

Joint Seminar on Project Management Techniques

**Scheduling Testing,
Balancing &
Commissioning**

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Mechanical Contractors Association
MCAA
of America

**Change Orders
Productivity
Overtime**

2012 EDITION

FEATURING NEW CONTENT ON HOW TO APPLY THE
MEASURED MILE METHOD OF PRODUCTIVITY ANALYSIS

A PRIMER FOR THE CONSTRUCTION INDUSTRY

**Presented by: Tom Carcaterra, P.E. – Principal of Thomas Carcaterra, P.E., LLC
Paul Stynchcomb, PSP, CFCC, SMD of FTI Consulting**



Scheduling Testing, Balancing and Commissioning

Testing, Balancing and Commissioning

How many of you have been approached to assist with the detailed sequencing of the Testing & Balancing process in the first two months of a project?

When do you sit down and actually plan the most efficient manner to accomplish Testing & Balancing in a detailed fashion?

Would you want to be able to tie the most efficient Testing & Balancing sequence / schedule into your contracts?

How to schedule TAB, and why TAB sequence is critical to a fully commissioned building.

Have Cx entity present and involved in all TAB sequencing EARLY in project timeline. Get Cx entity to assist with detailed TAB and Cx sequencing.

GOALS

- **Control the TAB Sequence**
- **Inspect Project for TAB Readiness**
- **Written Status Correspondence**
- **Be an Asset to the Project Closeout Process**
- **Obtain Modifications for Delays**

Testing, Balancing and Commissioning

A fully commissioned building requires the careful integration of -

Equipment Installation

Pressure testing / leak testing

Power to MEP Equipment

Start-Up and Controls Completion

TAB & TAB Verification

Cx Checklists (aka “Pre-FPT’s”)

Final Functional Performance Tests (FPT’s)

Post Occupancy System Verification

Testing, Balancing and Commissioning

How to Create the TAB Timeline

First, Define ALL Equipment

Completely list all AHU's Terminal Boxes, Coils, Pumps, Fans, FCU's, Chillers, Boilers, etc.

Use Spreadsheet.

Testing, Balancing and Commissioning

Second, Define All Systems

Define SYSTEMS comprised of various pieces of Equipment. For example, let's define the systems for a typical University laboratory. Each subsystem must be complete in order to test all systems together:

- Supply 100% OA AHU's System and Associated Air Valves
- Laboratory Exhaust System and Associated Air Valves
- Building Hot Water and Reheat System
- Fume Hoods / Snorkels
- Toilet and General Exhaust Systems
- General Construction (walls, doors, ceilings complete)

Testing, Balancing and Commissioning

Controllable Systems

Not only must the components of the system be installed, but they must be controlled. This means that the controls subcontractor must be “substantially” finished with their start-up and QA/QC checks before TAB may begin. Particularly true for spaces with pressure controls (like labs).

Testing, Balancing and Commissioning

Finally, Define TAB Schedule

- Determine whether specifications require concurrent air and water balancing in order to measure heat transfer characteristics (almost always required)
- On a system by system basis, identify the system being balanced, and the amount of time required to balance. Indicate whether air and water is being balanced concurrently or sequentially.
- Define manpower allocations for each system balancing activity

Testing, Balancing and Commissioning

Present detailed TAB schedule to the contractor, and tie your contract performance to that schedule.

A simple letter outlining your most efficient manner of performing TAB speaks volumes, and is much more likely to be incorporated into the project's contract schedule.

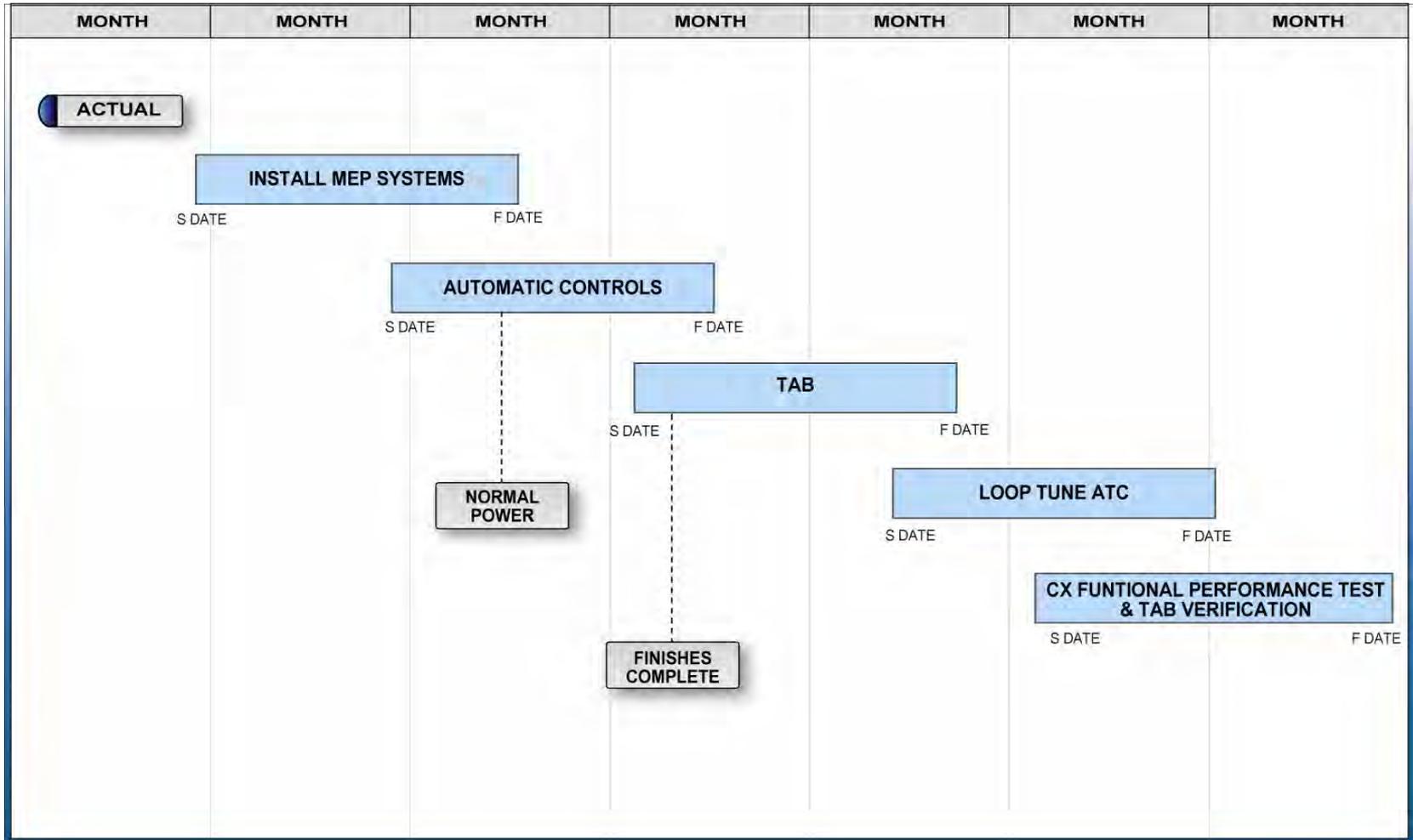
Cx meetings are also great opportunities to discuss and document the TAB sequences.

Testing, Balancing and Commissioning

Release pencil copies of TAB data as systems are completed, after TAB Supervisor has reviewed, for review by Cx and Engineer of Record.

The final TAB report then becomes a “formality”, and there are no surprises late in the project.

Testing, Balancing and Commissioning



Testing, Balancing and Commissioning

NEBB TAB PROCEDURAL STANDARDS

APPENDIX

APPENDIX B SAMPLE PRE-TAB CHECKLIST

This is a sample checklist to be provided by the TAB Firm to the installing contractor for the contractor's use in verifying system readiness prior to balancing.
(This recommended PRE-TAB checklist is available from www.nebb.org)

Project: _____

1.HVAC Units & Built-Up Units	Ready		Date		Ready		Date
	Yes	No			Yes	No	
a) GENERAL				d) COILS (ELECTRIC)			
Louvers installed				Sizes and construction			
Manual dampers adjusted and locked				Airflow direction			
Automatic dampers operating				Duct connections			
Housing construction complete				Safety switches			
Access doors closed				Contactors and disconnect switches			
Condensate drain piping and pan				Electrical service and connections			
Free from dirt and debris				Obstruction and / or debris			
b) FILTERS				e) FANS			
Type and size				Rotation			
Number				Wheel clearance and balance			
Clean				Bearing and motor lubrication			
Frame - Leakage				Drive alignment			
Temporary				Belt tension			
c) COILS (HYDRONIC)				Drive set screws tight			
Size and rows				Belt guard in place			
Fin spacing and condition				Flexible duct connector alignment			
Obstruction and / or debris				Starters and disconnect switches			
Airflow and direction				Electrical service and connections			
Piping leakage				f) VIBRATION ISOLATION			
Correct piping connections and flow				Springs and compression			
Valves open or set				Base level and free			
Air vents or steam traps							
Provisions made for TAB measurements							

III



Testing, Balancing and Commissioning

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Testing, Balancing and Commissioning

Pre-Functional Checklist
AHU-E-02 AHU serving Study Collection Level 2 (Rm 118.37)

Submittal / Approvals

Submittal. The above equipment and systems integral to them are complete and ready for functional testing. The checklist items are complete and have been checked off only by parties having direct knowledge of the event, as marked below, respective to each responsible contractor. This construction checklist is submitted for approval, subject to an attached List of outstanding items yet to be completed. A Statement of Correction will be submitted upon completion of any outstanding items contained in the List. None of the outstanding items preclude safe and reliable functional tests being performed. List attached.

<i>C. Cox</i>	7/23/10	<i>Keith Wick</i>	7/23/10
Mechanical Contractor	Date	Control Contractor	Date
<i>John Smith</i>	7/14/10	<i>C. Cox</i>	7/23/10
Electrical Contractor	Date	Sheet Metal Contractor	Date
<i>C. Tate</i>	7/26/10	<i>Keith Wick</i>	7/26/10
TAB Contractor	Date	General Contractor	Date

Construction checklist items are to be completed as part of startup & initial checkout, preparatory to performing functional test procedures.

- This checklist does not take the place of the manufacturer's recommended checkout and startup procedures or report.
- If this form is not used for documenting, one of similar rigor shall be used.
- Contractors assigned responsibility for sections of the checklist shall be responsible to see that checklist items by their subcontractors are completed and checked off.

Approvals. This filled-out checklist has been reviewed. Its completion is approved with the exceptions noted below.

<i>Matthew Caputo</i>	8/11/10	<i>Fred Wagner</i>	8-11-10
Commissioning Authority	Date	Owner's Representative	Date

Exceptions:

- 1) Additional loop tuning & trending required.
- 2) AHU Fan for Eoz does not match approved submittal.
- 3) Recirculation AP is greater than ratings of AFCV for chiller water system.
- 4) Can not read all TAB Notes due to bad copy.

Thomas A. Carcaterra, P.E., Q220

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Testing, Balancing and Commissioning

Pre-Functional Checklist
AHU-E-02 AHU serving Study Collection Level 2 (Rm 118.37)

Design Data	MFG:		Submittal Data	MFG:	York
	Model No:			Model No:	YC-77X113
	Supply Airflow L/s (CFM):	9,400 (19,917)		Supply Airflow L/s (CFM):	9405 (19,928)

Installed AHU	
MFG:	YORK
Model No:	T6N136557D
TAB Supply Airflow L/s (CFM):	9635 46

Remarks:

General:

1. Equipment labels attached?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
2. Are surfaces clean of foreign materials, construction dirt, and dust?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
3. Exterior casing in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
4. Interior casing in good condition?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
5. Access door handles, latches and hinges properly operate?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

Remarks:

Thomas A. Carcaterra, P.E., QCF

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Testing, Balancing and Commissioning

Pre-Functional Checklist
AHU-E-02 AHU serving Study Collection Level 2 (Rm 118.37)

Mechanical:

1. Contract filters installed and clean?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
2. No bypass around filter banks?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
3. No bypass around humidifier sections (as applicable)?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
4. Access door gaskets prevent air leakage?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
5. Maintenance access is proper for coils, filters and other AHU mounted devices?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
6. Vibration isolation equipment adjusted properly?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
7. Maintenance access is proper for coils, filters and other AHU mounted devices?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
8. Strainers are clean?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
9. Any differential pressure gages function properly and zero-out at no flow?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
10. Pipe penetrations sealed and properly supported?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
11. Supply fan motor / fan sheaves aligned and belt tension proper?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
12. Supply fan rotation correct?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
13. Supply fan guards installed?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
14. Fan vibration isolation proper?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
15. Fan(s) operate without excessive vibration?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
16. Thermometers, gages, sensors, isolation and automatic valves installed per specifications and visible from the floor (as applicable)?	Yes <input checked="" type="checkbox"/>	No <input checked="" type="checkbox"/>
17. Low Limit freeze stat sensor(s) located / arranged properly?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
18. All balancing devices installed properly?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
19. Tab complete?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

Remarks:

1) RETURN MAIN LINE PTT LOCATED BETWEEN BRANCHES

1) ALL BUT CARBON FILTERS

Thomas A. Carcaterra, P.E., QLB

Date: 1/25/2010 Page 3 of 9



Testing, Balancing and Commissioning

Pre-Functional Checklist
AHU-E-02 AHU serving Study Collection Level 2 (Rm 118.37)

Electrical:

1. Unit is properly grounded?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
2. All power / lighting wiring complete and operational?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
3. All required service outlets and lighting is installed?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

Remarks:

Controls:

1. Do all dampers fully close against blade seals automatically?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
2. Do all dampers fully open when commanded open?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
3. All controls are operationally complete?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
4. All safeties operational and pre-checked?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
5. Smoke detectors operational and tested (as applicable)?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

Remarks: *smokes to be checked by Fire Marshal*

Cooling Coil:

1. All Piping flushed, pressure tested and treated?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
2. Coil detail checked against drawings and all isolation vales, gauges, flexible connections, etc are in place?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
3. Coil fins are straight and in good shape?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
4. Coil is clean?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
5. Safing in installed to prevent bypass?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
6. Condensate Piping completed?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>

Remarks:

Thomas A. Carcaterra, P.E., QCF

Date: 1/25/2010 Page 4 of 9



Testing, Balancing and Commissioning

10 July 2009

OFEO Project No. 0700110
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C. Field Test Reports

1. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance. In addition, conform to provisions of Section 01400.
2. Report Forms or Outlines: Submit prior to commencing work, indicating adjusting, balancing, and equipment data required.
3. Final Copies: Provide for COTR and Architect-Engineer and include in operating and maintenance manuals.
4. Reports
 - a. Provide in letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
 - b. Include detailed procedures, sample report forms prior to commencing system balance.
 - c. Indicate data on AABC National Standards for Total System Balance forms or forms prepared following ASHRAE 111 or NEBB forms or forms containing information indicated in Schedules. Submit data in S.I. Metric units.

1.4 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01000.

1.6 PROJECT CONDITIONS

- A. Systems shall be fully operational prior to beginning procedures.

1.7 SEQUENCING AND SCHEDULING

- A. Test, adjust, and balance the air systems before the hydronic system.

PART 2 PRODUCTS (Not Used)

Project No. 50172X

TESTING, ADJUSTING, AND BALANCING

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Testing, Balancing and Commissioning

3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Fire and volume dampers are in place and open.
 8. Air coil fins are cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage is minimized.
 12. Hydronic systems are flushed, filled, and vented.
 13. Proper strainer baskets are clean and in place.
 14. Service and balance valves are open.
- B. Submit field reports.
- C. Beginning of work means acceptance of existing conditions.

Testing, Balancing and Commissioning

EASTON HALL RENOVATION
DCI 524-06.10 UMD QC 09-391-720 75% CONSTRUCTION DOCUMENTS
OCTOBER 14, 2009 DESIGN COLLECTIVE, INC.
BALTIMORE, MARYLAND

PART 3 EXECUTION
3.1 EXAMINATION

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

philosophies for environmental conditions and system output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, and equipment with functioning controls is ready for operation.

K. Examine strainers for clean screens and proper perforations.

and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, and equipment with functioning controls is ready for operation.

K. Examine strainers for clean screens and proper perforations.

TESTING, ADJUSTING, AND BALANCING

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Testing, Balancing and Commissioning

- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine equipment for installation and for properly operating safety interlocks and controls.
- P. Examine automatic temperature system components to verify the following:

7. Valves are in the position indicated by the controller.

- Q. Report deficiencies discovered before and during performance of TAB procedures. Add additional balancing devices if required. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system readiness checks and prepare system readiness reports. Verify the following:
 1. Permanent electrical power wiring is complete and controllers are operational.
 2. Hydronic systems are filled, clean, and free of air.
 3. Automatic temperature-control systems are operational.
 4. Equipment and access doors are securely closed.
 5. Isolating and balancing valves are open and control valves are operational.
 6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 7. Windows and doors can be closed so indicated conditions for system operations can be met.

