in view of the facts stated above.
7. Regarding the Contractor's argument about not using AE agent, DB noted that in the Trial mix-2, AE agent has been used and required parameters have been achieved. CAM expert in his communication of 13.2.2025, has informed that “*... it is to be informed that various combinations of Asphalt Emulsion from India (Hincol, ITPL, etc.), AE agent from different suppliers and Polymer Emulsion from Nichireki but could not meet the specification provided in the Contract* “. Therefore, the problem could be in the AE agent from a particular supplier or in other ingredients. Fact remains that with the use of AE agent also, required parameters for fresh properties have been achieved. The assertion of the Contractor that with the use of AE agent, required parameters (compressive strength) was not achieved, is also premature.
AE agent is important from the durability considerations. Some information is extracted from the internet and is reproduced below for understanding:

“An **air-entraining agent (AEA)** is a chemical admixture used to introduce and stabilize millions of microscopic, closed air bubbles (typically 10 to 1,000 microns in diameter) uniformly throughout a concrete or mortar mix.

Key Roles in Fresh Concrete

- **Improves Workability:** Tiny air bubbles act like microscopic ball bearings or lubricants, reducing internal friction between aggregate and cement particles.
- **Reduces Bleeding and Segregation:** Increases the cohesion of the mix, preventing heavy aggregate particles from settling and stopping water from bleeding to the surface.
- **Lowers Water Demand:** Better mobility allows the concrete to be placed and compacted easily with less mixing water.

Key Roles in Hardened Concrete

- **Enhances Freeze-Thaw Resistance:** Provides empty microscopic chambers that relieve internal hydraulic pressure when trapped water freezes and expands, preventing cracking and surface scaling.
- **Improves Impermeability:** Discontinues capillary channels and pores, which slows down water and chemical penetration.
- **Increases Scaling Resistance:** Protects against de-icing salts used during winter conditions.”

DB therefore concludes that either the source of AE agent was not correctly chosen under the guidance of the CAM expert, or the CAM expert’s role as per clause 1.5 of the Service Agreement between the Contractor and CAM expert was not discharged properly.

6.3 DB noted that the Contractor has Claimed for (i) additional cost due to use of ingredients procured from Japan, (ii) additional time due to delay in approval of CAM mix design, as its primary claims. Other claims viz. interest (pre-reference, pendente lite and future interest) and costs etc. are consequential.

6.4 DB’s analysis of the **delay claimed** by the Contractor in approval of CAM Trial Mix:

6.4.1 The Contractor stated that over a period of approximately 14 (fourteen) months (January 2024 - March 2025), the Engineer rejected a compliant CAM design mix on shifting and progressively expanded grounds, ultimately imposing a requirement for CAM Expert endorsement that has no express basis in the Contract. Looking to the dead-lock situation and resultant delay in execution of the project, the contractor yielded and went for a second trial mix design using Japanese origin constituents. the second trial mix was finally approved by the engineer on 25.3.2025 i.e. after a delay of about 14 months from the date of submission of the first trial mix. As the first trial mix was also fully compliant, this delay of 14 months is not attributable

to the contractor therefore the contractor is entitled to an extension of time by 14 months.

6.4.2 DB finds that the assertion made by the Contractor that Engineer wrongly rejected the first trial mix, is incorrect, for the reasons mentioned in para 6.2 above. DB, therefore, finds that the 14 months' time up till the approval of the second CAM mix on 25.3.2005, is attributable to the Contractor squarely. The 14-month time extension on the Employer's account, as claimed by the claimant, is **rejected**.

7.0 Decision of the Dispute Board:

7.1 After careful consideration of the rival arguments placed by the Parties and the analysis presented above, DB finds that the argument made by the Contractor that Trial mix-1 of CAM was fully compliant, is **not correct**. The test results referred to by the Contractor to declare the Trial Mix-1 as 'compliant', are for the CAM Test 'before execution' and not for the 'CAM Mix approval'. There was **no inconsistency** observed in the **determinations given by the Engineer** on CAM Trial mix-1 (ref. Para 2.16 (i) above). Allegations made by the Contractor against the Engineer, are found baseless.

7.2 Since CAM Trial mix-1 did not comply with the required specifications, whereas CAM Trial mix-2 complied with the specifications, the question of the Contractor making a claim for the differential cost does not arise. The Claim of the Contractor for **additional cost** (ref. Para 2.16 (ii) &(iii) above), **is rejected**.

7.3 Since the Trial Mix-1 was not successful in complying with the requirements, the delay of 14 months in getting Engineer's approval of CAM mix, is not attributable to the Engineer or Employer. The Claim of the Contractor for 14 months **extension of time** (ref. Para 2.16 (iv) above), **is rejected**.

7.4 Since the DB did not find the Claims for additional cost and time as sustainable, **other consequential claims** with respect to Cost and Interest (pre-reference, pendente lite and future interest) **are also rejected**.

7.5 DB does not find the contractor to be entitled to any other relief under this dispute.

7.6 DB decides that each party should bear its cost of the litigation. The fee paid to the DB for deciding the dispute is to be equally shared by the Parties.

This unanimous decision of the DB in Dispute No.-3 is declared on 01.10.2026 within the given time limit of 84 days.

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(Subodh Kumar Jain)
Member, DB

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(S.N. Agrawal)
Chairman, DB

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(Mahesh Kumar Gupta)
Member, DB