

Ian Bower

Technical Report 2

The Concordia Hotel

10/12/2012



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Executive Summary

The following technical assignment is a comprehensive report analyzing key facets of the Concordia Hotel project that affect the project's execution. The renovation project will take place from November 2011-January 2013. The project is located in the heart of D.C., the restraints of a restrictive site and tight schedule combined with the many complications of renovating a nearly 50 year old building has created a unique and extremely challenging project for The Turner Construction Company.

The project schedule was one of the key aspects for this project, mainly because the owner will lose revenue for each day that the hotel is not able to be opened. The extremely constricted project schedule was made even more demanding when structural reinforcement had to be made in order to make the building more structurally competent. This report includes a Detailed Project Schedule broken down into just under 200 activities. The construction schedule details project phasing, structural, MEP sequencing and the interior fit-out. It also includes key milestones and turnover dates important to both the owner and the project team. It is crucial to follow the schedule and meet the deadlines due to potential lost revenues to the hotel due to extended vacancies and loss of reservations. The exact amount of loss per day has been requested, however, it has not been provided by the Turner Construction Company.

A Detailed Structural Estimate along with a General Conditions Estimate is also included in this report. The Detailed Structural Estimate is broken up into four parts starting with Cast-in-Place Beams, Cast-in-Place Columns, Micro Piles and lastly the Concrete Slabs. After completing a detailed structural estimate it was discovered that the cost of the structural work will be \$5,132,564.81. The General Conditions Estimate amounted to \$1,330,610.00 and accounted for 6% of the total project cost.

Next, a Building Information Modeling (BIM) Use Evaluation was performed to evaluate the appropriateness and value of implementing BIM into the varying project stages. It was established that though BIM would not be effective in every project stage, it should be implemented in the coordination and construction phases of the project by employing it for various uses. Located in this document are suggestions for other areas in which BIM could have been utilized to make the project run more smoothly.

Lastly, an assessment of the key constructability issues was completed in order to evaluate the challenges associated with these systems. Through this evaluation it was discovered that the key constructability concerns were associated with the Micro pile installation, The Carbon Fiber Reinforcement Panels (CFRP) and lastly the MEP systems.

A. CPM and Detailed Project Schedule (See Next Page)

ID	Task Name	Duration	Start	Finish	July 1		May 1		March 1		Janu
					5/15	10/9	3/4	7/29	12/23	5/19	10/13
1	Key Project Milestones	5 days?	Tue 11/1/11	Mon 11/7/11							
4	Preconstruction	156 days	Tue 11/8/11	Tue 6/12/12							
11	Engineering	244 days	Tue 11/22/11	Fri 10/26/12							
12	Impacts	143 days	Mon 3/26/12	Wed 10/10/12							
19	Construction	331 days	Mon 12/12/11	Mon 3/18/13							
20	Site Mobilization	27 days	Mon 12/12/11	Tue 1/17/12							
23	Selective Demo & Prep	59 days?	Wed 12/21/11	Mon 3/12/12							
50	Foundations & Structure Work	109 days	Mon 3/12/12	Thu 8/9/12							
77	Risers	127 days	Tue 5/15/12	Wed 11/7/12							
86	MEP Equipment	115 days	Tue 6/19/12	Mon 11/26/12							
109	Elevators	147 days	Wed 8/1/12	Thu 2/21/13							
127	Exterior Envelope	122 days	Mon 7/2/12	Tue 12/18/12							
146	Interior Fit-Out	227 days	Mon 3/5/12	Tue 1/15/13							
160	Start-up & Commissioning	121 days	Mon 10/1/12	Mon 3/18/13							
161	Complete Sitework	21 days	Wed 11/28/12	Wed 12/26/12							
162	Punchlist & Project Turnover	15 days	Wed 1/16/13	Tue 2/5/13							

Project: Project1 Date: Fri 10/12/12	Task		External Milestone		Manual Summary Rollup	
	Split		Inactive Task		Manual Summary	
	Milestone		Inactive Milestone		Start-only	
	Summary		Inactive Summary		Finish-only	
	Project Summary		Manual Task		Deadline	
	External Tasks		Duration-only		Progress	

ID	Task Name	Duration	Start	Finish	July 1		May 1		March 1		January 1		No
					5/15	10/9	3/4	7/29	12/23	5/19	10/13	3/9	
1	Key Project Milestones	5 days?	Tue 11/1/11	Mon 11/7/11									
2	Contract Award	1 day?	Tue 11/1/11	Tue 11/1/11									
3	Project Start	1 day?	Mon 11/7/11	Mon 11/7/11									
4	Preconstruction	156 days	Tue 11/8/11	Tue 6/12/12									
5	Procurement	15 days	Tue 11/8/11	Mon 11/28/11									
6	Release of Key Trades	25 days	Fri 11/11/11	Thu 12/15/11									
7	Initial Submittals	82 days	Tue 11/22/11	Wed 3/14/12									
8	Sub Submittals to Turner	60 days	Tue 11/22/11	Mon 2/13/12									
9	Engineering, Reviews & Approvals by A/E	68 days	Mon 12/12/11	Wed 3/14/12									
10	Fabrication	105 days	Wed 1/18/12	Tue 6/12/12									
11	Engineering	244 days	Tue 11/22/11	Fri 10/26/12									
12	Impacts	143 days	Mon 3/26/12	Wed 10/10/12									
13	Emergency Generator	143 days	Mon 3/26/12	Wed 10/10/12									
14	Additional Roof Demolition	9 days	Mon 3/26/12	Thu 4/5/12									
15	Temp/Permanent Power-Switchgear Room	142 days	Tue 3/27/12	Wed 10/10/12									
16	Submit New Generator	1 day	Mon 3/26/12	Mon 3/26/12									
17	Review and Approve New Generator	3 days	Wed 4/25/12	Fri 4/27/12									
18	Fabricate/Deliver new Generator	70 days	Tue 5/8/12	Mon 8/13/12									
19	Construction	331 days	Mon 12/12/11	Mon 3/18/13									
20	Site Mobilization	27 days	Mon 12/12/11	Tue 1/17/12									
21	Site Mobilization	10 days	Mon 12/12/11	Fri 12/23/11									
22	Laser Scan Cores	10 days	Wed 1/4/12	Tue 1/17/12									
23	Selective Demo & Prep	59 days?	Wed 12/21/11	Mon 3/12/12									
24	Interior Demo-Core & Stairwells	59 days	Wed 12/21/11	Mon 3/12/12									
25	Complete Shoring-Support of Demo	15 days?	Wed 12/21/11	Tue 1/10/12									

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					5/15	10/9	3/4	7/29	12/23	5/19	10/13	3/9	
26	Selective Demo & Excavation For Micro-Piles Cellar Level	13 days	Wed 1/11/12	Fri 1/27/12									■ Selective Demo & Excavation For Micro-Piles Cellar L
27	Selective Demo Ground Level	5 days	Wed 1/11/12	Tue 1/17/12									■ Selective Demo Ground Level
28	Selective Demolition Roof Level	7 days	Thu 1/12/12	Fri 1/20/12									■ Selective Demolition Roof Level
29	Selective Demo Cellar Level-Foundation Work	13 days	Thu 1/12/12	Mon 1/30/12									■ Selective Demo Cellar Level-Foundation Work
30	Selective Demo Level 10-Ground level	33 days	Thu 1/12/12	Mon 2/27/12									■ Selective Demo Level 10-Ground level
31	Selective Demolition Typical Levels 9 Through 2	11 days	Mon 2/27/12	Mon 3/12/12									■ Selective Demolition Typical Levels 9 Through 2
32	Interior Demo-Layout & Control Lines	14 days	Mon 1/30/12	Thu 2/16/12									■ Interior Demo-Layout & Control Lines
33	Layout Benchmark @ Cores, Stairwell & Facades Cellar Level	2 days	Mon 1/30/12	Tue 1/31/12									■ Layout Benchmark @ Cores, Stairwell & Facades Cell
34	Layout Benchmark @ Cores, Stairwell & Facades Ground Level	2 days	Mon 1/30/12	Tue 1/31/12									■ Layout Benchmark @ Cores, Stairwell & Facades Gro
35	Layout Benchmark @ Cores, Stairwell & Facades Levels 2,4,6 & 8	5 days	Mon 2/6/12	Fri 2/10/12									■ Layout Benchmark @ Cores, Stairwell & Facades Lev
36	Layout Benchmark @ Cores, Stairwell & Facades Levels 3,5 & 7	5 days	Wed 2/8/12	Tue 2/14/12									■ Layout Benchmark @ Cores, Stairwell & Facades Lev
37	Layout Benchmark @ Cores, Stairwell & Facades Levels 9 & 10	5 days	Fri 2/10/12	Thu 2/16/12									■ Layout Benchmark @ Cores, Stairwell & Facades Lev
38	Layout Roof Level	2 days	Mon 2/13/12	Tue 2/14/12									■ Layout Roof Level
39	Exterior Demo at Balconies/Slab Infills/Façade	55 days	Sun 12/25/11	Thu 3/8/12									■ Exterior Demo at Balconies/Slab Infills/Façade
40	Selective Demolition Roof Level	4 days	Sun 12/25/11	Wed 12/28/11									■ Selective Demolition Roof Level
41	Selective Demolition Cellar Level	4 days	Wed 12/28/11	Mon 1/2/12									■ Selective Demolition Cellar Level
42	Selective Demolition Ground Level	4 days	Sun 1/1/12	Wed 1/4/12									■ Selective Demolition Ground Level

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					5/15	10/9	3/4	7/29	12/23	5/19	10/13	3/9		8/3
43	Selective Demolition Typical Levels 2,4,6, & 8	12 days	Thu 1/5/12	Fri 1/20/12										
44	Slab Infills Typical Levels 2,4,6, & 8	19 days	Sun 1/22/12	Wed 2/15/12										
45	Selective Demolition Typical Levels 3,5,7, & 9	18 days	Sun 1/29/12	Tue 2/21/12										
46	Selective Demolition Level 10	20 days	Sun 2/12/12	Thu 3/8/12										
47	Roofing	15 days	Fri 12/30/11	Thu 1/19/12										
48	Remove Existing Roof	12 days	Fri 12/30/11	Mon 1/16/12										
49	Install Temporary Waterproofing & Roofing	5 days	Sun 1/15/12	Thu 1/19/12										
50	Foundations & Structure Work	109 days	Mon 3/12/12	Thu 8/9/12										
51	Excavation	4 days	Mon 3/12/12	Thu 3/15/12										
52	Install Micro-Piles	20 days	Thu 3/15/12	Wed 4/11/12										
53	Install Underground Plumbing	5 days	Sat 3/17/12	Thu 3/22/12										
54	Footings/Elevator Pit	13 days	Sun 4/1/12	Tue 4/17/12										
55	Unforseen Existing Concrete Removal	5 days	Mon 4/16/12	Fri 4/20/12										
56	Form/Rebar/Place Cellar Level	6 days	Sun 4/22/12	Fri 4/27/12										
57	Form/Rebar/Place Ground Level	5 days	Sun 4/29/12	Thu 5/3/12										
58	Form/Rebar/Place Level 2	3 days	Thu 5/3/12	Mon 5/7/12										
59	Form/Rebar/Place Level 3	3 days	Sun 5/6/12	Tue 5/8/12										
60	Form/Rebar/Place Level 4	3 days	Tue 5/8/12	Thu 5/10/12										
61	Form/Rebar/Place Level 5	3 days	Thu 5/10/12	Mon 5/14/12										
62	Form/Rebar/Place Level 6	3 days	Mon 5/14/12	Wed 5/16/12										
63	Form/Rebar/Place Level 7	3 days	Wed 5/16/12	Fri 5/18/12										
64	Form/Rebar/Place Level 8	3 days	Fri 5/18/12	Tue 5/22/12										
65	Form/Rebar/Place Level 9	3 days	Tue 5/22/12	Thu 5/24/12										

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					5/15	10/9	3/4	7/29	12/23	5/19	10/13	3/9	
66	Form/Rebar/Place Level 10	3 days	Thu 5/24/12	Mon 5/28/12									
67	Slab On Grade	7 days	Fri 6/1/12	Mon 6/11/12									
68	Form/Rebar/Place Level Roof Level	5 days	Mon 6/11/12	Fri 6/15/12									
69	Install New Stair Tower #2	15 days	Fri 6/15/12	Thu 7/5/12									
70	Form/Rebar/Place Level Penthouse Level	6 days	Thu 7/5/12	Thu 7/12/12									
71	Strip Level 10-Ground Level	20 days	Sun 7/15/12	Thu 8/9/12									
72	Strip Roof	2 days	Tue 7/17/12	Wed 7/18/12									
73	Curing PH	3 days	Wed 7/18/12	Fri 7/20/12									
74	Strip PH	2 days	Sun 7/22/12	Mon 7/23/12									
75	Remove Temporary Stairs	3 days	Wed 7/25/12	Fri 7/27/12									
76	Install Pad For New Generator	3 days	Sun 7/29/12	Tue 7/31/12									
77	Risers	127 days	Tue 5/15/12	Wed 11/7/12									
78	Main Electrical Distribution & Risers	35 days	Tue 5/15/12	Mon 7/2/12									
79	Install New Waste/Vent Risers	15 days	Wed 6/27/12	Tue 7/17/12									
80	Install New Storm Risers	15 days	Thu 6/28/12	Wed 7/18/12									
81	Install New Duct Risers	15 days	Mon 7/16/12	Fri 8/3/12									
82	Install New Natural Gas Risers	15 days	Wed 8/1/12	Tue 8/21/12									
83	Install New Mechanical Piping Risers (Concurrent With Interior Piping)	55 days	Thu 8/23/12	Wed 11/7/12									
84	Install New Fire Protection Risers	15 days	Mon 10/1/12	Fri 10/19/12									
85	Flash & Tie-In Roof Drains	5 days	Mon 10/15/12	Fri 10/19/12									
86	MEP Equipment	115 days	Tue 6/19/12	Mon 11/26/12									
87	Roof/PH Level	115 days	Tue 6/19/12	Mon 11/26/12									
88	Install VRV's On Different Level	10 days	Tue 6/19/12	Mon 7/2/12									