Testing, Balancing and Commissioning

Field Panel Checkout

All Field Panels

Point Information					Startup								
Point Name	Descriptor	Type	Function	Address Node Id	Point	Proper Installation	Point to Point	Procedure Number	Alarmable	Alarmable Procedure #	Comment Number	Date	Initials
NH WPH AHU4 EF43	EX FAN 43	L2SL	Proof	30	0.5.1								
NH WPH AHU4 EF43	EX FAN 43	L2SL	On/Off	30	0.2.1								
NH WPH AHU4 EF43 DMP ES	DAMPER STATUS	LDI	Status	30	0.5.10								
NH WPH AHU6 EF39	EX FAN 39	L2SL	Proof	30	0.2.2								
NH WPH AHU6 EF39	EX FAN 39	L2SL	On/Off	30	0.2.2								
NH WPH AHU6 EF39 DMP ES	DAMPER STATUS	LDI	Status	30	0.4.2								
NMNH WPH LAB1 EF1 D1	EF-1-1 DAMPER 1	LAC	Value	30	0.3.1								
NMNH WPH LAB1 EF1 D1 ES	EF-1-1 ES 1	LDI	Status	30	0.5.3								
NMNH WPH LAB1 EF1 D2	EF-1-1 DAMPER 2	LAC	Value	30	0.3.2								
NMNH WPH LAB1 EF1 D2 ES	EF-1-1 ES 2	LDI	Status	30	0.5.4								
NMNH WPH LAB1 EF1 D3 ES	EF-1-1 ES 3	LDI	Status	30	0.5.5								
NMNH WPH LAB1 EF1 D4 ES	EF-1-1 ES 4	LDI	Status	30	0.5.6								
NMNH WPH LAB1 EF1 SP	EF-1-1 STATIC	LAI	Value	30	0.3.3								
NMNH WPH LAB1 EF1 S5	EF-1-1	L2SL	Proof	30	0.7								
NMNH WPH LAB1 EF1 S8	EF-1-1	L2SL	On/Off	30	0.1.1								
NMNH WPH LAB1 EF1 STATUS	EF-1-1 STATUS	LDO	On/Off	30	0.1.2								
NMNH WPH LAB1 EF2 D1	EF-1-2 DAMPER 1	LAC	Value	30	0.3.4								
NMNH WPH LAB1 EF2 D1 ES	EF-1-2 ES 1	LDI	Status	30	0.5.8								
NMNH WPH LAB1 EF2 D2	EF-1-2 DAMPER 2	LAC	Value	30	0.3.5								
NMNH WPH LAB1 EF2 D2 ES	EF-1-2 ES 2	LDI	Status	30	0.5.9								
NMNH WPH LAB1 EF2 D3 ES	EF-1-2 ES 3	LDI	Status	30	0.5.10								
NMNH WPH LAB1 EF2 SP	EF-1-2 STATIC	LAI	Value	30	0.3.6								
NMNH WPH LAB1 EF2 S6	EF-1-2	L2SL	Proof	30	0.5.11								
NMNH WPH LAB1 EF2 S8	EF-1-2	L2SL	On/Off	30	0.1.3								
NMNH WPH LAB1 EF2 STATUS	EF-1-2 STATUS	LDO	On/Off	30	0.1.4								
NMNH WPH LAB1 EF3 D1	EF-1-3 DAMPER 1	LAC	Value	30	0.3.7								
NMNH WPH LAB1 EF3 D1 ES	EF-1-3 ES 1	LDI	Status	30	0.5.12								
NMNH WPH LAB1 EF3 D2	EF-1-3 DAMPER 2	LAC	Value	30	0.3.8								
NMNH WPH LAB1 EF3 D2 ES	EF-1-3 ES 2	LDI	Status	30	0.5.13								
NMNH WPH LAB1 EF3 D3 ES	EF-1-3 ES 3	LDI	Status	30	0.5.14								
NMNH WPH LAB1 EF3 SP	EF-1-3 STATIC	LAI	Value	30	0.4.1								
NMNH WPH LAB1 EF3 S5	EF-1-3	L2SL	Proof	30	0.5.15								
NMNH WPH LAB1 EF3 S8	EF-1-3	L2SL	On/Off	30	0.1.5								
NMNH WPH LAB1 EF3 STATUS	EF-1-3 STATUS	LDO	On/Off	30	0.1.6								
NMNH WW1 DARK EXH DMP	DARKROOM EXH DMP	LAC	Value	27	0.1.8								
NMNH WW1 DARK EXH VP	DARK ROOM VP	LAI	Value	27	0.1.1								
NMNH WW1 EV W1 14 DMP	EV-W1-14 DAMPER	LAC	Value	27	0.2.1								



Testing, Balancing and Commissioning

Field Panel Checkout

All Field Panels

Point Information					Startup								
Point Name	Descriptor	Type	Function	Address Node Id	Point	Proper Installation	Point to Point	Procedure Number	Alarmable	Alarmable Procedure #	Comment Number	Date	Initials
NMNH WW1.EV.W1.14.VP	EV-W1-14 AIRFLOW	LAI	Value	27	0.2.2								
NMNH WW1.EV.W1.17.DMP	EV-W1-17 DAMPER	LAC	Value	27	0.2.3								
NMNH WW1.EV.W1.17.VP	EV-W1-17 AIRFLOW	LAI	Value	27	0.2.4								
NMNH WW1.EV.W1.5.DMP	EV-W1-5 DAMPER	LAC	Value	27	0.2.5								
NMNH WW1.EV.W1.5.VP	EV-W1-5 AIRFLOW	LAI	Value	27	0.2.6								
NMNH WW1.EV.W2.1.VP	EV-2-1 AIRFLOW	LAI	Value	27	0.0								
NMNH WW1.EV.W2.2.VP	EV-2-2 AIRFLOW	LAI	Value	27	0.0								
NMNH WW1.EV.W2.3.VP	EV-2-3 AIRFLOW	LAI	Value	27	0.0								
NMNH WW1.EV.W2.4.VP	EV-2-4 AIRFLOW	LAI	Value	27	0.0								
NMNH WW1.LAB.AHU4A.STATIC	AHU4 1ST FL A SP	LAI	Value	27	0.1.2								
NMNH WW1.LAB.AHU4B.STATIC	AHU4 1ST FL B SP	LAI	Value	27	0.1.3								
NMNH WW1.LAB.AHU6.STATIC	AHU6 1ST FL SP	LAI	Value	27	0.1.4								
NMNH WW1.MICRO.EXH.DMP	MICRO EXH DAMPER	LAC	Value	27	0.1.7								
NMNH WW1.MICRO.EXH.VP	MICRO EXH	LAI	Value	27	0.1.5								
NMNH WWG.LAB.AHU4.STATIC	AHU4 GND FL SP	LAI	Value	28	0.4.6								
NMNH WWG.LAB.AHU6A.STATIC	AHU6 GND FL A SP	LAI	Value	28	0.4.7								
NMNH WWG.LAB.AHU6B.STATIC	AHU6 GND FL B SP	LAI	Value	28	0.4.8								
NMNH WWG.LAB.FR21.ALM	FREEZER ALARM	LDI	Status	28	0.6.5								
NMNH WWG.LAB.FR21.TEMP	FREEZER ALARM	LAI	Value	28	0.5.1								
NMNH WWG.LAB.FR22.ALM	FREEZER ALARM	LDI	Status	28	0.6.6								
NMNH WWG.LAB.FR22.TEMP	FREEZER ALARM	LAI	Value	28	0.5.2								
NMNH WWG.LAB.FR23.ALM	FREEZER ALARM	LDI	Status	28	0.6.7								
NMNH WWG.LAB.FR23.TEMP	FREEZER ALARM	LAI	Value	28	0.5.3								
NMNH WWG.LAB.FR24.ALM	FREEZER ALARM	LDI	Status	28	0.6.8								
NMNH WWG.LAB.FR24.TEMP	FREEZER ALARM	LAI	Value	28	0.5.4								
NMNH WWG.LAB.FR25.ALM	FREEZER ALARM	LDI	Status	28	0.6.9								
NMNH WWG.LAB.FR25.TEMP	FREEZER ALARM	LAI	Value	28	0.5.5								
NMNH WWG.LAB.FR26.ALM	FREEZER ALARM	LDI	Status	28	0.6.10								
NMNH WWG.LAB.FR26.TEMP	FREEZER ALARM	LAI	Value	28	0.5.6								
NMNH WWG.LAB.FR27.ALM	FREEZER ALARM	LDI	Status	28	0.6.11								
NMNH WWG.LAB.FR27.TEMP	FREEZER ALARM	LAI	Value	28	0.5.7								
NMNH WWG.LAB.HPW.RES1	HPW RESISTIVITY	LAI	Value	28	0.4.1								
NMNH WWG.LAB.HPW.RES2	HPW RESISTIVITY	LAI	Value	28	0.4.2								
NMNH WWG.LAB.HPW.W134B.AL1	ALARM 1	LDO	On/Off	28	0.1.1								
NMNH WWG.LAB.HPW.W134B.AL2	ALARM 2	LDO	On/Off	28	0.1.2								
NMNH WWG.LAB.HPW.W149.AL1	ALARM 1	LDO	On/Off	28	0.1.3								
NMNH WWG.LAB.HPW.W149.AL2	ALARM 2	LDO	On/Off	28	0.1.4								
NMNH WWG.LAB.HPW.WG1.AL1	ALARM 1	LDO	On/Off	28	0.1.5								



Testing, Balancing and Commissioning

Field Panel Checkout

All Field Panels

Point Information					Startup								
Point Name	Descriptor	Type	Function	Address Node Id	Point	Proper Installation	Point to Point	Procedure Number	Alarmable	Alarmable Procedure #	Comment Number	Date	Initials
NMNH.WWG.LAB.HPW.WG1.AL2	ALARM 2	LDO	On/Off	28	0.1.6								
NMNH.WWG.MAU1.ALN.FRZ	MAU1 LOW TEMP	LDI	Status	28	0.6.1								
NMNH.WWG.MAU1.CCV	COOLING VLV	LAC	Value	28	0.3.5								
NMNH.WWG.MAU1.FILTER	FILTER STATUS	LDI	Status	28	0.6.2								
NMNH.WWG.MAU1.HCTEMP	PREHEAT TEMP	LAI	Value	28	0.2.1								
NMNH.WWG.MAU1.HCVA	1/3 STEAM PH VLV	LAC	Value	28	0.3.6								
NMNH.WWG.MAU1.HCVB	2/3 STEAM PH VLV	LAC	Value	28	0.3.7								
NMNH.WWG.MAU1.HSP	HIGH STATIC	LDI	Status	28	0.6.3								
NMNH.WWG.MAU1.OA.DMP.ES	DAMPER STAUTS	LDI	Status	28	0.6.12								
NMNH.WWG.MAU1.OAT	MAU1 OA TEMP	LAI	Value	28	0.2.2								
NMNH.WWG.MAU1.SFDAT	SUPPLY TEMP	LAI	Value	28	0.3.3								
NMNH.WWG.MAU1.SS	START/STOP	L2SL	Proof	28	0.6.4								
NMNH.WWG.MAU1.SS	START/STOP	L2SL	On/Off	28	0.2.2								
NMNH.WWG.MAU1.STATIC	SUPPLY STATIC	LAI	Value	28	0.3.4								
NMNH.WWG.MAU1.SVFD.SPEED	MAU1 SPEED SIG	LAC	Value	28	0.3.6								
NMNH.WWG.VENT.EXH.VP	WWG VENT ENC	LAI	Value	28	0.4.3								
NMNH.WWG.WG1.EXH.TEMP	WG1 ALCOHOL STOR	LAI	Value	28	0.4.4								
NMNH.WWG.WG1.EXH.VP	WG1 ALCOHOL STOR	LAI	Value	28	0.4.5								
NMNH.WWG.WG1.HORN	WG1 ALCOHOL STOR	LDO	On/Off	28	0.2.1								



QUESTIONS

NEBB's 2013 National Convention

Montreal, Canada May 4, 2013

Managing Change to Your Construction Contract

Presented by: **Paul L. Stynchcomb, PSP, CFCC**
Senior Managing Director, FTI Consulting



The Owner's Perception of "Change"



Introduction and Purpose

Managing Change to Your Contract

The purpose of this session is to offer a discussion as to how a testing and balancing subcontractor, or a commissioning subcontractor, can avoid complicated, time-consuming and expensive claims and litigation with owners and prime contractors and still be fairly compensated for extra and/or changed work and for project delays

Your Contract, Friend or Foe?

You Must *Equip* Yourself to Settle Potential Disputes and Thus, Avoid Claims by:

- **Understanding your contractual obligations**
- **Preplanning, labor and schedule monitoring**
- **Performing your work in accordance with the contract and in a timely manner**
- **Addressing change in a timely fashion**
- **Providing timely and proper notice**
- **Not waving your rights**
- **Maintaining accurate project records**
- **Submitting proper impact analyses**

Understanding Your Contract

- Let me see those *pro forma* contract documents.
- When must you start and finish your work?
- Does the work schedule require overtime?
- Can you participate in scheduling the work?
- Is there a “mutually agreed” schedule clause?
- What exculpatory and/or limiting language is included in your contract?
- What happens when a change occurs?
- What are the notice provisions – who do you notify and how much time do you have?
- What are the damages for finishing late?

Understanding the Problems

- **False Starts – arriving on site expecting TAB-ready systems, leaving and then remobilizing**
- **Who is responsible to ensure that predecessor work has been completed?**
- **After execution of the subcontract and after NTP – discovering changes in scope**
- **Schedule compression – the last craft on the totem pole**

Important Points for the TAB Contractor

- **Stipulate the planned TAB crew size in the contract documents.**
- **Define who (what party) will perform the pre-TAB walk through and check list.**
- **Agree to the TAB schedule (“mutually agreed schedule”).**
- **Know your baseline scope of work.**
- **Provide notice when the schedule or walk-through status are different than agreed to or as represented.**
- **Agree on how changed conditions (i.e. added VAVs, changed air handlers, etc.) will be identified to the TAB contractor.**
- **Remind contractual party *not* to waive your rights.**

Changes

If there were no scope changes on a construction project, there would be significantly fewer disputes, claims and litigation

What is a “Change”?

- Different type of work from that contained in the contract
- Different quantity of work from that contained in the contract
- Working in different conditions than could reasonably be inferred in the contract

Construction Change Orders

- **Directed Changes**
- **Constructive Changes**

What's the Difference?

Construction Change Orders

A directed change is a change which the owner acknowledges

A constructive change, which can be verbal or written, is one for which the owner does not acknowledge entitlement

Example of Constructive Change:

H&R Contractors has contracted to build a new steel framed office building. During the shop drawing review process, the A/E adds structural steel members that were not shown on the contract drawings and stamps the drawings “revise and resubmit”. The shop drawings are forwarded to H&R Contractors by the Owner. The added steel will cost only \$2,500 but will delay the project by two months.

Why is this a Constructive Change:

- **The owner has not acknowledged entitlement to a change**
- **A change occurs if the work was not included in the original contract scope and was not reasonably inferable**

The Spearin Doctrine in BIM “Coordination”

***United States v. Spearin* (248 U.S. 132), also referred to as the Spearin doctrine is a 1918 U. S. Supreme Court decision. It remains one of the landmark construction law cases. The owner impliedly warrants the information, plans and specifications which an owner provides to a construction contractor. The contractor will not be liable to the owner for loss or damage which results solely from insufficiencies or defects in such information, plans and specifications. The Supreme Court wrote: “. . . if the contractor is bound to build according to plans and specifications prepared by the owner, the contractor will not be responsible for the consequences of defects in the plans and specifications. This responsibility of the owner is not overcome by the usual clauses requiring builders to visit the site, to check the plans, and to inform themselves of the requirements of the work . . . the contractor should be relieved, if he was misled by erroneous statements in the specifications.”**

What Happens when Change Occurs?

- **Cost of performance may increase – triggering requirements to fulfill contract obligations of notice and quantification**
- **Changes often cause delay and impacts to labor productivity that add to the cost**
- **Changes may result in acceleration**
- **Disputes may arise as to change cost and impacts**

Construction Change Orders

Potential Impacts of Changes

- **Time impacts - delays**
- **Mitigation - acceleration**
- **Labor inefficiencies**
- **Escalation – labor & materials**

Managing Your Changes & Avoiding Claims

- **Most contracts include substantial hurdles**
- **To avoid claims – contractors must understand these hurdles and manage the contract terms**
- **Remember that the purpose of the contract is to shift the risk from someone else to you**
- **- and to protect the drafter of the contract, to the fullest extent possible, from your claims of added costs and delay**

When Change Occurs:

- **Timely notify in accordance with the contract**
- **Mitigate impacts where possible / reasonable**
- **Quantify impacts – schedule & productivity**
- **For delay – submit time impact analyses (“TIA”)**
- **For productivity – measure actual production**
- **Prepare costs for identifiable impacts**
- **Do not waive rights on change order forms or on monthly payment application certifications**
- **Expressly reserve rights where quantification is not possible at the time of price submission**
- **On federal government projects – understand the obligations and liabilities of claim certification**

Managing Your Changes & Avoiding Claims

The following are examples of standard contract clauses that you will probably encounter:

AIA A201 CHANGES CLAUSE

7.2 CHANGE ORDERS

7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect, stating their agreement upon all of the following:

- .1 change in the Work;
- .2 the amount of the adjustment, if any, in the Contract Sum; and
- .3 the extent of the adjustment, if any, in the Contract Time.

7.2.2 Methods used in determining adjustments to the Contract Sum may include those listed in Subparagraph 7.3.3.

7.2 CHANGE ORDERS

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- .3 the extent of the adjustment, if any, in the Contract Time.

AIA A201 CHANGES CLAUSE

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both.

