

Research Reports  
**Articles**



# Uncovering the hidden profit

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Engineering Procurement and Construction (EPC) companies, engaged in development of power infrastructure networks, very often find that their realized margin at the end of a project is significantly lower than budgeted margin envisaged at project initiation. Organizations are increasingly coming to realize that this is mostly due to **execution delays** and the associated cost overruns. So, companies have been dedicating efforts to reduce execution lead time.

Consequently, some companies in recent years have been successful in timely delivery of projects<sup>1</sup>. Ideally, this should have resulted in their realizing almost all of the budgeted margins. To the contrary, they still fall short; albeit by a smaller quantum – i.e. ~2-5% as compared ~8-10% in grossly delayed projects. However, even a loss of 2% is not small for infrastructure businesses – not when these projects only have gross margins in range of 5-10%!

It is evident that **while focusing on timely completion of projects is necessary, it's not sufficient to protect all of the project's margins – reducing lead time is only a battle half won!**

Where should a company focus to plug the margin leakage?

A deeper analysis of companies stuck in such a situation reveals that most reasons are largely related to the way material management is done. Below are few major issues:

- 1 Excess inventory at project end:** Very often, there is unutilized material at the end of the project which is worth as much as ~5% of contract value. Such a quantum translates into a direct hit on the bottom line. The realizable value from this as “sale as scrap” is barely 20-30% of the cost at which material was procured.
- 2 Significant amount of provision due to unaccounted material with sub-contractor:** It is quite interesting to note in this business that a sub-contractor is issued material worth lakhs of rupees without any financial collateral/guarantee. Of this, in spite of very strict company policies to limit material issuance, typically, at the end of the project, material worth 0.5-1% of contract value is leftover with the sub-contractor. Quite often, the sub-contractor does not return this excess material to the company.
- 3 High outstanding due to inter project transfer of material:** Time to time, projects suddenly run into material shortages with very little or no time for fresh procurement<sup>2</sup>. A prevalent material management practice in this industry, in such circumstances, is to transfer material from one project/client<sup>3</sup> to another. However, after the transfer of material is done, it is important to regularize transactions with the clients (the client that sent the material and the client receiving it) because otherwise it will create inventory-related anomalies in the books of both. Moreover, turnkey contractors can later claim retention money of work executed only post-regularization of all such transfers that may have happened. However, very often this regularization is done only towards end of the project. Till then, the retention money remains uncollected.
- 4 Unplanned operating expenses:** Because of all these pending documentation works related to material management, which delay the financial completion of the project, the company is often forced to keep stores open and deploy additional manpower for 2-3 years even after declaration of operational closure of project. This increases operating expenses.

<sup>1</sup> Final time extension granted by client has been considered to be project deadline

<sup>2</sup> Dependency on client (DISCOM) for nomination, inspection, dispatch instruction issuance etc. expands the lead time of fresh procurement (min. 1-2 months). Inter project transfers require less than ~15 days.

<sup>3</sup> Loosely termed as OSM -Owner Supplied Material

### Traditional approach

When faced with these material management problems among a chaos of other problems each project goes through, the traditional approach of managers is to try and solve them as and when they arise. So, for example, the company may try to wrangle for extra scope from the client to make use of excess material. Or, in the case of unaccounted material with sub-contractors, the company might decide to opt for a legal recourse. Unfortunately, when they do that, very often, trying to solve one problem gives rise to other issues. For example, even if the company manages to get extra scope from the client to consume material in hand, these might not get consumed completely. Or, a portion of the additional items sourced to complete the new scope can end up becoming excess! Similarly, legal battles to secure material stuck with sub-contractors can backfire by consuming huge amount of top management bandwidth, which could otherwise have been better utilized in solving other critical issues of project execution.

In this tumultuous environment, some issues can also remain masked for long and become a crisis after a point. For instance, in order to deal with unaccounted material with sub-contractors, companies often hold on to contractors' retention payments till all material gets reconciled. However, the project teams may delay reconciliation by as much as a year after physical work is completed! When their payments are thus delayed, it is not unknown for irate sub-contractors to resort to aggressive measures like vandalization of the site offices, disruption of work by forcibly locking the turnkey contractor's store etc. Such issues often force management to swing into crisis management with directive to release all payments immediately. Subsequently, the situation may get under control but not without some negative after-effects. For example, during this damage-control exercise, retention payment could get released to contractors who have significant material in their possession. They are unlikely to return it. This leads to additional loss for the company. Moreover, such incidents set a bad precedent for other running projects and may instigate sub-contractors to resort to violence to get their way whenever differences between them and the company arises.

