MEP INTERFACES

COMPLEXITIES OF MEP DESIGN

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Introduction

The design and installation of MEP systems, that intertwined network of ducts, pipes, wires, generators, controllers and emitters that bring our buildings to life, is an extremely complex and complicated part of any construction project.

Figure 1 shows the most common MEP systems that might be installed in a building – amounting to over fifty different MEP systems that need to be designed and coordinated with one another, as well as with other trades and disciplines.

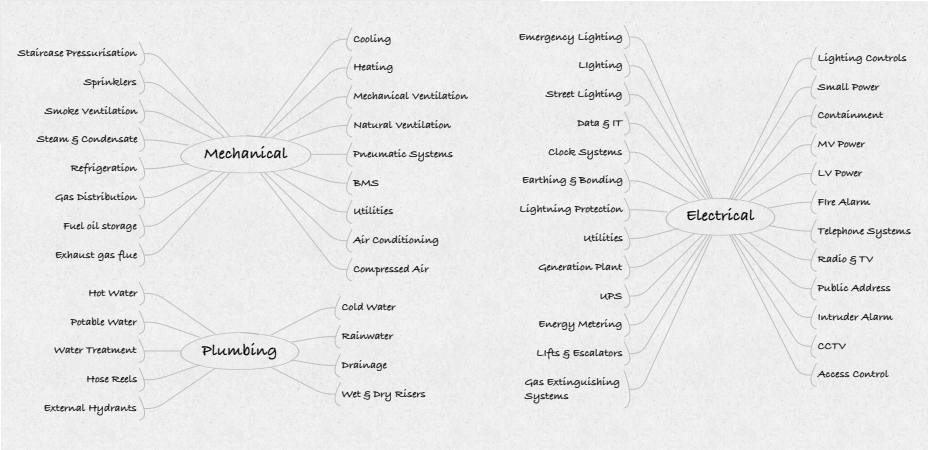

Figure 1 - MEP Systems in Buildings

Few of these systems can be regarded as stand-alone systems; many of them interface with others and all of them must be considered holistically for space planning requirements. Figure 2 shows the complex web of some of the interfaces that exist between each of the MEP disciplines - it makes for a very complicated picture!

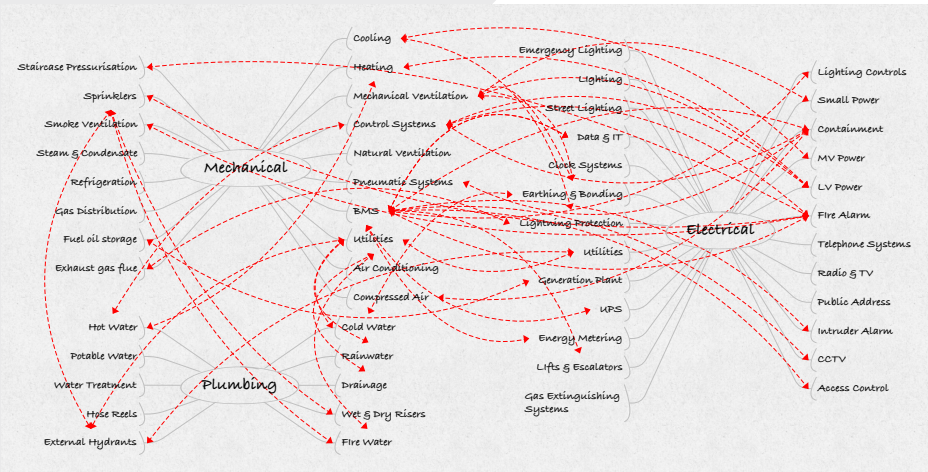

Figure 2 – Interfaces and relationships between MEP systems

The cost of MEP systems in a building project can range between 25% and 40% of the total construction cost depending on the nature and function of the building. Failure to identify, define and manage the many interfaces between MEP systems during design and through to installation can create circumstances that often give rise to costly disputes in construction projects.

- Some MEP interface problems are more common than others:
- Alignment of above ground and below ground drainage;
- Power supplies for mechanical equipment;
- Location and provision of primary service connections to shell spaces;
- Methods of termination of primary service connections to shell spaces;
- Provision of containment (cable trays and trunking) for other systems;
- Utilities connection points;
- Interfaces between site-wide distribution systems and individual building systems (district cooling for example); and
- Contractor designed elements.

With many MEP interface issues, the cost of rectification of the physical deficiencies can pale into insignificance when compared to the cost associated with the delay in rectifying the issue. An example I encountered on a recent project concerned a dispute over the design responsibility of the site electrical infrastructure and obtaining the appropriate approvals from the supply authority. The dispute resulted in a delay to the power-on date for the site, which in turn impacted the testing and commissioning of the MEP systems and introduced the need for additional standby generators while waiting for power to be connected. All of which delayed the project handover and invoked delay damages against the contractor.

