This White Paper aims to enlighten Airport Contract Management in the financial and schedule costs of Re-work and provide proven low cost risk management techniques to reduce the costs of construction Re-work.

Title: See Something, Say Something: Protect Your Project from the Hidden Cost of Re-Work.

Executive Summary

Contractor's Risk Management at airports typically concentrates on public safety, FOD, craft safety, security and preventing business interruption. All of which are important. However most frequently Airport Construction Risk Management is missing the largest financial risk, which is contractor quality control, more specifically the prevention of Re-work.

Re-Work, defined as "not building it right the first time" accounts for 8-25% of total construction project costs according to recent research studies. These costs include schedule impacts, materials, labor to remove and replace work in place, overhead, and claims expenses.

See Something Say Something

The campaign "See Something Say Something" in airport security has proven quite successful in involving public awareness with airport security. This success comes from communicating the hazards/concerns and asking for and giving permission to individuals to be aware and to take action.

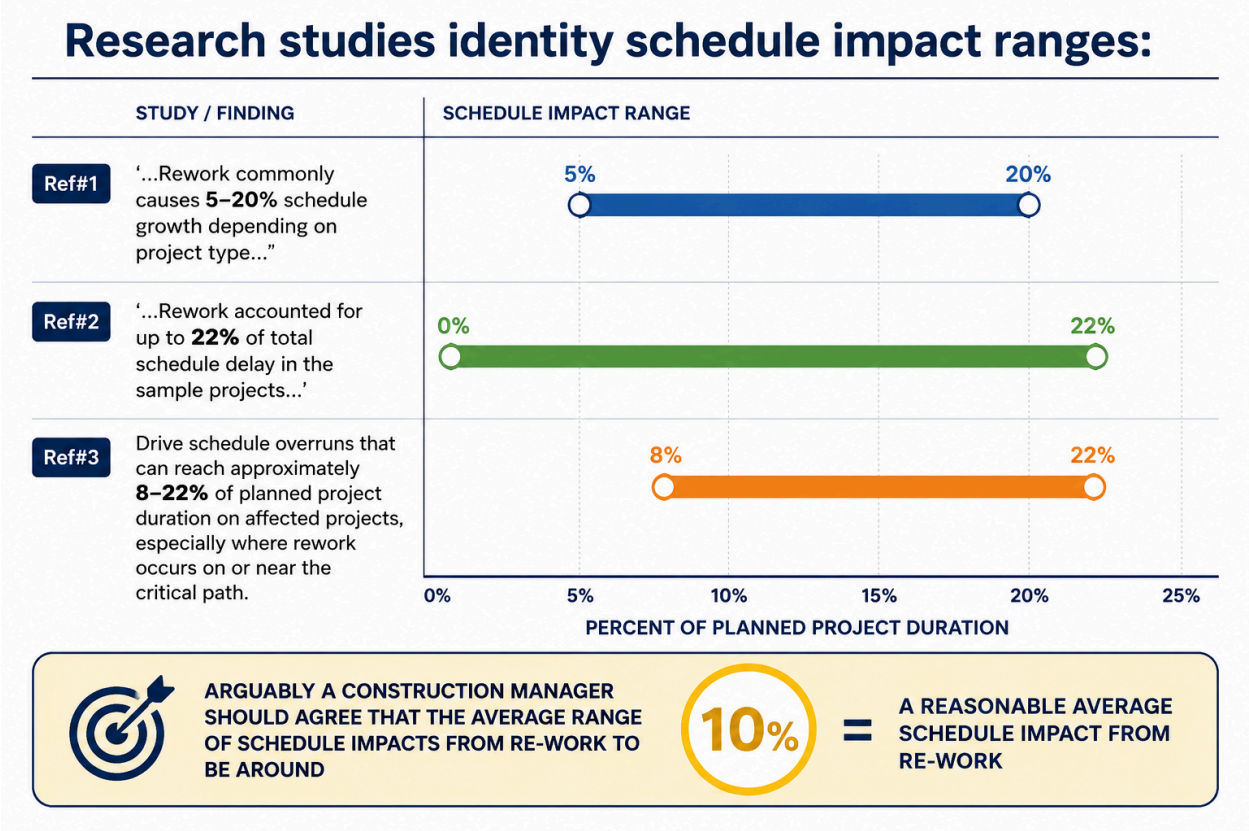
This same concept has successfully been expanded into airport construction safety and injury prevention, reducing the frequency and severity of workers' injuries over the past decade. The industry has a very clear picture of statistical injury rates in construction as culturally and contractually reporting of injuries is 'the norm' and encouraged (required). Before the injury, the 'see something says something' culture encourages craft to identify unsafe actions and behavior with their own as well as other's work. Eliminating the exposure before an incident.

