C.4 Façade Integration

Figure 1: CIP Formwork for Balconies

The Wellington Condominiums Façade has been analyzed and is detailed in the following sections outlined below:

- C.4.4.3.A Research Data and Recommendations
- C.4.4.3.B Structural Implications
- C.4.4.3.C Methods of Construction
- C.4.4.3.D Precast Estimate and Schedule
- C.4.4.3.E Other Impacts
- C.4.4.3.F Comparison of Two Façade Systems

C.4.1 Problem Statement

With many early problems and delays on the project, is there a way to constructing the building façade, in the winter months of 2007, in a more productive manner? Can this be done without ruining the architectural style and vision of the owner and architect design?

This was one of the first things that was looked at and asked to the project manager when analyzing the project schedule. The schedule at first was not this way but with early delays it has pushed back façade construction to the winter months.

C.4.2 Proposed Solution

At first glance the answer to this is 'Yes we can change the building façade!' But caution must be in place when wanting to change the architectural style of the building façade. The proposed solution would be to introduce a façade integration of exterior components. This will be done through the use of pre cast throughout the entire façade rather than on the first floor. The first floor mainly consists of cast stone exterior veneer that has to be situated with a crane. Following the construction of the cast stone exterior veneer, the rest of the floors utilize traditional brick masonry construction. One of the major reasons why exterior masonry construction cannot start is the formwork in place for the cantilevered cast-in-place condominium balconies. These balconies require a great deal of time to pour and form. After the fourth floor balconies are poured, they must wait to be at strength before the scaffolding is removed.

This creates huge logistical issues and delays in constructing the façade. If the system components can be preassembled whether they are the balconies or façade, cost and time could be saved to the project.

C.4.3 Analysis Steps

1. Learn in more detail about the current Wellington Condominiums Project façade and the possibility of the integration of façade components through the use of pre cast or preassemblies in fabrication shops.
2. If pre cast is the main alternative, a rendering should be created to show the owner that there are little if any differences to the architectural style and vision to the project.

3. Do a cost, schedule, and methods of construction comparison analysis of the building façade options.

C.4.4 Analysis Result Overview

The overview for the façade analysis is very clear before doing the investigation. Typically pre cast will save you cost and time in labor and equipment. During the winter months this becomes greater due to the loss of expected productivity during this time period. With the addition of not being able to start constructing due to the scaffolding in place for the cast-in-place balconies; there is a great demand for alternative means and methods of construction. The architectural style of the project has been rendered in the following research sections to see if the exterior has changed in dramatic or subtle ways. This is a major research step because if the exterior façade changes architecturally, most likely the owner or architect is not going to approve of the changes. But if a rendering can show that minimal changes would occur and substantial cost and schedule savings would result then this could be a good alternative to the Wellington Condominiums Project.

C.4.4.1.A Overview of the Current Wellington Condominiums Façade

In order for the Wellington Condominiums Project façade to achieve such high standards, the architects and planners first decided on what exterior material to use that was equally appealing and durable at the same time. After much contemplation, the architects and planners determined that the Wellington Condominium's building façade was to consist of predominately a traditional brick and cast stone exterior veneer**.** The cast stone veneer is primarily situated on the first floor building façade, is utilized around windows and doors as pre cast headers, and serves as a pre cast band and trim linking the transitions of façade materials. The brick façade continues up to the roof line where it is met by a 1 x 12 Azek Trim Board with Fypon BKT8X8x4 décor. Also scattered across the building façade is pre cast medallions and ornamentation to give the condominiums a refined and polished look.

The type of connection for the masonry is typical among the construction industry. The system that holds the façade and interior walls together is 22 gauge galvanized metal ties. The specifications call for the following list of items to be completed for the correct installation of anchoring masonry veneers:

5) Insert slip-in anchors in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.
6) Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
7) Locate anchor sections to allow maximum vertical differential movement of ties up and down.

8) Space anchors by no more than 16” o.c. vertically and 24” o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12” of openings and at intervals, not exceeding 36”, around perimeter.

The composition of the 1 hour fire rated exterior wall section of the first through the fourth floor starting from the exterior to the interior are as follows: brick/stone veneer, metal ties, 1 ½” minimum air space, 15” building felt, 5/8” dens glass gold sheathing, 6” metal studs, R-19 batt insulation, vapor barrier, and 5/8” type ‘X’ G.W.B.

C.4.4.1.B Original Estimate and Schedule

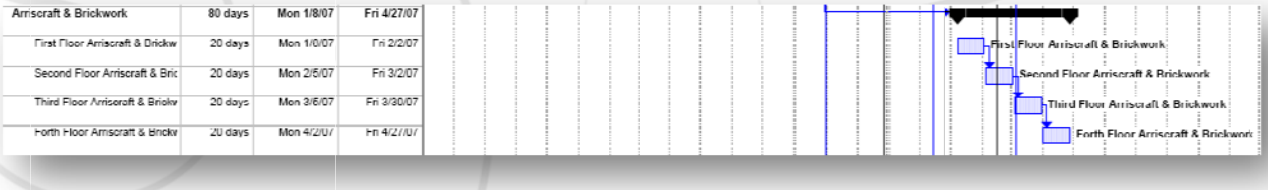
The Wellington Condominium’s original façade estimate and schedule are detailed as followed:

Original Estimate:

Wellington Condominiums Façade										Systems Costs
Qty	Assembly Number	Description	Unit	Mat.	Inst.	Total	Zip Code Prefix	Type	Release	
B20 Exterior Closure										
670.910	B20101023000	Flt precast conc,4" thick,5x18',smooth gray,low rise	S.F.	4,193.19	2,475.66	6,668.85	181	Open	2006	
8,998.600	B20101023150	Flt precast conc,4" thick,12x20',smooth gray,low rise	S.F.	79,187.68	9,898.46	89,086.14	181	Open	2006	
14,588.330	B20101305200	Brk vnr/met std bkup,std face,20gax3-5/8"nlb std,16" OC sp,rnng bn	S.F.	86,071.15	199,860.12	285,931.27	181	Open	2006	
			Totals	$169,452.01	$212,234.24	$381,686.25				
				x	x	x				
		Allentown PA location factor multiplier		0.90	1.074	1.027				
				$166,062.97	$227,939.57	$391,991.79				

~See Attached Appendix for Detailed Assemblies Takeoff~

Original Schedule:



Total: **80 Work Days = 16 Weeks**
Mon 1/8/07 – Mon 4/27/07

~See Attached Appendix for Full Schedule~

C.4.4.1.C Why GO Pre-Cast?

