SEPTEMBER 2025

VIEWPOINT

OFFICIAL QUARTERLY MAGAZINE OF CEAI

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Contractually Addressing Uncertainties in Projects

CEAI Consulting Engineers Association of India

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About CEAI

Consulting Engineers Association of India (CEAI) is the apex body of consulting engineers in India having membership of organisations as well as individuals. The membership represents large, medium and small consultancy companies/ organisations both in the private and public sector and eminent individual consultants. EPC organisations are also members of CEAI since they have planning and design engineers, apart from construction management consultants.

CEAI is the Member Association, of the International Federation of Consulting Engineers, commonly known as FIDIC, the acronym for Fédération Internationale Des Ingénieurs-Conseils, representing the Consulting Engineering Fraternity in India. FIDIC has membership of more than 100 Member Association of various countries and is headquartered in Geneva.

CEAI was incorporated in 1996, with the merger of two leading national associations Association of Consulting Engineers (India) {ACE(I)}, incorporated in 1960 and National Association of Consulting Engineers {NACE}, incorporated in 1976. Thus, CEAI has behind it six decades of accumulated knowledge and experience.

- CEAI promotes the interest and works to enhance the status of the consulting engineering profession in India
- CEAI advocates global networking and co-operation
- CEAI's activities include:
  - Quality development of Consultants.
  - Productivity enhancement.
  - Promotion of ethical practices.
  - Facilitation and interaction with government and other authorities/ bodies to streamline and improve the system of engagement of consultants.
- Regional Centres in Jaipur, Bengaluru, Kolkata and Mumbai to broad base activities.

Aims & Objectives

- Promote the professional interest and establish the rights and privileges of the status of consulting engineering profession in India
- Represent the consulting engineering profession within India and abroad. Connect the members locally and globally.
- Disseminate among the members information on all matters pertaining to engineering, especially knowledge and information related to consulting engineering profession by way of holding Conferences, Seminars, Courses, Workshops, Field/ Site Visits, etc. and thus assist in Continuing Education for the Professional Development of Members.
- Act as the principal champion for consulting engineering profession through constantly informing and educating the public and lawmakers about key engineering issues and making it possible to have the voice of the profession heard by the policy makers.
- Promote adoption of equitable forms of contracts and other documents used in consulting engineering practice.

Vision

- To represent, promote and enhance the status of consulting engineers in India as an honoured and dignified profession for nation building and propagate Indian engineering consultancy globally.

Mission

- Promote interests of the consulting engineering profession nationally and internationally.
- Promote sustainable, safe and sound engineering practices.
- Upgrade engineering knowledge and skill.
- Propagate code of professional ethics, safety, health and environment.

Values

- Commitment with tenacity to high ethical values, integrity, professionalism and achieving technical excellence and inclusive development.

Code OF Ethics

- CEAI has adopted a Code of Ethics, to which all members must abide. It is not just for the quality of the jobs they work on, but for the safety and well-being of the public at large.
- CEAI is the profession's most respected voice on the practice of ethical engineering.
- The code specifies the responsibilities of Consulting Engineers towards the society as well as the profession, to refrain from performing services unless competent to do so, to act in the legitimate interest of client, to be impartial, to maintain ethical relations with other consultants.

CODE OF ETHICS

PREAMBLE

Engineering consultancy services make significant contributions to the economic growth and sustainable development of the nation, and in safeguarding health, safety, welfare, and happiness of the society.

For the nation and the society to derive maximum benefits from engineering services, it is essential that, in addition to being of high technical standards, the services provided are of the highest universally accepted moral and ethical standards.

With a view to achieve the stated objective the Consulting Engineers Association of India (CEAI) has framed a "Code of Ethics" which is mandatory for all members of the Association to adopt and abide by.

This Code presupposes that every member of CEAI is a law abiding, truthful, honest, fair and just citizen of the society. In addition, the member must follow the directives of the Code in his/her professional practice.

THE CODE

Each CEAI Member shall:

Responsibility to Society	1	Ensure that he/she shall be ethically and socially responsible, and his/her professional services safeguard and enhance the health, happiness and safety of the society.
	2	Ensure he/she, in his/her profession upholds the principles of environmentally sustainable development and considers climate change in decision-making with appropriate knowledge and training, and also informs clients about the need for its inclusion.
	3	Treat all persons fairly and encourage equitable participation without regard to religion, race, caste, gender, descent, place of birth, or residence, so that everybody works with honesty, integrity, and mutual trust and respect in a transparent manner.
Responsibility to Profession	4	At all times, uphold the dignity, standing and reputation of the profession.
	5	At all times, provide services: (a) in accordance with the principle of 'Duty of Care', implying the obligation to take reasonable steps to avoid foreseeable harm to another person, group, or their property and society; (b) to meet and fulfill the requirements as agreed with the client as per the Design Brief of the client, or as required by the employer as per the employment contract, and give feedback for any changed context; and, (c) to ensure that the said services utilise appropriate technology, and be fit for the design life of the product or facility and for its intended purpose and use.
	6	Always be responsible and accountable for all the professional services provided under his/her responsible charge, including using validated and legal algorithms and software.
	7	Refrain from: (a) expressing in public an opinion on a professional topic unless he/she is sufficiently informed on the facts relating to the topic and he/she is competent to comment on it; (b) making public statements which are not in an objective and truthful manner; (c) casting any aspersions of an unjust or malicious nature; and, (d) performing any service beyond his/her competency.
	8	Imbibe, inculcate and emphasise the Code of Ethics periodically and internally within the organisation and also for oneself.

	9	Maintain knowledge and skills at levels consistent with developments in technology, legislation and management, and apply due skill, care and diligence in the services rendered to the client or employer.
	10	Continue professional development and advancement throughout his/her career.
Integrity	11	Act, without prejudice to the rights of other stakeholders, in the legitimate interests of the client or employer, and perform professional services with integrity and faithfulness.
	12	Act with fairness and justice towards his/her client or employer, and towards vendors, contractors, and other professionals in all matters pertaining to contracts relating to his/her professional services.
	13	Refrain from: (a) indulging or being or getting involved in any activity which in any manner seeks to affect or in any way influence the client or employer with regard to the selection of or the compensation for professional services; and/or affect or influence the impartial judgement of the professional himself/herself; and, (b) participating in any shape or form in the process of giving, promising or taking money, gift, or favour which may influence the judgment or conduct of a person in a position of trust or authority.
	14	Inform: (a) the concerned client or employer organisation's management first, of any unethical or unsafe act or situation; known or learnt by him/her in the course of his/her work or in any other work within his/her competency; and (b) the appropriate authorities, if the client or employer organisation's management is unable or unwilling to address the unethical or unsafe act or situation referred to in (a) above
	15	Facilitate in ensuring legal compliance by client or employer, contractors, vendors and others.
	16	(a) Refrain from utilising any data, information, computer hardware or software in his/her work that might infringe upon any Intellectual Property Rights, without obtaining proper legal clearance; and (b) Use all the data, business plans or strategies, and any other sensitive or confidential documents or materials, whether from the client or employer, or internal to the organisation, in a responsible manner, so that their confidentiality and security are not compromised.
	17	Promote an ethical culture in the organisation based on shared values, beliefs and norms such as trust, honesty, integrity, fairness, confidentiality and accountability, and actively adopt them to uphold professional ethics, and make decisions that are above reproach.
Impartiality	18	Be free of prejudice and personal preferences, in his/her professional advice and judgement.
	19	Refrain from accepting an assignment for services which prejudices his/her independent judgement.
	20	Inform the client or employer of any potential conflict of interest that exists or might arise in the performance of an assignment.
	21	Promote the concept of quality based services to encourage fair competition
	22	Cooperate fully with any legitimately constituted investigative body appointed or setup for inquiry into the administration of any contract where the professional is involved.

Relations with Other Consultants	23	Refrain from directly or indirectly injuring/damaging or attempting to injure/damage the professional reputation or practice or prospects of another fellow professional, except when the fellow professional is incompetent or has violated ethical norms.
	24	Refrain from associating in work with a professional whose methods of practice do not conform to the ethical practices as laid down in this Code.
	25	Refrain from: (a) trying to supplant another professional in any particular assignment; and (b) intervening in work of any kind which to his/her knowledge has already been entrusted to another professional, except when appointed as a Reviewer by the client or employer.
	26	Refrain from taking over the services being provided by another professional unless the client or employer formally appoints the professional to take over the ongoing assignment, after legally terminating the previous contract, and legally indemnifies the appointed professional against any deficiencies and losses already incurred or liable to be incurred due to the errors of omission and commission by the previous professional.
Relation with Clients	27	(a) Refrain from disclosing confidential information concerning the assignment, any technical process or any related matter, of the client or employer without the client's or employer's consent. (b) making comments in public/ social media regarding the work being done for the client.
	28	Publicity material as well as any paper/ article developed, written and published by the professional regarding the project to be as per the contract and the scope of work therein.
	29	Amicably attempt to resolve any issue with the client.
Relation with Employees	30	Provide opportunities for the professional development and advancement to other professionals in his/her employment or control, aimed to foster a culture where people are motivated, engaged, valued and can learn, develop, and grow.

The undertaking

I, the undersigned, certify that on my behalf and on behalf of the organisation, I have read and understood the Code of Ethics of CEAI and hereby undertake to abide by all its provisions and the Rules of the Association both in letter and in spirit, as may be amended from time-to-time, hereafter.

Member Registration No.:	
Name of Organisation: **(for organisational Members only)**	
Name of person signing the declaration:	
Designation: **(for organisational Members only)**	
Signature:	
Place:	
Date:	

Message from Chief Editor

Dear Fellow Engineers and Readers,

For a Nation heavily invested in developing its infrastructure on a large scale, the importance of flawless implementation of projects involving all concerned stakeholders cannot be overemphasised. What contributes immeasurably to the success or failure of a project or venture is one very important document called the “Contract”!

A Contract is ‘a legally binding agreement between two or more parties that creates specific obligations enforceable by law’. How successful a project is, apart from the performance and contribution of the project participants, primarily the project sponsor/ owner, project consultant, project manager, and stakeholders like the contractor, vendors, and suppliers, could depend on how well that piece of paper has been drafted. With the PPP mode of project execution, public participation is another factor to be reckoned with. All the same, a Contract needs to be clear and concise in contract terms, precise in stating contract objectives, scope of work, unambiguous in its role and responsibility definitions, and in spelling out stakeholder rights and obligations, while also addressing essential clauses of risk, confidentiality, dispute resolution, and termination.

A lack of transparency in contract terms can create uncertainties and difficulties in enforcing obligations of the concerned parties and resolving conflicts, thereby jeopardising project success. Over time, several stakeholders, be it the Client (Owner), the Consultant, or the Contracting firm, are becoming well aware of the need for a well-formulated and thoughtfully constructed Contract.

In response to requests from members and the engineering fraternity, it was decided to dedicate this edition of the ViewPoint to the theme of *"Contractually Addressing Uncertainties in Projects"* to create better awareness among project proponents and stakeholders, of various imponderables and many lacunae that prevail in Contracts to enable addressal at the stage of Contract formulation, by gathering diverse perspectives to resolve uncertainties and ensure project success and avert failure.

Members of CEAI and many who belong to the relevant stakeholder categories, including those from the legal fraternity, have contributed overwhelmingly to this issue of the ViewPoint, based on their experience. They have, through their articles, highlighted their lived experiences, lessons learnt, and conveyed invaluable suggestions which, if meticulously taken into consideration and implemented, could vastly benefit the consulting and contracting fraternity on ways to deal with contract agreements prior to project commencement.

Projects based on the FIDIC Conditions of Contract have proven to be fair and balanced with ‘equitable risk distribution’ when combined with minimal essential modifications in the Particular/ Special Conditions of Contract. However, government-funded projects, whether by the Union or State Government or Public Sector Bodies, follow the guidelines of their Standard Contract documents, which very often lead to disagreements. Whilst several improvements in the contracts have been put in place in recent times, there is scope for them to be more bilateral and reciprocal, involving mutual obligations, fair and balanced rights and risks, to circumvent ‘unconscionable terms’ that favour one party.

This edition of ViewPoint is to sensitise the client and the engineering and contracting fraternity about the need for the rights and interests of all parties to the contract to be ensured with the necessary legal protection, by outlining the responsibilities vis-à-vis functions and duties, as well as accountabilities of each party, and the enforceability of the legal remedies in a contract. In the final analysis, when all the stakeholders have a common aim to execute a “Contract” in letter and spirit as a team, supportive yet purposeful, then a Contract is truly and correctly fulfilled.

We trust that this issue of ViewPoint will prove to be beneficial to the readers in full measure!

With best wishes,

Sayona Philip

Message from Guest Editors

Dear Readers,

We thank the Consulting Engineers Association of India for giving us the opportunity to contribute to this issue of CEAI's ViewPoint on **"Contractually Addressing Uncertainties in Projects".**

Projects in the construction sector are envisaged with clear timelines, defined budgets, and well-structured performance objectives. Despite such clear formulations, the performance and execution of contracts is often met with various uncertainties which may arise from unexpected regulatory changes, court orders, fluctuations in prices of commodities, unforeseen natural events/ disasters, different or differing physical conditions, or supply chain disruptions - all of which present an inherent challenge in project execution.

These uncertainties manifest as tangible challenges such as delayed schedules, cost escalations, levying of damages, suspension of work, termination of contracts, and encashment of performance guarantees, which often lead to disputes between stakeholders. When contracts lack clear risk allocation mechanisms, there is a higher probability that the uncertainties may not be effectively managed. If projects are to withstand uncertainties and deliver outcomes, contracts must be structured to anticipate and manage unpredictability.

One of the most common uncertainties pertains to Force Majeure events. Many contracts contain standard references that do not clarify the application of specific events and their corresponding remedies. The recent global pandemic taught us that Force Majeure clauses should also incorporate scenarios such as epidemics, government lockdowns, or climate-related disruptions and may define the contractual consequences for time extensions, suspension rights, or limited cost recovery.

An important aspect of addressing uncertainties also hinges on managing dispute resolution effectively. The disputes arising in the construction sector often lead to litigation or arbitration, which hampers the project and affects various stakeholders at large. By setting up internal committees for enabling early resolution of disagreements through technical and contractual expertise, the issues can be resolved at the threshold before snowballing into a full-fledged dispute.

Exploring the availability of interim measures and reliefs during the subsistence of a contract is also an essential aspect where parties can secure themselves, whether for preservation of works, securing payments, preventing termination of contracts, or encashment of bank guarantees, maintaining the status quo without waiting for the final award, which ensures that projects are not derailed while the disputes are pending.

The role of consulting engineers and their involvement in contract negotiation and drafting can bridge the gap between technical realities and legal safeguards. Engineers are best placed to foresee operational risks, while lawyers provide the framework to address them. The collaboration between the two can convert contracts from adversarial documents into feasible instruments of risk management.

In these circumstances, uncertainty in contracts can be addressed with foresight and a balanced approach. The contracts that clearly allocate risks, anticipate disruption, and embed mechanisms for cooperation will not only reduce disputes but also strengthen trust among stakeholders.

Digitalisation has stepped into the legal sphere as well, and is bringing in changes in the way projects are executed and also how the legal work is done. It is up to us as to how and how fast we adopt and adapt.

We hope this edition offers valuable insights and sparks thoughtful reflection among readers.

Rajat Taimni
Head of Dispute Resolution
Tuli & Co.

Anubhav Dutta
Partner
Tuli& Co.

01

Contractually Addressing Uncertainties in Infrastructure Projects: Lessons from Implementing India's first Namo Bharat

Shalabh Goel
Managing Director
National Capital Region Transport Corporation (NCRTC)

Introduction

Infrastructure projects, by their very nature, are implemented in environments marked by complexity, scale, and uncertainty. While meticulous planning, robust engineering, and efficient execution are essential, the resilience of a project is equally determined by the strength of its contractual frameworks. Contracts are not merely legal documents; they are instruments of risk mitigation, dispute minimization, and assurance of continuity in the face of disruptions.

The Strategy

India's first Namo Bharat project, being implemented by National Capital Region Transport Corporation (NCRTC), is a testament to the fact that efficient contracts, when designed to address uncertainties effectively, can shape and pave the way for the successful implementation of a complex first-of-its-kind project. The first Namo Bharat corridor is being constructed on an 82 km stretch between Delhi, Ghaziabad, and Meerut. It is one of the very few projects in India to have been completed on time and within budget, despite the numerous challenges encountered during its implementation journey. From pandemic-induced stoppages to regulatory bans, weather extremes, and dynamic policy landscapes, NCRTC's contractual strategies provided an apt blanket that helped shield from these uncertainties and kept the implementation progress on track. From April 2019 to date, a total of 211 bids have been finalised, amounting to ₹17,517 crores.

Inspection Bay Line (IBL) at Namo Bharat Depot in Duhai, Ghaziabad

Of this project costing ₹30,274 crores, about 60 percent of the funding has been provided by multilateral banks, including the Asian Development Bank (ADB), Asian Infrastructure Investment Bank (AIIB), and New Development Bank. The team at NCRTC recognised the importance of the timely approval of bidding documents. Early initiation of approval processes and regular interactions with procurement teams of funding agencies were institutionalised. This ensured that

contractual clauses were well understood and accepted by all stakeholders, minimising delays and rework.

Various procurement-related documents, procurement regulations, standard bidding documents of multi-lateral development banks (MDB), and other organizations were collected, studied, and analysed for the development of Procurement Manuals, other procurement-related policy documents, Project Procurement Strategy, Procurement plan, and preparation of various bid documents. NCRTC also adhered closely to FIDIC General Conditions of Contract (GCC), making only minimal changes to the standard bidding documents as per the project requirements. This alignment enhanced the project's credibility with international financiers and ensured consistency with global best practices.

Another element of uncertainty in infrastructure projects is the availability of suitable vendors and contractors with the required capability. NCRTC proactively organised regular vendor meets to gauge market capacity, understand trends, and identify potential partners. This practice not only reduced risks linked to limited competition but also helped align contractual terms with market realities.

NCRTC workshop on procurement complexities

Land Acquisition and Shifting of Utilities

Delays in land acquisition and statutory approvals have been a recurring challenge in infrastructure projects across the country. As the expanse of the first Namo Bharat corridor stretches between two states, Delhi and Uttar Pradesh, it adds to the complexity and risk. NCRTC made significant efforts to ensure the availability of land required for the project. This involved extensive correspondence and multiple meetings with the Government officials to facilitate land acquisition.

As per the ongoing trend in the Metro industry, shifting of utilities and road widening works are kept under the scope of the main civil contractors only. However, there are numerous instances wherein the projects were delayed due to delays in approvals or shifting of utilities like gas, water, sewage pipeline, telecom cables, etc., owing to involvement of various Government agencies. Considering this fact, at NCRTC, it was decided to take up major utility shifting works like that of EHT/ LT lines, gas, water, sewage pipeline, road-widening, and initial pile load testing works in-house, directly awarding separate smaller contracts before onboarding the main civil contractors. This eventually helped in saving considerable time usually taken up for preparing the sites for the main civil activities by taking approvals from the various agencies, carry out utility shifting, road widening works and initial pile load testing to take up the first construction activity of piling in case of works related to elevated viaduct and elevated stations, after duly taking various access and approvals for shifting of the utilities. It was also ensured that access to site provisions was finalised only after necessary land and statutory clearances were obtained. This helped the main civil contractors mobilize and start directly with the execution of permanent civil works, like piling, with the availability of clear sites. This project execution methodology and

Namo Bharat site in Meerut

management, coupled with contractual safeguards, protected contractors from being penalised for idle resources due to delayed clearances.

Deliverables and Payment Terms

Cost overruns and disputes often arise from poorly structured deliverables and payment terms. NCRTC addressed this by ensuring that milestones and payments were designed in an optimal, sequential manner. Thus, as per the contract, on receipt of a bill, 80 percent of the payment must be made within 7 days, while the balance 20 percent must be made within 28 days after all the details are checked. This approach aligned payments with actual progress, incentivised timely delivery, and minimised grounds for conflict. Contractors benefited from predictable cash flows, while NCRTC retained assurance of accountability and performance.

Risk Sharing

NCRTC treated contracts not as static documents but as dynamic frameworks capable of accommodating disruptions without derailing timelines or finances. A proactive stance was adopted in embedding flexibility and risk-sharing provisions into the contracts. While several uncertainties were anticipated, others emerged during execution, requiring contractual mechanisms to step in as safeguards.

Operations and Maintenance Contracts

Setting another one-of-a-kind benchmark in the field of Operations and Maintenance, NCRTC awarded a 12-year O&M contract to DB RRTS India, a subsidiary of Deutsche Bahn AG, the National Railway operator of Germany. The work was awarded through an international competitive bidding process. This one-of-a-kind contract covers day-to-day operations and maintenance of key systems like signalling, tracks, and E&M, while excluding civil structures, rolling stock maintenance, and Automatic Fare Collection (AFC). This is a performance-based contract structured on a gross-cost model, which provides long-term cost visibility while linking payments to measurable service quality parameters. It ensures reliability, safety, and efficiency in the daily operations. Alongside this, NCRTC has also adopted the first-of-its-kind model for integrated procurement cum long-term (15 years) comprehensive maintenance of rolling stock through private participation to capture lifecycle costing. This procurement model was adopted to tap the use of the most suitable technologies and durable components on the one hand and the latest state-of-the-art technologies and practices on the other, at optimum costs. The comprehensive O&M contract and the aforesaid procurement cum long-term maintenance contract are now being considered for adoption by Indian Railways and other Metro companies.

A Namo Bharat coach being inspected

Provisions for Unforeseeable/ Unforeseen Events

The COVID-19 pandemic was perhaps the most unprecedented disruption faced during the project implementation phase. By December 2019, the World was sinking into panic due to the looming threat, much of which was still unknown. A question also arose for NCRTC about how to proceed with the bids. At first, the date of the bids was extended. Pre-Bid meeting, an integral part of procurement, used to take place in the form of in-person meetings. It was, however, tried for the first time on virtual platforms and was well received by the industry. A total of 24 representatives from all across the globe, including those from Korea, France, Germany, China, and Turkey, participated in the first-ever pre-bid meeting conducted by NCRTC on a virtual platform. The success of this initiative could be assessed from the fact that queries from several other

organisations were raised to learn from the experience of the pre-bid meeting on a virtual platform. NCRTC has, since then, made the pre-bid meeting on virtual platforms its norm. It was the innovative approach of NCRTC that a total of 39 bids amounting to ₹10,966 crores were awarded during the pandemic period. So, NCRTC Team was fully active during the COVID period as well, despite various challenges.

The construction of the project, which started in 2019, was also severely affected by the disease wreaking havoc all across the globe. Nationwide lockdowns brought construction activities to a halt, labour availability dropped sharply, and supply chains were severely disrupted. The second wave in 2021 worsened the situation. However, NCRTC's contracts contained provisions for such extraordinary circumstances that allowed for extension of time and cost compensation. This contractual foresight prevented adversarial relationships with contractors and ensured that the project could regain momentum rapidly once restrictions were eased. As a result, the Priority Section of the corridor was commissioned, as per scheduled timelines, on 20th October 2023. This was unprecedented and something which NCRTC is proud of.

Namo Bharat casting yard

Changes in Law and Regulations

Changes in law during long project cycles are another source of uncertainty for such mega infrastructure projects. Shifts in taxation regimes, introduction of new regulatory standards, or amendments in labour and safety laws can have financial and operational implications. NCRTC's contracts include provisions to account for such changes, ensuring that contractors are not unfairly burdened while protecting the project's viability.

Large-scale urban infrastructure projects are often subject to regulatory interventions aimed at balancing development with environmental and social considerations. NCRTC's contracts provide for time extensions and cost compensations in such situations as well, where delays are attributable to authorities rather than contractors. The National Green Tribunal (NGT) imposing temporary bans on construction activities in Delhi-NCR to control air pollution is one such example. Similarly, work had to be suspended during religious pilgrimages or festivals that require movement restrictions for safety and law-and-order reasons. By clearly defining responsibility for such disruptions, contractual disputes were avoided, and contractors were not penalised for circumstances beyond their control. This clarity builds trust and ensures smoother cooperation in the subsequent phases of construction.

Weather & Climate Factors

Infrastructure projects often face risks linked to exceptional weather conditions and unexpected physical site conditions. NCRTC's contracts included provisions to allocate these risks appropriately, either through insurance mechanisms or shared responsibilities, thereby safeguarding both the contractor and the client from disproportionate liabilities.

Namo Bharat casting yard for underground section

Insurance Provisions

Comprehensive insurance provisions within the contracts covered works and contractor's equipment, injury to persons and damage to property and contractor's personnel, and liabilities for breach of professional duty. It served as a critical safety net, ensuring that unforeseen incidents did not translate into crippling financial shocks. By mandating robust insurance mechanisms, NCRTC reinforced the resilience of the project ecosystem.

Contracts - The Way Ahead

As India undertakes a wave of mega projects under visionary initiatives such as the Gati Shakti National Master Plan, National Infrastructure Pipeline, and urban transformation programs, the learnings from NCRTC's contractual strategies are highly relevant. It's inevitable for large, complex projects to face uncertainties, whether from global crises, environmental constraints, or changing regulatory frameworks. Going ahead, success will depend not just on engineering and financing effectiveness but on the robustness of contractual frameworks as well.

NCRTC's experience demonstrates that contracts can be designed to share risks equitably, incentivise performance, and safeguard all parties. This requires foresight, proactive stakeholder engagement, and alignment with international standards. For clients, it means assuming responsibility for approvals and clearances before site handover. For contractors, it provides assurance that unforeseeable risks will not become crippling liabilities. For financiers, it enhances confidence in the project's long-term resilience.

Namo Bharat depot at Duhai, Ghaziabad

The Delhi-Ghaziabad-Meerut Namo Bharat corridor is a pioneering case of how uncertainties in large infrastructure projects can be contractually managed. NCRTC's proactive strategies in addressing pandemic disruptions, regulatory restrictions, environmental risks, and market uncertainties provide a model of resilience.

As India continues to invest heavily in transformative infrastructure, the importance of contractual preparedness cannot be overstated. Contracts that anticipate uncertainties, allocate risks fairly, and build in mechanisms for continuity are essential to ensure successful project outcomes. NCRTC's experience offers a valuable blueprint for practitioners, policymakers, and financiers alike, underscoring that in the journey of building a 'Viksit Bharat', resilient contracts are as important as robust engineering.

Sahibabad Namo Bharat Station in Operation

02

Bridging the Gap: Digitalisation and Contracts in Managing Project Uncertainties - Lessons from the New Pamban Bridge

Shailesh Biradar
Assistant Manager – Business Development
Balaji Railroad System Private Limited

Abstract

India's infrastructure sector is marked by ambition and complexity. Projects such as the reconstruction of the iconic Pamban Bridge demand precision in engineering and robustness in risk management. Infrastructure projects are never executed in ideal conditions - they face multiple uncertainties ranging from regulatory delays, supply-chain vulnerabilities, and environmental constraints to systemic shocks like the unprecedented COVID-19 global pandemic.

Traditional contracts in India do not anticipate or adequately address these uncertainties. They remain rigid, one-sided, and adversarial, transferring risk disproportionately to contractors. The pandemic exposed this weakness, resulting in months of delays, cost overruns, and disputes not only across India but in other countries as well.

The Pamban Bridge reconstruction provides a contrasting example. Here, digitalisation using Supervisory Control and Data Acquisition (SCADA), Programmable Logic Controller (PLC) -based synchronisation, Internet of Things (IoT) monitoring, digital approval systems, and CCTV surveillance, was embedded into the contract alongside adaptive provisions such as force majeure clauses, quality assurance regimes, and IT-enabled oversight. The project also faced severe site-specific challenges: narrow site access, reliance on a single material supplier, humidity and dew point delays in welding and painting, rough seas, high wind velocity affecting erection, and working at heights up to +40m above the Mean Sea Level (MSL).

This article presents a comparative analysis: the delays and costs that would have occurred under conventional practices, versus the resilience achieved with digitalisation and contractual foresight. International practices such as FIDIC, NEC4, and Australian Alliancing are examined, and a roadmap for India is proposed. Bridging this gap will allow India to deliver projects that are not only technically successful but also resilient against uncertainties.

Introduction

Infrastructure development is both the foundation and the accelerator of India's economic ambitions. The nation's growth story rests heavily on its ability to deliver complex engineering projects: metro networks, expressways, renewable energy parks, and iconic bridges. These projects are critical enablers of trade, mobility, and social development. However, they are also exposed to multiple uncertainties that could derail progress.

Uncertainties in projects arise from varied sources - fluctuating markets, changing regulations, court judgements, unpredictable site conditions, and global disruptions. The larger and more complex the project, the greater the risk that unforeseen factors could impact timelines and budgets. Contracts need to allocate risks fairly and provide remedies when uncertainties arise. Yet, in India, contracts often lean toward rigidity. They are traditionally employer-centric, designed to protect the owner/ authority by imposing stringent obligations on contractors, while underestimating the systemic uncertainties beyond a contractor's control. This imbalance has historically led to disputes, cost escalations, and delays.

Reconstructed Pamban Bridge Including Navigational Lift Span

The COVID-19 pandemic exposed the fragility of this approach. With lockdowns halting work, migrant labourers leaving sites, and global supply chains disrupted, projects across India were delayed by months. For many, contracts lacked adequate provisions for such force majeure events, leaving contractors to absorb penalties for circumstances well beyond their control, or in fact, those of anyone in the world

Against this backdrop, the Pamban Bridge reconstruction project offers critical lessons. The bridge, linking Rameswaram to the mainland, is not just an engineering structure but a cultural and economic lifeline. Its reconstruction demanded both cutting-edge technology and resilient project management. The contract embedded digitalisation measures such as Supervisory Control and Data Acquisition (SCADA) systems, Programmable Logic Controllers (PLC), IoT-based monitoring, and CCTV networks. Alongside, it included provisions for quality assurance through Non-Destructive Testing (NDT) and clauses that allowed flexibility during uncertainties.

Pamban Bridge Location Map

At the same time, the project stands as a landmark in Indian engineering. The new Pamban Bridge is India's first vertical lift sea bridge, replacing the historic Scherzer rolling lift span of 1913. Its 72.5-metre navigational span can be lifted in just 2.8 minutes through an electro-mechanical system of counterweights, drives, and ropes. The lift span, weighing over 520 tonnes, has been fabricated using corrosion-resistant E350 structural steel and 7,000 MT of stainless-steel reinforcement, making it one of the most durable marine bridges in the world. It rests on 1500 mm diameter piles to withstand tidal forces and high bending moments. The bridge's design and construction were guided by advanced tools such as SAP2000, ANSYS, TEKLA 3D modelling, and CNC machining, ensuring precision and quality in a challenging marine environment.

The project also faced extraordinary site-specific challenges: narrow approaches restricting movement of over-dimension cargo, dependence on a single supplier for stainless-steel reinforcement, and environmental hurdles such as high humidity, low dew point, rough seas, and high wind velocity affecting marine and erection activities. Adding to this were the risks of welding and erection at heights up to +40m above mean sea level.

Despite these formidable challenges, the project demonstrated resilience during the pandemic,

preserving several months of schedule and avoiding major disputes. By embedding contractual foresight and technological innovation, the Pamban Bridge has become both a symbol of India's engineering progress and a case study in managing project uncertainties. This article analyses how digitalisation and adaptive contracts made this achievement possible, and why such approaches are vital for the future of Indian infrastructure.

Causes of Project Uncertainty

Uncertainties in large-scale infrastructure projects are inevitable. They arise from a combination of predictable risks and unforeseeable events. The Pamban Bridge reconstruction had several layers of uncertainty:

a. **Regulatory**: Such projects must secure environmental and marine clearances, often with shifting compliance requirements. Regulatory delays could stall critical marine operations.

b. **Market**: Dependence on a single supplier of stainless-steel reinforcement (7,000 MT) created exposure to price volatility and supply chain bottlenecks. During COVID-19, steel prices rose sharply, amplifying risks.

c. **Technical**: Uncertainties included welding and erection at heights (+16m to +40m above MSL), the performance of specially rolled 20m long steel plates, and marine piling conditions. High humidity and low dew point repeatedly delayed welding, metalizing, and painting.

d. **Operational**: Narrow access roads constrained Over-Dimensional Cargo (ODC) transport. Rough seas and high wind velocities disrupted barge movements, erection, and welding cycles. Coordination with railway authorities for traffic blocks added further complexity.

e. **Force Majeure**: The COVID-19 pandemic struck within four months of commencement, halting work and straining supply chains. It compounded other risks, creating simultaneous shocks.

These challenges highlight how projects face a far more hostile risk environment than is often acknowledged at the contracting stage. Without adaptive clauses and digital tools, such uncertainties cascade into disputes and delays.

The Counterfactual: Sans Digital Tools or Adaptive Clauses

If the Pamban Bridge had been executed under a conventional paper-based contract with minimal technological provisions, the combination of challenges faced would have been overwhelming. These are discussed hereinafter.

a. **Pandemic Impact**: Within four months, COVID-19 would have halted all work. With no digital approval systems, resumption of site activities would have required physical submissions, which would have led to delaying the work by months.

b. **Access Constraints**: Narrow approach roads for ODC movement would cause repeated delays in transporting large, fabricated components. Without coordinated digital planning tools, every obstruction could have added weeks.

c. **Supply Risks**: Dependence on a single supplier of 7,000 MT stainless steel reinforcement could have crippled progress under lockdowns. Traditional contracts rarely include escalation clauses, exposing contractors to severe cost shocks.

d. **Material Transportation**: Special trucks transporting 20m steel plates faced logistical hurdles. In a conventional contract, such risks are borne by the contractor, potentially escalating disputes.

e. **Environmental Conditions**: Welding delays due to high humidity and low dew point would have compounded with manual quality checks. Late detection of defects could have meant rework, adding at least 1–2 months.

f. **Marine Operations**: Rough seas and high wind velocities would disrupt barge operations. Without SCADA-linked interlocks, unsafe lifts might have been attempted, which would mean risking accidents and stoppages.

g. **Working at Heights**: Welding at +16m and tower erection up to +40m above MSL required precision. Without digital monitoring, unsafe practices or errors could have escalated into prolonged delays.

h. **Dispute Escalations**: With no objective SCADA logs or digital records, disputes over railway blocks or weather conditions would have devolved into lengthy arbitrations.

Cumulatively, these challenges would have resulted in 5–8 months of delay, crores in additional costs, and heightened safety risks. In short, a conventional approach would have exposed the project to systemic failure.

Actual Outcomes with Digitalisation and Contractual Foresight

The Pamban contract mitigated many of the above risks through digitalisation and foresightful clauses:

a. **Pandemic Resilience**: Remote approvals enabled continuity despite lockdown. Engineers reviewed drawings and method statements digitally, preventing a loss of 2–3 months in the schedule.

b. **Marine Operations**: SCADA and PLC systems synchronised span lifts. Anemometer lockouts prevented unsafe operations during high winds. These led to abort cycles being halved and thereby saved 1–1.5 months.

c. **Quality Assurance**: Mandatory NDT using radiography and Phased Array Ultrasonic Testing (PAUT) coupled with digital logs helped detect defects early. The time saved was ~2 weeks.

d. **Environmental Monitoring**: IoT-based sensors tracked dew point and humidity. Welding was allowed only when the threshold limits were met, thereby improving safety and reducing rework.

e. **Material Logistics**: Real-time monitoring of coordinated movement of special trucks and barges. Narrow access bottlenecks were managed with digital scheduling tools.

f. **Working at Heights**: Digital cameras and CCTV systems monitored welding and erection at +16m to +40m. Safety interlocks reduce the risks of accidents or stoppages.

g. **Dispute Avoidance**: Time-stamped SCADA logs provided evidence in block disputes. Potential arbitrations were resolved on-site, saving 2 weeks of delay and significant costs.

The impact of the systems and procedures adopted is shown in a table.

Impact Summary

Challenge	Traditional Outcome	Digital/ Contractual Outcome	Time Saved	Cost Avoided
Pandemic lockdowns	2–3 months delay	Remote approvals	2–3 months	Avoided LDs
Marine lifts	Abort cycles, unsafe lifts	SCADA/ PLC interlocks	1–1.5 months	₹65–110 lakhs
QA/QC	Late defect detection	Early digital NDT	2 weeks	₹13–16 lakhs
Environmental	Rework from dew point	IoT monitoring	Weeks	Reduced rework
Logistics	Transport bottlenecks	Digital coordination	Weeks	Reduced claims
Disputes	Arbitration delays	SCADA evidence	2 weeks	₹12–20 lakh
Total	5–8 months delay	3–5 months preserved	3–5 months	₹90 lakh+

International Best Practices

Globally, contracts have evolved to treat uncertainties as inherent.

- **FIDIC MDB**: Recognises compensation events (e.g., regulatory changes, pandemics). Provides for multi-index price adjustment.
- **NEC4**: Based on collaboration, early warning mechanisms, and digital risk registers. Data-sharing platforms allow joint monitoring.
- **Australian Alliancing**: Contracts embed shared risk/ reward and mandate transparent digital dashboards.

By comparison, Indian contracts still lack clarity for 'compensation events' and digital obligations. The use of these for the Pamban Bridge contract showcased their effectiveness, but mainstream adoption would go a long way in minimising disputes.

Case Study: Pamban Bridge

The Pamban Bridge reconstruction was marked by unique challenges:

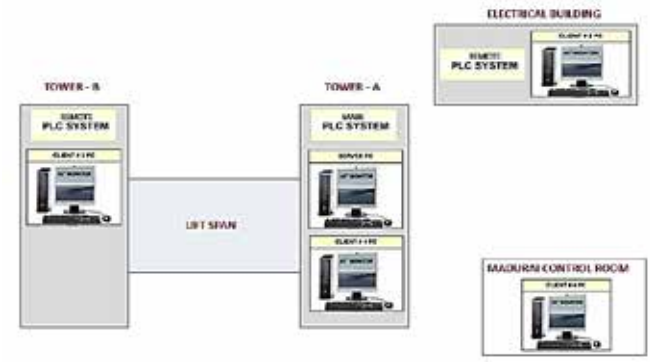
- Pandemic disruptions within four months.
- Narrow site access restricting ODC.
- Dependence on a single stainless-steel supplier.
- Transport of 20m rolled steel plates.
- High humidity and low dew point delaying welding/ painting.

Fabrication of Lift Span and Tower – Weld Inspection by PAUT.

- Rough seas and high winds disrupting barge operations.
- Welding at +16m and tower lifts up to +40m above MSL.

Despite these, the contract's digital and adaptive provisions ensured resilience:

- SCADA synchronisation enabled safe span lifts even in windy conditions.
- IoT for monitoring humidity/ dew point reduced rework.
- CCTV oversight improved safety at heights.
- Remote approvals-maintained progress during lockdown.
- SCADA logs resolved block disputes swiftly.



SCADA for Pamban Bridge

Thus, while challenges could have led to systemic breakdown, the project progressed steadily. The Project Management Consultant (PMC) played a stellar role in the successful completion of the Pamban Bridge Project.

Recommendations and Roadmap for India

In light of the experience gained from this project, it is recommended that, for successful and timely completion of projects, the following be adopted and incorporated at the tender stage.

- **Standardise Digital Clauses** in all public contracts and even large private contracts.

- **Data Schedules**: Define collection, retention, and audit of digital records.
- **Automated Triggers**: Link compensation to indices or weather thresholds.
- **Balanced Allocation**: Employers must also bear responsibility for delays for what the employer is to do or provide.
- **Expanded Force Majeure**: Include pandemics, supply chain shocks, and environmental extremes.
- **Capacity Building**: Train engineers and contractors in digital contract management.
- **Dispute Boards**: Base findings on digital logs to reduce arbitration.

Conclusion

Infrastructure projects, by their very nature, are exposed to uncertainties. These uncertainties - whether regulatory, legal, market-driven, technical, operational, or force majeure - are no longer exceptions but constants in the delivery of large and complex projects. The difference between success and failure lies not in avoiding uncertainty altogether, but in how contracts and technologies are designed to anticipate, absorb, and adapt to them, coupled with contractual provisions that are dynamic to address unforeseen conditions with a positive involvement of the owner/ authority

The new Pamban Bridge, India's first vertical lift sea bridge, is a shining example of this principle. Built in the second most corrosive marine environment in the world, during a period marked by the unprecedented disruption of COVID-19, the project stood resilient because its contract did not remain static. Instead, it embedded digitalisation measures - SCADA systems, PLC synchronisation, IoT-based environmental monitoring, and CCTV surveillance - along with contractual foresight through clauses for NDT-based quality assurance, adaptive risk allocation, and IT-enabled approvals. These measures ensured that challenges such as pandemic lockdowns, material transport restrictions, dependence on a single supplier, humidity-driven welding delays, and rough seas did not spiral into catastrophic overruns.

The outcome speaks for itself: while a conventional contract would likely have suffered 5-8 months of delay and spiralling costs, the Pamban project preserved 3-5 months of schedule and avoided significant disputes. The bridge today is not only an engineering marvel - with its 72.5 metre vertical lift span, 520-tonne weight, stainless steel reinforcement, and electro-mechanical lift system - but also a contract management milestone that demonstrates how digitalisation and adaptive provisions create resilience.

This case offers valuable lessons for India's broader infrastructure ecosystem:

- Rigid, employer-centric contracts must give way to balanced, adaptive frameworks that acknowledge systemic uncertainties.
- Digitalisation must be mainstreamed, not treated as an optional add-on. From data schedules to digital dashboards, the contract must define how information will be captured, shared, and used as evidence.
- Capacity building is essential - engineers, contractors, and clients must all be trained to work with digital contract management tools.
- Force majeure clauses must be modernised to explicitly include pandemics, supply chain disruptions, and climate-related events.

Ultimately, the story of the Pamban Bridge is not just about one project. It is about a paradigm shift in Indian contracting. By marrying cutting-edge engineering with digital-ready, risk-sensitive contracts, India can ensure that its infrastructure ambitions are not derailed by uncertainty, but instead delivered with confidence, resilience, and global credibility.

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About BARSYL

Established in 1986 and headquartered in Secunderabad, BARSYL is among India's leading railway and urban transit consultancies, with over 850 projects delivered in 15 countries across 5 continents.

CEAI National Award for Excellence in Project Engineering

With a workforce of more than 320 specialised professionals, BARSYL brings expertise in civil, track, bridge, signalling, telecom, and systems engineering. The firm is empanelled with Indian Railways, the World Bank, Asian Development Bank, and other multilateral agencies, making it a trusted partner for large-scale, complex infrastructure assignments.

BARSYL's portfolio includes prestigious projects such as the Delhi Metro, Hyderabad Metro, Dedicated Freight Corridor, Etihad Rail (UAE), and Colombo Suburban Railway (Sri Lanka). Its involvement in the new Pamban Bridge – India's first vertical lift sea bridge highlights its capability to manage projects of global significance in highly challenging environments.

As PMC for the Pamban project, BARSYL coordinated design reviews, quality assurance, contractual compliance, and digital monitoring frameworks. Its guidance ensured that uncertainties - from pandemic disruptions to environmental challenges such as rough seas, high winds, and humidity-induced welding delays - were managed systematically through digitalisation, proactive risk management, and contractual foresight.

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03

Uncertainty is the New Normal: How Procurement Contracts Must Evolve

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It is no longer a question of *whether* uncertainty will impact a project - but *when*, *how deeply*, and *how often*. From volatile geopolitical landscapes and climate-related disruptions to rapid technological shifts and unpredictable supply chain behaviour, uncertainty has become a permanent fixture in the landscape of projects. In this new reality, traditional procurement contracts - designed for predictability and control - are increasingly unfit for the purpose.

As procurement professionals, project owners, and legal advisors grapple with escalating risks and ambiguity, the time has come to fundamentally rethink how we design, negotiate, and execute contracts. The procurement contracts must evolve from being a rigid rulebook to a dynamic risk-sharing instrument - one that supports flexibility, collaboration, and resilience.