Construction Change Directives, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

AIA A201 CHANGES CLAUSE

7.3.4 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and

Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved

Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

CHANGES CLAUSE – FEDERAL CONTRACTS

FEDERAL CONSTRUCTION CONTRACT CLAUSES

CHANGES (AUG 1987)

(a) The Contracting Officer may, at any time, without notice to the sureties, if any, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract, including changes --

- (1) In the specifications (including drawings and designs);
- (2) In the method or manner of performance of the work;
- (3) In the Government-furnished facilities, equipment, materials, services, or site; or
- (4) Directing acceleration in the performance of the work.

(b) Any other written or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances, and source of the order and (2) that the Contractor regards the order as a change order.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for an adjustment based on defective specifications, no adjustment for any change under paragraph (b) of this clause shall be made for any costs incurred more than 20 days before the Contractor gives written notice as required. In the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

CHANGES CLAUSE – FEDERAL CONTRACTS

4.3 CLAIMS AND DISPUTES

4.3.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or

4.3.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract.

4.3.2 Time Limits on Claims. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first

4.3.2 Time Limits on Claims. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be initiated by written notice to the Architect and the other party.

inherent in construction activities of the character provided for in the Contract Documents, then

4.3.7 CLAIMS FOR ADDITIONAL TIME

4.3.7.1 If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

4.3.7 CLAIMS FOR ADDITIONAL TIME

4.3.7.1 If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

What do “Typical” Contract Changes Clauses Require as to Notice and Quantification?

Time Impact Clauses

9. The Contractor agrees that whenever it becomes apparent from the current monthly computer-produced calendar-dated schedule that any Contract completion date will not be met, he will take any or all of the following actions, with prior approval of the Engineer and at no additional cost to the District: (1) resequencing construction activities, (2) providing additional resources.

01310.09 CHANGE ORDERS, DELAYS AND TIME EXTENSIONS:

- A. When changes authorized by the Contracting Officer and/or delays are experienced, the Contractor shall submit a written Time Impact Analysis to the Engineer, illustrating the influence of each change or delay on the current Contractor's Construction Schedule completion date. Each Time Impact Analysis shall include a fragment network analysis (fragnet), demonstrating how the Contractor proposes to incorporate the change or delay into the Detailed Network Diagram. Additionally, the analysis shall demonstrate the time impact based on the

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01310-15

Contractor proposes to incorporate the change or delay into the Detailed Network Diagram. Additionally, the analysis shall demonstrate the time impact based on the

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01310-15

Waiver Language

Each Time Impact Analysis shall be submitted in triplicate and within 30 calendar days after a delay occurs or is recognized, or the Contractor receives a request for proposal for a potential revision from the Engineer. In cases where the Contractor does not submit a Time Impact Analysis for a specific change or delay within the specified period of time, then it is mutually agreed that particular potential revision or delay has no time impact on the Contract completion date and no time extension will be granted. Approval or rejection of each Time Impact Analysis by the Engineer or his authorized representative shall be made within approximately 30 calendar days after receipt of each Time Impact Analysis, unless subsequent meetings and negotiations are necessary. Upon approval, a copy of the Time Impact Analysis signed by the Engineer or his authorized representative shall be returned to the Contractor. Upon mutual agreement by both parties, fragnets illustrating the influence of Change Orders and delays will be incorporated into the Detailed Network Diagram during the first update after agreement is reached.

“Knows or Should Have Known”

State of Maryland • Department of General Services

General Conditions of the Contract Between Owner and Contractor

- D. The rights and remedies of the State and the obligations of the contractor under various provisions of the contract documents and under provisions of applicable law are cumulative and not exclusive.
- E. For any claim or cause of action accruing to the State as a result of or arising out of this contract, the State may collect damages of any kind, including consequential damages and damages for purely economic loss.

6.10 SOLICITATION WARRANTY – CONTINGENT FEES:

The contractor warrants that it has not employed or retained any person, partnership, corporation, or other entity, other than a bona fide employee, bona fide agent, bona fide salesperson, or commercial selling agency working for the contractor to solicit or secure this agreement, and that it has not paid or agreed to pay any person, partnership, corporation, or other entity, other than a bona fide employee, bona fide salesperson, or commercial selling agency, any fee or other consideration contingent on the making of this agreement. Contractor must comply with the provisions of 13-223 of SF&P.

6.11 ASSIGNMENT OF ANTITRUST CLAIMS:

- C. As used herein, claim means a written demand or assertion by one of the parties seeking, as a legal right, the payment of money, adjustment or interpretation of contract terms, or other relief, arising under or relating to this contract. A voucher, invoice, or request for payment that is not in dispute when submitted is not a claim under this clause. However, if the submission subsequently is not acted upon in a reasonable time, or is disputed as to liability or amount, it may be converted into a claim for the purpose of this clause.
- D. Within 30 days after contractor **knows or should have known** of the basis for a claim relating to this contract, contractor shall file a written notice of claim with the Procurement Officer.

Is the term “claim” limited to “delay”?

- C. As used herein, claim means a written demand or assertion by one of the parties seeking, as a legal right, the payment of money, adjustment or interpretation of contract terms, or other relief, arising under or relating to this contract. A voucher, invoice, or request for payment that is not in dispute when submitted is not a claim under this clause. However, if the submission subsequently is not acted upon in a reasonable time, or is disputed as to liability or amount, it may be converted into a claim for the purpose of this clause.
- D. Within 30 days after contractor **knows or should have known** of the basis for a claim relating to this contract, contractor shall file a written notice of claim with the Procurement Officer.
- E. Contemporaneously with, or within 90 days after, the filing of a notice of claim, contractor shall submit the written claim to the Procurement Officer. If contractor so requests, the Procurement Officer, on conditions the Procurement Officer deems satisfactory to the unit, may extend the time in which contractor must submit the claim. An example of when a Procurement Officer may grant an extension includes situations in which the Procurement Officer finds that a contemporaneous or timely cost quantification following the filing of the notice of claim is impossible or impractical.
- F. The claim shall set forth all the facts surrounding the controversy. Contractor, at the discretion of the Procurement Officer, may be afforded an opportunity to be heard and to offer evidence in support of the claim.
- G. The Procurement Officer shall mail or deliver written notification of the final decision within:
 - (1) 90 days after the Procurement Officer receives the claim if the claim is an amount for which the Appeals Board accelerated procedure, set forth in COMAR 21.10.06.12, may be used;

Schedule Revisions & Mitigation

State of Maryland - Department of General Services
General Conditions of the Contract Between Owner and Contractor

- (i) Sheet size of diagrams shall be 30 by 42 inches. Each updated copy shall show a date of the latest revision, and the date of the latest updating.
- (j) All schedules, including the initial schedule, recovery schedules, and monthly updates, shall be submitted in three (3) paper copies and one (1) copy on diskette.
- (k) The contractor shall be prepared to effect schedule revisions in the network in response to changes to the contract under the terms thereof, at the direction of DGS. In the event that change orders are experienced, they shall be reflected as new

(k) The contractor shall be prepared to effect schedule revisions in the network in response to changes to the contract under the terms thereof, at the direction of DGS. In the event that change orders are experienced, they shall be reflected as new activities in the network, or as changes in logic and/or time framing of existing activities. They shall be introduced at the next updating after receipt of a change order, and shall be subject to the approval of DGS. Change order logic shall affect only those intermediate activities and performance dates directly concerned. Adjustments required in completion dates for those intermediate dates, or for the contract as a whole, will be considered only to the extent that there is not sufficient remaining float to absorb the additional time which may be authorized for completion of individual activities.

schedules submitted under subsection H, (3) if requested by DGS with each monthly update submitted under subsection E, and (4) whenever the contractor changes the sequence of work, whether diagrams are requested by DGS or not.

M. Contractor must take all reasonable action to avoid or to mitigate the effects of delays, including but not limited to: (1) rescheduling or resequencing the work, (2) accepting other work and (3) reassigning personnel. When the contractor is responsible for any delay, the State may order the contractor to accelerate construction, work overtime, add additional shifts or manpower, work on weekends, or to do anything else reasonably necessary in order to finish on time, at no additional cost to the State. The contractor does not have the unilateral right to complete the work late and pay liquidated or other damages.

have the unilateral right to complete the work late and pay liquidated or other damages.

N. Failure of the contractor to request, as required by Section 3.06B and this Section 7.06, a time extension to which he might otherwise be entitled, shall constitute a waiver of contractor's right to an extension of the required completion date.

not reasonably to be able to complete the contract on time. Due account shall be taken of excusable delays, any extensions of time reasonably due the contractor for completion of additional work under change orders, and for delays for which the State is responsible, provided that the contractor has properly requested time extensions therefor. After submission of a bid, the contractor may not contest the reasonableness of the amount of liquidated damages stated in the contract.

What are Ways to Forecast and Control Changed Conditions?

- **Early review of the estimate – early identification of estimate “issues”**
- **Contemporaneous labor productivity reporting on a frequent basis**
- **Participation in the scheduling process**
- **Timely processing of change requests**

Project Planning & Labor Monitoring

- **Divide the project into identifiable units of work for the job plan and the schedule**
- **Assign planned labor hours to each activity**
- **Track actual labor hours by activity**
- **Prepare a planned craft curve for field labor**
- **Evaluate the planned v actual expenditures**
- **Review every schedule that is provided by the prime contractor**
- **Transmit written comments regarding the schedule (questions, deficiencies & objections)**
- **Whenever possible, get the *electronic* schedule for the baseline and each update**

Labor Performance Report Detail

Activity Code	Activity Description	Planned Hours	CO Hrs	Rev Plan	Last % C	Current % C	Earned Hours	PT AH	C Act Hrs	Wk -2	Wk -1	Cw
7550	Inst CHWS&R Mains Area B	500		500	30	50	250	300	450	-75	-150	-200
7570	Inst CHWS&R Brnchs Area B	700	50	750	10	20	150	120	200	-40	-45	-50
7590	Connections @ Mech Equip	100		100	10	15	15	10	12	0	0	3

The planned hours can be taken from the estimate or calculated independently

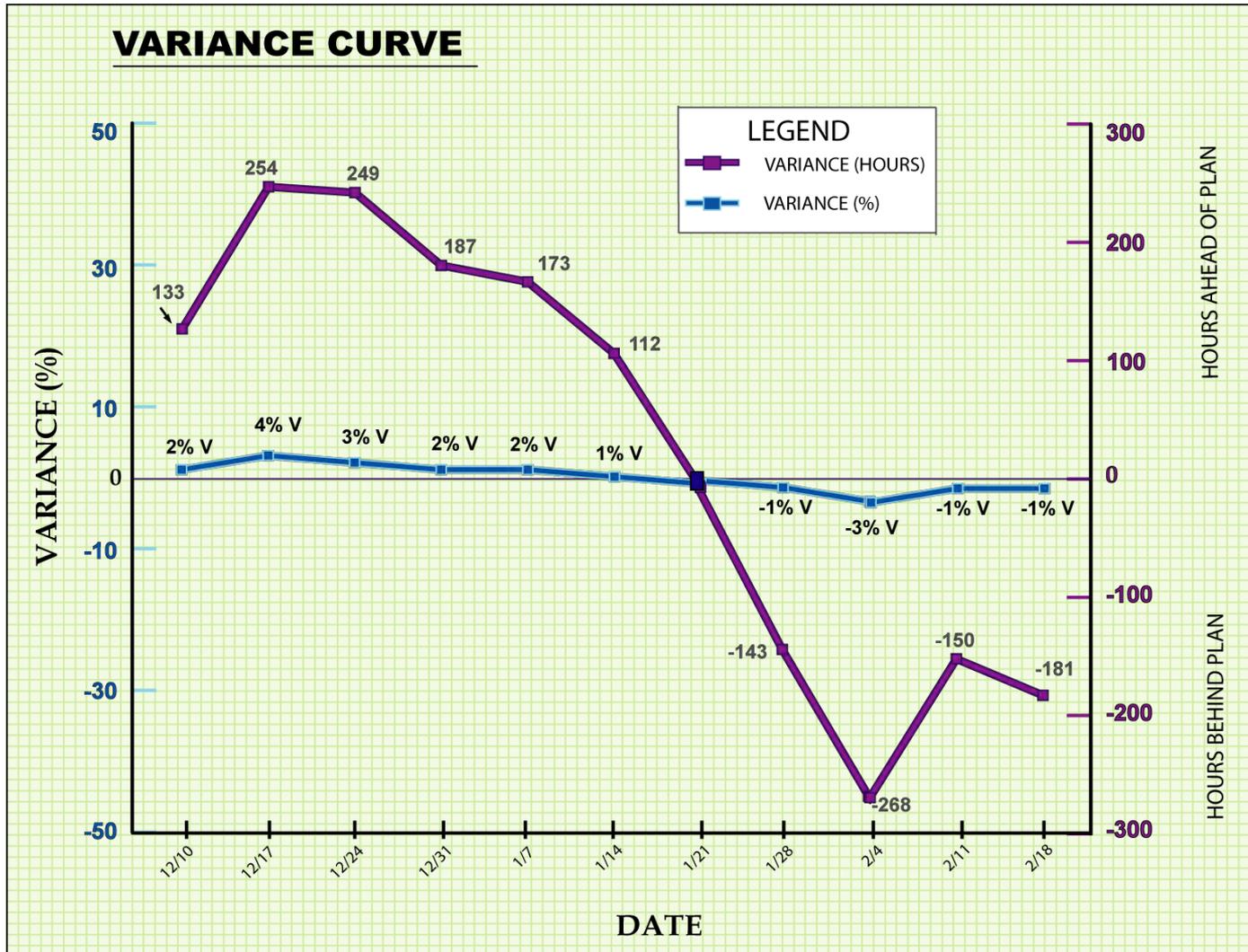
The plan must be updated with scope change labor hours

Earned hours = (Rev Plan) x (% complete)