The Wellington Condominium's original façade schedule indeed shows that construction will start in the winter months of 2007. This creates additional concerns of work area enclosure for the subcontractors during the winter months and who is responsible for the additional costs associated with that? In the original project estimate there was no line item for heating and enclosure for the construction of the building façade. During that time it was assumed that the façade would be enclosed before the winter and that no great influx of additional heating or enclosure was necessary. Therefore this would be the subcontractor's responsibility and digression as how to handle construction of the building façade. In either case a decrease in productivity and an increase in schedule and budget will occur for the project.

The construction of the cast-in-place cantilever balconies is another area of concern for the project team. These balconies are poured at every floor and are supported by a scaffolding system. The scaffolding system cannot be removed until the 4th floor balcony has reached full strength. After the 4th floor balcony has reached full strength, the scaffolding can then be removed to begin masonry façade construction. Therefore even if the project team wanted to get an early start and avoid winter conditions and pick up time on the schedule; they would not be able to do so until the 4th floor balcony has reached full strength.

The project team is now faced with a dilemma…The façade construction cannot start early and in fact will be delayed, façade construction will start in the winter time which will lead to decreased productivity and increased project schedule and budget, a masonry subcontractor that is very difficult to work with, and no general condition line items for temporary shelter and heating. What is the project team to do? Answer: **THIN BRICK PRECAST PANELS.**

C.4.4.1.D Overview of Façade Integration

The advantages of utilizing thin brick precast panels for the Wellington Condominiums Project are as followed:

- Brick precast panels will be constructed in a manufacturing shop and not on the project site. Therefore the production of brick precast panels can occur when the project team is constructing the structural components to the Wellington Condominiums. This will reduce any further delay in the construction of the building façade.
- With brick precast panels being constructed in a controlled environment, better quality control and craftsmanship can occur.
- No shelter or additional heating cost is necessary to include in the subcontractor or general conditions.

- Increased productivity in the installation of brick precast panels will result due to less subcontractor masonry need on the project site.
- A crane is already being used for the first floor construction of cast stone exterior veneer and can then be used for the installation of brick precast panels.
- Savings in schedule will significantly increase and enclose the building quickly during the winter months. This will help promote an increase in productivity to other subcontractor trades at the project site.
- Safety will increase on the project site with less influx of needed crews to construct the building façade.
- Local precast companies nearby project site for easy shipping and handling of panels.
- Panels can be engineered like standard precast panels and therefore makes the structural integrity of a brick wall no longer a concern.
- Visual quality of the façade is considered good and can be more appealing to architects and owners if designed and constructed correctly.

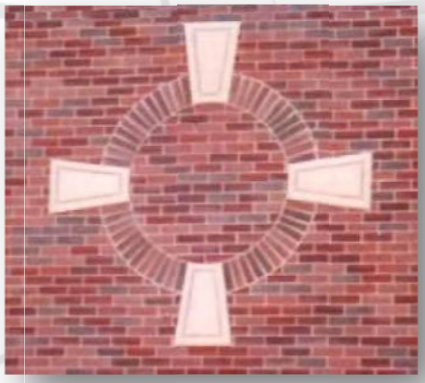


Figure 2: Thin Brick Precast Panel (API Manufacturer: www.apiprecast.com)

With all these advantages to using thin brick precast panels, it is something that the project team should look at if given enough lead time. Due to the poor subsurface conditions encountered early on in the project, it is still realistic for the project team to utilize a thin brick precast panel instead of traditional brick construction.

The company that can provide thin brick precast panels within the local area is a manufacturer called Architectural Precast Inc. (API).

Figure 3: API Website: www.apiprecast.com

API is located in Middleburg, PA about 2 hours away from the Wellington Condominiums project site. As discussed by a representative of API; the process is as followed for the production of thin brick precast panels:

1. API will produce precast elevation drawings or 'E drawings' from the Architect contract drawings.
2. After approval from the Architect, API will then begin production of precast panels.
3. The 'E drawings' are used to create individual precast piece details so that a carpenter can construct the negative mold.
4. A crew will assemble the mold, caulk all the joints, and apply a release agent to the mold in order to release concrete adhesion.
5. Steel reinforcing is constructed in the steel shop and then placed into the molds along with any connections or details that the panels may require. This follows accordance with PCI standards.
6. Molds are cleaned and checked for quality before being released to pour.
7. Form liners are manufactured to the architects design in order to control the placement of brick and to also control the concrete from leaking in front of the brick. Also the back of bricks has a keyway to ensure proper bondage to the concrete.
8. After the precast has cured, the liner is removed and the brick face is revealed.

This process is fairly typical for most projects and if pursued early enough, is deemed very feasible for the Wellington Condominiums Project.

C.4.4.2.A Façade Rendering Analysis

Figure 4: Thin Brick Precast Panel (API Manufacturer: www.apiprecast.com)

With thin brick precast being the main alternative, a rendering is created of wall sections to show the owner that there are little if any differences to the architectural style and vision to the project. The analysis will focus on the brick façade on Level 2, 3, and 4 as indicated in Figure 5.

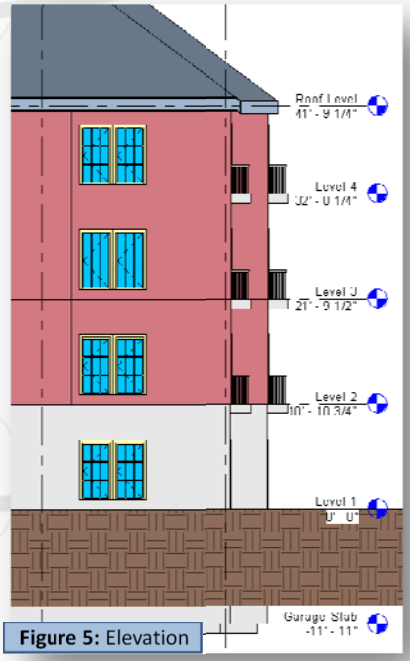


Figure 5: Elevation

The following renders will show the differences between what is currently being utilized versus what could be utilized with precast. With these renders an Architect can make a better judgment on utilizing precast without changing the style and environment for the Wellington Condominiums.