Over the last decade, global projects have faced a perfect storm of disruptions. COVID-19, trade wars, inflation spikes, energy shortages, raw material scarcities, regulatory changes, and increasingly frequent extreme weather events have exposed the fragility of traditional contracting approaches. Fixed-price contracts, locked-in schedules, and strict liquidated damages clauses simply do not work well in a world where supply chains can collapse overnight or political crises can shut down entire markets.

The traditional procurement playbook assumed a level of certainty that is no longer realistic. Projects were expected to follow linear paths, with clear scopes, predictable inputs, and controllable timelines. But in today's world, uncertainty is not the exception - it is the rule.

So, what is broken in today's contracts?

***First*, there is an over-reliance on fixed terms.** Many procurement contracts still rely on fixed pricing and fixed schedules, transferring all the risk to the suppliers or contractors. While this might have once provided predictability for project owners, it now often leads to inflated bids (to account for risk) or outright project failures when unforeseeable conditions arise.

***Second*, ineffective Force Majeure clauses.** The pandemic revealed that many force majeure provisions were ill-defined, inadequately scoped, or simply inapplicable to the nature of disruptions that are now occurring. Legal battles ensued over what constituted an "unforeseeable" event, and many contractors were left without recourse.

As per the Asian Development Bank, COVID-19 may be considered a force majeure event if:

- The contract was signed before the World Health Organization declared the pandemic.
- The extent of the disruptions were not predictable[1].

***Third*, adversarial risk allocation.** Traditional contracts often promote a zero-sum mindset, where risk is allocated through hard negotiation rather than mutual understanding. This undermines collaboration and can damage relationships when challenges arise mid-project.

***Lastly*, insufficient agility.** Contracts often lack mechanisms for dynamic repricing, flexible delivery timelines, or adaptive scope changes. In highly fluid environments, this rigidity becomes a liability.

Need for Contracts as Living Frameworks

To address uncertainty effectively, procurement contracts must evolve in structure, spirit, and function. They must become *living frameworks* - tools for navigating change, not merely enforcing compliance.

From Risk Transfer to Risk Sharing. The most critical shift is philosophical. Contracts must move from *risk transfer* to *risk sharing*. Instead of pushing all volatility onto suppliers, contracts should enable equitable sharing of risks based on capability, proximity to control, and value creation.

Collaborative contracting models such as *alliancing* or *integrated project delivery (IPD)* already reflect this mindset. These models incentivize shared outcomes and reward joint problem-solving, rather than punishing deviation from an idealized baseline.

Embedding Flexibility through Modular Clauses. Contracts must become more modular and adaptable. This includes:

- **Price Adjustment Mechanisms:** Tie pricing to indices (e.g., steel, fuel) to account for inflation and commodity volatility.
- **Scope Variation Protocols:** Clearly defined processes for adapting scope based on new information or constraints.
- **Time Contingency Allowances:** Pre-agreed time buffers or "relief events" for specific risk triggers like shipping delays or labour shortages.
- **Escalation & Dispute Resolution Mechanisms:** Step-wise conflict resolution paths to avoid deadlocks and project delays.

Flexibility does not mean abandoning discipline - it means preparing for the unexpected with smart guardrails.

Revisiting Force Majeure and Material Adverse Change (MAC). Unfortunately, despite the robust canon of pandemic predictions, the term "pandemic" is glaringly absent from pre-COVID-19 contracts. Even the more general term "epidemic" is hardly included in force majeure clauses drafted before COVID-19[2].

Force majeure clauses must be rewritten for the 21st century. They should be broad enough to capture a range of modern risks - from pandemics and cyberattacks to regulatory embargoes - and include clear thresholds for impact.

Alternatively, more granular *Material Adverse Change (MAC)* clauses can provide clarity on what constitutes an unacceptable shift in project fundamentals, triggering renegotiation or relief.

Incentivizing Transparency and Early Risk Disclosure. Uncertainty is magnified when parties hide information or delay bad news. Contracts should include incentives for early risk disclosure, joint risk assessments, and collaborative mitigation planning. This is where *relational contracting* principles shine: building trust-based contracts that prioritize long-term relationship value over short-term gains.

Incorporating Digital Tools for Dynamic Management. Smart contracts, digital twins, and project management platforms can provide real-time insights into supply chain health, performance metrics, and risk signals. Contracts should allow integration with such tools, enabling dynamic decision-making and automated compliance tracking.

For example, a digitally enabled contract could automatically adjust delivery expectations based on real-time shipping delays, or notify parties when key

performance indicators are breached - triggering pre-agreed response protocols.

The procurement contract of the future will not be a static PDF sitting in a drawer. It will be:

1. **Dynamic:** Designed to evolve over time as risks, data, and relationships change.
2. **Data-Integrated:** Linked to real-time project systems for performance monitoring.
3. **Collaborative:** Aligned with shared goals, with mechanisms for joint decision-making.
4. **Transparent:** Encouraging open book accounting, early warning systems, and proactive communication.
5. **Balanced:** Fair in risk allocation, ensuring viability for all parties across scenarios.

This has implications for procurement professionals. Procurement professionals must now wear multiple hats: negotiator, risk strategist, relationship manager, and change agent. This shift requires:

- **Skills Development:** Training in relational contracting, agile project management, and risk analytics.
- **Cross-functional Collaboration:** Working closely with legal, finance, operations, and external advisors to craft contracts that are both robust and adaptive.
- **Proactive Engagement:** Engaging suppliers early in the design phase to co-create workable frameworks and surface risks collaboratively.

The most forward-looking procurement teams are piloting "next-gen" contracting models - ranging from outcome-based contracts and performance-linked incentives to shared contingency funds and collaborative risk registers.

To conclude, the reality is clear. There is no returning to a world of predictable inputs and linear projects. The only certainty is continued uncertainty. In this environment, clinging to outdated contracting norms is not just inefficient - it is counterproductive and dangerous.

Procurement contracts must become tools of resilience and partnership. They must anticipate change, enable flexibility, and support cooperation under stress. This shift is not just a legal or commercial imperative - it is a strategic necessity.

Project success in the age of uncertainty will be defined not by how well one controls deviations from the plan, but by how effectively one adapts, responds, and recovers. That adaptation starts with reimagining the contracts that hold projects together.

The contract is no longer just a legal document - it is a living, breathing instrument of strategy.

Hence, it is essential to make sure that it is fit for the world of today.

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04

Managing Project Risks Through Interim Measures: Arbitration in Times of Uncertainty

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Introduction

Construction and infrastructure projects have to deal with multiple challenges, ranging from land acquisition, regulatory approvals, and financing contingencies, while accounting for uncertainties such as unforeseen climate events and other factors. These variations may derail projects and lead to financial and reputational loss. Alternative dispute resolution, and specifically arbitration, is the preferred means to resolve disputes. However, the unique nature of construction disputes adds complexity. Disagreements arising while projects are underway cause construction and dispute resolution to proceed in parallel, often influencing one another. A contractual deadlock might stall on-site work, while ongoing project developments may shift the parties' legal positions, especially when the contractors put up substantial collateral and security as part of the contractual terms and conditions. In this context, interim measures have become essential for navigating disputes and protecting parties from irreparable harm, resultantly allowing projects to move forward.

The Indian Framework: Legal Architecture for Interim Relief

The Indian statutory framework provides for interim reliefs under Sections 9 and 17 of the Arbitration and Conciliation Act, 1996 ("**the Act**")[1]. This article examines how interim measures in construction arbitrations are being deployed to manage uncertainties, safeguard commercial interests, and prevent vital infrastructure projects from being held hostage to prolonged legal battles.

Sections 9 and 17 of the Act are important safeguards in high-stakes construction disputes, enabling urgent relief to preserve the status quo or prevent irreparable harm during different project phases. Section 9 empowers parties to approach courts before a Tribunal is formed or even after an award, addressing urgent situations where immediate intervention is critical. By contrast, a Section 17 Application can be filed once the Arbitral Tribunal is constituted, allowing it to grant interim measures. In construction disputes, interim relief often safeguards parties from risks such as delayed land handover or abrupt terminations. Courts or arbitrators attempt to find a *via media* so equities can be balanced, and parties' interests are protected, pending final adjudication of claims on the merits. The grant of such relief depends on establishing a prima facie case, a balance of convenience, and the likelihood of irreparable loss being caused.

Powers under Sections 9 and 17 of the Act are wide, and interim measures are not bound strictly by the provisions of the Code of Civil Procedure, 1908[2], although Courts have emphasized that the same principles should be considered while granting relief.

They operate as flexible safeguards in construction disputes, ensuring that urgent protection is granted in a commercially pragmatic yet fair manner, so that arbitration remains effective and parties are not left to suffer irretrievable prejudice pending final resolution.

Recently, the Bombay High Court in *Ashoka Buildcon Ltd. vs Maha Active Engineers India Pvt. Ltd. & Anr.*[3], emphasised that the three tests - prima facie case, balance of convenience, and likelihood of irreparable loss would need to be satisfied before granting any injunction. Additionally, the Court also held that another fact needed to be considered was whether an applicant approaches the Court with reasonable expedition.

The aforesaid decision is in line with the landmark ruling of the Supreme Court in *Essar House Pvt. Ltd. vs Arcelor Mittal Nippon Steel India Ltd.*[4], where it held that Courts exercising jurisdiction under Section 9 of the Act would not be restricted by the rigours of the Code of Civil Procedure, 1908 or other procedural laws.

The thresholds for seeking relief under Sections 9 and 17 of the Act are similar. The only difference is in relation to who grants the order and when such an order is sought. As mentioned above, a Section 17 application can only be filed once an Arbitral Tribunal has been constituted. The Bombay High Court in *Godrej Properties Ltd. vs Goldbricks Infrastructure Pvt. Ltd.*[5] set out an additional point of distinction, on whether an Arbitral Tribunal can grant *ex parte* interim relief under Section 17 of the Act. The Court held that even though the Arbitral Tribunal is recognised to have the same power for passing orders as that of the Court, however, in light of the safeguards provided under the Act mandating equal treatment of parties and that each party should be given a full opportunity to present its case, *ex parte* orders should not usually be granted until after sufficient notice is provided.

Uncertainties Arising under Construction Contracts and Judicial Remedies

In this section, we analyse a few frequent roadblocks that become apparent in construction projects and how interim measures have been used by parties and subsequently dealt with by the Courts in India.

Termination and Blacklisting

Construction contractors often face termination notices for delays arising from diverse issues. Indian contracts usually allow termination without reason or upon specified events. Courts, however, have scrutinized such actions, with parties frequently seeking interim measures to restrain termination for protecting their interests during the pendency of the arbitration.

The Calcutta High Court in *Rolta Infrastructure & Technology Services Pvt. Ltd. vs Department of Information Technology & Electronics, Government of West Bengal*[6] was asked to step in after the State terminated a 99-year sub-lease of land given to Rolta for setting up an IT project. Rolta contended it could not complete construction as the State failed to provide power, water, and sewage, while the State alleged default and initiated eviction. Rolta sought Section 9 protection, contending that arbitration would be meaningless without a stay. The Court stayed the termination, holding its role was to preserve the subject matter until Arbitration, as permitting termination would cause irreparable harm and undermine fair adjudication of the dispute.

Apart from the termination of contracts, blacklisting or debarment is another serious issue. Blacklisting may potentially have a longer and more severe impact as it prevents contractors from bidding on future projects, causing severe ramifications.

In *Oasis Projects Ltd. vs National Highways & Infrastructure Development Corporation Ltd.*[7], the Delhi High Court overturned a Section 17 order that refused to grant a stay on a debarment order, which was passed against principles of natural justice. In this matter, Oasis was debarred for two years after its contract was terminated for delay in completing a highway project in Nagaland. Oasis claimed that local unrest, land acquisition issues, and natural events had stalled the progress, but the termination was followed by an automatic debarment under the contract. The

Delhi High Court found that this debarment, which effectively shut the contractor out of future tenders, could not be imposed without following basic principles of fairness, like giving prior notice and a chance to be heard.

Stay of termination is a challenge and is not granted in every instance. The Courts consider the peculiar facts and circumstances of each case before moulding appropriate relief. In *Ksheeraabd Construction Pvt. Ltd. vs National Highways & Infrastructure Development Corporation Ltd. & Anr.*[8], the contractor attempted to stay a termination notice issued by NHIDCL by filing a petition under Section 9, contending that delays were not their fault. The Delhi High Court dismissed the petition, stating that Courts should not override contractual terms entered into by the parties by way of issuing an injunction to restrain a contract which has been terminated, especially in infrastructure projects.

Force Majeure and Pandemic Disruptions

The Supreme Court's recent decision in *Chamundeshwari Electricity Supply Co. Ltd. vs Saisudhir Energy (Chitradurga) Pvt. Ltd. & Anr.*[9] deals with force majeure events in infrastructure contracts. The Supreme Court emphasized the need to invoke the correct contractual provision, even for seeking an extension of time due to force majeure. In this case, the State Commission and APTEL had both held that delays in completion of the evacuation system were beyond the control of the developer, constituting a force majeure event. The Supreme Court, however, held that the developer had failed to issue a notice within seven days of receiving knowledge of the force majeure event, which was a mandate under the contract.

In the case of *Standard Retail Pvt. Ltd. vs GS Global Corporation & Ors.*[10], the Bombay High Court turned down buyers' pleas for interim relief under Section 9 of the Act. The buyers sought to restrain encashment of Letters of Credit issued to a Korean steel supplier, citing COVID-19 and lockdown as force majeure. The Court rejected this, holding Letters of Credit to be independent from underlying contracts and cannot be stopped due to downstream business issues.

Invocation of Bank Guarantees

Bank guarantees are omnipresent in construction contracts, acting as financial assurance against delays, non-performance, or defect liability. However, their invocation amidst unresolved disputes can hamper the execution of the project. A bank guarantee is an independent contract between the issuing bank and the beneficiary, distinct from the underlying contract, and has to be honoured independently. However, it is the usual trend for Courts to intervene in very limited circumstances, such as where fraud of an egregious nature or irretrievable injustice is established.

The Delhi High Court in *Kotak Mahindra Bank Ltd. vs Union of India & Ors.*[11] has once again reiterated the position that a bank guarantee which is payable on mere demand by the guarantor is an unconditional bank guarantee. Once such a bank guarantee is invoked, the bank is bound to honour the same on demand, *de hors* the dispute between the parties.

In *Halliburton Offshore Services Inc. vs Vedanta Ltd. & Anr.*[12], the Delhi High Court dealt with a Section 9 petition seeking to restrain encashment of bank guarantees during the initial COVID-19 lockdown. Halliburton contended that the lockdown frustrated performance and invoked force majeure, while Vedanta argued that bank guarantees are autonomous instruments, enforceable save for fraud or irretrievable harm. The Court reaffirmed that force majeure must be strictly construed, and bank guarantees are independent contracts subject to limited exceptions. The Court initially granted a stay on the invocation of the bank guarantees, considering the COVID-19 lockdown fell under "special equities". However, upon a detailed examination of the facts, the Court later vacated the stay, finding that the delays attributable to Halliburton had occurred prior to the pandemic and therefore could not be excused as a force majeure event.

Regulatory Shifts

Regulatory changes are unanticipated and can appear as a major source of uncertainty in construction projects. Project schedules, cost structures, and

compliance requirements may all be directly impacted by modifications to labour laws, safety standards, tax regimes, environmental standards, or policies governing foreign investment. Such shifts have a major financial and operational impact, which makes them a common source of dispute when projects are being carried out.

In *Energy Watchdog vs Central Electricity Regulatory Commission & Ors.*[13], the Supreme Court provided critical guidance on how Indian Courts interpret the Doctrine of Frustration in commercial contracts impacted by external regulatory developments. The Court dealt with claims by power producers seeking relief from contractual obligations after Indonesian coal pricing regulations dramatically altered the cost structure of supply arrangements. The Court held that such cost escalation did not frustrate the contract since mere economic hardship does not amount to legal impossibility. Importantly, it ruled that where contracts contain a force majeure clause, that clause governs the parties' rights and risks, and the Doctrine of Frustration cannot be invoked to bypass such allocation. On the facts, Indonesian regulations were held not to qualify as force majeure under the agreements, which were confined to Indian laws and events.

The judgment sets the high bar for proving frustration of contract and reinforces the centrality of party autonomy. For construction disputes, especially where delay or cost escalation is blamed on force majeure events, *Energy Watchdog* stands as a reminder that Courts will first look into contractual clauses before allowing statutory doctrines to override them. This analysis becomes especially relevant in Sections 9 or 17 applications where a party seeks to restrain termination or invocation of bank guarantees by contending frustration due to external events.

Emerging Concept of Emergency Arbitration

The concept of emergency arbitration is essential to provide a swift and enforceable remedy in order to prevent commercial harm and disruption of large projects until the arbitration proceedings are underway. Emergency Arbitration is an evolving concept that has gained traction and is prevalent in various leading institutions such as the Singapore International Arbitration Centre, Hong Kong International Arbitration Centre, and London Court of International Arbitration, among others. It has been expressly recognised in India by the Supreme Court in *Amazon.Com NV Investment Holdings LLC vs Future Retail Ltd & Ors.*[14], wherein the issue before the Court was whether emergency arbitral awards are enforceable in India under Section 17 of the Act. The Court held that the emergency arbitral awards would be considered as an interim order under Section 17(1) and are directly enforceable under Section 17(2) of the Act, in cases where the parties have agreed to be governed under institutional rules which provide for emergency arbitration. The Bombay High Court in *Ebix Cash World Money Ltd. vs Ashok Kumar Goel & Ors*.[15] held that an emergency award could also be used as persuasive evidence to support the prayer for interim relief.

The availability and enforceability of emergency reliefs ensure contractual balance and continuity of the project until the dispute is adjudicated by the Arbitral Tribunal, while promoting party autonomy by ensuring the parties are not left without remedy.

Interest

While not usually an issue under a Section 9 or 17 Application, another recurring area of uncertainty in construction and infrastructure arbitration concerns the award of interest. An Arbitral Tribunal has statutory power to award *pendente lite* interest as well as post-award interest. Parties can, however, restrict the grant of *pendente lite* interest by incorporating clear contractual wording in the agreement. In *ONGC Ltd. vs M/s G & T Beckfield Drilling Services Pvt. Ltd.*[16], the Supreme Court, on analysis of the clause which was relied upon to canvass an argument that the agreement had a proscribed grant of *pendente lite* interest, held that the clause was applicable for payments that were to be made *inter se* parties. However, the clause could not bar the Arbitral Tribunal from awarding *pendente lite* interest. This reflects a growing recognition that

contractual interpretation is dynamic, with Courts increasingly adopting a proactive and purposive approach.

Conclusion

In modern construction disputes, legal conflicts now often focus on interim measures during the subsistence of contracts. Sections 9 and 17 of the Act are frequently invoked to secure urgent relief, though Courts and Tribunals have exercised restraint, intervening only where the applicant establishes and satisfies a prima facie case, balance of convenience, and likelihood of irreparable loss.

The Supreme Court has underscored the need for consistent and precise contractual language, cautioning that ambiguities fuel avoidable litigation and undermine the efficiency of arbitration.[17] Sound drafting thus not only reduces the scope for disputes but also strengthens the enforceability of interim protections.

Ultimately, the success of interim relief depends not just on judicial willingness but also on contractual foresight. Parties that anticipate risks and account for foreseeable and unforeseen hurdles at the drafting stage are better positioned to secure such reliefs. As India's infrastructure ambitions expand, the ability to manage uncertainty through effective interim mechanisms will play a decisive role in distinguishing resilient projects that withstand pressure from those that falter amidst disruptions.

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05

Construction Law - Problems and Prospects

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Introduction

1. Construction projects and contracts have grown in complexity and size with the consequence of potentially larger risks; however, the fundamentals remain the same - Project Completion depends to a great extent on good, timely, and competent project management coupled with more accurately worked out project Risk Management.

   There are a greater number of players in the arena of delivery of projects than ever before - that is a challenge. They include the Project Owner/ Authority/ Employer, the Project Managers, the Consultants, Bankers, Insurers, Principal-Contractors, Sub-contractors, Specialist Contractors, Vendors, Environmentalists, and a whole lot of related professionals. Each one is connected to the other through a network of a large number of activities, which result in creating ***rights and obligations***.

   Uncertainty of performance, including the data gathered and provided by one or the other agency, has a serious ripple effect. That creates challenges for Project Managers to find solutions on a continuous basis to eliminate or minimise various risks.

2. Various studies of large and medium-sized Construction Projects have categorised major risks into five main categories, apart from other minor risks.

   i. Demand for Projects
   ii. Financial need for projects
   iii. Technical Risks
   iv. Construction, Operation, Maintenance
   v. Regulatory, like Environmental

   Demand for development is needed for the country, although it may reach its peak, but operation and maintenance, or upgrading and replacement, would still be there, apart from the other real risks. For the latter i.e., the other real risks, it is necessary to be knowledgeable with regard to the governing laws, arranging funds, technical know-how, contracting, Operation & Maintenance (O&M), subletting, and interacting with agencies controlling the environment. Whilst one may handle the risks well, one cannot eliminate interaction with the other parties involved in the project. To minimise these risks, it is necessary to know the status, problems, and prospects of Construction Law.

   Apart from the risks mentioned above, at times situations arise due to variability and uncertainty about design, logistics, systems, stability of currency, objectives, and priorities etc. This paper deals with legal aspects only and not the various risk areas.

Good research is underway into risk management techniques. However, that is still in the process of refinement to establish various risk management tools to render the required efficiency. ***Ultimately, it is efficiency and clarity of the legal system that can effectively reduce uncertainty and hence the risks.***

3. This paper therefore deals with legal aspects and does not delve into project risk management per se, and the various management tools available, including the network (software and coordination). It briefly covers a discussion on the status of Construction Law in India and the problems and prospects associated with it.

Risks In Projects

It needs to be appreciated that for the evaluation of every risk, there is a complex canvas of laws, which is to be traversed to decide the significance and gravity, or otherwise, of the various risks involved. It may be a design failure, work failure, insurance dispute, indemnity bonds, financial distortion, shareholders' charges, risk of concessionaires on BOT and similar projects. The law will be used to decide the fate of any substantial project. The document handled/ used by stakeholders to shape a project is a **Contract**, and the tool to interpret the Rights and Obligations of the stakeholders is ***Construction Law***.

In the complexity related to the Contract and the Construction Law, there is one ray of hope, which lies in having a two-pronged approach to reduce risk. ***Firstly, a proper allocation of risk amongst the various players and secondly, a reasonable system of law.*** Any indifference to these aspects would result in the greatest potential risk.

1. At the very core of any business for development activity, there is risk. In the absence of risk, one cannot get opportunities. A risk is an outcome of uncertainty, which in turn is perceived because of one's ignorance about many aspects of Project Management, including a reasonable awareness of the Law. Just as a factor of safety is provided in designs, there must be a provision of good cushions in contracts to combat risk/ uncertainty. The expertise of management lies in striking a good balance between such provisions and the impact of risk.

2. Whenever disputes or differences are required to be resolved, it can be done through negotiation, reference to some third-party expert, through that person's finding/ opinion, or the person's persuasive efforts, which is termed Mediation/ Conciliation, and later Arbitration, if so desired. If these soft solutions are not chosen, the matters may be resolved by the courts. Whatever may be the stage of the process to resolve disputes, the parties consciously or otherwise talk of the ***Rights and Obligations*** under the Contract.

Problems of Construction Law

1. Although Construction Law is a distinctly established and important branch of law, it undergoes changes because of judgments pronounced by the court from time to time. That changes the doctrine and the interpretations.

2. Inviting experts to interact with courts or an Arbitral forum is not encouraged; the prospects of that are dim. The Infrastructure Industry has nothing to fall back on except the laws as per the **Indian Contract Act, 1872**[1]. The USA has over 600 statutes to govern contracts. The UK has many, including the **Unfair Contract Terms Act, 1977**[2]**.** They have over 20,000 judgments in case laws. The subject of law related to construction 'Risk Management' is vast.

3. Construction Law deals with some topics, which at one time or the other create a controversy. The risk related to Construction law is the result of uncertain, inconsistent, and even incorrect perceptions of obligations of parties under a contract.

Time as Essence & Extension of Time

1. When the process of adjudication starts, the preliminary issues of jurisdiction, limitation, and arbitrability are discussed with an unclear legal

position. One is confronted with handling the phrase "Time is of the Essence" when a project is delayed. The law says time is not perceived as an essence of a contract in cases where the contract has a provision for extension of time and also for recovery of damages for delay in performance. ***AIR 1979 SC 720 Hind Construction vs. State of Maharashtra***[3].

2. However, it is not clear if, in a situation where extension of time is granted, reiterating time as an essence, with or without such notice, would be acceptable. The essential feature of the performance of construction ought to be covered under Section 46 of the Indian Contract Act, whether it is "a reasonable time within which it has to be performed". The risk here is that, as many are aware, extension of time requires the concurrence of both parties and ought to be reasonable. ***Section 62 – Indian Contract Act, 1872***[4].

3. The Court interprets such concurrence by conduct when, unilaterally, an Employer grants an unreasonably short period as an extension of time. Employers many a times levy Liquidated Damages (LD) at the end of the project as an arm-twisting strategy for the Contractor to withdraw the claims which may otherwise be legitimate. The court does not want to interfere at the threshold for encashment of the Bank Guarantee towards Delay Damages. Under this threat, the contractor is asked to withdraw all claims from Arbitration. To say 'No' is to risk encashment of the Bank Guarantee.

4. It must be appreciated that Construction Contracts stipulate a date of completion. The provision is like a unicorn; we know about it, but no one has seen it. In very rare circumstances, our contracts can be completed in the stipulated time. They require an extension to be granted to revalidate the contract. Here, the Employer seems to believe, and courts do not frown, that such an extension of time, being an alteration/ amendment to the contract, must be done with the consent of both parties. Section 62 of the Indian Contract Act states that Risk arises from an unreasonable extension.

5. When a contractor continues to perform in the absence of an extension of time, it is only a tacit contract, whose performance can be withdrawn at any time without inviting any additional liability except for the breaches that occurred earlier than the original date of completion. "Provisional Extension without prejudice" is found to be legally tenable.

Levy Of Penalty/ Liquidated Damages

The well laid law in case of Liquidated Damages (LD) by a Constitution Bench in ***AIR 1963 SC 1405 Fateh Chand vs. Balkrishan Dass***[5] has got eroded or confused, or misunderstood on account of the judgement of ***Saw Pipes (2003) 5 SCC 705 ONGC vs. Saw Pipes***[6]. That led to Project Owners/ Authorities/ Employers and even some Courts seem to believe that the provision of LD is deemed agreement on a correct estimate of damage for delay and could be recovered without proof of damages. However, recently, through many judgments, the Courts have expressed that the loss must be proved.

Exclusion Clauses in a Contract

1. The introduction of the term 'accepted matters' led to the term 'Reference' being misused and misinterpreted, and now, for adjudication, there is the mandate of law under Section 28 of the Arbitration and Conciliation Act, 1996, that the Arbitrator will decide in accordance with the 'terms of the contract'. The Courts in India, unfortunately, do not find any term in a contract as unconscionable and exculpatory, i.e., unenforceable or unfair. An excellent judgment of the Supreme Court on Contracts of Adhesion in the Brojo Nath Ganguly case ***AIR 1986 SC 1571 Central Inland Water Transport Corporation Ltd vs. Brojo Nath Ganguly***[7]does not apply to a commercial contract (Construction Contract).

2. The Exclusion clause that 'no claim shall be payable on such an account' is enforceable. It is interesting to compare this approach with the law laid down by the Supreme Court ***AIR 1984 SC 1703, M/s A.***

T Brij Paul Singh vs. State of Gujarat[8]**,** for loss of profit in case the contractor is denied whole or part of the work.

3. Coming to the designs and drawings as supplied by the Project Owner/ Authority/ Employer, it is interesting to note the law laid down by the Mumbai High Court as reported in ***AIR 1994 Bom 48, State of Maharashtra vs. Saifuddin Mujjaffarali Saifi***[9].

   "There is no room for any implied undertaking by the employer that the completion is in accordance with the design or specification, is possible or practical."

4. That can be compared with the internationally acknowledged ***Spearin doctrine (United States vs Spearin, 248 U.S. 132 (1918)***[10] whereby it is the obligation of the designer to own its mistakes and thereby compensate the contractor.

   "If the contractor is bound to build according to plans and specifications prepared by the owner, the contractor will not be responsible for the consequences of defects in the plan and specifications."

Site Inspection Clause

1. In recent times, there has been a growing concern about the interpretation of the law related to Site Inspection. Since the Courts have not made a clear distinction, the job/ task/ work referred to as ***Site Inspection*** is misinterpreted as ***Site Investigation.*** The ***'Doctrine of Superior Knowledge'*** does not exist in the Indian Construction Law.

2. The drafter of the contract expects a limited, superficial inspection of the site. That is evident from the fact that only a short period is available between the last date of sale of the tender and the submission of the bid. Obligations are understood through simple expressions, ignoring surrounding facts.

Termination or Rescission of a Contract

1. All Construction Contracts carry well-drafted clauses for the termination of the contract. However, in practice, an impossible target for completion of balance work is unilaterally fixed by the Project Owner/ Authority/ Employer. The contract is terminated for not performing an impossible task. The notice of termination for reasons difficult to fathom is notice of ***'rescission'.*** The Project Owner/ Authority/ Employer does not appreciate that the term ***'rescission' in law means 'nullity' of contract,*** i.e., as if there was no contract between the parties. In such cases, legally speaking, an account has to be settled, and advantages/ gains have to be restored to the party suffering due to the notice resulting in the act of 'rescission'.

2. No eyebrow is raised when a contract is "terminated or rescinded" by operating the "risk and cost" clause. It is legally necessary to suspend the performance of the contract if the risk and cost clause is required to be operated. The work so executed must be of the same description and scope as per the earlier contract. There are a number of judgments ignoring this vital fact. On termination, what survives is the Arbitration clause only vide ***2007 (2) ALR 339 (SC) National Agricultural Co-op Marketing Federation of India Ltd vs. Gains Trading Ltd***[11].

Variations

1. The issue of variations or change in quantity as drafted in various contracts patently violates the essence that variations beyond a reasonable degree should be freshly negotiated and worked out.

2. Recently, all changes, be they Extra Items, change in quantity, or change in methodology or specifications, are termed as COS, i.e., Change of Scope, without understanding the legal applicability for each change. The law for Quantity variations will be different from the law for Extra Items and so on.

Bank Guarantees and Warranties

1. The greatest risk one can have for a Bank Guarantee is that it does not require any explanation from the Employer to encash the same. Unfortunately, even

in mobilisation advance, the Supreme Court did not appreciate that it is only the balance amount unpaid that could be recovered, and so there is nothing wrong in allowing the Employer to recover the whole amount of the Bank Guarantee. For Courts, it is at par with "I owe you" – a Promissory Note.

2. Examining the situation in the spirit of what the Supreme Court itself laid down in the famous case of ***Thippareddy AIR 1987 SC 1359 The Executive Engineer Tungabhadra Reservoir Division Munirabad vs. Thippa Reddy***[12]. ***One can't be the judge in one's own cause***. However, in the case of a Bank Guarantee, the Project Owner/ Authority/ Employer can be a judge in his own cause, and the Court refuses to maintain the status quo by giving a stay on encashment of the BG unilaterally without a proper process of adjudication of the disputes.

3. Nowadays, one single point of coercion/ blackmail of contractors is to hold a threat to encash the Bank Guarantee. In **United Precision Vs Kudremukh and Iron Ore Company**[13] of the Government of India, the Government obtained an ex-parte decree to encash the Bank Guarantee as a result of their demand for the counterclaims. The Hon. Retd. Judge, who was the Sole Arbitrator appointed by the same Court in Karnataka, found himself helpless in handling counterclaims already adjudicated by the Government itself and decreed by a Court. This is the riskiest business for Contractors.

Interest Clause

No interest clause in the contract is endorsed by the court. Thus, even if there is an abnormal delay in the dispute resolution system, the Arbitrator cannot award interest. Recently, in one of the arbitrations, the Arbitrators were appointed after 10 years of battle in the Court. Two years were taken in the proceedings till the Arbitrator declared the Award. The contract had a provision of a no-interest clause. **Where is the reasonability and justice to the party for the amount awarded after a lapse of 12 years,** and again, further time would be spent in a court for challenging the Award?

Even today, the issue related to the quantum of interest being reasonable or otherwise is most interfered with by the Courts. It is not often appreciated by the Arbitrators that ***future interest on the Award has to be deterrent to avoid delays in payment*** by the losing party, and delay is traditionally caused because of proceedings in a Court. It should be encouraged by the Court not to interfere with deterrent future interest, which has been recommended to be put at 18 per cent. It is suggested that it should be interpreted as a mandatory provision of law.

No Claim Certificate

Law generally favours the doctrine of Coercion/ Economic Duress, and the Court decided to give Arbitration on its merit - ***2007 Arb W.L. J (11) SC Ambica Constructions vs. Union of India***[14]. Some Government employers insist on an affidavit of No Claim Certificate before paying the Final Bill of their choice. Here, one is required to develop coercion theory before giving a No Claim Certificate as part of Contract Administration.

Jurisdiction of Arbitrator

1. There is an excellent **"Doctrine of Bid Parameters"** laid down in the Cochin Shipyard case ***(1984) 2 SCC 680 Tarapore Co vs. Cochin Shipyard Ltd.***[15] whereby in the event of the bid parameters being vitiated, the enforceability of the contract is questioned. As a matter of fact, the judgment has the essence that the portion vitiated by the distortion of bid parameters ***becomes otiose***. This law was distinguished by the distinction that it would not be so if a term in a contract excludes any compensation for a rise in prices. ***AIR 1992 SC 232 Associated Engs. Co. vs. Govt. of Andhra Pradesh and another***[16].

2. Thereafter, the floodgate opened cruelly against the descent right of the contracting fraternity to claim such adjustment through a series of judgements ***AIR 1988 SC 1166 Continental Construction Ltd. vs. State of Madhya Pradesh***[17]***, AIR 1992 SC 232***

Associated Engs. Co. vs. Govt. of Andhra Pradesh and another[16]***, AIR 1997 SC 980 New India Civil Erectors Pvt. Ltd. vs. ONGC***[18]***, AIR 1999 SC 3627 Rajasthan State Mines & Minerals Ltd. vs. Eastern Engineering Enterprise & Another***[19].

When a major market fluctuation took place on account of an abnormal increase in material costs, which can be termed as beyond the contemplation of any prudent contractor, the damage estimated at over Rs. 20,000 crores was denied to contractors. It happened when the prices of steel and cement went up. The Project Owner/ Authority/ Employer got enriched at the cost of the contractors. The courts could not help the contractors, because the doctrine of Bid-parameter was already destroyed.

3. It is rare that one finds some judgments that ignore such unfair conclusions of law and reiterate what is true about damage. To cite an example, in ***2007 Arb W.L. J (1) SC K. N. Satyapalan vs. State of Kerala***[20]**,** the Supreme Court allowed compensation even though the contract clearly excluded payment for escalation, payment for dumping site not being available, and payment for inconvenience caused by anti-social elements. However, in a matter of eleven days thereafter, a judgment ***2007 Arb. W.L. 99 (SC) Ramnath vs Union of India***[21] published in the same report, a few pages after the earlier one, asserts that the ***Arbitrator is not permitted to go beyond the four corners of the contracts*** and thereby implied that even unfair and unconscionable contracts need to be enforced and no escalation and claims expressly barred be awarded in a contract of Adhesion.

Computation and Proof of Damage

The Supreme Court has appreciated suggesting the Eichleay Formula and allowed Head Office overheads to be computed based on the Eichleay formula **2006*(2) ALR 498 SC Mc. Dermott International Inc. vs. Burn Standard Co. Ltd.***[22].The claims related to 'Acceleration' and' Loss of Productivity' are, even today, not appreciated. Analysis of a delay damage claim is an unheard-of avenue in Indian Construction Law cases. However, with the recent judgment, the ratio is watered down, and now one has to prove the loss by books of accounts or otherwise.

Process of Mitigation of Losses

In all litigations, including arbitration, it is expected that the contractor must mitigate the losses when damage occurs. Owners/ Authorities/ Employers expect contractors to accelerate the work without reasonable compensation. It is not appreciated that the contractor has to engage a larger labour force, better and or different equipment, and incur overtime to accelerate execution of the works. Beyond a suggestion about mitigation, there is no case law on obligations of the Employer to order acceleration or to compare bar chart dictating through a unilaterally charted programme. The Project Owner/ Authority/ Employer often does so and terminates a contract without inviting any liability.

Prospects: Speak Aloud

On account of the various issues as given in this article, someday the affected Infrastructure contracting fraternity may demand to bring about legislation in line with the ***Unfair Terms of Contract Act 1977 of the UK***[23] or have a chapter included in the Contract Act on lines of ***"Unconscionability" in Uniform Commercial Code (UCC) in U.S. law***[24]. Courts must take on the role of 'policing' and be prepared to refuse to enforce Unconscionable Terms. The contracting fraternity would need to speak louder to be heard.

Conclusion

In conclusion, one point to the provision in the German Civil Code, Sec. 138:

> **"***Contract could be* ***void*** *whereby a person profiting from distress, irresponsibility or experience of another…"*

Regarding contracts related to engineering projects, one needs to heed the words of an American Judge as per ***E. C. Erust Inc. vs Manhattans Construction Co. of Texas***[25].

"Gentleman, this is the case which should be settled between the parties trained in this field; ***you are in a far better position to adjust your differences*** *than those untrained in these related fields. As an illustration, I, who had no training whatsoever in engineering, had to determine whether or not the emergency generator system proposed to be furnished ..... met the specifications, when experts couldn't agree."*

It is high time that the Infrastructure Industry must come forward to impress the Governments and Courts to appreciate the problems of its trade and get an exclusive Act and law for the industry, rather than the general Indian Contract Act 1872. Apart from the law, the Owners/ Authorities/ Employers must come forward with a partnering concept and develop a contract document which must be just, fair, and equitable with no favour to just one side.

All said and done, professionals handling the project must be aware of the development of the law, follow and comprehend Contract Administration, albeit with basic knowledge of Law.

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06

Contractually Managing Uncertainties in Projects: An Intelligent Risk Management Framework

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Introduction: From Risk Transfer to Risk Intelligence

The world of engineering and construction has seen a profound change in how great projects manage uncertainty. The previous paradigm of "*all risk goes to the lowest bidder*" has been replaced by smart uncertainty management through expert contract writing, good data, and joint problem-solving.

The costliest lessons in the industry have always arisen from contracts that sought to reduce uncertainty by risk transfer instead of dealing with it through smart decision-making. The most successful projects of today accept uncertainty as controllable through better documentation, thorough data analysis, and cooperative frameworks that bring everyone together on the best possible outcomes.

The Foundation: Precision Contract Drafting

Beyond Boilerplate to Project-Specific Intelligence

Old-fashioned contract drafting was extraordinarily dependent on generic templates with little adaptation - a process that never managed to deal effectively with project-specific uncertainty. Advanced documentation starts by having a thorough analysis of the distinct risk profile of every project and creates language that responds to these particularities with sophistication.

Imagine a water treatment plant where typical environmental compliance provisions would state: *"Contractor shall comply with all environmental regulations."* Such boilerplate language is of no value when regulations change during construction. Intelligent drafting produced: *"Contractor shall comply with environmental regulations as defined in Schedule A (Regulatory Baseline). Changes to regulations occurring after contract execution that materially affect project scope, cost, or schedule shall be addressed through the Change Management Process defined in Section 12, with costs allocated based on the Risk Allocation Matrix in Schedule B."*

Data-Driven Scope Definition

Effective contract language requires full information. Instead of accepting typical geotechnical investigation spacing, one recent bridge job spent extra money on detailed subsurface exploration, sophisticated geophysical surveys, and ongoing groundwater observation. That extra investigation cost $400,000 but precluded $8 million of possible differing site

conditions claims by allowing precise specification to be incorporated for the foundations.

The contract duly mentioned this extensive inquiry: *"Foundation design is based on the Comprehensive Geotechnical Investigation (Schedule C), consisting of 147 borings, continuous groundwater monitoring, and geophysical correlation analysis. The Geotechnical Baseline Report (Schedule D) establishes expected conditions for all foundation locations."*

The Power of Reliable Data in Contract Formation

Establishing Factual Baselines for Decision-Making

Complete data turns contract negotiations into cooperative optimization procedures instead of combative risk-allocation rituals. When everyone starts with the same accurate data, debate is about optimal methods of dealing with quantified uncertainties rather than disputes over liability for unforeseen conditions.

Risk analysis augmented by technology makes contract documentation possible that deals with uncertainties with an unprecedented level of accuracy. Advanced monitoring systems, predictive statistics, and simulation modelling offer insights unimaginable using conventional investigative techniques. A smart city infrastructure project used IoT sensors, traffic modelling, and demographic analysis to develop data-driven performance specifications based on actual usage patterns*: "Traffic signal optimization shall decrease average intersection delay to 23.5 seconds (±3 seconds) based on the Traffic Pattern Analysis (Schedule H) for 14,000 hours of actual traffic observation."*

Collaborative Frameworks: Shared Intelligence, Shared Success

Aligning Incentives Through Transparent Risk Assessment

Optimal uncertainty management involves alignment of everyone around project success, not optimization for each party. Such alignment comes as a result of open risk assessment processes that bring to the surface optimal risk allocation depending on each party's ability to manage certain uncertainties.

A transportation infrastructure project employed extensive risk workshops with all senior stakeholders to define project uncertainties and assess management strategies. These workshops yielded an extensive Risk Allocation Matrix that allocated responsibility for each defined uncertainty to the most capable party to deal with it.

Performance-Based Contracting with Collaborative Optimization

Modern contracting is oriented toward results while developing collaborative structures for optimizing methods for obtaining these results. A renewable energy plant project illustrated such a strategy with outcome-based specifications necessitating certain energy generation targets while allowing for contractor innovation: *"Energy generation shall deliver 98.7 MW capacity factor according to the Wind Resource Analysis (Schedule L). Opportunities for performance improvement identified during construction shall be assessed through the Joint Technical Committee process, with benefits of implementation shared under the Innovation Incentive Framework (Schedule M)."*

Managing Specific Uncertainty Types

Technical Integration Risks

Current projects involve intricate system integrations, generating interdependency risks that cannot be efficiently governed through risk transfer. A hospital project incorporating building management, medical equipment, and security systems needed Interface Management Protocols detailing responsibility for system integration performance and setting out cooperative processes for solving integration issues: *"System integration performance shall be to the Integration Performance Standards (Schedule N) with*

interface testing being done in accordance with the Integration Testing Protocol. Integration problems needing design adjustments shall be handled through the Joint Integration Committee, with costs being apportioned based on the Integration Risk Matrix (Schedule O)."

Evolution of Environment and Regulations

Environmental rules keep changing during project lifespans, giving rise to uncertainty controllable through adaptive contract mechanisms and joint compliance strategies. A power plant solved regulatory uncertainty via extended baseline definition and adaptive compliance tools: *"Environmental compliance is founded on the Regulatory Baseline Analysis (Schedule P) valid at the time of contract signing. Regulatory change necessitating further compliance steps shall be reviewed through the Environmental Compliance Committee with implementation strategies optimized for cost savings and schedule impact reduction."*

GenAI-Powered Risk Intelligence: The Technology Integration Revolution

Generative AI is inherently revolutionizing how construction and engineering projects deal with uncertainty management, transforming organizations from reactive risk mitigation to proactive uncertainty intelligence. This technology explicitly enables the advanced contract crafting and collaborative frameworks outlined previously, offering the analytical muscle power to apply these strategies at unprecedented scale and accuracy.