Current payroll hours

Current week labor trend by activity . . . ahead or behind the labor plan

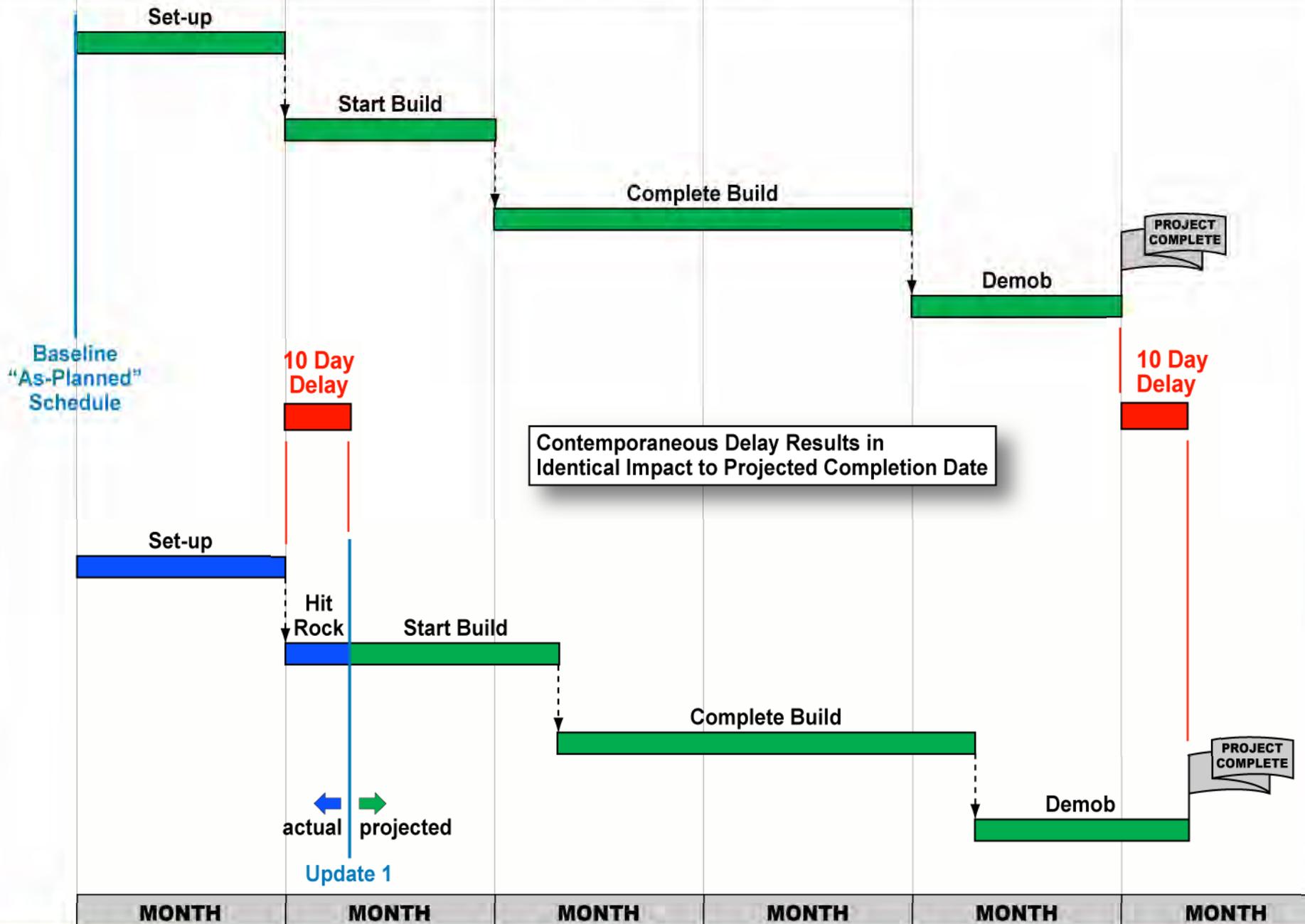
Variance Curve Derived from the LPR



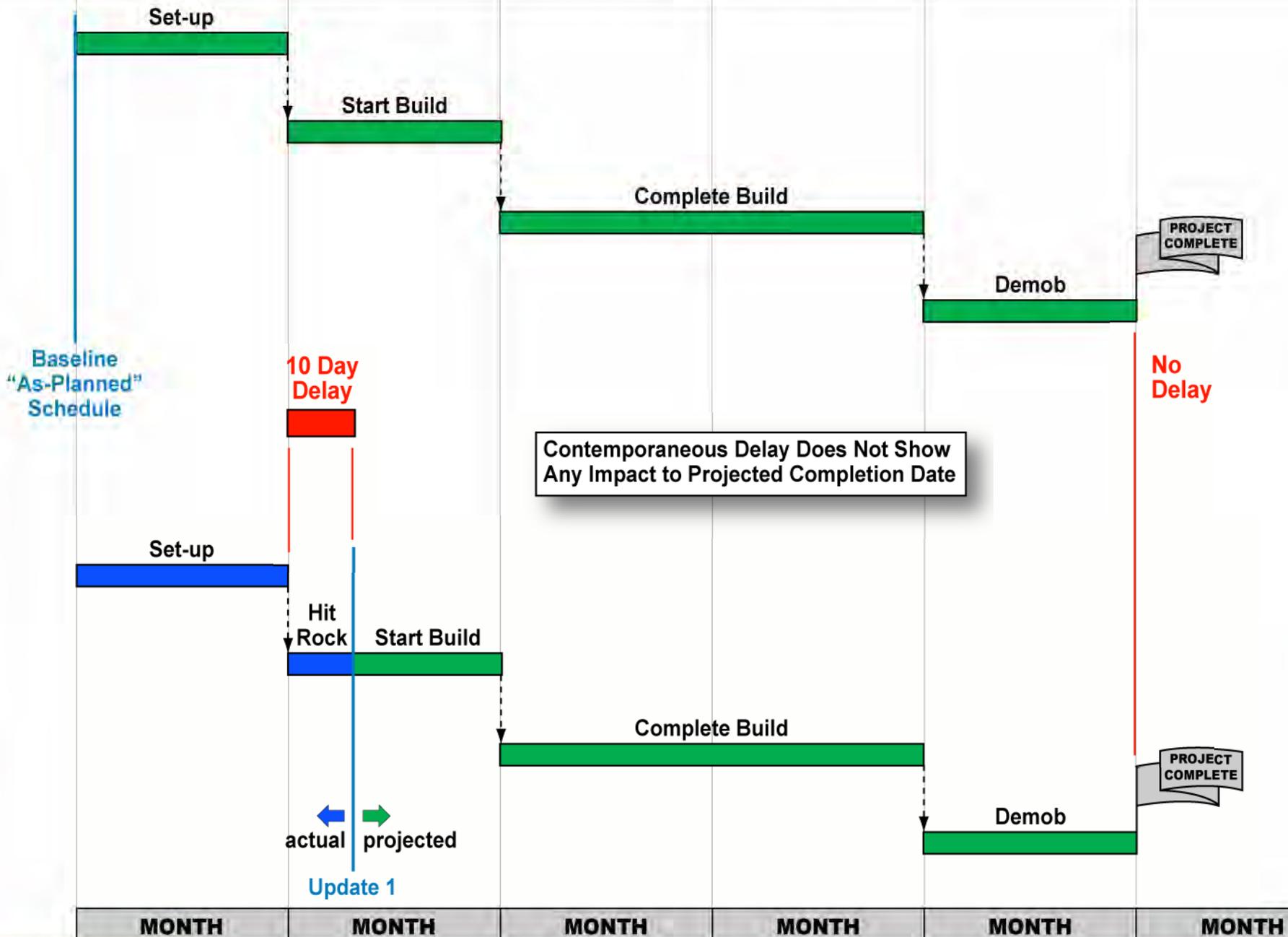
Schedule Analyses May Be Required

- **The contract may require the sheet metal subcontractor to submit TIAs or “fragnets” as impacts occur**
- **A TIA is a “time impact analysis” and if it is required by the contract, failure timely to submit the TIA may be construed to be a waiver of rights to claim**
- **If TIAs are required by the contract, the sheet metal subcontractor must submit its TIA even it has no access to the prime contractor’s schedule**
- **If access is granted, the TIA is evaluated in the update closest to the time of the impact**