The program that was used to create these renders for this analysis was Autodesk Revit® and is shown in the following subcategories:

- Current Façade Renderings
- Traditional v. Precast Brick Façade Comparison
- Rendering Analysis Conclusions

C.4.4.2.B Current Façade Renderings of Wellington Condominiums

Figure 6: West Building Render of Traditional Brick Veneer Façade

Figure 7: West Building Render of Traditional Brick Veneer Façade

Figure 8: North-West Building Render of Traditional Brick Veneer Façade

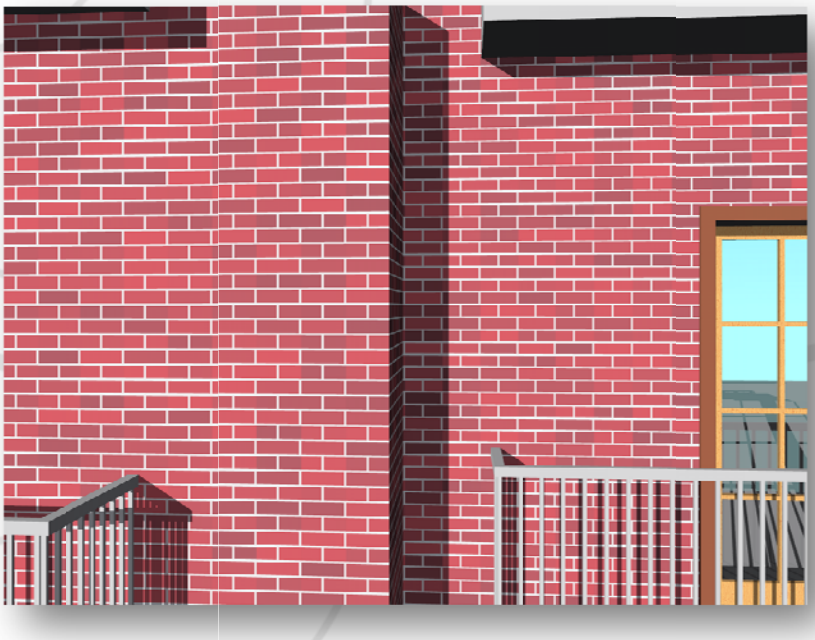


Figure 9: Detail of Traditional Brick Veneer Façade Render Utilizing Autodesk Revit®

C.4.4.2.C Traditional v. Precast Brick Façade Comparison Renderings

Figure 10A: Traditional Brick Veneer Façade Render Utilizing Autodesk Revit®

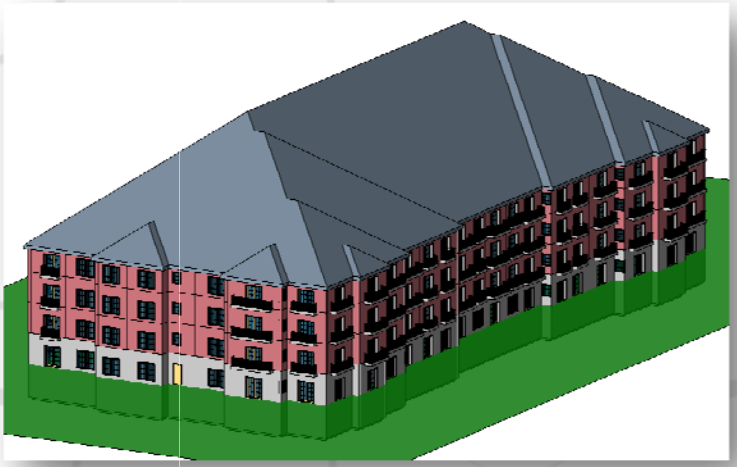


Figure 10B: Thin Brick Precast Panel Façade Render Utilizing Autodesk Revit®

Figure 11A: West Building Outline of Traditional Brick Veneer Façade

Figure 11B: West Building Outline of Thin Brick Precast Panel Façade

Figure 12A: West Building Close-up Render of Traditional Brick Veneer Façade

Figure 12B: West Building Close-up Render of Thin Brick Precast Panel Façade

Figure 13A: North-West Building Outline of Traditional Brick Veneer Façade

Figure 13B: North-West Building Outline of Thin Brick Precast Panel Façade

Figure 14A: North-West Building Close-up Render of Traditional Brick Veneer Façade

Figure 14B: North-West Building Close-up Render of Thin Brick Precast Panel Façade

C.4.4.2.D Rendering Analysis Conclusions

With thin brick precast being the main alternative, the renderings is of the wall sections shows the owner that there are little differences to the architectural style and vision to the project. The worst case scenario was modeled for the Wellington Condominiums project being one story height panels of up to an average of 15’- 20’length. It is in this analysis recommendation that the building façade if designed accordingly will look very similar and will not oppose any differences to the architectural style and vision to the project.

C.4.4.3.A Research Data and Recommendations

In order to decide on whether or not the Wellington Condominiums project team should implement a thin brick precast façade system the following main areas will be explored: structural implications, methods of construction, estimate, and schedule. Other considerations such as fire wall ratings and mechanical loads will be explored but will not be the major focus of the analysis.

C.4.4.3.B Structural Implications

The current structural system utilizes a Hambros Joist Composite Deck System which rest on load bearing metal stud walls with structural steel column tubing throughout. These loads are then transferred floor by floor to the foundation system located on the garage level. The current traditional brick veneer façade is a 3 story continuous load bearing wall that has very few places for tie-ins along the main structural system. A detail of the current façade is detailed in Figure 15.