Intelligent Contract Generation Augmenting Human Expertise

GenAI platforms disrupt contract drafting by creating project-oriented language that resolves uncertainties with advanced accuracy. The systems examine thousands of precedent contracts, regulatory conditions, and project specifications in unison to develop tailored contract clauses that mirror each project's distinct risk profile. Far from displacing the collaborative methods developed prior, GenAI enhances their efficacy by offering evidence-based insights that guide more informed risk allocation decisions.

As an example of geotechnical investigation, GenAI can augment the baseline report by reviewing similar projects: *"Ground conditions risk allocation includes machine learning examination of 847 similar projects with comparable geological conditions, with cost effects allocated in accordance with probability weightings derived from Monte Carlo simulation of 10,000 possible scenarios."* This technology complements instead of supplants the collaborative risk workshops that build successful allocation matrices.

Scenario Modelling for Enabling Collaborative Decision-Making

GenAI is superior to its predecessors at advanced risk scenario modelling that allows contract writers and project teams to foresee and prepare for likely uncertainties before they arise. Combining historical project data, meteorological patterns, supply chain behaviour, and regulatory trends, GenAI produces rich scenario analyses that feed into both contract language and collaborative management strategy.

This ability directly supports the performance-based contracting strategies outlined above. For the smart city traffic management example, GenAI can produce adaptive performance criteria: *"System performance requirements include GenAI analysis of 15,000 hours of operational history from similar facilities, factoring in weather fluctuations, usage patterns, and maintenance needs to set performance goals of 97.3% uptime with adaptive criteria that adjusts according to real-time conditions."*

Predictive Compliance Supporting Adaptive Frameworks

GenAI's capacity for processing and integrating regulatory data across multiple jurisdictions and forecasting regulatory change is a quantum leap in dealing with compliance uncertainty. These systems evaluate regulatory trends, legislative patterns,

and precedents in enforcement to create predictive compliance strategies that forecast regulatory change ahead of its implementation.

This ability acts directly in support of the adaptive compliance procedures outlined in the environmental and regulatory section. For renewable energy projects, GenAI may review environmental regulations across jurisdictions, carbon pricing developments, and grid interconnection requirements to create contract provisions that automatically adjust to regulatory shifts while ensuring the cooperative stakeholder alignment necessary for project success.

Dynamic Contract Optimization Throughout Project Lifecycle

An important aspect is that GenAI facilitates dynamic contract optimization along project life cycle through ongoing assessment of project performance, market dynamics, and stakeholder needs. In place of rigid contract documents struggling to anticipate all future conditions, GenAI makes intelligent contract frameworks possible that modify in line with new information while keeping everyone aligned on the project's success.

This technological ability shifts the collaborative frameworks described above from episodic workshop-based strategies into ongoing intelligence-based optimization. Real-time recommendations on contract adjustments by GenAI systems based on shifting circumstances facilitate proactive uncertainty management through the collaborative mechanisms designed in the initial contract framework.

The application of GenAI to uncertainty management is the technological refinement of the collaborative, data-driven methodologies that characterize winning contemporary project delivery. Organizations that excel in GenAI-facilitated uncertainty management will realize critical competitive benefits via the same dynamics that underpin success with advanced contract writing: *fewer disputes, better performance, and stronger stakeholder relationships based on intelligence-driven collaboration.*

Implementation Framework: Building Organizational Capabilities

Creating In-House Expertise for Advanced Documentation

Incorporating advanced drafting strategies involves building organizational competence that integrates legal acumen, technical experience, and project management skills. This interdisciplinary strategy facilitates contract crafting that meets uncertainties in an integrated manner while being practically implementable.

Effective organizations engage training programmes that build these integrated competencies, such as risk analysis methods, collaborative contracting strategies, and sophisticated documentation techniques that generate alignment, not adversarial alliances.

Technology Integration for Advanced Analysis

Contemporary contract drafting is highly advantaged by AI-based analysis tools that work through large volumes of technical information, detect patterns of risk, and recommend best-in-class allocation methods based on past project history. Such tools complement rather than displace human skill, allowing superior analysis of intricate uncertainties while complementing the collaborative foundations that make projects successful.

The Path Forward: Principles for Intelligent Uncertainty Management

Principle 1: Invest in Understanding Before Contracting

Effective uncertainty management starts with a thorough analysis to define project risks precisely and the best management strategies. This initial investment in knowledge rewards itself in minimized disputes, enhanced performance, and better project results.

Principle 2: Design for Collaboration, Not Combat

Contract language needs to structure agreements for collaborative problem-solving, not confrontational risk shifting. Sophisticated documentation develops unambiguous performance expectations, equitable risk distribution, and efficient processes for dealing with uncertainties when they arise.

Principle 3: Align Incentives Around Project Success

Ideal uncertainty management occurs when everyone has incentives for project success, not individual optimization. Contract design must incentivize collaborative uncertainty management practices and best-project outcomes.

Principle 4: Leverage Technology for Enhanced Intelligence

Advanced analytical technology, specifically GenAI solutions, offers unparalleled risk assessment and contract optimization capabilities. Businesses that successfully combine these technologies with human knowledge and cooperative architecture will gain considerable competitive leverage in uncertainty management.

Conclusion: The Competitive Advantage of Intelligent Risk Management

The future of project delivery is for those firms that excel in smart uncertainty management with advanced contract writing, sound information, collaborative models, and cutting-edge technology integration. Conventional risk transfer practices generate adversarial relationships that drive costs higher, push schedules longer, and lower quality results.

Sophisticated documentation that resolves uncertainty using exhaustive analysis, accuracy of language, collaborative processes, and AI-facilitated intelligence is a core competitive strength. Organizations that cultivate these integrated competencies will produce higher-quality project results and forge better relationships with clients and partners.

The cost of developing these capacities - in people, processes, and technologies- pays off in fewer disputes, better performance, and a stronger reputation for successful project delivery. Successful execution demands commitment to ongoing learning, collaborative partnerships, and smart utilization of technology to turn uncertainty into a project opportunity and a source of competitive advantage. The organisations that become proficient at these integrated capabilities will chart the future of project delivery.

07

From Ink To Code: Using Digital Contracts and Smart Triggers to Address Contractual Uncertainties in Indian Infrastructure Projects

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Abstract

Uncertainty has always been an intrinsic feature of infrastructure projects. Traditional contracts, signed in ink and managed through physical documentation, often struggle to keep pace with the evolving infrastructure landscape – spread over vast areas, involving a large number of people, continuous work, and stringent time frames. The rise of electronic agreements, often synonymous but different from advanced digital contracts with inbuilt programmable mechanisms, such as smart triggers, offers a new and competent mechanism for governance of contracts. These innovations can anticipate, record, and respond to uncertain events in real time, providing greater certainty, efficiency, clarity, and resilience to ongoing and future infrastructure projects. This article aims to situate e-contracts, digital contracts interchangeably referred to as smart contracts and smart triggers, in India's legal and policy framework, exploring their ability to contractually address uncertainties, thereby aiming to improve project delivery and align with India's growing digital and infrastructure ambitions.

Introduction

Uncertainty in infrastructure projects is no longer a delusional anomaly, but is rather transforming into a norm. Cost overruns, delays, regulatory shifts, environmental risks, and demand variations have become an intrinsic part of every other complex project. Traditionally, contracts aimed to allocate these risks through clauses such as force majeure, change in law, termination of payments, or through other risk mitigation measures. However, with the increasing complexity of projects, contemporary ink-based contracts have fallen short of keeping pace, revealing their limitations in anticipating and addressing uncertainty in a dynamic and timely manner. India's infrastructural landscape, driven by new and reformed initiatives such as Gati Shakti, the National Infrastructure Pipeline, and India's 500 GW renewable energy target by 2030, not only demands development but also legal and contractual reformation. In this context, e-contracts and smart triggers emerge as transformative instruments that can redefine risk management, transparency, and efficiency.

E-Contracts and Digital Contracts: Differentiated

The way that contracts are created and managed has transformed dramatically with advancements in digital technologies. What was once a paper and time-consuming process is now faster, smarter, sustainable, and far more convenient. Two terms often used in this

space are E-Contracts and Digital Contracts. While it is easy to get confused within these buzzwords, they are quite different from one another.

E-Contracts (Electronic Contracts) are essentially traditional contracts in digital form. They are created, shared, and signed electronically, often using tools like e-signatures or digital signatures. Digital Contracts, however, go a step further. These are not just contracts on a screen; they are powered by technology. They often use advanced features like blockchain authentication or smart contract mechanisms that automatically execute obligations once certain conditions are met.

The key differences lie in the speed of execution on account of the automation technology attached to these contracts, as explained hereinunder.

- **Execution:** E-Contracts mirror traditional contracts but are signed electronically. Digital Contracts, on the other hand, can self-execute, thereby removing the need for manual enforcement.
- **Automation:** While E-Contracts may require human oversight, Digital Contracts can be largely autonomous, relying on triggers based on coded conditions.
- **Technology:** E-Contracts need only basic digital tools, whereas Digital Contracts depend on advanced technologies like blockchain or AI.[1]

Both types of contracts are recognised and are in use in India; however, the framework around Digital Contracts is still evolving globally, with countries adopting different approaches for smart contracts and blockchain-based agreements. In practice, E-contracts are widely used in everyday businesses; meanwhile, Digital Contracts are more popular in tech-driven industries, especially where automation, security, and speed of resolution of an issue or a conflict are critical.

Evolving Landscape for Digital Contracts in India

In India's infrastructure and construction sector, digital contracts are emerging as tools of efficiency, trust, and transparency. Large projects, including the development of national highways, metro rail systems, or smart cities, often involve multiple stakeholders, complex procurement processes, and frequent disputes. Traditionally, these challenges slow down progress and increase costs. Digital contracts, however, are beginning to change that narrative.

A Digital contract, especially in the form of a smart contract on blockchain, can automate key obligations. For example, once a construction milestone is verified, such as laying a section of road or completing a building's foundation, the in-built system can automatically trigger payment to the contractor. This reduces payment delays, ensures accountability, and fosters trust between parties, ensuring cash flow throughout the project cycle. One of the other significant benefits is dispute reduction and resolution. In the construction industry, ambiguity in agreements often leads to litigation. Digital contracts, by automating compliance and making terms clear upfront, help minimise room for conflict. This not only saves time and money but also enables faster project completion.

While India's legal framework for smart contracts is still evolving, it is clear that the Authorities have opened up to the possibility of employing AI in the infrastructure sector. In a sector where delays and disputes have long been the norm, digital contracts represent a step toward building projects that are not just faster but are also more transparent and reliable.

Uncertainty in Infrastructure Projects: The Contractual Challenge

With the growing development of infrastructure projects with PPP arrangements, they are subjected to greater compliance scrutiny, excessive delays due to engagement of different contractors and technical staff, and red tape. This makes them highly vulnerable to uncertainties in the legal, economic, technological, and natural environment. Some of the common uncertainties include regulatory changes, such as revised tariff norms, demand risks during the development of the project, climate risks, and financing uncertainties,

especially in projects reliant on viability gap funding or governmental institutions, mainly delayed due to approval mechanisms.

Traditional concession agreements attempt to address these through detailed risk allocation matrices. However, the current statistics display a huge gap and show that static clauses cannot always capture evolving risks efficiently. For instance, force majeure clauses drafted before the COVID-19 pandemic proved inadequate to cover the complexity of lockdowns and supply chain disruptions.

The Role of Digital Contracts in Managing Uncertainty in Infrastructure

Infrastructure projects inherently involve uncertainties, whether due to weather, fluctuating demand, or unforeseen operational challenges. Traditional contracts, heavily reliant on paper documentation and manual monitoring, often struggle to keep pace and respond dynamically to such uncertainties. Digital contracts offer a transformative solution by integrating technology, data, and automation directly into the contractual framework.

Key Advantages of Digital Contracts[2]

a. **Real-time Adaptability:** These contracts can connect to external data sources such as weather APIs, traffic sensors, or commodity price feeds. This allows contractual obligations to adjust automatically in response to changing conditions. In addition to this, even though legislative changes or judicial pronouncements cannot be reduced to automated triggers, digital contracts can play an important role in detecting them early. By connecting to official notifications or curated legal databases, these contracts can immediately flag such developments. This ensures that parties are informed in real time, reducing uncertainty and allowing them to respond more quickly and collaboratively.

b. **Transparency:** Electronic platforms enable all stakeholders, including contractors, regulators, financiers, and project managers, to access the same data simultaneously. This reduces disputes over project status and ensures that decisions are informed and visible to all parties.

c. **Traceability:** Every approval, amendment, or communication is digitally recorded and timestamped. This creates a transparent trail, which can help as correspondence in resolving disputes or audits, giving parties confidence that contractual terms are enforceable and verifiable.

d. **Scalability:** These contracts are flexible and can be standardised across multiple projects, helping government agencies implement uniform risk frameworks and maintain consistent quality and accountability across large infrastructure programmes.

Smart Triggers: Bridging Law and Technology

A key innovation within Digital contracts is the use of smart triggers. These are basically pre-programmed contractual clauses that automatically activate upon the occurrence of predefined events. These events can be linked to external data sources, such as rainfall levels from meteorological departments, traffic counts from toll plazas, or updates published on government portals.

In smart or digital contracts, when a defined threshold is reached, the contract responds immediately, whether by adjusting risk-sharing arrangements or initiating a dispute resolution process. Similarly, in a metro rail concession project, if automated ticketing systems show that ridership falls below 70% of projected levels for a prescribed time period, a smart trigger could automatically revise the revenue-sharing formula for the concessionaire.

Unlike traditional contractual clauses, which require human intervention to enforce, smart triggers operate in real time, minimizing ambiguity and reducing disputes over whether a condition has been met. In the Indian context, where initiatives like FASTag,

BharatNet, and smart city dashboards are digitising vast amounts of data[3], the potential to embed such triggers is growing rapidly, making contracts not just agreements on paper, but capable of dynamically adapting to real-world developments occurring throughout the project cycle.

Some of the widely used key smart triggers include:

- **Force Majeure Triggers:** Automatically pausing construction obligations if precipitation (rainfall or snowfall) exceeds thresholds recorded by official weather stations.
- **Payment Triggers:** Releasing milestone payments once engineers upload certified digital evidence of completed work.

Performance Triggers: For example, in a metro project, if digital sensors show that trains are running late, more often than allowed, the system can automatically record the lapse and apply the agreed penalty. In a city water project, if smart meters detect that households are receiving less water or poorer quality than contracted, the contract can immediately trigger a deduction or corrective action. In this way, performance issues are spotted early and dealt with fairly, without waiting for long disputes. These triggers reduce ambiguity, shorten response times, and mitigate disputes by codifying responses to predictable uncertainties or prescribing responses to unforeseen circumstances. This is especially useful in India's infrastructure sector, where projects often face challenges linked to revisions in the economy, regulations, climate, and technology.

a. Economic Uncertainties

Big projects depend on financial models that can easily be disrupted by inflation, changes in interest rates, or fluctuations in demand. Smart triggers can connect with real-time data sources like the Wholesale Price Index (WPI) or toll collection figures from the National Highways Authority of India (NHAI). If numbers rise or fall beyond a certain level, the contract can automatically adjust tariffs or extend concession periods, keeping the project financially stable.

b. Regulatory Uncertainties

Policies and regulations in India often change, especially in sectors like renewable energy and taxation. Smart contracts can be linked to official gazette notifications or regulatory databases. This means that if a new rule comes into effect, the contract can trigger automated negotiation, thereby reducing conflict and keeping the project on track.

c. Climatic and Environmental Uncertainties

Extreme weather conditions and unpredictable monsoons often delay projects. By using data from the Indian Meteorological Department (IMD), smart contracts can adjust project timelines or even activate insurance cover automatically when certain thresholds are crossed.

d. Sector Specific Triggers

Beyond managing these uncertainties, smart triggers can also be designed for sector-specific applications, such as:

◊ Highways and Roads: In HAM projects, traffic sensors can feed data to smart triggers, automatically adjusting annuity payments based on actual traffic volumes.[4]

◊ Renewable Energy: Smart triggers linked to grid and weather data can extend commissioning deadlines if solar or wind generation falls below pre-agreed thresholds.[5]

◊ Urban Metro Projects: Ridership fluctuations due to economic or pandemic-related factors can activate automated renegotiation clauses, balancing risk between the government and concessionaire.[6]

◊ Smart Cities: Sensor-based monitoring can trigger bonus payments for exceeding service standards in water supply, waste management, or energy efficiency projects, encouraging innovation.[7]

Leveraging Digital Contracts and Technology in India's Road Infrastructure

Currently, India's road infrastructure is moving toward a technology-driven, data-informed approach. With over 6.4 million km of roads, ensuring quality, reducing disruptions, and optimising costs is critical to the smooth progress. Here, digital contracts and smart technologies are playing a transformative role. Digital contracts, especially performance-based maintenance contracts (PBMCs), are redefining accountability in the road infrastructure sector of India. Milestone-based digital agreements, often linked with real-time monitoring, allow authorities to release payments automatically once benchmarks are met. MoRTH, NHAI, and several state governments are adopting PBMCs to encourage innovation, transparency, and cost efficiency.[8]

Technologies such as AI-driven predictive maintenance, IoT-enabled sensors, drones, GIS mapping, and Building Information Modelling (BIM) complement these contracts.[9] BIM, in particular, is gaining traction in India for its ability to integrate design, construction, and operational data into a single digital model, helping the efficient and smart development of project models. Projects like the Bengaluru Suburban Railway and Hyderabad's Outer Ring Road use BIM to optimise design accuracy, track progress, manage materials, and coordinate stakeholders efficiently. By combining BIM with digital contracts, authorities can ensure compliance, predict maintenance needs, and plan interventions proactively.

A remarkable example of technology integration is the iRASTE (Intelligent Solutions for Road Safety through Technology and Engineering) project in Nagpur[10] iRASTE uses AI and machine learning to analyse traffic patterns and accident data to identify "grey spots" which could be prone to accidents. This data directly feeds into prescribed decision-making platforms, allowing authorities to prioritise repairs, optimise traffic flow, and prevent accidents efficiently.

Another significant example is employment and usage of real-time dashboards, blockchain-based payments, and environmental monitoring of infrastructure projects, which will help enhance transparency and accountability across large projects like the Delhi-Mumbai Expressway.

Conclusion

Uncertainty is an inherent feature of infrastructure projects. The evolution from traditional contracts to digital contracts with smart triggers represents a major step forward in Indian contract law and PPP practice. By embedding flexibility, transparency, and responsiveness, smart contracts will help reduce disputes, accelerate project delivery, and strengthen confidence in the stakeholders of the industry. For legal professionals, this evolution calls for new drafting sensibilities and a deeper engagement with technology. For engineers and project managers, it ensures that contracts can adapt alongside projects. Together, they enable a contractual ecosystem that is not only robust but also legally and practically resilient.

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Italy has officially approved the €13.5 billion ($15.6 billion) Messina Strait Bridge, set to become the world's longest suspension bridge. After decades of delays due to environmental and financial concerns, the project was greenlit on August 6, 2025. The bridge will connect Sicily to mainland Calabria, replacing ferry services and promising a major economic boost to southern Italy.

Source: https://constructionreviewonline.com/news/messina-strait-bridge-design-worlds-longest-suspension-bridge-gets-approval/#:~:text=The%20Italian%20government%20has%20granted%20final%20approval%20for,was%20officially%20greenlit%20on%20Wednesday%2C%20August%206%202025

Designed to withstand earthquakes up to magnitude 7.5 and winds of 180 mph, the bridge will span 3,666 meters with a 600-meter-wide navigation channel. It will carry three lanes of vehicle traffic and a rail line in each direction. Construction is expected to begin by late 2025 and finish by 2032, creating around 100,000 jobs and involving 300 suppliers.

Originally proposed in the 1960s and revived under the present Government, the project is now a national priority. Webuild, the lead contractor, has confirmed readiness to begin work. While high-speed rail infrastructure in Sicily remains underdeveloped, officials argue the bridge will transform regional logistics and trade.

This historic infrastructure marks a bold step in Italian engineering, blending ambition with resilience in one of Europe's most seismically active zones.

08

Unforeseen Physical Conditions: FIDIC and Indian Law

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Introduction

The global construction industry stands as a monumental pillar of economic growth, a sector responsible for shaping the physical fabric of our societies from essential transportation networks and energy facilities to residential and commercial urban landscapes. Valued at trillions of dollars annually, it is a realm of ambitious engineering, complex logistics, and significant investment. However, this industry is inherently fraught with uncertainties. While economic fluctuations, regulatory changes, and labour dynamics present their own challenges, a particularly deceptive and often financially devastating category of uncertainty lies below the surface, viz, unforeseen physical conditions. To these can be added environmental contamination, man-made or other physical obstructions or pollutants, conditions and obstructions en route to the site, torrential rains, forest fires, etc.

These are not mere inconveniences. Latent geological surprises, hidden subsurface obstructions, or unexpected archaeological finds are silent diversions, emerging without warning to fundamentally alter a project's foundation, both accurately and symbolically. They challenge reasonable pre-tender assessment, transforming carefully calculated budgets into increased costs and planned schedules into indefinite delays. Indeed, industry studies consistently reveal that geological uncertainties alone are a primary driver of project failures and disputes. They are frequently cited as the single largest cause of claims in major infrastructure projects, contributing to average cost increases often ranging from 10% to 30% and significantly extending project timelines. The absolute scale of this challenge is underscored by the substantial portion of claims directly attributable to these hidden site complexities.

This important issue resonates deeply within the Indian context, where the pace of development is accelerating at an unprecedented rate. India is currently in the midst of a transformative infrastructure drive. The scale and complexity of projects often traverse diverse geological terrains, densely populated urban areas, and historically significant sites, inherently amplifying the risk of encountering challenging physical conditions. As India pushes the boundaries of its construction capabilities with mega-projects, the effective contractual allocation and management of these underground uncertainties becomes not merely a legal detail but a fundamental determinant of project success, financial viability, and ultimately, the nation's developmental path. Without clear and equitable mechanisms to address these challenges, the risks of ballooning costs, prolonged delays, and intractable disputes threaten to undermine the very foundations of India's infrastructural objectives.

This paper delves into the intricate contractual and legal battleground surrounding these 'invisible' risks that are not detected and reported in the investigations. An attempt is made to analyse how FIDIC's internationally recognized standards and the evolving landscape of Indian law attempt to allocate and manage such profound uncertainty of unforeseen physical conditions.

The Critical and Complex Connection of Unforeseen Physical Conditions for Project Work Progress

The challenge of unforeseen physical conditions in construction extends far beyond the mere act of discovery; it leads to a highly critical and complex area concerning the allocation of risk and its reflective financial and time consequences. That is not simply about encountering a surprise; it is about navigating the contentious landscape of who ultimately bears the burden when the ground below a project is different from what is contained in the investigation reports.

At its heart, the complexity stems from a fundamental conflict of interests and practical realities, which are discussed hereinunder.

The Ideal vs. Reality of Site Investigation

On one side stands the ideal of comprehensive site investigation. Theoretically, thorough geotechnical surveys, boreholes, geophysical testing, geological and historical data analysis conducted before bidding should reveal all relevant subsurface conditions. All of them are to provide the client, the consultants, the contractors, and other agencies connected with the project execution with a complete picture, allowing for accurate pricing and realistic scheduling.

However, site investigation often falls short of the ideal due to practical limitations. Cost, time constraints, access restrictions (especially in brownfield sites or active urban environments), and the inherent variability of geological formations mean that a truly exhaustive investigation is rarely feasible or economically viable. Contractors, especially during the bidding phase, operate with imperfect information, relying on limited data provided by the client or their own constrained investigations. This gap between the ideal and reality creates the breeding ground for uncertainty.

Employer's Desire for Budget Certainty vs. Contractor's Exposure to Unknowns

This practical limitation feeds into the core contractual conflict:

1. **The Employer's Desire for Budget Certainty**
   Clients, whether public or private entities, typically seek fixed prices and predictable completion dates. Their financial models, funding arrangements, and operational plans are built upon the assumption of defined costs and timelines. They aim to transfer as much risk as possible to the contractor, believing that the contractor, as the specialist, should account for all potential eventualities.
2. **The Contractor's Exposure to Unknowns**
   Conversely, contractors, particularly those operating under lump-sum or fixed-price arrangements, face enormous exposure to unknowns arising from unforeseen physical conditions. Each unexpected rock formation, underground water table, or forgotten service/ utility line can translate directly into significant cost overruns for additional excavation, dewatering, re-design, and specialist equipment. Simultaneously, these discoveries inevitably lead to project delays, incurring prolongation costs, liquidated damages, and reputational damage. The contractor bids based on foreseeable conditions; being held fully accountable for truly unforeseeable conditions can be financially crippling and fundamentally unfair.

This inherent tension, where one party desires certainty and the other grapples with unavoidable uncertainty, transforms the discovery of unforeseen physical conditions into a complex legal and commercial battleground, making their contractual management a paramount concern in any construction undertaking.

Contractual Provisions for Unforeseen Physical Conditions: The FIDIC Approach

The Fédération Internationale des Ingénieurs-Conseils (FIDIC) suite of contracts is globally recognized for providing a balanced and comprehensive framework for construction projects. Central to FIDIC's philosophy is the principle of allocating risks to the party best able to foresee, control, and mitigate them. In the context of unforeseen physical conditions, this fundamental approach often means that the Employer bears a significant portion of this risk, a stance designed to promote transparency, reduce speculative bidding, and encourage a more collaborative project environment.

FIDIC's standard forms, particularly the Red Book (Conditions of Contract for Construction, where design is primarily by the Employer), meticulously address the procedures and entitlements related to encountering unexpected ground conditions.

Key Clauses:

1. **Sub-Clause 4.10 (1999 Red Book)[1]/ 4.11 (2017 Red Book)[2]- Site Data and Information**

   A foundational aspect of FIDIC's risk allocation for site conditions is the Employer's obligation to provide information. Sub-Clause 4.10 (1999) and 4.11 (2017) mandate the Employer to make available to the Contractor all relevant site data and information that they possess concerning the Site and its subsurface. This data, such as geological reports, borehole logs, and previous survey findings, is important for the Contractor's tender preparation and risk assessment. The Contractor is deemed to have examined this data and to have inspected the Site and its surroundings and use that information for their bid.

   It is vital to note that while the Red Book places an onus on the Employer to provide data and generally takes the risk of unforeseeable conditions, other FIDIC forms, like the Silver Book (Conditions of Contract for EPC/Turnkey Projects), adopt a different risk profile. In the Silver Book, the Contractor typically assumes a much greater responsibility for site conditions, often including their accuracy, reflecting its "turnkey" nature where the Contractor takes primary responsibility for design and overall project risk. This distinction highlights FIDIC's adaptable approach to risk allocation based on project type.

2. **Sub-Clause 4.12 (1999 Red Book)/ 4.12 (2017 Red Book) - Unforeseeable Physical Conditions**

   This is the cornerstone clause for addressing the specific uncertainty of unforeseen physical conditions.

   The clause precisely defines "physical conditions" (Sub-Clause 1.1.6.9 in 1999; 1.1.70 in 2017) as natural physical conditions and man-made obstructions or pollutants on the Site, excluding climatic conditions. Importantly, "unforeseeable" (Sub-Clause 1.1.6.8 in 1999; 1.1.69 in 2017) means "not reasonably foreseeable by an experienced contractor by the date for submission of the Tender." It is not whether the specific Contractor knew about the condition, but whether an experienced contractor, exercising due care and having reviewed all available data and conducted reasonable site investigations, should have been able to foresee it. This distinction is paramount; foreseeability is not equivalent to actual foreknowledge. An experienced contractor might not have been aware of a condition, but if it could have been reasonably predicted based on the available information and a diligent site reconnaissance, it would not be considered "unforeseeable" under FIDIC. Upon encountering physical conditions that the Contractor considers unforeseeable, a strict procedure must be followed:

   The Contractor must give immediate notice to the Engineer, describing the conditions and explaining why they are considered unforeseeable. This notice is important for preserving claims. The Engineer, upon receiving notice, is obligated to investigate the conditions. This typically involves site visits, discussions with the Contractor, and potentially engaging experts.

The Engineer then determines whether the conditions are indeed unforeseeable. Under the 2017 Red Book (Sub-Clause 3.7 - Agreement or Determination), the Engineer is expected to act neutrally and make a fair determination of the matter. If the Engineer determines that the conditions are unforeseeable and that the Contractor has suffered delay and/or incurred Cost due to them, the Contractor becomes entitled to an Extension of Time (EOT) and/or payment for such additional Cost.

3. **Differences (1999 vs. 2017)**

   While the core principles remain, the 2017 edition introduced refinements. The Engineer's role in making an "Agreement or Determination" (Sub-Clause 3.7) is more clearly defined as acting impartially. Furthermore, the 2017 edition places greater emphasis on stricter time limits for claims (Sub-Clause 20.2.1), requiring a detailed claim within 28 days of the event, otherwise, the entitlement is forfeited. This underscores the importance of prompt action and diligent record-keeping by the Contractor.

4. **Sub-Clause 13 (Variations)**

   A determination that unforeseen physical conditions exist and necessitate a change in the works often leads to a Variation instruction issued by the Engineer under Sub-Clause 13. This mechanism allows for formal adjustment of the scope of work, the Contract Price, and the Time for Completion to account for the new conditions. This structured approach ensures that the project adapts to reality while maintaining contractual integrity.

5. **Sub-Clause 20.1 (Claims, Disputes and Arbitration - 1999)/ 20.2 (Claims for Payment and/or EOT - 2017)**

   The principal claims procedure outlined in Sub-Clause 20 is fundamental to asserting any entitlements arising from unforeseen physical conditions. The Contractor must strictly adhere to the notice periods and procedural requirements for submitting claims for Extension of Time and/or additional payment. Failure to do so can result in the forfeiture of their rights, even if the conditions were genuinely unforeseeable. The 2017 edition, with its more stringent time limits, reinforces this necessity.

Overall Risk Allocation in FIDIC

In summary, FIDIC's Red Book embodies a balanced risk allocation philosophy for unforeseen physical conditions. By placing the risk of true unforeseeability primarily on the Employer, it aims to:

1. Encourage Employers to conduct thorough site investigations and provide comprehensive data, as they ultimately bear the risk of hidden conditions.
2. Ensure contractors are not forced to add excessive contingencies to their bids to cover unknown site risks, leading to more competitive and realistic pricing.
3. Provide clear procedures and defined entitlements to help manage expectations and offer a structured pathway for addressing claims, reducing the likelihood of protracted disputes.
4. This approach acknowledges that while site investigation is paramount, geological conditions can be inherently unpredictable, and it is more equitable for the party benefiting from the project (the Employer) to bear the consequences of truly unidentifiable risks.

Indian Law Provisions Governing Unforeseen Circumstances

Unlike the specific and detailed contractual mechanisms found in FIDIC for unforeseen physical conditions, Indian law primarily addresses such uncertainties through general principles enshrined in the Indian Contract Act, 1872, alongside specific contractual provisions like Force Majeure clauses. Judicial precedents play an important role in interpreting and applying these principles.

Indian Contract Act, 1872[3]

The Indian Contract Act provides the foundational legal framework for agreements in India. While it does not specifically mention "unforeseen physical conditions," two key doctrines are relevant:

a. Section 56: Doctrine of Frustration

Section 56 of the Indian Contract Act states that "An agreement to do an act impossible in itself is void." More pertinently, addresses situations where an act, after the contract is made, becomes impossible or unlawful because of some event which the promisor could not prevent. In such cases, the contract becomes void.

The doctrine of frustration operates when, after the formation of a contract, an unforeseen event occurs, rendering the performance of the contract impossible or, more commonly, commercially or physically impracticable, or radically different from what was contemplated by the parties when they entered into the agreement. The event must be beyond the control of the parties and not self-induced. In the Indian interpretation, "impossibility" is not confined to mere literal or physical impossibility. As elaborated by the Supreme Court, it also extends to situations where the performance becomes "impracticable and useless from the object and purpose which the parties had in view." This means that if the fundamental purpose of the contract is defeated or rendered commercially senseless by an unforeseen event, it may amount to frustration.

The threshold for invoking Section 56 in the context of unforeseen physical conditions in construction projects remains exceptionally high. Merely increased cost, inconvenience, or difficulty in performance due to unforeseen ground conditions generally does not amount to frustration under Section 56. The change must be so fundamental that it alters the very basis of the contract, making it radically different from what was originally agreed upon. Courts are reluctant to release parties from their contractual obligations merely because the performance has become more onerous or less profitable than anticipated. The commercial adventure itself must be destroyed or rendered purposeless.

Elaboration on *Satyabrata Ghose v. Mugneeram Bangur & Co.* (1954 SC)[4]: This landmark Supreme Court judgment is the cornerstone for understanding frustration in India.

Facts: In this case, a developer agreed to sell a plot of land after developing it with roads and drains. Due to wartime restrictions and requisitioning of the land, the development became impossible for a significant period.

Supreme Court's Interpretation: The Court clarified that "impossibility" under Section 56 should not be understood in a literal or physical sense. It emphasized that the doctrine applies when a "supervening event" renders the contract's performance impracticable from the commercial point of view or when the object of the contract is frustrated. The Court stated, "The change of circumstances must be such as to make the performance of the contract impossible in fact, or commercially impracticable, or to affect the purpose of the contract fundamentally."

Application to Construction: For unforeseen physical conditions in a construction project, applying the judgment of the *Satyabrata Ghose* case means asking - did the unforeseen condition (e.g., unexpectedly hard rock, massive underground water, discovery of an unmovable ancient structure) fundamentally destroy the "buildability" or the commercial purpose of the project? In most cases, the answer is no. While it will undoubtedly make the project significantly more expensive and protracted, it rarely renders the act of building entirely "impossible" or commercially "useless." For instance, encountering harder rock might require different machinery and more time, but the structure can still be built. Therefore, contractors seeking relief under Section 56 for unforeseen physical conditions often face an uphill battle, as the event usually just makes the contract more expensive, not impossible.

b. Force Majeure Clauses

Unlike the statutory doctrine of frustration, Force Majeure is primarily a creature of contract in India. It is not defined in the Indian Contract Act, and its applicability and scope depend entirely on how it is drafted within the specific contract.

The parties must explicitly include a Force Majeure clause in their contract, enumerating the specific events that would constitute Force Majeure. If "unforeseen physical conditions" are not expressly listed, it may be challenging to invoke the clause for such occurrences. For contractors, it is important to ensure that the Force Majeure clause in their construction contracts explicitly covers events such as "unforeseen physical conditions," "adverse ground conditions," "subsurface obstructions," "geological anomalies," or similar precise terminology, if they intend to seek relief under it for such events. A generic clause covering "acts of God" or "natural calamities" might not be sufficient. Typically, successful invocation of a Force Majeure clause will entitle the affected party to an Extension of Time (EOT) for the period of delay caused by the Force Majeure event. However, it generally does not automatically grant entitlement to additional cost or financial compensation, unless the clause is specifically drafted to include such monetary relief. Parties often fail to negotiate for financial relief within force majeure clauses, making them only a partial remedy.

Elaboration on *Energy Watchdog v. Central Electricity Regulatory Commission* (2017 SC)[5]: This pivotal Supreme Court judgment clarified the relationship between contractual Force Majeure and statutory frustration under Section 56.

Significance: The Court held that if a contract contains a Force Majeure clause that specifically covers the supervening event, then the rights and obligations of the parties will be governed by that clause. In such a scenario, Section 56 of the Indian Contract Act (frustration) will generally not apply separately. Section 56 only comes into play if the event is not covered by the Force Majeure clause, or if the Force Majeure clause itself becomes impossible to perform.

Impact on Unforeseen Conditions: This ruling implies that if a construction contract has a Force Majeure clause that addresses unforeseen physical conditions, the parties must first look to that clause for their remedies. Only if the clause is silent or if the event is so catastrophic that it falls outside the contemplation of even a broad Force Majeure clause would the higher threshold of Section 56 for contractual frustration potentially be considered. This reinforces the paramount importance of precise contractual drafting.

Principles of Equity and Unconscionability

While Indian courts generally uphold the sanctity of contracts (*pacta sunt servanda*), there is a growing recognition of the need to prevent gross injustice arising from excessively one-sided or unconscionable clauses, especially where there is a significant disparity in bargaining power. Indian courts have, in certain contexts, shown a willingness to intervene where contractual terms are so unfair or unreasonable that they shock the conscience. This is particularly relevant if one party had virtually no real choice but to accept the dictated terms, leading to unequal bargaining power.

Elaboration on *Central Inland Water Transport Corporation Ltd. v. Brojo Nath Ganguly* (1986 SC)[6] and *Pioneer Urban Land & Infrastructure Ltd. v. Govindan Raghavan* (2019 SC)[7]

***Brojo Nath Ganguly* (1986 SC):** While this case primarily dealt with employment contracts, the Supreme Court laid down seminal principles regarding unconscionable contracts. It held that if a contract or a term in it is unconscionable, unreasonable, and opposed to public policy, especially if it results from unequal bargaining power, it could be struck down. The court observed that such a term would be "opposed to public policy if it is shown to be unfair or unreasonable."

***Pioneer Urban Land & Infrastructure Ltd. v. Govindan Raghavan* (2019 SC):** This case, in the context of builder-buyer agreements (consumer contracts), reiterated and applied the principles from *Brojo Nath Ganguly*. The Supreme Court emphasized that one-sided clauses that grant the developer

disproportionate rights while restricting the buyer's remedies are inherently unfair and constitute an "unfair trade practice."

Potential Applicability by Analogy to Egregious Construction Clauses: While these cases are often cited in service or consumer contexts, their underlying principles against oppressive and unreasonable clauses, especially when imposed on a party with no real choice, could potentially be argued by analogy in construction contracts. If a "one-sided" clause concerning unforeseen physical conditions is so draconian that it effectively renders the contractor an insurer of inherently unforeseeable risks and was imposed in circumstances of starkly unequal bargaining power, a contractor could theoretically argue for its unenforceability based on these principles. However, it is crucial to acknowledge that courts are generally more hesitant to interfere in purely commercial contracts between sophisticated parties, assuming they have sufficient legal advice and bargaining capacity. The bar for proving unconscionability in a commercial construction contract is significantly higher than in consumer or employment contexts.

Specific Relief Act, 1963[8]

The Specific Relief Act, 1963, deals with specific performance of contracts. If performance of a contract becomes impossible due to unforeseen physical conditions, it could impact the grant of specific performance. For instance, if the nature of the project is fundamentally altered or rendered impossible to perform, a court may refuse to grant specific performance of the original contract. This Act is more relevant to the remedies sought rather than the substantive rights regarding unforeseen circumstances themselves.

Indian law, through the Indian Contract Act and judicial pronouncements, provides a framework for addressing unforeseen circumstances. However, its application to unforeseen physical conditions in construction projects is more stringent than contractual mechanisms like FIDIC, heavily relying on the precise drafting of the contract and the high threshold for proving frustration or unconscionability.

Client's One-Sided Clauses in Particular Conditions

While standard contract forms like FIDIC aim for a balanced distribution of risks, the practical reality in the construction industry often sees this equilibrium disrupted. This frequently occurs through the use of Particular Conditions, which are custom clauses designed to modify or supplement the standard General Conditions of a contract. While legitimate for project-specific needs, these conditions are often misused by clients to unilaterally transfer a disproportionate share of risk, especially concerning unforeseen physical conditions, to the contractor.

Motivation for One-Sided Clauses

Clients, driven by a desire for maximum cost and time certainty, often draft these clauses to offload potential financial exposure arising from unexpected site challenges. This is particularly true for projects with a prolonged operational history, where the client (often a municipal body or public utility) has accumulated a wealth of historical data, operational records, and undocumented interventions over decades. The inherent tension lies in the client seeking a fixed price while possessing superior knowledge about the site's hidden complexities, which they may choose not to fully disclose. This creates an imbalance where the contractor is expected to price risks they cannot reasonably foresee or investigate within tender timelines.

Categorization of One-Sided Clauses

The forms these one-sided clauses take are varied, but generally aim to divest the client of responsibility for unforeseen physical conditions:

1. **Absolute Risk Transfer Clauses:** These clauses unequivocally place all responsibility for site conditions, regardless of foreseeability, on the contractor.

Example: "The Contractor acknowledges having fully inspected the Site and is deemed to have accepted all subsurface and physical conditions, known or unknown, existing or latent, including those resulting from historical operations. No claim for additional payment or extension of time shall arise from any such conditions encountered."

Implication: This directly contradicts the "unforeseeable" test found in balanced contracts, making the contractor an absolute insurer of all site unknowns.

2. **Exclusion of Remedies Clauses: These acknowledge unforeseen conditions but severely limit the contractor's entitlements.**

   Example: "In the event of unforeseen physical conditions, the Contractor's sole entitlement shall be an extension of time, with no claim for additional cost, loss, or expense howsoever arising, including from the discovery of historical underground structures or contamination."

   Implication: The contractor bears significant uncompensated costs for remedial work, specialized equipment, or extended site management.

3. **Strict/ Punitive Notice Provisions: These impose excessively short deadlines for notification, often impossible to meet in complex situations.**

   Example: "Any claim related to unforeseen physical conditions, including discovery of legacy infrastructure, must be notified in writing to the Engineer within 48 hours of discovery, failing which all rights to such claim are irrevocably waived."

   Implication: Such clauses are designed to procedurally bar legitimate claims, even when substantial unforeseen issues arise.

4. **Disclaiming Employer Information Clauses: Clients often provide existing data but disclaim all responsibility for its accuracy or completeness.**

   Example: "All historical site plans, operational logs, and existing infrastructure drawings provided by the Employer are for informational purposes only. The Contractor shall not rely on such information and is solely responsible for verifying all site conditions and the accuracy of all provided data."

   Implication: This forces the contractor to incur significant costs for independent verification or to accept risks based on potentially unreliable information, particularly problematic for brownfield sites with extensive undocumented history.

Hiding Details for Prolonged Operational History Projects

In projects with a long operational history, such as the reconstruction or expansion of existing facilities, clients often possess detailed knowledge, historical data, and operational records that are not always fully or accurately disclosed to bidding contractors. This non-disclosure, whether intentional or due to negligence, effectively hides crucial details that could significantly impact the project's execution.

Undocumented Infrastructure: Over decades, pipes, chambers, defunct equipment, or foundations may have been buried or abandoned without proper record-keeping. Encountering these during excavation for new structures or pipelines leads to costly delays and re-designs.

Contamination and Hazardous Materials: Older plants might have legacy contamination (e.g., chemical spills, heavy metals in soil, asbestos in old structures) that is not fully investigated or disclosed, posing significant health, safety, and disposal challenges.

Unrecorded Repairs/ Alterations: Previous repairs, modifications, or temporary structures might not be documented in formal drawings, leading to unexpected conditions when demolition or excavation commences.

Varying Ground Conditions over Time: Decades of operational loads, chemical exposure, and water ingress can alter subsurface conditions in ways not captured by recent limited investigations.

By withholding or providing incomplete information, clients effectively transfer the risk of these hidden historical conditions to the contractor, despite being the repository of the most complete, albeit possibly unorganized, knowledge. This creates an information lopsidedness that fundamentally undermines fair risk allocation and the ability of the contractor to accurately price the work.

Consequences of One-Sided Clauses and Hidden Details

The combination of one-sided clauses and the non-disclosure of historical information leads to severe consequences:

Inflated Bids and Risk Premiums: Contractors, wary of the undisclosed risks, significantly inflate their bids with large contingencies, increasing the project's overall cost for the client.

Increased Disputes and Litigation: The emergence of unforeseen historical conditions inevitably leads to claims and prolonged disputes, as contractors seek compensation for risks, they could not reasonably foresee. This damages relationships and siphons resources into legal battles.

Adversarial Project Environment: Trust erodes, leading to a hostile rather than collaborative working relationship.

Project Delays and Failures: Significant unforeseen conditions, especially those related to historical operations, can cause major delays and even project abandonment if remedial costs become prohibitive for the contractor.

Reduced Competition: Reputable contractors with a strong risk management ethos may decline to bid on projects where information is clearly being withheld or where the contractual terms are excessively punitive, leaving the client with fewer and potentially less capable bidders.