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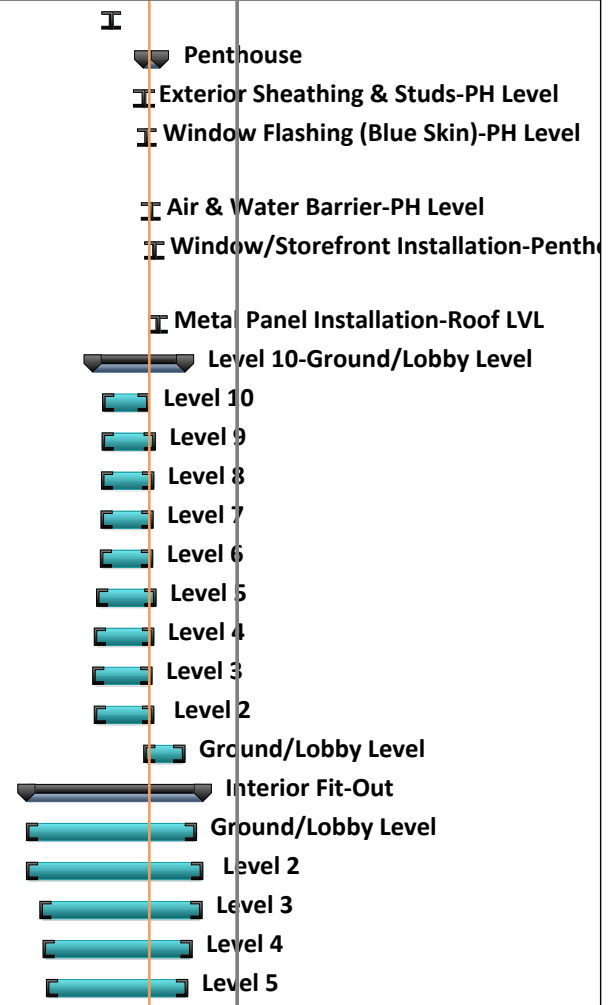
ID	Task Name	Duration	Start	Finish	July 1		May 1		March 1		January 1		No
					5/15	10/9	3/4	7/29	12/23	5/19	10/13	3/9	
89	Set, Connect & Vacuum Condensing Units (Levels 4 To 8)	6 days	Mon 10/22/12	Sun 10/28/12									Set, Connect & Vacuum Condensing U
90	Set, Connect & Vacuum Condensing Units (Levels Cellar To 3)	6 days	Mon 11/19/12	Mon 11/26/12									Set, Connect & Vacuum Condensing U
91	Install Gas Fired Water Heaters & Pumps (PH Level)	5 days	Mon 10/1/12	Fri 10/5/12									Install Gas Fired Water Heaters & Pump
92	Set AHU 2 (PH Level)	2 days	Mon 10/22/12	Tue 10/23/12									Set AHU 2 (PH Level)
93	Install Mechanical Ductwork On Roof (PH Level)	15 days	Mon 10/22/12	Fri 11/9/12									Install Mechanical Ductwork On Roof
94	Install Ductwork & Fans For Stair Pressurization Systems (PH Level)	5 days	Wed 10/24/12	Tue 10/30/12									Install Ductwork & Fans For Stair Press
95	Install Electrical Wiring For Stair Pressurization Systems (PH Level)	5 days	Wed 10/24/12	Tue 10/30/12									Install Electrical Wiring For Stair Pressu
96	Install Hoistway Ventilation Systems (PH Level)	5 days	Wed 10/31/12	Tue 11/6/12									Install Hoistway Ventilation Systems (
97	Set, Connect & Vacuum Condensing Units (Levels 9 & 10)	2 days	Mon 11/5/12	Tue 11/6/12									Set, Connect & Vacuum Condensing U
98	Energize AHU # 2	2 days	Mon 10/22/12	Tue 10/23/12									Energize AHU # 2
99	Cellar Level	62 days	Wed 8/1/12	Thu 10/25/12									Cellar Level
100	Install/Connect Transformers & Switchboards (Cellar Level)	34 days	Wed 8/1/12	Mon 9/17/12									Install/Connect Transformers & Switchb
101	Install/Connect Generator (Cellar Level)	5 days	Tue 10/9/12	Mon 10/15/12									Install/Connect Generator (Cellar Level)
102	Install/Connect Owner Supplied UPS (Cellar Level)	5 days	Tue 10/9/12	Mon 10/15/12									Install/Connect Owner Supplied UPS (C
103	Set AHU 1 & MAU 1 (Cellar Level)	2 days	Wed 10/10/12	Thu 10/11/12									Set AHU 1 & MAU 1 (Cellar Level)
104	Install Booster Pump (Cellar Level)	1 day	Wed 10/10/12	Wed 10/10/12									Install Booster Pump (Cellar Level)

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	Project Summary		Manual Task		Deadline	
	External Tasks		Duration-only		Progress	

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					5/15	10/9	3/4	7/29	12/23	5/19	10/13	3/9	
105	Energize AHU 1 (Cellar Level)	0 days	Fri 10/12/12	Fri 10/12/12									◆ Energize AHU 1 (Cellar Level)
106	Install Fire Pump (Cellar Level)	5 days	Fri 10/12/12	Thu 10/18/12									┃ Install Fire Pump (Cellar Level)
107	Start-up & Load Bank Test Generator (Cellar Level)	5 days	Tue 10/16/12	Mon 10/22/12									┃ Start-up & Load Bank Test Generator (Cellar Level)
108	Install/Connect Fire Command Center Control Panel Power (Cellar Level)	5 days	Fri 10/19/12	Thu 10/25/12									┃ Install/Connect Fire Command Center Control Panel Power (Cellar Level)
109	Elevators	147 days	Wed 8/1/12	Thu 2/21/13									▬ Elevators
110	Build Platforms And Car Slings	5 days	Wed 8/1/12	Tue 8/7/12									┃ Build Platforms And Car Slings
111	Elevator Inspections (Duplicate)	5 days	Wed 8/1/12	Tue 8/7/12									┃ Elevator Inspections (Duplicate)
112	Install Ancillary Elevator Equipment (PH Level)-Not Applicable	5 days	Wed 8/1/12	Tue 8/7/12									┃ Install Ancillary Elevator Equipment (PH Level)-Not Applicable
113	Install Pit Equipment	2 days	Mon 10/1/12	Tue 10/2/12									┃ Install Pit Equipment
114	Install Starter Rails	3 days	Wed 10/3/12	Fri 10/5/12									┃ Install Starter Rails
115	Install Rails	8 days	Mon 10/15/12	Wed 10/24/12									┃ Install Rails
116	Pipe/Wire Machine & Controller	7 days	Thu 10/25/12	Fri 11/2/12									┃ Pipe/Wire Machine & Controller
117	Start-Up Machine & Controller	3 days	Mon 11/5/12	Wed 11/7/12									┃ Start-Up Machine & Controller
118	Install Hoist Ropes/Remove Tirak	5 days	Thu 11/8/12	Wed 11/14/12									┃ Install Hoist Ropes/Remove Tirak
119	Install Entrance Frames-All Floors	6 days	Thu 11/15/12	Thu 11/22/12									┃ Install Entrance Frames-All Floors
120	Block In Entrance Frames	0 days	Mon 11/26/12	Mon 11/26/12									◆ Block In Entrance Frames
121	Install Hoistway Doors	4 days	Tue 11/27/12	Fri 11/30/12									┃ Install Hoistway Doors
122	Install Hoistway Wirings	5 days	Mon 12/3/12	Fri 12/7/12									┃ Install Hoistway Wirings
123	Install New Elevator Cabs	7 days	Mon 12/10/12	Tue 12/18/12									┃ Install New Elevator Cabs
124	Install Fixtures	2 days	Wed 12/19/12	Thu 12/20/12									┃ Install Fixtures
125	Adjust Elevators	10 days	Fri 12/21/12	Thu 1/3/13									┃ Adjust Elevators
126	Test Elevators	2 days	Tue 1/8/13	Wed 1/9/13									┃ Test Elevators
127	Exterior Envelope	122 days	Mon 7/2/12	Tue 12/18/12									▬ Exterior Envelope

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					5/15	10/9	3/4	7/29	12/23	5/19	10/13	3/9	
128	Complete Window Flashing Details	5 days	Wed 8/1/12	Tue 8/7/12									
129	Penthouse	22 days	Mon 10/1/12	Tue 10/30/12									
130	Exterior Sheathing & Studs-PH Level	3 days	Mon 10/1/12	Wed 10/3/12									
131	Window Flashing (Blue Skin)-PH Level	5 days	Thu 10/4/12	Wed 10/10/12									
132	Air & Water Barrier-PH Level	5 days	Thu 10/11/12	Wed 10/17/12									
133	Window/Storefront Installation-Penthouse	4 days	Thu 10/18/12	Tue 10/23/12									
134	Metal Panel Installation-Roof LVL	5 days	Wed 10/24/12	Tue 10/30/12									
135	Level 10-Ground/Lobby Level	120 days	Mon 7/2/12	Fri 12/14/12									
136	Level 10	60 days	Fri 7/20/12	Thu 10/11/12									
137	Level 9	68 days	Thu 7/19/12	Mon 10/22/12									
138	Level 8	68 days	Wed 7/18/12	Fri 10/19/12									
139	Level 7	68 days	Tue 7/17/12	Thu 10/18/12									
140	Level 6	68 days	Mon 7/16/12	Wed 10/17/12									
141	Level 5	77 days	Mon 7/9/12	Tue 10/23/12									
142	Level 4	77 days	Thu 7/5/12	Fri 10/19/12									
143	Level 3	77 days	Mon 7/2/12	Tue 10/16/12									
144	Level 2	77 days	Thu 7/5/12	Fri 10/19/12									
145	Ground/Lobby Level	54 days	Tue 10/2/12	Fri 12/14/12									
146	Interior Fit-Out	227 days	Mon 3/5/12	Tue 1/15/13									
147	Ground/Lobby Level	220 days	Mon 3/5/12	Fri 1/4/13									
148	Level 2	227 days	Mon 3/5/12	Tue 1/15/13									
149	Level 3	208 days	Thu 3/29/12	Mon 1/14/13									
150	Level 4	192 days	Wed 4/4/12	Thu 12/27/12									
151	Level 5	182 days	Tue 4/10/12	Wed 12/19/12									



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					5/15	10/9	3/4	7/29	12/23	5/19	10/13	3/9	
152	Level 6	177 days	Fri 4/13/12	Mon 12/17/12									Level 6
153	Level 7	167 days	Tue 4/17/12	Wed 12/5/12									Level 7
154	Level 8	167 days	Thu 4/19/12	Fri 12/7/12									Level 8
155	Level 9	187 days	Mon 4/23/12	Tue 1/8/13									Level 9
156	Level 10	177 days	Fri 4/27/12	Mon 12/31/12									Level 10
157	Cellar Level	131 days	Tue 7/10/12	Tue 1/8/13									Cellar Level
158	Penthouse Level	115 days	Wed 8/1/12	Tue 1/8/13									Penthouse Level
159	Swimming Pool	20 days	Thu 10/11/12	Wed 11/7/12									Swimming Pool
160	Start-up & Commissioning	121 days	Mon 10/1/12	Mon 3/18/13									Start-up & Commissioning
161	Complete Sitework	21 days	Wed 11/28/12	Wed 12/26/12									Complete Sitework
162	Punchlist & Project Turnover	15 days	Wed 1/16/13	Tue 2/5/13									Punchlist & Project Turnover
163	Final Punchlist & Turnover	15 days	Wed 1/16/13	Tue 2/5/13									Final Punchlist & Turnover

Project: Project1 Date: Fri 10/12/12	Task		External Milestone		Manual Summary Rollup	
	Split		Inactive Task		Manual Summary	
	Milestone		Inactive Milestone		Start-only	
	Summary		Inactive Summary		Finish-only	
	Project Summary		Manual Task		Deadline	
	External Tasks		Duration-only		Progress	

B. Detailed Structural Systems Estimate

The existing structure consists of concrete columns, and beams. This structure received many upgrades to the structure and foundation due to the additional dead load of the new elevator/stair core. And the dead load of the swimming pool on the upper floors. Some of the upgrades included a renovation of the foundation through the installation of 78 Micro piles and carbon fiber reinforcement to slabs and beams.

The detailed Structural estimate is broken up into four parts starting with a beam takeoff and cost estimate, a column estimate, a foundation estimate and finally a slab cost analysis for the demolished floors. Unfortunately this report was not able to include the Carbon Fiber Reinforcement Panels (CFRP) Due to R.S. Means not having this as one of their takeoff items. In order to assemble a more accurate structural estimate this should also be included. A summary of the costs are shown in Table 1.