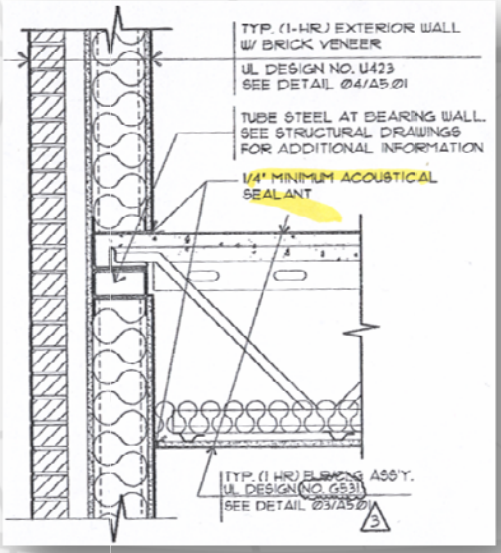


Figure 15: Typical 1- HR Exterior Wall with Brick Veneer

When consulted with one of the local head directors at API Manufacturing, the discussion of the current structural system became of concern when wanting to use a precast façade. Precast panels typically fall into the range of 150 lbs./ft^3. With a 7” thick panel spanning 10’ in unsupported height, a value of 875 lbs./ft becomes a concern. The current load bearing metal stud walls will not have enough structural integrity to withstand the loading of the precast panels. Therefore other means and methods must be done to implement a precast façade.

The current structural system grid with structural steel column tubing without load bearing metal stud walls are depicted in Figure 16 and 17.

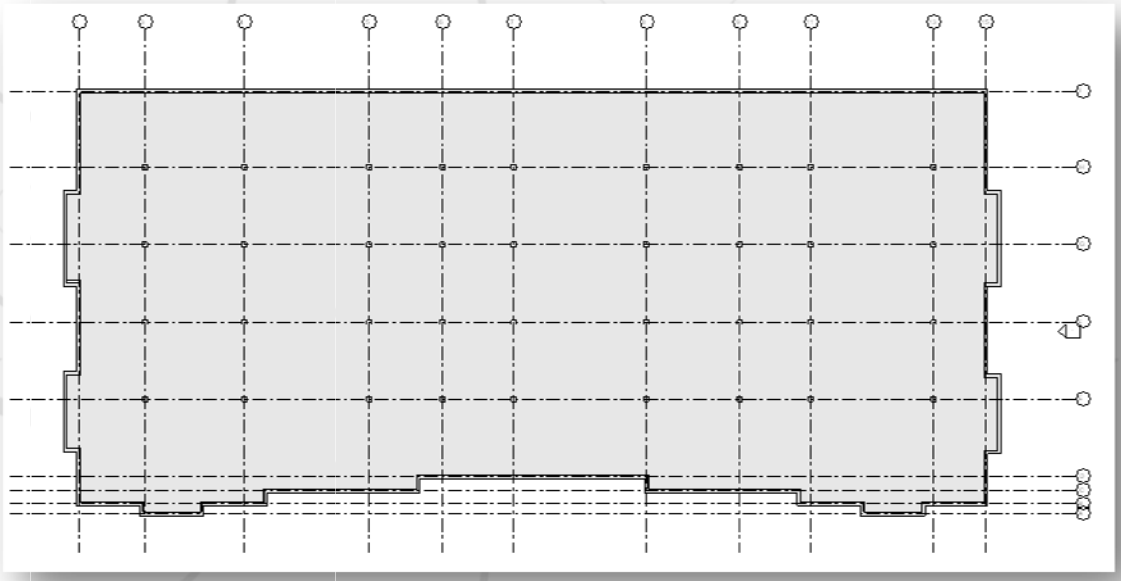


Figure 16: Current Structural System Grid with Structural Steel Column Tubing

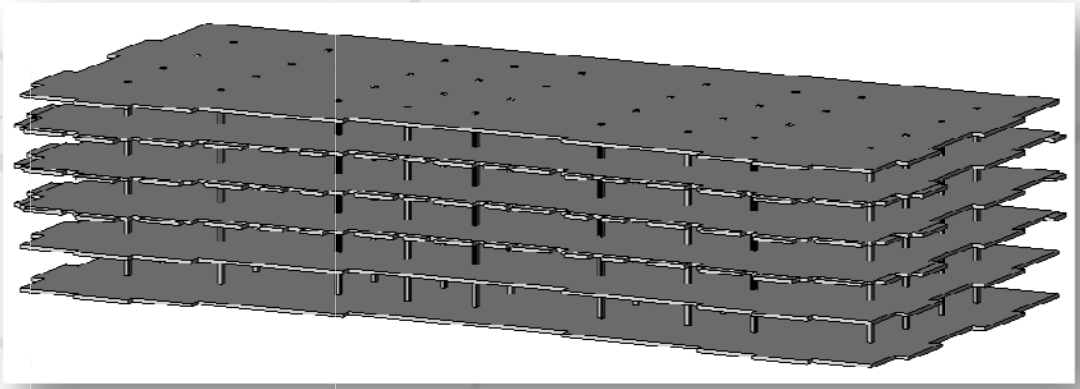


Figure 17: Current Structural System with Structural Steel Column Tubing

As shown in Figure 16 and 17, the connections for the precast would be very difficult due to the thin concrete deck and load bearing metal stud walls. Therefore two options have been discussed and are proposed:

1. **Scrap and Go Methodology:** Change the Hambros Joist Composite Deck System to another structural system that is in more in line with precast assemblies.
2. **Modify Methodology:** Utilize the Hambros Joist Composite Deck system but introduce more structural steel column tubing and steel reinforcement around the exterior building footprint to support the precast panels.

The first idea would be a viable solution to the Wellington Condominiums project team if implanted early enough in the design. From the Hambros Joist Composite Deck System Analysis was identified two other systems that may be in more favor of an alternative structural system that can support precast panels.

The second idea of utilizing more structural steel tubing and steel reinforcement would be a viable solution for the Wellington Condominium project team during the early phases of construction. Due to early problems with subsurface conditions and schedule of great concern due to construction of the façade in the winter months; this idea could be implemented. Therefore this analysis will explore idea #2 with the utilization of the current structural system with modifications made.