Ultimately, the short-term perceived gain of cost certainty by imposing one-sided clauses and withholding historical information often backfires, resulting in higher actual project costs, protracted timelines, and a legacy of dispute and mistrust.

Specific Cases on Unforeseen Ground Conditions/Obstructions in India

Direct Supreme Court judgments dealing solely with "unforeseen physical conditions" and allowing claims despite one-sided clauses are less common, often due to the fact that such disputes are frequently resolved through arbitration and typically do not reach the apex court. However, principles from cases dealing with variations, delays, and the employer's responsibilities can be highly instructive.

Onus of Proof and Site Investigation Clauses

While a specific landmark Supreme Court case solely on this point is hard to pinpoint, the general principle consistently upheld in various High Court and arbitral awards is that the onus of proving unforeseeability generally rests on the Contractor. The Contractor must demonstrate that, despite exercising due diligence and an "experienced contractor" test, the conditions could not have been reasonably foreseen.

If a contract includes a clause stating the "Contractor is deemed to have investigated and accepted all site conditions," courts and tribunals typically place a heavy burden on the contractor to show that their investigations were reasonable but still failed to uncover the hidden condition. Cases often deny claims where the contractor has not conducted adequate pre-bid due diligence, even if the employer's data was limited. The argument is often "Had the plaintiffs wished to make such a provision in the event of unforeseen conditions being encountered, it would have been the easiest thing in the world for them so to have done so."

Conversely, if the employer provided misleading or insufficient site information, the scenario shifts. While Indian courts are generally hesitant to imply warranties, there is a strong argument to be made if the employer actively suppressed information or provided data that was knowingly false or materially inaccurate, and the contractor relied on it. This could potentially lead

to a claim for misrepresentation or a finding that the employer breached an implied duty to provide accurate information, even if specific contract clauses try to disclaim liability. However, this is a high bar to cross, requiring robust evidence of active misrepresentation or fraud rather than mere inadequacy of data.

Arbitration Awards as an Indicator

While not binding precedents like Supreme Court judgments, numerous arbitration awards in India have dealt with unforeseen physical conditions. These awards, if challenged and upheld by High Courts, provide insights. Arbitrators, having technical expertise, are often more amenable to a nuanced view of foreseeability. They frequently consider:

- The extent and quality of site investigation data provided by the employer.
- The standard industry practice for site investigations on similar projects.
- Whether the contractor's own pre-bid investigations were reasonable and diligent.
- The actual nature of the encountered condition and whether it falls within typical geological variations or is a true anomaly.
- The impact of "no claim" clauses in the light of actual events.

Dispute Resolution Outcomes and Rationale:

Indian courts, particularly the Supreme Court, have increasingly adopted a pro-arbitration stance. When disputes arising from unforeseen physical conditions or analogous situations reach arbitration, the outcomes and rationale often reflect the following:

Reliance on Contract Terms: Arbitrators first and foremost interpret the specific terms of the contract, including any Particular Conditions related to site risk, force majeure, or variations. The more precise and clear these clauses are, the less the room there is for expansive interpretation.

Application of "Experienced Contractor" Test: In cases of unforeseen conditions, the "experienced contractor" test (similar to FIDIC's approach) is frequently applied. The contractor needs to show not just that they did not know, but that a reasonably experienced contractor, after proper due diligence, could not have foreseen the condition.

Employer's Responsibility for Site Data: While "information only" clauses exist, if the employer provides data, there is an implied understanding that it is provided in good faith. Cases where the data is demonstrably flawed, insufficient, or misleading may lead to a finding against the employer, especially if the contractor can prove reliance and resultant loss.

Rebalancing of Unconscionable Clauses: While the threshold is high for commercial contracts, the principles from *Brojo Nath Ganguly* and *Pioneer Urban Land* (discussed earlier) indicate a judicial inclination to intervene against truly unconscionable or grossly unfair clauses where there is significant unequal bargaining power, and the clause negates the very purpose or benefit of the contract for one party. This argument, though difficult, can be a last resort against the most draconian "all risk" clauses.

Emphasis on Notice Periods: Indian arbitral awards and court decisions consistently uphold the importance of strict adherence to notice provisions. Failure to provide timely notice, even for legitimate claims, is a frequent reason for dismissal, reinforcing the "Notice is King" principle.

In Indian law, while adhering to a strict interpretation of contract and a high threshold for frustration, successful outcomes for contractors regarding unforeseen physical conditions often hinge on:

- Ensuring specific force majeure or variations clauses cover such eventualities and avoid absolute risk transfer.
- Diligent pre-bid due diligence and clear qualifications in the tender.

- Meticulous documentation during execution and effective project management.
- Leveraging the employer's default/ breach argument if the unforeseen condition is a consequence of the employer's action or inaction (as seen in cases dealing with employer's implied duties).
- Strategic engagement with dispute resolution mechanisms, particularly arbitration, where technical expertise allows for a more nuanced assessment of foreseeability and contractual equity.

Contractor's Playbook: Navigating Unforeseen Conditions

The presence of one-sided clauses in construction contracts, particularly those attempting to transfer the entire burden of unforeseen physical conditions to the contractor, necessitates a robust and multi-faceted approach. Contractors must implement strategic measures both during the pre-contractual phase and throughout project execution to mitigate risks and protect their entitlements.

Proactive Measures (Pre-Contractual Phase)

The first line of defence against difficult one-sided clauses lies in comprehensive pre-bid diligence and a sophisticated tendering strategy.

1. Enhanced Site Investigations

Going beyond a superficial review, contractors must undertake enhanced and exhaustive site investigations. These inter alia would include:

Commissioning supplementary ground investigations, if feasible and permissible, to gather more detailed and reliable subsurface data than that provided by the client.

A rough analysis of all information provided by the client (e.g., bore logs, geological reports, previous survey data), judgmentally assessing its completeness, consistency, and potential for misinterpretation.

A detailed physical inspection of the site, noting any visible indicators of unusual ground conditions, historical features, or access challenges, and comparing these observations with the provided data.

Reviewing historical maps, geological surveys, and adjacent project data to anticipate potential subsurface issues.

2. Qualifying Tenders and Reservations

When faced with one-sided clauses that assign unacceptable risks, contractors should not shy away from qualifying their tenders. This involves:

Explicitly outlining the assumptions made regarding site conditions based on the available data. E.g. "Our bid assumes a rock classification Class IV or better, and any deviation requiring more extensive rock breaking will be treated as an unforeseen physical condition."

Inserting reservations or exclusions for risks deemed unmanageable or unknowable. This could involve stating that the bid price does not include the cost of certain unforeseen ground conditions, which would be subject to a variation.

Where appropriate, submitting alternative wording for particularly difficult clauses that align more closely with principles of fair risk allocation.

3. Negotiation and Legal Review

The tender phase is an important window for negotiation. Contractors should:

Point out the commercial implications and potential for disputes arising from one-sided clauses.

Explain how fair risk sharing (as found in FIDIC Red Book principles) ultimately benefits the project by encouraging more accurate pricing and reducing contingencies.

Stress the absolute necessity of a thorough legal review of the entire contract document before signing. Legal counsel can identify high-risk clauses, assess their enforceability under Indian law, and advise on strategies for mitigation or negotiation.

4. **Developing an Internal Risk Matrix**

Developing an internal risk matrix is an invaluable tool. This systematic approach helps:

List all potential risks related to unforeseen physical conditions.

Evaluate the potential financial, time, and reputational impact of each risk.

Outline specific actions to mitigate identified risks, including those related to one-sided clauses.

Clearly define who within the contractor's organization is responsible for managing each risk. This proactive assessment facilitates informed bidding and robust risk management throughout the project.

During Project Execution

Once the contract is signed, especially when confronted with one-sided clauses, contractors must remain vigilant.

- **Strict Adherence to Notice Provisions**

  Even if a notice provision seems unfair, the contractor must strictly adhere to it to preserve any potential claims. Every procedural step, every deadline, and every communication method specified in the contract must be followed precisely. Failure to give timely and proper notice is a common reason for legitimate claims being denied.

- **Comprehensive Documentation**

  Comprehensive documentation is the bedrock of any successful claim or defence. This includes:

  ◊ Maintaining daily logs of activities, manpower, equipment, and all site conditions encountered.

  ◊ Visual documentation of unforeseen conditions (e.g., rock strata, water ingress, obstructions) before, during, and after remedial works.

  ◊ Engaging engineers or specialists to prepare reports detailing the nature of the unforeseen conditions, their impact, and proposed remedial measures.

  ◊ Archiving all formal and informal communications (emails, letters, meeting minutes, etc.) related to the conditions and their resolution.

  ◊ Maintaining separate, detailed records of all costs incurred (labour, plant, materials, subcontractors) specifically attributable to dealing with the unforeseen conditions.

- **Maintain Clear Communication**

  Maintain open, yet formal, lines of communication with the Engineer/ Owner, Employer.

  ◊ Provide early warnings of potential delays and cost impacts as soon as unforeseen conditions are discovered.

  ◊ Confirm all verbal instructions or agreements in writing.

  ◊ Ensure regular progress reports highlight any issues related to site conditions and their impact. This builds a credible record of the contractor's efforts and the evolving challenges.

- **Engage External Experts**

  Do not hesitate to engage external experts early if unforeseen conditions or disputes begin to escalate.

  ◊ Technical Experts: Geotechnical engineers, structural engineers, or forensic construction experts can provide independent assessments and reports supporting the contractor's position.

  ◊ Legal Experts: Construction lawyers can advise on the interpretation of complex clauses, the strength of potential claims, and the optimal dispute resolution strategy under Indian law.

Dispute Resolution Pathways

When direct resolution proves elusive, contractors must navigate the contractual dispute resolution mechanisms.

- **Amicable Settlement**

  Always the preferred first step, emphasizing the

benefit of early negotiation and compromise. An attempt at amicable settlement can often prevent disputes from escalating and preserve commercial relationships.

- **Dispute Adjudication Boards (DABs)**

  If the contract incorporates FIDIC's multi-tiered system (or a similar ad-hoc board), this is an invaluable intermediate step. DABs offer a quick, cost-effective, and technically informed resolution by independent experts. Their decisions are binding on an interim basis, ensuring continuity of the project while parties consider further steps. This helps prevent minor issues from snowballing into major disputes.

- **Arbitration/ Litigation**

  These serve as the ultimate recourse when other avenues fail.

  ◊ Cost and Time Implications: Acknowledge that arbitration and litigation are typically costly, time-consuming, and resource-intensive, often impacting project cash flow and diverting management attention.

  ◊ Arguments Against One-Sided Clauses: In these forums, contractors can mount arguments against one-sided clauses based on:

  - Arguing that the clause is so unfair or oppressive that it should not be enforced, particularly if there was a significant disparity in bargaining power (drawing on principles from *Brojo Nath Ganguly* and *Pioneer Urban Land*).
  - Arguing that the unforeseen conditions constitute a fundamental breach by the employer (e.g., misleading site information, failure to provide suitable site) that vitiates the one-sided clause.
  - In rare cases, arguing that the clause is contrary to public policy, especially if it undermines the fundamental principles of fairness in contracting.
  - Relying on principles of contractual interpretation where ambiguity exists, seeking to interpret the clause in a manner that favours fairness and commercial reasonableness, rather than literal harshness.

Recommendations for Stakeholders

Addressing this important gap requires a concerted effort from all participants in the construction ecosystem:

For Employers/Clients

a. **Adopt Principles of Fair Risk Allocation:** Clients should move away from the mindset of absolute risk transfer and embrace the FIDIC philosophy of allocating risks to the party best able to foresee, control, and mitigate them. For unforeseen physical conditions, this often means retaining a degree of risk, which ultimately leads to more realistic bidding and fewer disputes.

b. **Invest in Thorough Pre-Tender Geotechnical Investigations:** A robust initial investment in comprehensive, high-quality site investigations is paramount. Providing comprehensive, reliable, and transparent site data to prospective bidders reduces their unknowns, allowing them to submit more accurate and competitive bids, thereby minimizing the need for large contingencies.

c. **Avoid Overly Aggressive One-Sided Clauses:** Clients should refrain from incorporating clauses that make contractors absolute insurers of unforeseen physical conditions. Such clauses, while seemingly offering certainty, invariably lead to higher project costs (due to risk premiums), increased disputes, and a reduced pool of competent bidders. A truly fair contract is a sign of a robust and sustainable project.

d. **Promote Collaborative Contract Management:** Foster an environment of collaboration rather than confrontation. When unforeseen conditions arise,

engage proactively with the contractor, leveraging contractual mechanisms like Variations, rather than adopting an adversarial stance that forces the contractor into protracted claims.

For Contractors:

a. **Conduct Independent and Thorough Due Diligence on Site Conditions:** Contractors must not solely rely on employer-provided data. It is imperative to perform their own diligent site investigations, analysis of available information, and, where permissible and feasible, supplementary geotechnical studies during the tender stage.

b. **Seek Comprehensive Legal Review of All Contract Documents:** Before submitting a bid or signing a contract, engage experienced construction legal counsel to meticulously review all terms, especially the Particular Conditions. Understand the precise implications of every clause related to risk allocation, claims, and dispute resolution.

c. **Propose Qualifications and Amendments to One-Sided Clauses During Tender:** Do not accept onerous clauses without attempting to negotiate. Clearly state assumptions in the bid regarding site conditions and propose specific qualifications or amendments to clauses that impose unacceptable or unquantifiable risks. This upfront clarity can prevent future disputes.

d. **Maintain Impeccable Record-Keeping and Strict Adherence to Notice Provisions:** During project execution, "Notice is King." Meticulous daily records, progress reports with time impact, photographic evidence, and strict adherence to all contractual notice periods for claims (even those deemed unfair) are non-negotiable. Failure to comply procedurally can forfeit valid entitlements.

e. **Understand the Limitations of Indian Law Regarding Frustration/ Force Majeure and Focus on Clear Contractual Entitlements:** Contractors must be acutely aware that Indian courts have a high threshold for applying the doctrine of frustration or for allowing claims under generic force majeure clauses for increased costs due to unforeseen physical conditions. Therefore, the focus must be on securing clear, express contractual entitlements for such events within the contract itself, rather than relying on broad legal doctrines.

For the Legal/Policy Framework in India:

a. **Discuss Potential for Legislative Clarity or Judicial Guidance:** There is a strong case for exploring whether legislative clarity or more consistent judicial guidance could be provided for handling unforeseen conditions in construction. Drawing lessons from FIDIC, particularly the concept of the "experienced contractor" test and the balanced allocation of risks for true unforeseeability, could serve as a valuable reference point for Indian law.

b. **Advocate for Greater Use of Independent Dispute Adjudication Boards (DABs):** Promoting and mandating the use of independent and technically sound DABs/DAABs in large infrastructure projects can significantly reduce the burden on courts and arbitration. These boards offer speedy, technically informed, and interim binding decisions that keep projects moving, preventing small disputes from escalating into debilitating legal battles.

Conclusion

The universal challenge of unforeseen physical conditions in construction projects, often amplified by the prevalence of one-sided contractual clauses, presents a significant hurdle to the smooth execution and financial viability of infrastructure development, particularly in a rapidly growing economy like India's. While FIDIC contracts offer a globally recognized, balanced framework for risk allocation, the frequent imposition of overly burdensome Particular Conditions by clients can unfairly shift substantial risk to contractors.

Navigating this complex terrain demands a sophisticated understanding from all stakeholders. For contractors, this means not only a meticulous grasp of FIDIC's provisions but also a keen awareness of the nuances of the Indian legal landscape, including the doctrines of frustration and principles of unconscionability under the Indian Contract Act. Proactive measures such as thorough due diligence, strategic tender qualifications, and impeccable project documentation are not just best practices, but important safeguards. Similarly, clients have a vital role in fostering more equitable contract environments through transparent data sharing and a commitment to fair risk distribution.

Ultimately, the goal is to move beyond an adversarial dynamic towards one of collaboration and shared responsibility. By embracing balanced contractual frameworks, investing in comprehensive preliminary investigations, and leveraging efficient dispute resolution mechanisms like Dispute Adjudication Boards, the Indian construction industry can better manage these inherent uncertainties. This shift will not only reduce disputes and cost overruns but will also ensure the timely and successful delivery of the mega-projects important for India's continued developmental trajectory.

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6. Central Inland Water Transport Corporation vs Brojo Nath Ganguly & Anr on 6 April, 1986
7. Pioneer Urban Land And Infrastructure Ltd vs Govindan Raghavan on 2 April, 2019
8. The Specific Relief Act 1963

India-Germany submarine partnership advances with Mazagon Dock Shipbuilders Limited (MDL) contract talks for Project 75(I)

Negotiations mark key step in six-submarine programme under Atmanirbhar Bharat

MDL has begun formal contract negotiations with Indian procurement authorities for Project 75(I), a flagship programme that envisages the construction of six next-generation conventional submarines.

According to an official statement, the initiative is aimed at enhancing indigenous naval capability through international technology transfer and strategic collaboration.

Under the programme, six modern submarines designed in Germany will be built by MDL in India. The project is expected to strengthen strategic and industrial ties between India and Germany, reflecting a shared commitment to maritime security, defence innovation, and long-term technological cooperation.

Source: Excerpts from The Hindu

09

Project Delays and Cost Claims in EPC Contracts: A Technical Review of DRB and Arbitration Pathways

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Abstract

Effective dispute resolution is crucial for the success of all contracts, including Engineering, Procurement, and Construction (EPC) highway contracts that cover long distances and involve multiple stakeholders. For EPC projects, in India, disputes commonly stem from the delayed handover of the Right of Way (RoW), difficulties in the procurement of Fly Ash, cost escalation due to design changes, and unapproved scope deviations. Model EPC agreements provide for land availability, site protection, and a tiered dispute-resolution process that includes a Dispute Review Board (DRB), but interpretational differences, weak contemporaneous records, and procedural lapses often undermine those safeguards. Drawing on the history of claims for material substitution and detour haulage, this paper identifies shortcomings in RoW delivery, the absence of enforceable change of scope procedures, and the limited practical effect of DRB recommendations, and it offers targeted reforms to reduce arbitration and strengthen governance.

Introduction

EPC contracts are the predominant procurement route for India's highway programme because conceptually they consolidate design and construction responsibilities within a single framework. Execution, however, routinely encounters operational and contractual issues. Fragmented RoW delivery disrupts work sequencing and increases costs because of longer haul distances for borrow material and the need for temporary diversions. Material Procurement, even though encouraged by MoEF&CC and MoRTH notifications to source fly ash from Thermal Power Plants (TPPs) becomes problematic when the Memoranda of Understanding (MoUs) with the latter are delayed or not concluded. The contractors then per force have to rely on distant borrow areas or private suppliers, resulting in claims for extended haulage, idle plant, unapproved technical deviations, and at times, ambiguous specifications. When these issues are referred to dispute-resolution mechanisms, insufficient contemporaneous documentation and missed procedural steps frequently limit contractual remedies.

Right of Way (RoW)

Delayed RoW and Deemed Withdrawal

EPC contracts typically stipulate that 90 percent of the Right of Way (RoW) must be handed over on the Appointed Date, with the balance to follow within a defined period, often 150–180 days. In practice, however, projects usually commence with only 80-82 percent of land actually available in the field, which is in possession, while the remainder is held up due to compensation disputes, local resistance, or encroachments. Contract provisions may allow the contractor to treat unavailable portions as withdrawn if not delivered/ handed over within the prescribed timeframe. In reality, contractors tend to continue

execution on accessible stretches to avoid slippage of milestones, while simultaneously raising claims for detours, extended haulage, or additional costs.

Site Protection Responsibility

EPC agreements typically require contractors to protect stretches of Right of Way (RoW) already handed over against encroachments and adverse possession. Authorities often attribute re-encroachment or obstruction to contractors' negligence, while contractors argue that these obligations presuppose actual physical access rather than mere documentary possession. This distinction becomes critical in areas where unresolved compensation disputes or local unrest prevent unhindered entry. The interpretative tension between "legal possession" and "practical possession" highlights a structural ambiguity in EPC projects and continues to generate disputes over risk allocation.

Material Procurement

Background and Claim Overview

Material procurement and substitution are also among the most frequent reasons for disputes to arise in EPC highway projects. A recurring issue concerns the availability of **fly ash** from nearby, Thermal Power Plants (TPPs). Contractors often assume at the bidding stage that the fly ash will be provided free of cost, as envisaged by prevailing environmental policy. When that does not materialize, they are compelled to either:

1. procure borrow soil from distant borrow areas, leading to increased haulage costs, and/ or
2. purchase fly ash from private vendors at prevailing market rates.

Such substitutions not only escalate the cost of embankment construction but also alter the execution methodology. Contractors typically advance claims that these circumstances fundamentally change the risk allocation embedded in the EPC framework.

Policy Circulars Cited in Support of Claims

Contractors commonly anchor claims on Notifications, Amendments and Circulars issued by Ministries of the Government of India - Ministry of Environment, Forest and Climate Change (MoEFCC) and the Ministry of Road Transport & Highways (MoRTH). The contractor's point of view is that they rely on these documents and base their bid on "zero-cost fly ash" as being justified, and that the absence of MoUs with local TPPs results in shifting the procurement and transportation risks unfairly onto them.

Legal Grounds and Contractor's Position

From a contractual standpoint, these claims are generally advanced as **Change of Scope (CoS)** matters. The key grounds include:

1. **Policy reliance** - at the time of bid, free fly ash is considered as an input based on the mandated Government policy.
2. **Implementation failure** - Authorities do not facilitate MoUs with nearby TPPs, depriving contractors of access to intended benefits. In the interest of the environment, increasing incidences of effects of climate change, and minimising project cost, the Authorities should ensure that the TPPs from where the fly-ash is to be sourced are onboard prior to the assigning of any contract for construction.
3. **Cost burden** - reliance on distant borrow sources and non-continuity of land of RoW increase lead distances, thereby adding to time and cost.
4. The Contractors often emphasize that the circulars of the Ministry and field-level instructions effectively require revisions to suit the conditions prevailing at the site, which warrant a change in the construction methodology. Even if not formally incorporated into the EPC contract, these conditions need to be duly considered to constitute a practical reallocation of risk.

Contractual Risks and Dispute Resolution Board (DRB)

Functionality: Strengths and Shortfalls

A Dispute Resolution Board (DRB) is intended to

provide quick, project-level redressal before escalation of a matter for arbitration. While the mechanism has proven useful in filtering claims, its effectiveness is often constrained by:

1. **Non-binding character** - DRB recommendations carry weight but remain advisory unless both the parties accept them.
2. **Partial participation** - hearings are sometimes unattended by either party, undermining the legitimacy of the proceedings.
3. **Evidentiary gaps** - many claims suffer from missing contemporaneous documentation such as RFIs, detour verification, or joint measurement logs.

DRB Mechanism and Contractual Framework

A typical EPC Agreement establishes a multi-tiered dispute-resolution path that begins with reference to a Dispute Review Board and proceeds to Arbitration if required. While DRBs often issue reasoned recommendations, those recommendations are not binding unless accepted by both parties to the dispute.

For RoW and Site Protection

Contractors commonly invoke the DRB for claims arising from non-contiguous RoW, extended haulage distances, idle machinery, loss of profit, loss of business opportunities, technical deviations, and an increase in time taken. While contractors often invoke the dispute resolution clause to allege non-availability of unencumbered RoW, the stand taken by the Authorities is that the contractor failed to safeguard the stretches of land already handed over or commenced/ continued execution without registering any formal protest.

For Material Procurement

1. **DRB Practice and Grounds for Rejection:** Dispute Resolution Boards (DRBs), when faced with such claims, have frequently declined large-value entitlements on grounds such as:
    a. **Absence of MoUs** - contractors did not comply with the amended requirement to secure formal supply arrangements with TPPs.
    b. **Lack of substantiation** - additional lead and cost impacts were unsupported by contemporaneous Request for Inspection (RFI) records, detour mapping, or haulage logs.
    c. **Circulars do not modify a contract** - external policy directions, while indicative of intent, cannot be deemed to modify EPC clauses unless incorporated through formal CoS/ MoU orders.
    d. **No cost endorsement** - revised quantities or costs were not validated by the Independent Engineer or the Authority Engineer or Authority.

All these create hardships for the Contractors. It would be prudent for the Authority to remind the contractor to follow the necessary and required practices and procedures to prevent any hardships.

Contractual Implications

These arise on account of the difference between guidelines of a **policy or notification or a circular** and their **contractual enforceability**. Government notifications or circulars, however well-intentioned, do not automatically modify contractual obligations. For enforceability, the risks and responsibilities must be regularized through:

a. Change of Scope orders,

b. Supplementary Agreements, or

c. Drawings and Bill of Quantities which are formally approved, if there is a variation with respect to the original bid document.

The lesson is clear: reliance on implied instructions, verbal assurances, or policy circulars without formal incorporation leaves contractors vulnerable to rejection of escalation claims.

Escalation to Arbitration

Where DRB recommendations are partially or wholly rejected, disputes typically escalate to arbitration as per

the dispute resolution clauses of an EPC agreement.

Authorities often raise counterclaims for delay, damages, toll losses, disallowance of works or undertaken without CoS approval, or recovery of idle costs. The Contractors defend their position by pointing to field-level directions (which the Authority has not reduced to writing), the urgency of maintaining timelines, and prior notifications of site access difficulties. The arbitration issues usually rely on the **evidentiary sufficiency** of contemporaneous physically recorded documentation, such as notices, documents, and approvals, rather than the occurrence of disruption itself.

Recurring shortcomings in project administration often contribute to the escalation of the matter to arbitration:

a. **RoW enforcement gaps** - handovers treated as administrative acts, without accountability for actual site access or removal of encumbrances, and maintaining them throughout the duration of the project.

b. Appropriate Environmental Clearances, Railway Clearances or any other that may be necessary, which are not arranged timely also lead to disputes.

c. **Unformalized innovations** - technical adjustments based on circulars or verbal instructions executed without Change of Scope (CoS) approvals.

d. **No incentive for early claim resolution** - absence of fast-track mechanisms for smaller claims leads to delay and dilution of evidence.

e. **Inadequate documentation** - lack of real-time joint records and geo-tagged logs complicates claim validation

Cross-Case Analysis and Suggestions for Systemic Changes

Comparative Insight: Package-Level Variations

Comparative experience across projects shows different outcomes depending on the contract administration processes adopted. In some packages, phased RoW availability is formalised through **Supplementary Agreements**, aligning milestones with land delivery and avoiding disputes, whereas in others, the absence of such agreements leave the RoW fragmented and contested, leading to escalation of the issues into disputes. This contrast underscores the value of proactive documentation, structured change control, and adaptive administration in mitigating risks inherent in EPC highway contracts. It also brings out the need for handing over 100% of RoW free of all encumbrances.

Comparative Review: Procedural Gaps vs. Proactive Compliance

Experience from different projects illustrates how proactive documentation and structured agreements decisively influence dispute outcomes.

a. **Scenario A**: Delays in Right of Way (RoW) handover managed through a Supplementary Agreement that formalized phased access and revised milestones. The arrangement minimized idle resources, prevented escalation of claims, and enabled continuous execution despite setbacks.

b. **Scenario B**: Phased access in the absence of a Supplementary Agreement creates ambiguities regarding responsibilities and planning of the works. The resulting disruptions can escalate into formal claims and, eventually, arbitration.

These are shown in Table-1: Comparison of Effect of Contract Documentation

Table-1: Comparison of Effect of Contract Documentation

Package	RoW Status	Supplementary Agreement	Dispute
Scenario A	Phased, Delayed	Yes	No
Scenario B	Fragmented, Disputed	No	Yes

The contrast underscores the preventive role of proper and **timely documentation** and **agreements**.

Suggested Reforms for EPC Projects

The changes that could be made to improve the functioning of EPC highway Projects are given in Table-2: Reform Areas and Suggested Actions.

Table-2: Reform Areas and Suggested Actions

Reform Area	Suggestions
RoW Handling	Mandatory Supplementary Agreements to be executed within 7 days (time being of the essence) in cases of phased or delayed handover.
DRB Outcomes	DRB decisions to be binding for disputes less than ~₹25 crore unless specifically challenged.
Monitoring Tools	Deploy GIS-based RoW dashboards with access logs and geo-tagged site handover records.
Implementation	Government circulars/ notifications to be given cognisance only if integrated into contracts through signed CoS documentation.

These measures suggested would provide **flexibility** to address evolving site realities as well as **formal accountability,** which would ensure enforceability and accountability.

Governance Takeaways

The cross-package comparison highlights that effective EPC delivery is a function not only of sound engineering but also of robust governance and contract management. The key institutional lessons are:

1. Timely and enforceable documentation, including MoUs and CoS orders are indispensable.

2. RoW delays and site obstructions require defined accountability between Authority and contractor, and should be that of the party that is in a position to take care of and resolve the matter.

3. Strengthening DRB efficacy through **limited binding jurisdiction** to reduce repetitive litigation.

4. Field-level technical innovations must be recorded and signed by the parties to the contract and are traceable to prevent later disputes.

The changes suggested are for a **preventive governance model** where risks are addressed upfront and the manner in which they would be resolved are provided. That would reduce claims and arbitration later on.

Stakeholder Roles and Procedural Oversights

Contractual disputes in large EPC projects seldom arise from a single event; they stem from a series of infractions and failures in coordination, procedural diligence, and documentation.

Role Mapping of Key Stakeholders

The case below illustrates how informal practices and gaps in compliance create conditions for claims, counterclaims, and eventual arbitration, and may be a court case. Table-3 gives the contractual mandate, procedural lapses, and their resultant impact.

Table-3: Contractual Mandate, Procedural Lapses, and their Resultant Impact

Stakeholder	Contractual Mandate	Procedural Lapse/ Oversight	Impact on Dispute Outcome
Project Authority	Acquisition and handover of RoW; Approval of Scope Changes	RoW provided in fragmented and phased manner; Absence of Joint Records	Triggers delays, Unclear claims, and Lack of clarity in execution sequence
Contractor	Timely execution of Scope as defined and to specified Quality	No MoUs with material sources; None or Weak or Limited contemporaneous records	Viewed as having been executed voluntarily; Claims lack substantiation.
Authority Engineer (AE)	Certification of: Site conditions, Detours, and Design deviations	RFI detours and Design changes/ updates not verified and approved by the Authority	Documentation gaps weaken the evidentiary basis of claims
Dispute Board (DRB)	Independent forum for interim claim adjudication	Recommendations non-binding. Parties can disagree on interpretation	Results in escalation to arbitration.
Land Acquisition Agencies	Ensure physical handover post-compensation disbursal	Land access not fully cleared at handover stage	Contributes to execution halts and site-related disputes.
Material Suppliers/ TPPs	Provide fly ash as per Ministry circulars and sign MoUs with TPP	No formal MoUs with TPP, contractor for delivery validation	Claims based on fly ash procurement rejected due to lack of formal linkages

Procedural Deficiencies Identified

Several recurring deficiencies undermine dispute defensibility:

1. **No Joint Records** - absence of co-signed RFIs and measurement logs complicates validation of claims.
2. **No Supplementary Agreement** - phased RoW not formalized; execution proceeds without formal documentation of obligations.
3. **Unapproved Scope Changes** - circular-driven measures such as fly ash substitution implemented without Change of Scope (CoS) approval.
4. **Weak DRB Authority** - recommendations remained non-binding, reducing deterrence and prolonging dispute cycles.

Stakeholder Impact Matrix

The impact of the procedural deficiencies and their consequences are shown in a matrix form, in Table No. -4.

Table No.-4: Stakeholder Impact Matrix

Project Event/ Action	Principal Responsible Stakeholders	Consequence of Lapse
RoW Handover in Non-Contiguous Sections	Project Authority, Revenue Agencies	Delay in site access. Resource idling. Compensation claims
Detour Acknowledgment and Quantification	Contractor, Authority Engineer	Detour claim denied due to unverified routing and lack of logs
Fly Ash Availability and MoU Coordination	Contractor, Supply Sources, Project Authority	Claim rejected for lack of contractual linkage with suppliers
Change of Scope or Technical Deviations	Contractor, AE, Project Authority	Claims disallowed due to missing approvals and documentation

Summary Observations

The above example demonstrates that **well-drafted contractual clauses alone are insufficient** without effective compliance and enforcement mechanisms. The enforceability of rights and claims depends on:

1. Timely and co-signed documentation (Recorded Field Instructions, MoUs, Supplementary Agreements).
2. Procedural diligence by all parties and related agencies.
3. Binding mechanisms for Dispute Boards to reduce escalation.
4. Coordinated accountability across the Authority, contractor, and supporting agencies.

Weak binding mechanisms and reliance on informal field practices undermine claim defensibility and may result in extended dispute timelines. Strengthening EPC frameworks with **clearer accountability, enforceable documentation, and automated dispute monitoring** is essential to reducing systemic risks.

Suggestions and Policy Interventions

Drawing from the comparison of the procedure for **Scenario A, in which the resolution** was smooth due to the adoption of timely preventive procedures **and on the other hand for Scenario B, in which the procedures were not followed and could thus result in a dispute,** which could be prolonged and costly, it is suggested that systemic interventions to enhance dispute resilience in EPC highway projects be adopted as follows.

Comparative Snapshot: Scenario A vs Scenario B

A comparison of the procedures adopted in the two scenarios is given in Table No.-5.

Table-5: Comparison of Procedures adopted in Scenarios A and B

Aspect	Scenario A (Resolved)	Scenario B (Disputed)
RoW Handover	Phased but jointly verified	Fragmented; encroachments; only partial physical access available
Change Management	Supplementary Agreement executed	No formal Supplementary Agreement
Technical Deviations	CoS processed with records	CoS, not processed, hence not valid: No reservation of rights
Dispute Handling	Settled at the site level	Escalates to DRB and Arbitration
Cost Claims	Absorbed via mutual adjustment	From the claims made, many could be denied

Insight: Timely documentation, formal change validation, and proactive engagement materially reduce escalation and minimise disputes.

Right of Way (RoW) Governance

Issues: Delayed physical possession despite "paper handover"; access blocked by protests/ encroachments.

Suggestions:

1. GPS/drone-verified **joint RoW certification** before Appointed Date.
2. **Add clauses pertaining to automatic time and cost relief** if delays >15 days.
3. Mandate **Supplementary Agreements** for phased handover to be signed within 7 days.

Technical Deviation Governance

Issues: Fly ash unavailability; borrow soil used without CoS; Circulars treated as binding.

Suggestions:

1. **CoS** to be issued for any changes as a result of any Circular or Notification issued by the Authority or Government which is to be made applicable to the Contract, provided that the basic nature and stipulations are not vitiated
2. Launch **NHAI deviation dashboard** with time-stamped logs.
3. Introduce a **pilot clause** for capped-budget innovations while ensuring 100% RoW is handed over as per the agreed schedule and sequence, all statutory approvals are granted within stipulated timelines, there is no change in scope, and all other Authority obligations, such as land acquisition, encumbrance removal, and timely payments, are duly fulfilled.

DRB Strengthening & Arbitration Prevention

Issues: Claims rejected for lack of MoU, RFI, CoS; DRB rulings remain non-binding.

Suggestions:

Make **RFIs, Detour maps, and AE certifications mandatory** for claims of all values.

DRB decisions below **₹10 Cr to be made binding** unless challenged within 30 days from the date of issue of the DRB decision.

Authority to appoint a **legal expert to** DRBs for contracts exceeding ₹500 Cr, depending on project complexity, statutory interface, foreign participation, and in the interest of public policy.

Stakeholder Integration & Coordination

Issues: Weak alignment and coordination amongst the Authority, AE, Revenue bodies, and suppliers.

Suggestions:

Create **corridor-specific Land Coordination Cells (LACCs)** with Authority, AE, Collectorate, suppliers, and contractor.

Project Grievance Redressal Committees (PGRCs) shall address land, safety, and all project-related issues in a meeting in the 3rd week of every month and resolve matters in one sitting. As and when required, the PGRC should meet for 2-3 or more days at a stretch if necessary.

Drone-based RoW dashboards for parcel-wise clearance tracking.

Financial Safeguards & Procurement Protocols

Issues: Fly ash unavailability and unclear sourcing resulting in strained liquidity.

Suggestions:

Introduce a **Material Ownership Matrix** in BOQ tagging Authority/ Contractor/ Shared responsibility.

Require **pre-award MoUs** with TPPs for unhindered fly ash supply.

Allow **5% contract-value advance** against approved CoS linked to circulars, subject to audit controls.

Conclusion

Disputes in EPC highway projects often arise not from a single contractual failure but from systemic weaknesses in the administration, execution, and governance of the contract. Comparison of contrasting project packages clearly illustrates that. In some cases, fragmented Right of Way (RoW) handovers, undocumented technical deviations, and the absence of Change of Scope (CoS) approvals can lead to significant financial claims being rejected due to poor records, missing MoUs, and non-compliance with formal notice and reservation protocols. Project authorities face criticism for not ensuring unencumbered site access or exercising effective oversight on contractual procedures.

Projects where Supplementary Agreements are executed, RoW handovers jointly verified, and scope adjustments or changes are formally documented in time would enable progress as scheduled and avoid escalation into dispute resolution pathways.

The learning is clear: while EPC contracts are designed for efficiency and risk allocation, their successful delivery depends on:

Verified and timely RoW handover using GPS or drone certification,

Legally valid documentation through CoS orders or Supplementary Agreements,

Binding DRB outcomes for lower-value claims to reduce unnecessary escalation to arbitration,

Cross-agency coordination tools, such as dashboards and grievance forums, to enforce accountability, responsibility, and timely actions.

Embedding the safeguards as suggested would strengthen procedural discipline, protect public funds, and ensure faster, dispute-resilient infrastructure delivery.

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10 Lack of Certainty in Projects Needs to be Addressed in Contracts

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Abstract

Infrastructure development has long been acknowledged as both a catalyst and a barometer of economic growth. Roads, highways, bridges, and transport corridors not only facilitate mobility but also generate significant multiplier effects across industrial supply chains and regional development. Yet, the execution of such projects is persistently undermined by uncertainties that manifest in delays, escalating costs, and protracted disputes. These uncertainties stem from a complex interplay of operational inefficiencies, contractual ambiguities, and unforeseen external shocks. From land acquisition hurdles and compensation disputes to the challenges of scope variations and force majeure events, projects are routinely exposed to risks that threaten their commercial viability.

The COVID-19 pandemic was a watershed moment, bringing into sharp focus the inadequacies of contractual provisions in anticipating the unforeseeable. It revealed the criticality of risk allocation mechanisms, Extension of Time (EOT) clarity, and dispute resolution frameworks in sustaining contractual equilibrium. This article, drawing on experiences from Indian highway and bridge projects under the aegis of the National Highways Authority of India (NHAI), examines these issues in depth. It highlights the legal and practical lacunae in current approaches, applies established legal theories and contractual doctrines, and proposes reforms at both contractual and policy levels. The emphasis lies not only on strengthening contract drafting but also on embedding resilience through institutional reform, technological integration, and alignment with global best practices.

Introduction: Contracts as the Backbone of Infrastructure Delivery

The successful execution of infrastructure projects in India is shaped by a confluence of statutory frameworks, institutional mechanisms, and private capital mobilization. Projects are often implemented under complex Public-Private Partnership (PPP) structures, Engineering-Procurement-Construction (EPC) contracts, or hybrid annuity models, each carrying distinct contractual responsibilities. Amidst these frameworks, the legal maxim *pacta sunt servanda*, agreements must be kept, becomes the central pillar, underscoring that the enforceability and clarity of contracts are indispensable for commercial certainty.

While engineering innovation and project management practices command visibility, the contractual framework remains the silent skeleton holding the project together. It defines obligations, apportions risks, and prescribes remedies for breaches or disruptions. Yet, Indian infrastructure contracts are

often criticized for being more reactive than proactive. Despite voluminous technical detail, many fail to anticipate operational realities. For instance, clauses governing land acquisition timelines are framed in aspirational rather than enforceable terms. Similarly, force majeure definitions, sometimes archaic, do not reflect contemporary risks such as pandemics or cyber disruptions. The result is what jurists describe as "contractual incompleteness," a phenomenon where inevitable gaps lead to post-dispute negotiations, arbitral delays, and financial instability.

The Nature of Uncertainties in Infrastructure Delivery

Uncertainties in project execution may be conceptualized under three broad categories: External Factors, Contractual Ambiguities, and Operational Inefficiencies.

External Factors

These include Natural Calamities, Political Upheavals, Pandemics, and Regulatory changes. In contractual jurisprudence, these events invoke doctrines such as *force majeure* or the common law principle of *frustration of contract*, codified in Section 56 of the Indian Contract Act, 1872. However, judicial interpretations of these doctrines often remain conservative, demanding high thresholds of impossibility. For example, in *Satyabrata Ghose v. Mugneeram Bangur & Co.* (1954), the Supreme Court held that delay caused by requisitioning of the land by the government did not frustrate the contract unless it radically changed the contractual foundation. Such rulings underscore the gap between doctrinal expectations and project realities.[1]

Contractual Ambiguities

The second source of uncertainty arises when roles and risks are insufficiently demarcated. The legal maxim *lex specialis derogat legi generali*, the specific overrides the general, applies here. If contracts fail to include specific clauses on land acquisition responsibility, general provisions on employer obligations may lead to contested interpretations. Similarly, overlapping obligations for utility shifting or environmental clearances often create grey areas that invite disputes.

Operational Inefficiencies

The third source arises from institutional bottlenecks. Land acquisition delays are emblematic of this category. Theoretically, the 2013 Land Acquisition Act provides for fair compensation and structured timelines.[2] Yet, outdated land records, resistance from dispossessed communities, and departmental lethargy create systemic delays. This mismatch between statutory promise and operational delivery exemplifies the doctrine of *lex non cogit ad impossibilia*, the law does not compel the impossible. Contractors, left without access to sites, nevertheless face obligations to mobilize resources, leading to idle charges and spiralling claims.

An illustrative case is a four-lane expansion in eastern India, where only 55% of the land was available on the appointed date. Here, the doctrine of *quid pro quo*, mutuality of obligations, was undermined, as the employer demanded mobilization without reciprocating by providing encumbrance-free land. The consequences included EOT claims, arbitration, and eventual escalation of project costs, borne in part by the public exchequer.

Compensation Disputes and Extension of Time Challenges

Compensation disputes under the 2013 Act *ibid* reflect another layer of uncertainty. Though the statute prescribes market-linked valuation with multipliers, practical implementation falters. Outdated valuation bases and inconsistent multiplier applications erode trust, triggering community protests and project stoppages. This illustrates the maxim *ubi jus ibi remedium*, where there is a right, there must be a remedy. In practice, however, remedies for landowners clash with contractual obligations of contractors, producing a triadic conflict between law, contract, and community.

Extension of Time (EOT) clauses reveal parallel weaknesses. While contracts typically allow for extensions due to employer delays or force majeure, definitions often remain restrictive. The COVID-19 crisis demonstrated this starkly: in several contracts, pandemics were not expressly included, requiring government notifications for relief. This ad hocism undermines commercial certainty and contravenes the principle of *certainty of contract*, a cornerstone of both Indian and international commercial law.

Moreover, EOT approvals are notoriously delayed, leading to cash flow disruptions for contractors. In legal theory, this violates the principle of *time is of the essence*, a doctrine recognized under Section 55 of the Indian Contract Act. In infrastructure contexts, failure to recognize the cascading effect of delayed approvals translates into financing defaults, increased Non-Performing Assets (NPAs), and broader macroeconomic stress.