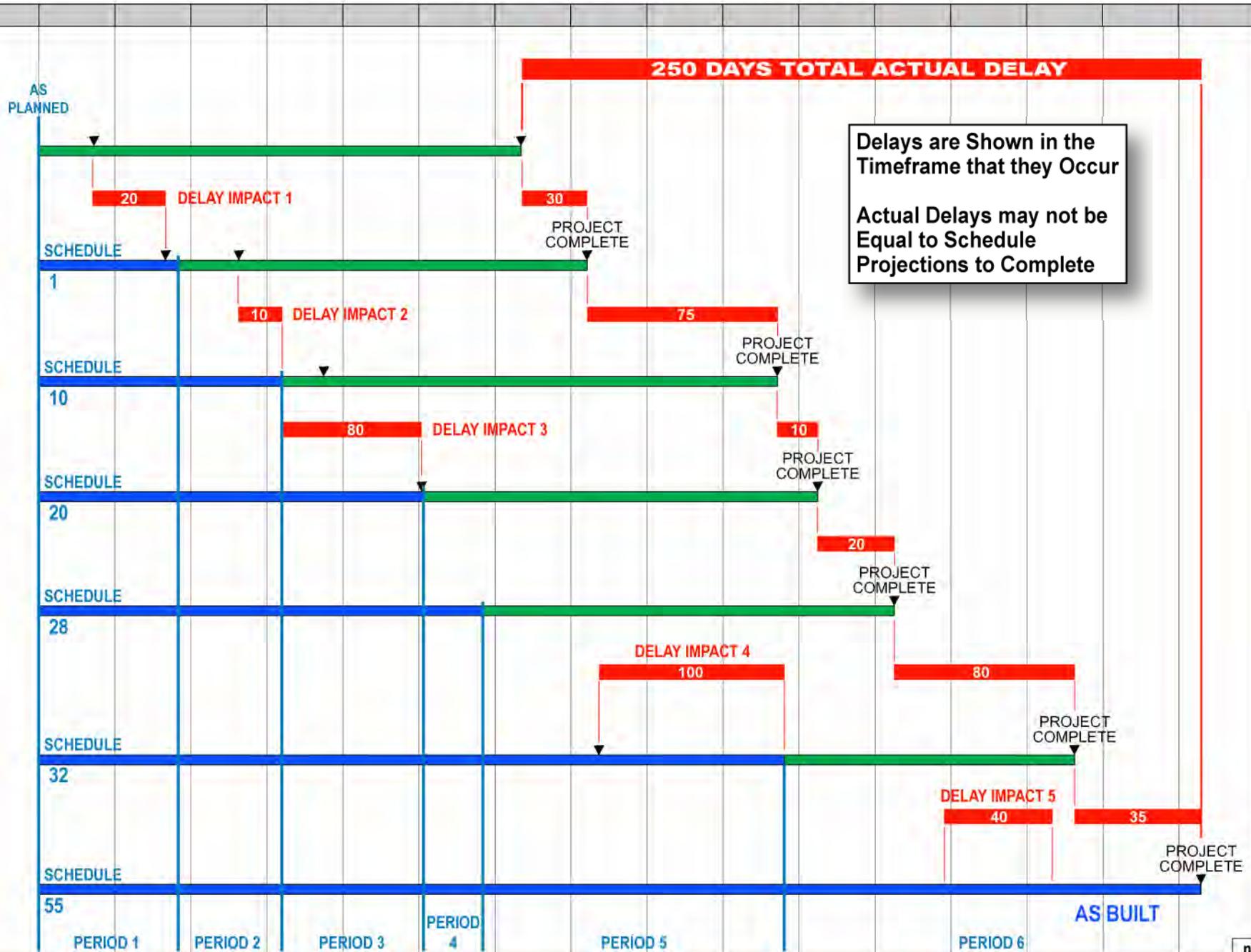
Schedule Update 1



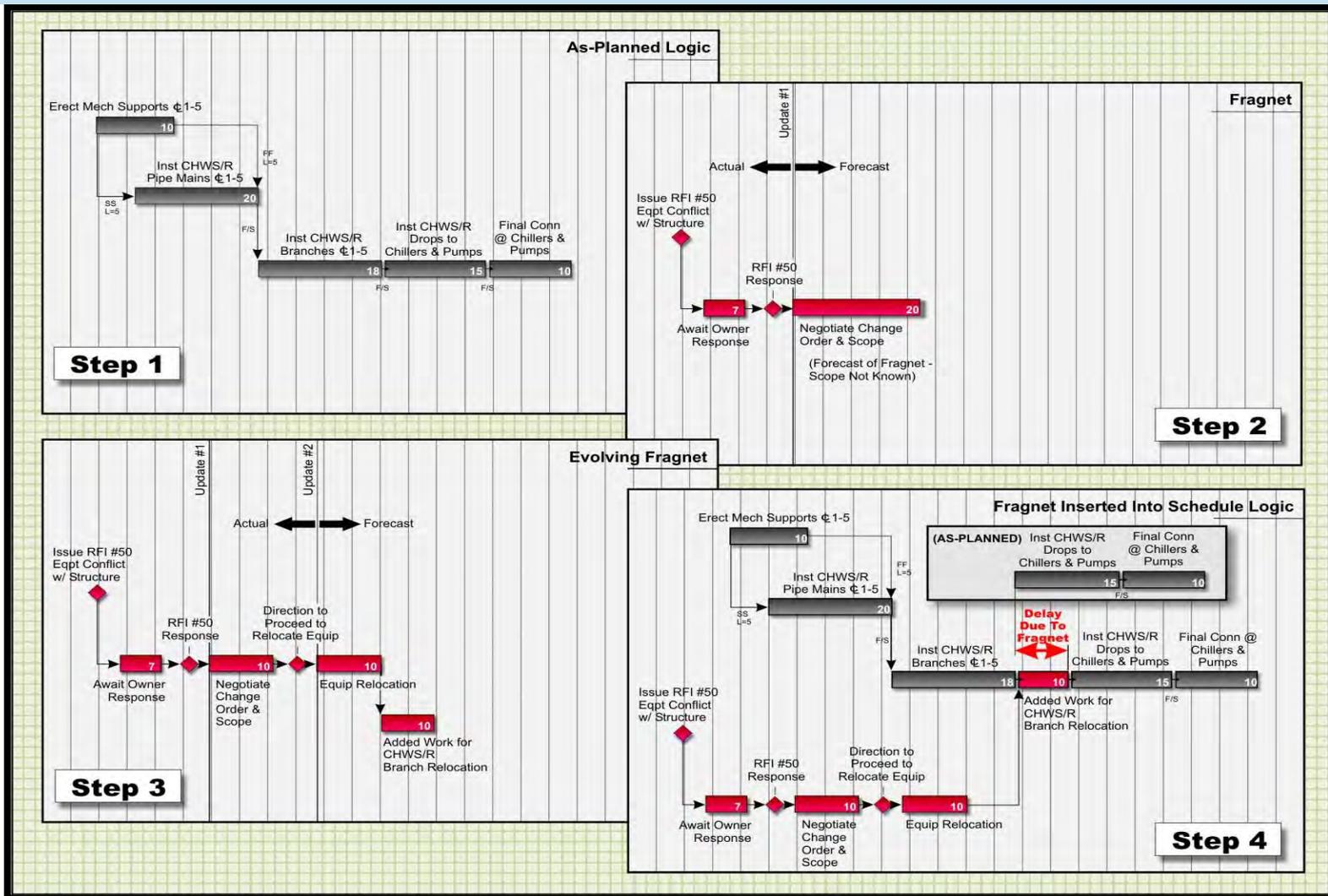
Schedule Update 1 - Recovery Plan



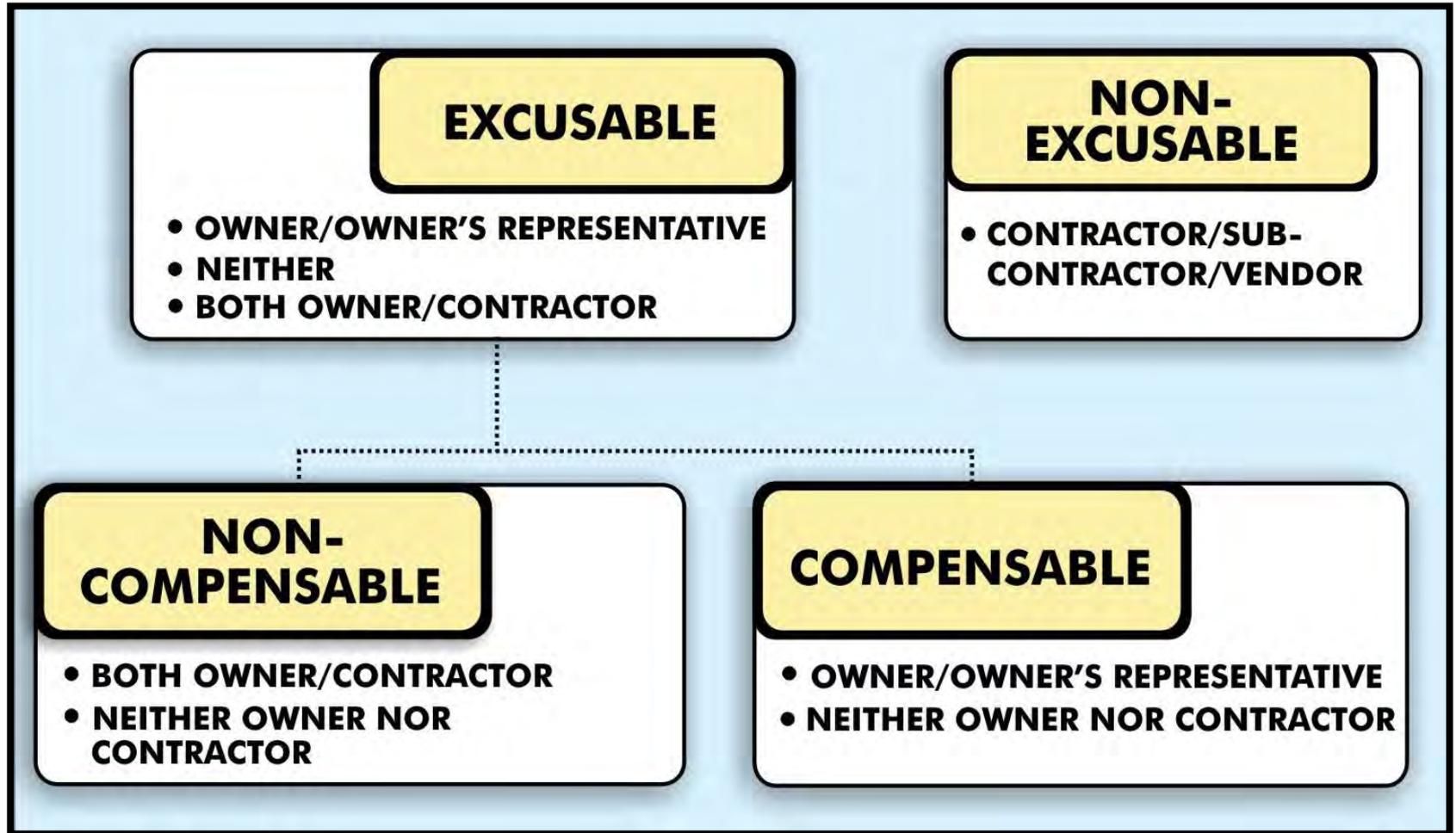
Project Delay Summary



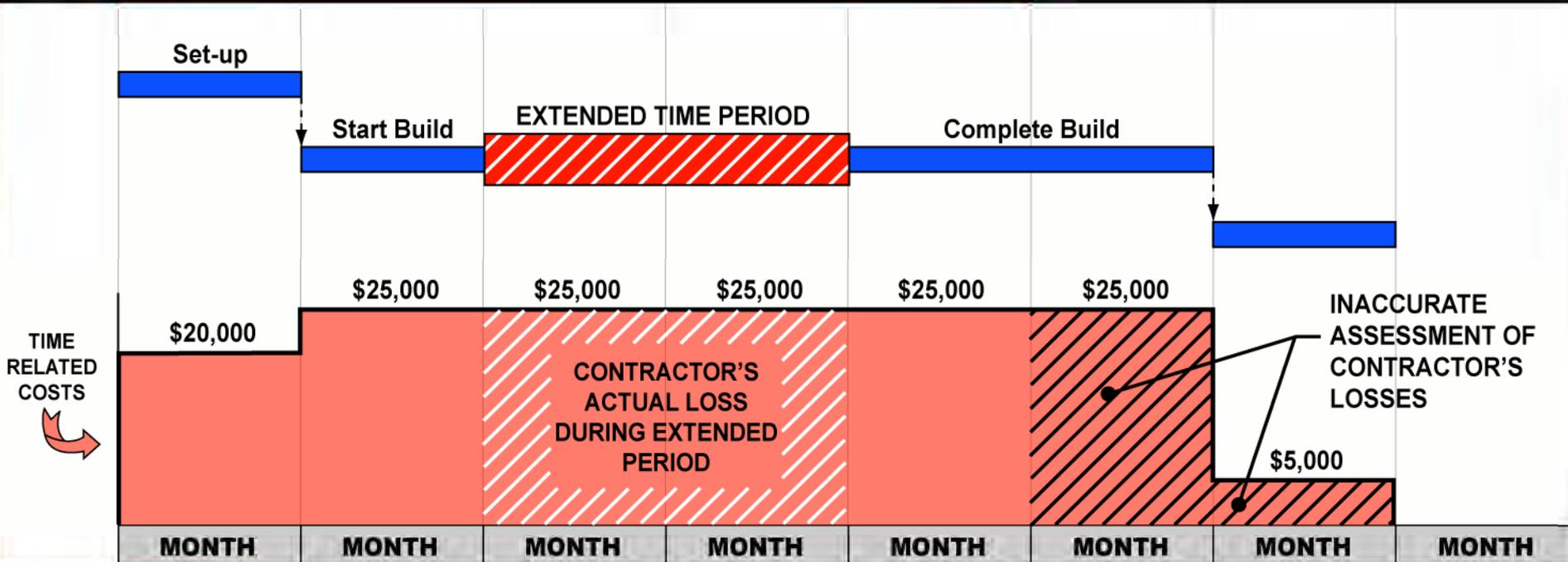
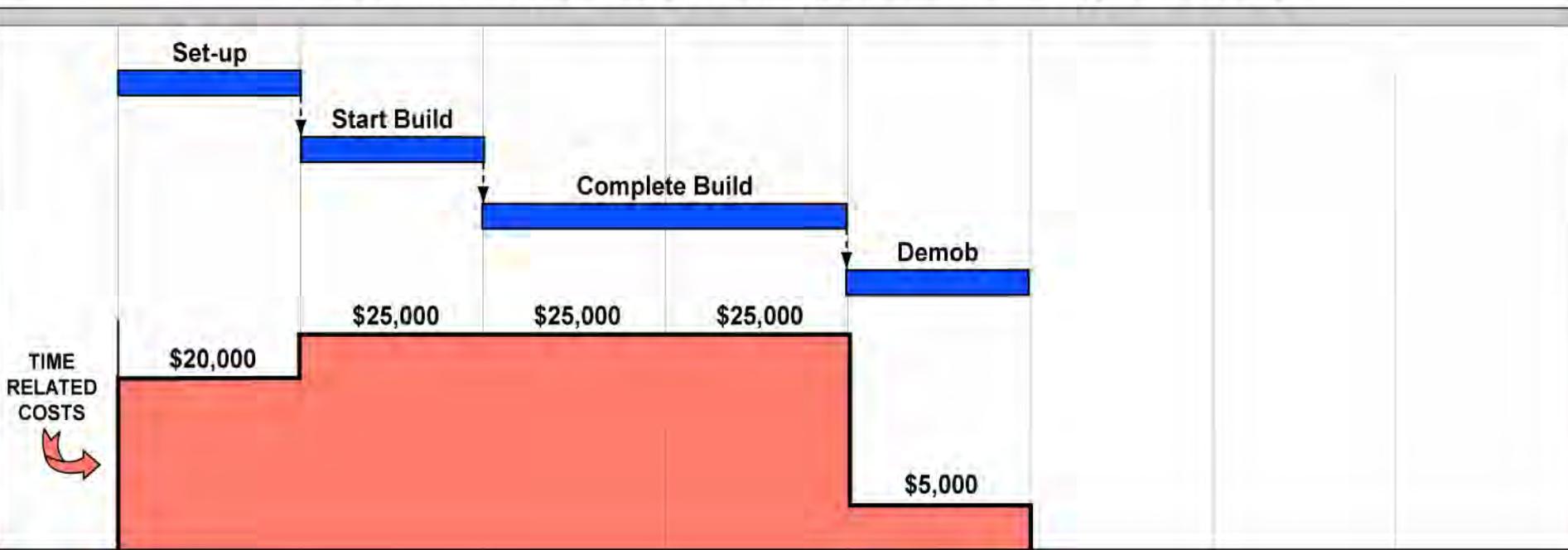
Time Impact Analysis



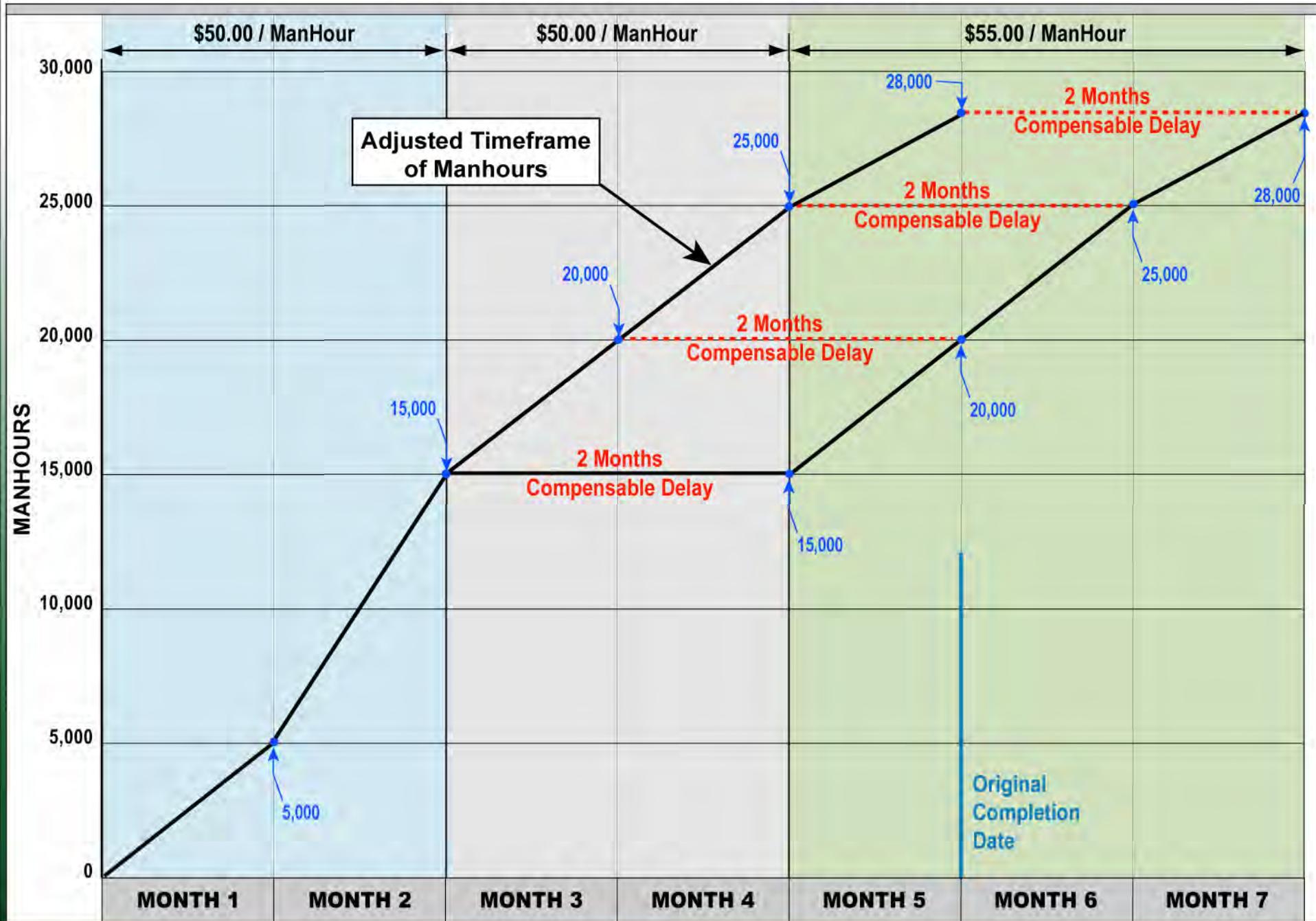
Excusable vs. Non-Excusable Delay



Determination of Daily Rate Applicable to Days of Delay



Calculation of Escalation Costs



The “Should Haves” for a Change Order Impact Analysis

- **An accurate & current schedule**
- **Should have met the contract requirements for notice & quantification**
- **Prepared a “fragnet” time impact analysis (“TIA”)**
- **A way to measure labor inefficiencies**

“Full Accord”

Many Owners Expect All Impact Costs to be Included in the Change Order Pricing

- **Time extension costs**
- **Labor inefficiencies**
- **Costs to mitigate delay**

“Full Accord & Satisfaction”

“Full Accord”

State of Maryland - Department of General Services
General Conditions of the Contract Between Owner and Contractor

E. Contractor's entitlement to compensation or additional time for delays for which the State is responsible or for which an extension is due the contractor is also subject to Sections 3.06 and 7.06.

G. Execution of a written change order by contractor, or failure of the contractor to dispute the terms of a written order of the Procurement Officer strictly in accordance with contract requirements, shall be binding and conclusive and shall operate as an accord and satisfaction as to (a) all compensation payable to contractor for the work associated with the change order, and (b) contractor's right to an extension of the contract completion time. Contractor may not execute or accept a change order subject to any conditions or reservation of rights or claims which have not been agreed to in writing the Procurement Officer. Any attempt by the contractor to impose such conditions or reservations shall not be binding on the State. Contractor's sole remedy for disputing the terms of an order by the Procurement Officer or for making a claim therefor is to follow strictly the procedures stated in this Section 3.07 and Sections 3.06 and 6.13.

3.08 UNAUTHORIZED WORK:

The contractor shall not be paid for any work outside the scope of the contract not authorized in writing by the Procurement Officer.

SECTION 4 - CONTROL OF THE WORK:

4.01 INTERPRETATION OF THE CONTRACT DOCUMENTS – AUTHORITY OF THE ARCHITECT:

- A. The Procurement Officer shall be the final interpreter of the contract documents. He will furnish with reasonable promptness, through DGS or the architect, such clarifications as he may deem necessary for the proper execution of the work. Clarifications issued by the architect shall be consistent with the intent of the contract documents and, when in special instances the architect is authorized by the State so to act, the architect has authority to stop work whenever such stoppage may be necessary to ensure the proper execution of the contract.
- B. Except as otherwise expressly provided in the contract documents, all decisions of the architect are subject to approval by the Department. The architect has no authority to waive or change the requirements of the contract documents except as provided in Section 3.07C(11) above.

4.02 CONFORMITY WITH CONTRACT REQUIREMENTS:

- A. All work performed and all materials furnished shall be in conformity with the contract requirements.
- B. In the event the Procurement Officer finds the materials, or the finished product in which the materials are used or the work performed are not in complete conformity with the contract requirements and have resulted in an inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected by and at the expense of the contractor.
- C. In the event the Procurement Officer finds the materials or the finished product in which the materials are used are not in complete conformity with the contract requirements, but have resulted in a satisfactory product, he shall then make a determination if the work shall be accepted. In this event, the Procurement Officer will document the basis of acceptance by a Change Order which will provide for an appropriate adjustment, if any, in the contract price.

4.03 ADJACENT WORK:

The State shall have the right, at any time, to contract for and/or perform other work on, near, over or under the work covered by this contract. In addition, other work may be performed under the jurisdiction of another State agency. The contractor shall cooperate fully with such other contractors and carefully fit his own work to such other work as may be directed by the procurement officer.

THE PROGRESS PAYMENT RELEASE

CONTRACTOR'S INTERIM GENERAL RELEASE

FOR AND IN CONSIDERATION OF THE SUM OF _____ DOLLARS (\$ _____) as INTERIM PAYMENT, in hand paid by Universal City Development Partners ("Universal") the receipt and adequacy of which is hereby acknowledged, the undersigned hereby fully and forever releases, acquits and discharges Universal City Development Partners, its partners, parent, related and affiliated corporations, their agents, employees, consultants, officers, directors, successors and assigns, all of whom are hereinafter referred to as "Releasee" from all manner of action and causes of action, suits, claims, judgments, damages and rights hereafter accrued or accruing in favor of the undersigned including without limitation, any and all liability arising out of or in connection with that certain Agreement No. 97-3538, dated May 20, 1997, between UNIVERSAL CITY DEVELOPMENT PARTNERS, as Owner, and THE [REDACTED] CONTRACTING COMPANY, as Contractor, including all work labor and materials furnished, performed or provided pursuant thereto or otherwise in connection with the Universal's Islands of AdventureSM -- Island No. 2 -- General Construction, up to and through

If you didn't sign the Change Order, but signed this payment release, have you waived your rights?

Can you disagree with this language if the interim payment form is included in the contract?

The Actual Change Order

UNIVERSAL CITY DEVELOPMENT PARTNERS
1000 UNIVERSAL STUDIOS PLAZA
ORLANDO, FLORIDA 32819

CHANGE ORDER

PROJECT: Universal's Islands of AdventureSM DATE:

This Change Order represents a written modification between the parties to the Agreement referred to above and is based on the terms and conditions of that Agreement. This Change Order supersedes all prior negotiations, qualifications, and terms for the changes in scope specifically described in this Change Order and the Work contemplated is, except as otherwise specifically provided, subject to all the terms and conditions of the Agreement including, without limitations, those concerning payment. By executing this Change Order, Contractor acknowledges that this Change Order includes all direct and indirect charges arising out of this change. Contractor further agrees that by executing this Change Order it will be adequately compensated for the cost and time impact of the change(s) required by Universal. All claims against Universal which are incidental to or as a consequence of this change, including without limitation, delays, disruptions, suspensions, acceleration or other impacts are fully satisfied. Universal reserves its rights in accordance with the Agreement to issue any and all additional credits for insurance attributable to the Work represented in this Change Order and to audit Contractor's records to confirm the accuracy for any and all allowable insurance credits given or to be given in connection with this scope change. Contractor will commence its services upon execution of this Change Order and will complete the Work in accordance with the appropriate schedule, it being understood and agreed that time is of the essence in the completion of each and every provision or condition of the Change Order and the Agreement.

specifically described in this Change Order and the Work contemplated is, except as otherwise specifically provided, subject to all the terms and conditions of the Agreement including, without limitations, those concerning payment. By executing this Change Order,

What do you do if you disagree with this language?

UNIVERSAL CITY DEVELOPMENT
PARTNERS

THE WHITING-TURNER
CONTRACTING COMPANY

Can you disagree with this language if the change order form is included in the contract?

Reservation of Rights

“The execution of this Change Order represents the Contractor’s estimate of direct costs only. The Contractor expressly reserves the right to submit, at a later date, added costs and time extensions attendant to this change order arising from, but not limited to: extended field and home office overhead, labor inefficiency, disruptions, impacts to the critical path, schedule resequencing and acceleration.”

What Happens When Change Negotiations Fail?

What is a “Claim”?

As defined by the Federal Acquisition Regulation (“FAR”) Subpart 2.1, 2, 101 (b)(2):

Claim, means a written demand or written assertion . . . seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to the contract. However, a written demand or written assertion by the contractor seeking the payment of money exceeding \$100,000 is not a claim under the Contract Disputes Act of 1978 until certified as required by the Act

As defined in the American Institute of Architects Glossary of Construction Industry Terms:

A demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to terms of the Contract (Ref: AIA Document A201)

“The Architect’s Handbook of Professional Practice” Volume 3, AIA Press.

What is a “Claim”?