It was determined that in order to provide proper connection support to the precast façade, 45 structural steel column tubing and steel reinforcement be placed around the exterior building footprint. These columns would span an unsupported and total height (4 stories) of on average 10’ and 40’ respectively. This reinforcing would have to be designed to carry the loading conditions and be properly distributed to the foundation system by a licensed structural engineer. Figures 18 thru 22 shows a possible view of what this structural modification would look like imposed onto the Wellington Condominiums.

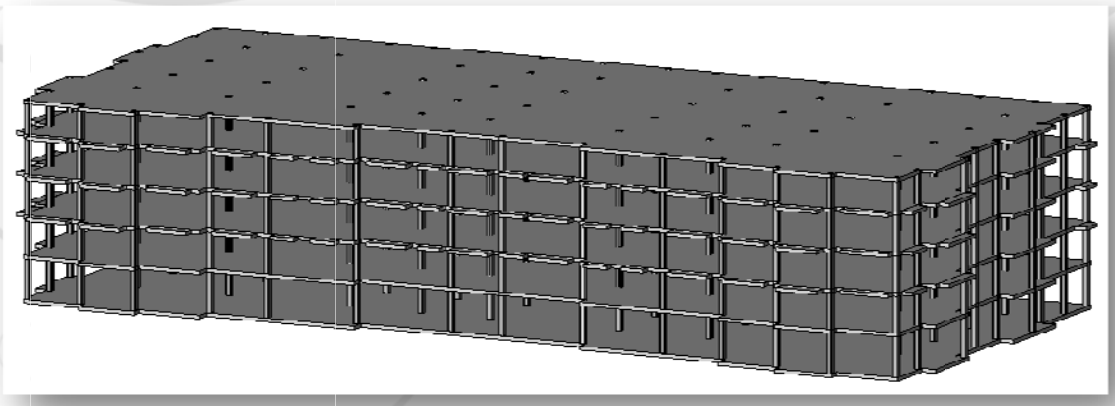


Figure 18: Modified Structural System with Structural Steel Column Tubing

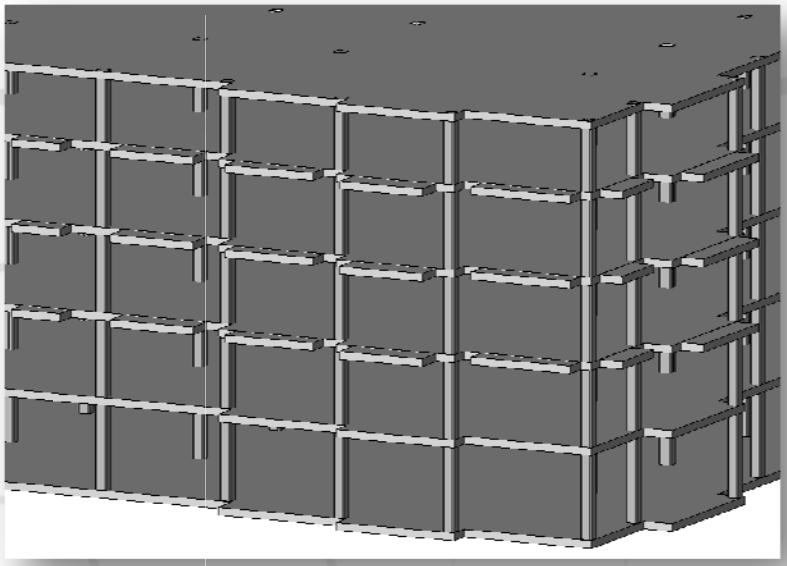


Figure 19: Modified Structural System Close-up

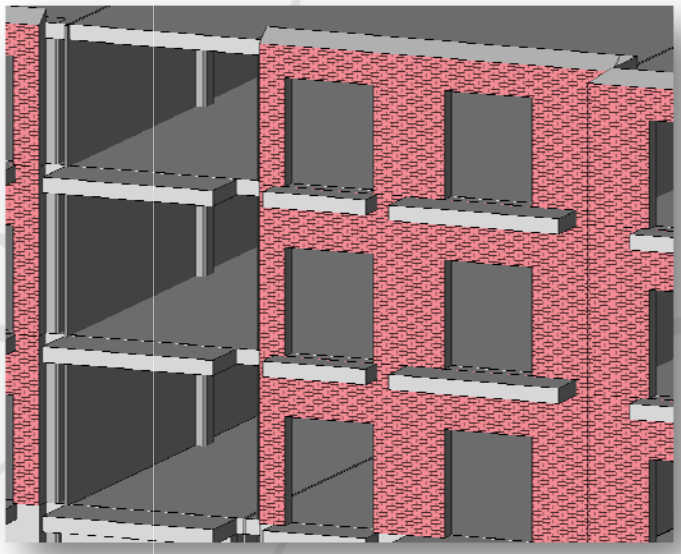


Figure 20: Modified Structural System Interaction Close-Up

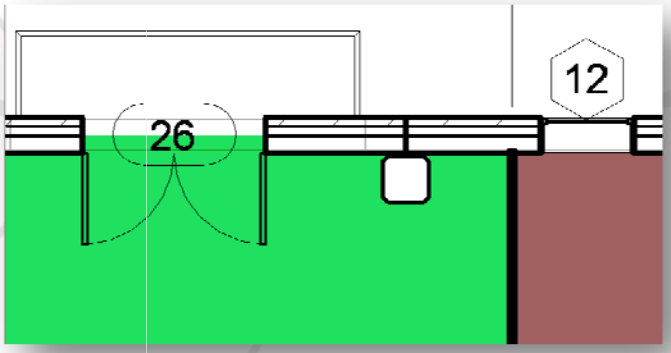


Figure 21: Modified Structural System Interaction Floor Plan

Figure 22: Modified Structural System Living Space Implications

The structural connection between the precast panel and modified structural system with structural steel column tubing is shown in Figure 23.

