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A Norwegian case study

Visual Lean planning tools in the construction industry

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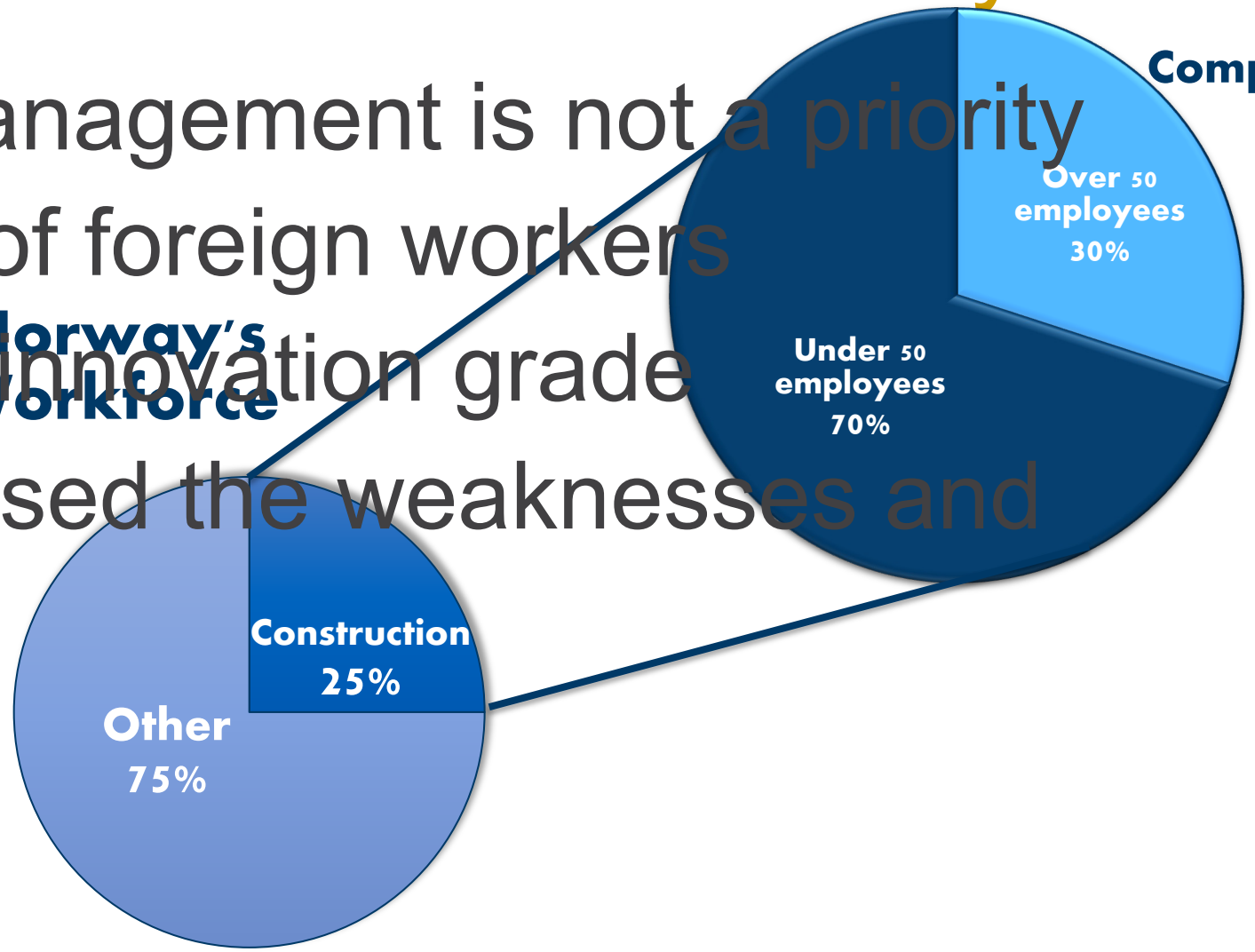
Content

- Aim
- Industry context
- Research methodology
- Visual Lean planning in the Norwegian construction industry
- Case study: The KA23 project
- Lessons Learned
- Barriers and opportunities for change
- Conclusions

The Norwegian construction industry

- Knowledge management is not a priority
- Large portion of foreign workers
- Low technical innovation grade
- Covid 19 exposed the weaknesses and opportunities



(SINTEF,2020)

Aim

- How can **visual Lean planning** tools be used in a **Norwegian construction project** to increase the **cohesion between planning and production**?