- In the vernacular, it means that a dispute exists between the parties to a contract. Usually, one party to a contract “claims” that certain events have given rise to delay and/or added costs for which reimbursement is being sought; for which the other party denies responsibility for the events and/or the requested remedies
- If changed work becomes the subject of an executed change order, usually a claim does not exist
- A claim should not be confused with *NOTICE*. Notice and a claim are different in form and substance
- A claim is a demand for redress under the contract and contains the particulars of what is being sought as compensation for a changed condition, in time and/or money

Preserve Rights to File a Claim

- **Do not execute documents (change orders and payment waivers) that limit or restrict your rights to file claims, without careful consideration**
- **Review all contract clauses that attempt to restrict your rights to file a claim (for time and/or money)**
- **Exhaust all opportunities amicably to settle outstanding issues in the form of change orders**
- **Read the contract and understand the clauses governing filing a claim**
- **Submit timely and properly formatted notice of claim**
- **Ensure that the content of the claim comports with the contract**

Points to Remember When Preparing a Claim

- **Contractual notice and a claim are (usually) two different documents**
- **Include in the claim the amount of time and/or costs being sought**
- **Include in the claim, or as an exhibit, a narrative that clearly defines the conditions giving rise to the impacts and damages in a concise fashion and in a chronological or issue based order, so that the reader can understand each element of the claim**
- **Provide sufficient exhibits and backup information (i.e. notice letters, photographs, e-mails, drawings , accounting forms and similar documentation) to support each element of the claim**
- **Include time impact analyses and inefficiency studies identifying and quantifying losses in labor productivity as applicable to the particular claim**
- **Provide an accounting of the direct and indirect costs arising from the claimed conditions**
- **File the claim in a timely fashion and to the appropriate party; certified if necessary**

There are several common components in a contractor's claim. These may include, depending on the nature of the claim:

- **A critical path method (“CPM”) schedule impact analysis. Such analyses can include fragnets, or time impact analyses (“TIAs”), a windows analysis and/or as-planned versus as-built schedule analysis to support any claim for a time extension**
- **Craft level analyses showing as-planned versus as-built craft curves**
- **Inefficiency studies identifying and quantifying losses in labor productivity**
- **An accounting of the direct costs arising from the claimed conditions**
- **An accounting of the indirect costs arising from the claimed conditions**
- **A narrative of the cause and effect nexus that can include a written description of the events, photographs, citations to the contract, documents such as letters and electronic correspondence, RFIs, change directives and other proofs that demonstrate the changed nature of the work, the resulting damage and a summary of the desired relief**

Preserve Your Rights – Even if You Don't Actually File a Claim

Many subcontractors have the philosophy that “claims” must be avoided at all cost. While it is certainly desirable to avoid distracting and time consuming disputes, or costly litigation, the failure of a contractor to file a “claim” in a timely fashion may forever bar the contractor from the relief (i.e. costs and/or time extensions) to which the contractor may be otherwise entitled

Before a decision is made by a contractor to delay or to avoid altogether filing of a “claim”, a thorough evaluation should be made by upper management as to the potential risks and liabilities that result from the decision not to file a claim

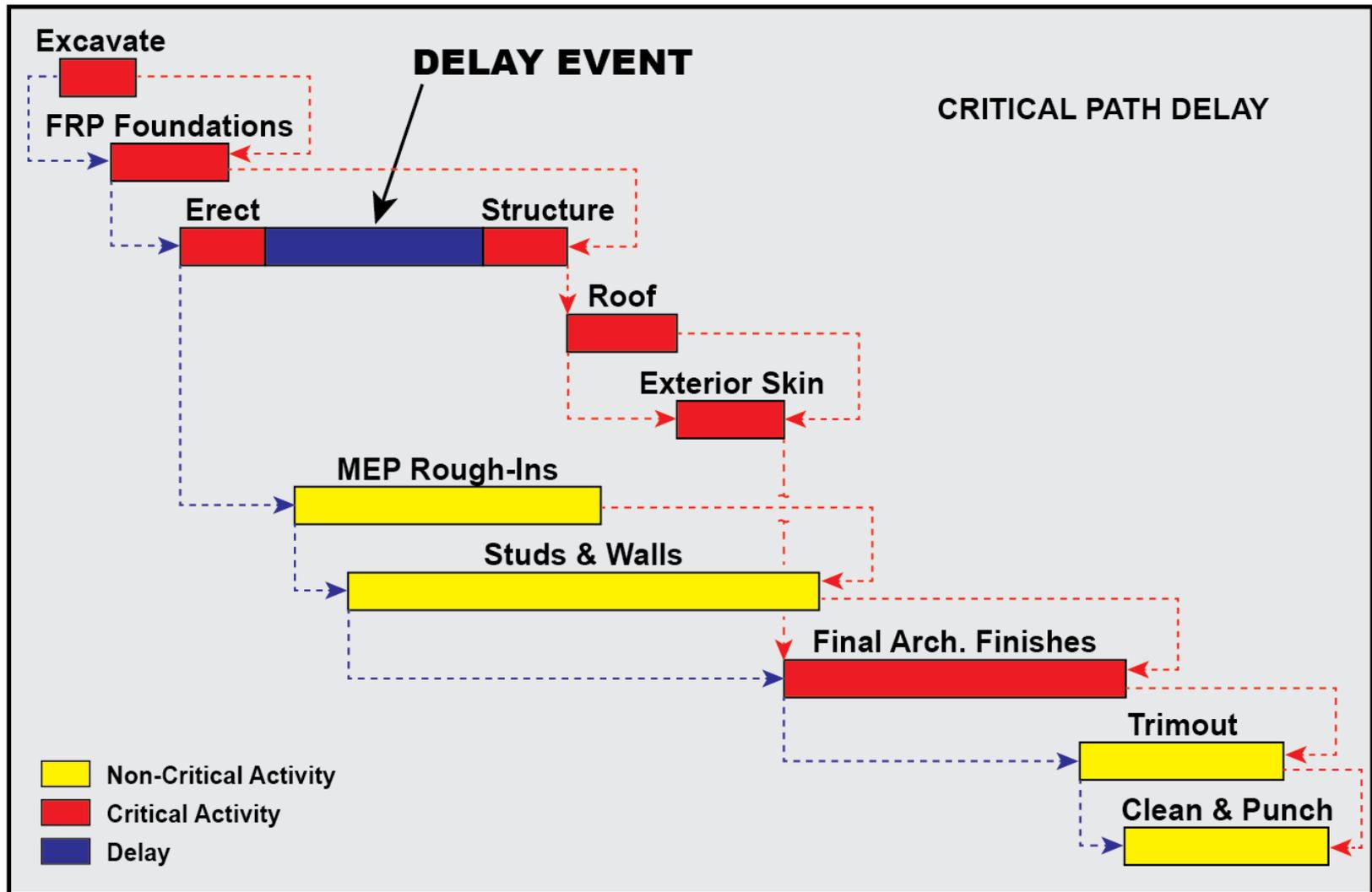
Construction Change Orders

Measuring the Impacts Of a Change

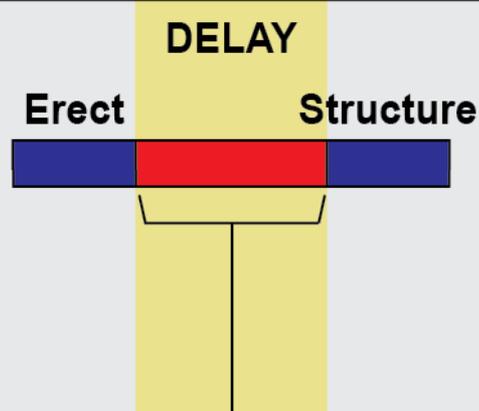
The Fragnet or Time Impact Analysis (“TIA”)

FRAGNETS, or the TIME IMPACT ANALYSIS, are comprised of a group of activities that describe a potential delay to the schedule. The fragnet is input into the schedule at the earliest point at which the changed condition is known, or should have been known. From this process, time impacts are measured in the project schedule update

Fragnets

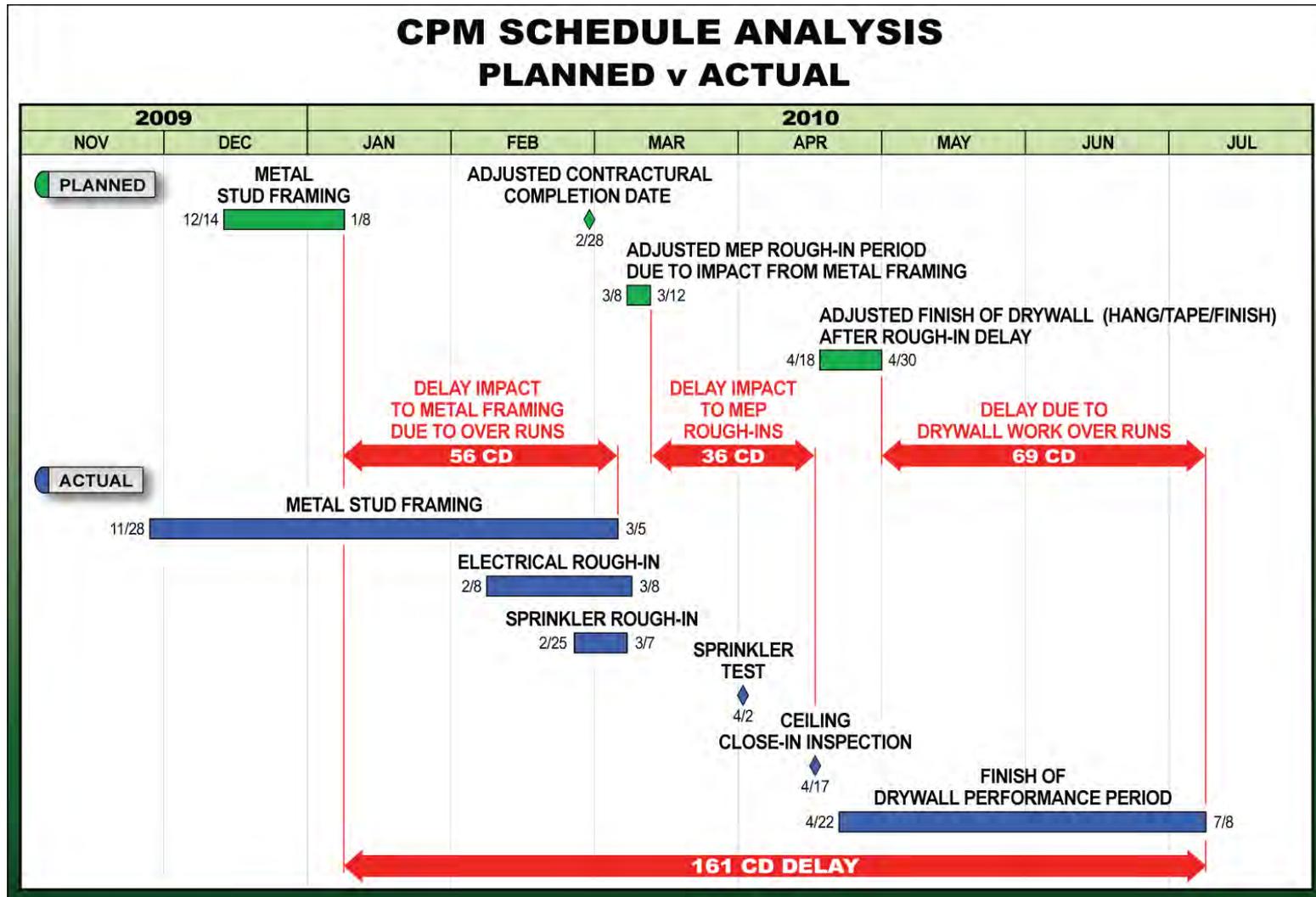


Development of the CPM Fragnet



- Identify each new fragnet impact as a set of activities
- Estimate durations for each new fragnet activity
- Leave no gaps in time in the fragnet (estimate waiting periods, owner review periods, etc. as durations & identify as activities)
- Tie the fragnet into the activities which will be restrained by completion of the fragnet activities

In addition to the claim narrative, supporting documentation can be provided as exhibits to assist the reviewer in reaching the desired conclusion. If a schedule analysis has been performed to support a claim for an excusable and/or compensable time extension, summaries of this analysis can be included in the claim, as shown below:



Time Impact Analysis Notification

“Pursuant to the Contract Documents, Reputable Contractors, Inc. has analyzed Change Order #2 impacts in the current CPM schedule update (through May 28, 20XX). Activity 1210-1215 was added into the update after masonry erection (1205-1210) and prior to erection of bar joists (1215-1220) in the Locker Room area.”

“Prior to the insertion of this change, the affected path of logic had zero float after the modification to the Contract finish date from 3/27/XX to 4/24/XX by CO #1.”

“The result of the impact analysis was the creation of a -7 WD (10 CD) path of negative float beginning at the CO #2 activity. We herewith request a 10 CD time extension to the project finish date, compensatory.”

Time Impact Analysis Notification

**What do you do when the
Prime Contractor declares
that the CPM Schedule is a
“State Secret”**

Time Impact Analysis Notification

- **You must request the native schedule files in electronic format**
- **Even without the schedule – you must submit TIAs**

How to Estimate the Impacts of Change on Labor Productivity

The Measured Mile Method

- **The measured mile method of inefficiency quantification is the most widely accepted methodology in the industry**
- **The measured mile method produces a labor productivity comparison between productive and non-productive areas or time frames within the project**
- **This methodology captures all types of labor inefficiencies in one measurement for the area or time period under study**
- **By utilizing actual production data from the project and comparing the more productive area or time frame to the impacted area or time frame, the contractor's estimate can be ignored**
- **This methodology requires the project to have less impacted areas or time frames to compare with the impacted areas or time frames**

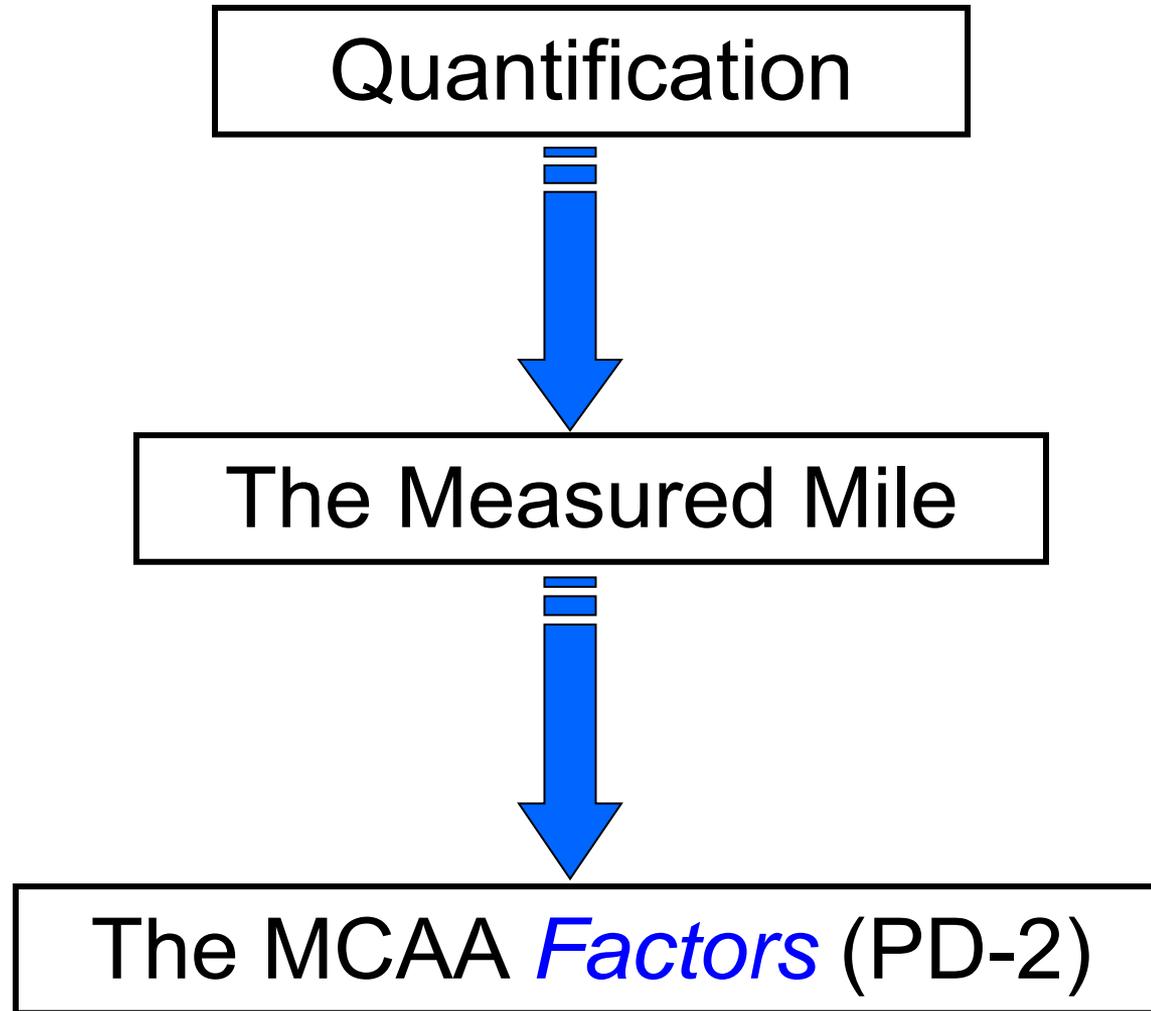
The Measured Mile Method

- **This methodology also requires that the contractor maintain, or establish after-the-fact, its productivity rate of materials installed to hours extended (i.e. linear feet of pipe per labor hour, by specified time frame)**
- **This type of productivity analysis results in a comparison of productivity rates between the impacted and less, or non-impacted, crews (i.e. establishes the “should have spent” labor consumption on the project)**
- **Reported decisions from the courts have established the need for the party making claim to establish its measured mile comparison between similar, but not necessarily identical, types of work performed under similar conditions, preferably on the same project site**
- **Any dissimilarities in types of materials installed, the conditions under which they were installed, or the crews that installed them must be fully explained and potentially adjusted in the inefficiency computation**

Quantification of Inefficiency

- Although the measured mile method of inefficiency quantification is the most widely accepted methodology in the industry, frequently it cannot be applied because there is no unimpacted or less impacted area or time frame, or the contractor's record keeping does not support the use of the measured mile method
- Can the contractor simply use the modified total cost method (i.e., subtract its bid labor and change order labor from the total labor expended on the project)? Yes, however this should be the contractor's "last resort" for inefficiency quantification because it is the least accepted
- The preferred method (after the measured mile) for use by a mechanical contractor is to apply the MCAA *Factors* to estimate the contractor's loss of labor productivity

Loss of Labor Productivity Quantification



What are the MCAA *Factors*?

- **A set of estimating guidelines that have proven reliable and credible for over thirty years in estimating a mechanical contractor's loss of labor productivity**
- **Prepared by the Management Methods Committee of the MCAA in 1971 using an industry survey method of data collection**
- **Accepted by the major boards of contract appeals, other trial venues, and in arbitration tribunals as reliable and useful guidelines for estimating loss of labor productivity**
- **Reasonably simple to understand and employ within all levels of the mechanical contracting industry**
- **Can be used to forward price of retroactively price loss of productivity requests for equitable adjustment**
- **Now supported by a user's manual published by the MCAA**

Using the MCAA *Factors*

The *Factors* Provide for a Reasonable Quantification of Damages

- The MCAA *Factors* are not based on a statistical formula and are not represented to produce an exact measure of damages
- Reported cases have made it clear that a contractor's damages arising from inefficiency impacts do not need to be proven with mathematical exactness
- When using the MCAA *Factors*, a labor intensive contractor must employ knowledge of productivity concepts accepted in the industry, knowledge of the specific project conditions and a careful reading of each MCAA *Factor* category description

Using the MCAA Factors

What about those Three Percentages?

