PANDEMICS AND PRODUCTIVITY: QUANTIFYING THE IMPACT

PRELIMINARY FINDINGS ON MITIGATION IMPACTS FOR SHEET METAL, HVAC AND MECHANICAL, CONTRACTORS

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Michael McLin, Managing Director at Maxim Consulting Group, works with construction-related firms of all sizes to evaluate their business practices and assist with management challenges. His areas of specialization include organizational assessments, strategic planning, project execution, productivity improvement, prefabrication, peer groups, and training programs. McLin has consulted with some of the most sophisticated contractors in the U.S. and his industry experience includes some of the most complex construction projects undertaken in the U.S. He is adept at utilizing available tools and analysis to identify opportunities and challenges within an organization. In addition to his expertise in many facets of the construction world, McLin is a nationally recognized public speaker and published author.

Dan Doyon, Director at Maxim Consulting, works with construction-related firms to solve complex business challenges to drive revenue and profitability. His broad experience in business process improvement across construction and related industries provides him with a unique perspective to identify and solve operational issues. His subject expertise includes organizational assessments, strategic business planning, financial planning and analysis, technology, organizational design and transition, productivity improvement, peer groups and prefabrication system design. With Doyon’s guidance and recommendations, companies have driven over $160B in top line sales growth and hundreds of millions in operational savings and improved processes.

Brian Lightner, Associate Director at Maxim Consulting, is responsible for client evaluation and implementation of processes. He has worked with construction firms, including the first ISO 9000 certified General Contractor in the U.S., to lead process improvement initiatives. He is keenly aware of the challenges that contractors face, including in their field operations. Lightner’s areas of expertise include project planning/scheduling/execution; field productivity assessments; project recovery; and process improvement/integration/standardization. His experience with both construction specialties and highly successful general contractors allow him to execute many exemplary field operation and productivity studies.
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TABLE OF CONTENTS

Executive Summary................................................................. 1
Preliminary Findings............................................................... 1
Part I - Pandemic Mitigation Tracking................................. 1
Part II - Productivity Benchmarking................................. 1
Part I - Pandemic Mitigation Tracking................................. 2
Objective................................................................. 2
Data Collection and Methodology ....................................... 2
Sample Set................................................................. 3
Summary Findings........................................................... 6
Roadmap................................................................. 6
EXECUTIVE SUMMARY

Preliminary Findings

Pandemics negatively impact construction productivity. To date, no resource existed to aid contractors in quantifying these impacts for the purpose of seeking equitable compensation for lost productivity, adequately pricing upcoming work that will take place under pandemic driven work rules and conditions, and properly formulating financial projections that take into account stress on cash flow due to both decreases in productivity and the associated increases in overhead costs.

In late April 2020, New Horizon's Foundation retained Maxim Consulting Group, LLC to quantify these impacts so that member contractors have a practical resource useful for mitigating pandemic related productivity losses. The study builds on and correlates to similar work published in ELECTRI International’s “Pandemics and Construction Productivity: Quantifying the Impacts.”

Two methods are used to quantify the magnitude of pandemic related productivity losses and are described in detail in this paper.

Part I - Pandemic Mitigation Tracking

A random sample of over 20,000 labor hours collected from Mechanical, Plumbing, and Sheet Metal contractors to date indicates 8.7% of hours available on projects to do productive work are lost due to mitigation requirements such as PPE management, cleaning & disinfection, access rules, and extra administration time. Identical sampling methods used in the ELECTRI study indicated similar results for electrical contractors on over 77,000 hours sampled. The combined average loss on mitigation for MEP contractors is 7.35%. It is reasonable to expect that if these hours were available crews would be putting work in place. Mitigation activities are out of scope.

The combined sample sets of the two studies provide a convincing quantification of losses on mitigation tasks - contractors should prepare change orders to seek direct financial compensation for these lost hours as well as use this data to adjust scope and pricing for future work under similar conditions.

Part II - Productivity Benchmarking

Preliminary findings, including research conducted via the ELECTRI International study, indicate that additional productivity losses of 12.4% may occur due to non-mitigation related impacts including, but not limited to: extra mobilizations/demobilizations, work fatigue from anxiety and excess absenteeism, social distancing effects, off shift work, altered delivery & material receiving, inspection and cleaning requirements, etc..

Further MEP data is being collected at the time of writing and will be published at a later date.

