

Resubmitted Thesis Report

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Problem Identification

From the schedule comparison in August 2011 provided by Turner Construction, many activities were delayed as show in the following chart:

Milestone	Contract Days	(1) Current Date	(2) TCCo Milestone	(3) INOVA Milestone	Delta 1 Col 2 - Col 1
Issue NTP			09-Aug-10	11-Oct-10	
Make Ready Work	66	14-Oct-10	14-Oct-10	16-Dec-10	0
Concrete Substantially Complete	364	16-Sep-11	09-Aug-11	10-Oct-11	-38
Building Watertight	446	15-Dec-11	29-Oct-11	31-Dec-11	-47
P&HVAC Major Components	476	04-Jan-12	28-Nov-11	30-Jan-12	-37
Electrical Major Components	442	05-Oct-11	25-Oct-11	27-Dec-11	20
Conditioned Air	490	18-Jan-12	12-Dec-11	13-Feb-12	-37
Issue Non RUP	681	21-Jun-12	20-Jun-12	22-Aug-12	-1
Substantial Completion	681	18-Jun-12	20-Jun-12	22-Aug-12	2

Activities such as concrete, building watertight, plumbing & HVAC components, and conditioned air are delayed a month or a month and a half. Some of the delays are caused by extrinsic factors such as earthquake occurred on August 23rd, 2011 and hurricane. Crane was shut down due to the earthquake for re-inspection. Time was also taken to repair the water damage on the crane motors after the hurricane

Below is the original master schedule plan of the SPT basically follows the sequence below:

- Utilities and site work

Activity Name	Activity Code	Original Duration	Remaining Start	Actual Start	From	To	Actual Finish	Summary
NOVA SOUTH PATIENT TOWER - MASTER SC...								
PROJECT MILESTONES								
301	201	201	19-Sep-11	19-Sep-11	20-Sep-11	20-Sep-11	20-Sep-11	
CONTRACT MILESTONES								
SP-1210		0	0		08-Sep-11	20-Sep-11	20-Sep-11	STRUCTURAL CONCRETE COMPLETE FOUNDATION
SP-1220		0	0		09-Oct-11	20-Sep-11	20-Sep-11	MAJOR ELECTRICAL COMPONENTS FUNCTIONAL/REMAIN P&M
SP-1310		0	0		09-Oct-11	20-Sep-11	20-Sep-11	MECHANICAL COMPONENTS FUNCTIONAL
SP-1320		0	0		15-Oct-11	20-Sep-11	20-Sep-11	BUILDING REVENUE INVESTMENT
SP-1330		0	0		15-Oct-11	20-Sep-11	20-Sep-11	CONTRACTOR AIR
SP-1340		0	0		15-Oct-11	20-Sep-11	20-Sep-11	ISSUE WORKP&M
CONSTRUCTION MILESTONES								
SP-1110		0	0		08-Sep-11	20-Sep-11	20-Sep-11	STRUCTURAL CONCRETE COMPLETE FOUNDATION
SP-1110		0	0		09-Oct-11	20-Sep-11	20-Sep-11	MAJOR ELECTRICAL COMPONENTS FUNCTIONAL/REMAIN P&M
SP-1120		0	0		09-Oct-11	20-Sep-11	20-Sep-11	MECHANICAL COMPONENTS FUNCTIONAL
SP-1130		0	0		15-Oct-11	20-Sep-11	20-Sep-11	BUILDING REVENUE INVESTMENT
SP-1140		0	0		15-Oct-11	20-Sep-11	20-Sep-11	CONTRACTOR AIR
SP-1150		0	0		15-Oct-11	20-Sep-11	20-Sep-11	ISSUE WORKP&M
UTILITIES AND SITE WORK								
SP-1420		0	0		08-Sep-11	20-Sep-11	20-Sep-11	UTILITIES WORK COMPLETE
SP-1430		0	0		09-Sep-11	20-Sep-11	20-Sep-11	STEEL WORK/SHIMBOSS
EARTHWORK AND FOUNDATIONS								
SP-1400		0	0		08-Sep-11	20-Sep-11	20-Sep-11	CONCRETE STRUCTURE SUBSTANTIAL/COMPLETE
SP-1405		0	0		08-Sep-11	20-Sep-11	20-Sep-11	CONCRETE STRUCTURAL TOP OUT
SP-1410		0	0		08-Sep-11	20-Sep-11	20-Sep-11	HELIPAD WORK COMPLETE
MEP SYSTEMS								
SP-1420		0	0		15-Oct-11	20-Sep-11	20-Sep-11	CONTRACTOR AIR
SP-1430		0	0		15-Oct-11	20-Sep-11	20-Sep-11	CONTRACTOR AIR
FAÇADE AND ROOF								
SP-1400		0	0		15-Oct-11	20-Sep-11	20-Sep-11	CURTAIN WALL COMPLETE
SP-1420		0	0		15-Oct-11	20-Sep-11	20-Sep-11	PRECAST COMPLETE
SP-1430		0	0		15-Oct-11	20-Sep-11	20-Sep-11	REMOVAL CORE IN
SP-1440		0	0		15-Oct-11	20-Sep-11	20-Sep-11	ROOF COMPLETE
CORE CONSTRUCTION								
SP-1400		0	0		15-Oct-11	20-Sep-11	20-Sep-11	MEP ASSEMBLY AND RISERS COMPLETE
SP-1410		0	0		15-Oct-11	20-Sep-11	20-Sep-11	MEP 5TH FLOOR COMPLETE
SP-1420		0	0		15-Oct-11	20-Sep-11	20-Sep-11	PUBLIC ELEMENTS COMPLETE
SP-1430		0	0		15-Oct-11	20-Sep-11	20-Sep-11	PAINTER ELEMENTS COMPLETE
INTERIOR FITOUT								
SP-1400		0	0		15-Oct-11	20-Sep-11	20-Sep-11	7TH FLOOR INTERIOR FIT OUT
SP-1410		0	0		15-Oct-11	20-Sep-11	20-Sep-11	7TH FLOOR FIT OUT/ME
SP-1420		0	0		15-Oct-11	20-Sep-11	20-Sep-11	2ND FLOOR FIT OUT
SP-1430		0	0		15-Oct-11	20-Sep-11	20-Sep-11	GROUND FLOOR FIT OUT
SP-1440		0	0		15-Oct-11	20-Sep-11	20-Sep-11	INTERIOR FITOUT COMPLETE
SP-1450		0	0		15-Oct-11	20-Sep-11	20-Sep-11	5TH FLOOR FIT-OUT
PERMITS & SITE DEVELOPMENT								
GENERAL CONTRACTOR SELECTION PROCESS								
UTILITY INSTALL/RELOCATION								
DWP								
AIRTT								
VERIZON								
SITE PERMIT								
ROUGH GRADING PERMIT								
CORE AND SHELL PERMIT								
BUILDING PERMIT								