Quality Control has not developed the culture to this level of Re-work prevention. Yet.

Schedule Impacts of Re-work

Generally speaking research shows Re-work schedule impacts ranch for 0-22% of project delays. The below chart references some of these schedule impact studies. For the Airport Manager to get a real feel

for Re-work impacts, they need to talk to the field supervisor (i.e. contractors field Foreman and General Foreman) who will, when asked, will give a blunt and non polished response. Simply ask 'on this project how many injuries have we had? What impact has that had?'. Then ask how much re-work we have had on this project and the impact. Preferably these questions are asked with contractor management not in attendance where free and non-polished answers are provided.



Financial Costs of Re-work

Depending on the referenced Study, budget impacts from Re-work range from 8 to 23% of Total project costs.

- "Previous studies identified that rework could add around 10% of the total project's costs where it is mostly unnecessary and avoidable…" Ref#4
- "US based Construction Industry Institute (CII) has the Field Rework Index (FRI) as a simple tool that helps projects identify causes of rework. They conclude that >4% of rework is ≥ average of 8% cost growth and <4% of rework is ≥ average -1.5% of cost growth…" Ref #5
- "Research conducted by the Associated General Contractors of America found that the average cost of rework (from nine industrial projects) was 12.4% of the project cost…" Ref #6

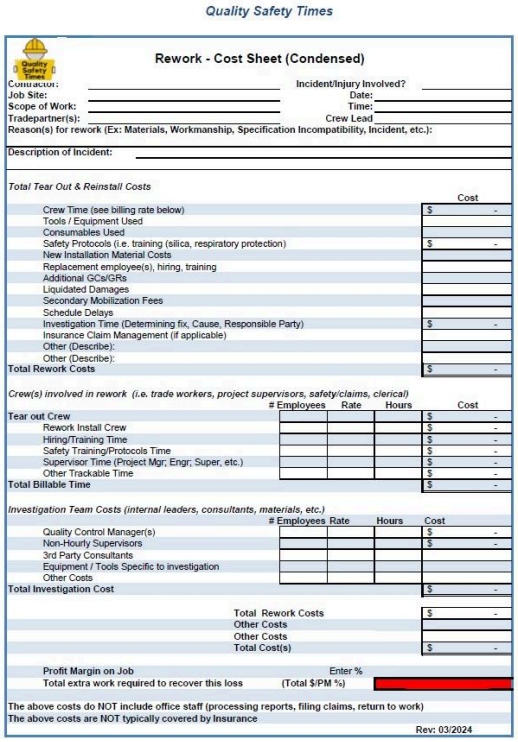
Re-Work - Not Reported

So why are these numbers not typically verifiable or 'common knowledge'? There are a number of reasons:

- Encouragement by senior management to ‘take care of the problem at the lowest level possible’. Example: a mechanical contractor installs a value incorrectly by a craft person, noticed by the foreman and repaired.
- Re-work is almost never a reportable insurance claim, thus there is no need to ‘report’ the Re-Work financial costs nor schedule impact.
- Who wants to tell the boss (owner) “we made a mistake?”
- Contractors have no ‘contractual requirement’ nor ‘reimbursement need’ to track the financial nor schedule impact of Re-work.