In spite of such incidents, most infrastructure companies don't see material management-related issues as a major problem – most count them as a price of being in this business. They are aware that in a large project spread over a few years involving large quantities of material changing hands, some material-related risk is involved. However, towards the end of the project, if the quantum of loss is large, there are hard questions asked. One or few people in the project (the project managers, the store heads etc.) will be called to account and sometimes fired/replaced. Or, companies may choose to chastise people concerned for poor discipline and exhort a commitment from them that the situation will not be repeated. Unfortunately, the situation does repeat, again and again in almost every project.

Why does this happen? Is there something more fundamentally wrong with material management in projects?

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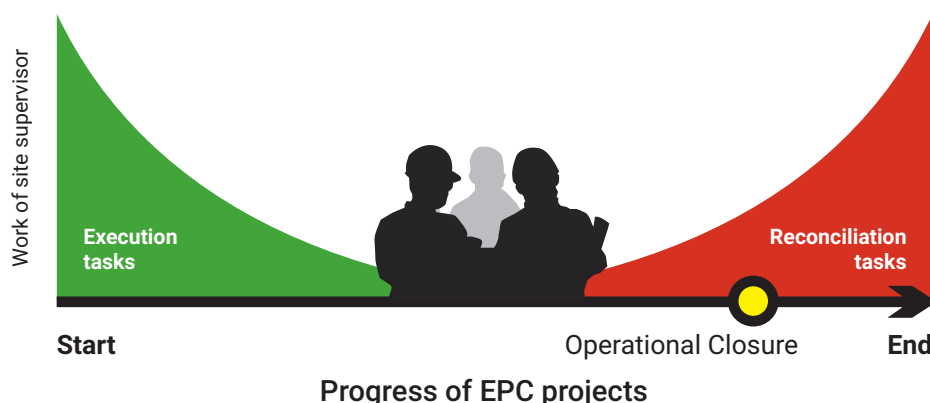
<sup>4</sup> Sub-Contractor payment terms: 60-70% of running bill after work completion, 20-25% after taking over by client, 5-10% as retention after one year of project completion.

## Lifecycle of projects and material reconciliation

Site engineers in most projects are responsible for end-to-end activity completion of a billable entity<sup>5</sup>. These tasks can be divided into two sets: execution-related tasks and material reconciliation-related tasks. Execution-related tasks are getting BOQ (material requirement) approved, ensuring timely material availability, physical work completion, taking joint measurements with the client<sup>6</sup> and handing and taking over and sub-contractor bill preparation. Material reconciliation for each project entity (e.g. electrification of a village) involves reconciling quantity of material issued, amount consumed during execution and quantity billed to client. Since EPC projects generally involves three parties – turnkey contractor's store, sub-contractor, and the client, material reconciliation is required to be done across all the three parties<sup>7</sup>: hence the name “3-way reconciliation”. In most EPC projects, these two sets of activities (execution and material reconciliation) tend to happen rather erratically – depends on where top management’s attention is focused on at a particular point in time.

During initial phase of a project, management's attention is on supply and kick-starting execution work as soon as possible, so that avenues of billing can be generated. In this phase, there is significant effort by project teams to open as many work fronts as possible so that billing can be maximized. This resonates well with the client as well since they are measured by funding agencies on the basis of work executed (and fund utilized). Busy with a queue of execution tasks, the project managers or site engineers find that they have very little or no time to spare for material reconciliation-related tasks in this phase of the project.

Gradually, as the avenues of billing and corresponding easy cash flows deplete<sup>8</sup>, towards the end of the project, focus of top management shifts towards ensuring collection through closure of work fronts that are incomplete (taking over of billable entities by client). However, closure requires resolution of all open issues. Most of these issues are related to ensuring that material required to complete the remaining scope is available. However, the quantity of this material can be ascertained only after material already procured and used in the project is reconciled for all items. Therefore, towards fag end of the project, the management's attention, by necessity, shifts towards material reconciliation. Unfortunately, by then, there may be significant damages already created by this procrastination of reconciliation tasks.



<sup>5</sup> Billable entity is smallest project entity possible that can be billed to client after work completion e.g. rural electrification projects have villages/feeders as billable entities.