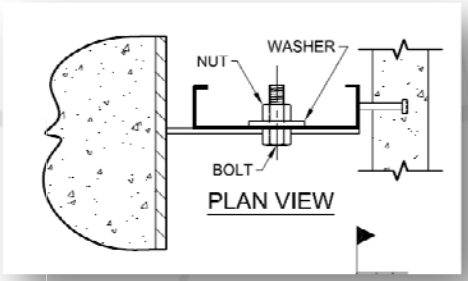


Figure 23: Modified Precast Structural Connection Detail (www.slenderwall.com)

With the installation of structural steel column tubing and steel reinforcement, the connection can then be made properly between both systems. With proper design and installation techniques this can be seen as structurally feasible to the Wellington Condominiums project team. To check with this design methodology, Mark Taylor from Nitterhouse was consulted as to if this would be structurally feasible. From conversations with Mark Taylor, this would be deemed a viable option to the project team at Wellington Condominiums.

C.4.4.3.C Methods of Construction

Once the structural system has been analyzed and deemed feasible to the Wellington Condominiums project team; a methods of construction of the precast assembly can then be investigated.

With the utilization of API, the entire erection will be done under API subcontracting crew and will not need Wellington Condominiums project subcontracting crews. Therefore this saves the logistics of crane and trucking of material onto the responsibility of API. When consulting with API, the specifications of typical thin brick precast panels are as followed:

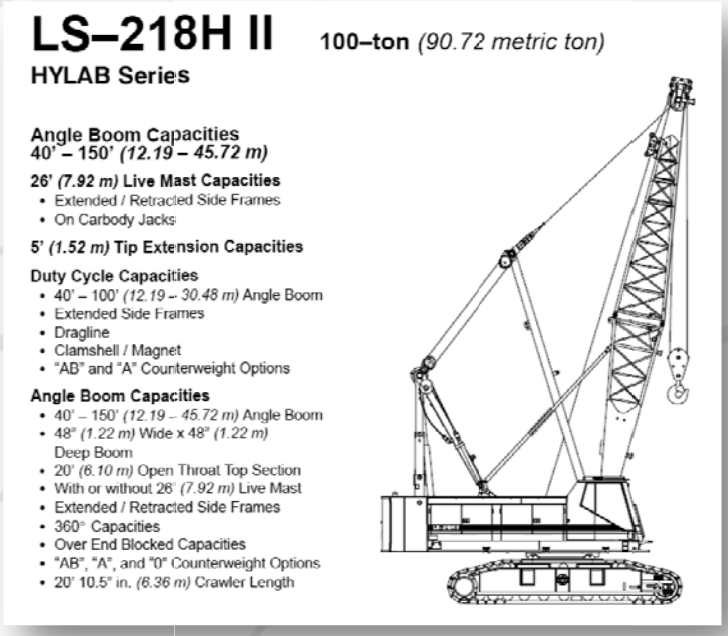
- Dimensions
  - Length: 15’ typical (up to 60’ +)
  - Height: 7’ typical (up to 14’)
  - Thickness: 7” typical
  - Wellington Condominiums (20’ x 10’ x 7”)
- Weight (20’x 10’ x 7”)
  - 150 lbs./ft^3
  - 875 lbs./ft
  - 17,500 lbs./panel ~ 8.75 tons/panel
- Productivity
  - 40 man hours/panel
  - 8-15 pieces/day

- Cost
  - $30 - $35 / panel
  - Includes:
    - Consultation and Shop Drawings
    - Fabricated Products and Connections
    - Shipping and Handling
    - Installation Crew and Equipment (crane)
  - Not included:
    - Calking
- Time Frame (typical):

Shop Drawings:	6 Weeks
Owner Changes and Approval:	4 Weeks
Fabrication Before Construction Starts:	2 Weeks
Erection:	5 Weeks
Total:	**17 Weeks**

With this information, the crane size and selection can then be done. The highest and most weight a construction crane would be required to pick is: 60’ @ 10 tons/panel.

Crane Data Sheet: Amquip Lattice Boom Crawler Crane



LS–218H II **100–ton** *(90.72 metric ton)*
HYLAB Series

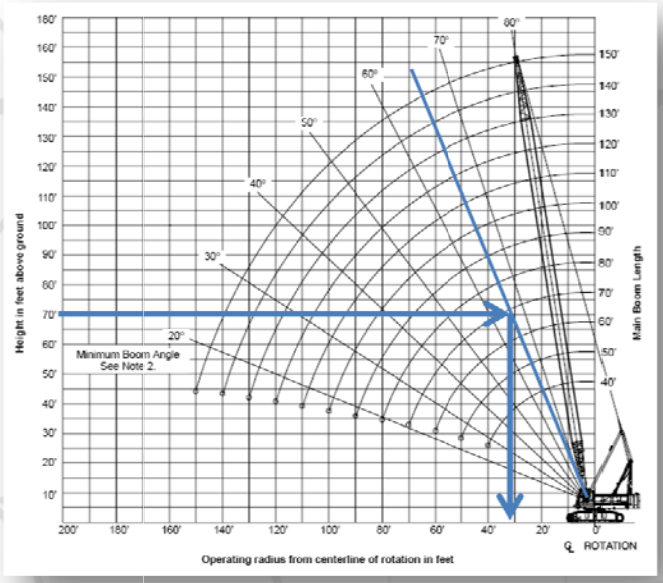
Angle Boom Capacities
40’ – 150’ *(12.19 – 45.72 m)*

26’ *(7.92 m)* Live Mast Capacities
- Extended / Retracted Side Frames
- On Carbody Jacks

5’ *(1.52 m)* Tip Extension Capacities

Duty Cycle Capacities
- 40’ – 100’ *(12.19 – 30.48 m)* Angle Boom
- Extended Side Frames
- Dragline
- Clamshell / Magnet
- “AB” and “A” Counterweight Options

Angle Boom Capacities
- 40’ – 150’ *(12.19 – 45.72 m)* Angle Boom
- 48” *(1.22 m)* Wide x 48” *(1.22 m)* Deep Boom
- 20’ *(6.10 m)* Open Throat Top Section
- With or without 26’ *(7.92 m)* Live Mast
- Extended / Retracted Side Frames
- 360° Capacities
- Over End Blocked Capacities
- “AB”, “A”, and “0” Counterweight Options
- 20’ 10.5” in. *(6.36 m)* Crawler Length