Statistics - tracking the financial costs of Re-work

87% of statistics quoted in publications are questioned by the reader. Ref #7. In tracking the financial costs of Re-work, Just the word ‘Re-Work’ has different interpretations and definitions. Additionally, identifying the bases for costs impact from Re-work can be argumentative. To provide the construction industry with a great training tool and allow individual tracking of Re-work costs specific to an impact, Quality Safety Times has made available a free online cost tracking worksheet. This worksheet requires the input of costs (time, material, external legal/consultants, etc.) as well as identifying the profit margin for the organizations, which calculates the amount of billables in dollars required to make up for that specific loss. This is a great training tool for supervisors and a great project for a summer intern to track an entire project's Re-work costs.



Quality Safety Times

Rework - Cost Sheet (Condensed)

Contractor: _____ Incident/Injury Involved? _____
Job Site: _____ Date: _____
Scope of Work: _____ Time: _____
Tradepartner(s): _____ Crew Lead _____
Reason(s) for rework (Ex: Materials, Workmanship, Specification Incompatibility, Incident, etc.):
Description of Incident: _____

Total Tear Out & Reinstall Costs

	Cost
Crew Time (see billing rate below)	$ -
Tools / Equipment Used	
Consumables Used	
Safety Protocols (i.e. training (silica, respiratory protection)	$ -
New Installation Material Costs	
Replacement employee(s), hiring, training	
Additional GCs/GRs	
Liquidated Damages	
Secondary Mobilization Fees	
Schedule Delays	
Investigation Time (Determining fix, Cause, Responsible Party)	$ -
Insurance Claim Management (if applicable)	
Other (Describe):	
Other (Describe):	
Total Rework Costs	$ -

Crew(s) involved in rework (i.e. trade workers, project supervisors, safety/claims, clerical)

	# Employees	Rate	Hours	Cost
Tear out Crew				$ -
Rework Install Crew				$ -
Hiring/Training Time				$ -
Safety Training/Protocols Time				$ -
Supervisor Time (Project Mgr; Engr; Super, etc.)				$ -
Other Trackable Time				$ -
Total Billable Time				$ -

Investigation Team Costs (internal leaders, consultants, materials, etc.)

	# Employees	Rate	Hours	Cost
Quality Control Manager(s)				$ -
Non-Hourly Supervisors				$ -
3rd Party Consultants				
Equipment / Tools Specific to investigation				
Other Costs				
Total Investigation Cost				$ -

Total Rework Costs	$ -
Other Costs	
Other Costs	
Total Cost(s)	$ -

Profit Margin on Job — Enter %
Total extra work required to recover this loss (Total $/PM %)

The above costs do NOT include office staff (processing reports, filing claims, return to work)
The above costs are NOT typically covered by Insurance