Dispute Resolution and the 3C Committee: Promise and Pitfalls

Arbitration, celebrated as the primary dispute resolution mechanism under infrastructure contracts, often fails to deliver timely outcomes. Average arbitration timelines in India exceed project lifespans, nullifying their efficacy. Pre-arbitral mechanisms such as Dispute Review Boards (DRBs) or Dispute Avoidance Boards (DABs), modelled on FIDIC standards, remain underutilized. Their failure contravenes the doctrine of *effet utile*, that contractual provisions must be interpreted to have a practical effect.[3]

The NHAI's Conciliation and Settlement Committees (3C) were designed to correct this inefficiency by providing faster, negotiated settlements. While they have resolved long-pending claims, the absence of standardization and digitization hampers their effectiveness. Inconsistent documentation formats and unenforced timelines dilute their credibility. Here, the principle of *justice delayed is justice denied* becomes apt, not only for contractors awaiting dues but also for the state, which incurs opportunity costs in stalled projects. Strengthening the 3C framework with digital submissions, transparent progress dashboards, and time-bound decision-making could transform it into a robust institutional innovation.

The essence of the 3C framework lies in its alignment with the principles of Capacity, Consent, and Consideration. Capacity reflects the committee's ability to address complex disputes with institutional competence; Consent emphasizes the voluntary and cooperative nature of negotiated settlements, ensuring that outcomes are mutually accepted; and Consideration underscores the fairness of the process by balancing the interests of contractors and the state. Together, these three pillars encapsulate the objective of the 3C Committees - to deliver efficient, equitable, and credible resolutions that restore confidence in the infrastructure contracting ecosystem.

Contractual and Policy Strategies for Managing Uncertainties

To address these challenges, a proactive contractual philosophy is required.

a. Risk Allocation Must be Clear and Equitable

Following the maxim *qui sentit commodum, sentire debet et onus*, he who derives a benefit ought also to bear the burden, the employer must assume responsibility for land acquisition delays, while contractors should bear risks within their operational control.

b. Predefined EOT and Cost Compensation Mechanisms

These can provide predictability. Formula-based compensation models, linked to inflation indices or benchmarked costs, can reduce the need for adversarial claim negotiations. This aligns with international best practices, where contracts under New Engineering Contracts (NEC) frameworks emphasize collaboration over confrontation.

c. Early Dispute Avoidance Must be Institutionalized

Mandatory quarterly DAB reviews can surface

issues before they harden into disputes. Requiring parties to engage with the 3C Committee before initiating arbitration would preserve resources and maintain project momentum.

d. Digital Monitoring and Contract Management

Digital Monitoring tools can embed transparency. Thus, GIS-based land acquisition trackers, integrated with public dashboards, could reduce bureaucratic opacity. Cloud-based site diaries and blockchain-based contract management platforms could ensure contemporaneous, tamper-proof records, aligning with the principle of *audi alteram partem*, hear the other side, in claims adjudication.

Industry-Level Recommendations

Reforms must transcend individual contracts and address systemic inefficiencies. Land acquisition policies require uniform valuation guidelines, enforceable timelines, and structured community engagement to prevent resistance. Pre-bid processes should mandate joint surveys to minimize data asymmetry, aligning with the principle of *caveat emptor*, let the buyer beware, tempered by fair disclosure duties on the employer.

Capacity building is equally critical. Regular training on the Ministry of Road Transport and Highways (MoRTH) and FIDIC clauses can professionalize contract management. Standardization of force majeure clauses to cover pandemics, climate-induced events, and disruptions caused by regulatory changes is an urgent requirement. The adoption of collaborative contracting models, such as FIDIC alliances or NEC3 frameworks, can foster a spirit of partnership rather than adversarial posturing.[4]

Analysis from an Indian Perspective

Upon a careful review of the uncertainties affecting the infrastructure projects, it becomes clear that the issues are not limited to one specific defective drafting of the contract or delayed execution. Instead, the issue is a structural one that lies at the intersection of law, economics, and governance. In this manner, Contracts can be understood as attempts to 'price in' uncertainty, to allocate foreseeable risks, and to provide remedies when foreseeable shocks occur. As Oliver Williamson's theory of transaction cost economics dictates, contracts are inherently incomplete because no drafter can anticipate and document every possible contingency. In the infrastructure field, this incompleteness gets magnified by the scale of stakeholders, the rigidity of the statutory regimes, and the unpredictability of externalities such as pandemics, climate-induced events, regulatory changes, and other such *force majeure* events.[5]

Legal doctrines attempt to bridge the aforesaid incompleteness, whilst simultaneously dealing with their own *lacunae*. The well-known doctrine of *pacta sunt servanda*, which means that agreements that are consented to must be upheld, often collides with the maxim *rebus sic stantibus*, which in essence provides for the termination of an agreement in the case where fundamental circumstances surrounding the contract are changed. Indian courts, after the case of *Satyabrata Ghose*, have shown a general inclination towards the preservation of contracts, to the point that upholding the obligations therein is impossible. Yet, infrastructure projects operate in a sort of grey area where, while performance may be technically possible, but may lead to commercial backlashes. This jurisprudential paradox

Table 1 – Example of Risk Allocation Matrix (Industry-Level Recommendations)

Risk Type	Responsible Party	Contractual Remedy	Monitoring Tool
Land Acquisition Delay	Employer	EOT + Cost Compensation	GIS Tracking
Utility Shifting Delay	Employer/Contractor	EOT Proportionate	Monthly Progress Reports
Force Majeure Event	Both Parties	EOT + Shared Costs	Government Notifications

is recognised by the Judicial system as 'commercial impracticability', wherein contractors are left exposed to massive financial risks, whereas employers insist solely on performance.[6]

From a purely economic perspective, it created institutional inefficiency, where the rules of the game are misaligned with economic reality. Land acquisition delays or compensation disputes are not just operational hiccups; rather, in their rudimentary sense, they are market distortions that increase transaction costs, deter investments, and reduce the credibility of the PPP framework. The World Bank's PPP guidance repeatedly emphasizes that investor confidence is built on predictable dispute resolution and fair risk allocation, rather than absolute guarantees.[7]

To remedy these issues, international practice offers an instructive contrast. Under FIDIC's Gold Book (for long-term contracts), emphasis is placed on shared risks and mechanisms that evolve and adapt with circumstances.[8] The NEC Suite of contracts in the UK goes a step further by embedding collaboration and early warning systems as enforceable obligations. These approaches embody the principle of *effet utile*, ensuring that contractual provisions must have real, practical effects, rather than becoming dead letters once disputes arise.[9]

In contrast, the Indian experience reveals an adversarial scenario. Herein, contractors approach claims as battles where the employers resist until compelled, and dispute resolution mechanisms are invoked too late into the process as a last attempt to save the project. This can conceivably be remedied by a shift from adversarial contracting to collaborative contracting, from 'claim management' to 'risk partnership'. While *prima facie* this may sound aspirations, it does, however, resonate with the legal maxim of *qui sentit commodum*, *sentire debet et onus,* which means those who enjoy the benefits must also bear the burdens.

Technological tools could bolster the aforementioned shift. Blockchain-based smart contracts, for instance, can auto-trigger EOTs or partial compensations when pre-defined events like *force majeure* notifications are recorded. AI can analyse satellite data to track land acquisition/work progress, providing transparent, tamper-proof evidence in claims. Such innovations, though experimental, represent the frontier of contract management, moving from static documents to dynamic, living instruments of governance.

It is pertinent to realise that infrastructure projects are not merely commercial undertakings. Rather, they are vessels of constitutional promise, delivering mobility, connectivity, and economic opportunity, while simultaneously being a conduit of national development. Thus, the maxim *salus populi suprema lex*, the welfare of the people is the supreme law, should permeate contractual design. Risk allocation cannot be solely about financial calculus; it must balance fairness, efficiency, and equity. If contractors are bankrupted by delays not of their making, or if landowners are under-compensated, the legitimacy of the entire infrastructure ecosystem suffers. Conversely, if contracts become too investor-friendly, the public exchequer bears unsustainable burdens. The genius lies in finding equilibrium, contracts that are robust yet flexible, fair yet commercially viable, enforceable yet adaptive.

Conclusion

The management of uncertainties in infrastructure projects hinges on foresight, clarity, and resilience. The COVID-19 pandemic was not merely an external shock but a systemic stress test, exposing the fragility of existing contractual regimes. To move forward, Indian infrastructure contracting must embrace clarity in risk allocation, robustness in EOT provisions, efficiency in dispute resolution, and transparency through digital integration. Land acquisition and compensation, the Achilles' heel of project delivery, demand urgent policy streamlining.

Ultimately, infrastructure contracts must internalize the maxim *salus populi suprema lex*, the welfare of the people is the supreme law. By embedding resilience into contracts and institutions, India can ensure that

projects deliver not only physical assets but also economic certainty and public trust. In doing so, the sector will advance towards the ideal of predictable, fair, and sustainable project delivery, where law and practice align to serve both commerce and community.

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Excerpts from "Milord, AI is courting the legal system now"

From transcribing witness statements to streamlining petitions, next-gen AI firms are helping tackle India's case backlog by Himanshi Dhawan

Anyone who enjoys a courtroom drama on TV will acknowledge that the resolution to a real-life case can be a longer affair. To say nothing of jargon-spewing lawyers, confounding paperwork and the many adjournments. Though technology has leapfrogged in sectors like finance and banking, for many citizens-turned-litigants, the justice system appears to be stuck in time.

But change may be in the offing with many courts experimenting with using AI for case filing, research and to reduce administrative tasks. Companies like Nyaay AI, Jhana AI and Adalat AI have customised their products for Indian courts, training them on local languages, jargon, and workflows. AI is also being used for multilingual translation, document defect detection, case summarization, etc. to bring speed and efficiency that the hallowed court halls have not seen of late.

So let's wait and watch!

Source: https://timesofindia.indiatimes.com/toi-plus/law/milord-ai-is-courting-the-legal-system - now/articleshow/123735998.cms

11

Contractually Addressing the Conundrum of Uncertainties in Projects

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Abstract

Uncertainties are inherent in every contract, and even the best-drafted documents cannot eliminate the risk of claims, disputes, and overruns that arise during project delivery. Complex engineering and infrastructure projects - especially in India's fast-evolving environment - are increasingly exposed to challenges ranging from scope creep and resource constraints to stakeholder conflicts, technological disruptions, external market shocks, and legal or regulatory ambiguities. To ensure project success, contracts must evolve from mere risk allocation tools to comprehensive governance instruments: anticipating, monitoring, mitigating, and resolving uncertainty on every front. An uncertainty problem is one of the key factors that influences the project implementation parameters. Issues must be foreseen to the maximum extent to minimise the uncertainties, or if inevitable, have a mechanism to address.

This article examines the key uncertainties encountered in projects, drawing on real-life situations. It offers suggestions for contract-based remedies and frameworks, founded on lessons learnt and international standards such as FIDIC, thereby synthesising insights into an actionable reference for consulting engineers and project leaders.

Sources and Manifestations of Project Uncertainty

Scope Creep and Contractual Definition

Scope Creep is the unauthorised or uncontrolled evolution and expansion of a project's objectives and deliverables. This arises from:

- Gaps between preliminary engineering and tender documentation.
- Technological advancements emerging post-contract finalisation.
- Loosely articulated employer expectations, which increase and shift during implementation.
- Change in client requirements

Contractual Situation:

Contracts must address scope definition, the correlation between specifications and Bill of Quantities (BOQ), change order mechanisms, and provision for minor variation due to unforeseen site conditions. When deliverables or specifications are ambiguous, parties tend to interpret terms in their favour, leading to arbitration and delays.

Remedies & Provisions: Exhaustive & Unambiguous Scope and Robust Change Control

- Contract schedules and annexures must provide granular detailing, with clear procedures for authorised changes.

- Change Order clauses (e.g., FIDIC Clause for Variations and Adjustments) must require written notice, independent cost assessment, and dispute resolution for disagreement.
- Making provisions in contracts for future likely changes which cannot be finalised during the tender stage, to be included as provisional sums.
- Each document of a contract should have a reconciled BOQ and specification matrix.
- Change order log and dedicated communication path established in contract, with price/ time adjustment formulae.
- Regular scope review by a Project Review/ Steering Committee to be mandatory.

Resource Constraints and Mobilisation

Resource constraints - skilled labour, equipment, and materials - cause chronic delays and cost escalation.

Situations Observed:

- Scarcity of specialised workforce, particularly in remote locations.
- Supplier or vendor may not be reliable.
- Mechanisation and skill enhancement requirements are inadequately specified or implemented.

Contractual Remedies:

- Resources to be scheduled in the contract as per milestones, with required skill sets, experience, and machinery benchmarks.
- Clauses for dynamic review and adjustment of resource deployment at periodic intervals, which are linked to Extension of Time (EOT), critical delays, or milestone achievement.
- Provide for mandatory training, mechanisation targets, and digital workflows (BIM, robotics, remote monitoring, etc.).
- Exploring pre-casting and factory fabrication to minimise labour-intensive in situ work.

Resource Planning and Dynamic Adjustment

- Contractor to submit periodic resource plan and output benchmarks; contract must allow for up and down-scaling at the Engineer's reasonable direction.
- Specify welfare, training, digitalisation, and remote guidance (TV screens, online platforms) to ensure productivity and skill enhancement.
- Technical Challenges and Engineering Uncertainties
- Technical challenges include unforeseen ground conditions, design mismatches, document control lapses, non-standard templates, and incompatibility between systems.

Situations Observed:

- In a Metro project, soil investigation intervals were changed from 500m to 25m/ 100m based on the first phase surprises, in which each pier required individual foundation designs due to different strata as per the soil investigation report.
- Poor integration between architectural, MEP, and civil teams leads to clashes and redesign.

Contractual Remedies:

- Site investigation clauses with mandatory borehole intervals, geological and geophysical survey requirements, and contractual allocation of investigation obligations, responsibility, and accountability.
- Schedule for coordinated system integration by using a digital platform so that the interfaces between civil, architectural, equipment, and Mechanical, Electrical & Plumbing (MEP) are correctly shown.
- Quality control and audit clauses for documentation, drawings, revisions, and interoperability of digital platforms. All concerned, to work on a single platform for proper and error-free depiction of the interaction and interrelation between all items, areas and systems.

Progressive Technical Data and Cross-disciplinary Integration

- All critical interfaces (civil, MEP, architectural, equipment) must have integrated schedules, so that no mismatch occurs.
- Central coordination cell with authority and protocol in contract for rapid issue escalation.
- Quality audit by independent third parties, contractually required at defined project stages

Stakeholder Conflicts and Role Management

Stakeholder conflicts stem from divergent priorities, unclear roles, non-standard documentation and terms, communication lapses, and resource limitations.

Situations Observed:

- Disorganised document control leads to duplicate management, unclassified responsibilities, and confusion on design revisions.
- Government, funding agencies, contractors, and PMC fail to take and coordinate critical decisions, resulting in delays and claims.

Contractual Remedies: Stakeholder Mapping and Communication Protocols

- Stakeholder mapping in contract: define roles, responsibilities, priorities, and escalation paths.
- Establishment of regular coordination meetings (Reviewing/ Steering Committees), joint sign-off protocols for major decisions, and dispute escalation ladders.
- Contract to annex stakeholder matrix, define coordination and communication format, response timelines, and hierarchy of authority.
- Document repository protocol mandatory for revision, clarity, and traceability. Mandate standardization for all documentation and workflows.

External Market Changes and Legal/Economic Shocks

External uncertainty includes inflation, law and regulation changes, volatile prices, payment delays, and unanticipated government actions.

Situations Observed:

- Geopolitical decisions resulting in complex analysis of the impacts and their uncertainties over the duration of the situations created by the decisions.
- Payment delays resulting in compounded interest claims.
- Lack of clarity in price escalation clauses leads to disputes over cost increases and consequent methodology for price adjustments arising due to inflation or regulatory changes.
- Disagreements about Goods and Services Tax (GST) clauses and inclusions/ exclusions in General Contracting tenders.

Contractual Remedies:

- Price adjustment and or indexation clauses to be with reference to benchmarks for inflation and material cost changes.
- Force Majeure and change in law provisions, covering economic shocks and establishing protocols for notification, cost and time adjustment, and dispute handling.
- Cost estimate as in the Detailed Project Report (DPR) to be continuously updated with escalation and cost adjustment mechanism.
- Conflict resolution mechanisms like Dispute Resolution Board, negotiations, and mediation to help in resolving stakeholder disputes.
- All disputes to be resolved in a time-bound manner.

Delay Events, EOT, and Condition Precedents

Delays in projects occur due to employer, contractor, or third-party actions and require clear attribution, notice, and response mechanisms.

Contractual Framework:

- EOT clauses must detail notice periods, required

particulars for sustainment of the claim, and condition precedent clauses, such as the claim to be valid only if the process is adhered to.

- Concurrent Delay Assessment and Periodic Delay Analysis must be contractually specified.
- The Engineer's Determination period must be "reasonable and practicable," accommodating the scale and complexity of the project.

Remedies & Provisions:

- Condition precedent clauses, especially in respect of staking a claim, submission of detailed particulars (e.g. FIDIC contract) in the contract must be strictly honoured. The contractor cannot rely on Section 28 of the Indian Contract Act to override these clauses to ensure timely determinations.
- Each distinct delay event needs a separate document to be submitted, an interim notice, and supporting particulars contemporaneously to ensure that time is not set at large at any point in time.
- Delay Analysis Method (whether prospective or retrospective, but preferably using prospective methods) must be agreed at the bidding stage and documented in the contract.
- Base Schedule resetting to be tied contractually to crucial delay events, not just EOT or completion date changes.

Baseline Management and Contract Programme Logic

Baseline schedules and logical sequencing are essential for monitoring progress and underpinning all claims/ damages/ insurance/ completion analyses

Situations Observed:

- Baseline Schedule to be finalised within 21days by the Contractors and reviewed in the next 21 days (as per FIDIC) after contract commencement, often fails to fully incorporate method statements or phases, especially in the case of large projects having complexities due to their involvement with multiple stakeholders.
- The above leads to situations where Contractors submit Activity Lists which may not be prepared with proper network logic and may be based on many empirical assumptions, which make delay attribution and EOT analysis unreliable in the later stages.

Remedies & Provisions:

- Level of detailing of the Baseline Schedule programme should be agreed at initial phases with provisions to elaborate further, keeping the original intent unchanged at the macro level. However, critical interfacing relations and all critical method statements should be elaborated threadbare before finalising the full contract program to avoid conflicting interpretations later while claiming EOT and consequential costs.
- Appropriate and reasonably foreseeable floats or those that can be accommodated based on the Employer's inputs and risks should be suitably pre-agreed with sufficient clarity.
- Contract must mandate progressive upgrades to schedule and realign contract program upon **each** EOT event and not just based merely on what was done initially.

Risk Registers - Creation, Review, and Integration

- Most projects are based on assumptions that involve the elements of time, cost, technology, engineering, various deliverables, sourcing strategies, administrative/governmental regulations, statutory clearances, court judgements, financing, political situations, extreme weather uncertainties, and stakeholder interfacing challenges etc. Hence, contractual programmes must pre-identify and make suitable provisions to accommodate consequences arising out of such situations.
- A Risk Register is invaluable for systematic documentation, review, and integration of risks into contract management to facilitate smooth project implementation. This should be maintained online so that all entries, responses, decisions, acceptance, and implementation can be monitored.

Contractual Requirements:

- Add clauses mandating "Risk Review Workshops" with all key stakeholders at scheduled intervals for reviewing the Risk Register entries since the last meeting itemised.
- Link Risk Register review and update to payment milestones, critical path changes, and periodic schedules.
- Specify intervals (preferably every month for major/ critical projects and 3 months for other projects) for review with all stakeholders, mitigation action tracking, cost and/or time allocation (from time to time, but not prolong any decision beyond 3 months), and necessary documentation of incidents and resolutions.
- Incorporate an Audit Protocol to ensure accountability of the respective stakeholder actions.
- Risk Resolution to be linked to the project schedule and payment triggers.

PMC and Engineers to be Independent of Each Other

The Project Management Consultants (PMCs) and Engineers must play independent, quasi-judicial roles in the interpretation and determination of claims, variations, and completion certifications.

Contractual Issues:

- Engineers, when forced to act as agents of the employer, risk diluting objectivity and timely determinations.
- Absence of time limits for determination or approval delays scheduling and planning for contractors.

Remedies & Provisions:

- Delimit the Engineer and PMC intervention scope to contractual matters, interpretation, variation approval, claim evaluation, and certificates - restricting cross-supervision or employer interference.
- Time-bound approval and/or determination for each submission to be mandated in the contract.

Transparency in Sourcing, Critical Equipment, and Force Majeure

Transparency and contingency in sourcing are critical to avoid unforeseen project halts.

Situations Observed:

- Equipment procurement is impacted by unanticipated use of components from countries that are not reliable, and could cause supply chain disruptions, which could lead to stalling of the project. Force Majeure may not adequately cover the actual risks.

Contractual Remedies: Sourcing and Supply Chain Resilience

- Sourcing clauses to inter alia require declaration of the country of origin, providing periodic updates, and backup alternatives, including declaration and vetting of status on the necessity of triggering exploring alternatives to offset the possible impacts, should the geopolitical situation so demand.
- Contract provision for collective wisdom and contingency planning; force majeure to be expanded to include supply chain and regulatory disruptions; commercial disruption or impediments, or hostilities, be they declared or undeclared
- Alternative Sourcing Provisions: In the event of geopolitical or market disruption, the contract should allow for alternatives, either pre-agreed or modified with predefined adjustment mechanisms.
- Force Majeure clause provisions: Contracts must recognise the limitations of conventional force majeure and provide process-oriented responses to chain disruptions.

Dispute Resolution and Claims Management

The growing complexity and spread of projects through different geographies and administrative jurisdictions

are resulting in increased claims. The legal consultancy engagement and Dispute Resolution Boards (DRB) are frequent, but they must be contractually limited in their remit.

Contractual Provisions:

- Dispute Adjudication Boards (DAB) or DRB must act within the "four walls of the contract," refrain from overriding condition precedents (notice, time limits), and time and cost determinations must be explicit in their process.
- Arbitration or mediation clauses must provide escalation hierarchy, defined triggers, and binding timeframes for determinations and implementations.

Case Study - Risk Lessons

- **Soil Investigation:** Initial investigations, which were done at intervals of long distances, led to redesigns; revised contract mandated closer borehole intervals and combined geophysical surveys, reducing risk.
- **Stakeholder Forums:** Steering committees and system integration sessions minimised cross-disciplinary confusion.
- **Payment Structures:** Regular updates and clear payment schedules avoided compounded interest and major payment disputes.
- **Legal Framework:** GST and price escalation clauses handled cost overruns and regulatory instability.

Risk Categorisation—Template for Contract Interpretation

Category	Description & Contractual Provisions
Clarity of Scope	BOQ-Specifications reconciliation, progressive scoping, authorised change mechanisms
Stakeholders	Stakeholder mapping, regular forums, escalation paths, joint sign-off
Technology	Mandatory updating, cross-disciplinary audits, interoperability standards
Dependencies	Linked schedules, critical path documentation, third-party integration audit
Resource Requirements	Output benchmarks, periodic review matrix, and flexibility protocols
Supplier Maturity	Performance bonds, vetting protocols, predefined alternate suppliers
Commercial	Price escalation, regulatory change, court judgements, penalty-interest mechanisms
Duration	Milestone management, baseline updating, time impact analysis, EOT governance
Service Integration	O&M handover schedules, training and documentation annexures

Conclusions: From Static Rulebooks to Living Contractual Frameworks

To truly address project uncertainties contractually is to embrace complexity - anticipating, documenting, governing, and resolving risks at every project stage. The contemporary contract goes beyond mere risk allocation; it must be a "living document" responsive to ground realities, technological shifts, market changes, and stakeholder ambitions.

The Key takeaways are:

- **Precision plus Flexibility:** Contracts must combine exact scope of works and definitions with adaptable procedural mechanisms for change.
- **Continuous Risk Management:** Risk Registers and reviews should be mandated, tracked, and tied to work schedules as well as payment schedules.
- **Stakeholder Engagement:** Proactive communication, standardised documentation, and joint decision forums to minimise misunderstanding and delays.
- **Legal and Financial Resilience:** Price variation, Force Majeure, and dispute settlement layers safeguard every party's position.

- **Technology and Integration:** Requirements for BIM, digital monitoring, mechanisation, and training for continuous professional development to ensure projects remain future-ready.
- **Dispute Control:** Escalation hierarchies, condition precedents, professional liability, and insurance must be contractually mandated.

In summary, contractually addressing uncertainties is not about avoiding disputes or claims entirely, but about robustly managing them - ensuring projects proceed from planning through commissioning with minimal surprises, transparent governance, and fair outcomes for all stakeholders. The evolution of contractual language, frameworks, and practical experience must continue, as each project provides new lessons - and improved templates for the future.

Consulting engineers, project managers, and contracting agencies alike must treat the contract not just as a risk containment tool but as the central instrument for collaborative, claims-resilient project delivery. Only in this way will the elusive dream of "uncontested" contracts come closer to reality, even as uncertainties persist.

In a policy shift, the World Bank has re-embraced **large-scale hydropower, approving financing for several mega dam projects** after a decade-long retreat. This move signals a renewed focus on engineering-driven infrastructure to meet global energy demands, despite persistent environmental and social concerns.

Leading the charge is the **Rogun Dam in Tajikistan**—a $6.3 billion project poised to become the world's tallest dam at 1,100 feet. Originally launched in 1976 and only 30% complete, Rogun exemplifies the engineering complexity of high-head dams in seismic zones. Its completion promises to eliminate winter blackouts in Tajikistan, but will also alter downstream hydrology, impacting water availability in Afghanistan, Turkmenistan, and Uzbekistan.

Equally ambitious is the Grand Inga project in the Democratic Republic of Congo. With a projected cost of $100 billion, this eight-dam cascade on the Congo River could double the output of China's Three Gorges Dam. The engineering challenge lies in managing the river's immense flow while minimizing ecological disruption—a task complicated by the scale and geopolitical sensitivities.

In Nepal, the Upper Arun Dam, backed by Indian firms, is another example of engineering ambition meeting environmental risk. Located in a seismically active region prone to glacial lake outburst floods, the $1.1 billion project highlights the need for robust geotechnical and hydrological assessments.

Despite the technical prowess required, critics argue these projects overlook modern energy trends, favouring decentralized, low-impact renewables. Yet, the World Bank sees hydropower as a strategic complement to solar and wind, especially in regions with limited grid stability.

As these mega dams move forward, the **engineering community faces a dual challenge: delivering resilient infrastructure while navigating complex socio-environmental trade-offs**.

'Excerpts from various sources'

12 Contractual Legal Responsibility and Dispute Resolution in Construction Suspensions Triggered by Religious and Ecological Uncertainties in India

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Abstract

The legal and contractual consequences of religious and cultural concerns that sometimes slow down or impede construction projects in India are discussed in this article. It first situates the problem within the framework of current legislation, stressing how heritage, environment, and religious character laws/ rules set non-negotiable restrictions that trump contracts. It then looks at how courts have enforced laws, which has strengthened the power of laws and made things very confusing for Corporations. Pursuant to that, the article turns to look at how standard Indian EPC and concession contracts fall short of properly mitigating hazards linked with religious or cultural sensitivities. It advocates for an impartial risk allocation framework that classifies religious and cultural difficulties as employer hazards, includes legislative safeguards as criteria, and matches dispute resolution mechanisms with internationally recognised practices by drawing on inspired viewpoints from FIDIC, the World Bank, and legal systems in Australia and the United Kingdom.

Problematic Areas of a Contract

"In India, the climate, the soil, the face, the dress, the language, the gods, the customs change every few miles."

India just marked its 79th Independence Day and is widely seen as a rapidly rising nation, whether in terms of economy or international impact. Similarly, infrastructure development in India has seen exponential expansion in recent decades, with an increase in the number of public-private partnerships. Infrastructure development has evolved as a key component of a nation's economic policy. Swift urbanisation, striving public projects, and the enlargement of roads, metro, electricity, and modern large-scale projects demonstrate a national obligation to growth. However, in a country as customarily varied and naturally conscious as India, carrying out such projects is rarely a simple technological task. Aside from fiscal, technical, and monitoring concerns, project timetables are increasingly being distressed by religious, cultural, and environmental factors that were not anticipated during contract negotiations.

It is not uncommon to unearth an ancient temple during excavation, a mosque or dargah along the route of a highway, or swamplands and revered groves in the project zone. Each of these scenarios has serious legal ramifications, frequently resulting in project delays, redesign, or even abandonment. What is more pertinent is that they cause disagreements between the employer and the contractor about which party should shoulder the financial expense of such disruptions.

However, it would be wrong to say that Indian laws do not deal with these situations as the domestic laws in this

regard, like the Ancient Monuments and Archaeological Sites and Remains Act, 1958, the Places of Worship (Special Provisions) Act, 1991, and the Environment (Protection) Act, 1986 create mandatory restrictions on the alteration or destruction of religious and ecological sites. While the Forest (Conservation) Act, 1980, and the Wetlands (Conservation and Management) Rules put limitations on development/ construction activities in culturally and ecologically sensitive areas.

It would not be wrong to mention herein that in the Indian scenario, the Courts of Law have consistently stepped in to uphold these laws, often issuing injunctions or stay orders to pause construction until compliance is confirmed. Despite the comprehensive nature of the public law framework, the private law aspect, predominantly the construction contracts, specifically the distribution of risk and liability in contracts, is not sufficiently developed. Standard form of contracts used by public entities, such as the General Conditions of Contract from the Central Public Works Department, concession agreements from the National Highways Authority of India, and FIDIC-based contracts for major infrastructure projects, typically handle uncertainty with broad clauses on force majeure, unforeseen site conditions, or changes in law. They seldom address the risk of disruptions due to religious structures or culturally protected landscapes.

The above contractual ambiguity creates a breeding ground for conflicts. Contractors frequently contend that these situations fall under force majeure or the employer's risk, justifying their claims for time extensions and cost reimbursement. Contrariwise, employers argue that contractors should familiarise themselves with site conditions and accept the risk of delays unless explicitly exempted. This lack of clarity results in lengthy arbitration and litigation, driving up transaction costs for both parties and postponing public projects of national importance. A dilemma that often arises surrounds the question of whether familiarising oneself with the project site is deemed to be equivalent to conducting detailed investigations and studies of the site.

The current article aims to explore the often-overlooked intersection of contract law, cultural diversity, and environmental regulations in India. It focuses on the current allocation of liability in construction contracts when faced with religious and ecological uncertainties, as well as how courts and arbitral tribunals have resolved such disputes. The article seeks to identify doctrinal gaps and practical challenges, suggesting that specific contractual mechanisms such as customised risk allocation clauses and mandatory cultural and ecological impact assessments are essential to harmonise developmental goals with constitutional commitments to religious freedom and environmental protection.

Pursuant to the above, it is submitted that although financial and technical uncertainties have been widely studied, the religious and ecological aspects remain largely unexplored, despite their frequent and significant impact.

Religious and ecological sensitivities have consistently shown their ability to influence the trajectory of construction projects in India, leading to contractual uncertainty and legal disputes. A notable instance is the Hyderabad Metro Rail project, where construction timelines were affected by the presence of temples and mosques along the planned route. In a city characterised by religious diversity, relocating these structures became a contentious issue, necessitating careful negotiation with communities and adherence to legal protections like the Places of Worship (Special Provisions) Act, 1991, and municipal regulations. What initially seemed like an engineering alignment issue, during planning, quickly evolved into a legal and contractual risk. The failure to secure clear sites within the agreed-upon timelines led to disputes between the employer and the contractor over whether the delays were unforeseeable obstacles or fell within the contractor's contractual obligations. This situation highlights how religious challenges, though rooted in local sensitivities, ultimately become matters of liability, time extensions, and cost recovery.

Projects intersecting ecologically sensitive areas routinely face a familiar array of challenges. The Hasdeo Arand forest in Chhattisgarh is emblematic of such conflicts: mining and infrastructure proposals there have provoked sustained resistance, rooted both in the ecological value of the landscape and the rights

of local communities as recognised by the Forest Rights Act, 2006, and the Panchayat (Extension to Scheduled Areas) Act, 1996. Comparable scenarios have played out in Tamil Nadu and Maharashtra, where infrastructure projects crossing wetlands or sacred groves have been stalled or rerouted following judicial intervention under statutes like the Environment (Protection) Act, 1986.

In these contexts, geography emerges not merely as a physical backdrop but as a legally operative category, imposing enforceable obligations on project proponents. Sacred trees, forest corridors, and traditional community sites are invested with cultural and spiritual meaning and significance, thus attracting statutory safeguards and judicial scrutiny. For contractors and employers, this creates significant uncertainty regarding compensation and time extensions. The risks involved transcend purely environmental or contractual factors, instead reflecting a complex mixture of cultural, statutory, and social claims.

Taken together, these instances reveal a broader pattern: religious and ecological features embedded in the landscape constitute recurrent, sometimes unpredictable, barriers to project implementation. They generate public law obligations and, at the same time, initiate disputes in private law about how risk is allocated under the contract. Existing contractual frameworks, however, tend to address such uncertainties only in broad terms, typically under "force majeure" or "change in law" provisions, without recognising their distinctive and persistent character in the Indian context. This disconnect underpins recurring disputes and prolonged arbitrations, as neither party can clearly show that the contract anticipated or explicitly excluded liability for these culturally and ecologically rooted uncertainties.

Statutory and Regulatory Landscape (Domestic Law)

A distinctive aspect of construction in India is not merely technical; legal uncertainty often takes centre stage, shaping risk in ways that contracts alone cannot control. Statutory regimes relating to religious sensitivities and environmental protections override private agreements, rendering many contractual promises unenforceable when public law intervenes.

Consider the Ancient Monuments and Archaeological Sites and Remains Act, 1958 (AMASR). Since its 2010 amendment, construction is categorically prohibited within 100 meters of a protected monument, with another 200 meters falling under strict regulations laid down by the National Monuments Authority. This statutory ban applies automatically; contractual assurances of an "encumbrance-free" site are irrelevant if the law forbids activity. For contractors, discovering that a "prohibited zone" intersects their project alignment is not a mere physical inconvenience; it is a legal impossibility. If the contract does not explicitly address such risks, disputes inevitably arise as to whether these delays constitute force majeure, unforeseeable site conditions, or simply fall to the contractor's account.

A parallel legal constraint emerges under the Places of Worship (Special Provisions) Act, 1991. By freezing the "religious character" of all places of worship as of 15 August 1947, it blocks any change or litigation (except in rare instances). Practically, if a place of worship stands on a project's path, private agreements cannot override the statutory restriction. The Supreme Court has reinforced this by restraining lower courts from entertaining related disputes, so removal or relocation is effectively barred. There are no specific judicial directions with regards to such cases. Contracts seldom address such contingencies, often leaving parties to litigate liability when construction is stalled.

Environmental statutes present another layer of non-negotiable obligations. The Environment (Protection) Act, 1986, and the accompanying EIA Notification require prior environmental clearance for many projects; retroactive approval is not an option, as the Supreme Court has repeatedly affirmed. Similarly, the Forest (Conservation) Act, 1980 (as interpreted in the T.N. Godavarman line of cases) demands central approval for the diversion of any land deemed as a "forest," regardless of its formal record. Noncompliance leads to project stoppage or even contempt proceedings. Contracts that are silent or misguided in their allocation of such risks cannot cure the resulting legal defect; performance itself becomes unlawful.

Judicially developed regimes add to this landscape. The doctrine of Eco-Sensitive Zones, developed through Supreme Court decisions, imposes buffer areas around wildlife sanctuaries and national parks where construction is restricted. Wetlands Rules, 2017, together with Supreme Court and National Green Tribunal oversight, create additional zones that are off-limits for development. The Delhi Ridge jurisprudence operates similarly, with the apex court's injunctions functioning as near-permanent bans. These are not hypothetical constraints; they are tangible, enforceable, and often overlooked at the bid stage.

The legal implication is clear: contracts in India cannot authorize what public law prohibits. Yet, standard forms often allocate site risk broadly to contractors, offering limited relief through force majeure or change-in-law clauses. International forms like FIDIC provide for time and cost relief under "unforeseeable physical conditions," but Indian EPC and PPP contracts frequently dilute such protections or neglect latent legal risks altogether. Courts, applying Section 56 of the Contract Act, are reluctant to excuse performance for commercial inconvenience, requiring genuine impossibility to be proven. Unless a contract expressly assigns these legal risks to the employer, contractors may find themselves denied compensation when projects are halted by statutory or judicial prohibitions.

From a doctrinal perspective, these statutes and rulings illustrate that religious and environmental uncertainties are a class of non-allocable risks governed by overriding law and not amenable to private reallocation. The challenge is not whether risks may be contractually shifted, but whether contracts should incorporate mechanisms such as conditions precedent, authority risk allocation, or clear entitlements to extension and compensation to address these realities. In their absence, disputes are inevitable.

Religious and Cultural Uncertainties within India's Contractual and Legal Framework

Across India, major infrastructure initiatives frequently encounter significant resistance rooted in religious and cultural sensitivities. Projects such as the Enayam Port in Tamil Nadu and the Vizhinjam International Seaport in Kerala have faced substantial delays due to community opposition. Similarly, the Silver Line rail project, disputes over church lands in Bengaluru, objections to mining and nuclear facilities in Odisha, Jharkhand, and Kudankulam, and even controversies concerning cemeteries and religious symbols in Mumbai, collectively demonstrate the profound influence of sacred sites and cultural landscapes on the progress of contractual obligations. These instances illustrate that, while economically essential, development projects are particularly susceptible to collective mobilisation to oppose them when faith or communal identity is perceived to be at risk.

From a legal standpoint, such interruptions occupy a complex intersection between private contractual obligations and broader public law restrictions. The Indian Contract Act, 1872, provides the foundational framework: Section 32 pertains to contingent contracts dependent on uncertain future events, while Section 56 addresses the doctrine of frustration where performance becomes impossible or unlawful. Nevertheless, Indian courts have generally adopted a narrow interpretation of "impossibility," often declining to excuse delays if alternative means of performance exist. Furthermore, the Places of Worship (Special Provisions) Act, 1991, and various heritage preservation laws restrict any alteration to religious structures, while constitutional protections under Articles 25 and 26 reinforce community claims.

The result is a zone of considerable contractual indeterminacy. Employers may seek to characterise such disputes as force majeure events, contractors might invoke frustration, and local communities rely on statutory and constitutional safeguards. Judicial responses have typically favoured negotiated relocation and compensation rather than outright demolition, but this compromise often leaves the allocation of liability unresolved. Ultimately, recurring uncertainty pervades infrastructure contracts in India, highlighting the necessity for more precise drafting that explicitly accounts for religious and cultural considerations within the country's pluralistic legal framework.

Contractual Solutions in Light of Religious and Cultural Uncertainties

Religious and cultural objections introduce a significant layer of unpredictability into infrastructure law, particularly when compared to environmental clearance frameworks, which tend to be more regulated and systematic. Unlike environmental risks, religious and cultural objections often arise without warning, prompting judicial intervention and creating substantial uncertainty for contractors, financiers, and project sponsors. Addressing these risks through clear and equitable contractual provisions is therefore essential for project success and investor confidence.

Risk Allocation for Religious Impediments

Internationally recognised standard contracts, such as the FIDIC Red and Silver Books, classify unforeseeable disruptions, particularly those instigated by public authorities or community groups as the employer's risk. Contractors are thus entitled to both extensions of time and compensation for additional costs when such events occur. In contrast, Indian concession and EPC contracts frequently impose strict deadlines on contractors, with very limited exceptions, effectively penalising them for disputes entirely beyond their control. A more balanced model would be to explicitly categorise religious or cultural objections as the employer's risk events, thus providing time and cost relief, much like the FIDIC framework does.

Statutory Safeguards as Conditions Precedent

Multilateral lenders, including the World Bank and ADB, insist on "social safeguard compliance" before funds are released. Their model agreements treat clearances, environmental, cultural, and resettlement as conditions precedent, ensuring that contractors mobilise only after the state resolves these issues. Indian contracts, however, often place the burden of securing such permits on contractors, exposing them to post-award religious or cultural challenges. To align with global standards, Indian agreements should specify statutory and religious clearances as employer obligations and conditions precedent, allowing contractors to suspend or terminate the contract without penalty if these are not met.

Legal Doctrines: Frustration and Impossibility

Indian courts have traditionally been reluctant to excuse contract performance merely due to delays from protests or court injunctions, applying Section 56 of the Contract Act quite narrowly. In contrast, English law's frustration doctrine and FIDIC's force majeure provisions afford relief when unforeseeable socio-political events render performance impossible. Indian contracts would benefit from an explicit provision that treats injunctions or statutory restraints arising from religious objections as force majeure or change-in-law events, thereby entitling contractors to relief without resorting to prolonged litigation.

Institutional Mechanisms for Dispute Resolution

Other jurisdictions, such as the UK and Australia, have specialised bodies like the Planning Inspectorate or Land and Environment Court to provide structured, binding, and timely resolutions to disputes over the relocation of religious or cultural sites. In India, such disputes are scattered across various courts and benches, leading to prolonged and unpredictable delays. Contracts should therefore include escalation clauses that refer disputes to a specialised body, such as a proposed National Infrastructure Mediation Authority, to ensure both efficiency and sensitivity to statutory and cultural issues.

Implications for Investor Confidence and Project Bankability

Lenders and investors increasingly scrutinise risk allocation in public-private partnerships and EPC contracts. Unpredictable treatment of religious objections undermines project bankability and increases financing costs. By adopting risk allocation practices aligned with the World Bank's Environmental and Social Framework and FIDIC standards, Indian contracts can provide investors with greater assurance that such risks are foreseeable and borne by the party

best positioned to manage - the state or the employer.

In conclusion, while religious and cultural objections cannot be eliminated from infrastructure projects, their impact can be managed through precise contractual mechanisms. Assigning responsibility to the party best equipped to handle these risks state or employer, will bring Indian contractual practice into closer alignment with international norms and foster a more stable environment for contractors and investors alike.

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13 Uncertainties in Projects and Contracts

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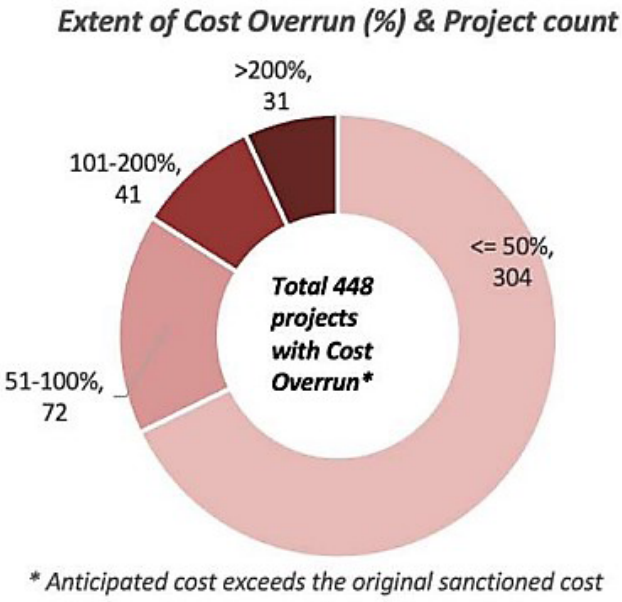
Introduction

In the last ten years, India has significantly scaled up its infrastructure spending, with total capital investment by both central and state governments climbing from around ₹5 lakh crore in 2015–16 to an expected ₹14 lakh crore in 2024–25- a surge of approximately 180%. However, while these figures highlight the government's commitment to building the nation's infrastructure, many projects continue to struggle with delays and rising costs.

Official data from the Ministry of Statistics and Programme Implementation indicates that more than 40% of major government projects (1838 nos..) have experienced setbacks, often running behind schedule by more than 30 months. The financial impact is equally concerning, with cost overruns surpassing ₹6 lakh crore as of 2024.



At the core of these challenges are recurring contractual and administrative hurdles, which remain some of the biggest barriers to delivering infrastructure projects on time and within budget in India. According to government data, the primary factors contributing to cost and time overruns are:

- Land Acquisition
- Environmental clearance
- Financial issues
- Contractual/internal issues
- Manpower shortage
- Litigation issues

In addition to the above, contractual uncertainties to time and cost overruns pose challenges in the day-to-day management of infrastructure projects. These are discussed below.