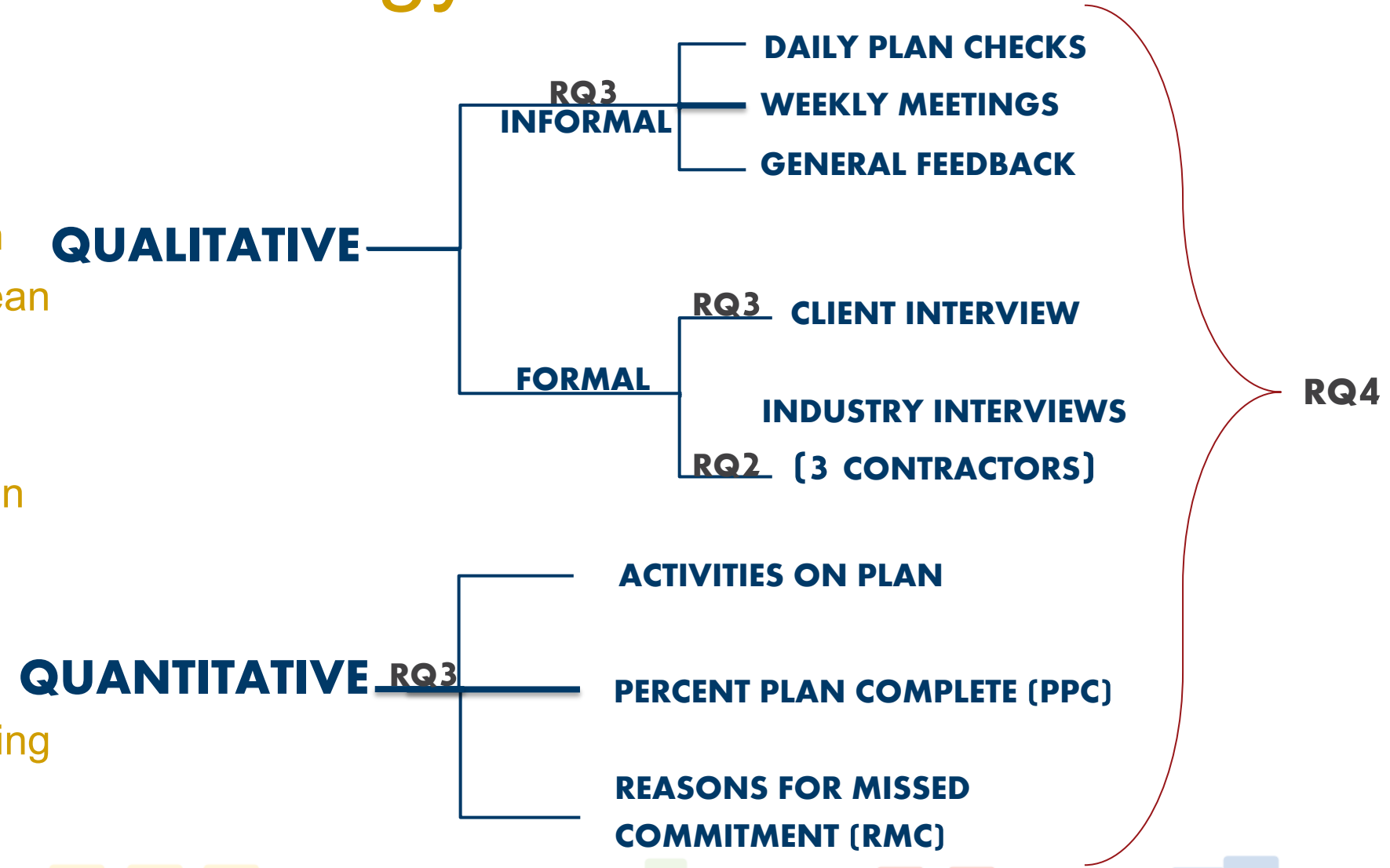
Research methodology

RQ1 - What is visual Lean planning?

RQ2 - How have Norwegian contractors applied visual Lean planning?

RQ3 - What are the lessons learned from using the LPS in the KA23 project?

RQ4 - Which visual Lean planning processes improve the cohesion between planning and production?

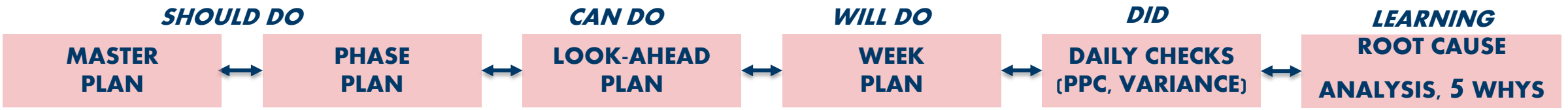


Visual Lean planning

- Collaboration
- Accountability
- Increase cohesion between planning and production
- Communication tool
- Improve project delivery
- Continuous learning

The Last Planner® System (LPS)

- Entire project lifecycle
- Achieve planned activities

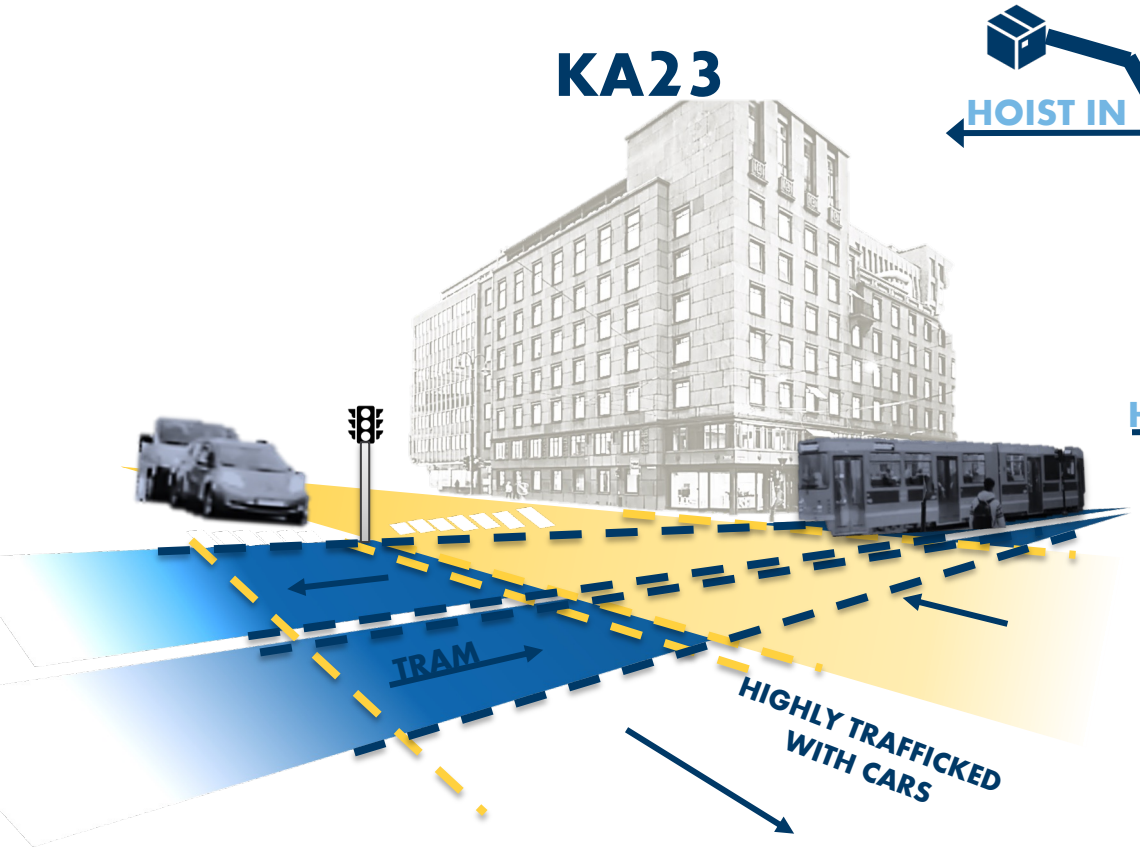


(Lean Construction Institute, 2017)