Detailed Structural Estimate			
Item	Description	Extended Total	Extended Total O&P
1	Cast-in-Place Beam	\$ 147,792.20	\$ 197,877.33
2	Cast-in-Place Columns	\$ 2,314,994.51	\$ 3,010,473.14
3	Micro Piles	\$ 159,939.00	\$ 200,421.00
4	Concrete Slabs	\$ 1,349,318.19	\$ 1,723,793.34
5	Total	\$ 3,972,043.90	\$ 5,132,564.81

Table 1 Detailed Schedule Estimate Summary of Major Systems

1. Cast-In-Place Beams

New Beams were installed to strengthen and support slabs and replace beams that were removed from the structure. Some beams were removed to make room for the new stairs and elevator cores.

Cost data was taken from RS Means Cost works Data from the RS Means web source for this portion of the structural estimate. For the cast-in-place concrete beams the item that most closely matched the beams within the building was the item with a line item # 033053400300 and with a description of “Structural concrete, in place, beam (3500 psi), 5 kip per L.F., 10’ span, includes forms(4 uses), reinforcing steel, concrete, placing and finishing”. This item came with an extended total of \$953.41/C.Y. as well as an extended total with o&p of \$1,276.51/C.Y.

The analysis began with the first floor and moved up and through the building to the high roof. The High roof beams were accurately assessed under similar beam types with similar measurements. This was completed so as to save space and eliminate confusion in the detailed takeoff below.

Details concerning the descriptions, measurements, quantities as well as the costs of these beams are listed below in Table 1.

Beam Schedule							
Item	Description	Length (ft.)	Width (ft.)	Depth (ft.)	C.Y.	Extended Total	Extended Total O&P
1	1B01	73.32	1.5	1.5	6.1	\$ 5,825.34	\$ 7,799.48
2	1B02	71.47	1.5	1.5	6.0	\$ 5,678.35	\$ 7,602.68
3	1B03	26.21	0.9	2.1	1.9	\$ 1,802.82	\$ 2,413.78
4	1B04	10.13	0.7	2.1	0.5	\$ 506.75	\$ 678.48
5	1B05	23.06	0.7	2.1	1.2	\$ 1,153.57	\$ 1,544.50
6	TB01	54.18	1.0	1.5	3.0	\$ 2,869.76	\$ 3,842.30
7	TB01C	33.05	1.0	1.5	1.8	\$ 1,750.57	\$ 2,343.81
8	TB02	170.32	1.0	1.5	9.5	\$ 9,021.38	\$ 12,078.62
9	TB03	150.71	1.0	1.5	8.4	\$ 7,982.69	\$ 10,687.93
10	TB04	60.53	1.0	1.5	3.4	\$ 3,206.11	\$ 4,292.62
11	TB04C	19.88	1.0	1.5	1.1	\$ 1,052.99	\$ 1,409.83
12	TB06	210.41	1.0	1.5	11.7	\$ 11,144.83	\$ 14,921.69
13	TB06C	18.35	1.0	1.5	1.0	\$ 971.95	\$ 1,301.33
14	TB08	123.24	1.0	1.5	6.8	\$ 6,527.68	\$ 8,739.84
15	TB09	119.13	1.0	1.5	6.6	\$ 6,309.99	\$ 8,448.37
16	TB11	133.75	1.0	1.5	7.4	\$ 7,084.37	\$ 9,485.18
17	TB12	114.18	1.0	1.5	6.3	\$ 6,047.80	\$ 8,097.33
18	TB13	126.77	1.0	1.5	7.0	\$ 6,714.65	\$ 8,990.18
19	TB14	246.38	1.0	1.5	13.7	\$ 13,050.06	\$ 17,472.59
20	TB15	227.27	1.0	1.5	12.6	\$ 12,037.86	\$ 16,117.36
21	TB16	126.16	1.0	1.5	7.0	\$ 6,682.34	\$ 8,946.92
22	TB17	155.29	1.0	1.5	8.6	\$ 8,225.28	\$ 11,012.74
23	TB17C	92.05	1.0	1.5	5.1	\$ 4,875.63	\$ 6,527.93
24	TB18	192.26	1.0	1.5	10.7	\$ 10,183.48	\$ 13,634.55
25	TB18C	28.03	1.0	1.5	1.6	\$ 1,484.67	\$ 1,987.81
26	TB19	78.04	1.0	1.5	4.3	\$ 4,133.56	\$ 5,534.38
27	TB19C	27.71	1.0	1.5	1.5	\$ 1,467.72	\$ 1,965.12
28				Total		\$ 147,792.20	\$ 197,877.33

Table 2 Cast-In-Place Beam Estimate

2. Cast-In-Place Column Estimate

Certain columns were removed and relocated to provide additional support for key areas near the elevator/stair core and to support the swimming pool on the top floor.

Cost data was taken from RS Means Cost works Data from the RS Means web source for this portion of the structural estimate. For the cast-in-place concrete columns the item that most closely matched the columns within the building was the item with a line item # 033053400920 and with a description of “Structural concrete, in place, beam (4000 psi), square, avg. reinforcing, 24”x24”, includes forms(4 uses), reinforcing steel, concrete, placing and finishing”. This item came with an extended total of \$1,032.01/C.Y. as well as an extended total with o&p of \$1,342.05/C.Y. The following estimate is not entirely accurate based on the fact that most of the columns are 12”x30” while the estimate is taking off for square columns that are 24”x24”. This discrepancy will cause an inaccuracy in the estimate; while it is a slight difference it will cause a substantial difference. This estimate can still be used as a reference for the cost of installing the cast-in-place columns.

The analysis began with the first floor and moved up and through the building. The estimate includes all the newly constructed cast-in-place columns all the way to the Roof since there are no newly constructed columns located on in the High Roof area.

Details concerning the descriptions, measurements, quantities as well as the costs of these beams are listed below in Table 3.

Column Schedule							
Item	Description	Length (ft.)	Width (ft.)	Depth (ft.)	C.Y.	Extended Total	Extended Total O&P
1	N1	97.53	1	1.5	146.295	\$ 150,977.90	\$ 196,335.20
2	N2	97.53	1	1.5	146.295	\$ 150,977.90	\$ 196,335.20
3	N3	97.53	1	2.5	243.825	\$ 251,629.84	\$ 327,225.34
4	N4	97.53	1	2.5	243.825	\$ 251,629.84	\$ 327,225.34
5	N5	97.53	1	2.5	243.825	\$ 251,629.84	\$ 327,225.34
6	N6	97.53	1	2.5	243.825	\$ 251,629.84	\$ 327,225.34
7	N7	97.53	1	2.5	243.825	\$ 251,629.84	\$ 327,225.34
8	N8	97.53	1	2.5	243.825	\$ 251,629.84	\$ 327,225.34
9	N9	97.53	1	2.5	243.825	\$ 251,629.84	\$ 327,225.34
10	N10	97.53	1	2.5	243.825	\$ 251,629.84	\$ 327,225.34
11	Total					\$ 2,314,994.51	\$ 3,010,473.14

Table 3 Cast-In-Place Column Estimate

3. Foundation Renovation (Micro Piles)

The Micro Piles were installed to provide a more competent structural system capable of providing the new stair/elevator cores. The Structural estimate will include 78 micro piles.

Cost data was taken from RS Means Cost works Data from the RS Means web source for this portion of the structural estimate. The Micro Piles that were installed in the foundation of the structure are 7” and will be drilled to 11’-0” into rock. Based on the geotechnical report water was discovered 8’-0” below the surface, this combined with a depth of 50 has resulted in choosing the item that most closely matched.

The item with a line item # 316326131300 and with a description of “Fixed end caisson piles, open style in wet ground, to 50’ deep, 18” diameter, 0.065 C.Y./L.F., machine drilled, pulled casing and pumping, includes excavation, concrete, 50 lb. reinforcing/C.Y. excludes mobilization, boulder removal, disposal”. This item came with an Extended Total of \$41.01/V.L.F. as well as an Extended Total with O&P of \$51.39/V.L.F.

The following estimate is not entirely accurate based on the fact that the holes are 7” in diameter and not 18” in diameter like the estimate from R.S. Means Cost works has. I am also assuming that the depth of each micro pile was to 50’ depth, this information has not yet been provided by Turner. Knowing the exact depth of each micro pile is a crucial piece of information that will help improve the accuracy of the estimate. This slight difference will not result in an accurate estimate; however it will help provide a reference to how much this work is likely to cost.

Details concerning the descriptions, measurements, quantities as well as the costs of these beams are listed below in table 4.

Micro Piles				
Item	Description	Depth (ft.)	Extended Total	Extended Total O&P
1	78 Micro Piles	50'	\$ 159,939.00	\$ 200,421.00
2		Total	\$ 159,939.00	\$ 200,421.00

Table 4 Micro Pile Estimate

4. Concrete Slabs

The main elevator/stair core was removed from the structure so new slabs need to be formed, reinforced and poured to complete the installation of the new stair and elevator cores.

Cost data was taken from RS Means Cost works Data from the RS Means web source for this portion of the structural estimate. A structural estimate of the cast-in-place concrete slabs was completed using many assumptions due to lack of information provided by the Turner Construction Company. Some of the information that was not provided was the amount and type of rebar in each slab, the type of concrete used for the pour of the slabs and many other items that will be addressed in this portion of the estimate.

An analysis of the Structural cast-in-place concrete slabs was completed to estimate the cost of the Structural cast-in-place concrete slab. The line item that most closely matched this item was 033053401900 which has a description of “Structural concrete, in place, elevated slab (4000 psi), flat slab with drop panels , 125 psf superimposed load, 20’ span, includes forms(4 uses), reinforcing steel, concrete, placing and finishing”. With the concrete slab having an average thickness of 8” the structural concrete slab was estimated by taking a square foot take off of the area where the new concrete was to be poured from the ground level all the way to the high roof.

Details concerning the descriptions, measurements, quantities as well as the costs of the installation of these slabs are listed below in table 5.

Slab Construction					
Item	Description	Area (ft^2)	C.Y.	Extended Total	Extended Total O&P
1	First Floor	330.23	220.26	\$ 120,096.42	\$ 153,426.68
2	Even Floors	1690	1127.23	\$ 614,610.89	\$ 785,183.33
3	Odd Floors	1352	901.78	\$ 491,688.71	\$ 628,146.66
4	Roof	338	225.44	\$ 122,922.18	\$ 157,036.67
5			Total	\$ 1,349,318.19	\$ 1,723,793.34

Table 5 Slab Construction

General Conditions (GC) Estimate

The General Conditions Estimate can be broken down into 8 main areas: Temporary Facilities, Staffing Plans, Hoist Facilities, Temporary Utilities, Cleaning, Protection & Safety, and lastly the Fringes/Taxes/Insurance/Bonds. The Staffing Plan portion of the GC estimate includes all of the management and support staff on the Concordia project.

The GC estimate accounts for just over 5% of the project cost, this is a typical GC estimate and very accurate for this specific project.

Overall, GC costs account for approximately \$27,721 a week. It is apparent that monitoring the project schedule is critical for maintaining the project budget and not incurring any additional GC costs. Any clarifications that are needed can be found in Tables 5-14.

General Conditions (GC) Estimate		
Items	Description	Total
1	Temporary Facilities	\$ 59,450.00
2	Staffing Plan	\$ 522,000.00
3	Hoist Facilities	\$ 100,300.00
4	Temporary Utilities	\$ 113,900.00
5	Cleaning	\$ 106,875.00
6	Protection & Safety	\$ 18,600.00
7	General Expenses	\$ 105,656.00
8	Fringes/Taxes/Insurance/Bonds	\$ 303,829.00
	Total GC Estimate	\$ 1,330,610.00

Table 6 General Conditions (GC) Estimate Summary

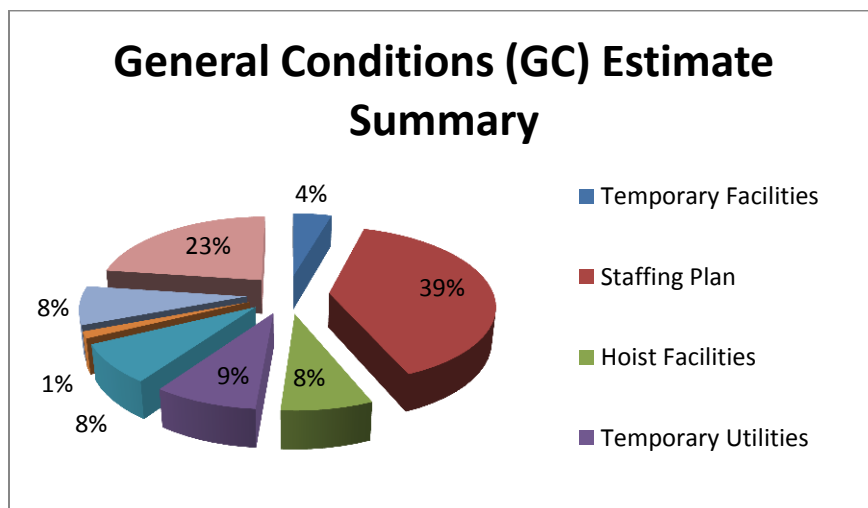


Table 7 General Conditions (GC) Estimate Summary Pie Graph

1. Temporary Facilities

General Condition (GC) Estimate-Temporary Facilities					
Items	Description	Cost	Unit	Qty.	Total
1	Misc. Tools and Supplies	\$ 200.00	Month	12	\$ 2,400.00
2	Trailers-2 sets	\$ 500.00	Month	12	\$ 6,000.00
3	Office set-up	\$ 700.00	Month	1	\$ 700.00
4	Deliver, Setup & Return Offices	\$ 2,000.00	ea.	1	\$ 2,000.00
5	Steps, Improvements	\$ 500.00	ea.	1	\$ 500.00
6	Utility Hook-ups	\$ 2,500.00	ea.	1	\$ 2,500.00
7	Move Office into Building (Walls/Phones/Etc.)	\$ 15,000.00	ea.	1	\$ 15,000.00
8	Vehicle Allowance (Inc. Maintenance and Mileage)	\$ 1,950.00	Month	13	\$ 25,350.00
9	Temporary Roof	\$ 5,000.00	ea.	1	\$ 5,000.00
	Temporary Facilities				\$ 59,450.00