Load Radius (Ft.)	Boom Angle (deg)	Over End Blocked	360° Rotation				
			Side Frames Extended			Side Frames Retracted	
		AB CTWT (lb)	AB CTWT (lb)	A CTWT (lb)	0 CTWT (lb)	A CTWT (lb)	0 CTWT (lb)
16	81.8	154,900	154,900	134,300	88,700	76,000	45,700
17	81.1	146,200	146,200	119,800	78,900	69,400	41,600
18	80.4	138,400	138,400	108,100	71,000	63,800	38,100
19	79.6	131,300	131,300	98,300	64,400	59,000	35,100
20	78.9	124,800	123,900	90,100	58,900	54,800	32,400
25	75.2	99,900	87,200	63,000	40,700	40,000	23,200
30	71.5	80,500	66,800	47,900	30,500	31,000	17,500
35	67.7	64,100	53,700	38,300	24,000	25,000	13,800
40	63.7	52,900	44,700	31,600	19,500	20,700	11,100
50	55.4	38,700	32,900	22,900	13,700	15,000	7,400
60	46.2	30,100	25,600	17,500	10,000	11,200	5,100
70	35.2	24,200	20,600	13,800	7,500	8,600	3,400
80	19.5	19,900	16,900	11,000	5,600	6,700	2,100

~See Attached Appendix for Full Crane Specifications~

From the graphs we can see that at a load radius of 35’ and a boom angle of 67.7 degrees will result in a maximum pick of 64,100 lbs. Our requirement is no more than 20,000 lbs. at a load radius of 35’ and a boom angle of 67.7 degrees. Therefore this crane will work and can easily and safely assemble the precast panels.

Figure 24: Construction Crane (75’ @ 65 degrees)

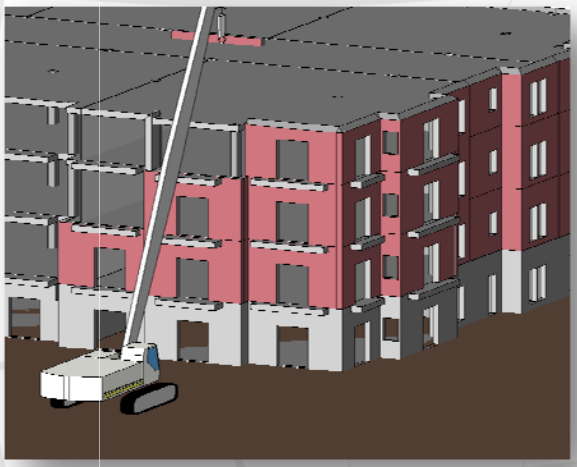


Figure 25: Construction Crane (75’ @ 65 degrees)

To construct the façade it was recommended by API to construct one façade area at a time rather than enclosing floor by floor. The assembly and installation of the precast panels would start on the south-west building end and continue to move the crane in a clockwise manner around the building footprint.

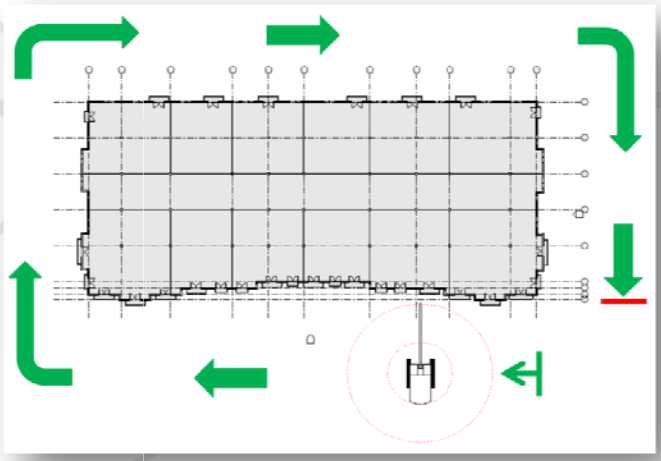


Figure 26: Construction Crane Site Movement

An example of one section of the precast panel installation is as followed:

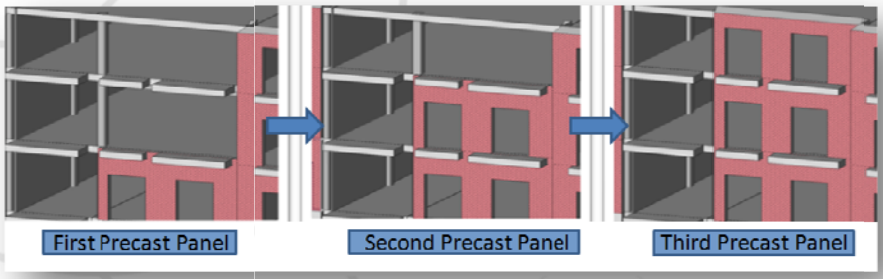


Figure 27: Precast Panel Installation

C.4.4.3.D Precast Estimate and Schedule

The Wellington Condominium's precast façade estimate and schedule are detailed as followed:

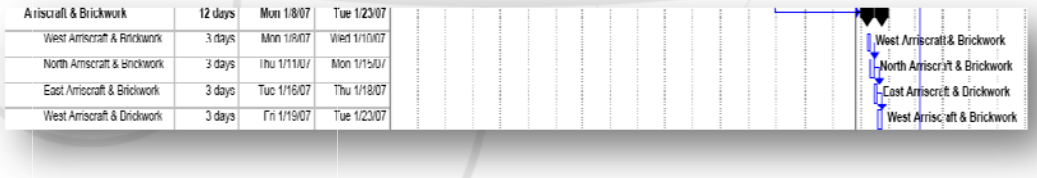
Original Estimate: **Total: $391,992**

Original Schedule: **80 Work Days = 16 Weeks**
Mon 1/8/07 – Mon 4/27/07

Precast Estimate: $30/SF x 22,800 SF = $684,000
$35.40/VLF x 40' x 45 Steel Column Tubing = $63,720
(2006 RS Means 1.027 Location Factor Applied)
Total: $767,909 ($375,917)