Contractor interviews

CONTRACTOR	1	2	3	Seltor
Project size	70 - 3000 MNOK	9 - 1000 MNOK	80 - 2400 MNOK	6 - 400 MNOK
Project types	Buildings and Infrastructure	Buildings	Buildings and Infrastructure	Buildings

KA23 Case study



HOIST IN

COLLECT

STORAGE TERMINAL

DELIVER

ORDER

HOIST OUT

TRANSPORTATION COMPANY

SUPPLIERS

PACK & CONTROL

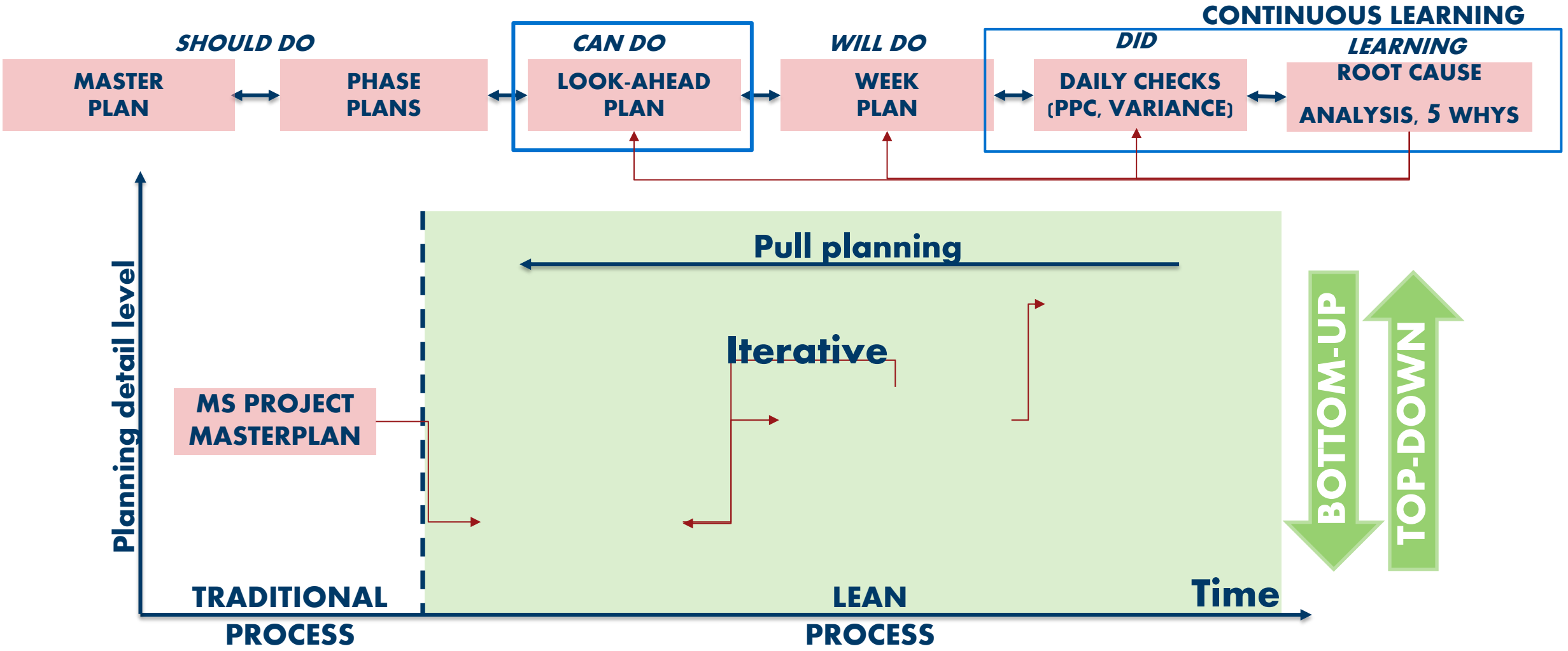
SUBCONTRACTORS

LOGISTICS PLANNERS

MYLOC LOGISTICS SYSTEM

BOOK DELIVERY TIMES

KA23: Production plan hierarchy



KA23: Production plans

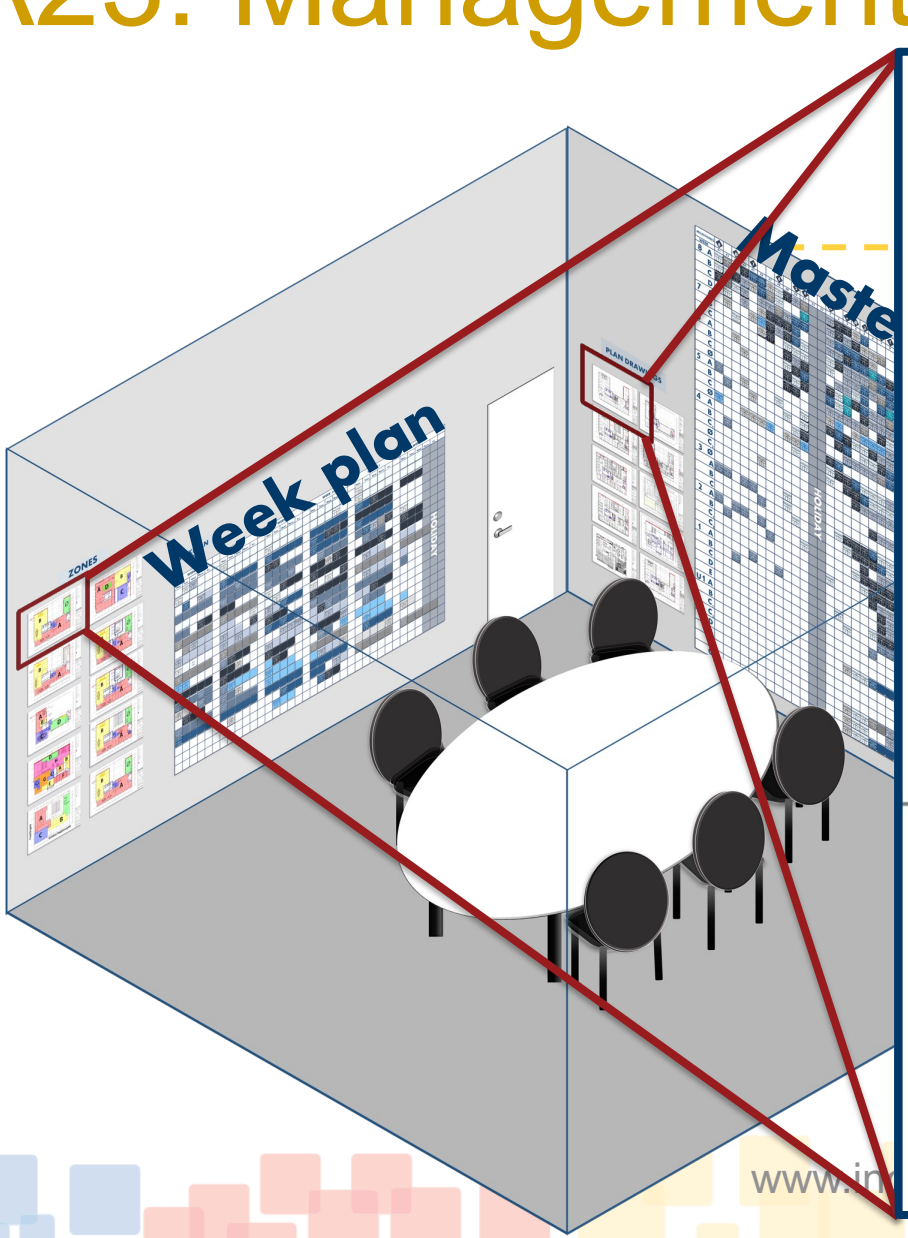
LEAN PROCESS

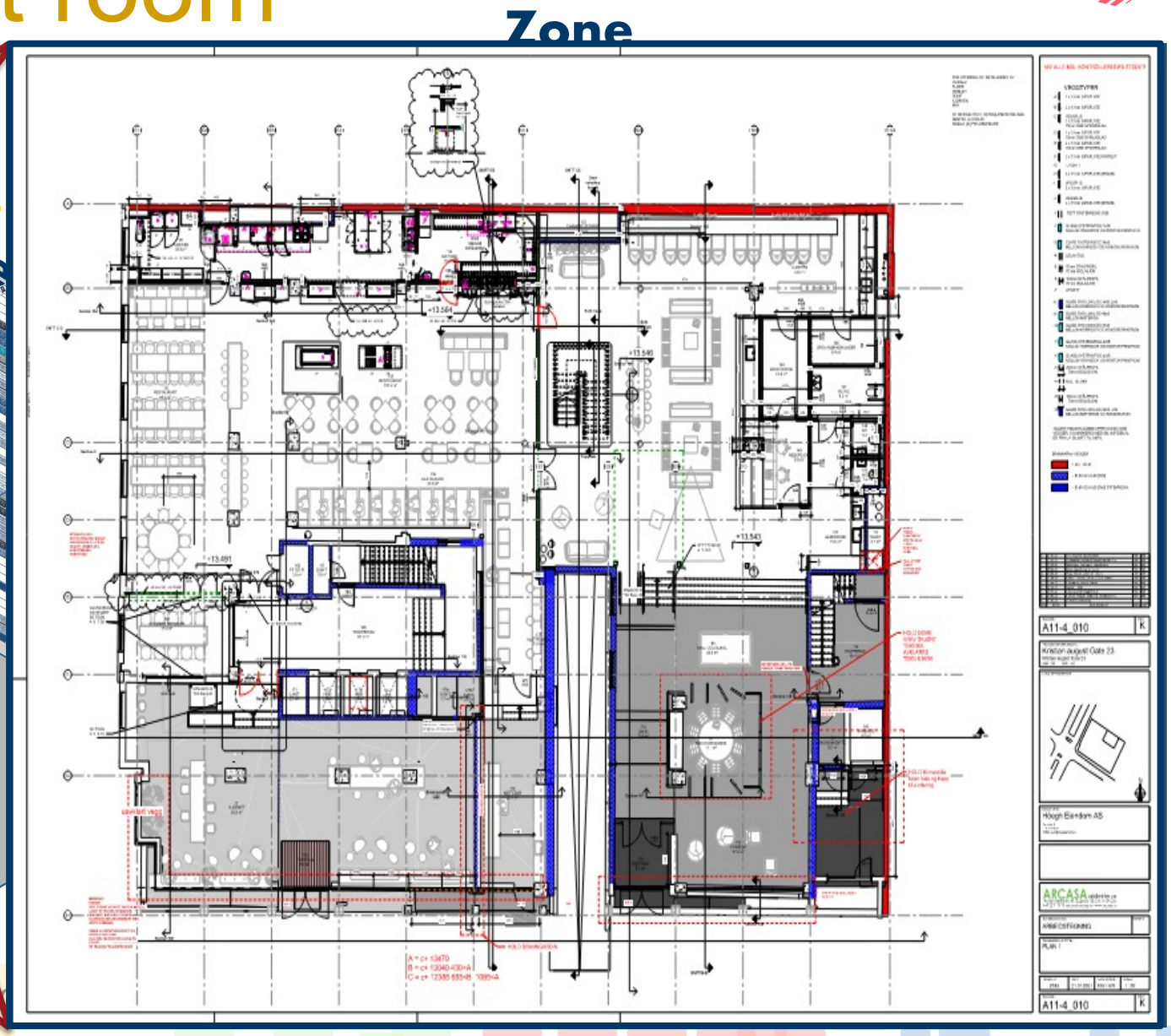
	MS PROJECT MASTERPLAN	PHASEPLAN	MASTERPLAN	WEEK PLAN
FUNCTION	SET MILESTONES, GUIDE OVERALL PRODUCTION, LEGALLY BINDING	FIND THE FLOW, DEPENDENCIES AND SEQUENCE OF ACTIVITIES	SHOW MILESTONES, PLAN THE WEEKLY ACTIVITIES AND COORDINATE DEPENDENCIES	PLAN THE DAILY ACTIVITIES AND VISUALIZE DEPENDENCIES