Table 8 General Conditions (GC) Temporary Facilities

2. Staffing Plan

General Condition (GC) Estimate-Staffing Plan					
Items	Description	Cost	Unit	Qty.	Total
1	General Superintendent-Nicholas Vangeli	\$ 11,000.00	Month	12	\$ 132,000.00
2	Project Superintendent-Chuck McClellan	\$ 8,200.00	Month	12	\$ 98,400.00
4	Project Manager (Part time)-JT Armstrong	\$ 3,500.00	Month	12	\$ 42,000.00
3	Project Engineer-Bailey Wilson	\$ 8,400.00	Month	12	\$ 100,800.00
5	Project Executive (Part time)-Gary Ball	\$ 4,000.00	Month	12	\$ 48,000.00
6	MEP Engineer/Coordinator-Gregg West	\$ 8,400.00	Month	12	\$ 100,800.00
	Staffing Plan				\$ 522,000.00

Table 9 General Conditions (GC) Staffing Plan

3. Hoist Facilities

General Condition (GC) Estimate-Hoist Facilities					
Items	Description	Cost	Unit	Qty.	Total
1	Monthly rental, Inc. Maintenance	\$ 5,500.00	Month	8	\$ 44,000.00
2	Install and Remove	\$ 7,500.00	ea.	2	\$ 15,000.00
3	Gate Rental	\$ 250.00	ea.	10	\$ 2,500.00
4	Loading Platform	\$ 2,000.00	ea.	1	\$ 2,000.00
5	Operate Material Hoist	\$ 2,600.00	Month	8	\$ 20,800.00
6	Operate Material Hoist	\$ 1,500.00	ea.	2	\$ 3,000.00
7	Monthly Maintenance Charge	\$ 1,500.00	Month	2	\$ 3,000.00
8	Temporary Entrances Protection	\$ 200.00	ea.	10	\$ 2,000.00
9	Cab Protection	\$ 1,000.00	ea.	1	\$ 1,000.00
10	Operate Temp Elevators	\$ 3,000.00	Month	2	\$ 6,000.00
11	Overtime Operation	\$ 500.00	Month	2	\$ 1,000.00
	Hoist Facilities				\$ 100,300.00

Table 10 General Conditions (GC) Hoist Facilities

4. Temporary Utilities

General Condition (GC) Estimate-Temporary Utilities					
Items	Description	Cost	Unit	Qty.	Total
1	Operate Permanent System	\$ 15,000.00	ea.	1	\$ 15,000.00
2	Change A/C Filters on Permanent System	\$ 2,000.00	Month	4	\$ 8,000.00
3	Temporary Lighting	\$ 15,000.00	ea.	1	\$ 15,000.00
4	Electric Current Charge	\$ 1,500.00	Month	12	\$ 18,000.00
5	HVAC use	\$ 7,000.00	Month	4	\$ 28,000.00
6	Hoist Power	\$ 2,000.00	Month	8	\$ 16,000.00
7	Rental Toilets (1 toilet per 25 men	\$ 110.00	ea.	60	\$ 6,600.00
8	Job Office Toilet	\$ 200.00	Month	12	\$ 2,400.00
9	Setup Temporary Water and Sewer	\$ 2,500.00	ea.	1	\$ 2,500.00
10	Water Usage Charges	\$ 200.00	Month	12	\$ 2,400.00
	Temporary Utilities				\$ 113,900.00

Table 11 General Conditions (GC) Temporary Utilities

5. Cleaning

General Condition (GC) Estimate					
Items	Description	Cost	Unit	Qty.	Total
1	Cleaning Labor	\$ 2,400.00	ea.	3	\$ 7,200.00
2	Cleaning Materials	\$ 1,500.00	ea.	1	\$ 1,500.00
3	Glass Cleaning	\$ 7,500.00	ea.	1	\$ 7,500.00
4	Trash chute (Install/Remove, Rental-8 , Protection-10 floors)	\$ 20,500.00	ea.	1	\$ 20,500.00
5	Rubbish Removal	\$ 425.00	ea.	91	\$ 38,675.00
6	Final Cleaning	\$ 0.35	GSF	90000	\$ 31,500.00
	Cleaning				\$ 106,875.00

Table 12 General Condition (GC) Estimate Cleaning

6. Protection & Safety

General Condition (GC) Estimate-Protection & Safety					
Items	Description	Cost	Unit	Qty.	Total
1	Materials for Protection and Safety	\$ 0.05	GSF	90000	\$ 4,500.00
2	Drug Testing	\$ 500.00	ea.	1	\$ 500.00
3	Site Fence	\$ 560.00	ea.	5	\$ 2,800.00
4	Entrance Gate-Vehicle	\$ 750.00	ea.	1	\$ 750.00
5	Sidewalk Bridge	\$ 7,500.00	ea.	1	\$ 7,500.00
6	Fire Extinguisher	\$ 35.00	ea.	30	\$ 1,050.00
7	First Aid Supplies	\$ 125.00	Month	12	\$ 1,500.00
	Protection & Safety				\$ 18,600.00

Table 13 General Condition (GC) Estimate Protection & Safety

7. Fringes/Taxes/Insurance/Bonds

General Condition (GC) Estimate-Fringes/Taxes/Insurance/Bonds		
Items	Description	Total
1	Staff Employee Benefit Expense (EBE)	\$ 253,607.00
2	S.S./U.I./Taxes	\$ 44,297.00
3	WC Insurance	\$ 5,925.00
	Fringes/Taxes/Insurance/Bonds	\$ 303,829.00

Table 14 General Condition (GC) Estimate Fringes/Taxes/Insurance/Bonds

8. General Expenses

General Condition (GC) Estimate-General Expenses					
Items	Description	Cost	Unit	Qty.	Total
1	Copier (Purchase/Lease, Supplies & Maintenance)	\$ 550.00	Month	12	\$ 6,600.00
2	Office Supplies, Coffee/Water	\$ 500.00	Month	12	\$ 6,000.00
3	Monthly Phone Data Charges	\$ 400.00	Month	12	\$ 4,800.00
4	Fax Machine	\$ 500.00	ea.	1	\$ 500.00
5	Nextel-Phone & Service	\$ 100.00	Month	48	\$ 4,800.00
6	Main Office Phone Charges	\$ 0.50	\$ vol	22000	\$ 11,000.00
7	Bid sets	\$ 2,500.00	ea.	1	\$ 2,500.00
8	Shop Drawing Production	\$ 100.00	Month	13	\$ 1,300.00
9	Plotter Service	\$ 10.00	Sheet	200	\$ 2,000.00
10	Laptops	\$ 2,400.00	ea.	2	\$ 4,800.00
11	System Setup	\$ 1,500.00	ea.	1	\$ 1,500.00
12	Maintain	\$ 95.00	hr.	48	\$ 4,560.00
13	Accounting Ledger Cost, Pay line	\$ 11.50	Man Mo.	208	\$ 2,392.00
14	Network Connectivity	\$ 136.00	Man Mo.	24	\$ 3,264.00
15	RFC Support Service, EDP	\$ 1.12	Vol	22000	\$ 24,640.00
16	Expediting Travel	\$ 1,500.00	ea.	1	\$ 1,500.00
17	Job Progress Photos	\$ 200.00	Month	12	\$ 2,400.00
18	Digital Camera & Media	\$ 300.00	ea.	1	\$ 300.00
19	Job Signs	\$ 1,500.00	ea.	1	\$ 1,500.00
20	Directional Signs	\$ 500.00	ea.	1	\$ 500.00
21	Postage/Overnight Express Service	\$ 150.00	Month	12	\$ 1,800.00
22	Record Document Storage	\$ 2,000.00	ea.	1	\$ 2,000.00
23	Existing Condition Laser Study	\$ 10,000.00	ea.	1	\$ 10,000.00
24	Layout Control Lines	\$ 5,000.00	ea.	1	\$ 5,000.00
	General Expenses				\$ 105,656.00

Table 15 General Condition (GC) Estimate General Expenses

C. Building Information Modeling (BIM) use evaluation

Turner Construction Company created a BIM product in order to help coordinate the installation of the Carbon Fiber Reinforcement Panels (CFRP) and MEP systems. Turner completed a point scan model in order to assess the current condition of the slab work that was required for the structural renovation of the structure. Turner has developed this BIM product for their own personal use and it will be transferred over to the owner upon completion of the project for facility management purposes. The MEP systems demanded careful planning and clash detection due to the restrictive 8' clear space between slabs. The CFRP installation also required extensive coordination with the MEP systems due to the restrictions on cutting or core drilling through the panels. Based on the complexity of the systems, the restrictive space and the capabilities of BIM for end user facility management the use of BIM was very appropriate and was extremely beneficial to the GC, the owner and of course the success of the project. Another benefit that Turner could have taken advantage of would have been to use it for 4D modeling, and Site Utilization Planning. A 4D model would have benefitted the Superintendent in planning schedules and providing a better understanding of the demo/renovation progress of this project to subcontractors and their laborers. It would have also helped improve flow through the construction progress of this renovation by utilizing the site and planning work more efficiently.

BIM PROJECT EXECUTION PLAN
VERSION 2.0
FOR
[Concordia Hotel]
DEVELOPED BY
[Ian Bower]
[Turner Construction Company]

This template is a tool that is provided to assist in the development of a BIM project execution plan as required per contract. The template plan was created from the buildingSMART alliance™ (bSa) Project “BIM Project Execution Planning” as developed by The Computer Integrated Construction (CIC) Research Group of The Pennsylvania State University. The bSa project is sponsored by The Charles Pankow Foundation (<http://www.pankowfoundation.org>), Construction Industry Institute (CII) (<http://www.construction-institute.org>), Penn State Office of Physical Plant (OPP) (<http://www.opp.psu.edu>), and The Partnership for Achieving Construction Excellence (PACE) (<http://www.engr.psu.edu/pace>). The BIM Project Execution Planning Guide can be downloaded at <http://www.engr.psu.edu/BIM/PxP>.

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SECTION A: BIM PROJECT EXECUTION PLAN OVERVIEW

To successfully implement Building Information Modeling (BIM) on a project, the project team has developed this detailed BIM Project Execution Plan. The BIM Project Execution Plan defines uses for BIM on the project (e.g. design authoring, cost estimating, and design coordination), along with a detailed design of the process for executing BIM throughout the project lifecycle

SECTION B: PROJECT INFORMATION

1. **PROJECT OWNER: PRIVATE**
2. **PROJECT NAME: CONCORDIA HOTEL**
3. **PROJECT LOCATION AND ADDRESS: WASHINGTON D.C.**
4. **CONTRACT TYPE / DELIVERY METHOD: RENOVATION: BRIEF PROJECT DESCRIPTION: THE IMF CONCORDIA IS A 10-STORY PLUS CELLAR AND UNDERGROUND PARKING GARAGE EXTENDED STAY FACILITY WITH TWO MAIN STRUCTURES CONNECTED AT THE GROUND FLOOR. WHILE THE ENTIRE BUILDING IS COMPOSED OF 178 ROOMS THE BOND BUILDING HAS 78 WHILE THE CONCORDIA HOUSES THE OTHER 100. IT WAS DESIGNED IN BY BERLA & ABLE.**
5. **ADDITIONAL PROJECT INFORMATION: THE BIM EXECUTION PROCESS FOR THIS PROJECT DETAILS THE STRENGTHS AND WEAKNESSES OF BIM IMPLEMENTATION IN THE VARYING STAGES OF THE PROJECT.**
6. **PROJECT NUMBERS:**

PROJECT INFORMATION	NUMBER
	2010-035

7. **PROJECT SCHEDULE / PHASES / MILESTONES:**

PROJECT PHASE / MILESTONE	ESTIMATED START DATE	ESTIMATED COMPLETION DATE	PROJECT STAKEHOLDERS INVOLVED
PRELIMINARY PLANNING	8/21/11	9/20/11	Owner, GC, Architects
DESIGN DOCUMENTS	9/20/11	7/15/12	Owner, GC, Architects
CONSTRUCTION DOCUMENTS	11/8/11	12/1/11	Owner, GC, Architects, Subcontractors
CONSTRUCTION	12/12/11	2/18/13	Owner, GC, Architects, Subcontractors, Occupants
OPERATION	12/15/11	Ongoing	Owner, Occupants