Leaving pandemic related productivity losses of this magnitude unaddressed is a significant problem for contractors. For specialty contractors a loss of 10% labor productivity often results in a 100% loss in project profitability. The magnitude of this issue represents a very real threat to a contractor's ability to remain in business if left un-mitigated. Worse, the nature of productivity losses is a lag effect that often goes unnoticed by conventional projection and reporting systems until it is too late. The true financial impact of productivity losses can take as long as 3-6 months to fully play out in a companies’ finances. Cash flow projections based on assumptions that do not include excess production costs and associated overhead costs can easily foster a false sense of security. This ripples further as resources (labor, equipment, and management) assumed to be available to execute new billable work are delayed as a result of slower productivity on existing work. It is only a matter of time before these impacts catch up to a company's cash flow cycles.

The earlier contractors use this information the better equipped they will be to weather the negative impact of pandemic driven productivity losses.
PART I - PANDEMIC MITIGATION TRACKING

Objective
The objective of Pandemic Mitigation Tracking is to quantify lost productivity directly associated with jobsite pandemic mitigation requirements such as PPE management and training, health screenings, cleaning and disinfecting, job site access and administration, all instituted to minimize exposure.

Data Collection and Methodology
Labor hours on impacted projects were collected from field supervisors on a daily basis via an application developed by the consultants for iOS and Android smartphones and tablets. Data collection began on April 30th, 2020 and continues at the time of this publication. Figure 1 shows the interface used by field supervision to enter time as well as the definitions provided to participants for normalizing data:

Figure 1: Application interface for entering daily time and included definitions for participants.
A single data point for this research represents time reported to five standardized time codes, per project, per day. Standard definitions for each time code normalize the data across the range of participants in the sample and were provided to participants in both a pdf instruction manual as well as embedded in the application itself. The time codes and definitions are:

- **100 – Total Hours Worked**: Sum of all labor hours worked on the project for the day.
- **200 – COVID Safety & Training**: Any/all forms of time lost due to COVID specific safety huddles, orientations, respirator training & fitting, etc.
- **201 – COVID Distancing & Access Rules**: Any/all forms of time lost due to site logistics, waiting to access work areas, waiting on medical screenings, extra distance to lunch & break areas, etc.
- **202 – COVID Cleaning & Disinfecting**: Any/all forms of time lost due to COVID related cleaning and disinfection of tools, equipment, and personal effects (including handwashing.)
- **203 – COVID Administration**: Any/all forms of time lost due to COVID related administration, paperwork, management of suspected cases, additional work coordination meetings, etc.

Definitions of activities for each time code category were determined from:
- Local, state and federal government guidelines for social distancing
- OSHA’s ‘Guidance on Preparing Workplaces for COVID-19’
- OSHA’s ‘Interim Enforcement Response Plan for Coronavirus Disease 2019’
- Firsthand accounts provided by contractors.

Participants received instruction for using the data collection tools via a combination of methods:
- Recorded Webinar
- PDF Instruction Manual
- Instructions and FAQ embedded in the application
- Direct access to the research project’s consultants via phone, text or email for questions and technical support

Each day, the consulting team reviewed sample size and geographic coverage using a heat map linked to the sample data set.

The analysis of the data collected centers on a simple argument: *It is reasonable to expect that the percent of labor hours, on average, that a contractor loses on jobsite pandemic mitigation requirements are hours not available to produce work at estimated rates of production and/or rates of production as defined in resources such as recognized manuals of labor units published by trade associations.*

**Sample Set**

*Figure 2* provides a table that depicts the breakdown of hours collected and tasks coded to mitigation related activities for New Horizons Foundation – plumbing, mechanical and sheet metal contractors.
Figure 3 provides a table that depicts the breakdown of hours collected and tasks coded to mitigation related activities for the New Horizons Foundation study, covering all MEP trades.

<table>
<thead>
<tr>
<th>Task Code</th>
<th>Total Hours</th>
<th>% of Total Hours</th>
<th>% of Mitigation Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Hours Available</td>
<td>20,893</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitigation Safety &amp; Training</td>
<td>470</td>
<td>2.25%</td>
<td>25.90%</td>
</tr>
<tr>
<td>Mitigation Distancing &amp; Access Rules</td>
<td>439</td>
<td>2.10%</td>
<td>24.19%</td>
</tr>
<tr>
<td>Mitigation Cleaning &amp; Disinfecting</td>
<td>580</td>
<td>2.78%</td>
<td>31.96%</td>
</tr>
<tr>
<td>Mitigation Administration</td>
<td>326</td>
<td>1.56%</td>
<td>17.96%</td>
</tr>
<tr>
<td>Total</td>
<td>1,815</td>
<td>8.69%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Figure 4 provides a table that depicts the breakdown of hours collected and tasks coded to mitigation related activities for combined New Horizons Foundation and ELECTRI studies, covering all MEP trades.