CREATED BY	ASSISTANT PROJECT MANAGER	SUBCONTRACTORS [PROJECT MANAGERS & FOREMEN]	SUBCONTRACTORS [PROJECT MANAGERS & FOREMEN]	SUBCONTRACTORS [FOREMEN]
CREATION TIME	BEFORE PRODUCTION STARTS	WHEN PRODUCTION IS PLANNED	WHEN PRODUCTION IS PLANNED	EVERY THREE WEEKS
UPDATED	WHEN BIG CHANGES TO PLAN OCCUR	WHEN REPLANNING ACTIVITIES	WHEN MAIN ACTIVITIES ARE COMPROMIZED OR REPLANNED	WEDNESDAY FOREMEN MEETINGS
CHECKED	WHEN CHANGES TO PLAN OCCUR	WHEN REPLANNING ACTIVITIES	THURSDAY PROGRESS. MEETINGS	DAILY PLAN CHECKS (MON-THURS) MONITORED BY PERCENT PLAN COMPLETE AND DEVIATION TRACKER
PLAN OUTLOOK	ENTIRE PROJECT LIFECYCLE (12 MONTHS)	SPECIFIC PHASES (3-9 MONTHS)	ENTIRE PROJECT LIFECYCLE (12 MONTHS)	3-6 WEEKS