Site Access, Tree Cutting Permissions & Clearances, Encroachments

Timely and unhindered site access is crucial for the smooth start of any construction project. Many projects in India commence before ensuring full (100%) land

availability, which often leads to subsequent delays and complications during execution.

Delays frequently occur when the Employer does not have full possession of the land or when existing occupants have not been relocated, causing confusion over contractual timelines and claims for idle resources.

Obtaining statutory permissions, such as those required for tree cutting, is often a complex process involving multiple authorities. Delays or ambiguities in responsibility for acquiring the approvals can halt construction and result in disputes over time extensions and costs. Contracts must clearly state which party is responsible for securing such permissions, and that project timelines do not begin until all clearances have been received. It is advisable that during contract preparation, responsibilities be appropriately distributed between both parties based on the capacity of the party best suited for that task, taking into account their respective capacities and capabilities.

Encroachments, such as unauthorized structures or informal settlements, add to delays in projects if not addressed before the construction begins. Clear contractual provisions assigning responsibility for land clearance and statutory approvals are vital to avoid project delays and consequent legal and/ or financial complications; issues that have affected many infrastructure projects. To minimize such issues, the Employer should ensure clear land possession and obtain all necessary permissions, such as tree cutting or environmental clearances, before specifying the Commencement Date in the contract.

Non-Clarity in Scope of Works

A clearly defined scope of work is fundamental to the success of any construction project. Ambiguities or omissions in the scope of works can lead to misunderstandings, change orders, disputes over responsibilities, additional time, and claims for additional costs or extensions of time.

It is often observed that tenders are floated and contracts awarded without sufficient planning or adequate time spent on the preparation of detailed Work Requirements. This leads to frequent changes by the Employer during the execution phase, resulting in increased costs and project delays. The most frequent changing Work Requirements are the addition of facilities during execution, changes in technical specifications, interface responsibilities, etc.

The employer should invest adequate time and actively involve all relevant stakeholders to finalize the scope of work in detail prior to issuing the tender.

Incomplete or Ambiguous Design Documents

The design phase should generally not exceed 25% of the total project duration. However, in many projects, it often consumes more than 50% of the project's timeline. An incompetent designer is one of the significant factors contributing to design delays in infrastructure projects. When designers lack the necessary expertise, knowledge of applicable codes and standards, or experience with similar project types, the quality and

accuracy of design outputs often suffer. Incomplete or unclear design documents are a frequent source of contractual problems in construction projects. When drawings or specifications lack essential details or there are inconsistencies, the contractors are uncertain about the required scope and standards of work.

This often leads to requests for clarifications, delays, and the need for costly variations or rework once design issues are resolved. Disputes commonly arise over who is responsible for filling design gaps and whether such changes warrant additional time or payment.

To prevent these issues, it is essential for the Employer to clearly specify design requirements and provide comprehensive, coordinated documents before tendering. Also, to enhance the quality of outputs in infrastructure projects, it is essential to engage competent designers with the right expertise, experience, and design tools/facilities.

Unidentified Utilities.

The diversion of unidentified utilities is a common and disruptive issue in projects. When unidentified utilities such as water lines, electrical cables, or telecom ducts are discovered only during excavation, they can cause unexpected delays, cost overruns, and safety concerns. For example, if a sewer line is unexpectedly encountered and cannot be diverted due to technical or regulatory constraints, it may require the design team to rework portions of the project to avoid the utility, leading to both design and construction delays. Similarly, finding a high-voltage electrical cable along the alignment can halt excavation until the responsible utility authority evaluates, diverts, or de-energizes the line, potentially shutting down the site for several days or weeks. In some instances, the inability to divert a major water main can force the team to redesign structural foundations, thus impacting the project timeline and budget.

To minimize project delays, the authorities should arrange meetings with the respective civic authorities and utility owners to coordinate and obtain the latest drawings or information regarding existing utilities. This proactive coordination will help ensure that all parties have access to up-to-date utility data, facilitating smoother planning for diversion or protection works and reducing the risk of unexpected site conditions that can cause delays. Clear allocation of duties and current utility data reduces the risk of unforeseen issues and enables both parties to respond efficiently when unknown utilities are encountered.

Unforeseen Site Conditions

Unforeseen site conditions such as unexpected soil types (e.g., encountering expansive clay instead of the anticipated sandy soil) may require changes to the foundation design, soil stabilization measures, or deeper piles, resulting in redesign, increased material and labor costs, and project delays. Unexpectedly high groundwater tables require extensive

dewatering, necessitating pumps, drainage systems, and environmental permits, causing an increase in operational costs, and can slow down excavation and other activities. Presence of hard rock strata may cause a change in design and excavation methodology requiring blasting or special machinery. This adds to the equipment budget, may require specialized permits and contractors, and can delay schedule milestones. Discovery of contaminated soil requiring hazardous waste removal requires compliance with environmental regulations, specialized disposal methods, and additional health and safety measures, often leading to substantial cost overruns and time extensions.

Unanticipated archaeological findings like ancient artifacts typically require work stoppage, formal assessments by experts, and official permissions. Construction cannot resume until relevant authorities provide clearance, resulting in potentially lengthy project delays. Such unforeseen conditions can often disrupt construction schedules and increase costs. When these conditions differ materially from what was indicated in the tender documents or reasonably anticipated, differences may arise over responsibility for addressing and paying for the additional work.

To avoid such disputes, contracts should clearly define the procedures and entitlements relating to unforeseen site conditions, including how such changes are to be notified, verified, and measured for cost and time impact. The contractor should be required to conduct reasonable site investigations before commencing work, with relevant clauses outlining the extent of this obligation. At the same time, the Employer should make all available site data—such as geotechnical reports or previous surveys—accessible and accurate. If the risk of unforeseen conditions is to remain with the contractor, this must be explicitly stated. Clear and fair allocation of risk, along with efficient procedures for addressing site surprises, is essential to prevent project disruptions and contentious claims.

Condition of Buildings Falling Under Influence Zone in Underground Project

In underground construction projects such as tunnels or metros, buildings and structures located within the influence zone are at potential risk of damage due to ground movement, settlement, or vibrations. It is essential that a thorough assessment of these buildings' existing conditions is carried out before construction begins.

The Employer should provide updated and accurate data on all buildings falling within the alignment and influence zone to assist in proper risk assessment and planning. If the responsibility to conduct building condition surveys or collect such data is assigned to the contractor, this must be clearly specified in the contract, along with detailed requirements and methodologies. The contract should also outline clear procedures for monitoring and protecting these structures, as well as for handling claims of damage. Proper documentation and clear allocation of responsibilities help reduce disputes, protect third-party interests, and safeguard the project from delays and additional costs.

Safety at Work

Safety on construction sites is of paramount importance, both legally and ethically, as accidents or unsafe working conditions can result in injuries, fatalities, project shutdowns, and severe legal or financial liabilities. Contracts must clearly outline safety obligations, standards, and procedures, referencing relevant local regulations and international best practices. In India, the construction sector accounts for one in four workplace fatalities, according to a study by the Ministry of Labour and Employment. For example, the recurring collapse of an under-construction bridge in Bihar highlighted the dangers of structural failure. Falls from height are a leading cause of fatal construction accidents in major Indian cities, as per National Crime Records Bureau (NCRB) data. Other frequent hazards include being struck by falling objects, failure of earth retaining structures/supports in underground projects, and vehicle movement within sites, which contributed to several fatal accidents during the Metro construction. The contractor must deploy a team that is both competent and well-versed in safety standards relevant to the work environment.

The contractor is typically responsible for implementing comprehensive safety measures, regular training, and the use of appropriate personal protective equipment. The Employer should ensure ongoing compliance through audits and require the timely submission of safety plans and incident reports. If specific site hazards are anticipated—such as working at height, confined spaces, or underground activities—these must be precisely described in the contract, along with required mitigation measures. Importantly, the contract should include appropriate penalties for any violations or unsafe practices detected on site, and these penalties must be enforced decisively.

Clear responsibilities and the consistent enforcement of safety requirements, including penalties, foster a culture of safety and help prevent accidents throughout the project.

Availability of Resources.

The timely mobilization of adequate plant, machinery, and skilled manpower is crucial for maintaining construction schedules and project quality. Delays in deploying equipment or staff, or a shortage of essential resources, can lead to project slowdowns, substandard work, and contractual disputes over progress and performance. In India, construction projects often face manpower shortages during major festive seasons, crop seasons, when many workers return to their hometowns, sometimes causing significant site disruptions and affecting project timelines. Contracts should clearly specify the minimum requirements and timelines for mobilizing plant, machinery, and workforce, as well as procedures for monitoring their availability throughout the project.

The contractor is typically responsible for ensuring that appropriate resources are available at all times and should provide regular updates or resource deployment schedules to the Employer. If the Employer is to supply any plant or manpower, this must be explicitly stated in the contract. The contract should also include provisions for remedies or penalties in case of resource shortages or failure to mobilize as agreed. Clear resource planning and contractual requirements help minimize delays and ensure smoother project execution.

Exceptional Circumstances

Exceptional circumstances such as natural disasters, extreme weather, pandemics, strikes, changes in law, or political unrest can abruptly disrupt construction projects and impact costs, timelines, and resource availability. To safeguard both parties, contracts must include clear force majeure and exceptional events clauses, defining what constitutes an exceptional circumstance, the procedures for notification, and the resulting rights and obligations. These clauses should specify whether extensions of time, cost compensation, or contract termination are permissible in such events.

Both the Employer and contractor should promptly inform each other upon the occurrence of any exceptional circumstance and cooperate to minimize delay and damage. By anticipating and addressing exceptional circumstances in the contract, disputes are minimized, and both parties have a structured approach for managing risks outside their reasonable control.

Way Forward

Project implementation typically involves two critical phases: planning and construction. Experience shows that many projects fail primarily due to inadequate planning. To ensure successful execution, it is essential to address the following key points during the planning phase:

a. **Planning of Project: The** Employer should spend adequate time in planning of the project and its implementation. Do a proper plan for work requirements, resources, funds, and monitoring of implementation.

b. **Clearly Define Work Requirements:** Prepare a detailed and precise scope of work, technical specifications, and deliverables to avoid ambiguities during execution

c. **Involve All Stakeholders Early**: Engage all relevant stakeholders such as government departments, local authorities, land revenue, electricity, water supply, and telecom agencies in the planning process. Early involvement helps to proactively identify and address land acquisition issues, relocation of utilities, and potential statutory or regulatory hindrances.

d. **Conduct Thorough Site Surveys and Data Collection:** Undertake comprehensive surveys and investigations, including geological, geotechnical, and topographical studies, to ensure planning is based on accurate site conditions.

e. **Identify and Pre-qualify Competent** Agencies/ Contractors: Screen and pre-qualify contractors or agencies based on their technical capability, experience with similar projects, and financial standing, to ensure selection of the most suitable partners for implementation.

f. **Secure Funding in Advance:** Ensure project funding is fully secured and allocated before tendering, to avoid interruptions or delays due to cash flow issues during execution.

g. **Obtain All Necessary Permissions and Clearances:** Complete all statutory approvals and clearances, such as environmental, forest, land acquisition, and right-of-way permissions, before commencing construction.

h. **Develop a realistic and detailed project schedule**: Ensure that the project schedule accurately reflects the scope of work, available resources, and all known constraints. Only with a realistic and achievable project schedule can effective cost control be maintained; otherwise, unrealistic scheduling can lead to unforeseen adverse impacts on projects and cost overruns.

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Contractual Strategies for Managing Uncertainty in Infrastructure Projects: A Legal Framework

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Introduction

India's infrastructure sector is vital to its economic growth, but large-scale projects in transport, energy, and urban development face significant uncertainties ranging from regulatory delays and land acquisition issues to shifting policies and unforeseen site conditions. In this high-risk environment, contracts play a crucial role in managing uncertainty. Well-structured infrastructure contracts define risk allocation, responsibilities of the parties involved, and mechanisms for handling delays and cost overruns. Major Projects in India typically follow three models - EPC (Engineering, Procurement, and Construction), Public-Private Partnerships (PPPs), or long-term concession agreements, each with distinct risk-sharing and payment frameworks.

Infrastructure contracts in India are governed by the Indian Contract Act, 1872 (**"Contract Act"**) supported by sector-specific rules and judicial interpretations. Key clauses like risk allocation, force majeure, and price escalation help manage unforeseen challenges and protect project viability. Frequent disputes in large projects make efficient resolution vital. The Arbitration and Conciliation Act, 1996, provides a faster and more flexible alternative to litigation.

This article examines legal and contractual tools for mitigating uncertainty and outlines a roadmap for enhanced contractual protections.

Nature of Uncertainties in Infrastructure and Engineering Projects

The uncertainties in infrastructure and engineering projects are listed in Table-1.

Table-1: Uncertainties in Infrastructure and Engineering Projects

Type of Uncertainty	Description	Examples
Technical Uncertainty	Arises from design flaws, technology limitations, or innovation challenges.	Unexpected soil conditions affecting foundation stability.
Financial Uncertainty	Involves funding issues, cost overruns, or economic fluctuations.	Inflation increasing material and labour costs during the project.
Environmental Uncertainty	Caused by natural events or regulatory changes related to the environment.	Delays due to unforeseen flood or other natural calamity, or stricter emission laws.
Political/ Legal Uncertainty	Results from policy changes, legal disputes, or permitting delays.	Project halted or abandoned due to changes in government regulations.
Operational Uncertainty	Linked to logistics, resource availability, or labour productivity.	Equipment breakdown or skilled labour shortage.
Social Uncertainty	Public opposition, community impact, or stakeholder conflicts.	

Legal and Contractual Framework in India

The Contract Act is the legal framework governing contracts in India. Section 32 of the said Act deals with contingent contracts, while Section 56 codifies the doctrine of frustration**.** The Supreme Court has consistently held that frustration applies only in exceptional cases where unforeseen events make performance impossible. It is a misconception that for an event to be classified as force majeure, the event should render the possibility of the original scope of the contract impossible[1].

To ensure consistency, standard model contracts are widely used in various sectors. MoRTH provides standardized agreements for highway projects, while CPWD offers standard forms for public works contracts. In infrastructure projects, PPP Model Concession Agreements help define clear terms between the Public and Private Sectors. Moreover, FIDIC-based contracts are adopted in projects funded by multi-lateral funding agencies, offering a global framework for contract management. Regulatory bodies such as the Department of Expenditure of the Ministry of Finance, Government of India (DoE), Comptroller and Auditor General of India (CAG), Central Vigilance Commission (CVC), and National Highways Authority of India (NHAI) issue guidelines promoting transparency, fairness, and accountability in contracting processes. These measures ensure that public projects are executed efficiently, with minimal risk of corruption, while maintaining clarity and consistency in terms and conditions.

Key Contractual Safeguards to Handle Uncertainties

An effective contract does not eliminate risk, but rather strategically incorporates mechanisms to mitigate it. In India's infrastructure sector, certain standard contractual provisions have become well-established tools for managing uncertainty and ensuring project resilience.

Force Majeure Clauses

Force majeure clauses absolve parties of liability when unforeseen events that are beyond their control prevent or hinder their performance. According to *Black's Law Dictionary*, the term '*force majeure'* means an event or effect that can be neither anticipated nor controlled."[2]

This underlines how force majeure provisions are intended to cover truly unforeseen and uncontrollable events, reinforcing their importance in infrastructure contracts. Events such as natural disasters, wars, political unrest, or pandemics may constitute force majeure. These clauses generally allow for the suspension of contractual obligations or extensions of time without penalty. The COVID-19 pandemic served as a recent example, where contractors across India invoked force majeure to seek relief from stringent timelines. In a study, the authors observed that the "*onset of the Covid-19 pandemic in India has proven not only to be a humanitarian crisis, but also an economic crisis of an unprecedented scale…. Uncertainty as to the performance of contracts has led to parties envisaging breaches of contract and assessing their rights and remedies in relation to the same.*"[3].

While the applicability of such provisions has been recognized, the extent of relief is highly contingent on the precise language of the clause in the contract. The COVID-19 pandemic was the first phenomenon of its kind since it affected the whole world; it knew no boundaries and respected no status.

A risk assessment study on Indian construction projects observed that "*Construction projects are prone to complexity and uncertainty. Management of risks is a deciding factor in the success or failure of the projects.*"[4]. This underscores the need for structured risk quantification tools, such as the "Risk Factor and Priority Model," to make informed decisions regarding contract design and risk allocation.

For example, in the case of *Halliburton Offshore Services Inc. v. Vedanta Ltd. Delhi High Court, 2020*, the Contractor (Halliburton) faced delays in drilling obligations due to COVID-19 lockdowns and invoked force majeure. The Court acknowledged that COVID-19 constituted a force majeure event in this context. However, it emphasized that the mere existence of COVID-19 did not automatically excuse all obligations; its impact must be proven.[5]

Change in Law Clauses

Varying legal provisions address risks arising from sudden changes in legislation or regulations. For example, when the government imposes new taxes or introduces environmental clearance requirements, it can significantly affect project costs and timelines. Such clauses typically provide for compensation or contract extensions, thereby mitigating potential disputes over the increased costs resulting from governmental actions.

Price Escalation or Adjustment Clauses

Considering the high time frame of the completed infrastructure project, it is almost bound to have inflationary pressures and changes in the commodity price, price of material, and costs of labour. Price escalation clauses save contractors from having to incur these expenses on their own by adjusting the payment in accordance with the government-approved indices, for example, the Wholesale Price Index (WPI). These clauses ensure that there is a balance in the economy of the parties by offering a reasonable compensation mechanism.

Extension of Time and Delay Penalties

Public infrastructure contracts often involve issues of expediency, making it essential for agreements to clearly define when extensions of time (EOT) may be granted and when penalties or liquidated damages will apply. EOT provisions help prevent unfair penalties for delays caused by factors outside the contractor's control, such as land acquisition or clearance delays. Conversely, liquidated damages hold the contractor accountable for delays resulting from their own fault.

Dispute Resolution Mechanisms

Given the high incidence of disputes in Indian projects, multi-tiered dispute resolution mechanisms are crucial. Contracts typically outline a structured process: negotiation, mediation, and, if needed, arbitration. Arbitration under the Arbitration and Conciliation Act, 1996, is favoured over litigation due to its flexibility, efficiency, reducing disruptions, and promoting amicable resolutions.

Performance Guarantees and Security

Contractors are typically required to provide bank guarantees or other forms of security to ensure their commitment. However, to prevent misuse, contracts must specify the conditions under which guarantees can be invoked. In India, court judgments have established that the invocation of guarantees is permissible, provided it is done without fraud or causing irreparable harm, ensuring both security for the employer and fairness to the contractor.

Termination Clauses

Termination clauses allow either party to end the contract under specific conditions, such as delays, material defaults, or force majeure. To ensure fairness, these clauses often include compensation structures, safeguarding parties' investments or work completed. Well-drafted termination provisions serve as a critical safeguard in long-term infrastructure projects, balancing flexibility with stability.

Specific Safeguards and Best Practices in the Indian Context

Although contractual solutions like force majeure clauses and escalation clauses offer valuable protection, Indian infrastructure projects require protection that is adapted to the local environment. There are three practices, pre-contract due diligence, performance guarantees and insurance, and dispute resolution frameworks that would be of importance in this context. "*In most infrastructure projects, force majeure provisions may not provide compensable relief to contractors/ concessionaires. Other provisions, such as 'change in law', may entitle the contractors/ concessionaires to claim costs or revenue.*"[6]

Pre-Contract Due Diligence and Feasibility Assessments

The due diligence conducted at the pre-contracting phase is one of the most productive ways to avoid future conflicts. Determination to establish risks can be enhanced by feasibility studies, environmental impact assessment, and socio-economic consultation before the total breakout in the execution stage. An example would be a lack of proper land survey or neglecting to consider local community resistance. Many projects for highway construction and mining have been derailed in India. Effective due diligence not only minimizes the unexpected risks but also provides an opportunity to draft the contractual clauses in a more realistic approach, including willingness to share the risks of delays, cost increases, and environmental issues. The essence of using this preventive measure can be seen in the international best practices, where it is required to consult the stakeholders in World Bank-financed projects.

One of the examples is the Hyderabad Metro Rail (HMR) – A PPP Success Story, wherein Harvard University featured the Hyderabad Metro Rail project as a global model of PPP success. Developed through a public–private partnership and executed amidst challenges like land acquisition obstacles, public protests, and financial constraints, it nevertheless emerged as a critical urban infrastructure achievement.[7]

The Hyderabad Metro Rail project illustrates the value of comprehensive pre-contract due diligence, effective risk-sharing, and stakeholder management. Careful negotiation of concession agreements and local engagement enabled successful infrastructure outcomes despite significant challenges.

Performance Guarantees and Insurance Mechanisms

Performance guarantees, typically provided as bank guarantees or surety bonds, serve as assurance that contractors will fulfill their contractual obligations. The Indian courts have resolutely held the enforceability of these guarantees with limited exceptions, like in the case of fraud or injustice that is irreversible. Meanwhile, dependence on assurances should be supplemented with thorough insurance systems; some of the risks that the construction and infrastructure contracts should cover include accidents, natural calamities, and third-party liability. Insurance helps distribute the risk in the most efficient ways so that a disaster does not undermine the financial status of contractors or employers. The

combination of performance guarantees and insurance forms a safety net in two tiers that can cover the project stakeholders against default and external shocks that cannot be controlled.

Dispute Resolution Clauses: Arbitration, Adjudication, and Courts

Given the inevitability of disputes in large-scale projects, carefully designed dispute resolution clauses are indispensable. Indian contracts increasingly adopt multi-tiered mechanisms: initial negotiation, followed by adjudication or mediation, and culminating in arbitration. Arbitration, governed by the Arbitration and Conciliation Act, 1996, is particularly common due to its relative speed, flexibility, and confidentiality. The Supreme Court in *BALCO v. Kaiser Aluminium*[8] reaffirmed the autonomy of arbitration agreements, giving investors confidence in India's arbitration regime. At the same time, adjudication panels and Dispute Adjudication Boards (DABs), frequently used in FIDIC contracts, are gaining traction in Indian PPP projects as a faster and more technical method of resolving disputes during execution. Courts remain a forum of last resort, with judicial intervention limited to enforcement and review. This layered structure provides efficiency while preserving the final safeguard of judicial oversight. As noted by the authors in one study, the parties seeking to invoke force majeure for COVID-19 face the onerous burden of proving that the pandemic was the sole cause of non-performance and that no alternative performance was possible.[9] This heightened evidentiary standard, coupled with the varied drafting of clauses, makes disputes inevitable even in the presence of force majeure provisions, thereby underlining the importance of robust dispute resolution mechanisms.

Judicial Approach and Case Studies

The Indian judiciary has played a pivotal role in shaping how uncertainties in infrastructure contracts are addressed. Courts have consistently sought to strike a balance between the sanctity of contractual obligations and the practical realities of large-scale projects.

Narrow Application of the Doctrine of Frustration

The doctrine of frustration under Section 56 of the Indian Contract Act, 1872, has been applied sparingly by the Supreme Court and High Courts. In *Alopi Parshad & Sons Ltd. v. Union of India*[10], the Court rejected a claim for enhanced payment due to wartime price escalation, holding that mere commercial hardship does not frustrate a contract. Similarly, in *Energy Watchdog v. CERC*[11],the Supreme Court emphasized that fluctuations in coal prices could not be treated as frustration unless explicitly contemplated by the contract.

These rulings underline the judiciary's commitment to preserving the certainty of contracts, leaving it to the parties to incorporate protective clauses such as escalation or hardship provisions.

Judicial Support for Arbitration

Indian courts have consistently promoted arbitration as the preferred method for resolving infrastructure disputes. In *Bharat Aluminium Co. v. Kaiser Aluminium Technical Services Inc.* ("BALCO")[12] the Supreme Court confirmed the principle of minimal judicial interference and recognized the validity of international arbitration agreements seated outside India. More recently, amendments to the Arbitration and Conciliation Act, 1996, have reinforced this pro-arbitration stance, mandating time limits and streamlining enforcement procedures. This judicial support has been instrumental in making arbitration a credible and efficient mechanism for infrastructure disputes.

Concession Agreement Disputes

Courts have also dealt with disputes arising under Concession Agreements, particularly in the transport and energy sectors. In *Reliance Infrastructure Ltd. v. State of Goa*[13], the Bombay High Court addressed termination of a Concession Agreement for an airport project. The Court stressed the importance of clearly drafted termination and compensation clauses to avoid prolonged litigation and financial uncertainty. Similar disputes in highway and renewable energy concessions

demonstrate that poorly defined provisions on exit rights and compensation remain a major source of conflict in India.

The judges have thus sent two messages, one being that the risks involved in a commercial relationship should be allocated and dealt with between the parties contractually and not be transferred to courts by the claims of frustration, and the other being that carefully drafted termination and arbitration clauses can be the key instruments of efficiency and fairness in long-term infrastructure contracts.

In the *Paliyekkara toll case*, the Supreme Court affirmed the primacy of road safety and passenger rights over contractual revenue, urging the concessionaire to seek relief through administrative remedies, a clear reminder that maintenance obligations must be explicitly addressed in PPP agreements.[14]

Recommendations

Contractual safeguards can only prove effective in as far as risks are identified, allocated, and managed effectively. Indian contracts may be more favourable to investors as they already have elements of force majeure and escalation clauses, but further strengthening is needed to make the contract more resilient.

Enhancing Risk Assessment and Allocation Frameworks

A key weakness in Indian infrastructure contracting is the failure to systematically assess risks on a project-by-project basis. Risks are often either unfairly allocated to contractors or left ambiguously defined, leading to disputes. Establishing a formal process to outline technical, financial, regulatory, and environmental risks is essential. These frameworks should align with global best practices, ensuring that each risk is assigned to the party best equipped to manage it.

Training and Capacity Building for Contract Managers

Infrastructure contracts often fail during implementation due to a lack of professionalism in drafting and managing them. Many government officials and contract administrators struggle to understand complex clauses, such as escalation provisions or changes in law, leading to misinterpretation and unnecessary litigation. Regular training, certification, and cross-border exchanges in contract management are essential for both government bodies like NHAI and the private sector. These initiatives would enhance precision and strategic execution in contract management.

Encouraging Standardization with Flexibility

Standardized contract forms, like those from MoRTH or CPWD, enhance predictability and reduce transaction costs. However, rigid use without project-specific adaptation can lead to conflicts. A modular approach using standard templates with tailored schedules and annexures maintains consistency while addressing unique project risks. FIDIC contracts exemplify this balance effectively.

Conclusion

Uncertainty is inherent in infrastructure projects, especially in countries like India, where mega-projects intersect with complex socio-political realities. Contracts are crucial for managing these risks, ensuring fairness in resolving issues.

Indian jurisprudence upholds the sanctity of contracts, with exceptions made through doctrines like frustration and force majeure. Commercial hardship is not accepted as a valid excuse for non-performance, making it essential to specifically negotiate clauses on escalation, changes in law, and hardship. The judicial support for arbitration has further enhanced trust in alternative dispute resolution mechanisms, thus attracting international investors.

The Indian experience shows that the contract law needs to be revisited to build in proper safeguards to address situations that may be encountered. The rise of technologies like smart contracts and digital monitoring systems promises a transformative shift in managing infrastructure risks.

The solution lies in creating a resilient contractual ecosystem. By integrating international best practices while adapting to local realities, India can reduce disputes, build investor confidence, and deliver projects on time, ensuring continued infrastructure-driven growth.

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When Pre-Determined Compensation Capping Clashes with Construction Realities- The Site Access Dilemma

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Abstract

As India races to expand its infrastructure, the availability of land poses unexpected hurdles like site access delays, often slowing down progress and leading to idling of expensive resources or a lack of productivity. As many of the public projects were marred by uncertainty about the final cost due to long-standing disputes on what is the cost of delay on non-availability of sites in the promised timelines in the contract, pre-determined fixed/ capped compensation was adopted as a popular method included in the Contracts to have a predictability of cost from the perspective of the Government bodies.

This article takes a closer look at Indian infrastructure projects and how predetermined, fixed/ capped compensation clauses affect the Contractor and Employer when site access delays occur. While these clauses intend to help Employers to manage budgets to some extent for their delays attributable to their not being able to fulfil their obligations, they are often accused of falling short of covering the real costs claimed to be faced by Contractors, like idle equipment, disrupted schedules, and rising overheads.

By comparing standard FIDIC guidelines with modified contract terms, the article shows how pre-determined fixed/ capped compensation rules can shift risk to the contractor. Efforts are made to bring the perspective of Employers, Contractors, and Engineers/ PMC (Project Management Consultant) to highlight practical challenges and the potential for disputes. Real-life examples reveal that on large/ mega projects, most of the contractors are claiming that fixed payouts rarely match actual losses, often leading to arbitration and strained working relationships. Legal insights stress the need for more flexible and balanced risk-sharing. The article provides suggestions for smarter compensation strategies, better tracking systems, and clearer contract language that reflect the realities on the ground.

Introduction

Infrastructure projects are built on a simple yet critical foundation: timely access to the site. Without it, even the most carefully prepared schedules, mobilized resources, and technical expertise can quickly collapse into a cycle of delays, disruptions, and mounting costs.

To manage this risk, many Employers nowadays include pre-determined fixed/ capped compensation clauses for delayed site handover; often by amending the Particular Conditions of Contract (PCC). On paper, such clauses promise clarity and limit exposure. In practice, however, they often oversimplify a complex problem, offering only a token remedy for what is usually a far deeper financial and operational impact. Despite recurring access-related hurdles, contracts continue to rely on fixed compensation models that are facing a challenge to account for these uncertainties.

This article explores the issue from the perspective of all stakeholders/ parties involved, i.e., the Employer's priority for financial predictability, the Contractor's need for fair compensation, questioning and whether pre-determined fixed/ capped compensation truly manages risk or merely shifts burdens and the Engineer's Perspective with respect to limitations to deal in a pre-determined fixed/ capped compensation framework. It also evaluates the practical effects of such clauses in dynamic project environments and outlines potential reform requirements based on real-world cases and best international practices.

Understanding Site Access Delays

Site access delays not only stall the start of works but also create a chain reaction of cost escalations, unused assets, and strained cash flows.

Delays in access typically arise from a combination of systemic and local factors, such as:

- Land acquisition and resettlement: prolonged negotiations, legal disputes, and compensation challenges.
- Utility relocation: particularly in urban environments, shifting of water, sewer, electrical, signalling, telecom, and other utility services often involves multiple agencies with overlapping jurisdictions.
- Third-party approvals: environmental/ heritage clearances, railway crossings, and local authority permissions can take months or years.
- Local disruptions: festivals, political interventions, community protests, or law-and-order situations that unexpectedly halt site activities.

Each of the above causes may be classified as being beyond the Contractor's reasonable control, yet has far-reaching consequences on project schedules and financial performance. In effect, a delayed site is not merely a late start; it becomes the seed for disputes, claims, and long-term financial effects for both Employer and Contractor.

Understanding Pre-determined Fixed/ Capped Compensation

Pre-determined Fixed/ Capped compensation on-site delays is a contract clause that limits a contractor's claimable costs for client-risk events. It specifies a pre-determined fixed per day and/ or maximum amount payable either as a percentage of the contract value or a fixed rupee amount, or a defined number of days, regardless of the operational impact of the delay. This means that the Contractor's entitlement for delays in accessing construction sites cannot exceed the pre-agreed cap.

- Purpose of Pre-determined Fixed Capping:
- Protects the Employer from unlimited monetary risk.
- Encourages both parties to mitigate and manage delays proactively.
- Provides clarity and predictability in financial planning.

With this background. it becomes essential to examine how Employers and Contractors perceive pre-determined fixed/ capped compensation clauses and whether such clauses genuinely balance risk or simply shift the burden from one party to the other.

Risk Allocation under FIDIC v/s modified PCC in practice

- Standard FIDIC Provisions: Under standard FIDIC provisions for employer-risk events, the

Contractors are generally entitled to either or both an Extension of Time (EOT) and compensation of cost (actual loss) on a case-by-case basis, and reflects the principle of balanced risk allocation, ensuring that the party responsible for the delay bears its financial and time consequences.

- PCC Modifications in Practice: However, in practice, modified Particular Conditions of Contract (PCC) to internationally practiced Standard Bidding Documents (SBDs) by many Employers often amend these rights by prescribing pre-determined fixed compensation at a nominal daily rate. These modifications may also include the imposition of a maximum cap on such costs on a project or restricting the scope of allowable costs.

The Employer's Perspective: Containing Uncertainty

It is to be noted that this challenge is recognized not only by Indian execution agencies but also by FIDIC, and in this effort, FIDIC proposed an amendment in the Green Book, second edition 2021. The Green Book formula simplifies and speeds up Contractors' claims for prolongation costs and helps Employers verify these claims without expert or legal intervention, as delineated in Sub-Clause 11.1. The Green Book's structure and rules, including the use of set compensation mechanisms, offer a practical and straightforward method to manage site delay compensation without complex calculations. Although the Green Book was originally intended for lower-value engineering and building projects, many Employers have adopted a similar approach by capping compensation at a set daily rate or limiting recoverable costs.

For Employers managing the uncertainties of large-scale projects, pre-determined fixed/ capped compensation provides a vital anchor for financial control. Large infrastructure projects, particularly those funded by multilateral funding agencies, are bound by strict financial ceilings. In such cases, fixing a predetermined amount for delays in accessing construction sites provides budgetary discipline, enabling Employers to plan expenditures without the fear of runaway claims. It also creates predictability, sparing the Employer from protracted debates over the real expenses of idle manpower, equipment, or financing charges. It further puts an obligation on the Contractor to mitigate and manage the risk of delays within manageable limits.

Equally important, capped sums help in deterring inflated claims. Contractors may otherwise be tempted to present highly exaggerated or unverifiable assessments of losses, and a pre-determined fixed/ capped compensation framework minimizes this risk. Moreover, capped compensation brings administrative efficiency; it allows the Engineer to apply the clause mechanically, avoiding lengthy disputes and facilitating quicker closure of issues.

Pre-determined fixed/capped compensation also helps Employers avoid audit risks by ensuring that payments for delays remain within pre-approved and verifiable limits, simplifying financial reporting and accountability.

In essence, pre-determined fixed/ capped compensation acts as a shield for Employers, offering comfort and certainty in areas often outside their control, such as land acquisition hurdles, utility shifting delays, environmental clearances, or even resistance from locals.

The Contractor's Perspective: Losses Beyond the Cap

Pre-determined fixed/ capped compensation is one way of looking at the effects of delays, but for Contractors, it often masks a deeper financial struggle. For Contractors, delays in accessing construction sites result in costs that may or may not follow nominal pre-determined fixed/ capped compensation amounts at all stages of the construction schedule. Overheads continue to accumulate daily, with site offices, supervision staff, and financing expenses adding to the burden.

Equally disruptive is the programme resequencing that follows a delayed site handover. Workflows are

interrupted, productivity declines, and indirect costs rise as Contractors are forced to reorganize resources inefficiently. In some extreme cases, the consequences are even harsher; overall project delays triggered by late site access can expose Contractors to liquidated damages, despite the underlying cause being on account of the Employer.

For example, a fixed compensation of ₹2,000-₹5,000 per km per day and sometimes a percentage (%) of contract value fixed may appear reasonable in drafting, but is negligible when weighed against the real expenses of maintaining heavy equipment, specialized staff, and extended project overheads. Moreover, in certain cases, no compensation is payable if delays in land handover do not affect the execution of certain predefined items, further limiting the contractor's allowed costs despite bearing the financial burden of unused assets.

Another aspect is the application of concurrent delays, where the application of even such a theoretical amount may not be assessed.

In today's competitive bidding environment, Contractors often accept such modified PCC conditions with pre-determined fixed/ capped compensation to secure the contract, despite knowing that the risk allocation is one-sided. From the Contractor's viewpoint, pre-determined fixed/ capped compensation is less a safeguard than a mirage; a provision that appears to address risk but leaves the bulk of actual losses uncompensated.

The Engineer's Perspective: Limitation to Deal in Pre-Determined Fixed/Capped Compensation Framework

In Indian infrastructure projects, particularly those financed by multilateral agencies, the Engineer or Project Management Consultant (PMC) takes on a crucial role in contract administration, design review coordination, stakeholder management, and dispute resolution.

The Engineer/ PMC is contractually obligated to make fair, reasonable, and impartial determination as required under the FIDIC or equivalent contracts within the provisions of the contract. In cases where delays fall within the zone of pre-determined fixed/ capped compensation events, the Engineer's assessment is guided strictly by the explicit contract terms rather than by equitable considerations. The Engineer, whose duty is to administer the contract strictly as written and signed by both parties, mostly assesses compensation as per the pre-determined fixed method, which is perceived as favouring one party.

Due to this limitation, most of the time the Engineer comes under heavy criticism for working without a broader perspective by either the Contractor or both the Employer and the Contractor. It must be understood that if these fail to address the delay impact fairly, they were there in the contractual provisions, which were overlooked or agreed by both parties for just getting the Contract through.

Case Studies and Industry Insights

Real-world examples expose the limitations of pre-determined fixed/ capped compensation and highlight the power of flexibility in risk management. Several case studies show the pitfalls of set compensation in the face of delays in accessing construction sites where it goes beyond reasonable control.

It is seen that modification of Particular Conditions of Contract (PCC), specifically by introducing pre-determined fixed/ capped compensation for delays in accessing construction sites, is a popular condition adopted by Employers. In most projects, contractors are subjected to such pre-determined fixed/ capped compensation, which they challenge during contract execution on the grounds that it was insufficient to cover the actual losses incurred. Most of these projects experience significant site delays, resulting in:

- Idle Labour and Machinery.
- Frequent replanning and rescheduling of linear works.

- Increase in Overheads and Loss of Opportunity.
- Substantial financial losses that exceeded the capped amounts.

This shows that while PCC clauses provide a theoretical ceiling on compensation, the contractors claim beyond the capping limit, citing monetary risk far beyond these limits, a systemic risk leading to dispute, and an expensive resolution process in the current contract frameworks, contrary to what was thought of while framing the contract.

This reflects how:

1. Rigid compensation clauses are not aligned to reflect actual project realities in linear projects, where even small missing stretches can disrupt the entire sequence of works.
2. Balanced risk allocation is essential; capping compensation is a good idea for small delays and protects the Employer superficially, but when delays exceed a reasonable limit, they can lead to under-compensation, disputes, and arbitration.
3. Contracts need to be based on considering all stakeholders' perspectives so that while the Contractor may face financial losses, the Employers also suffer from strategic misuse of delay events.

The Ripple Effect: Delays that Outlive Deadlines

Unplanned Site delays, coupled with the scenario where the compensation does not match the ground reality, don't just pause construction; they ripple outward:

1. Stalled progress affecting linked packages.
2. Strained Employer - Contractor - Engineer relations.
3. Arbitrations that drag on for years, even after completion of a project.
4. Costlier financing due to extended loan tenures.

Legal Lens: How Arbitrators and Courts View Access Delays

Indian arbitral tribunals and courts have consistently emphasized that risk allocation must reflect ground realities, not just the words on paper.

- Judicial Approach: Courts often look at "substance over form," recognizing that when access delays are attributable to the Employer (or statutory authorities), the Contractor cannot be expected to absorb unlimited losses. Even when capped clauses exist, tribunals have sometimes interpreted them narrowly to avoid unjust enrichment of the Employer.
- Arbitral Insights: Dispute Adjudication Boards (DABs) and Arbitral Tribunals frequently note that fixed daily compensation rarely captures the cascading financial impact of delays in linear projects like railways, metros, highways, or pipelines etc.
- Case Law Trend: Increasingly, tribunals distinguish between time risk (extensions of time) and cost risk (compensation). While time relief is generally granted, monetary compensation tends to be restricted if capped clauses exist unless Contractors prove exceptional circumstances or ambiguity in drafting.

In short, while legal bodies acknowledge the challenges of capped models, Contractors often face an uphill battle unless clauses are drafted with flexibility or clarity.

Rebalancing the Scales - Towards Fairer Risk Allocation

Fixed compensation models no doubt have their own advantages when dealing with minor delays on large projects or any kind of delays in small projects. However, they fail to reflect the dynamic risks inherent in large-scale infrastructure projects. Instead of prescribing solutions, it is crucial to identify areas that need close attention to mitigate monetary risk, improve

risk management, and ensure equitable outcomes for both Employers and Contractors.

Based on experience and case studies, the following areas require focused analysis:

1. Compensation Mechanisms:
    - Review the basis and limits of existing pre-determined fixed/ capped compensation clauses that remain uniform across the project duration.
    - Assess whether the fixed amounts or percentages adequately reflect real expenses for labour, equipment, overheads, and financing.
2. Contractor Mobilization and Sequencing Risks:
    - Examine how mobilization plans, programme scheduling, and workflow sequencing are impacted by access delays.
    - Identify sections where isolated delays can cascade into broader inefficiencies.
    - Land acquisition, utility relocation, and approvals should be monitored and controlled with a goal of no delay in the critical path.
    - Compensation can be dynamic based on the phase of the project and resource criticality, even if the concept of capping is followed.
3. Legal and Contractual Ambiguities:
    - Identify ambiguous PCC clauses that may shift risk disproportionately to Contractors.
    - Examine past arbitration/ court case outcomes for similar projects to highlight contract-based vulnerabilities.
4. Monitoring and Progress Reporting:
    - Evaluate the effectiveness of existing progress tracking systems for early identification of delays.
    - Assess whether real-time reporting can generate alerts that facilitate timely interventions, potentially affecting the frequency of disputes and the level of transparency.
5. Stakeholder Communication and Coordination:
    - Analyse channels for communication between Employers, Contractors, and Authorities.
    - Identify gaps where misalignment or delayed responses exacerbate site access issues.
6. Impact on Linked Packages and Project Sequencing:
    - Study interdependencies between project packages and the ripple effect of delays.
    - Identify areas where minor access delays can stall overall project progress.
7. Applicability of Standard Forms (FIDIC) v/s Modified PCC:
    - Compare risk allocation under standard FIDIC clauses, taking clues from Green Book guidelines with modified PCC rules.
    - Highlight areas where pre-determined fixed/ capped compensation is suitable and where it falls short.

Conclusion

While pre-determined fixed/ capped compensation clauses offer financial predictability and administrative simplicity, including eliminating the requirement of vetting tons of documents to substantiate costs for the Employers, they fall short beyond a point in addressing the real-world complexities of site access delays in mega infrastructure projects in India. By systematically examining these areas, project stakeholders can get a better understanding of where risks are concentrated, where compensation provisions may be inadequate, and where operational adjustments are needed. Adjusting the paradigm from "capping liability in absolute" to adopting flexible compensation with "shared responsibility" with a dynamic application of compensation formula suitable to both parties in the larger interest of predictability and fairness, is key to building a more resilient and collaborative infrastructure

ecosystem. True progress comes not from shifting losses made from unforeseeable situations, but from sharing responsibility. By aligning contractual provisions with ground realities, stakeholders can reduce disputes, enhance trust, and ensure more equitable outcomes in large-scale infrastructure development. In a nutshell, having provisions that provide accountability and predictability for both parties with a compensation formula that addresses all stages of a project and which avoids lengthy documentation upkeep, and tries to substantiate the costs incurred due to site access delay issues, will be a boon for the nation's development.

About Nippon Koei India

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IMPACT OF CHANGES IN GST RATES ON CEMENT INDUSTRY

Union Finance Minister Mrs. Nirmala Sitharaman recently announced revised Goods and Services Tax (GST) rates, effective from 22nd September 2025, aimed at boosting affordability and infrastructure growth. While the reform touches most infrastructure industries, from energy to construction materials, the broadest and most visible impact is in cement: the backbone of housing and infrastructure

Key changes in the cement sector include a reduction in GST on cement from 28% to 18%, an increase in GST on coal and petcoke from 5% to 18% (with the cess removed), and a reduction in GST on renewable energy (RE) equipment from 12% to 5%.