MASTER SCHEDULE
Through September 2, 2011

Data Date: 02-Sep-11

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- Earthwork and foundations
- Structure
- MEP systems
- Façade and roof
- Core construction
- Interior fitout

Potential schedule acceleration

In order to catch up the schedules, Turner Construction reviewed the material deliveries and fabrication schedules and finally had come up with the solution to re-sequence the floor fit out and had multiple floors in progress at the same time. Turner also find out that the key to success catch up the schedule will be the building closed in. And seen from the original schedule, the duration for interior fit-outs are 248 days started from May 16th 2011 to May 18 2012 which is quite long period of time. According to study and research done so far, the pre-designed smart room can help to finalize the room layouts with detailed medical equipments and architectural elements in advance and therefore reduce the schedule pressure and minimize the uncertainty of budget towards the end of construction project. It can also be input as part of the the sequence of SIPS schedule for the 3rd to 11th floor so that the the activity durations such as for the floor fit out and furnishings can be shortened.

Other potential part to accelerate the schedule can be the consideration in advance of the installation of light gage metal framing on the east elevation during August 2011 which was stopped due to the redesign that will coordinate better with the women's hospital construction. Detail was mentioned in the analysis of Integrated Project Delivery(IPD).

Besides the 5th mechanical floor, the floor layout was quite similar. Also the proper delivery schedule of mechanics such as air handling units, transformers is a potential accelerator for the schedule.

According to all the potential factors considered above, a non-traditional SIPS schedule is developed for a much more detailed trades and activities with the designated area of SPT. And for structure part, the duration for concrete pour each floor is roughly 10 days based on the data provided by Turner Construction.

The schedule is expected to accelerate for one month comparing to the original schedule. The cost savings for general condition can be roughly $\$601,850 / 24\text{month} = \$25,077$ in terms of

temporary utilities, personnel and so on. Other savings can be labor savings, crane and other machine rental savings, savings for material storage and so on.

10/26/2010

Floor	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
3RD										
4TH										
5TH										
6TH										
7TH										
8TH										
9TH										
10TH										
11TH										

- F/R/P COLUMNS AND WALLS
- FRAME DECK
- MECHANICAL ROUGH-IN
- SET REBAR
- ELECTRICAL ROUGH-IN
- POUR DECK
- STRIP FORMWORK
- REMOVE RESHORES
- CORE CONSTRUCTION
- PRECAST
- TESTING
- INSULATION
- INTERIOR FITOUT



Problem Identification for Net Zero Energy analysis

As already stated in the final report, energy consumption is one of the most concerned issues for Inova Fairfax South Patient Tower due to the high energy demand for hospitals. SPT has the goal to reduce energy for 25% by selecting highly efficient mechanical equipments, adding green features and so forth. The study of value engineering data relating to the energy efficiency shows that SPT has potential room for improvement in terms of design changes and technical progress. Therefore further research and study are pursued to find more ways to increase the energy efficiency which can also be understand as sustainability of SPT towards the Net Zero Energy goal.

So far, for the SPT, changes were made to save energy such as:

- Adjust light fixture allowance to revise patient room light fixtures from 9/room to 7/room
- Combine reheat loop with preheat loop for heating hot water
- Change elevator speed from 700 fpm to 350 fpm
- Delete redundant reheat water risers
- Delete radiant heat at patient rooms

Other MEP systems also be readjust to fit better for the SPT. For example, to reduce number of heating convertors and hot water circulating pumps from four to three and increase the size of the new pumps by 50%.

Absolute Net Zero Energy for SPT with the size 236,000 ft² is impossible so far with the current construction technology. So the applicable goal is to maximize the energy savings for new constructed building.