KA23: Meeting structure

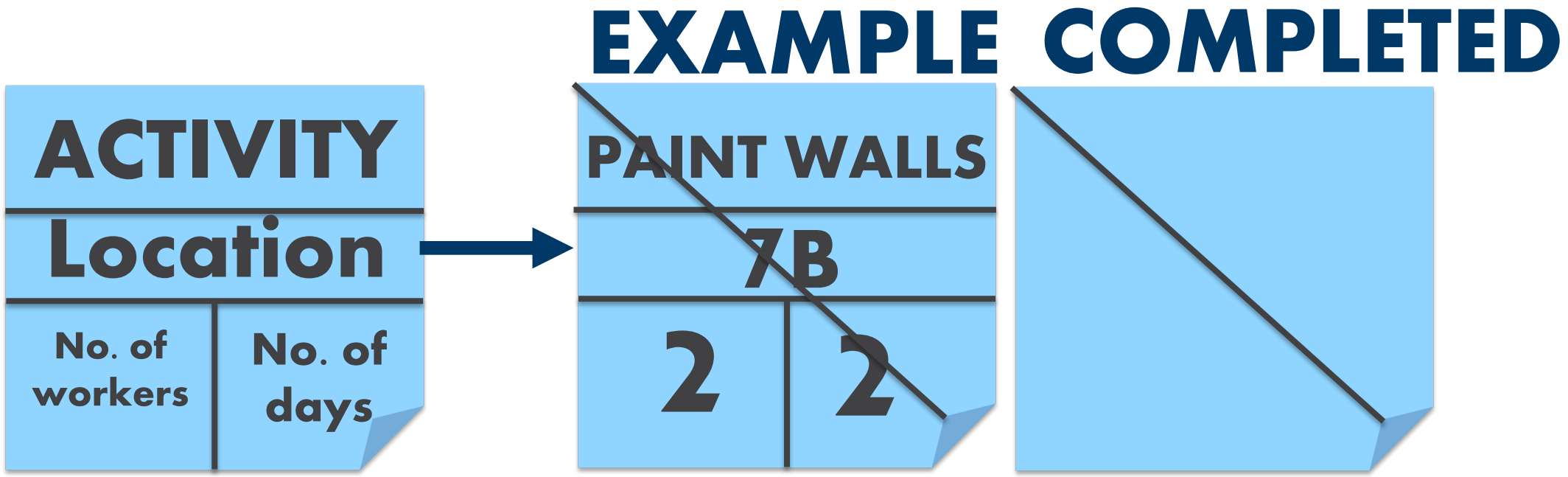
EXTERNAL ATTENDEE	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	SELTOR OWNER
FOREMAN	DAILY PLAN CHECK	DAILY PLAN CHECK	DAILY PLAN CHECK	DAILY PLAN CHECK	SITE MANAGER
FOREMAN	H&S ROUNDS		FOREMEN MEETING	LOGISTICS MEETING	SITE MANAGER
PROJECT MANAGER, FOREMAN				PROGRESS MEETING	SITE MANAGER
PROJECT MANAGER			TECHNICAL MEETING		ENGINEERING MANAGER
CLIENT				CLIENT MEETING	PROJECT MANAGER