<sup>6</sup> This is inspection by the client to ensure that work has been completed as per scope/quantity/quality defined

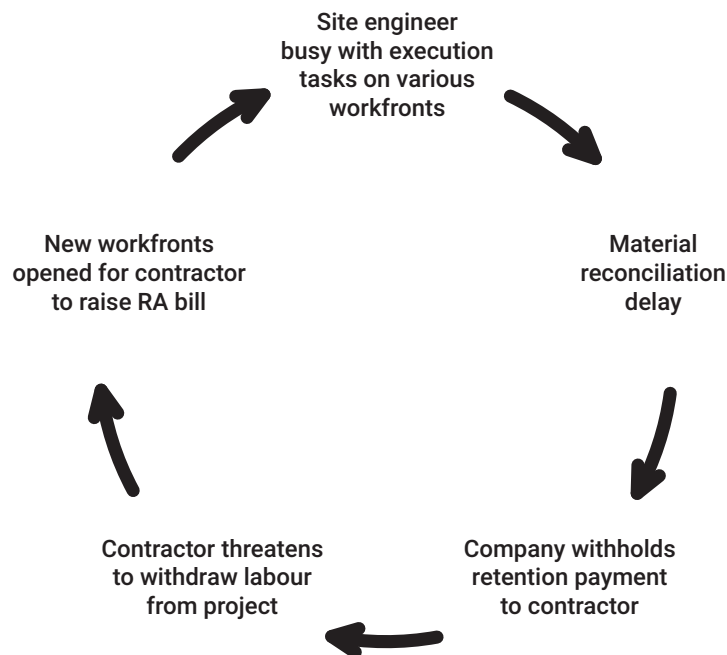
<sup>7</sup> Usually in projects reconciliation with contractor gets done when entity is eligible and that with client is done when billing is done.

<sup>8</sup> Payment terms: Supply (~70-80% of Contract Value) : 60% against supply, 30% after erection(closure of work fronts),10% retention(after project closure)

## The damages of delayed reconciliation

The company has to pay a steep price for the fact that reconciliation and regularization tasks are either ignored or proceeds very slowly in the initial part of the project. With delay in these tasks, bill of quantities (requirement) does not get corrected in timely fashion on the company information systems. This has multiple repercussions. Based on whether the bill of materials planned was in excess or short of real requirement, there may be excess material procured or a shortage of material for execution. In either case, it hurts the company. A shortage in material can lead to execution delays. At the same time, excess material, if issued to subcontractor, can at times remain stuck as unaccounted, unrecovered inventory. Sometimes, inventory may also lie as excess in the site stores. Such material will be indicated as outstanding on the books until it is eventually either written off (unrecoverable inventory) or sold as scrap (excess or damaged inventory). When this happens, companies are forced to reverse a portion of the outstanding inviting uncomfortable questions from financial auditors. This problem can also happen due to lack of timely regularization of inter-project transfer of material.

Reconciliation delays because of site engineers' preoccupation with execution tasks also leads to the company withholding retention payment to contractors even though the contractor has completed physical work. One way to ensure that the contractor gets paid and keeps the labor around is to let him raise an RA (running account) bill by showing progress in execution. However, this can be done only if another work front is opened up for him to work on. When many such work fronts are opened, the site engineers become even busier in execution-related tasks leaving them with scant time to take care of reconciliation/regularization of material.