SECTION C: KEY PROJECT CONTACTS

ROLE	CONTACT NAME	LOCATION	E-MAIL	PHONE
Project Manager(s)	JT Armstrong	Washington D.C.	jtarmstrong@tcco.com	301-509-2823
BIM Manager(s)	Yet to be provided	Washington D.C.	Yet to be provided	Yet to be provided
Operations Manager	Ben Short	Washington D.C.	Not Provided	Not Provided
Project Executive	Gary Ball	Washington D.C.	gball@tcco.com	703-200-1972
Project Engineer	Bailey Wilson	Washington D.C.	bawilson@tcco.com	571-527-1128
General Superintendent	Nicholas Vangeli	Washington D.C.	Not Provided	Not Provided
Assistant Superintendent	Chuck McClellan	Washington D.C.	cpmcclellan@tcco.com	202-330-9873
MEP Engineer/Coordinator	Gregg West	Washington D.C.	Not provided	Not Provided

SECTION D: PROJECT GOALS / BIM USES

1. MAJOR BIM GOALS / OBJECTIVES:

Priority (1-3)	Goal Description	Potential BIM Uses
1- Most Important	Value added objectives	
3	Increase effectiveness of Design	Design Authoring, Design Reviews, 3D Coordination
2	Accurate 3D Record Model for FM Team	Record Model, 3D Coordination
1	Eliminate field conflicts	3D Coordination

BIM Use*	Value to Project	Responsible Party	Value to Resp Party	Capability Rating			Additional Resources / Competencies Required to Implement	Notes	Proceed with Use
	High / Med / Low		High / Med / Low	Scale 1-3 (1 = Low)					YES / NO / MAYBE
				Resources	Competency	Experience			
Maintenance Scheduling	Low	Facility Manager (FM)	Medium	1	1	1	Design reviewing software to allow FM to view BIM product components, Building Automation Systems linked to the construction model/actual model, user ready interface and friendly user operational abilities	Be capable of understanding and manipulating Maintenance Management System and many of the MEP systems within the structure as well as the control systems	No
Record Modeling	Med	Facility Manager (FM)	High	1	2	1	Model Manipulation	Need to have the ability to navigate, review and manipulate the BIM product and 3D Model, use the product for updates to the facility, and to maintain a thorough understanding of site processes in order to assure correct input	Maybe
		Designers	Low	3	3	3			
		GC & Subs	Medium	2	3	2			
Cost Estimation	Low	GC	Medium	2	3	2	Model-based estimating software, design authoring software and cost data	Ability to define specific design modeling procedures which yield accurate quantity take-off information, identify quantities for the appropriate estimating level (ROM,SF, etc..) upfront	No
4D Modeling	High	GC	High	3	3	3	3D Modeling Manipulation, Design authoring software, 4D Modeling Software	knowledge of scheduling and phasing of construction, manipulate, navigate and review 3D Model and knowledge of 4D Scheduling Software	No
3D Coordination (Construction)	High	GC	High	3	3	3	3D model manipulation, review and assessment	Ability to deal with multiple trades, project challenges	Yes
		Subcontractors	High	2	2	2			
Existing Conditions Modeling	Medium	GC	High	2	3	2	3D model manipulation, review and assessment	Accurate assessment of existing conditions for demolition and construction	Yes

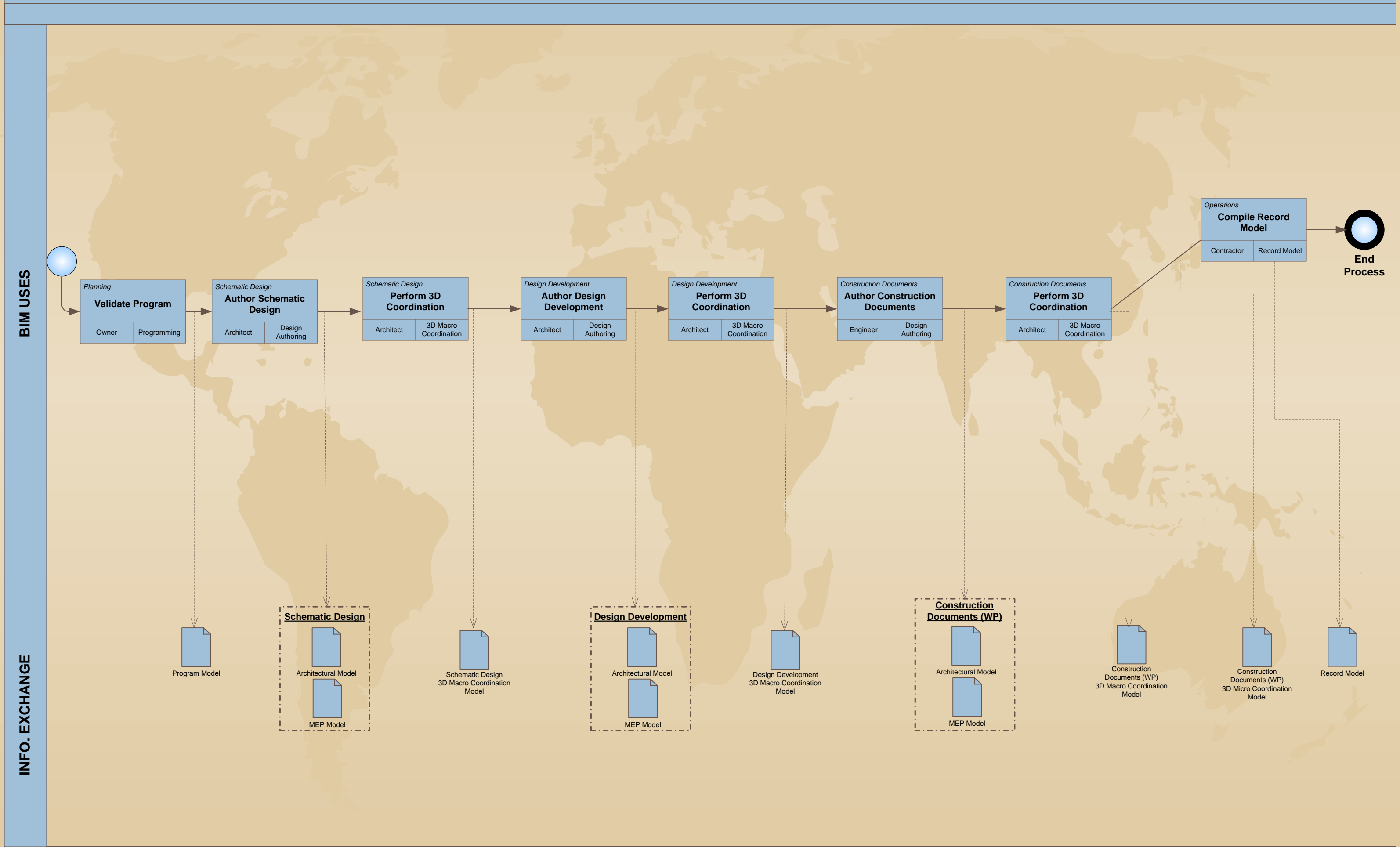
* Additional BIM Uses as well as information on each Use can be found at <http://www.engr.psu.edu/ae/cic/bimex/>

2. BIM USES:

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
	PROGRAMMING	X	DESIGN AUTHORIZING		SITE UTILIZATION PLANNING		BUILDING MAINTENANCE SCHEDULING
	SITE ANALYSIS	X	DESIGN REVIEWS		CONSTRUCTION SYSTEM DESIGN		BUILDING SYSTEM ANALYSIS
		X	3D COORDINATION	X	3D COORDINATION		ASSET MANAGEMENT
			STRUCTURAL ANALYSIS		DIGITAL FABRICATION		SPACE MANAGEMENT / TRACKING
			LIGHTING ANALYSIS		3D CONTROL AND PLANNING		DISASTER PLANNING
			ENERGY ANALYSIS	X	RECORD MODELING	X	RECORD MODELING
			MECHANICAL ANALYSIS				
			OTHER ENG. ANALYSIS				
			SUSTAINABILITY (LEED) EVALUATION				
			CODE VALIDATION				
	PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)		PHASE PLANNING (4D MODELING)
	COST ESTIMATION		COST ESTIMATION		COST ESTIMATION		COST ESTIMATION
	EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

SECTION F: BIM PROCESS DESIGN

1. LEVEL ONE PROCESS OVERVIEW MAP: PROCESS OVERVIEW MAP (NEXT PAGE)

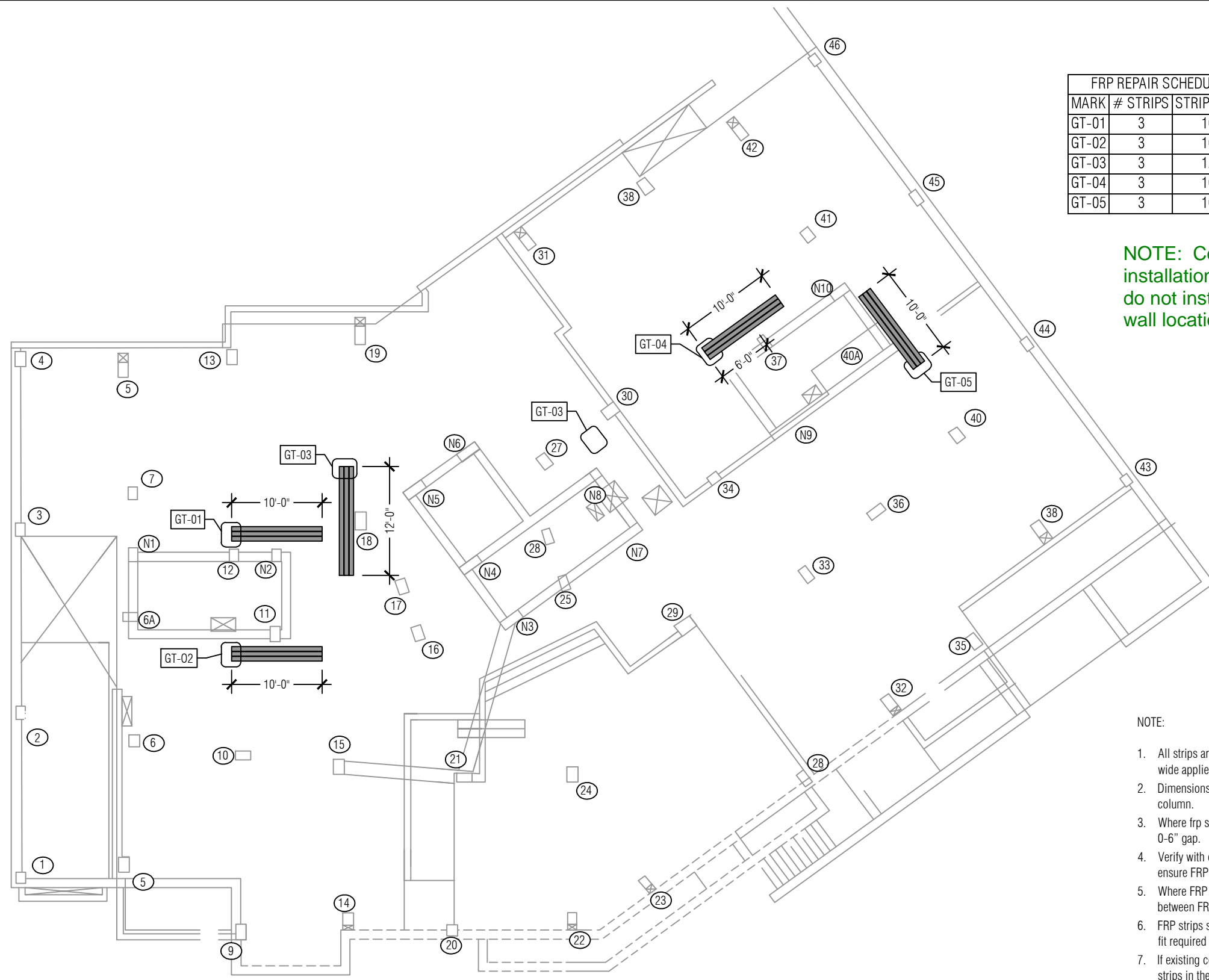


D. Constructability Challenges

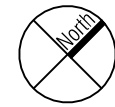
1. Slab Strengthening Through CFRP

The purpose of the CFRP is to provide greater strength characteristics to slabs and beams. This system was implemented on several floors in many areas where there was a shortage of supportive members.

The main constructability challenge with the CFRP system was the coordination of the installation of the panels so as to prevent any core drills from penetrating the panels. Close coordination was required between core drills and the installation of the CFRP panels through the utilization of BIM coordination in order to reduce/eliminate the likelihood of strength compromising penetrations through the panels. Drawings have been attached below to show the extent of the CFRP panels. For clarification of the system and its many locations refer to the attachments included at the end of this document.



Plan View - Ground Level - Top Reinforcing
Not to Scale



FRP REPAIR SCHEDULE - GROUNDLEVEL TOP REINFORCING			
MARK	# STRIPS	STRIP LENGTH	NOTES
GT-01	3	10'-0"	CENTER LENGTH WITH COL N2
GT-02	3	10'-0"	CENTER LENGTH WITH COL 11
GT-03	3	12'-0"	CENTER LENGTH WITH COL 18
GT-04	3	10'-0"	
GT-05	3	10'-0"	CENTER LENGTH WITH COL 40A

NOTE: Coordinate all CFRP installation with interior walls - do not install strips lengthwise at wall locations.