The lowered GST on cement enhances housing affordability and reduces construction costs. For instance, constructing a 1,000 sq. ft. house typically requires 400 cement bags at ₹ 315 per bag (excluding GST); under the new rates, this would now save approximately ₹ 12,600 compared to the previous GST rates - benefiting households, builders, and infrastructure segments. Although cement demand has low price elasticity, cost savings improve overall construction economics.

The increase in GST on coal is largely offset by improved Input Tax Credit (ITC) utilisation, resulting in a neutral or slightly positive impact for captive power plants.

Notably, the reduced GST on Renewable Energy (RE) equipment lowers capital cost for solar, wind, and waste-to-energy projects, thereby shortening payback periods.

Overall, the GST rate revision improves project economics and promotes sustainability. By reducing construction costs and boosting renewable energy uptake, these changes align with India's transition to cleaner energy and its 2070 net-zero carbon-emission goal.

Contributed by:Holtec Consulting Private Limited

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Contractual Mechanisms to Navigate Uncertainties in Mega Urban Transit Projects: Chennai Metro Rail Project Phase-II

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Abstract

With rapid urban growth and rising traffic congestion, sustainable transport systems such as metro rail have become critical to ensure reliable mobility in India. In dense cities, where road expansion is limited, governments are increasingly investing in metro networks. However, metro construction involves multiple stakeholders, viz., employers/ authorities, contractors, consultants, statutory bodies, public bodies, public occupants, and financing institutions, creating inevitable uncertainties that must be addressed contractually to secure the successful delivery of the project. This article examines how contractual provisions in the Chennai Metro Rail Phase-II, a mega expansion project, which is one of the largest ongoing metro projects, are structured to deal with these uncertainties. Furthermore, the article gives insights and emphasizes the role of baseline programmes and multi-layered dispute resolution mechanisms, which become essential tools for implementing these mechanisms.

Introduction

Chennai Metro Rail Limited (CMRL), a joint venture of the Government of India and the Government of Tamil Nadu, has undertaken significant urban transit infrastructure development. Phase I (2010–2019) covered 45 km with 32 stations, followed by a 9 km extension in 2021. Phase II, currently under implementation, covers 119 km (76 km elevated and 43 km underground), with 128 stations across three corridors, and is being executed through 65 complex contracts valued at INR 63,500 crore. The project is notable for deploying 23 Tunnel Boring Machines, making it one of the largest metro projects currently under execution worldwide.

Double Decker section at PORUR

Large metro projects invariably encounter various uncertainties (other than obvious challenges of Engineering and Geology) that impact time, cost, and quality, and require a pre-determined framework to be

Intersection of Corridor 4&5

incorporated into the contracts to mitigate the delivery risks. These uncertainties include land acquisition delays, complexities of utility diversions, evolving design requirements, and multi-stakeholder interface risks. Unless contractually anticipated and treated appropriately, such issues escalate into disputes.

Chennai Metro Rail Phase-II provides a case study of contractual mechanisms applied to mitigate these risks.

Challenges Encountered

Like the scenarios encountered during the construction of other Metro Projects or any other mega infrastructure projects, Chennai Metro Rail Limited and the appointed Engineers/General Consultants (GC) have also faced various challenges, a few of which are listed below.

a. Land Acquisition

b. Complexities in Charted as well as uncharted Utility Diversions and Traffic Management

c. Multiplicity of authorities

d. Design changes to accommodate land issues, as well as plans of other authorities

e. Complex Interface Management with multiple Contractors/ Disciplines, including challenges due to Multiple stakeholders, and

f. Scarcity of suitable contractors to take up this quantum of work in a city; not to mention the resource issues.

Many of the above-listed uncertainties have the potential to result in additional Time and Cost scenarios for individual packages, which further may have cascading critical implications on the other connected packages. That may, in turn, impact the timely delivery of the Program and adherence to the budget. The assessment of Time and Cost implications is a real challenge and leads to various disputes between the parties. The challenges listed above are deliberated upon and the mitigation measures used, albeit with suitable provisions in various contract packages as well as post-contract administration measures, without impacting the risk balance on such uncertainties.

Challenges in Land Acquisition

As for other Government Infrastructure Projects, the acquisition of land in densely populated urban areas has been a challenge to the commencement and smooth sailing of the Chennai Metro Phase II Project. Involvement and the necessity of negotiations with multiple landowners, relocating displaced families and/ or businesses, obtaining legal and regulatory approvals, political and religious linkages of some land pockets, etc., all pose significant challenges for the acquisition of land. The responsibility and liability for land acquisition primarily lie with the Special Purpose Vehicle (SPV) or a Regulatory body formed and supported by the state government. In most cases, 90% to 95% of the land is acquired as scheduled, but the balance 5 to 10% of the land acquisition invariably delays the project and has a critical impact due to multiple reasons.

To overcome the challenges of land acquisition, efforts are made by the Employer to minimize private land acquisition by realigning routes and using government land where possible. However, some private land acquisition was unavoidable. Therefore, the same has been considered in the Contracts by providing a schedule of access dates, with some stretches having deferred access.

In case of any inordinate delay beyond the anticipated time for acquisition, provisions have been incorporated

into the Contract for compensating for the affected time and resources of the Contractor and/or omission of the part of the scope of the Works under the Contract. Moreover, in order to avoid any anticipated disputes over the possession or handover of the land parcels for execution of works with the Contractor, issuance of Land Delivery Receipt jointly signed by the parties of the Contract has been implemented. The contractor's resources which would remain idle were regularly monitored. These are mitigated based on robust records that are maintained. CMRL took a proactive step to provide a fully functional common PMIS platform, which is maintained meticulously for all the Contractors, GCs, and DDCs to engage and collaborate.

Complexities in Utility Diversions and Traffic Management

Metro construction frequently encounters uncharted utilities, unreliable records, and complex coordination with multiple civic agencies. Diversions of electricity, water, sewer, and telecom networks, coupled with traffic management in dense corridors, often cause delays and public inconvenience.

As per the Contract, the responsibility for managing the liaison for the diversion of utilities was allocated to the Contractors, and they were asked to price such risks by suitably loading in the contract value. They are also supported by provisions made for compensation of the actual cost of these works executed through a provisional sum. Regular coordination with authorities, structured approval mechanisms, and detailed traffic diversion plans were mandated. These steps minimized ambiguity, which otherwise led to disputes. In addition, regular meetings are organized and chaired by the Employer's senior management to address the critical and major issues with all the concerned authorities/ stakeholders. Prompt decisions are taken wherever there is a potential to disrupt the progress. Even though the risk of liaison and diversion of the utilities under the alignment of the Project has been allocated to the Contractor, the Employer has provided proactive assistance to avoid critical delays.

Traffic arrangement at Sterling Road junction

Traffic arrangement Sholinganallur Junction

Chennai city, being a coastal town, bears the fury of cyclones and heavy rains, leading to flooding in and around the work sites, a condition that applies to almost the whole city. The Employer/ the Engineer has steered pre-emptive measures by rigorously following up to ensure preparedness for the monsoons and has ensured that appropriate emergency measures are in place in case of orange/ red alerts. This proactive approach has led the contractor's team to tide over the situation in the past 3 years without any major damages or stoppages on account of the diversion of utilities. A flexible compensation mechanism for the Lump Sum contracts in general is adopted to deal with these situations to compensate for the extra work done by the contractors.

Challenges Due to Design Modifications

Design revisions/ modifications are inevitable in metro projects due to integration with other infrastructure (flyovers, rail lines, other government projects),

development requirements being executed in parallel, to cater to the ever-increasing demand by various other authorities within the same space, with no comprehensive pre-information available at a common platform. They also occur due to evolving technologies, and interface requirements between civil and systems contractors, changes associated with land eviction delays due to court cases, etc. Incorporation of modern signalling, communication, and safety technologies within design frameworks also adds to the complexity. As different contractors handle the civil works, the electrical, signalling, allied systems, and rolling stock, the design coordination across multiple packages is a major challenge.

Metro Structures. Artistic view of Metro Viaduct integrated with highway bridge

To manage this, the contracts included variation provisions, flexible design frameworks, and approval mechanisms for modifications. Building Information Modelling (BIM) was adopted for early and comprehensive visualisation, clash detection, and multidisciplinary coordination. Regular stakeholder meetings ensured early identification of conflicts with other Contract Packages and/or Interface Contractors, while contractual clauses defined the processes and procedures for compensation and extensions of time.

Moreover, the adoption of flexible and modular design standards helps in easier integration with the existing and additional requirements.

Complex Stakeholder Management

The Metro Rail Projects usually run through the busy and congested areas of the City, thus requiring robust coordination with multiple parties or stakeholders such as interfacing Contractors, utility agencies, consultants, regulatory bodies, public, associations, etc., who have different priorities and responsibilities.

The overlapping responsibilities and timelines of multiple stakeholders often lead to challenges in the timely completion of the Metro Project. Therefore, the structured coordination mechanisms, proactive engagement, and clear frameworks help in mitigating these risks to a great extent.

To minimize the risks due to multiple stakeholders, for the Chennai Metro Project, continuous stakeholder engagement and management are being undertaken. A structured and well-informed communication plan to ensure regular and timely communication of the Project updates to the respective stakeholders has been implemented. Regular Coordination Meetings, chaired by the Employer and the Consultant, are held for information to all concerned and also for the resolution of conflicts between the interfacing Contractors and stakeholders.

As mentioned above, all uncertainties and challenges are addressed promptly and systematically documented

during periodic reviews through a structured approach that actively involves all the stakeholders for identifying suitable mitigation measures. To overcome program deficiencies and to strengthen dispute resolution mechanisms, some of the practices discussed below have been implemented.

Baseline Programme

In a major infrastructure project like Chennai Metro Phase II, where as many as 65 construction contracts are in place with their own individual schedules, but interlinked in many ways, the overall schedule is a complex web. Each stage of the programme is monitored since an uncontrolled delay in one contract package impacts others and may result in them going beyond control. Hence, a logically linked Baseline Schedule linking all individual packages into one was done, and that became the main document to monitor and control the progress of each individual package. The Baseline Schedule plays a vital role in assessing and determining the entitlement to the Extension of Time. Even though the Baseline Schedule is of great importance in the context of delivery of the individual packages and ultimately the whole program, there are issues at times, since an individual schedule may have some deficiency or issues, such as incomplete scope coverage, sequencing of activities, missing links between design, interface, and third-party approvals, and unrealistic durations for construction and commissioning. Technical flaws like open-ended activities, excessive constraints, and errors in calendar setup further compromise the integrity of the Baseline Schedule. These deficiencies can lead to inaccurate progress tracking, misaligned resource planning, thus undermining the delay mitigation frameworks and ultimately resulting in disputes over attribution of delay, eventually affecting timely project delivery and contractual compliance.

To mitigate these challenges, it is essential to establish robust planning protocols that include multi-level scheduling, critical path analysis, and volumetric progress measurement. To control the same, in Chennai Metro Phase II Program, Baseline Schedules are reviewed against constructability, execution strategy, and resource logic, and wherever inconsistencies are found, they are jointly addressed and resolved along with the Contractor in a collaborative manner to remove/rectify them. Regular updates, rolling schedules, and recovery plans are implemented to reflect the actual progress and adapt to unforeseen changes. Delay analysis techniques—such as Time Impact Analysis and As-Planned vs As-Built comparisons—are being used to assess impacts and support Extension of Time (EOT) claims. A collaborative review process between Contractors and Engineers, backed by documented evidence and transparent communication, is being pursued for maintaining schedule reliability and contractual alignment.

In line with the above standard principles, at Chennai Metro Rail Limited, all the delay events, irrespective of the accountability, are documented and analysed, for identification of probable impacts on the completion of the Project. Based on the analysis, recovery plans and measures are implemented for reducing the impact to the extent possible. Since the causes and impacts of events that are delayed are properly documented, validation of claims with evidence and evaluation of extension of time applications can be determined with increased accountability and reduced disputes. It is pertinent to note that due to all the above proactive measures, the Employer and the Engineer can assess, determine, and agree with the parties on the Extension of Time.

Adoption of Multi-layered Dispute Resolution Mechanisms

To minimize and avoid immediate recourse to arbitration or litigation and to ensure structured resolution of disputes, standard forms of contract such as multi-tiered Dispute Resolution Mechanisms were embedded, consistent with FIDIC principles but adapted to CMRL's context. The sequence for the dispute resolution that is followed is:

- **Engineer's Determination:** Based on consultations with both parties and contemporaneous records,

the Engineer issues fair determinations, which are binding unless contested.

- **Standing Grievance Redressal Committee (SGRC):** An Employer-constituted Standard Grievance Redressal Committee, comprising senior in-house officials, provides an additional level of redressal before more formal frameworks.
- **Dispute Board (DB):** Independent external experts from a pre-approved panel render impartial decisions based on documentary evidence and party submissions.
- **Mediation:** Provides a final opportunity for amicable settlement before arbitration.

This layered approach ensures that most disputes are resolved during the contract execution itself, without stopping any works or deferring claims until project closeout. Arbitration is being treated as the last resort.

The SGRC or DB delivers its decision based on documentary evidence and the submissions of the Parties. Such decisions are binding unless further challenged. Where dissatisfaction persists, the Parties are afforded an opportunity for amicable settlement through Mediation before invoking arbitration.

This structured, multi-tiered approach is working to ensure that a significant proportion of disputes are resolved at preliminary stages—through the Engineer's Determination, SGRC, and occasionally through DB until now, thereby reducing the incidence of arbitration. Notably, disputes are being addressed contemporaneously during the currency of the Contract, without impeding the progress of Works or deferring resolution until the completion of the Project.

Conclusion

Chennai Metro Rail Phase-II demonstrates that uncertainties inherent in large urban infrastructure projects can be mitigated and effectively managed through clear contractual provisions and, above all, proactive management and a collaborative approach. Robust baseline scheduling, continuous monitoring and updating of the schedules, collaborative approach to seek course correction in parts to avoid idling of critical and expensive resources, systematic and robust documentation including effective utilization of new digital technologies, and multi-tiered dispute resolution mechanisms—ranging from Engineer's Determination to SGRC, DB, and Mediation, all enable timely resolution of claims without delaying execution. This approach reduces reliance on arbitration, enhances accountability, and supports the timely delivery of vital public transport infrastructure.

17

Force Majeure, Frustration & Beyond: Evolving Contractual Clauses for an Unpredictable World

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Introduction

Care and precision are exercised while framing contractual clauses, allocating risks, assigning obligations, and providing remedies in events of breach; however, contracts are vulnerable to unforeseen events, which can make performance difficult and at times impossible, impractical, or commercially unviable. To address and cater to such contingencies, two legal principles have historically played a central role: the **Doctrine of Frustration** and **Force Majeure**.

The COVID-19 pandemic inherently brought out the limitations of these two doctrines. The pandemic led to the Government having to impose lockdowns, which resulted in disruptions in the supply chain and widespread business shutdowns. These prompted a flood of disputes over non-performance of contracts. Courts and Arbitral Tribunals worldwide were faced with a glaring question, i.e., whether such an unforeseen event gave an excuse to the parties from non-performance and the consequent liabilities. COVID-19 also exposed the inadequacy of the traditional force majeure clauses being used in contracts and highlighted the need for evolving contractual frameworks in an unpredictable world.

This article discusses the legal Doctrines of Frustration and Force Majeure, their evolution, especially in the wake of COVID-19, and suggests key elements that should be incorporated into force majeure clauses, keeping in view the uncertainties that are inherent in life.

Doctrine of Frustration: Concept and its Origin

Frustration occurs when an unforeseen event, which occurs after the parties have entered into a contract, makes performance of the contract impossible, illegal, or completely different from what was originally intended. The unforeseen event changes the nature of the contract drastically. Unlike force majeure, frustration arises as an implied principle of law.

The principle of frustration originates from the English common law and experienced major growth in the nineteenth century. The landmark English case *Taylor v. Caldwell* (1863) laid the foundation. In this case, a music hall hired for concerts was destroyed by fire before a series of concerts could occur. Thus, the contract could not be executed as the subject matter of the contract had been destroyed. The court ultimately held that the contract was discharged as performance was rendered impossible without the fault of the parties.

Krell v. Henry (1903) is another landmark decision on the doctrine of frustration. This case involved a dispute

over a contract for the rental of a room to view the processions for King Edward VII's coronation. When the coronation was suddenly postponed, the planned event, which was the foundation for the contract, could not take place. The English Court of Appeal held that the contract was discharged due to the frustration of purpose. Thus, with this case, the frustration doctrine was extended to cases where the commercial purpose of the contract was defeated. The ripple effect of the *Krell v Henry* (supra) decision resonates and can be discerned in cases even today.

Indian Position

In India, the doctrine of frustration is codified in **Section 56 of the Indian Contract Act, 1872**, which provides that

> "*A contract to do an act which, after the contract is made, becomes impossible, or, by reason of some event which the promisor could not prevent, unlawful, becomes void when the act becomes impossible or unlawful.*"

In other words, if an unforeseeable event occurs after the parties have entered into the contract, and such an event cannot enable the contract to be performed, then the contract becomes void, is terminated, and both parties are then excused from performing the contract.

Parallelly to the Indian Contract Act, 1872, the common law principles have also played a vital role for development of the frustration doctrine in India, which has evolved over a period of time through various judicial pronouncements, recognising that a contract can be discharged if the happening of a particular event makes it impossible to perform the contract or alters the nature of the contractual obligations to an extent that it would be inequitable of the parties to go on with the agreement they entered into.

The Hon'ble Supreme Court's judgment passed in the case of *Satyabrata Ghose v. Mugneeram Bangur & Co.* is a landmark judgment that significantly clarified the scope and application of the doctrine of frustration under the Indian Contract Act. The Hon'ble Supreme Court held that frustration occurs only when a supervening event, without the fault of either party, renders the performance of the contract impossible or fundamentally alters the nature of the obligations undertaken. The Court clarified, however, that temporary impediments, delays, or mere commercial hardship is insufficient and do not necessarily frustrate the contract, when the core object of the contract remains achievable.

In *Alopi Parshad & Sons Ltd. v. Union of India*, the Hon'ble Supreme Court held that market fluctuations and increased costs do not amount to frustration.

Therefore, three basic conditions are needed to satisfy the doctrine under Section 56:

a. there must be a subsisting contract,
b. some part of the contract is still to be performed, and
c. the performance has become impossible after the contract is entered into, due to a supervening, unforeseeable event.

This doctrine holds significance in Indian Law as it acts as a safeguard and protects the parties from being obligated to compensate for unforeseeable events.

Force Majeure: Definition and Purpose

Force Majeure (from French, meaning "**superior force**") refers to contractual provisions that excuse or suspend performance of contractual obligations when extraordinary, unforeseeable events beyond a party's control prevent fulfillment of such obligations. In other words, a force majeure clause in a contract may relieve the parties from performance of the contract on the happening of an event over which they have no control. Unlike frustration, force majeure depends on contractual agreement and allows parties to tailor remedies.

Typically, force majeure clauses in contracts define triggering events or "force majeure events", such as natural disasters, wars, epidemics, etc. The force

majeure clauses in a contract also set out notice and mitigation duties, and prescribe remedies in case of the occurrence of any force majeure event, such as suspension of the contract, time extensions, or termination.

Judicial Interpretation

Courts generally interpret force majeure clauses in *stricto sensu*. In *Energy Watchdog v. CERC*, the Hon'ble Supreme Court held that mere commercial hardship does not constitute a force majeure event unless expressly covered in the provisions of the contract. The Court reiterated that the party invoking force majeure must show that the event was beyond its control and rendered performance impossible.

Evolution of Force Majeure Clauses: Pre-COVID Trend

Traditionally, force majeure clauses focused on natural disasters ("acts of God") and political risks (war, strikes, acts of terrorism). **Pandemics** or public health emergencies were rarely listed explicitly in contractual force majeure clauses.

Impact of COVID-19 on Force Majeure clauses

COVID-19 completely reshaped force majeure clause drafting worldwide. Clauses now expressly include "pandemics, epidemics, public health emergencies, quarantines, lockdowns" as triggering events/ force majeure events.

Thus, while pre-COVID force majeure clauses were broadly drafted, covering mainly "acts of God", or political risks such as war and strikes, leaving pandemics and health crises largely unaddressed and open to interpretation, post-COVID force majeure clauses have become highly specific, expressly listing pandemics, epidemics, public health emergencies, quarantines, and lockdowns as force majeure events.

Judicial Approach to COVID-19

In the wake of COVID-19, several High Courts of India grappled with force majeure claims. In *Halliburton Offshore Services v. Vedanta Ltd.*, the Delhi High Court recognized lockdown as a force majeure event, granting interim relief from encashment of bank guarantees and excusing Halliburton from having to continue to perform its obligations during the period of lockdown. Similarly, in *Standard Retail Pvt. Ltd. v. G.S. Global Corp.*, the Bombay High Court acknowledged that restrictions imposed by the government due to COVID-19 would constitute force majeure.

In the case of *Transcon Iconia Pvt. Ltd v ICICI Bank*, the Bombay High Court, while determining whether the moratorium period would be excluded for NPA classification, observed inter alia as under:

'38… the period of the moratorium during which there is a lockdown will not be reckoned by ICICI Bank for the purposes of computation of the 90-day NPA declaration period. As currently advised, therefore, the period of 1st March 2020 until 31st May 2020, during which there is a lockdown, will stand excluded from the 90-day NPA declaration computation until — and this is the condition — the lockdown is lifted.

Therefore, the common observation amongst the Courts in India remained that the Covid-19 pandemic is a force majeure event**.**

Executive Approach to COVID-19

Similar to the private sector, the Government contracts and the Public Sector transactions were also adversely impacted on account of the Covid-19 pandemic and imposition of lockdown throughout the country. To address this peculiar situation, the Ministry of Home Affairs came out with a Notification dated 19-02-2020, declaring that the interruptions in the supply chain due to COVID-19 from China or any other country shall be covered under the ambit of force majeure.

Similarly, the Ministry of New and Renewable Energy vide Office Memorandum dated 20-03-2020 declared Covid-19 as a force majeure event, and granted time extensions with regard to the scheduled commissioning date of Renewable Energy projects, in light of the disruption of the supply chain due to the pandemic.

The Ministry of Roads, Transport and Highways, also in its Circular dated 18-05-2020, classified the pandemic as a force majeure event.

Beyond Force Majeure: Hardship & Related Clauses

Hardship Clauses

Hardship provisions, recognized in civil law systems and under the **UNIDROIT Principles of International Commercial Contracts (2016)**, address situations where performance, though possible, has become excessively onerous due to unforeseen events. A hardship clause in a contract allows the parties to modify or excuse their obligations when one party experiences a hardship which causes that party's circumstances to change to such a degree that the party is unduly burdened and cannot meet its contractual obligations. Such clauses provide for renegotiation of the terms of the contract in the event of hardships, and essentially offer a middle ground between frustration and force majeure.

Material Adverse Change (MAC) or Material Adverse Effect (MAE) Clauses

MAC (or MAE) clauses, which are common in finance and M&A, allow termination of the contract in the event unforeseen events fundamentally alter a party's financial or operational standing. During COVID-19, MAC clauses were widely invoked to renegotiate acquisitions and lending agreements.

Looking Ahead: Contracting in an Unpredictable World

The increasing frequency of global disruptions, climate change, pandemics, cyber threats, geopolitical tensions, etc., highlights the need and importance of drafting comprehensive, resilient contracts. Based on recent jurisprudence and commercial practice, it is suggested that effective force majeure clauses should include:

a. A **comprehensive, exhaustive definition of force majeure events**;

b. Causation Standard, i.e. clauses must specify whether performance must be "impossible," "illegal," or "substantially hindered". The consequences to follow can vary on the basis of the respective causation standard.

c. Notice & Communication Obligations. Clauses should provide for mandatory prompt written notice with details of the event, impact, and expected duration;

d. Tiered Remedies such as suspension, extension of time, partial performance, renegotiation, and termination as a last resort; and

e. Interaction and alignment with other Clauses, such as hardship, termination, and MAC provisions, to avoid overlap.

Conclusion

The doctrines of frustration and force majeure reflect the law's effort to balance contractual certainty with the inherent unpredictability of life. Although frustration remains a narrow judicial doctrine, it operates on an all-or-nothing discharge when performance becomes impossible. In contrast, force majeure is a flexible contractual device that allows parties to allocate risks in advance and prescribe tailored remedies.

The COVID-19 pandemic served as a turning point, compelling businesses and legal practitioners to revisit standard clauses and incorporate broader, more precise, and adaptive drafting. Going forward, effective contractual drafting must not only excuse non-performance but also facilitate renegotiation and continuity.

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Egypt's New Delta Wastewater Treatment Plant: A Giant Step for Clean Water and Agriculture

Egypt has built the world's largest wastewater treatment plant in the El Hammam area on the North Coast. Completed in 2023, the New Delta Wastewater Treatment Plant is a massive project designed to clean used water and help grow crops in the desert.

Every day, the plant treats 7.5 million cubic meters of agricultural drainage water. This water comes from the old Delta region and travels through a 174-kilometer canal, which is considered the longest artificial river in the world.

The treated water is used to irrigate up to 2 million acres of land in the Western Desert. This helps Egypt grow more food, reduce pollution in lakes and the Mediterranean Sea, and create new farming communities.

The project also helps protect the environment. By managing floodwaters and wastewater, it prevents land from sinking and reduces the need to release water from the High Dam during rainy seasons.

Built by a team of Egyptian companies, the plant earned four Guinness World Records, including the largest sludge treatment facility and the biggest epoxy-coated structures.

Costing $522 million, the plant is part of Egypt's long-term plan to improve water use and support sustainable development until 2050.

'Excerpts from several sources'

18

Fixed Budget-Based Contract for Works and Services - An Elaboration for Better Understanding

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Introduction

This has reference to the Circular[1] issued by the Government of India in reference to the General Financial Rules (GFR)[2], on "General Instructions on Procurement and Project Management", from the Procurement Policy Division, Department of Expenditure, Ministry of Finance, Government of India, dated 29th October 2021 (No. F.1/1/2021-PPD). Clause 15 therein is elaborated here for the understanding of the provision/ instruction issued in reference to Rule 6(1) of the GFR to overcome certain difficulties in the procurement of services and works for various special projects.

The Government circular clearly indicated the concerns expressed by CVC (Central Vigilance Commission), CAG (Comptroller & Auditor General), and the National Institution for Transforming India (NITI) Aayog about the procurement and project management being followed, and CVC even prepared the document on "Reforms in Public Procurement and Project Management". All these have been directed towards new mechanisms/ strategies of procurement to overcome the challenges, and also suggested exploring the possibilities of employing alternative procurement methods. Accordingly, the Department of Expenditure (DoE) issued the circular with the instructions within the meaning of Rule 6(1) of the GFR for empowering executing agencies to take effective decisions in public interest, not only without favour but also without fear.

Additional Methods of Procurement

The "Additional Methods of Procurement" given in the circular describes the Fixed Budget–based Selection (FBS) for Consultancy Services also. The GFRs of 2017 provide three methods for the selection or evaluation of consultancy proposals as

1. Quality and Cost Based Selection (QCBS),
2. Least Cost System (LCS), and
3. Single Source Selection (SSS).

Fixed Budget-based Selection (FBS)

The circular dated 29th October 2021 (No. F.1/1/2021-PPD) has introduced the Fixed Budget-based Selection (FBS) for works and consultancy services. That method of selection for a contractor/ consultant is being elaborated in this article.

While petty contracts of material supply, or routine works, etc., for government departments will probably follow the LCS method, all other projects of substantive nature with a requirement of legitimate qualification and experience of the party to be entrusted for the work, are to follow the QCBS method of procurement.

For specialised types of works and services, where competition is in terms of capability (qualification, capacity, and experience) required to deliver, the Fixed Budget-based Selection (FBS) has been allowed for both consultancy services as well as works. Under this method, the cost of the services or works shall be specified as a fixed budget in the tender document itself. In case of consultancy work, the cost is to be estimated by relevant expert(s) based on the total effort that would be required for preparing the consultancy report (for fulfillment of the scope), like a detailed design report or any such other report for a specialised technical work. In case of non-consulting services like construction works, the budget for the works would be known from the Detailed Project Report (DPR) prepared before going to the FBS procurement process, using the Schedule of Rates (SOR) or rate analysis, or the market rates. Thus, the circular states that the FBS may be used for services and works, as follows:

1. When the scope of consultancy or works required can be precisely defined without any ambiguity;
2. When the budget can be reasonably estimated accurately and set based on reliable cost estimates and /or any previous case of successful execution of similar projects; and
3. When the budget is considered sufficient for the consultant or contractor to perform the assignment, delivering the scope in complete quality and content.

Selection of Consultant of Contractor under FBS

It is very important to understand that under FBS, the selection of the consultant or contractor is to be made by one of the two methods:

1. By a competitive selection process, strictly based on quality (i.e., qualification, capacity, and experience of the consultant or contractor), using specific marking criteria for quality in the manner indicated in Rule 192(i) of the GFR. All these details of the marking scheme are to be included in the invitation of the bid itself, and these bids will be received without any financials. The proposal with the highest technical score (in terms of qualification, capacity, and experience for the project) shall be considered for placement of the contract.
2. In case of repetitive or multiple assignments, the Public Authority may like to empanel a group of suitable consultants/ contractors, through an open advertisement process specifying quality criteria (i.e., specified qualification and experience). Thereafter, the selection of a specific consultant/ contractor for a specific assignment can be from such a panel. But, that shall be based on the FBS process and with overall consideration of the members from the empanelled list based on merit in terms of timeliness, practicability, number of other assignments completed, etc.

The steps of the FBS process of procurement, as given above, are unambiguous for the bidders as well as the Public Authority/ Client. Even then, in most cases, Public Authorities/ Clients are uncertain and not prepared to adopt the FBS process of procurement in a large number of the most important projects. Therefore, a few recommendations are provided as guidance for adopting the FBS selection process.

Recommendatory Notes for the FBS Process

Recommendatory Notes for the FBS process of procurement to be successful:

1. The FBS process for procurement can be adopted for both consultancy services as well as for construction works.
2. A most appropriate and accurate budget estimate is required to be prepared for the assignment of the services or works for which the FBS procurement process is to be adopted. The cost estimate for the services or works must be the most accurately prepared, whether it be for consultancy or construction works. It may be required to be prepared by a relevant specialist or organization

with long experience in the specific domain area for a consultancy service. In case of budget for construction works, an accurate cost estimate shall be prepared through a detailed project report, i.e., DPR, by using relevant SOR, rate analysis, and market rates.

3. The scope of work for the assignment (services or works) should be very explicit and abundantly clear in every possible way without any hidden or implied scope of work, even in the case of a very specialised type of work. Further, there must not be any ambiguity in the scope of work, which can be interpreted differently.

4. In the invitation of the bid for FBS process of procurement, which is to be based on quality only (i.e. qualifications, capacity and experience of the bidders), the various parameters of qualification and experience that are going to be marked with their levels/ grades are to be indicated clearly (in the manner indicated in the Rule 192(i) of the GFR) so that the bidders themselves are also able to evaluate their own bids.

5. The whole essence of the FBS process of procurement is to eliminate the possibilities of low-quality delivery by a lowly paid and dissatisfied consultant or contractor. In those cases, the consultant/ contractor does not take any pride in delivering the assignment, as it is not the best they have delivered.

6. The FBS process of procurement does not absolve the Public Authority/ Client or the Consultant/ Contractor of all other routine contractual obligations, and those are to be followed more meticulously to achieve the best result from the FBS method.

7. The success of any project is also dependent on the quality of the tender document, where enough clarity on the broad framework as well as the detailed scope for execution of the services or works is given explicitly in sufficient detail. It must also include all the obligations of both the consultant/ contractor as well as the Public Authority/ Client.

8. The delivery milestones and schedule of payment to the consultant/ contractor should be made in consonance with the progress of work and commensurate to the required cash flow for the consultant/ contractor, to ensure planned progress of their works. Thus, milestones for payment to the consultant/ contractor should be linked to the deliverables, completion of an activity, completion and acceptance of any part of the works relating to the project.

9. If in the FBS method, since the detailed design is made the responsibility of the contractor, there should be a very strict schedule of submissions of the site/ field investigation reports, laboratory test reports, detailed design, drawings, and their approval by the Client. Liquidated damages must be specified for any delay from either party, which must be legally supported and very strictly accounted for. The Project Executing Agency may not have the capacity to check the designs for approval as per the schedule set in the bid/ contract and would thus be subjected to penalty (which may be in various forms). Therefore, a team of experts (at least two or more) could be hired separately for each project being executed as per the FBS method, for timely approval to avoid penalty, and to maintain intensive examination of the submissions by the consultant/ contractor. The consultant/ contractor shall have the complete freedom to optimize the technical solutions for the project, but without any compromise and deviation from the prescribed and established standards and specifications stipulated in the contract. The team of experts should approve any innovative technical solution on behalf of the Public Authority/ Client based purely on quality (technical acceptability) and merit in terms of economy, safety, and security.

10. The construction projects normally have many stages where decisions and approvals are to be given by the Client during project execution to the consultant or the contractor. Due to a lack of capacity, the Public Authority/ Client may not be able to make decisions promptly. All such delays have serious implications in terms of time and

cost overrun in projects, which result in financial and time extension claims by the consultant or the contractor. Such matters remain buried due to other pressing issues relating to the project, which demand attention. In the interest of the project, all such delays in taking decisions and conveying approval should be eliminated by taking the help of hired experts as indicated in (ix) above.

11. In addition to all the actions listed above, the Project Executing Agency needs to ensure quality by regular inspection and quality checks, especially linking such inspections to the critical stages of the project. Wherever possible, all such inspections should be scheduled in the contract itself. None of the inspections should be avoided or missed for any reason, to ensure the best results, as aimed for, are derived from the project.
12. Digitalisation of Project Management and Monitoring, as also called for in the GFR, would help in drawing attention to actions to be taken, decisions to be given, activities/ tasks to be performed by each party/ agency related to a contract, and thus, prevent time and cost overrun to a large extent.

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COAL INDIA LIMITED (CIL) PLANS DATA CENTRES IN CLOSED MINES TO BOOST INFRA, SUSTAINABILITY

CIL was evaluating the potential of establishing data centres in its decommissioned mines, leveraging existing infrastructure to meet the country's growing demand for digital capacity while advancing sustainable development.

The state-owned miner had already taken steps for a comprehensive feasibility study by consultants, officials told PTI.

The exercise will include a conceptual study of setting up data centres in India with a special focus on their viability within decommissioned CIL mines.

The study will cover site assessments, preparation of a comparison matrix to evaluate identified locations, and a Preliminary Feasibility Report (PFR) for the most suitable site. Four sites across CIL subsidiaries Umrer (WCL), Saraipali in Korba (SECL), Himgir Rampur near Jharsuguda (MCL), and Nigahi (NCL) have been shortlisted.

Source: Excerpts from Business Standard

Ethics Corner

Vandana Randhawa
Chairperson
Ethics Committee, CEAI

Ethical Practices in the Consulting & Construction Industry - An ongoing Development

Approximately 6 years ago, in 2019, a large Canadian conglomerate, the SNC Lavalin Group, was embroiled in a groundbreaking controversy pertaining to allegations of bribery and unethical practices in the procurement of construction contracts in Libya. It was alleged that between 2001 and 2011, the Group and its international marketing arm paid millions to Muammar Gaddafi, the son of the Libyan ruler, with the intent of securing contracts for its unit[1]. The year 2019 proved to be significant because it was during this time that SNC Lavalin ceded to the charges and finally settled the matter by agreeing to pay 280 million (Canadian Dollars) as a penalty while being put under a three-year probationary period.

The issues raised and accepted by the Group purportedly shook the very foundation of the Canadian Government, while raising essential questions about the undue practices undertaken by various large companies to increase their outreach and business. Even though the Group saved itself from being permanently blacklisted by agreeing to settle the matter and undertake an internal overhaul of procedures, the case established a lesson for future contractors to refrain from practices that may call into question the very integrity of their companies.

The company was involved in cases in other countries, also. The World Bank had debarred it for 10 years due to bribery allegations related to its work on the Padma Bridge Project in Bangladesh and misconduct on a Cambodia project.. As a consequence of the organisation's image being marred by the many cases of bribery and corruption, SNC-Lavalin rebranded in 2023 to become AtkinsRéalis. It has implemented a comprehensive integrity program and has been recognized as a Compliance Leader by the Ethisphere Institute.

Understanding Ethical Practices in the Consulting & Construction Industry

Corruption erodes trust, weakens democracy, hampers economic development, and further exacerbates inequality, poverty, social division, and the environmental crisis[2]. It also escalates costs. Construction, being one of the most important growth facilitators of any economy, when plagued with the practice of corruption, endangers not only the economy itself but also threatens safety, public health, and trust. In such cases, ethics and ethical practices become key to the simultaneous growth of any country and its development.

A few of the ethical management practices expected from the players of the consulting and construction engineering industry include transparent and honest

practices, anti-corruption practices, and provisions for dealing with conflicts of interest.

While many companies and conglomerates have established procedures and practices for upholding the principles of ethics and integrity management in their day-to-day functioning, there have been instances, like the SNC Lavalin case, which have shocked the core of the industry with the gravity and scale of the offence and the high-ranking officials involved.

Corrupting Tender Processes

In a number of cases pertaining to unethical practices within the construction and consulting engineering sector, it has been found that the buck started at the tender process, with incumbent companies using money and other methods to cause undue influence within such procurement processes in their favour. One such case arose in the year 2021, when Amec Foster Wheeler Limited, a project, engineering, and technical services company, was charged with fostering a bribery scheme in Brazil. The charges filed were a result of the collaborative efforts of the Securities and Exchange Commission (SEC), USA, the U.S. Department of Justice, Brazil Controladoria-General da União (CGU)/Advocacia-Geral da União (AGU), the Ministério Publico Federal (MPF), and the United Kingdom Serious Fraud Office (SFO)[3]. While acceding to the charges, the defaulter company agreed to settle the matter by paying USD 43 million in relation to the scheme, along with an amount of more than USD 10 million to settle SEC charges.

A startling factor associated with the charges leveled against the defaulter company was that it continued to avail the services of the employee, who was knowingly engaging in corrupt activities for the sole purpose of expanding their business.

While the Amec Foster and the SNC Lavalin cases provide essential lessons for discouraging companies from engaging in unethical and corrupt practices, they also raise various questions about the existing deficiencies within the procurement procedures, which could be easily misused by the defaulters. Needless to mention, that in developing countries like India, the level of imperfections within the tender processes may be considerably higher, while the risks may also be greater.

Corruption and Blacklisting – Understanding the Consequences

In all the aforementioned cases, before the defaulter companies settled the allegations, they were initially under the threat of being blacklisted from participating in future procurement processes, at national and international levels. 'Blacklisting', as the name may imply, causes severe damage to the reputation and work, not only of the company, but of the many employees associated with different projects.

Under the procurement procedures established by the World Bank, blacklisting of any contractor company will render the same ineligible to participate in future bids for a determined time period. In the Indian legal jurisprudence, blacklisting, like any other law, is subject to judicial action, wherein the Court, if satisfied, may reverse or affirm the decisions of the authorities, subject to whether the principles of natural justice were followed at the time of the blacklisting. In the case of **Erusian Equipment & Chemicals Ltd. v. State of West Bengal and Anr**[4]., the Hon'ble Supreme Court of India observed that,

> "Blacklisting has the effect of preventing a person from the privilege and advantage of entering into a lawful relationship with the Government for purposes of gains. The fact that a disability is created by the order of blacklisting indicates that the relevant authority is to have an objective satisfaction. Fundamentals of fair play require that the person concerned should be given an opportunity to represent his case before he is put on the blacklist."

In another case, **Kulja Industries Limited v. Chief General Manager W.T. Proj. BSNL & Ors**[5], the Hon'ble Court, while affirming the decision of

blacklisting of the Appellant Company for corruption allegations, directed the Respondent Authority to,

"For the sake of objectivity and transparency, formulate broad guidelines to be followed in such cases *(blacklisting*). Different periods of debarment depending upon the gravity of the offences, violations, and breaches may be prescribed by such guidelines. While, it may not be possible to exhaustively enumerate all types of offences and acts of misdemeanour, or violations of contractual obligations by a contractor, the respondent-Corporation may do so as far as possible to reduce if not totally eliminate arbitrariness in the exercise of the power vested in it and inspire confidence in the fairness of the order which the competent authority may pass against a defaulting contractor."

Even though the Indian Court has followed the principles of justice in holding the law of blacklisting in the aforementioned cases, it is necessary to highlight the strong stance taken by the judiciary against acts of corruption in Indian contracts. Needless to say, international organizations, like the World Bank and the Asian Development Bank, have also established a clear stance on unethical practices.

From a bare perusal of the aforementioned cases and consequences, it may be reasonable to infer that any allegation of corruption or unethical practice may cause a company to suffer such consequences, which may not only lead to severe loss of reputation but also a considerable loss of financial turnover. The consequences also affect the future of employees of the company.

Embracing the Bright Side

At this juncture, it may be appropriate to mention that while the aforementioned cases highlight the few negative pictures within the industry, not all is dark. With the ongoing transformation of the construction and consulting engineering industry, many leading companies are actively adopting anti-corruption and ethical practice codes, while strongly opposing any acts that may raise questions with respect to their functioning and reputation. Digitalisation of Project Management processes and procedures and financial transactions would go a long way in minimising, if not eliminating, fraudulent practices. They would also greatly contribute to ensuring the quality of design and the works executed, as well as make accountability transparent.

Efforts are being made by prominent players to uphold transparency, honesty, and fair practices. Not only this, but various international organizations like FIDIC and domestic ones like CEAI have also been promoting the adoption of the established Code of Ethics to govern the day-to-day affairs of their member companies, thereby actively working towards transforming industry practices for the better.

As per the Code of Ethics established by FIDIC, it is the responsibility of the Consulting Engineering Industry to:

a. Act at all times in the legitimate interest of the client and provide all services with integrity and faithfulness;

b. Neither offer nor accept any remuneration of any kind which in perception or in effect seeks to affect the consulting engineer's impartial judgment or to influence the process of selection or compensation of the engineer; and

c. Cooperate fully with any legitimately constituted investigative body which inquires into the administration of any contract for services or construction. [6]

Complementing this global framework, the CEAI Code of Ethics serves as a robust national standard, guiding Indian consulting engineers to uphold integrity, accountability, and fairness in every engagement.

Its Preamble says:

Engineering consultancy services make significant contributions to the economic growth and sustainable

development of the nation, and in safeguarding the health, safety, welfare, and happiness of society.

For the nation and the society to derive maximum benefits from engineering services, it is essential that, in addition to being of high technical standards, the services provided are of the highest universally accepted moral and ethical standards.

With a view to achieve the stated objective, the Consulting Engineers Association of India (CEAI) has framed a "Code of Ethics" which is mandatory for all members of the Association to adopt and abide by.

This Code presupposes that every member of CEAI is a law-abiding, truthful, honest, fair, and just citizen of society. In addition, the member must follow the directives of the Code in his/her professional practice."[7]

It spells out Responsibility to Society, Responsibility to Profession, Integrity, Impartiality, Relations with Other Consultants, Relation with Clients, and Relation with Employees.

Every Member, be it an Individual or an Organisation, is required to sign an undertaking to abide by the Code of Ethics and the Rules of the Association of CEAI.

The provisions of the code have been designed in an intricate manner to deal with the various instances being raised with respect to the shortcomings of the consulting engineering industry. That said, it is important to note that cases continue to emerge where acts of bribery, corruption, conflicts of interest, etc., arise.

All hope may, however, not be lost, as with all the effort and labour being put in place by organizations and industries, on their own, and with the many codes being established with the ongoing transformation of the industry, the mode and means of operations, it is expected that such labour will bear fruit.

