



Infrastructure Construction & Quarry – AI ERP TicketingOS

Roads · Dams · Bridges · Electric Transmission · Train Lines · Airports · Quarry Aggregates

EPC project management · BOQ tracking · Equipment utilisation · Material testing

1. Master Infrastructure EPC Execution Flow (BOQ → Commissioning)

ID	Department	Process	Activity	Action	Progress %
I001	Sales/Bidding	TENDER	RFP response	Estimation, BOQ, bid submission	5
I002	Legal	CONTRACT	Agreement	EPC contract, payment terms, penalty clauses	10
I003	Planning	SCHEDULE	Primavera/MS Project	WBS, critical path, resource loading	15
I004	Procurement	MATERIAL	Steel, cement, aggregates	PO to suppliers, batch tracking (furnace #, mix design)	20
I005	Quarry	AGGREGATE PRODUCTION	Crushing & screening	Blast → haul → crush → grade (20mm, 40mm, GSB)	25

ID	Department	Process	Activity	Action	Progress %
I006	Plant	BATCHING	Concrete / asphalt plant	Mix design, temperature (asphalt), slump test	30
I007	Construction	SITE WORK	Clearing, excavation, embankment	GPS machine control, compaction test	40
I008	Construction	SUB-BASE / BASE	GSB, WMM, DLC	Layer thickness, density (core cutter / nuclear gauge)	50
I009	Construction	PAVING / STRUCTURE	Asphalt / concrete pavement, bridge deck, dam concreting	Temperature control, curing, reinforcement placement	65
I010	Electrical	TRANSMISSION LINE	Tower erection, stringing	Foundation, tower assembly, conductor tension	70
I011	Rail / Air	TRACK / RUNWAY	Track laying, runway marking	Survey, ballast, rail fastening, airfield lighting	80
I012	QA/QC	TESTING	Field & lab	Concrete cube, asphalt extraction, core cutting	85
I013	Commissioning	HANDOVER	Trial run	Load test (bridge), voltage test (transmission), runway inspection	95
I014	Finance	FINAL BILLING	RA bill & closure	Final measurement, retention release	100

2. Project-Specific Construction Workflows

 **Road / Highway**

Clear & grub →
Earthwork (GPS dozer) → GSB
→ WMM →
DLC → Asphalt (BC, SDBC, WC)
→ Drainage →
Signage →
Handover

 **Bridge / Flyover**

Pile foundation
→ Pier →
Abutment →
Girder launching →
Deck slab →
Wearing coat
→ Expansion joint → Railing
→ Load test

 **Dam / Reservoir**

Diversion tunnel →
Foundation excavation →
Roller compacted concrete (RCC) / Earthfill →
Spillway →
Gates →
Reservoir filling →
Instrumentation

 **Electric Transmission Line**

Tower spotting
→ Foundation
→ Tower erection →
Insulator stringing →
Conductor pulling → Sag adjustment →
Testing →
Energisation

 **Train Line (Railway)**

Earthwork →
Blanket layer →
Ballast →
Sleeper & rail laying →
Track alignment →
Overhead electrification (OHE) →
Signalling →
Trial run

 **Airport (Runway & Terminal)**

Land grading → PVD installation (soft soil) →
Pavement (PCC/FAA spec) → Runway marking →
Airfield lighting → Navigational aids → Terminal building → Commissioning

 **Quarry (Aggregates)**

Drilling & blasting → Excavator loading → Haul truck →
Crusher (primary, secondary, tertiary) →
Screening → Stockpile by grade → Dispatch to project

 **Critical Control Points (Infrastructure)**

- **Material testing:** Aggregate impact value, flakiness index, concrete cube strength (7/28 days), asphalt Marshall stability.
- **Compaction:** Field density (sand replacement / nuclear gauge) – 98% of MDD required.
- **Safety:** Barricading, flaggers, PPE, trench shoring, high-risk activity permits.
- **Environment:** Dust control (water sprinkling), noise monitoring, quarry reclamation plan.
- **Quality documentation:** Each layer signed by engineer – digital platform with GPS coordinates.