**Figure 4**: Mitigation Hours by Task Code (New Horizons Foundation + ELECTRI).

<table>
<thead>
<tr>
<th>Task Code</th>
<th>Total Hours</th>
<th>% of Total Hours</th>
<th>% of Mitigation Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Hours Available</td>
<td>98,098</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitigation Safety &amp; Training</td>
<td>2,068</td>
<td>2.11%</td>
<td>28.68%</td>
</tr>
<tr>
<td>Mitigation Distancing &amp; Access Rules</td>
<td>2,304</td>
<td>2.35%</td>
<td>31.96%</td>
</tr>
<tr>
<td>Mitigation Cleaning &amp; Disinfecting</td>
<td>1,980</td>
<td>2.02%</td>
<td>27.46%</td>
</tr>
<tr>
<td>Mitigation Administration</td>
<td>858</td>
<td>0.87%</td>
<td>11.90%</td>
</tr>
<tr>
<td>Total</td>
<td>7,210</td>
<td>7.35%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Figure 5 provides a view of week over week mitigation percentage over the course of reporting in the combined studies.

**Figure 5**: Mitigation Hours as a Percent of Total Hours by Week.
Summary Findings

On average, 7.35% of hours provided to impacted projects are lost by MEP trades as a result of mitigation tasks at the time of this publication.

Of the 7.35% loss, 29% of it is lost due to safety & training requirements, 32% is lost due to distancing and access requirements, 27% is lost due to cleaning & disinfecting, and 12% is lost due to administration.

These numbers can and should be used by contractors in the preparation of change orders, the pricing and adjusting of scope in upcoming work on impacted projects, and to ‘stress’ test financial projections.

In general, contractors should not be required to itemize the 7.35% loss into sub-categories since all categories require management on active projects during a pandemic. Federal distancing guidelines, OSHA requirements, and the resulting general contractor and subcontractor safety plans apply to most active projects, regardless of region or type. For example, the following existing standards are referenced by OSHA as applicable in times of pandemic and apply to all projects across the country:

- 29 CFR § 1904, Recording and Reporting Occupational Injuries and Illness.
- 29 CFR § 1910.133, Eye and Face protection.
- 29 CFR § 1910.1020, Access to Employee Exposure and Medical Records.
- Section 5(a)(1), General Duty Clause of the OSH Act.

It is possible that local, state, owner driven, or contractor-specific mitigation requirements could affect the degree and complexity required to comply with mitigation requirements. In such cases, contractors should use the 7.35% loss as a baseline from which modifications specific to their situation are made. Factors to consider are provided in the section entitled “Roadmap” below.

Is the situation improving with time? It is too early to tell. It is reasonable to expect that early uncertainty surrounding the necessity and degree of mitigation requirements will ease as the specific disease is better understood and enforcement agencies more clearly define requirements. It is also reasonable to expect that contractors will improve their ability to cope with mitigation requirements as time goes on, provided they know what to expect. Until then, contractors should consider several factors to assess the degree of impact they will experience that will modify the current average including:

- GC/CM/Owner Site-Specific Safety Plans
- GC/CM Site Logistics Plans
- Quality of Work Coordination
- Local, state, or other modifiers to Federal Guidelines

With the number of hours and projects sampled, 7.35% is a solid calculation of the current average loss experienced daily by contractors across the country with a margin of error of plus or minus 1%.

Roadmap

Contractors should utilize the average loss in productivity in the following scenarios:

- Use the average provided as either direct calculation of loss in the preparation of change orders requesting relief for the time lost managing pandemic mitigation requirements or as backup to negotiations of change orders currently pending.
- Use the average provided as a multiplier on active projects to forecast financial projections, schedule impact, and resource availability.
Use the average provided as a multiplier for estimating projects that will require pandemic mitigation factors as projects re-open and for future projects, assuming prolonged mitigation requirements.

Factors that should be considered as modifications to the baseline average include but are not limited to:

- Detailed knowledge of federal, OSHA, and CDC applicable guidelines and directives.
- Local and state modifiers or additions to federal, OSHA, and CDC guidelines and directives.
- Availability and clarity of owner, GC/CM project specific safety plans.
- Project specific characteristics that influence social distancing and logistics.
- Relationship with the GC/CM.

A change order calculator is intended for publication once further research is complete. Until then, contractors should look to SMACNA for news and information regarding additional training and education as well as referrals for support and assistance in developing change order requests.

Contractors should also look to SMACNA for further publications as research is active and future updates are currently planned.