~ 1.96 Times the Original Cost

Precast Schedule: 1 day/15 precast panels x 45 Precast Panels x 4 floors = 12 days



Arriscraft & Brickwork	12 days	Mon 1/8/07	Tue 1/23/07
West Arriscraft & Brickwork	3 days	Mon 1/8/07	Wed 1/10/07
North Arriscraft & Brickwork	3 days	Thu 1/11/07	Mon 1/15/07
East Arriscraft & Brickwork	3 days	Tue 1/16/07	Thu 1/18/07
West Arriscraft & Brickwork	3 days	Fri 1/19/07	Tue 1/23/07

~See Attached Appendix for Full Schedule~

12 Work Days = 2.4 Weeks
Mon 1/8/07 – Tue 1/23/07

Note: First floor Stone Veneer Precast will be supplied by another manufacturer and therefore not in the estimate of the Precast Façade. The Precast schedule on the other hand includes the first floor. Most likely the subcontracting crew that is installing 2nd, 3rd, and 4th floor precast brick panels can install 1st floor precast stone veneer panels.

Results: By utilizing a precast façade in its entirety the following results occur:

- Estimate/Budget Increase: **$375,917**
- Schedule Decrease: **68 Work Days**
- Total Schedule Compression: **24 Work Days (4.8 Weeks Saved)**
- Revenue/Cash Flow Brought in for Weeks Saved:
  - $280/Week/Condominium x 4.8 Weeks x 48 Condominiums = **$64,512**
  - General Conditions: **$47,640**

GENERAL CONDITIONS		DIVISION TOTAL ---------->			$47,640
SR. PROJECT MANAGER	4.8	WKS	$3,500.00	$16,800	
SUPERINTENDENT	4.8	WKS	$3,000.00	$14,400	
LABORER	4.8	WKS	$800.00	$3,840	
ASSISTANT SUPERINTENDENT	4.8	WKS	$2,500.00	$12,000	
CONSTRUCTION TRAILERS	1.2	MTH	$300.00	$360	
MATERIALS & SUPPLIES	1.2	MTH	$200.00	$240	

- Other impact factors: Sell off condominiums faster by putting façade on building and owners can move in at an earlier date. Service is improved to clients and will affect other locally owned business. Increase owner's usage of facilities supporting the condominiums. (I.e. Banks, stores, restaurants, YMCA, and others.)
- Surrounding area is owned and operated by owner/developer and must look at the entire picture rather than just the condominium's impact. Even if a project were to lose money, a developer in the long run may benefit due to the services and quality of life within the community.
  - Food Example
    - 48 Condominiums
    - 3 people/Condominium
    - $50/Person/Day
    - 4.8 weeks additional time of buying food from owner's stores and restaurants
    - Generate: **$241,920**
  - Living Cost Example
    - Pharmacy, furniture, local clothing stores, miscellaneous
    - Assume $100/Week/Person
    - Generate: **$69,120**
- Revised Estimate/Budget SAVINGS: **$47,275**

C.4.4.3.E Other Impacts

Other impacts that may affect the selection of whether or not to use traditional versus precast brick façade are as followed:

- Mechanical Loading
- Fire Rating

For this analysis, the mechanical impacts are considered the same due to API's insulated precast system. This increases the precast R-value for the system to a level that is acceptable in the construction industry.

Fire rating for the exterior wall system is 1 hour and therefore is achievable by both systems. No further analysis is required.

C.4.4.3.F Comparison of Two Façade Systems

The comparison of the two façade systems have been created through a matrix chart based on the owner requirements of which system overall is better for the project.

Compare and Contrast Facade Systems	Orginal Facade System					Precast Facade System				
Categories of Interest	Ratings	Total Weight	Weight	Grade	Comment	Ratings	Total Weight	Weight	Grade	Comment
Material and Equipment	7	7.83	4.31	55.00%	Poor	7	7.83	5.87	75.00%	Good
Change Orders	9	5.83	3.79	65.00%	Okay	9	5.83	4.37	75.00%	Good
Cost	1	13.03	11.76	85.00%	Great	1	13.03	7.61	55.00%	Poor
Architectural Style	2	12.83	10.91	85.00%	Great	2	12.83	9.62	75.00%	Good
Schedule	3	11.83	7.69	65.00%	Okay	3	11.83	11.24	95.00%	Excellent
Mechanical	11	3.83	2.87	75.00%	Good	11	3.83	2.87	75.00%	Good
Fire Rating	12	2.03	2.12	75.00%	Good	12	2.03	2.12	75.00%	Good
Structural System Impact	4	10.03	8.12	75.00%	Good	4	10.03	5.96	55.00%	Poor
Labor Intensive	5	9.83	5.41	55.00%	Poor	5	9.83	8.36	85.00%	Great
Installation	8	6.83	4.44	65.00%	Okay	8	6.83	5.81	85.00%	Great
Versatility	10	4.83	3.62	75.00%	Good	10	4.83	3.14	65.00%	Okay
Quality Control	6	8.83	4.86	55.00%	Poor	6	8.83	8.39	95.00%	Excellent
TOTAL		100.00	69.9		Okay		100.00	75.4		Good
Average			70.00%					72.50%		

The comparison of the two façade systems have shown that a grade rating of 69.9 and 75.4 for the original and precast façade respectively. This indicates that the project team should select the precast façade system over the original façade system. The advantages of choosing the precast system are as followed:

- Large Schedule reduction
- No shelter and heating required
- Less Crews needed
- Higher safety and increased productivity
- Higher quality control
- Condominium Owners can move in earlier
- Increase profits of other facilities to counteract the additional cost of precast

With all these advantages it is worth if caught early enough by the project team to value engineer the façade and structural supporting system. This also adds to the mat slab redesign because it would add value to the project due to the excellent distribution of loading to subsurface conditions and would not require additional structural footings. Therefore with all these advantages it is of the project team's best interest to utilize thin brick precast panels.