3. Milestone-Based Payment (RA Bills & Advance)

Milestone	Release Condition	Payment %	Applicable For
Mobilisation advance	Contract signed, bank guarantee submitted	10%	All EPC
Material on site (aggregates, cement, steel)	Inward QC passed, stacking area	15% (material advance)	Roads, bridges
Sub-base / base completed (km)	Engineer measurement, density test passed	20% (running bill)	Roads, runways
Paving / concreting (per cubic metre)	Cube test passed, core cut acceptance	30% (running bill)	All
Structure completion (bridge girder / tower)	Load test / alignment check	15%	Bridges, transmission
Commissioning & handover	Trial run successful, defect liability period starts	5% (balance after retention)	All
Retention release (after 12 months)	No major defects	5% (retention)	All

💰 RA (Running Account) bills are auto-generated weekly based on surveyed quantities – linked to WBS.

4. ERP Module Mapping & AI Automation (Construction)

📦 Modules

Bidding & Contract · BOQ & Costing · Planning (CPM) · Procurement (material) · Quarry management · Plant (batch) · Site execution · QA/QC lab · Equipment & fleet · Billing & RA · Safety & compliance

🤖 AI Automation

- Delay prediction (weather, resource) – alerts project manager
- Concrete strength prediction (from curing temperature + mix design)
- Haul route optimisation (quarry to site) – reduces fuel 15%
- Equipment breakdown forecast (telematics data)
- Automatic subgrade compaction pass counting (GPS + accelerometer)

AI Function	Automation
Progress monitoring via drone	Weekly orthomosaic → AI compares planned vs actual earthwork volume (cut/fill) → creates variance ticket
Asphalt temperature tracking	IoT sensor in paver → AI alerts if temperature below laydown spec → stops work ticket
Quarry crusher optimisation	Feed rate + screen size → AI adjusts jaw setting to maximise 20mm aggregate yield

AI Function	Automation
Batching plant auto-reorder	Stock level of cement, fly ash, admixture → PO to supplier
Safety violation detection	CCTV + AI → no helmet/vest → auto ticket to safety officer

5. Final Infrastructure EPC + TicketingOS Architecture

Tender → Contract → Planning → Procurement (Quarry/Plant) → Site Execution → QA/QC → Billing → Commissioning → Handover

Internal ERP: Bidding → Planning → Material → Quarry → Site → QA → Equipment → Billing → Safety

AI TicketingOS: AI Delay Prediction → AI Concrete Strength → AI Haul Route → AI Equipment Maintenance → AI Progress Drone → AI Safety Detection

🔄 Every construction activity (from blast to asphalt) becomes a ticket – real-time dashboard for owner, contractor, lender.

Material & Construction Traceability

Aggregate batch (quarry)
– Blast date,

Concrete batch – Mix design #, plant

Asphalt batch
– Bitumen grade, mixing

Layer acceptance – Digital sign-off

Final as-built – QR code on manhole / pier

crusher log,
sieve analysis
report

ID, slump, cube
serial#, curing
temperature

temperature,
laying location
(GPS), density
test

with surveyor's
GPS points,
compaction
reading

– scan to see
material
certificates, test
results,
contractor
details



Infrastructure Construction Dashboards

- Project schedule variance (planned vs actual – by WBS)
- Material consumption vs BOQ (cement, aggregate, steel)
- Equipment utilisation – dump trucks, excavators, pavers (hours vs idle)
- Concrete cube pass % (7d & 28d strength)
- Asphalt layer density compliance % (core samples)
- Quarry production (tonnes per shift) vs target
- RA bill approval turnaround time (days from measurement to payment)
- Safety incidents per million man-hours, near-miss tickets closed
- Carbon footprint – from haulage, asphalt plant, crusher