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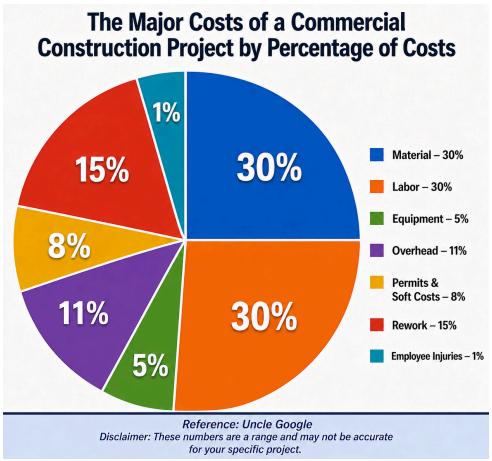
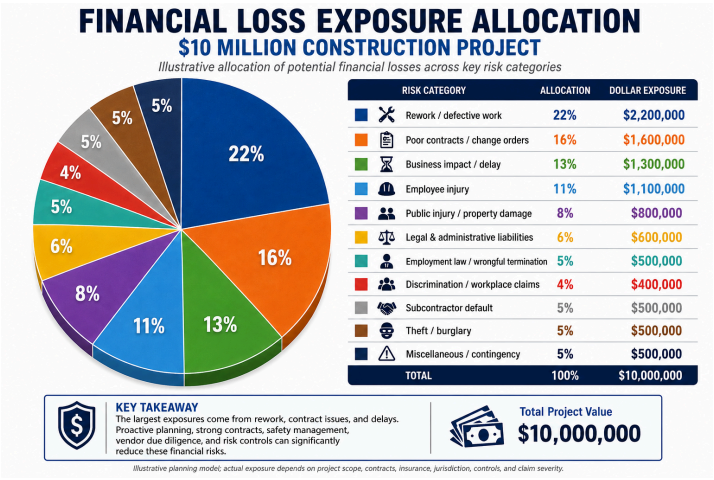
Worksheet tracking the financial impact on construction projects from Re-work including the amount additional billables needed to recover from the loss based on profit margin. Digital Online version available www.qualitysafetytimes.com/rework-cost-worksheet/

Case study - Allocation of Loss Control Resources

Risk and Constriction Managers for airports should consider the question 'Are we allocating our loss control resources correctly?'

We should and must always place human life as a priority. However when considering Loss Control Resource allocation we must understand the source of losses and loss potential.





Consider this scenario, which the author recently walked through with the CEO of a large Commercial Contractor.

Q: Your last major project, what was it and what was the contract value?

A: Commercial Project with value about $80,000,000.

Q: On this project what was the approximate financial cost of craft injuries?

A: Approximately $10,000 in direct Worker injury financial costs.

Q: As to percentage of Contract value, what was your direct employee injury?

A: with the use of a calculator 0.000125%

Then I asked the CEO if he did start his construction profession in the trades - which he did, thus he had a good understanding that most 're-work' is never reported. As identified above.

Next the CEO was asked on this same project what he expected his "Re-work" costs to be as percentage of Contract value. His first response was 'you do not want to know'. He estimated his Re-work costs to be 15% of project value.

Then he was asked how many safety professionals they had on staff (38 was the answer). The CEO was next asked the number of QC staff he had. The answer was 6 QC staff 'companywide'. Pointing out the obvious to him, '...your ratios are wrong in loss control resource allocation…'

Airport Loss Control - Allocation of Resources

As an Airport Executive, allocation of resources is most likely the most challenging of responsibilities. We can never lose sight of human safety, FOD, and Security being a priority. But the question remains allocation of resources. We can assume that the 'finical' costs of craft injuries is arguably less than 1% of project value, while 'arguably' Re-work costs are approximately 15% of project value. Consider Airport Contractual requirements for Construction Contractors performing services on airport projects.

Contractor Selection & Contract Language / Requirements

Historically, the construction industry measures contractor safety (i.e., injury prevention) excellence through the benchmarking of a construction firm's EMR and OSHA recordable rates. Measuring excellence through the absence of events is a challenge and a poor measuring tool in evaluating a successful safety program. Trade partners' safety pre-qualifications have advanced to evaluations of safety programs, planning orientations, job hazard analysis, pre-task plans and weekly safety meetings.

The same challenges exist with the evolution of QA/QC programs, which commonly measure the lack of 'rework' (i.e., lack of claims). Best-in-class QA/ QC programs mirror safety programs via their processes, policies and implementation. And yet costs of rework continue to rise in commercial construction. Two main challenges exist for contractors in reducing rework:

1. Prequalification process of evaluating a "paper" QA/QC program.
2. Involvement and on-going training of craft employees.