KA23: Management room

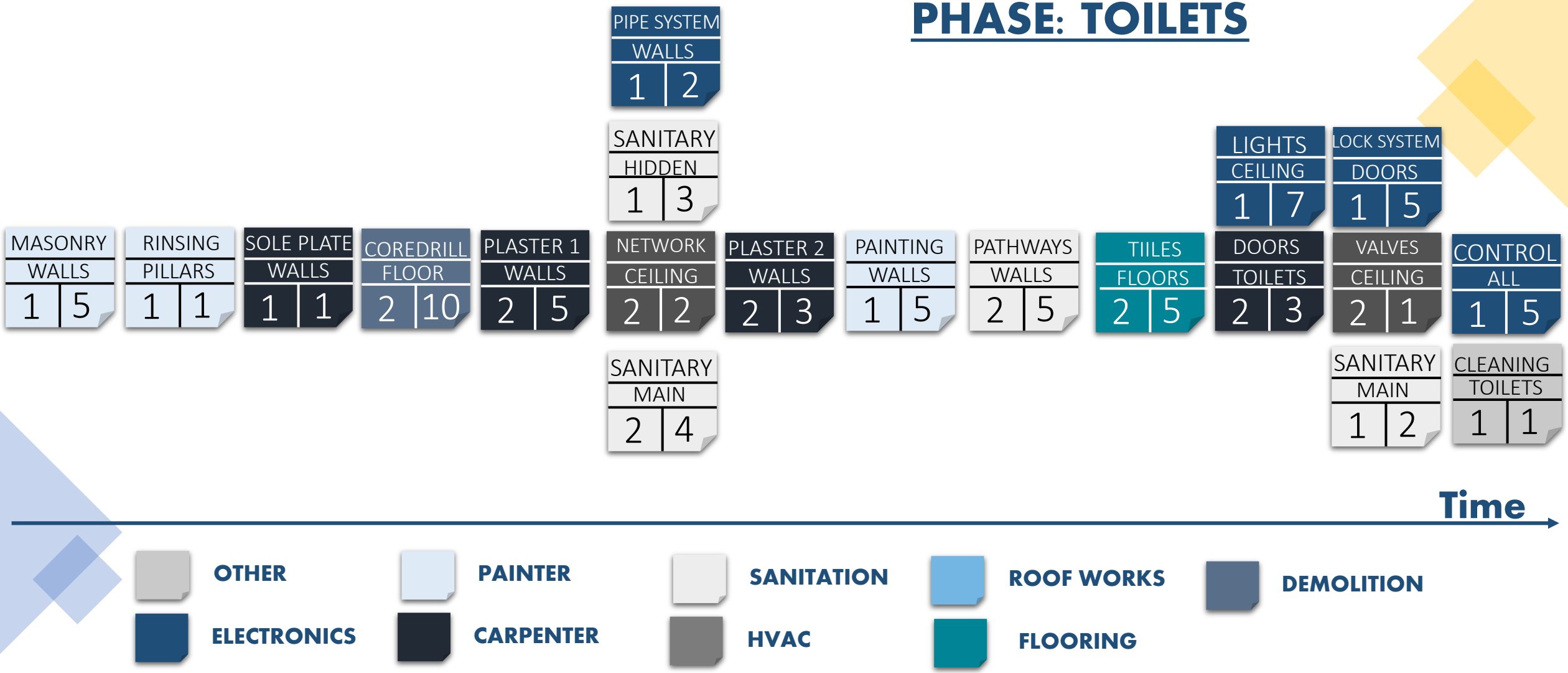




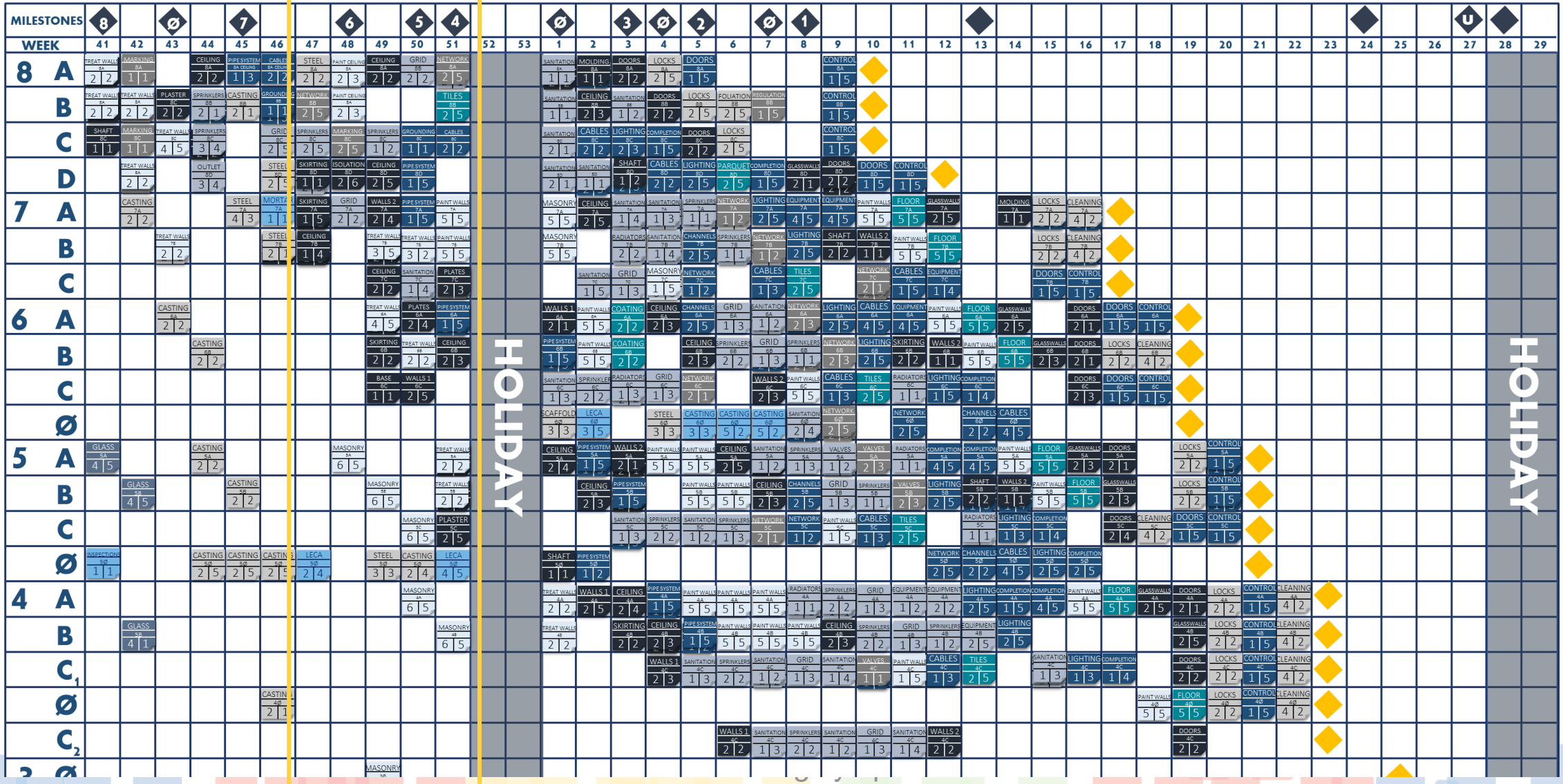
Post-it format



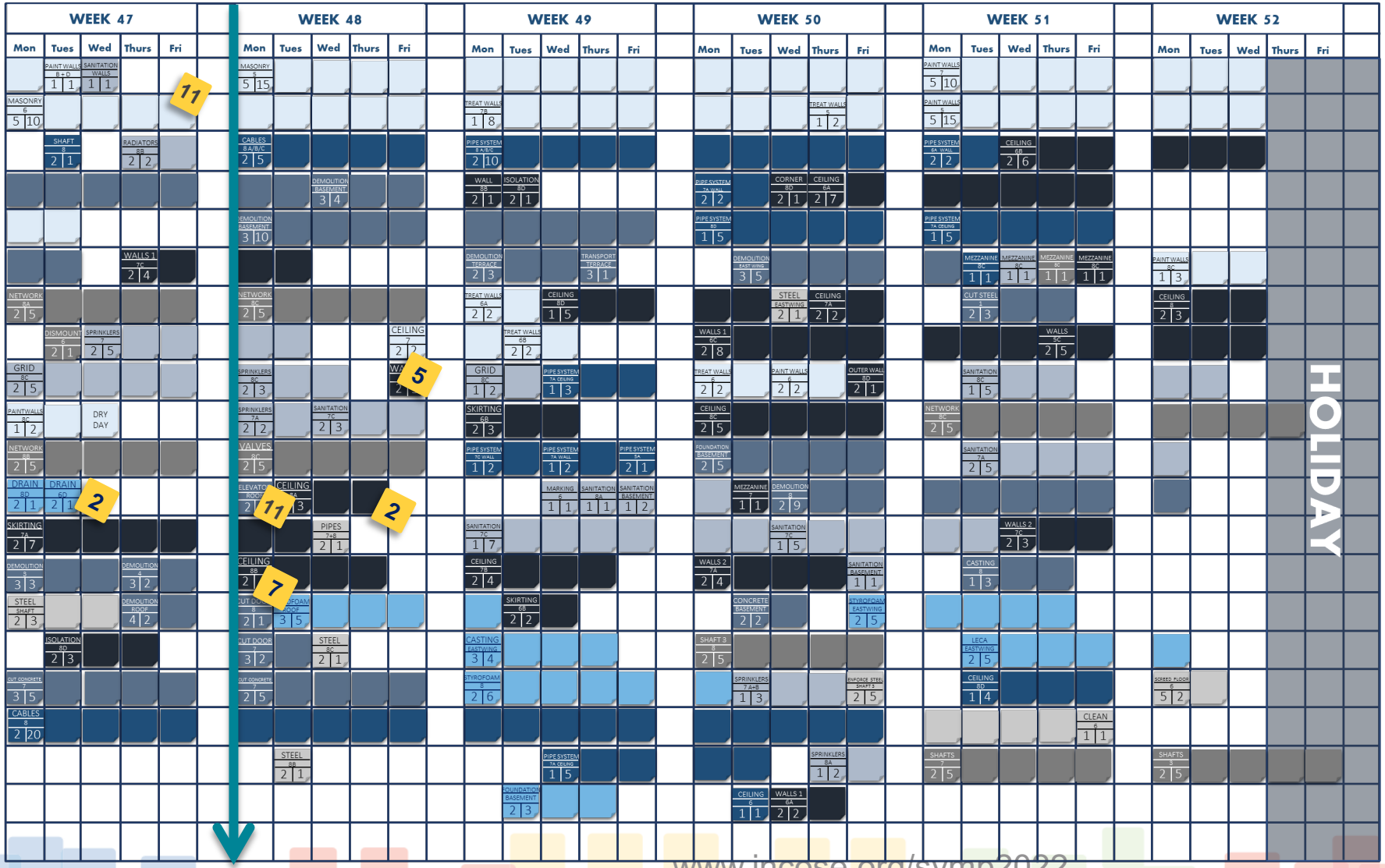
KA23 Phase plans



KA23: Master plan



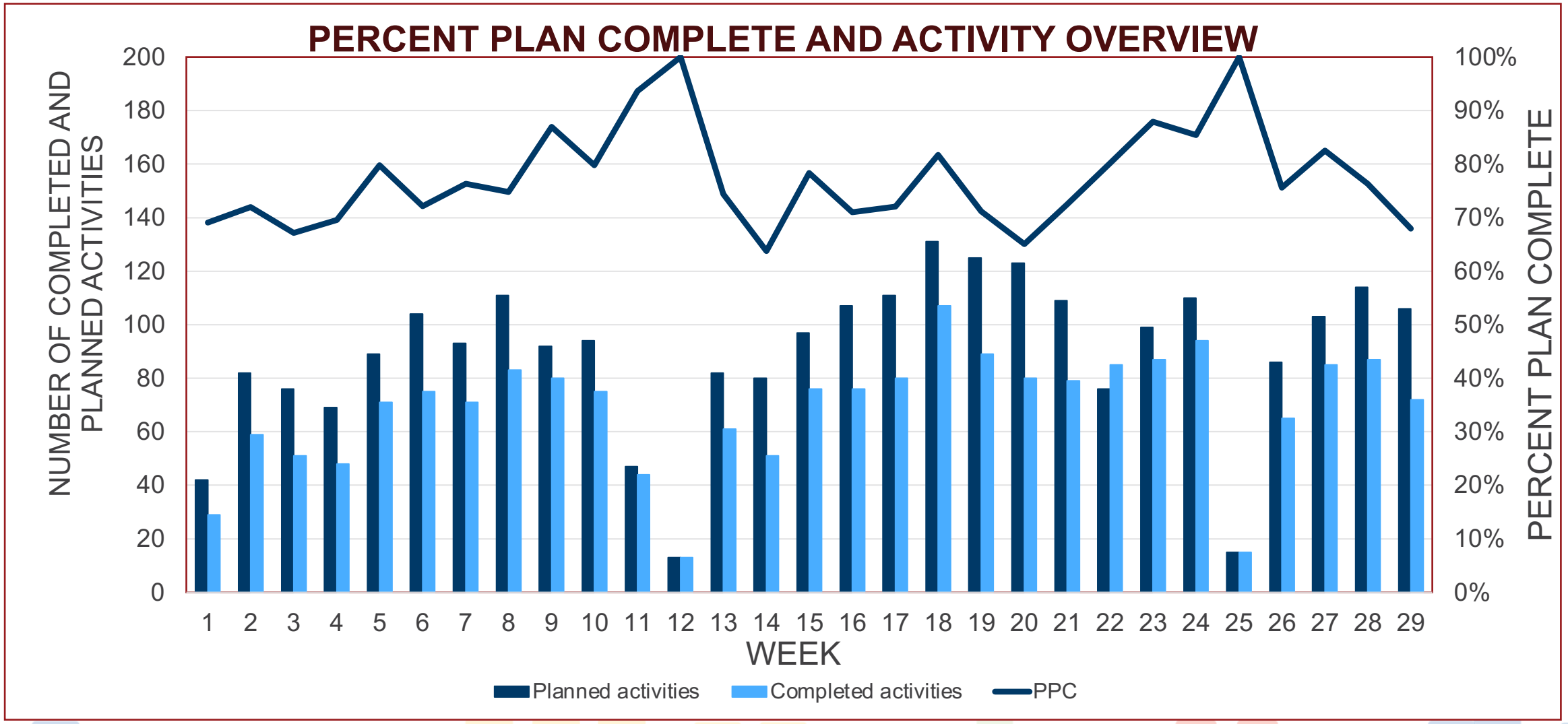
KA23: Week plan- Plan check



RMC

1. WEATHER
2. LACK OF MATERIALS
3. LACK OF WORKERS
4. LACK OF ENGINEERING DECISIONS
5. INCOMPLETE PREDECESSOR
6. ILLNESS
7. LACK OF MATERIALS
8. LACK OF/POOR PLANNING
9. HEALTH & SAFETY
10. THEFT
11. UNFORESEEN
12. LOGISTICS
13. LACK OF QUALITY CONTROL

Percent Plan Complete



Reasons for Missed Commitment

CATEGORY	DESCRIPTION	OCCURRENCE	
INCOMPLETE PREDECESSOR	Delayed preceding activity	267	39.1%
SHORTAGE OF MANPOWER	Insufficient number of workers on site	81	11.9%
INSUFFICIENT PLANNING	Unrealistic or insufficient planning	68	10.0%
REPRIORITIZATION	Focus shifted to other, critical, activity	65	9.5%