- Each MCAA *Factor* has three percentages of impact intensity that must be considered and applied:

Minor - - Average - - Severe

- These impact intensity ratings arrived at by interviewing the labor supervisors
- Considerations can include:
 - Crew size at the time of impact
 - Number of trades working in the same areas
 - Number of supervisors available to address changes
 - Condition of the schedule – is the work critical?
 - Will overtime be employed to mitigate delay?

Factors Affecting Labor Productivity

Factor	Percent of Loss per Factor		
	Minor	Average	Severe
1. STACKING OF TRADES: Operations take place within physically limited space with other contractors. Results in congestion of personnel, inability to locate tools conveniently, increased loss of tools, additional safety hazards and increased visitors. Optimum crew size cannot be utilized.	10%	20%	30%
2. MORALE AND ATTITUDE: Excessive hazard, competition for overtime, over-inspection, multiple contract changes and rework, disruption of labor rhythm and scheduling, poor site conditions, etc.	5%	15%	30%
3. REASSIGNMENT OF MANPOWER: Loss occurs with move-on, move-off men because of unexpected changes, excessive changes, or demand made to expedite or reschedule completion of certain work phases. Preparation not possible for orderly change.	5%	10%	15%
4. CREW SIZE INEFFICIENCY: Additional workers to existing crews "breaks up" original team effort, affects labor rhythm. Applies to basic contract hours also.	10%	20%	30%
5. CONCURRENT OPERATIONS: Stacking of this contractor's own force. Effect of adding operation to already planned sequence of operations. Unless gradual and controlled implementation of additional operations made, factor will apply to all remaining and proposed contract hours.	5%	15%	25%
6. DILUTION OF SUPERVISION: Applies to both basic contract and proposed change. Supervision must be diverted to (a) analyze and plan change, (b) stop and replan affected work, (c) take-off, order and expedite material and equipment, (d) incorporate change into schedule, (e) instruct foreman and journeyman, (f) supervise work in progress, and (g) revise punch lists, testing and start-up requirements.	10%	15%	25%

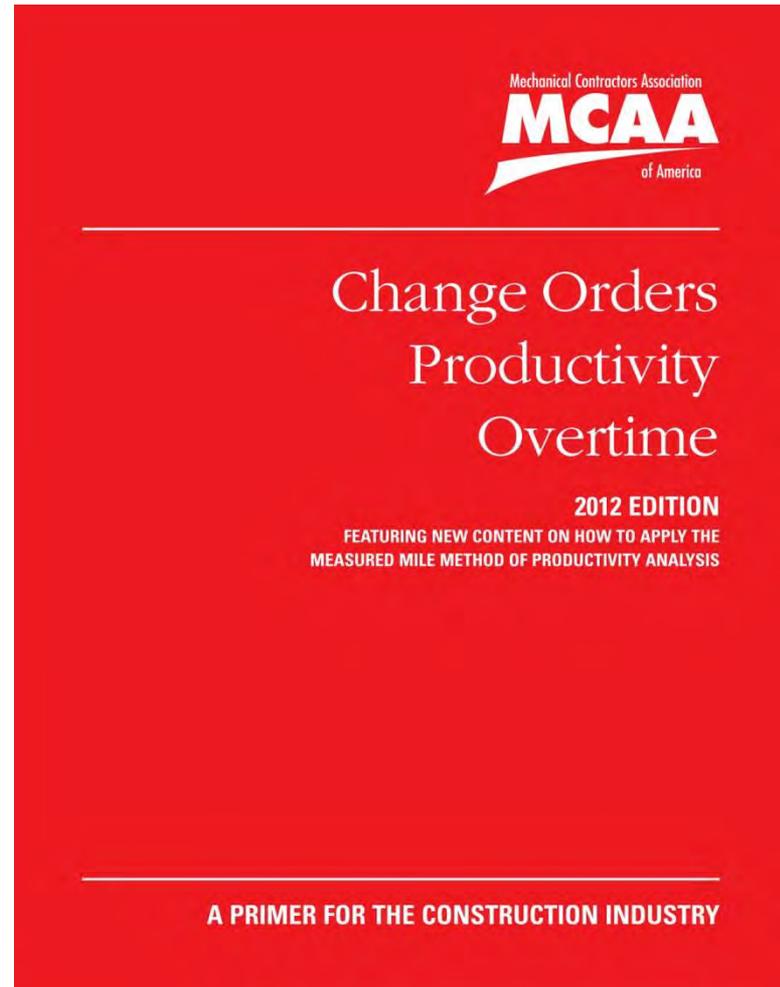
Factors Affecting Labor Productivity

Factor	Percent of Loss per Factor		
	Minor	Average	Severe
7. LEARNING CURVE: Period of orientation in order to become familiar with changed condition. If new men are added to project, effects more severe as they learn tool locations, work procedures, etc. Turnover of crew.	5%	15%	30%
8. ERRORS AND OMISSIONS: Increases in errors and omissions because changes usually performed on crash basis, out of sequence or cause dilution of supervision or any other negative factors.	1%	3%	6%
9. BENEFICIAL OCCUPANCY: Working over, around or in close proximity to owner's personnel or production equipment. Also badging, noise limitations, dust and special safety requirements and access restrictions because of owner. Using premises by owner prior to contract completion.	15%	25%	40%
10. JOINT OCCUPANCY: Change cause work to be performed while facility occupied by other trades and not anticipated under original bid.	5%	12%	20%
11. SITE ACCESS: Interferences with convenient access to work areas, poor man-lift management or large and congested worksites.	5%	12%	30%
12. LOGISTICS: Owner furnished materials and problems of dealing with his storehouse people, no control over material flow to work areas. Also contract changes causing problems of procurement and delivery of materials and rehandling of substituted materials at site.	10%	25%	50%
13. FATIGUE: Unusual physical exertion. If on change order work and men return to base contract work, effects also affect performance on base contract.	8%	10%	12%
14. RIPPLE: Changes in other trades' work affecting our work such as alteration of our schedule. A solution is to request, at first job meeting, that all change notices/bulletins be sent to our Contract Manager.	10%	15%	20%
15. OVERTIME: Lowers work output and efficiency through physical fatigue and poor mental attitude.	10%	15%	20%
16. SEASON AND WEATHER CHANGE: Either very hot or very cold weather.	10%	20%	30%

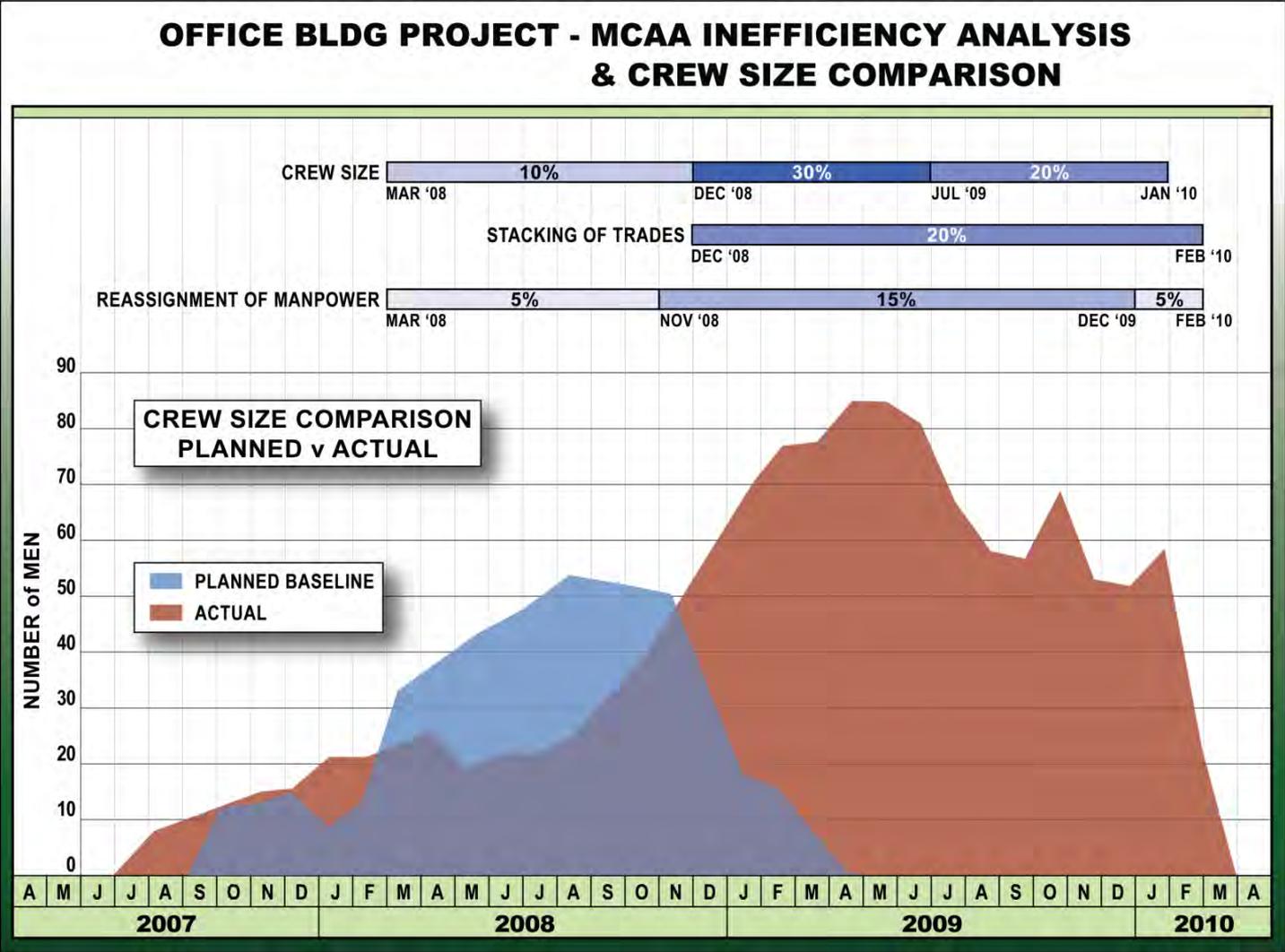
Important Reference Materials

**Reference the Chapters
on Changes, Delay
& Labor Inefficiencies
In the MCAA's 2012
Management Manual –**

**Now Formally Adopted
by SMACNA**



An example of an inefficiency exhibit supporting the claimant's loss of labor productivity component may appear as follows:



“Cumulative Impact”

- Cumulative impact is an adverse condition that arises from the presence of changes in scope (usually multiple) and reduces the labor efficiency of both change work and base contract work (called impacts of the changed work to the unchanged work)
- The reality of cumulative impact has been well recognized by courts and boards of contract appeals
- Cumulative impact can be quantified by several methods, including the measured mile and use of the MCAA *Factors*
- It is virtually impossible to quantify, and thus to include, the adverse effects of cumulative impact in a single, discrete change order for the purpose of forward pricing
- The most accurate measurement of the adverse effects of cumulative impact arising from scope changes is accomplished at the conclusion of the project or project phase

“Cumulative Impact” Quantification – the MCAA factors

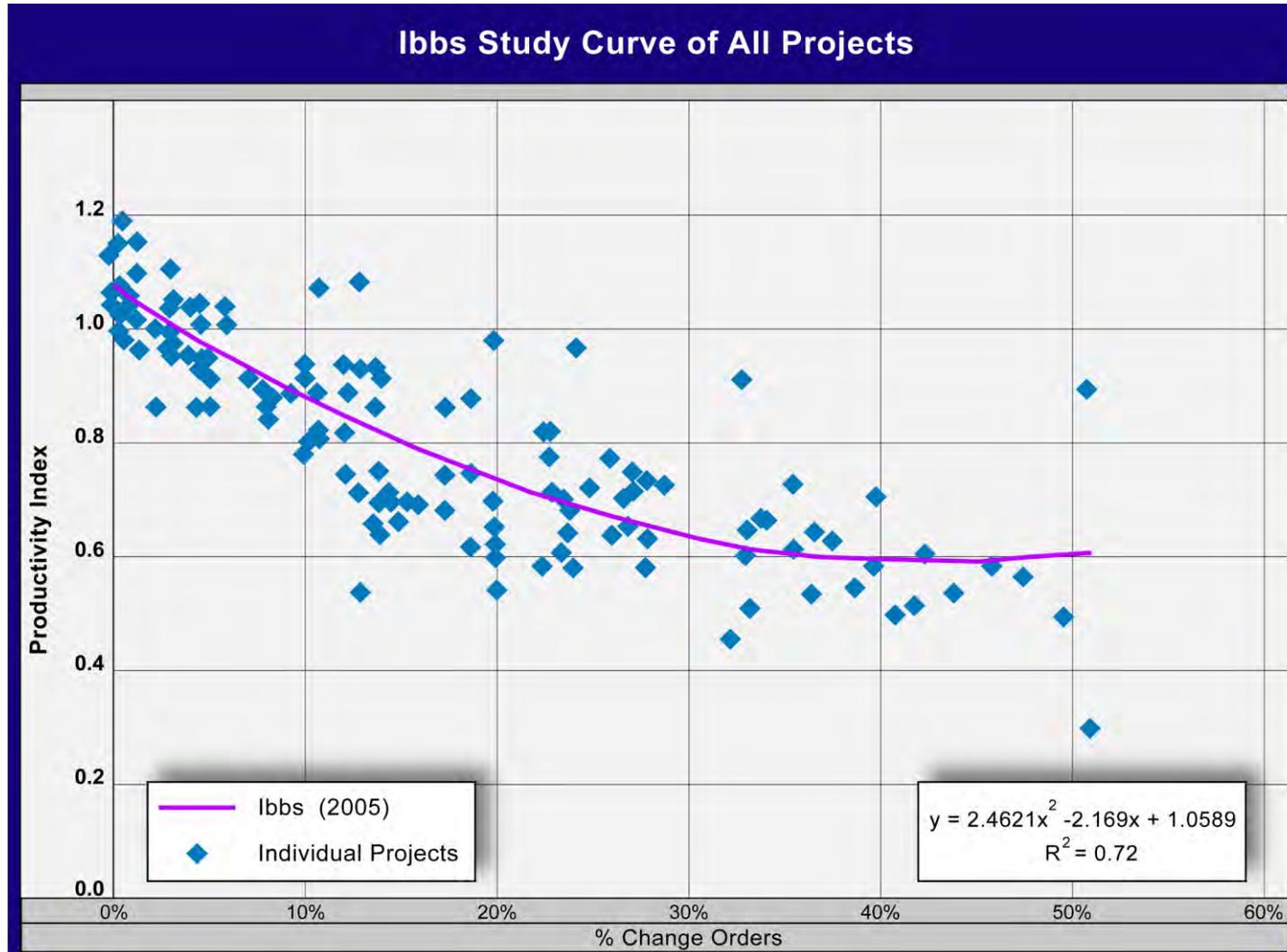
- **Can the MCAA *Factors* be used to estimate the cumulative impacts of scope changes to the unchanged (base contract) work?**

YES

These MCAA *Factors* are often components of a cumulative impact claim:

- **Stacking of Trades**
- **Reassignment of Manpower**
- **Dilution of Supervision**
- **Crew Size Inefficiency**
- **Overtime Inefficiency**

Ibbs Study



“Cumulative Impact” Reservation of Rights

“The execution of this Change Order represents mutual acknowledgement that the contractor’s price includes only the direct costs for this modification. The contractor expressly reserves the right to submit, at a later date, added costs and/or time extension requests attendant to this modification arising from, but not limited to: extended field and home office overhead, labor and equipment inefficiencies, disruptions, cumulative impacts, impacts to the critical path, schedule re-sequencing and/or acceleration.”