Safety and Quality in Construction Contracts

Safety of persons and property has long been part of the standard American Institute of Architects (AIA) contract. This language requires contractors to take reasonable precautions for safety and to promptly remedy damage and loss. The AIA indicates that quality control is, "an indispensable aspect of construction contracts" (Ensuring Excellence: Quality Control in Construction Contracts, AIA Contract Documents, 2023). Consensus Docs uses similar language in its general conditions that are embedded into all of its agreements, which are endorsed by AGC and over 40 other industry organizations. An example would be under the Consensus Docs 200 Agreement Between the Owner and Constructor and General Terms and Conditions (2023) the following: 3.11 . . . . Constructor shall prevent against injury, loss, or damage to persons or property by taking reasonable steps to protect: (a) its employees and other persons

at the Worksite; (b) materials and equipment stored onsite or offsite for use in the Work; and (c) property located at the Worksite and adjacent to work areas.

Training and certification are key components contractors rely on to meet contract requirements. This includes training, certifications and continuous education, generally specific to professional staff. Most trade workers receive on-the-job training, making the sharing of quality information at that (craft) level lacking. The question is "How can trade specific, craft level ongoing quality training be completed?" The challenge is how do contractors implement meaningful (trade-specific) QA/QC training for crews? The answer is simple and proven. Contractually require weekly, trade-specific, quality meetings, immediately following the weekly safety meetings.

Loss Control Staffing: Every major airport project the author has been involved with (over 40 years) identifies the quantity and professional resume of 'safety' professionals the Contractor is required to have on site. Most often tied directly to the number of craft employees on site and sometimes high hazard work. This is one of the 'program requirements" that has reduced the severity and frequency of craft injuries on projects. In the Author's 40 plus years of construction risk management experience not one Contract required a single dedicated, educated, degreed 'Quality Control' professional.

Pre-Task Plans: Frequently Contracts require every crew to complete a Daily Pretask Plan. This often has contract requirements for identifying crew hazards, step by step processes, tools/equipment required, maybe additional permits required. Etc. With Re-work arguably accounting for the single largest loss potential on projects, why not require daily Pre-Task Plans to identify quality installation requirements and allow for crews to 'see something say something'?

Improving the prequalification process, embracing craft involvement and sharing lessons learned have greatly contributed to the reduction of craft worker injuries. To state the obvious, the goal of both the safety and QA/QC programs is to prevent losses in regards to injuries and rework

Subcontractor Default

Subcontractors default for three primary reasons according to River Steenson, senior vice president, subcontractor default insurance, NFP:

1. Lack of labor which leads to an inability to maintain schedule
2. Financial insolvency
3. QA/QC problems Subcontractor default insurance claims are a low frequency and high severity type exposure

According to River Steenson, senior vice president, subcontractor default insurance, NFP. Quality issues generate about 20% of all the cost to cure a sub default insurance claim. That represents a massive opportunity to reduce the size of a claim by just focusing on each subcontractor's quality on the project site.

Recommendations

There are easy low costs strategies that Airport Construction Managers can take to reduce the impact of "Re-work" (most Construction Contracts already require the below for project 'safety" (injury prevention)):

1. Required Contractors to submit a detailed project specific Quality Control plan within their Responses (including sub-contractors).
2. Include 'Contractor Quality Control" in pre-bid and pre-award meetings.
3. Require "certificated' Construction Quality Control professionals on the Contractors on site team
4. Require Contractors to include in daily Pre-Task Plans "trade specific quality control"
5. Require Contractors to hold trade specific weekly Quality Control training meetings

Conclusion

The goal of this White Paper was to assist the Air Port Construction Managers in identifying the Costs of Re-work as the single largest loss potential on a project and provide a starting point to reduce the financial and schedule impact from Re-work. The goal of both the Safety /Injury Prevention and QA/QC programs is to prevent losses in regards to injuries and rework. The above recommendations each are proven 'injury prevention' processes. Easily adapting these steps will reduce financial and schedule the impacts to airport operations.

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7. Statistics. Quote by author with no statistical reference to back up the static quoted.