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CEAI NEWS

⌘ CEAI ACADEMY

Webinar on "BIM, Digital Twin, XR & Power BI in Project Management"

Under the banner of CEAI Academy, CEAI-WRC organised a webinar on ***"BIM, Digital Twin, XR & Power BI in Project Management"*** on the 3rd July 2025 to highlight the technical advancements in the essential digital tools and technologies that are transforming how engineering projects are executed – faster, virtually error-free due to interconnections with all stakeholders, and hence are smarter. Five speakers delivered enlightening and captivating presentations that had an audience of over 300. They demonstrated how project execution could be improved with better, timely interaction leading to better collaboration amongst the stakeholders; keeping planning updated and streamlining the workflows to meet the schedules; progress can be seen by all concerned; and they also result in improved decision making vis-à-vis project requirements and activities; and contribute to the furtherance of HSE.

Mr Charles Simoes was the Moderator. Mr. Simoes is an Adjunct Faculty at the Sardar Patel College of Engineering for MTech classes in Structural Engineering and Construction Management. With his vast experience, he was able to appropriately guide the speakers.

Mr Krishna V Karve, BIM Coordinator at Techture Structures, Nagpur, presented on *Building Information Modelling (BIM)*, which is referred to as Multi-Dimensional Modelling in the Process Industry, a smart, 3D model-based process. He explained how it provides professionals, be they architects, engineers (all disciplines), field personnel for construction/ erection, operations, and maintenance, with the insight and tools to boost efficiency in planning, designing, constructing, and managing urban areas, buildings, infrastructure, industrial plants, etc. The integrated BIM model enables cross-disciplinary collaboration on one model. That enhances understanding of inter-disciplinary impacts, helps avoid conflicts, and ensures adequate space for construction, erection, and maintenance. The system also meticulously records all changes and their originators. Post-completion, the BIM model becomes a comprehensive record for all future maintenance, making it an essential requirement for nearly every engineering project today.

Mr Varunkumar K Panchal, Project Manager BIM & Digital Engineering at Sanghvi & Associates Consultants Pvt. Ltd. (SACPL), then dwelt on the next development - *Digital Twin,* which seamlessly picks up where BIM leaves off. It uses the physical model to provide real-time data for simulation. He explained how Digital Twins can be invaluable for the integration, testing, monitoring, and maintenance of physical assets.

Mr Suhas P Bhagwat, Founder & CEO, Avroglide Consultants, expounded on *Extended Reality (XR)*, a term used to collectively refer to the technologies of Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). They have applications in every field, including engineering, project management, and construction. They are unique due to the immersive experience they provide to the user. Deployment of XR applications helps in achieving enhanced operational efficiencies and effectiveness,

better adherence to safety and quality, as well as reduced operating costs. He showed how integration of XR with BIM or 3D Models of the facilities to be built brings in innovative benefits for project stakeholders, such as immersive visualisation of complex design and engineering aspects, enhanced construction workflows, and effective collaboration among project stakeholders, amongst other benefits.

Mr Tuhin Jana, DGM PMO, TATA Consulting Engineers Limited, introduced the *Power BI Desktop* and showed how it seamlessly integrates powerful interactive visualisations with robust data querying and modelling tools. It serves as the primary resource for creating and publishing reports to Power BI, providing crucial insights precisely when and where required.

Dr Amarnath C B, a recognised SME for Digital Transformation in the AECO sector, spoke about the *Bureau of Indian Standards' National BIM Guidelines* and how that helps in the transition from the existing digital platforms to BIM and beyond.

All the presentations were very well received, and there was good interaction..

Precursor Webinar on IRC Codes of Practice for Bridge Engineers

CEAI Academy organised a **Precursor webinar** on the ***"IRC Codes of Practice for Bridge Engineers"*** on 21st August 2025.

The session was held to give an insider's view of one of the most comprehensive training programmes on the IRC Bridge Codes. The Course Coordinators shared the following:

- Highlights of each training module
- Learning outcomes and real-world applications
- Insights into the latest revisions IRC Bridge codes
- Why this course is a must for bridge engineers

Panellists:

- Er. G. Sharn, SS (Retd.), MoRTH
- Er. A. K. Basa, Convenor, B-3 Committee of IRC
- Prof. Mahesh Tandon, Chairman, Tandon Consultants Pvt Ltd.
- Dr Harshavardhan Subbarao, Chairman & MD, Construma Consultancy Pvt Ltd.
- Er. I. K. Pandey, SS (Rtd.), MoRTH
- Mr S. K. Puri, SS (Retd.), MoRTH

Speakers:

- Er. Alok Bhowmick, MD, B&S Engineering Consultants Pvt Ltd
- Er. V. N. Heggade, Founder & CEO, DECON Complete Solutions
- Er. Amitabha Ghoshal, Advisory Consultant & Past President, CEAI
- Er. M. M. Ghosh, Consultant, INSDAG
- Er. R. S. Sharma, Former Secretary General, IRC & Past President, CEAI
- Er. M. V. Jatkar, Director, GILCON Project Services Ltd

Training Course on "Construction Law for Professionals"

CEAI Academy successfully organised a Training Course on ***"Construction Law for Professionals"*** from 23rd to 26th August 2025 at the India Habitat Centre, New Delhi.

Mr Prashant Kapila, President CEAI, inaugurated the course.

The faculty comprised Dr Milind Wankhede, Ms Sadiqua Fatma, Mr G C Kabi, Ms Eshjyot Walia, Mr Ishan Khanna, Mr Ramanjit Singh, and Mr Gagan Anand.

Mr. Prashant Kapila addressing the participants

Dr. Milind Wankhede delivering a lecture

Mr. Gagan Anand delivering a lecture

View of Participants

Speaker making a point

FIDIC Contracting Training Program

CEAI Academy conducted a "FIDIC Contracting Training Program" on 28th & 29th August 2025 at the India International Centre, New Delhi.

The trainers were Ms. Nino Tsaturova, Head of Contract Principles at the FIDIC Academy, FIDIC and Mr. Irakli Khergiani, President, Georgian Association of Consulting Engineers (ACEG), FIDIC Member.

The Faculty and the delegates

The Faculty being felicitated

Training on "Design of Chimneys and Stacks for Power Plants & Other Industrial Applications"

In keeping with India's decarbonization initiatives and the Net Zero 2070 target, CEAI Academy, in collaboration with CEAI Eastern & North-Eastern Region (CEAI-E&NER), launched a comprehensive Online Training Programme on "Design of Chimneys and Stacks for Power Plants & Other Industrial Applications". It was held on every Saturday and Sunday. It commenced on 30th August 2025 and ended on 27th September 2025.

For a country like India, with per capita demand for energy steadily rising, fossil fuel-based thermal power plants would remain relevant for the next few decades, along with a gradual and phased transition towards renewable energy. To mitigate the emission and dispersal of particulate matter from thermal power plants as well as other industrial establishments, such as iron & steel plants, oil & gas refineries, petrochemical plants, alumina, zinc, & copper refineries, cement plants, a crucial role is played by chimneys and stacks.

The 10-session series, spread across 5 weekends, brought together experts to deliver in-depth knowledge on the design, analysis, advanced design techniques, innovation, safety, and risk aspects in chimneys and stacks. The experts who delivered the sessions were Mr R L Dinesh, Former Discipline Head & Senior General Manager, TATA Consulting Engineers Limited, Mr Anirban Datta, Founder & CEO, PIMECAS Engineering Solutions, Dr Nirmalya Bandyopadhyay, Former Director, STUP Consultants Private Limited, and Dr K Suresh Kumar, Principal/Vice President, Global Consulting, RWDI

The course covered the types and functions of chimneys and stacks, the environmental and regulatory considerations, and did a deep dive into thermofluid dynamics, structural stability, load analysis, and vibration control. The course also explored advanced design tools like Computational Fluid Dynamics (CFD) and wind tunnel analysis, alongside dedicated sessions on both steel and RCC designs.

In addition to technical aspects, the program highlighted safety, risk mitigation strategies, and introduced emerging technologies and state-of-the-art construction methods. The final session focused on real-world case studies, helping participants relate theory to practical applications.

The course was designed for professional design engineers, academicians, and researchers from the energy sector, steel & metallurgical sector, oil & gas and petrochemical sector, and other process and manufacturing industries, engineering consulting organisations, as well as EPC firms. Some of the reputed firms that participated were Development Consultants Private Ltd., HOLTEC, Tata Consulting Engineers Ltd., MahaGenco, BSECPL, Spectrum World, EDEL, etc. Some students also participated.

Intensive Training Course on "IRC Codes of Practice for Highway Bridges"

CEAI Academy started a programme on "Intensive Training Course on 'IRC Codes of Practice for Highway Bridges" on the 5th September 2025. The training sessions are held every Friday and Saturday. It will conclude on 21st November 2025.

Workshop on "XR & AI in Engineering & Construction Industry"

Under the aegis of CEAI Academy, CEAI-WRC held a day-long workshop on **"XR & AI in Engineering & Construction Industry**" on 13th September 2025 at the IMC, Mumbai, which provided the opportunity to feel the immersive experience that XR offers and also see the power of AI, both of which can aid professionals in various areas.

Dr Harshavardhan Subbaro, Chairperson CEAI-WRC and Chairman & Managing Director, Construma Consultant Pvt. Ltd., graciously played the host and compered the workshop.

Mr Suhas P Bhagwat, Member of CEAI-WRC's Core Group, who helped put together the workshop, supplemented the important points shared by the speakers.

Mr Pawan Rallabandi, Business Unit Head – Digital and Advanced Technologies, Tata Consulting Engineers, made a thought-provoking presentation on the Usage of AI in Engineering and Construction, and how Artificial Intelligence is set to transform the industry's future. The session began with insights into current challenges and opportunities, underlining the critical shift from traditional design and construction practices to computation-driven methods. Usage of AI was mapped across the entire project value chain. In planning and design, generative design for plant layouts and buildings was highlighted for enabling faster and smarter decision-making. In engineering and documentation, automation of SLD and P&ID drawings was presented as a driver of efficiency and accuracy. The construction and execution segment emphasised AI-based Quality control and defect detection, and predictive safety management. The presentation also covered cases such as AI-powered virtual assistants for planning and design support, Intelligent SLD generation, Integrated AI Approach for Analysis, GenAI-enabled PFD-to-P&ID automation, AI-Powered Video Intelligence for HSE (Health Safety & Environment), underscoring AI's role in enhancing productivity, safety, and overall project excellence.

The *Use Cases of Extended Reality (XR) for the Engineering & Construction Industry* was very lucidly covered by Mr Suhas P Bhagwat, Founder & CEO, Avroglide Consultants. He started with the fundamental aspects of the three components of XR, namely Virtual Reality, Augmented Reality - Mixed Reality, and brought out the immense benefits that the industry has been securing through the deployment of XR-based solutions in its operations. He explained the scientific principles of the technologies, required to be understood by both the solution providers as well as the users, such as human sense and perception, accommodation & vergence, frame rate & latency, screen resolution, field of view, degrees of freedom, etc. He also dwelt on the need for the solution providers and the users to have a good understanding of the features and characteristics available with different XR Hardware devices so as to make a judicious choice for the given use case. Examples of XR applications for various functions in the value chain of industrial projects with a focus on Engineering, Construction and Plant Operations were presented with illustrations and video clips, which helped highlight the functioning and benefits of these applications.

Mr Himanshu Arora, the Co-founder & CEO, Dimensionless Technologies, in his presentation on *"AI Applications for Bidding and Proposal Processes for Engineering & Construction Projects"*, highlighted that while proposal development remains a critical activity for construction firms, the process has been persistently inefficient. He emphasised how AI-driven automation now represents a breakthrough with the potential to transform this longstanding challenge. He showcased a demo of PropelPro, a pioneering platform that automates the entire bid development process through four integrated modules: PropelScout for opportunity identification and market intelligence, PropelRead for tender document analysis with automated risk categorisation, PropelFlow for complete bid lifecycle management, and PropelWrite for AI-assisted proposal drafting leveraging insights from historical proposals.

During the demonstration, he explained that PropelPro has been specifically engineered for construction and engineering requirements and is currently delivering results for prominent industry leaders, including Thermax, KEC International, Jakson Green, and Insolare Energy. He concluded by illustrating how the platform fundamentally transforms the proposal approach - from initial opportunity identification through to final submission - resulting in better quality bids, improved operational efficiency, and enhanced win rates in the competitive marketplace.

Dr Nishant Sinha, Co-founder and Chief Technical Officer (CTO) at KGraph AI Solutions Pvt. Ltd., delivered an engaging presentation and live demonstration on *"AI-Powered Video Intelligence for HSE Compliance and Risk Control in Project Engineering,"* showcasing how AI can fundamentally reshape enterprise video intelligence. He introduced BLUE, the company's flagship AI-powered video intelligence platform. Dr Sinha highlighted how state-of-the-art video compression (up to 98% reduction in storage) and vision-language models are transforming traditional CCTV into a proactive tool for safety compliance, operational efficiency, and risk control.

Thereafter, a live demo by Mr Ashish Mehta, Co-Founder and Director, effectively demonstrated practical use cases that covered manufacturing plants, fuel stations, and quick service outlets. Attendees witnessed how BLUE's AI agents go beyond object detection by enabling natural language queries such as "Show forklift near-misses from last week," and how the system generates real-time alerts, compliance checks, and operational insights.

The presentations also addressed industry challenges such as limited bandwidth, prohibitive GPU costs, and narrow use-case coverage, showing how BLUE's architecture overcomes these barriers with CPU-based edge devices and scalable GPU processing at the server. Participants had a first-hand view of how KGraph AI is enabling enterprises to move from passive monitoring to proactive, scalable, and cost-effective foresight.

Mr Rageeth R, Business Development Head, Bala Aatral Solutions Pvt. Ltd., talking about "XR for Enterprise: Accelerating Workforce Readiness and Operational Excellence," showed how XR solutions transform traditional industrial training across sectors such as defence, steel, automotive, energy, infrastructure, and manufacturing. XR solutions can address critical workforce challenges by bridging skill gaps, enhancing safety compliance, reducing training costs, and accelerating operator readiness. Supported by Aatral's DAXR analytics platform, organisations can track training performance, predict skill gaps, and ensure continuous workforce upskilling. The company has built end-to-end expertise in developing immersive simulators, training platforms, immersive visualisation solutions, and remote assistance applications.

During the Demo session, they showcased the VR Safety Training solutions designed to transform safety culture through consequence-based experiential learning. The demo featured modules on Fire Safety, Work at Height, and Electrical Safety, enabling trainees to virtually experience high-risk scenarios, understand the consequences of unsafe actions, and develop safe work practices - leading to measurable behavioural reinforcement and improved safety outcomes.

Delegates wore the headset and had the opportunity to experience the effectiveness of the immersive VR safety training.

Mr Chetan Kavdia, Hon. Secretary & Treasurer, CEAI-WRC and Managing Attorney, Secure Legal & Associates, at the close of the workshop, thanked the delegates for their active participation, some of whom travelled about 1000 km to attend the event and the several organisations that sponsored various functions of the Workshop.

The feedback from the delegates was very encouraging and confirmed the adage that self-experiencing is the best mode of learning.

Dr. Harshavardhan Subbarao making the opening remarks

Mr. Pawan Rallabandi presenting Usage of AI in Design & Construction

Mr. Ashish Arora demonstrating AI Powered Video Intelligence

Mr. Suhas Bhagwat expounding on XR

A lady delegate using VR-1

A delegate using VR-2

Mr. Himanshu Arora explaining use of AI for Bidding

A delegate using VR-1

Dr. Nishant Sinha on AI-Powered Video Intelligence

Delegates, Speakers & Organisers

⌘ CEAI EVENTS

Webinar on "Role and Opportunities for Engineers in Project Appraisal for Banks & Financial Institutions"

CEAI Future Leader Forum (FLF) organised a webinar on ***"Role and Opportunities for Engineers in Project Appraisal for Banks & Financial Institutions"*** on 4th July 2025.

Mr Indranil Aich, Managing Partner, AICH Appraisers Auctioneers and Valuers, put in perspective the critical role of professional and chartered engineers in project appraisal for banks and financial institutions.

Participants gained insights into statutory obligations, major engineering disciplines involved, and selection criteria for domain experts, Lender's Independent Engineer (LIE), and Techno-economic viability (TEV) specialists. The session also covered empanelment details with banks, reporting patterns, and key focus areas in financial and technical audits. Two case studies – one on coal mining and the other on a paper plant modernisation were presented to provide practical insights for professionals looking to excel in project evaluation and appraisal.

GYAAN SETU - A Knowledge Sharing Evening

CEAI-WRC collaborated with M/s. Shiv Aum Steels Ltd. and M/s. Jindal Steel Ltd **for "*GYAAN SETU - A Knowledge Sharing evening, Usage of Parallel Flange and Hollow Structural Steel Sections for Sustainability",*** which was held on 6th August 2025 at Hyatt Vastrapur, Ahmedabad.

Mr Rahul Vakil, Director VMS Projects Consultants Pvt Ltd and VMS Engineering & Design Services, made a presentation about CEAI and its activities.

Other speakers from CEAI-WRC who shared their experience by showcasing projects and design requirements were:

- Mr B B Gharat, Associate Vice President, Technology, Quality & Training, TATA Consulting Engineers Limited, who spoke on *"Usage of Parallel Flange and Hollow Structural Steel Sections for Sustainability"* and showed examples of projects where these sections have been used.

- Mr Dipesh Panchal, Senior Design Engineer, VMS Consultants, presented *"Case Studies of Projects with Parallel Flange and Hollow Structural Steel Sections"* and covered the details of design and fabrication.

- Mr Charles Simoes, Adjunct Faculty, Sardar Patel College of Engineering, Former Associate Director, Aker Solutions, explained the *"Design Provisions for Parallel Flange and Hollow Structural Steel Sections".*

There were over 100 attendees and the presentations were very well appreciated.

Dignitaries Lighting the Lamp

Mr. Rahul Vakil presenting about CEAI

Mr. B B Gharat making a presentation

Mr. Charles Simoes making a presentation

Mr. Dipesh Panchal making a presentation

View of the Audience

.Webinar on "Tackling Fraud and Corruption in the Infrastructure Industry"

CEAI organized a webinar on ***"Tackling Fraud and Corruption in the Infrastructure Industry"*** on 12th August 2025.

The Speakers, Mr. Nigel Krishna Iyer, Co Founder of myB4.ai, and Mr. Anil Iyer, Chartered Civil Engineer, shared their experiences and discussed:

- Levels of fraud and corruption in our industry
- How it is currently perceived and dealt with
- Why the mindset on the subject needs to be changed
- Practical measures on how consulting engineering companies can tackle the issue

Nigel Krishna Iyer

Anil Iyer

Indian Process and Eco Sustain Expo and Conference

CEAI participated as an exhibitor and a Supporting Association at the ***Indian Process and Eco Sustain Expo and Conference***, held from 22nd to 24th August 2025, at the HITEX Exhibition Centre in Hyderabad. CEAI's presence was a powerful statement, sparking meaningful conversations and reaffirming CEAI's vital

role as a catalyst for sustainable infrastructure and professional excellence.

CEAI's strategic objectives for the event were to elevate CEAI's profile as a thought leader, generate high-quality leads for membership and training, gather real-time stakeholder feedback, and forge new collaborations.

The outcomes speak volumes about CEAI's collective impact:

- Booth Footfall: 201 verified visitors
- New Membership Inquiries: 62
- Training & Certification Leads: 87 prospects
- Strong early interest in CEAI's Annual Conference 2025 from over 70 individuals and 15 companies.
- Initiated partnership discussions with five associations/ companies.

A key insight from the field highlighted the urgent need for CEAI to bridge vendors, project owners, and policymakers to address L1 procurement challenges, advocating for equitable practices. CEAI's booth became a hub for robust dialogue on these critical issues, showcasing CEAI's thought leadership in action.

Seminar on "Long Span Crossings and Their Sustainability"

CEAI-E&NER, jointly with the Indian Association of Structural Engineers (IAStructE) – Eastern Region, and in collaboration with M/s GPT Infraprojects Limited, organised a Seminar on ***"Long Span Crossings & their Sustainability"*** on 6th September 2025, at the HHI, Kolkata.

The book *'Vidyasagar Setu across Hooghly - a unique engineering feat*', authored by Er. Amitabha Ghoshal and Er. Subrata Basu was released by Smt. Antara Acharya, IAS, Secretary, Public Works Department, Government of West Bengal.

Er. Anirban Datta, Chairman, CEAI-E&NER, welcomed the 250+ participants. Thereafter, Mr. Alok Bhowmick, President, IAStructE and Vice President, CEAI, Er. Anirban Sengupta, Vice President (East), IAStructE, and Er. Chandrachudha Bhattacharyya, Honorary Secretary, E & NE Region, CEAI, also addressed the gathering.

The Keynote Address was delivered by Er. Shashank Rajbhoj, General Manager (Design), AFCONS Infrastructure Limited. He highlighted the various challenges that were associated with the Chenab Railway Bridge.

Dr Sumantra Sengupta, Deputy Director (Technical), B&S Engineering Consultants Private Limited, spoke on the Design considerations for long-span bridges. The talk covered seismic forces, wind effects, stability, and fatigue criteria.

Er. Alok Bhowmick, Managing Director, B&S Engineering Consultants Private Limited, presented a Case Study on Structural Assessment, Repair, & Rehabilitation of a 64-year-old railway bridge at Mokama, Bihar.

Dr Satish Jain, Managing Director, UHPC India Private Limited & Satish Jain Consulting Engineers Private Limited, delivered a lecture on the Use of High-Performance Concrete in Long-Span Bridges.

Er. Santanu Majumdar, Managing Director, Mageba Bridge Products Private Limited, spoke about Bridge Appurtenances in long-span bridge systems.

Dr Nirmalya Bandyopadhyay, Former Director, STUP Consultants Private Limited, spoke on the Construction methodology and its impact on the planning and design of long-span bridges.

Er. Amitabha Ghoshal, Former President, Consulting Engineers Association of India, & Former Director, STUP Consultants Private Limited, and Er. Subrata Basu, Executive President, HUTNI Projekt FM (India) Private Limited, focused on the review of long span cable stayed bridge planning and development with reference to the Vidyasagar Setu.

Er. Angshuman Pandey from Imagegrafix Software Solutions Private Limited, Mr Giri Prakash from

Freyssinet Menard India Private Limited, Mr Md. Zeeshan Alam from Midas Research and Development Centre India Private Limited, Mr Ashish Kumar Rai from Trimble Solutions India Private Limited, and Mr Shishir Kumar from SOFiSTiK India Private Limited also presented case studies.

Two Technical Sessions were chaired by Er. Amitabha Datta, Former Director, STUP Consultants Private Limited, and Er. Debendra Narayan Chatterjee, Managing Director, BABTECH Engineering Consultants.

The concluding session of the event was a Panel Discussion on Bridge Failure, moderated by Er. Syama Prasad Datta, Chief Engineer (Retd.), Public Works Department, Government of West Bengal. The other Panellists in the session were Er. Amitabha Ghoshal, Dr Nirmalya Bandyopadhyay, Er. Alok Bhowmick, Er. Anirban Sengupta, Er. Partha Gangopadhyay, and Er. Rajib Chattaraj, Fmr Chief Engineer (NH Wing), Public Works Department, Government of West Bengal.

Members of CEAI-E&NER, along with participants from Government Departments, Industry, Academia, and professional societies, had joined for the event. The participants were from the Public Works Dept, Government of West Bengal, CSIR-CRRI, Indian Institute of Engineering Science & Technology, Jadavpur University, National Institute of Technology, Durgapur, several Institutions, with very good representation from the private sector.

Lighting of the Lamp by the dignitaries

Address by Smt. Antara Acharya, IAS

Er. Anirban Datta, Chairman, E & NE Region, CEAI

Er. Shashank Rajbhoj giving the Keynote Address

Smt. Antara Acharya, IAS releasing the book

View of the audience

View of the audience

Lecture on Improvement of Road Safety in India

CEAI Future Leader Forum organised a lecture on ***"Improvement of Road Safety in India"*** on 11th September 2025. Mr Suvendu Seth, Transport Planner & Road Safety Consultant, was the Speaker.

Mr. Suvendu Seth spoke on Road Safety situation worldwide, Road Safety situation in India, UN Decade of Action on Road Safety, Approaches to improve Road Safety, Crash analysis, Causes of Road Crashes, Crash Data Collection, Treating Crash Locations, Safe System Approach, Difference vis-à-vis Conventional System, Ways to manage Speed, Vision Zero.

CEAI MEMBER NEWS

- Mr Alok Bhowmick, Vice President-CEAI, Chairman of CEAI Academy, and Managing Director of B&S Engineering Consultants Pvt. Ltd., was conferred the ACCE(I) – GOURAV Award 2025 by the Association of Consulting Civil Engineers (India) for his significant contributions to the Civil Engineering profession. The award was presented during the 33rd ACCE(I) Annual Awards function held in Puducherry on June 28, 2025.
- Mr V N Heggade, GC member, delivered the keynote address at the inaugural session of the Fib Symposium 2025, held in Antibes, France.
- CEAI Member Dr Makarand G Khare, Director, Terranova Consultants, delivered a presentation at the workshop on "Design and Construction of Diaphragm Walls" held on 11-12 July 2025 at Chennai.
- Mr Amitabha Ghoshal, Former President, CEAI, authored an insightful article titled *"A Blueprint for Building Bridges to Last," which was* published in *The New Indian Express*. The link to the editorial page is: https://www.newindianexpress.com/opinions/2025/Jul/29/a-blueprint-for-building-bridges-to-last
- Mr Prashant Kapila, President of CEAI, authored an article on a current topical theme, "India's infrastructure future: Building climate-positive, resilience-centric systems" published in Economic Times. The link is: https://etedge-insights.com/sdgs-and-esg/sustain-ability/indias-infrastructure-future-building-cli-mate-positive-resilience-centric-systems/
- Mr Sunil Srivastava, Managing Director, Balaji Rail Road System, authored *"Urban Connectivity: A cornerstone for sustainable and inclusive cities"* which has been published in Construction Times. The link is : https://drive.google.com/file/d/1ZL2tifJrug1Q-WiTfcIXX0Dr5zvvDQwP1/view?usp=sharing

- Mr Gagan Anand, Managing Partner, Legacy Law Offices LLP and Special Senior Standing Counsel, Government of Himachal Pradesh, has authored an insightful article titled "*Construction and air pollution – finding an environmentally sound way out*. which has been published in the August 2025 Edition of the prestigious Construction Law International (CLint) journal of the International Construction Law Projects Committee of the International Bar Association (IBA), United Kingdom. The link is:

  https://www.ibanet.org/document?id=CLInt-August2025

- **Holtec Consulting Pvt Ltd** (www.holtecnet.com) is proud to share a significant milestone achieved in the field of sustainable energy solutions for the cement industry. Our team has successfully completed a state-of-the-art Waste Heat Recovery (WHR) based power plant in **Malaysia**, harnessing the otherwise lost heat from cement manufacturing operations, to generate clean electricity. This achievement not only reflects engineering excellence and meticulous project execution but also demonstrates our collective commitment to energy efficiency, carbon footprint reduction, and long-term sustainability in the cement sector.

  This milestone is not only a testament to advanced engineering and seamless project execution but also a matter of pride for the Indian consultancy fraternity, showcasing our ability to deliver world-class sustainable solutions on an international stage.

⌘ FIDIC NEWS

FIDIC Asia Pacific Conference 2025 - Bali, Indonesia

The *FIDIC Asia Pacific Annual Conference 2025* took place from August 18 to 20, 2025, in Bali, Indonesia. It was organised by the National Association of Indonesian Consultants (INKINDO) and endorsed by FIDIC**.** More than 250 delegates attended the sessions to discuss new technologies transforming the engineering and construction industry.

The conference theme was ***"New Technologies Transforming the Engineering and Construction Industry"*,** and it deliberated on the cutting-edge innovations that were reshaping the engineering consultancy sector.

The conference, held at Meru Sanur Hotel, Bali, Indonesia, commenced with the Inaugural Ceremony, which was followed by a series of welcome addresses and keynote speeches:

- Welcome Address by Mr. Afiansyah Harahap, OC Chairman
- Speech by Mr Erie Heryadi, INKINDO Chairman
- Speech by Mr Sudhir Dhawan, FIDIC Asia Pacific President
- Recorded Video Welcome Address by Ms Catherine Karakatsanis, FIDIC President
- Welcome Address by Mr. Prashant Kapila, FIDIC Board Member, representing Ms. Catherine Karakatsanis, FIDIC President

Chairman of INKINDO – Mr. Erie Heryadi

FIDIC Asia Pacific President - Mr Sudhir Dhawan

Recorded Video Welcome Address of FIDIC President - Ms. Catherine Karakatsanis

Welcome Address by FIDIC Board Member - Mr. Prashant Kapila

FAP awards were presented to the following

- Envoy of Excellence: Mr. Zulkifli Halim & Mr. Irawan B. Koesoemo (Indonesia)
- Emerging Leader: Ms. Harshita Jain (India)
- Editorial Award: Mr. Amitabha Ghoshal (India)
- Powerhouse Award: MA associations from Nepal, Korea, and Pakistan
- Outstanding Infrastructure Projects: Companies from Japan, Pakistan, China, and India for major transit, healthcare, energy, telecom, and road projects.
- The main conference program comprised six thematic sessions, combining keynote presentations, technical papers, and panel discussions.

Organisers and MA Participants at the FAP Conference

FIDIC Annual Global Infrastructure Conference 2025

The ***FIDIC Annual Global Infrastructure Conference 2025*** was held from 21st to 23rd September 2025, at the Cape Town International Convention Centre, South Africa.

CEAI Representation

FIDIC Board Members

FIDIC honoured **Mr K K Kapila**, CEAI Past President, with the Louis Prangey Award, **FIDIC's highest award**. He is the first Asian to get the Award and only the 20th recipient in 113 years. Kudos to Mr Kapila for this well-deserved recognition and extraordinary honour.

⌘ OTHER NEWS

Building Infrastructure Excellence with Effective DPRs & Robust Monitoring - A Strategic Pathway to Viksit Bharat

At the conference on ***"Building Infrastructure Excellence with Effective DPRs & Robust Monitoring- A Strategic Pathway to Viksit Bharat"***, Prashant Kapila - President, CEAI and Board Member, FIDIC - International Federation of Consulting Engineers - shared his perspectives as a panel speaker.

He emphasised that India's ambitious infrastructure journey demands not incremental tweaks, but a fundamental rethinking of how we approach:

- DPRs - evolving from static reports to intelligent, dynamic blueprints driven by data, GIS, and life-cycle costing.
- Consultancy - moving beyond service provision to become knowledge partners and integrators, using digital twins, AI, and sustainability tools.
- Contracts - transforming from risk-allocation tools into collaboration frameworks, aligned with global best practices such as FIDIC.
- Monitoring - embracing real-time digital dashboards, drones, and IoT for transparency, accountability, and public trust.

"The future of Indian infrastructure will not be written in cement and steel alone, but in trust, innovation, and global collaboration." - Prashant Kapila

Hyderabad Hosts WOC India 2025 Roundtable, Focus on Cement Industry and Sustainable Infrastructure

DECCAN NEWS SERVICE
HYDERABAD

Hyderabad hosted an exclusive media roundtable ahead of the World of Concrete (WoC) India 2025 Expo, spotlighting growth opportunities, innovation, and sustainable solutions in the construction and cement industry. The 11th edition of the Expo is scheduled from October 8–10, 2025, at the Bombay Exhibition Centre, Mumbai, with over 15,000 industry professionals, 250 exhibitors, and 50+ global speakers participating.

The roundtable, held at Hyatt Palace, featured eminent industry leaders including Rohit Vora (CEO, Jindal Panther Cement), Dr. S.P. Anchar (Consultant-Architect), Somnath Ghosh (Vice President, CEAI), Nivedha R (Founder & CEO, WOW Materials), Pranav Desai (Chief of innovations & R&D, Birla Nu), Vijay K Kosaraju (Founder & MD, ROBOMATIC Precon), and Rajneesh Khattar (Sr. Group Director, Informa Markets India). Discussions focused on market trends, sustainable practices, and technologies shaping South India's infrastructure growth.

Telangana's construction sector recorded nearly 12% growth in 2024–25, contributing over ₹80,000 crore to the state economy. With government-led infrastructure projects, FDI reforms, and sustainability initiatives such as eco-friendly construction materials, the region is emerging as a hub for modern and resilient urban development.

Speaking at the event, Vijay K. Kosaraju highlighted the role of precast concrete technologies in enabling faster, safer, and environmentally responsible construction. Rohit Vora emphasised Jindal Panther Cement's eco-conscious operations and carbon reduction initiatives, while Nivedha R showcased recycled plastic shuttering boards, reducing deforestation and plastic waste.

Mr. Rajneesh Khattar noted, "India is taking giant strides toward becoming a global leader in resilient and sustainable infrastructure. WoC India 2025 is perfectly timed to showcase innovations that will shape the sector's future."

The Expo will feature 3 days of conferences, masterclasses, innovation showcases, and awards, with global participation from Germany, Korea, China, USA, and Spain. Supported by 1Lattice and OR.IHA, the event aims to strengthen collaboration, highlight cutting-edge solutions, and accelerate adoption of sustainable construction practices.

With Hyderabad witnessing rapid urbanization, over 200 high-rise buildings completed, and 250 more under construction, the roundtable underscored the critical role of cement, concrete, and innovative technologies in driving South India's infrastructure transformation.

Hyderabad welcomed chief stakeholders from government, infrastructure and construction sectors at an exclusive roundtable hosted by Informa Markets on 15 September 2025. Held at the Hyatt Palace, the gathering brought together senior representatives from the National Highways Authority of India, Larsen & Toubro, UltraTech Cement, JSW Cement and key industry associations to shape the future of construction in India.

Discussions centred on innovation, sustainability and strategic collaboration, with participants sharing best practices for adopting green building materials, leveraging digital construction technologies and strengthening public-private partnerships. The roundtable provided a platform to forge new alliances and gather insights ahead of next year's marquee event.

The World of Concrete India Expo and Conference is scheduled from 8 to 10 October 2025 at the Bombay Exhibition Center in Mumbai. In a significant collaboration, the Consulting Engineers Association of India (CEAI) has joined Informa Markets as the official supporting association. This partnership underscores CEAI's commitment to championing cutting-edge engineering solutions and fostering cross-sector dialogue.

As part of this collaboration, Mr. Somenath Ghosh, Vice President of CEAI, addressed the press conference roundtable and outlined the association's vision and initiatives. He emphasized CEAI's role in driving sustainable infrastructure development and highlighted upcoming programs designed to enhance practitioner engagement and knowledge exchange among consulting engineers nationwide.

⌘ FORTHCOMING PROGRAMMES

By CEAI:

The very prestigious **CEAI Annual Conference and Awards 2025** will be held on 26th & 27th November 2025 at Hotel Shangri-La, New Delhi. The theme of the Conference is "Engineering India Forward: Strategy, Sustainability & Innovation for Inclusive Infrastructure". The conference will have a galaxy of eminent National and International Speakers.

The **CEAI National Awards 2025** will be presented during the Conference. The 'Awards 2025' has received a record number of nominations from organisations and individuals. The Awards will be presented in various designated categories. CEAI's Lifetime Achievement Award, to be named the "CEAI **Shri Mahendra Raj Lifetime Achievement Award",** will also be presented on the occasion.

By CEAI Academy:

Programmes to look forward to, that are tentatively planned to be organised by the CEAI Academy, are:

a) Intensive online Training on Highway DPR: Scheduled to launch in December, this program will comprehensively cover all related aspects. Designed as a basic-level training, it is tailored for young and mid-level Highway/Bridge Engineers involved in DPR preparation.

b) Five training programs on Sustainable Development

c) Workshop on Cybersecurity

d) An online training program on Artificial Intelligence.

VIEWPOINT DECEMBER 2025

The themes for the quarterly issues of CEAI's magazine "ViewPoint" for the balance period in the years 2025-2026 are given below:

Month & Year	Theme
December 2025	Asset Management for Sustaining Built Facilities
March 2026	Solid Waste Management and the Need for Stricter Waste Management Policies
June 2026	Climate Change, Urban Flooding, and Landslides
September 2026	Urban Rejuvenation - A Tech-Enabled Approach
December 2026	Smart Cities or Smart Villages: Where Should India Invest More

The theme for the December 2025 edition of ViewPoint is **"Asset Management for Sustaining Built Facilities".**

The assertion that India has only recently become conscious of asset management may not be entirely accurate, as the industry has been growing for a considerable time, albeit incrementally. There has been an increased awareness about asset management in recent times, driven by higher financial literacy, digitalisation, and supportive economic policies.

Asset management for sustaining built facilities in India requires a strategic, long-term approach to facility maintenance, focusing on optimal resource utilisation, such as energy, water, etc., by the usage of natural lighting or renewables or power and water saving fixtures, thus making a conscious effort to reduce harm to the environment through the asset's lifecycle. To integrate sustainability into the asset lifecycle, eco-conscious decisions need to be taken from the initial design and construction phases through the operational phase and eventual decommissioning of the facility.

The ViewPoint invites Professionals and Organisations engaged in asset management to share their experiences by providing Case Studies of relevant projects, especially engineering projects, on practical issues encountered and how they addressed unanticipated challenges, pre-empted setbacks by helping Clients establish clear policies, built strategic roadmaps vital for long-term success and prevented asset failure or security failure.

Articles could include how digitalisation could support asset management, prevent issues by implementing regular maintenance and inspections; utilise asset management software for monitoring, tracking and automation; evaluate and conduct regular audits, and train employees on proper asset handling and performing risk analyses.

Photographs, charts, diagrams, drawings, etc., would benefit readers for a better appreciation of the issues encountered in asset management and how they were addressed.

Articles for the December 2025 edition of ViewPoint need to reach CEAI by 25 November 2025. Articles have to be in MS Word - Times New Roman 12 with single line spacing with before and after 6 pt and normal margin, on A4 size. A recent, clear and bright passport-size photograph of the author(s) is to be sent along with the article. For details of formatting, please refer to "Format for Articles for CEAI Viewpoint" on CEAI's website, under 'Publications'. The 'CEAI Conditions of Publication' can also be seen on the website.

All Professionals are encouraged to use CEAI's ViewPoint to showcase the capabilities and achievements of Engineers in India and help educate and guide young engineers.

Advertisement in ViewPoint

ViewPoint is circulated to all CEAI Members, FIDIC, Ministries of the Government of India, Public and Private Sector Undertakings, Construction Firms, Contractors, Consultants, Foreign Missions, Multilateral Funding Institutions in India, and other organisations related to or dealing with the engineering profession. Thus, all stakeholders partnering in development and progress are its readers.

Support from CEAI members and stakeholders is sought for increasing the number of advertisements, so that ViewPoint gains in its stature as a unique Technical Publication for the fraternity and the public at large to disseminate information on how Consulting Engineers are helping society improve the quality of assets created and are doing so sustainably. The rates for advertisements in VIEWPOINT are given below:

VIEWPOINT ADVERTISEMENT:

	Rate Per issue* (INR)	Discounted rate at 10% for 2 consecutive issues*(INR)	Discounted rate at 20% for 4 consecutive issues* (INR)
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Full Page (B&W) (Conditions Apply)	8,000.00	14,400.00	25,600.00
Notes: ****GST @ 5% or as prescribed will be added to the above rates***			

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Tech Quiz

1. **In which type of contract is there a possibility of an unbalanced tender?**
   a. Percentage Rate Contract
   b. Lump-Sum Contract
   c. Item Rate Contract
   d. Turn-Key Contract

2. **The "Earnest Money Deposit (EMD)" in a tender is meant to:**
   a. Cover the contractor's initial expenses
   b. Secure the performance of the contract
   c. Show the bidder's seriousness and commitment
   d. Pay the consultant's fees

3. **In civil engineering contracts, "Liquidated Damages" refer to:**
   a. Penalties for delayed completion
   b. Incentives for early completion
   c. Payments for extra work done
   d. Refunds of excess payment

4. **Which of the following is not a type of Integrated Contract?**
   a. Lump Sum Contract
   b. Design - Build Contract
   c. Turn-Key Contract
   d. BOT Contract

5. **To award the BOT contract, what conditions are evaluated?**
   a. Contractor's Income Tax Return
   b. Contractor's Cash Flow Projections
   c. Contractor's Medical History
   d. Contractor's Criminal Background

6. **Which of the following conditions can make a contract legally invalid?**
   a. A contract has lawful consideration
   b. A contract is made by the free consent of parties
   c. A contract is termed as Void legally
   d. A contract has an offer and acceptance

7. **In tendering, what is meant by "Lowest Responsive Bidder"?**
   a. The bidder with the lowest price, regardless of the quality
   b. The bidder who submitted the lowest and meets all the requirements.
   c. The first bidder to submit a bid
   d. The bidder who offers the fastest completion time.

8. **Which of the following is not typically a factor considered during the tender evaluation process?**
   a. Financial stability of the bidder
   b. Past experience and track record of the bidder
   c. Social media presence of the bidder
   d. Compliance with technical specifications.

9. **A"Joint Venture" (JV) in tendering refers to:**
   a. A collaboration between two or more companies to undertake a specific project together
   b. A single contractor taking multiple projects simultaneously
   c. A government and private sector partnership
   d. A contractor working with a subcontractor

10. **Which of the following is not typically included in a tender document?**
    a. Instructions to Bidders
    b. Detailed Project Report
    c. Contract Conditions
    d. Payment Conditions

The first person to email the correct answers to CEAI info@ceai.org.in will get a congratulatory email and be acknowledged by publishing the person's photograph in the next issue.

Compiled by Neha Jain, TCE/ Rajiv Maini, CEAI

Answers to Tech Quiz June 2025 issue
1 (d), 2 (d), 3(c), 4(b), 5(c), 6(c), 7(d), 8(b), 9(b), 10(c)

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- 200+ delegates: engineers, policymakers, financiers, academicians
- Plenary sessions, workshops & exhibitions
- CEAI Awards Ceremony celebrating excellence
- Networking with leaders & decision-makers

KEY OBJECTIVES

- Foster collaboration across industry & government
- Accelerate adoption of green & smart technologies
- Shape policy with expert-driven insights
- Build stronger peer networks for risk & governance

DELEGATE BENEFITS

- Access to all sessions & exhibition
- Conference kit & official materials
- Networking lunches, coffee & tea breaks

EARLY BIRD REGISTRATION ENDS 10 OCTOBER 2025

CEAI ANNUAL CONFERENCE & AWARDS 2025

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FIDIC PUBLICATIONS

1	FIDIC Contracts Guide (2nd Ed. 2022)
2	EPC Turnkey Contract 2nd Ed 2017 Silver Book Reprinted 2022 with amendments
3	Construction Contract 2nd Ed 2017 Red Book, Reprinted 2022 with amendments
4	Plant & Design Build Contract 2nd Ed 2017 Yellow Book, Reprinted 2022 with amendments
5	The Short Form of Contract (2nd Edition, 2021)
6	Conditions of Contract for EPC Turnkey Projects (First Edition, 1999)
7	EPC/Turnkey Contract 2nd Ed (2017 Silver Book)
8	Conditions of Contract for Construction (First Ed. 1999)
9	Construction Contract 2nd Ed (2017 Red Book)
10	Conditions of Contract for Plant & Design-Build (First Ed, 1999)
11	Plant and design-build contract 2nd Ed (2017 Yellow book)
12	Dredgers Contract 2nd Ed (2016 Blue-Green Book)
13	Client/Consultant Model Services Agreement 5th Ed (2017 White Book)
14	GUIDE to Conditions of Contract for Design, Build and Operate Projects (2008 GOLD BOOK) 1st Ed 2011
15	Conditions of Contract for Works of Civil Engineering Construction (4th Ed. 1987 Reprinted 2011)
16	Conditions of Contract for Design-Build and Turnkey First Edition 1995 Reprinted 2011
17	Conditions of Contract for Underground works (2019 Emerald Book)

Please contact CEAI Secretariat for availability and price.


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