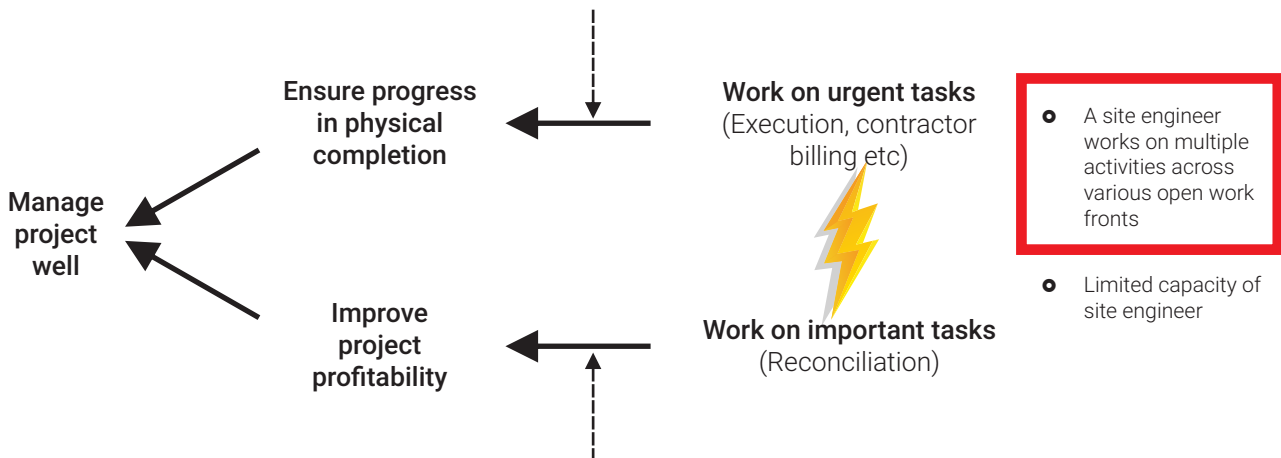


Even after the project managers' focus shifts towards material reconciliation at the end of the project, the fact that there is a huge amount of pending documentation to tackle makes this a laborious task. So, while trying to take care of these, site engineers are naturally not able to visit the work sites as frequently as before and address emergent obstacles to execution in a timely manner. But when the project delays due to these issues become significant, the project manager is forced to drop the reconciliation tasks and pay attention to solving complaints or concerns raised by the client in the site observation reports (SORs). This further delays reconciliation of material. Eventually, the store at site is forced to remain open for as long as one year after the physical work completion to complete material reconciliation tasks.

## Finding core issue at play

Project managers are aware of these damages. And, while they may logically want to complete material reconciliation on a timely basis<sup>9</sup>, it is clear that they and other execution resources are not able to do so since they face an ongoing dilemma of choosing between urgent and important tasks at different phases of a project. Owing to their limited capacity, they always pick up urgent "execution work" on priority in the beginning of the project. The important activity of "reconciliation" is done only after execution work is largely finished i.e. towards the end of the operational closure of the project.

- Many requirements of project progress are unavoidable (Ex. Customer expectations)
- Visible project progress prevent escalations to top management



- Regular reconciliation mitigates extent of material lost on account of contractors
- Actual requirement (excess or shortage) of procurement is triggered after reconciliation

### The core conflict

<sup>9</sup> Ongoing basis means material reconciliation gets done after work completion (as per closure criteria e.g. taking over by client) of billable entity.



### The way out: resolving the dilemma

This conflict exists because of a common underlying assumption in this industry. It is assumed that an engineer who is involved in physical completion of an entity is the only one equipped to complete reconciliation for that entity. So, the same engineer is expected to complete both sets activities –execution and reconciliation. This leads to situation of rampant bad multitasking for him, especially towards the end of the project wherein, he cannot procrastinate reconciliation tasks any further. However, this assumption of a single engineer having to be responsible for both sets of tasks is erroneous because as long as there is access to and completeness of the required information – i.e. as-built drawing, approved joint measurement and HOTO, any engineer can complete reconciliation work of any entity. Therefore, it is possible to release the site execution team from reconciliation tasks and form a dedicated team of engineers responsible only for the three-way reconciliation.

A dedicated team would ensure that both activities will progress simultaneously. But where will these resources come from? Projects with already wafer slim margins in this industry can hardly afford to hire more people! The answer to this is that no new hires are needed, and that this reconciliation team can be carved out from the existing execution team. For instance, if 50 engineers are engaged in the end-to-end work in a project, 45 can be made responsible for execution and rest for reconciliation. What is interesting to note is that in spite of the fact that less engineers would now be working on execution, their output will actually increase. This is because instead of trying to address execution in multiple sites and simultaneously taking care of material reconciliation, now the site engineer can work continuously on execution without interruptions. Thus, work will get completed faster.

The actual number of engineers to be allocated in each group can be a dynamic number depending on the existing workload (time it would take to flush out the queue before the group). However, in order to ensure efficient use of both sets of resources, principles of **flow management have to be used in execution** and in the ongoing 3-way reconciliation process. The steps the team in charge of reconciliation have to follow are as follows:

- **WIP control:** A limit should be placed on the maximum number of work fronts that can be taken up for execution and maximum work fronts that can remain open for reconciliation under a site engineer. For example, let's assume in a project, WIP norm per site engineer is set at 5 villages (for execution) and 4 villages (for reconciliation). Every time the engineer completes an entity (a village), he can pass that entity to the reconciliation team to complete the associated documentation work and take up another work front for execution. The time taken for reconciliation work compared to execution is much shorter, therefore ideally, the reconciliation work will get completed soon after execution. This will allow both tasks to progress smoothly. However, in case of some exigency, the reconciliation work experiences serious obstacles, and gets stuck, the site engineer has to wait for the reconciliation team to catch up. He can open a new work front only when all except 4 villages are reconciled (closed by reconciliation team). A mixed WIP rule like this is adopted to force timely closure of reconciliation tasks. As long as the combined WIP norm fixed for execution work and that for reconciliation work is not exceeded, the site engineer can continuously open new work fronts.