> "Without properly defined interfaces, even the best designs will provide opportunities for costly disputes to develop."

How Design and Construction Interfaces have changed

When I started my career (over thirty years ago) it was usual for the MEP subcontractors to be discipline-specific in that there would be a separate subcontractor for mechanical and plumbing installations and another subcontractor for the electrical installation.

Over time, design and build procurement gained popularity and the MEP subcontractors became bigger multi-discipline organisations that would be responsible for the complete MEP installation. At the same time, MEP consultants started to fragment into specialisms. For example, systems that would have been designed by an electrical engineer such as security and IT systems are now commonly designed by specialists.

Current trends in the construction industry, and particularly in large projects, is to have separate contractors responsible for parts of the installation under separate contracts. On infrastructure projects the MEP

installation can be done by different contractors in each building with a separate contractor responsible for the site-wide utilities installation.

The development of smart building technologies that operate on integrated common platforms and networks further creates another set of interfaces that is perhaps more difficult to define. The bridge between software, system hardware and operational outputs includes not only physical interfaces but also the compatibility of each system's communication protocols.

It should come as no surprise then that a fragmented design process coupled with multiple installation contracts and ever-changing technologies creates numerous interfaces that must be accurately defined and described in the contract scope of work to avoid subsequent disputes arising.

HKA has undertaken extensive research into the causes of dispute in construction projects and our findings are published annually in our research paper, CRUX. Interface management and poorly defined contract requirements feature in the top five causes of disputes in the 700 projects we analysed.

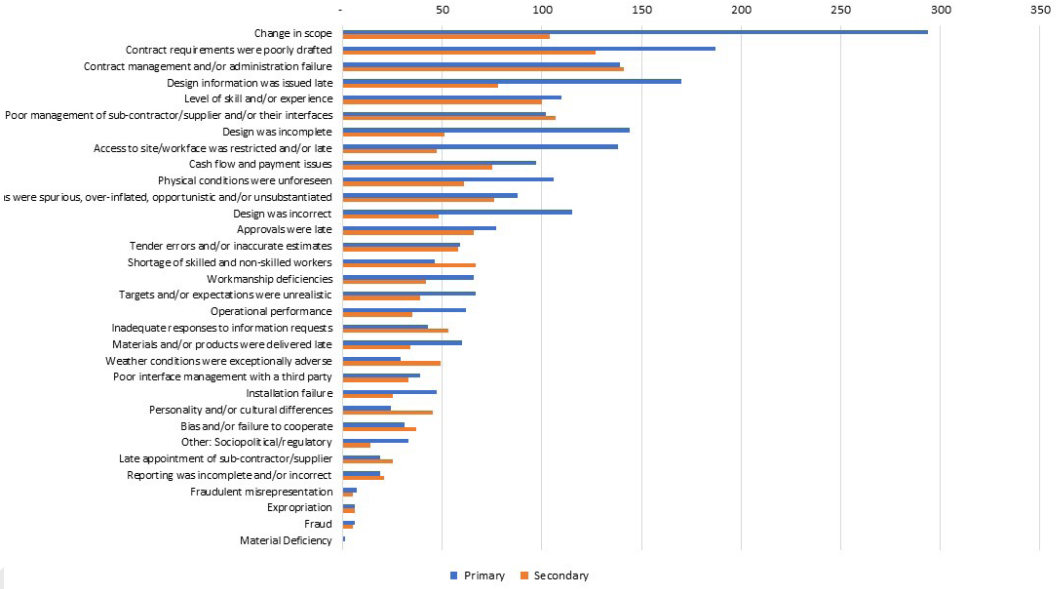

Figure 3 – HKA CRUX Summary of Primary and Secondary causes of disputes in the Built Environment

How to mitigate the risk of disputes arising from Interface issues?

In many of the disputes I have seen, poorly written scopes of work that fail to adequately define interface responsibilities are frequently referenced as a primary source of dispute. Project specifications that run to many hundreds of pages and are generated from software packages using typical specifications for MEP systems either lack the "glue" of the basic information that defines who does what or, if it is defined, it is not done accurately.

Defining the interfaces at the design stage through the simple use of a responsibility matrix and obtaining buy-in from construction and design

managers early in the process would eliminate a huge amount of potential for subsequent disputes.

The increasing use of collaborative design processes such as BIM and the adoption of advanced modelling and simulation software in MEP design are fantastic developments in the automation of MEP design. These tools and processes allow systems to be designed extremely quickly and to very high levels of accuracy. That said, failure to know and understand the interfaces in MEP system design cannot be rectified by the use of sophisticated software alone. Indeed, it could be argued that over-reliance on these tools by inexperienced engineers may be a root cause of some of the issues that are encountered!

The old adage that "the devil is in the detail" is hugely relevant in MEP systems design. Without properly defined interfaces, even the best designs will provide opportunities for costly disputes to develop.

If you require any further information, please contact Bill Haggart on BillHaggart@hka.com