Overtime Inefficiencies in Changes and Claims

Overtime Inefficiency

- **Overtime is the most written about category of labor inefficiency in the construction industry. Importantly, the inefficiency costs of overtime may exceed the premium costs of the overtime**
- **Often, owners or primes will authorize payment for overtime direct payroll costs (i.e. overtime premium costs), but will deny the resulting labor inefficiency costs**
- **Best practice is to offer forward priced estimates of inefficiencies when overtime is proposed and reach agreement as to payment before the overtime work commences**
- **If the owner or prime deny the overtime inefficiencies, the mechanical contractor must notify in writing that payments made to cover direct costs are exclusive of inefficiencies – rights to collect the costs of inefficiency at a later date should be preserved**

Overtime Inefficiency

- **What if your contractual party (i.e. prime or owner) refuses to acknowledge and pay for the costs of the labor inefficiency associated with the overtime schedule?**
- **The first step is proper and timely notification**
- **The second step is to provide the estimated (forecasted) inefficiency costs on a regular basis (i.e. monthly) to your contractual party**
- **The third step is to prepare pending change orders that are submitted to your contractual party for approval and payment that include the inefficiency costs**

Overtime Inefficiency

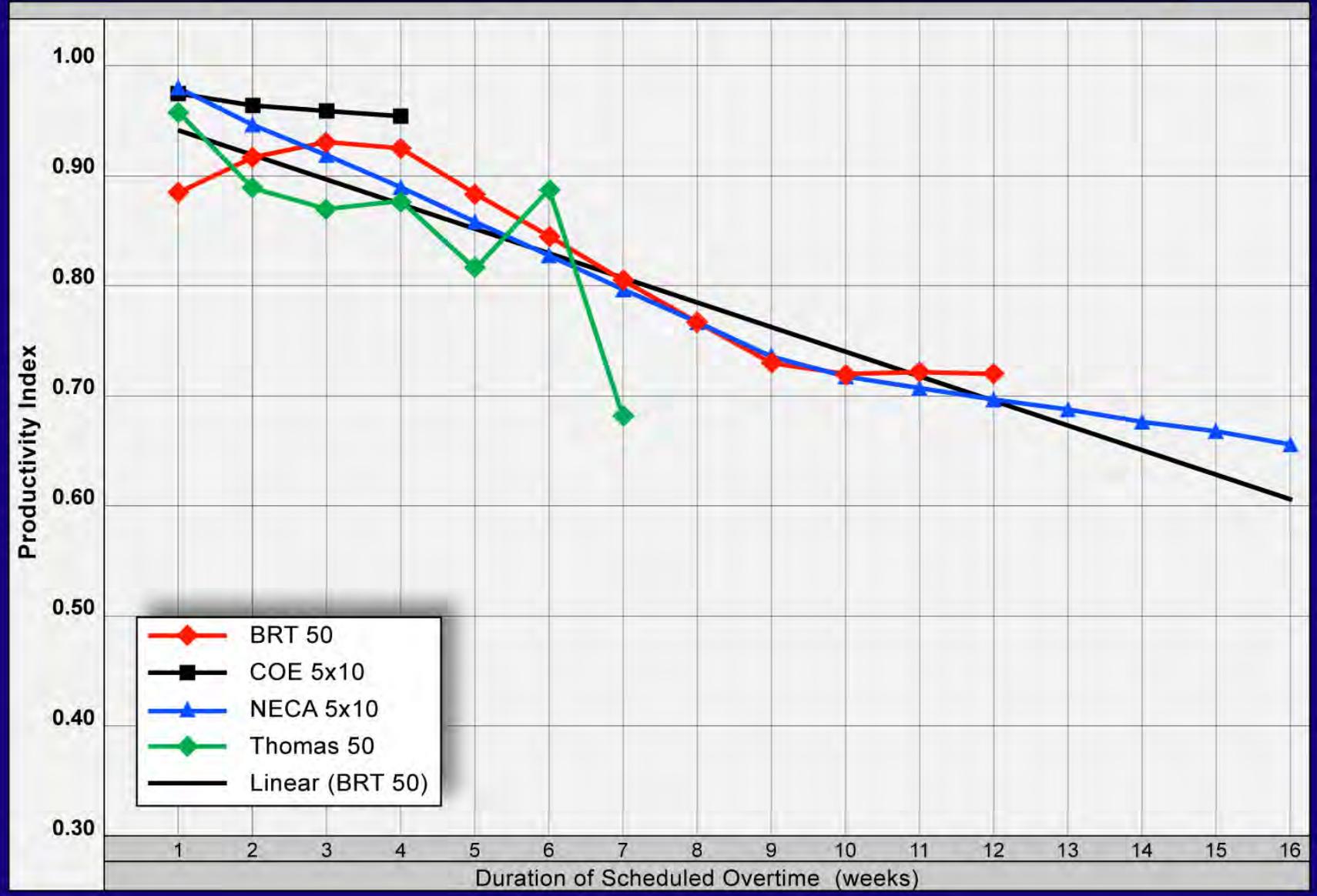
- **While a measured mile analysis will include overtime inefficiencies, it cannot be performed prospectively and the other requirements of a measured mile must be met**
- **The MCAA's *Factors Affecting Labor Productivity* only contain three general percent impact estimates: 10% for “Minor”, 15% for “Average” and 20% for “Severe” to measure overtime inefficiencies**
- **The better practice is to employ one of the more particularized studies contained in the MCAA's publication**
- **While no empirical study has been performed prior to the publication of the latest chapter on overtime inefficiency, we have relied upon the four most widely accepted studies in the construction industry in compiling the data contained in this section of the MCAA's publication**

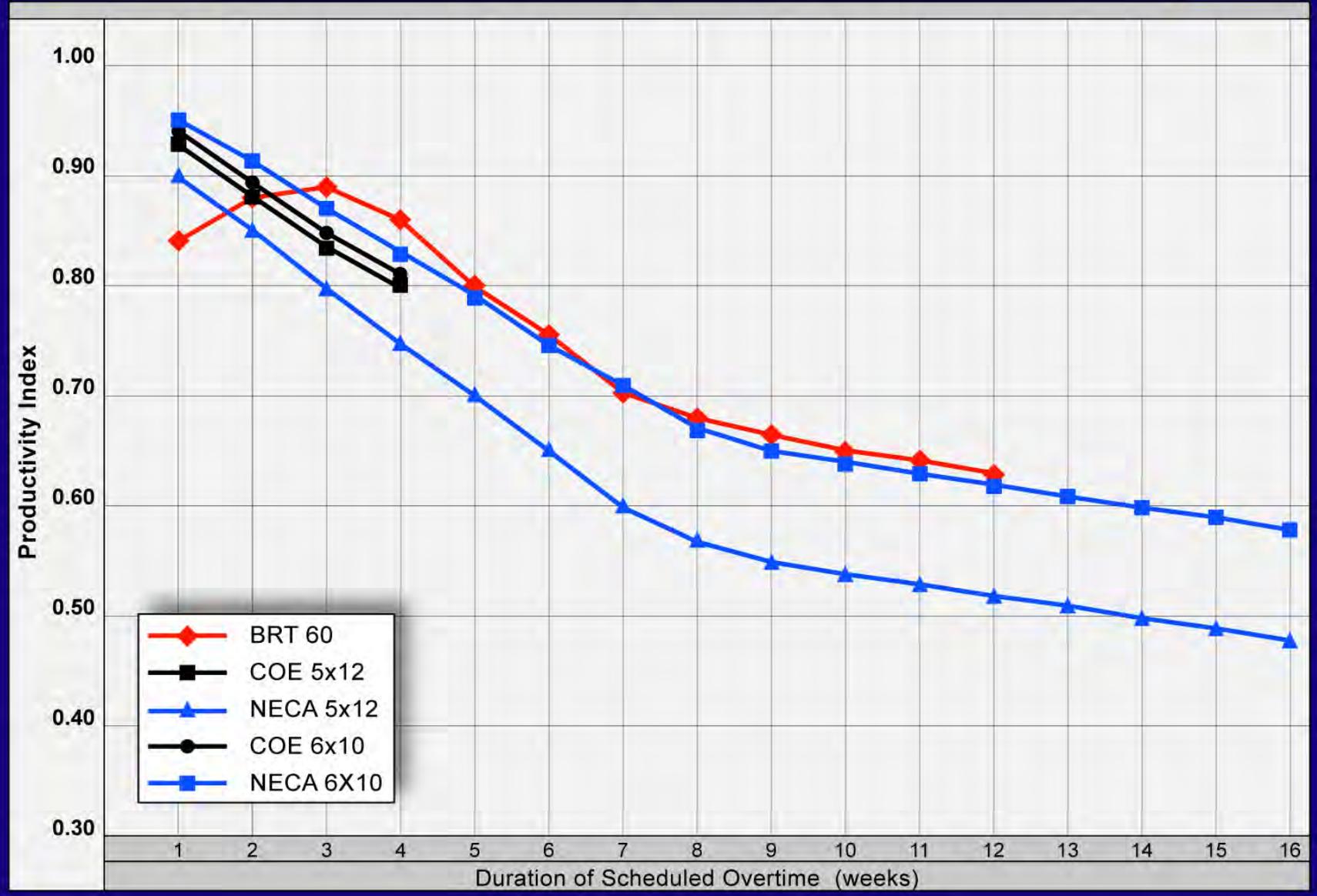
Overtime Inefficiency

- The four studies utilized in the new chapter come from long published data that have been relied upon for decades:
- The BRT curves – often cited as a reasonable means of estimating inefficiencies caused by overtime. Data collected on one construction project for a 12 week period
- The NECA tables – offering the longest measurement period – 16 weeks. While there is no supporting empirical data in NECA’s files, this is a widely utilized guide to quantifying overtime inefficiencies
- Thomas Study – a comparison of widely used overtime inefficiency data with empirical data collected under Dr. Thomas’ supervision. Found that the BRT curves offer a “good representation” of overtime inefficiency
- The COE *Impact Evaluation Guide* EP 415-1-3 – withdrawn by the COE but not repudiated, correlates well with the other studies and can be used to *support* other methods of quantification

Overtime Inefficiency

- The curves can be used to forward and retroactively estimate labor efficiencies
- The inefficiency percentages are to be applied to the straight time labor and to the overtime labor for all workers performing overtime work
- Use labor hours rather than labor dollars to quantify labor inefficiencies.
- These curves are not represented to be precise – they are represented to produce reasonable estimates of the labor inefficiencies arising from overtime schedules
- Use the COE's curves as *support* for the other curves





Overtime Inefficiency

- **Precautions must be taken to notify that premium labor costs and labor inefficiencies will be recovered for overtime schedules**
- **If possible, establish the means of estimating the overtime inefficiency before the overtime schedule is implemented**
- **Overtime inefficiencies can be retroactively estimated, but by that time, the contractor has incurred the damage**
- **Include the inefficiency in the change order billing along with the premium payroll costs**
- **Use the appropriate table to forward price the overtime inefficiencies**

Overtime Inefficiency

“This change order proposal represents the direct additional payroll costs arising from the requested overtime schedule. No overtime inefficiencies are included in this proposal. Amalgamated Mechanical Contractors expressly reserves its rights to request compensation for labor efficiencies attendant to the requested overtime schedule. A revision to this change order proposal containing the costs for overtime labor inefficiencies will be forwarded for processing as soon as these costs can be computed. We estimate that the labor inefficiencies arising from this overtime schedule will not be less than _____ %.”

Overtime Inefficiency

“The overtime pricing contained herein includes the added payroll costs for the overtime schedule provided by your office. Furthermore, this change order proposal contains a loss of labor productivity estimate based on the overtime schedule that we have received from your firm. The proposed overtime schedule provided by your office is the basis of our estimate for direct and inefficiency costs associated with this change order request. Amalgamated Mechanical Contractors expressly reserves the right to submit a separate change order proposal in the event the overtime schedule changes in any manner from that upon which we have relied in the pricing of this proposed change order.”

How to Identify and Manage Change Order General Conditions

How to Identify and Manage Change Order General Conditions

Starting Out – Know what change provisions are in your contract:

- **Read the contract carefully before signing**
- **Consider risks of the contract terms**
- **Industry form contract change provisions**
 - **Consensus Docs 200**
 - **AIA (A201 2007)**
 - **EJCDC (Engineering Joint Contract Documents Committee)**
 - **CMAA (Construction Management Association of America)**

How to Identify and Manage Change Order General Conditions

What to do when a change is identified:

Know Your Contract

Fulfill Notice Requirements

**Maintain Detailed
Documentation**

**Procedures for Proceeding
Before Change Order is Signed**

**Consider Impacts to Schedule
& Productivity**

How to Identify and Manage Change Order General Conditions

Examples of events leading to a change:

- **Owner driven scope changes**
- **Changes in planned sequence of work activities**
- **Differing site conditions**
- **Errors, omissions or incomplete specifications & construction drawings**
- **Changes in time**
- **Others**

**Directed
Changes**

**Constructive
Changes**

How to Identify and Manage Change Order General Conditions

Pricing Changes – Cost Category Examples:

Direct Costs

- Field labor
- Materials
- Equipment
- Consumables
- Small tools
- Most general conditions
- Subcontracts
- Bond
- Permits
- Fuel, oil, grease on owned equipment

Direct or Indirect

- Supervision
- Some types of insurance
- Major equipment overhauls

Indirect

- Fabrication shop
- Home office overhead

How to Identify and Manage Change Order General Conditions

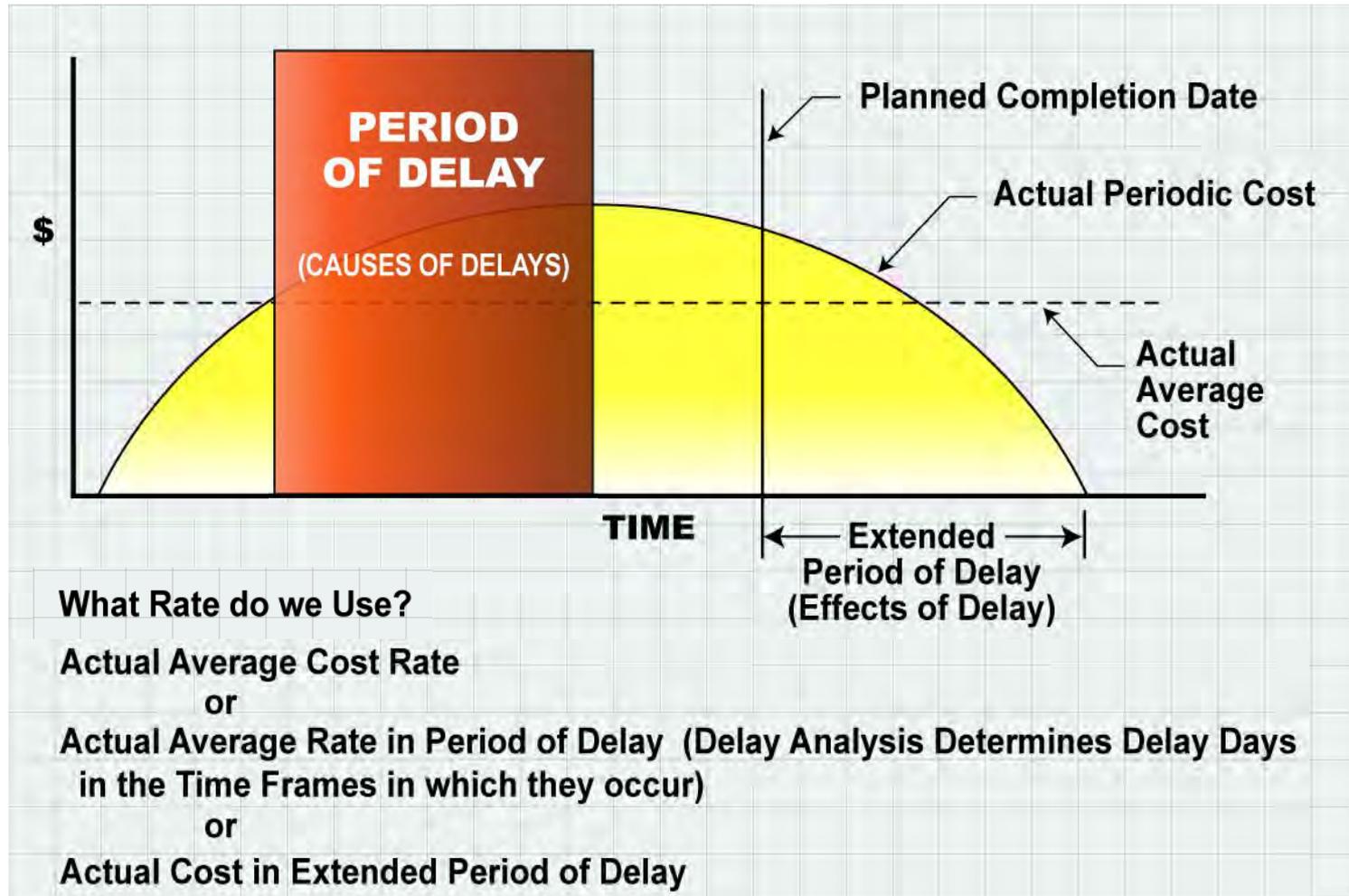
Contract Change Provisions:

	<u>Consensus Docs</u>	<u>AIA</u>	<u>EJCDC</u>	<u>CMAA</u>
Notice Requirements	14 days	21 days	30 days	10 days
Guidance on Pricing Elements				
- unit price	✓	✓	✓	✓
- lump sum	✓	✓	✓	✓
- cost & fee	General	General	Detailed	Detailed

Other Considerations:

- flow down provisions
- authorization procedures
- time for acceptance
- “full accord and satisfaction” language
- waiver of consequential damages
- escalation of a change → dispute resolution provisions

Determination of Daily Rate Applicable to Days of Delay



How to Identify and Manage Change Order General Conditions

Pricing change orders:

- **Lump sum forward pricing vs. known costs**
- **Pricing elements:**
 - **Direct costs**
 - **Indirect costs**
 - **“Fee”**
 - **Overhead**
 - **Profit**
 - **Bond, Taxes**

To Recap:

Managing Change to Your Contract Means:

- **Vetting your estimate before the project begins**
- **Reading your contract from cover to cover**
- **Participating in the development of the project schedule**
- **Participating in the updates to the project schedule**
- **Tracking and reviewing your labor trends**
- **Taking steps to avoid waiving your rights**
- **Providing timely and proper notice of impacts**
- **Reviewing your superintendents' daily reports**
- **Documenting changed conditions (i.e. digital photos)**
- **Apprising senior management when major impacts occur**

Thank you for your participation!

**Paul L. Stynchcomb, PSP, CFCC
Senior Managing Director, FTI Consulting**