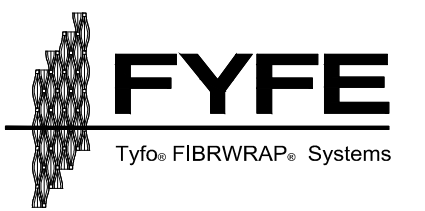
NOTE:

- All strips are 1 layer of the Tyfo® SCH-41H System, 6" wide applied to top of specified slab.
- Dimensions taken from column are to centerline of column.
- Where FRP strips are shown adjacent to column, provide a 0-6" gap.
- Verify with contractor location of new penetrations to ensure FRP will not interfere.
- Where FRP strips are butted, there shall be a 0-1/2" gap between FRP strips.
- FRP strips spacing labeled 'typ' may be adjusted $\pm 3"$ to fit required number of strips for a given strip group.
- If existing conditions prevent the application of the FRP strips in the specified layout, FRP strips may be stacked to decrease the width. No more than 2 strips may be stacked and the specified number of strips must remain. Wherever possible apply FRP strips as specified.
- See Detail 'A' on sheet 10 for typical section view and general notes.
- See Detail 'C' on sheet 10 for typical section at slab edge.
- See repair schedule for further notes.
- See Detail 'D' on sheet 11 for FRP layout at core drilled penetrations not shown.

Revision No.	Revised By	Revision Date

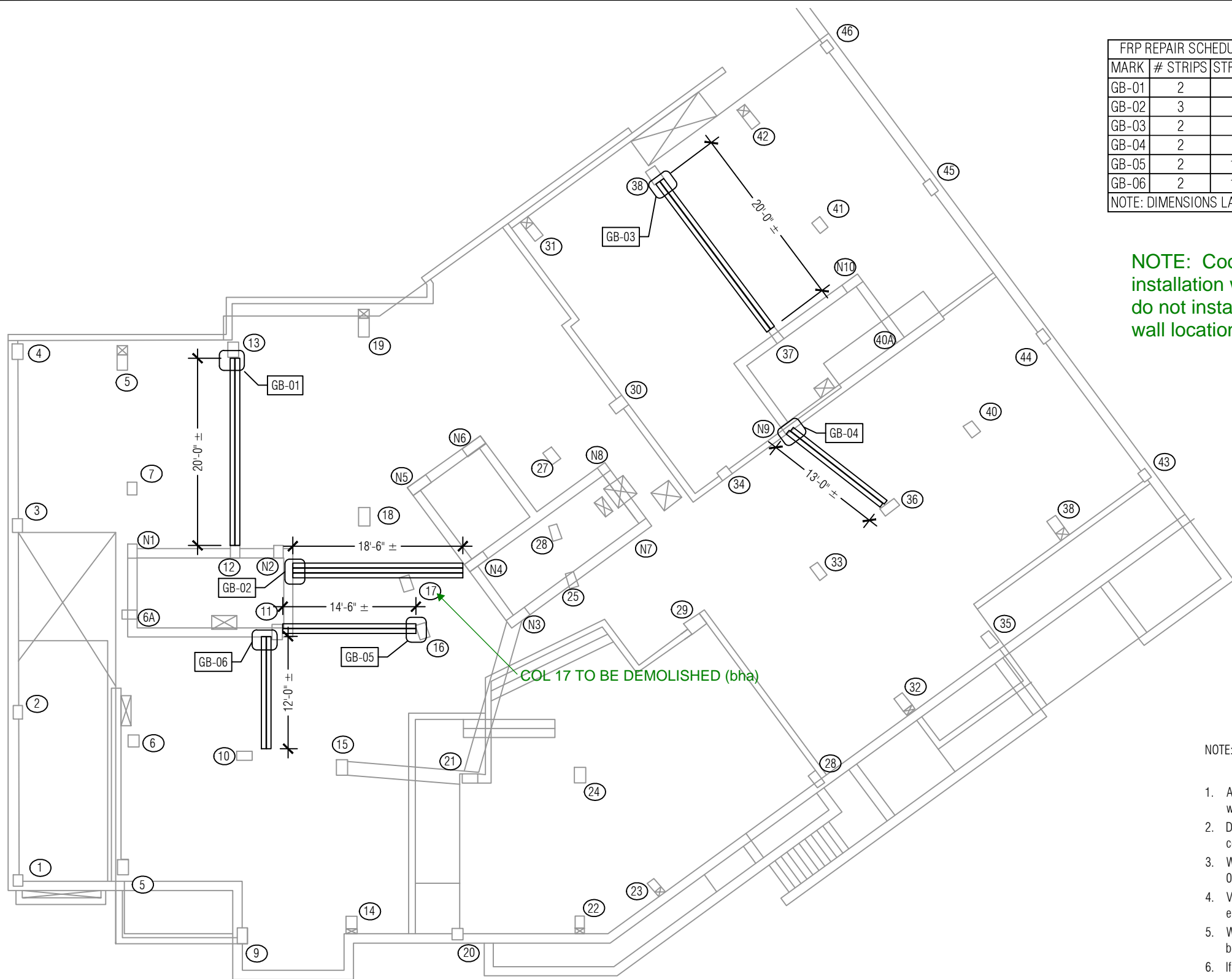
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Dwg. No.: 13313 The Concordia 2559-01	
Project No.: 13313	Original Date: 2011/12/22
Drawn by: E. Jimenez	Revised by: E. Jimenez
Engineer: S. Wisotzkey	Revision Date: 2012/01/17
Plan Checker:	Revision Time: 11:00 AM
Approved by:	Sheet: 1 of 11



Plan View - Ground Level - Bottom Reinforcing
Not to Scale



FRP REPAIR SCHEDULE - GROUND LEVEL BOTTOM REINFORCING			
MARK	# STRIPS	STRIP LENGTH	NOTES
GB-01	2	20'-0"±	EXTEND COL-COL
GB-02	3	18'-0"±	EXTEND FROM COL N4 TO BEAM
GB-03	2	20'-0"±	EXTEND COL-COL
GB-04	2	13'-0"±	EXTEND COL-COL
GB-05	2	14'-6"±	EXTEND COL-COL
GB-06	2	12'-0"±	EXTEND COL-COL

NOTE: DIMENSIONS LABELED '±' SHOULD BE FIELD VERIFIED

NOTE: Coordinate all CFRP installation with interior walls - do not install strips lengthwise at wall locations.

NOTE:

- All strips are 1 layer of the Tyfo® SCH-41H System, 6" wide applied to bottom of specified slab.
- Dimensions taken from column are to centerline of column.
- Where FRP strips are shown adjacent to column, provide a 0-6" gap.
- Verify with contractor location of new penetrations to ensure FRP will not interfere.
- Where FRP strips are butted, there shall be a 0-1/2" gap between FRP strips.
- If existing conditions prevent the application of the FRP strips in the specified layout, FRP strips may be stacked to decrease the width. No more than 2 strips may be stacked and the specified number of strips must remain. Wherever possible apply FRP strips as specified.
- See Detail 'B' on sheet 10 for typical section view and general notes.
- See repair schedule for further notes.
- See Detail 'D' on sheet 11 for FRP layout at core drilled penetrations not shown.

Revision No.	Revised By	Revision Date

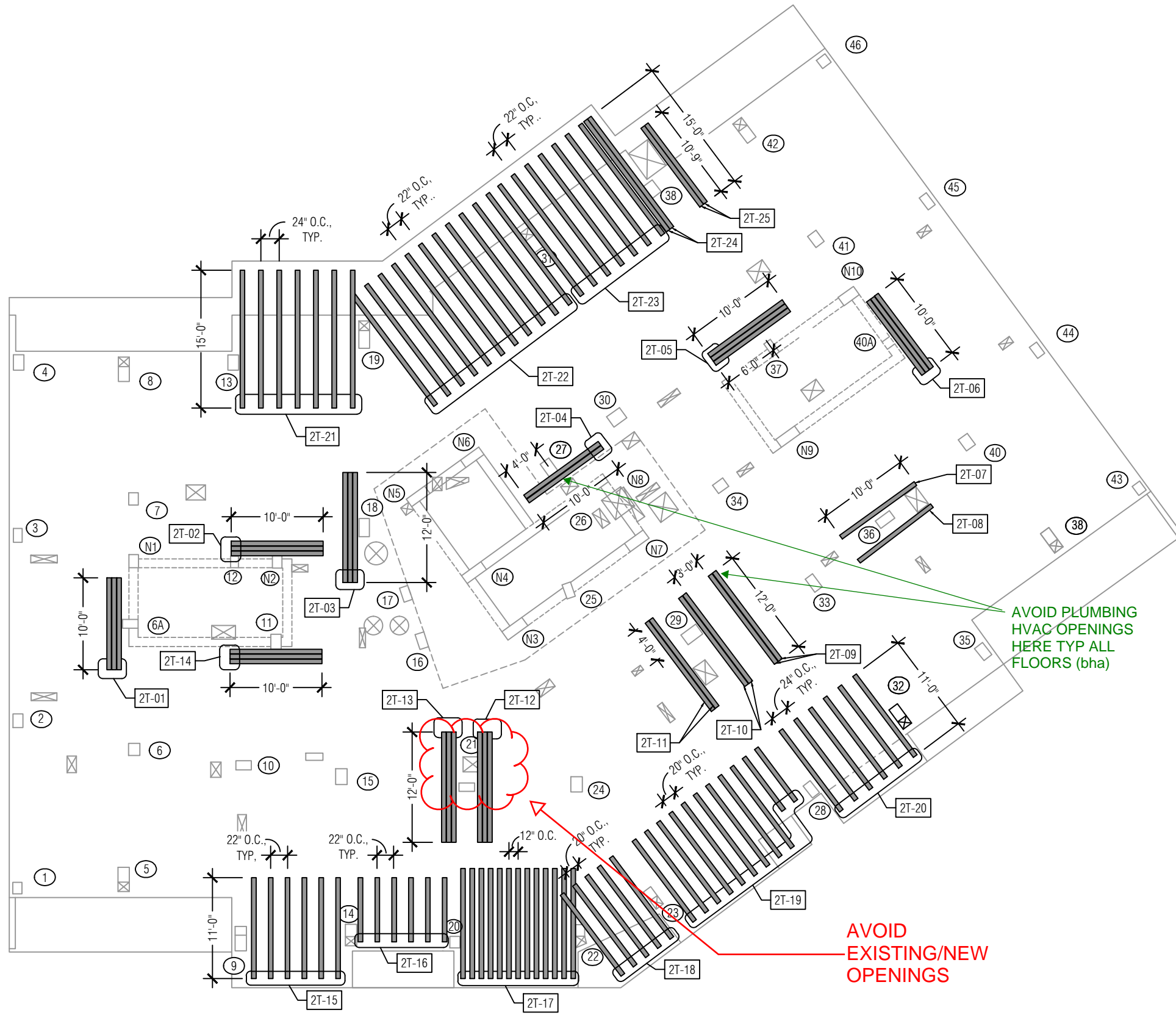
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Dwg. No.: 13313 The Concordia 2559-02	
Project No.: 13313	Original Date: 2011/12/22
Drawn by: E. Jimenez	Revised by: E. Jimenez
Engineer: S. Wisotzkey	Revision Date: 2012/01/17
Plan Checker:	Revision Time: 11:00 AM
Approved by:	Sheet: 2 of 11



Plan View - Level 2 - Top Reinforcing
Not to Scale



FRP REPAIR SCHEDULE - LEVEL 2 TOP REINFORCING			
MARK	# STRIPS	STRIP LENGTH	NOTES
2T-01	3	10'-0"	CENTER LENGTH WITH COL 6A
2T-02	3	10'-0"	CENTER LENGTH WITH COL N2
2T-03	3	12'-0"	CENTER LENGTH WITH COL 18
2T-04	2	10'-0"	
2T-05	3	10'-0"	
2T-06	3	10'-0"	
2T-07	1	10'-0"	CENTER LENGTH WITH COL 36
2T-08	1	10'-0"	CENTER LENGTH WITH COL 36
2T-09	2	11'-0"	
2T-10	2	11'-0"	
2T-11	2	11'-0"	
2T-12	3	12'-0"	
2T-13	3	12'-0"	
2T-14	3	10'-0"	CENTER LENGTH WITH COL 11
2T-15	6	11'-0"	22" O.C. SPACING
2T-16	6	7'-0"	22" O.C. SPACING
2T-17	14	11'-0"	12" O.C. SPACING
2T-18	5	11'-0"	20" O.C. SPACING
2T-19	11	11'-0"	20" O.C. SPACING
2T-20	7	11'-0"	24" O.C. SPACING
2T-21	7	15'-0"	24" O.C. SPACING
2T-22	11	15'-0"	22" O.C. SPACING
2T-23	7	15'-0"	22" O.C. SPACING
2T-24	2	15'-0"	
2T-25	2	10'-9"	

NOTE: Coordinate all CFRP installation with interior walls - do not install strips lengthwise at wall locations.

NOTE:

- All strips are 1 layer of the Tyfo® SCH-41H System, 6" wide applied to top of specified slab.
- Dimensions taken from column are to centerline of column.
- Where frp strips are shown adjacent to column, provide a 0-6" gap.
- Verify with contractor location of new penetrations to ensure FRP will not interfere.
- Where FRP strips are butted, there shall be a 0-1/2" gap between FRP strips.
- FRP strips spacing labeled 'typ' may be adjusted $\pm 3"$ to fit required number of strips for a given strip group.
- If existing conditions prevent the application of the FRP strips in the specified layout, FRP strips may be stacked to decrease the width. No more than 2 strips may be stacked and the specified number of strips must remain. Wherever possible apply FRP strips as specified.
- See Detail 'A' on sheet 10 for typical section view and general notes.
- See Detail 'C' on sheet 10 for typical section at slab edge.
- See repair schedule for further notes.
- See Detail 'D' on sheet 11 for FRP layout at core drilled penetrations not shown.