LACK OF MATERIALS	Lack of necessary equipment or supplies	63	9.2%
DRAWINGS/ENGINEERING	Insufficient drawings or client decisions	55	8.1%
UNFORESEEN	Factors or scenarios impossible to predict	21	3.1%
WEATHER	External conditions related to weather	18	2.6%
DISEASE	Pandemic-related obstructions to production	15	2.2%
QUALITY CONTROL	Deviation from Standards and/or specifications	15	2.2%
LOGISTICS	Logistical obstructions or setbacks	9	1.3%
HEALTH AND SAFETY	H&S hazard or incident	4	0.6%
THEFT/VANDALISM	Theft or vandalism on site	2	0.3%

KA23 potential improvements

- Not applying the LPS in the design phase
- No logistics or H&S activities on the plan
- Late phase planning
- Not using a look-ahead plan
- Lack of week plan structure
- No soundness check
- Lack RMC follow up
- Little client involvement

Recommendations

- Pull value from customer
- Manage workflow
- Communicating the rationale
- Visual Lean planning in the design phase
- Look-ahead planning
- Soundness checking
- Early phase planning
- Well-structured plan
- Physical and digital tools
- BIM is essential

Barriers and opportunities for change

Barriers

- The culture in construction
- Many different companies involved
- Subcontractors are used to financial sanctions

Opportunities

- Incentives
- Technology 4.0
- Integration of tools

Limitations of the research methodology

- Project duration vs. Research duration
- Only one project reviewed
- Biased researcher
- Inaccuracies
- Subjectivity

Conclusions

- Visual Lean planning in essence
  «One size does not fit all»
- A culture of prevention
- Integrating H&S and logistics
- Knowledge transfer
- Client involvement
- Introducing digital tools
- Continuous learning

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