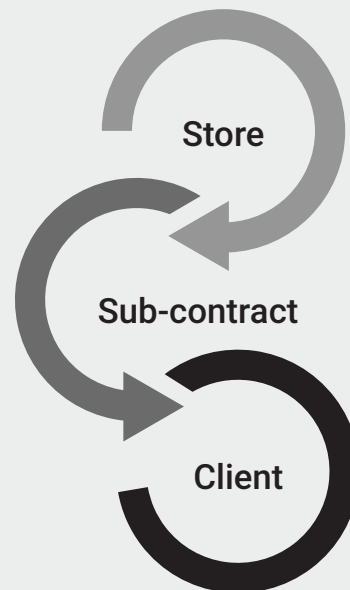
## Three-way reconciliation at entity level

It is to be noted here is that material reconciliation is now at an entity level. This has several advantages over the general practice of reconciliation at an aggregate level i.e. contractor level.

In most EPC companies, material reconciliation as currently practiced, is limited to reconciling the material issued to a contractor and what has been consumed by the contractor. It is not simultaneously compared with amount of material billed to client. Such a practice increases probability of revenue leakage – i.e., material maybe declared to be consumed by sub-contractor but not eventually billed to client. For example, let's say a contractor worked in 50 villages and was issued 100 kms of conductor. After completion of 50 villages, the sub-contractor can claim that all 100 kms have been erected in 50 villages. So as far as the company is concerned, the issue of material matches consumption and the sub-contractor's account is reconciled. But in case, on actual measurement with client, quantity erected turns out to be 95 kms, the client will only pay for 95 kms. So, the company stands to lose. Also, sometimes multiple contractors are engaged simultaneously or one after other, to complete the work of a billable entity. In such cases, too if reconciliation is done at contractor level, company would not be able to determine individual contractor's difference in material issued and consumed. For example, let's say village 1 was undertaken by contractor 1 and contractor 2; village 2: contractor 1 and contractor 3 and village 3: by contractor 1 alone. If reconciliation is done at aggregate level for these three contractors, it would be difficult to trace differences between material issue and consumption, if any.

Doing an entity level reconciliation among the three elements – company store, subcontractor and client simultaneously would help identify difference in quantity issued, consumed and billed to the client easily. There are other benefits too. The bill of material will self-correct when material reconciliation is done at entity level making sure there is no excess or shortage of material.

However, it has to be mentioned that the ERP<sup>10</sup> systems in place in most companies cannot handle this continuous, entity level, three-way reconciliation since any ERP's purview is limited to company material issued and returned. It has no visibility of how much material was consumed by the contractor in the process of erection nor does it have visibility to the quantity billed to client. For keeping track of these, a different module with the required logic has to be added on the existing ERP. The advantage of this addition for the company is that it will have real-time visibility and amazing transparency. This will allow for better material control, proactive problem resolution of issues (e.g. timely material regularization) and consequently clean and faster financial closure of projects.



<sup>10</sup> Enterprise Resource Planning system refers to a type of software that organizations use to manage day-to-day business activities such as accounting, procurement, risk management, compliance, and supply chain.



- **Gate control:** However, before passing on a completed work front to the reconciliation team, the execution team has to meet the closure/handover criteria i.e. ensure a full kit of documents and information needed to complete reconciliation tasks without interruption. For this, at the handover point between execution and reconciliation teams, a strict stage gate control is deployed. This clean hand over condition means that entities not meeting the closure criteria would get filtered immediately and in a timely fashion (while sub-contractor has not moved his resources to other locations) so that corrective action can be taken.
- **Full kit:** The full kit for the execution team has to hand over to the reconciliation team consists of all pre-defined documents, access of entity in IT module, contractors' acceptance of final bill and debit etc. Ensuring full kit is necessary to eliminate significant waiting time which would otherwise be required to collect missing information from execution teams. Since execution teams have their own priorities trying to get the required information from them later would lead to interruptions, rework and delays.
- **High frequency management:** In spite of these steps (WIP control, gate control and full kit), time-to-time reconciliation tasks will experience obstacles that have to be addressed and resolved in a timely manner. For this, a process of daily management and predefined issue resolution frequency has to be put in place to facilitate early issue identification and resolution.

The combined effect of following these flow management rules in the three-way material reconciliation process and in execution, will not only help the company curb wastages, but it will also help complete projects faster. Thus, EPC companies can de-stress their typically chaotic business and unearth a hidden profit margin.

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