Revision No.	Revised By	Revision Date

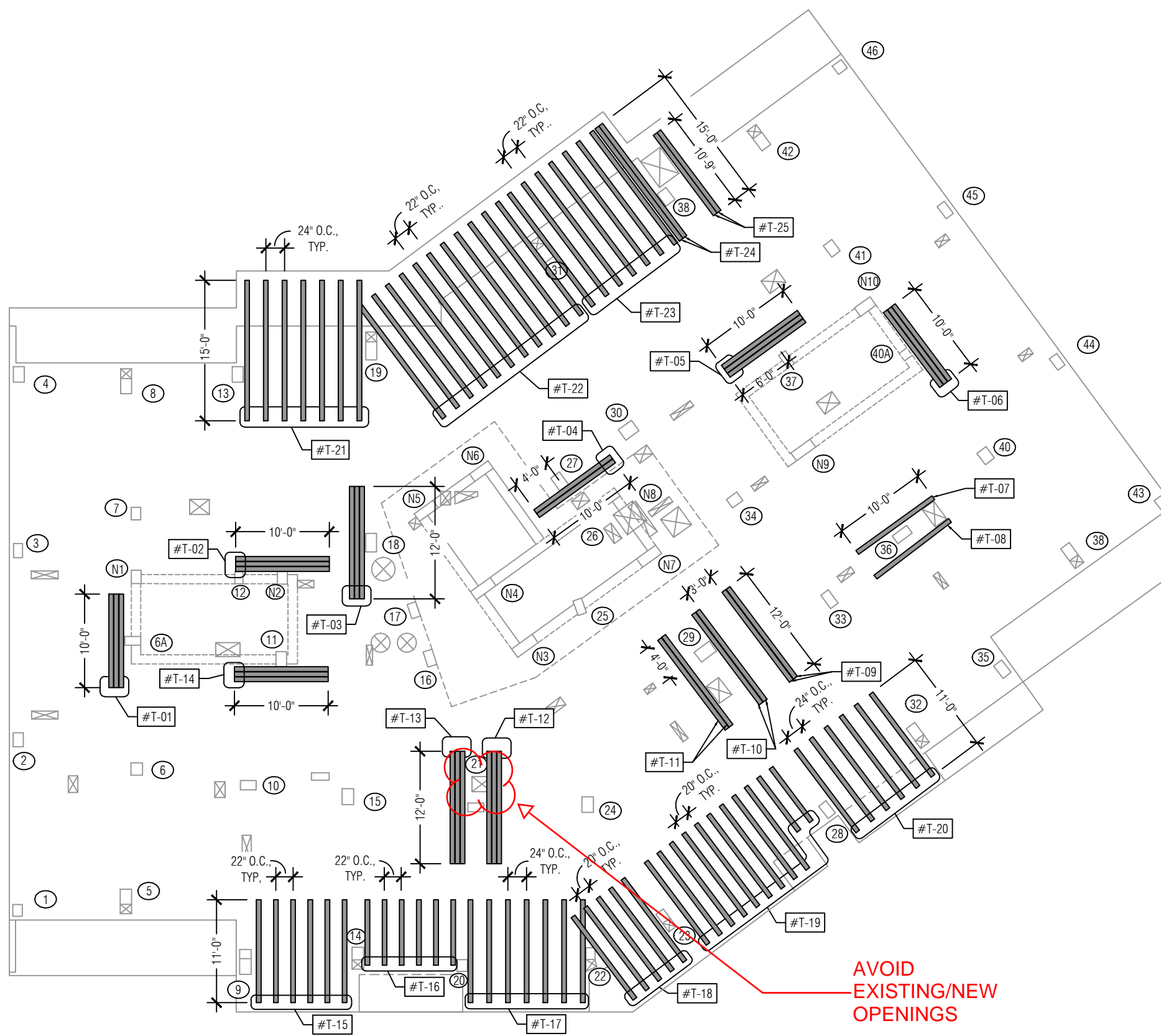
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Dwg. No.: 13313 The Concordia 2559-03	
Project No.: 13313	Original Date: 2011/12/22
Drawn by: E. Jimenez	Revised by: E. Jimenez
Engineer: S. Wisotzkey	Revision Date: 2012/01/17
Plan Checker:	Revision Time: 11:00 AM
Approved by:	Sheet: 3 of 11



Plan View - Levels 4,6,8,10 - Top Reinforcing
Not to Scale



**AVOID
EXISTING/NEW
OPENINGS**

FRP REPAIR SCHEDULE - LEVELS 3-10 TOP REINFORCING			
MARK	# STRIPS	STRIP LENGTH	NOTES
#T-01	3	10'-0"	CENTER LENGTH WITH COL 6A
#T-02	3	10'-0"	CENTER LENGTH WITH COL N2
#T-03	3	12'-0"	CENTER LENGTH WITH COL 18
#T-04	2	10'-0"	
#T-05	3	10'-0"	
#T-06	3	10'-0"	CENTER LENGTH WITH COL 40A
#T-07	1	10'-0"	CENTER LENGTH WITH COL 36
#T-08	1	10'-0"	CENTER LENGTH WITH COL 36
#T-09	2	11'-0"	
#T-10	2	11'-0"	
#T-11	2	11'-0"	
#T-12	3	12'-0"	
#T-13	3	12'-0"	
#T-14	3	10'-0"	CENTER LENGTH WITH COL 11
#T-15	6	11'-0"	22" O.C. SPACING
#T-16	6	7'-0"	22" O.C. SPACING
#T-17	7	11'-0"	24" O.C. SPACING
#T-18	5	11'-0"	20" O.C. SPACING
#T-19	11	11'-0"	20" O.C. SPACING
#T-20	7	11'-0"	24" O.C. SPACING
#T-21	7	15'-0"	24" O.C. SPACING
#T-22	11	15'-0"	22" O.C. SPACING
#T-23	7	15'-0"	22" O.C. SPACING
#T-24	2	15'-0"	
#T-25	2	10'-9"	

NOTE: '#' REPRESENTS LEVEL

NOTE: Coordinate all CFRP installation with interior walls - do not install strips lengthwise at wall locations.

NOTE:

- All strips are 1 layer of the Tyfo® SCH-41H System, 6" wide applied to top of specified slab.
- Dimensions taken from column to centerline of column.
- Where FRP strips are shown adjacent to column, provide a 0-6" gap.
- Verify with contractor location of new penetrations to ensure FRP will not interfere.
- Where FRP strips are butted, there shall be a 0-1/2" gap between FRP strips.
- FRP strips spacing labeled 'typ' may be adjusted ± 3" to fit required number of strips for a given strip group.
- If existing conditions prevent the application of the FRP strips in the specified layout, FRP strips may be stacked to decrease the width. No more than 2 strips may be stacked and the specified number of strips must remain. Wherever possible apply FRP strips as specified.
- See Detail 'A' on sheet 10 for typical section view and general notes.
- See Detail 'C' on sheet 10 for typical section at slab edge.
- See repair schedule for further notes.
- See Detail 'D' on sheet 11 for FRP layout at core drilled penetrations not shown.

Revision No.	Revised By	Revision Date

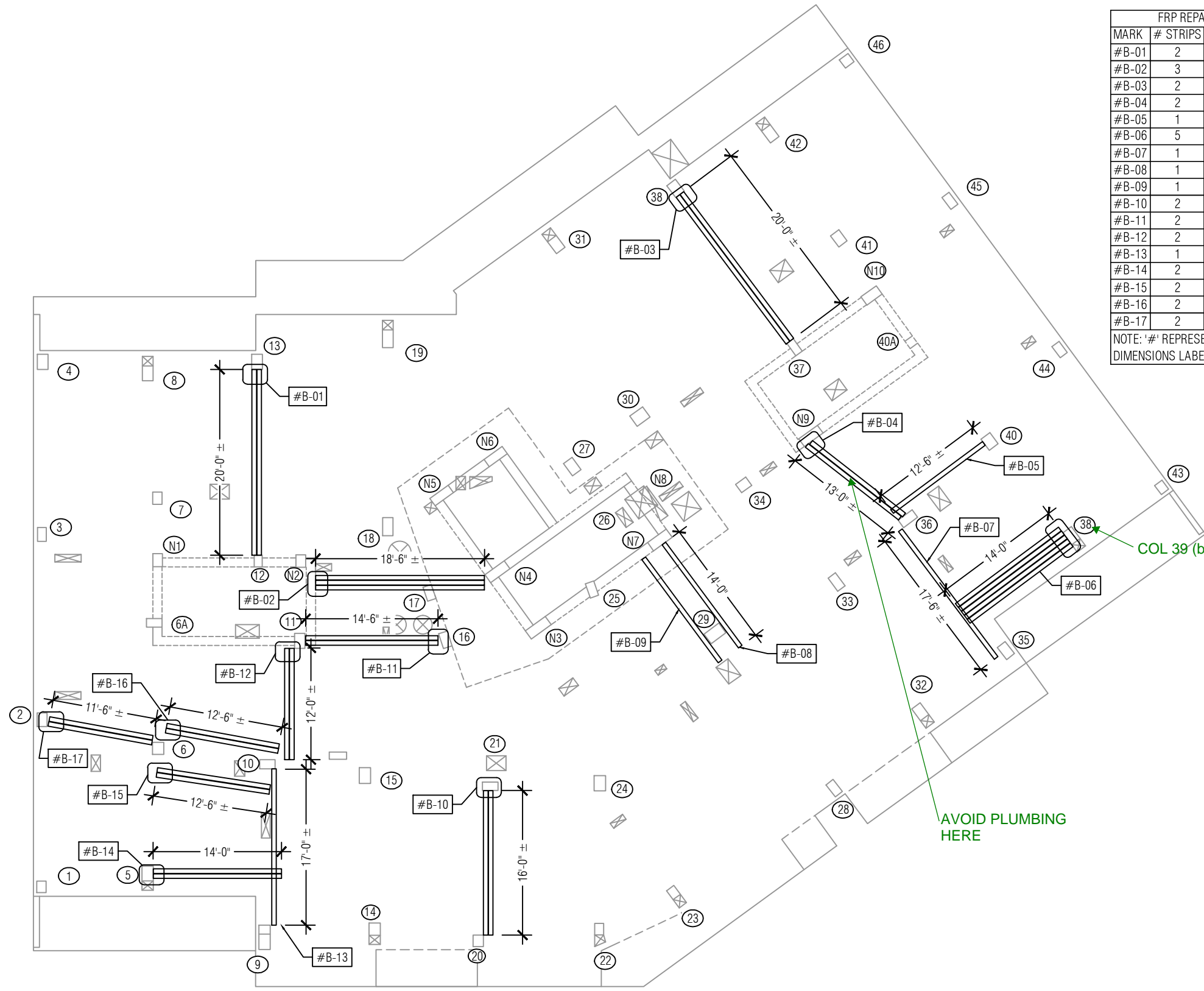
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Dwg. No.: 13313 The Concordia 2559-04	
Project No.: 13313	Original Date: 2011/12/22
Drawn by: E. Jimenez	Revised by: E. Jimenez
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Approved by:	Sheet: 4 of 11



Plan View - Levels 2,4,6,8,10 - Bottom Reinforcing
Not to Scale



FRP REPAIR SCHEDULE - LEVELS 2-10 BOTTOM REINFORCING			
MARK	# STRIPS	STRIP LENGTH	NOTES
#B-01	2	20'-0"±	EXTEND COL-COL
#B-02	3	18'-0"±	EXTEND FROM COL N4 TO BEAM
#B-03	2	20'-0"±	EXTEND COL-COL
#B-04	2	13'-0"±	EXTEND COL-COL
#B-05	1	12'-6"±	CENTER STRIP WITH COL 40
#B-06	5	14'-0"	CENTER STRIPS WITH COL 39
#B-07	1	18'-0"±	EXTEND COL-COL
#B-08	1	14'-0"±	EXTEND TO BEAM, APPLY 0-6" FROM COL 29
#B-09	1	14'-0"±	EXTEND TO BEAM, APPLY 0-6" FROM COL 29
#B-10	2	16'-0"±	EXTEND COL-COL
#B-11	2	10'-0"±	EXTEND FROM COL 16 TO BEAM
#B-12	2	12'-0"±	EXTEND FROM COL 10 TO BEAM
#B-13	1	17'-0"±	EXTEND COL-COL
#B-14	2	14'-0"	CENTER STRIPS WITH COL 5
#B-15	2	12'-0"±	EXTEND COL-COL, ALIGN WITH COLS
#B-16	2	12'-0"±	EXTEND COL-COL, ALIGN WITH COLS
#B-17	2	12'-0"±	EXTEND COL-COL, ALIGN WITH COLS

NOTE: '#' REPRESENTS LEVEL
DIMENSIONS LABELED '±' SHOULD BE FIELD VERIFIED

NOTE: Coordinate all CFRP installation with interior walls - do not install strips lengthwise at wall locations.

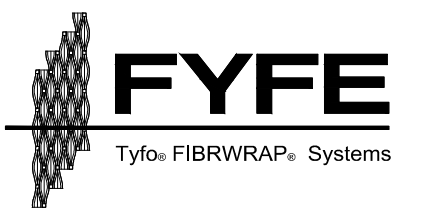
NOTE:

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Revision No.	Revised By	Revision Date

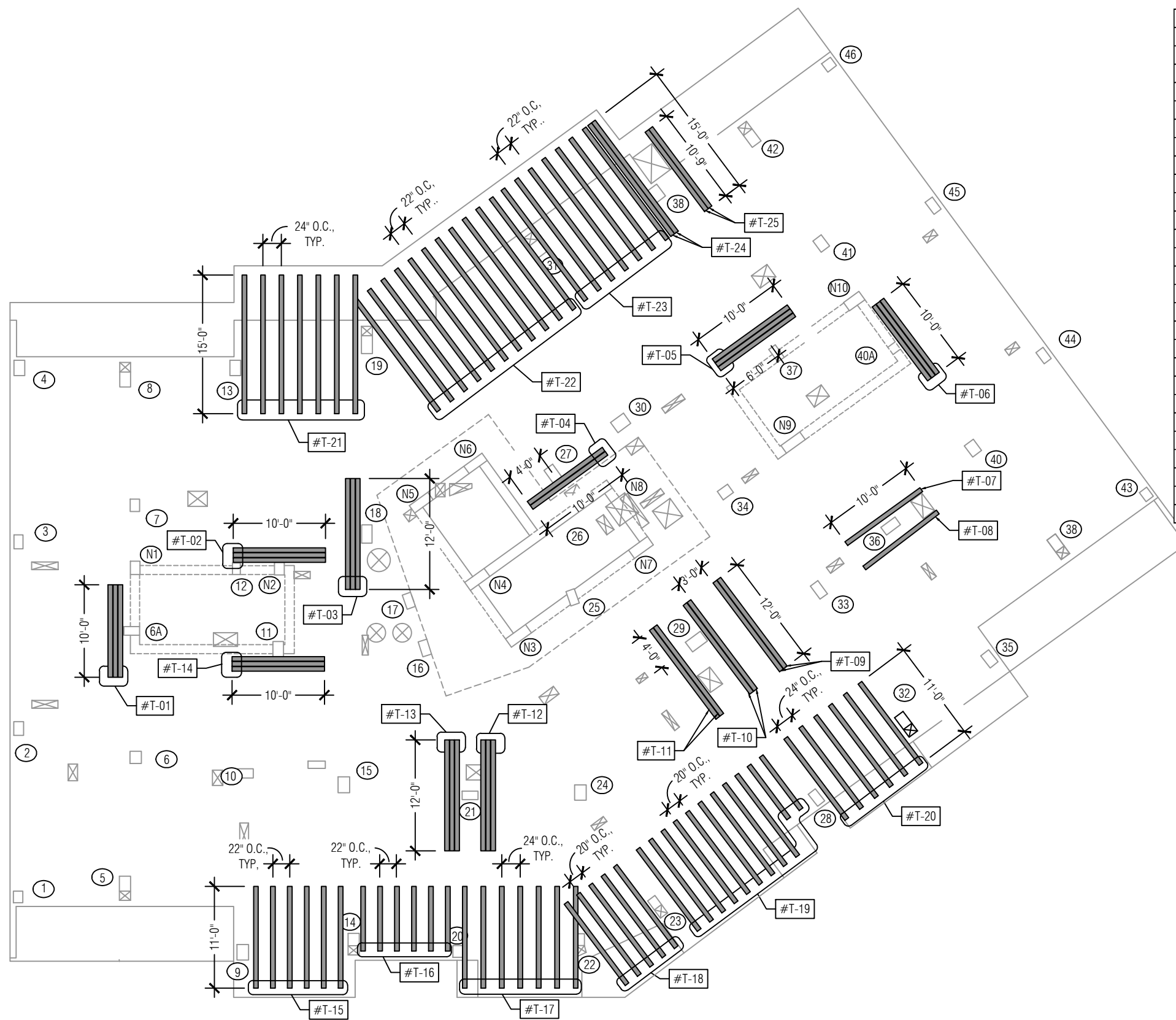
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Dwg. No.: 13313 The Concordia 2559-05	
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Approved by:	Sheet: 5 of 11



Plan View - Levels 3, 5, 7, 9 - Top Reinforcing

Not to Scale



FRP REPAIR SCHEDULE - LEVELS 3-10 TOP REINFORCING			
MARK	# STRIPS	STRIP LENGTH	NOTES
#T-01	3	10'-0"	CENTER LENGTH WITH COL 6A
#T-02	3	10'-0"	CENTER LENGTH WITH COL N2
#T-03	3	12'-0"	CENTER LENGTH WITH COL 18
#T-04	2	10'-0"	
#T-05	3	10'-0"	
#T-06	3	10'-0"	CENTER LENGTH WITH COL 40A
#T-07	1	10'-0"	CENTER LENGTH WITH COL 36
#T-08	1	10'-0"	CENTER LENGTH WITH COL 36
#T-09	2	11'-0"	
#T-10	2	11'-0"	
#T-11	2	11'-0"	
#T-12	3	12'-0"	
#T-13	3	12'-0"	
#T-14	3	10'-0"	CENTER LENGTH WITH COL 11
#T-15	6	11'-0"	22" O.C. SPACING
#T-16	6	7'-0"	22" O.C. SPACING
#T-17	7	11'-0"	24" O.C. SPACING
#T-18	5	11'-0"	20" O.C. SPACING
#T-19	11	11'-0"	20" O.C. SPACING
#T-20	7	11'-0"	24" O.C. SPACING
#T-21	7	15'-0"	24" O.C. SPACING
#T-22	11	15'-0"	22" O.C. SPACING
#T-23	7	15'-0"	22" O.C. SPACING
#T-24	2	15'-0"	
#T-25	2	10'-9"	

NOTE: '#' REPRESENTS LEVEL

NOTE: Coordinate all CFRP installation with interior walls - do not install strips lengthwise at wall locations.

NOTE:

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- Dimensions taken from column are to centerline of column.
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- Verify with contractor location of new penetrations to ensure FRP will not interfere.
- Where FRP strips are butted, there shall be a 0-1/2" gap between FRP strips.
- FRP strips spacing labeled 'typ' may be adjusted $\pm 3"$ to fit required number of strips for a given strip group.
- If existing conditions prevent the application of the FRP strips in the specified layout, FRP strips may be stacked to decrease the width. No more than 2 strips may be stacked and the specified number of strips must remain. Wherever possible apply FRP strips as specified.
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- See Detail 'C' on sheet 10 for typical section at slab edge.
- See repair schedule for further notes.
- See Detail 'D' on sheet 11 for FRP layout at core drilled penetrations not shown.

Revision No.	Revised By	Revision Date

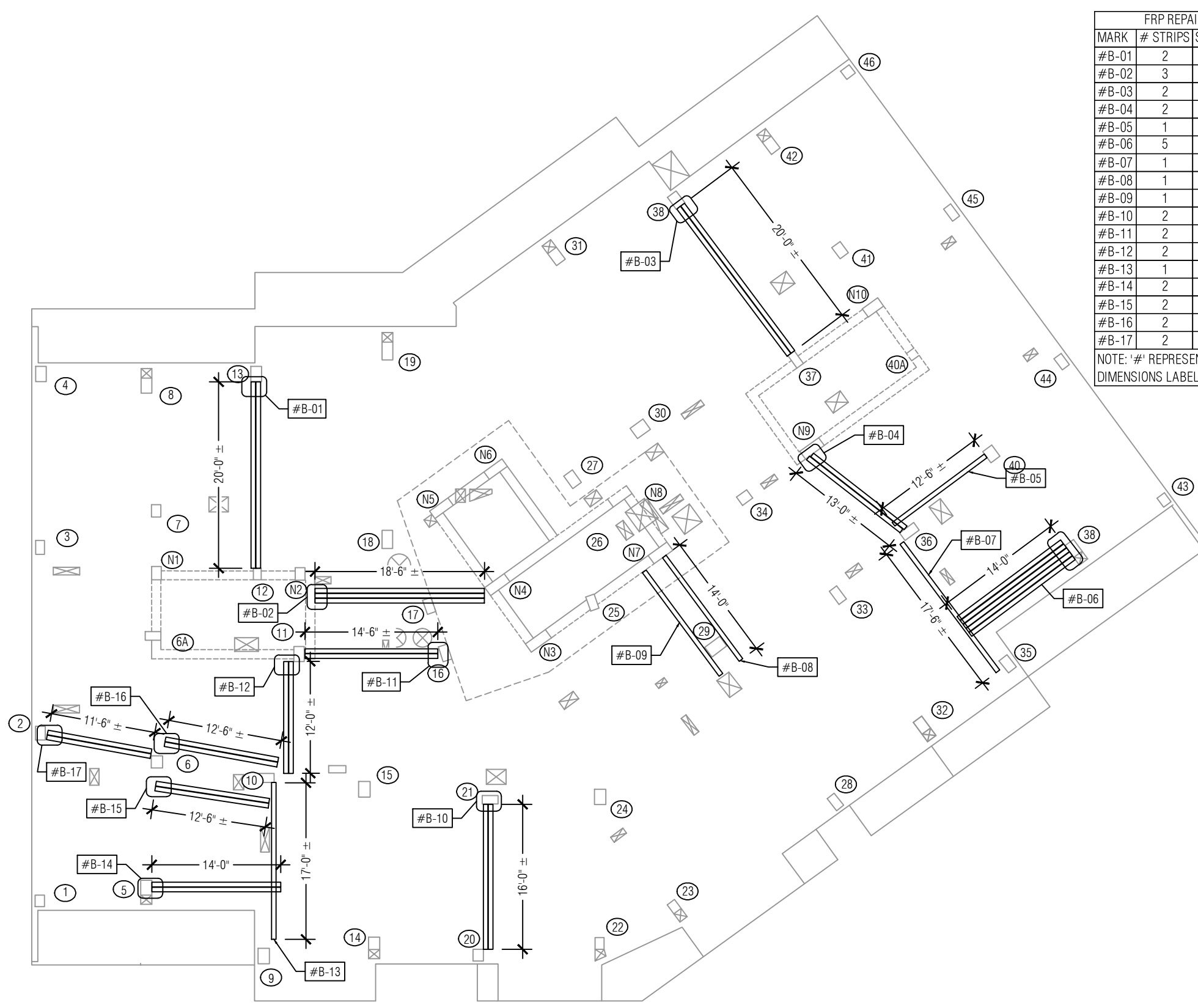
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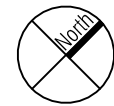


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Project No.: 13313	Original Date: 2011/12/22
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Engineer: S. Wisotzkey	Revision Date: 2012/01/17
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Approved by:	Sheet: 6 of 11



Plan View - Levels 3, 5, 7, 9 - Bottom Reinforcing
Not to Scale



FRP REPAIR SCHEDULE - LEVELS 2-10 BOTTOM REINFORCING			
MARK	# STRIPS	STRIP LENGTH	NOTES
#B-01	2	20'-0"±	EXTEND COL-COL
#B-02	3	18'-0"±	EXTEND FROM COL N4 TO BEAM
#B-03	2	20'-0"±	EXTEND COL-COL
#B-04	2	13'-0"±	EXTEND COL-COL
#B-05	1	12'-6"±	CENTER STRIP WITH COL 40
#B-06	5	14'-0"	CENTER STRIPS WITH COL 39
#B-07	1	18'-0"±	EXTEND COL-COL
#B-08	1	14'-0"±	EXTEND TO BEAM, APPLY 0-6" FROM COL 29
#B-09	1	14'-0"±	EXTEND TO BEAM, APPLY 0-6" FROM COL 29
#B-10	2	16'-0"±	EXTEND COL-COL
#B-11	2	10'-0"±	EXTEND FROM COL 16 TO BEAM
#B-12	2	12'-0"±	EXTEND FROM COL 10 TO BEAM
#B-13	1	17'-0"±	EXTEND COL-COL
#B-14	2	14'-0"	CENTER STRIPS WITH COL 5
#B-15	2	12'-0"±	EXTEND COL-COL, ALIGN WITH COLS
#B-16	2	12'-0"±	EXTEND COL-COL, ALIGN WITH COLS
#B-17	2	12'-0"±	EXTEND COL-COL, ALIGN WITH COLS

NOTE: '#' REPRESENTS LEVEL
DIMENSIONS LABELED '±' SHOULD BE FIELD VERIFIED

NOTE: Coordinate all CFRP installation with interior walls - do not install strips lengthwise at wall locations.

NOTE:

- All strips are 1 layer of the Tyfo® SCH-41H System, 6" wide applied to bottom of specified slab.
- Dimensions taken from column are to centerline of column.
- Where FRP strips are shown adjacent to column, provide a 0-6" gap.
- Verify with contractor location of new penetrations to ensure FRP will not interfere.
- Where FRP strips are butted, there shall be a 0-1/2" gap between FRP strips.
- If existing conditions prevent the application of the FRP strips in the specified layout, FRP strips may be stacked to decrease the width. No more than 2 strips may be stacked and the specified number of strips must remain. Wherever possible apply FRP strips as specified.
- See Detail 'B' on sheet 10 for typical section view and general notes.
- See repair schedule for further notes.
- See Detail 'D' on sheet 11 for FRP layout at core drilled penetrations not shown.

Revision No.	Revised By	Revision Date

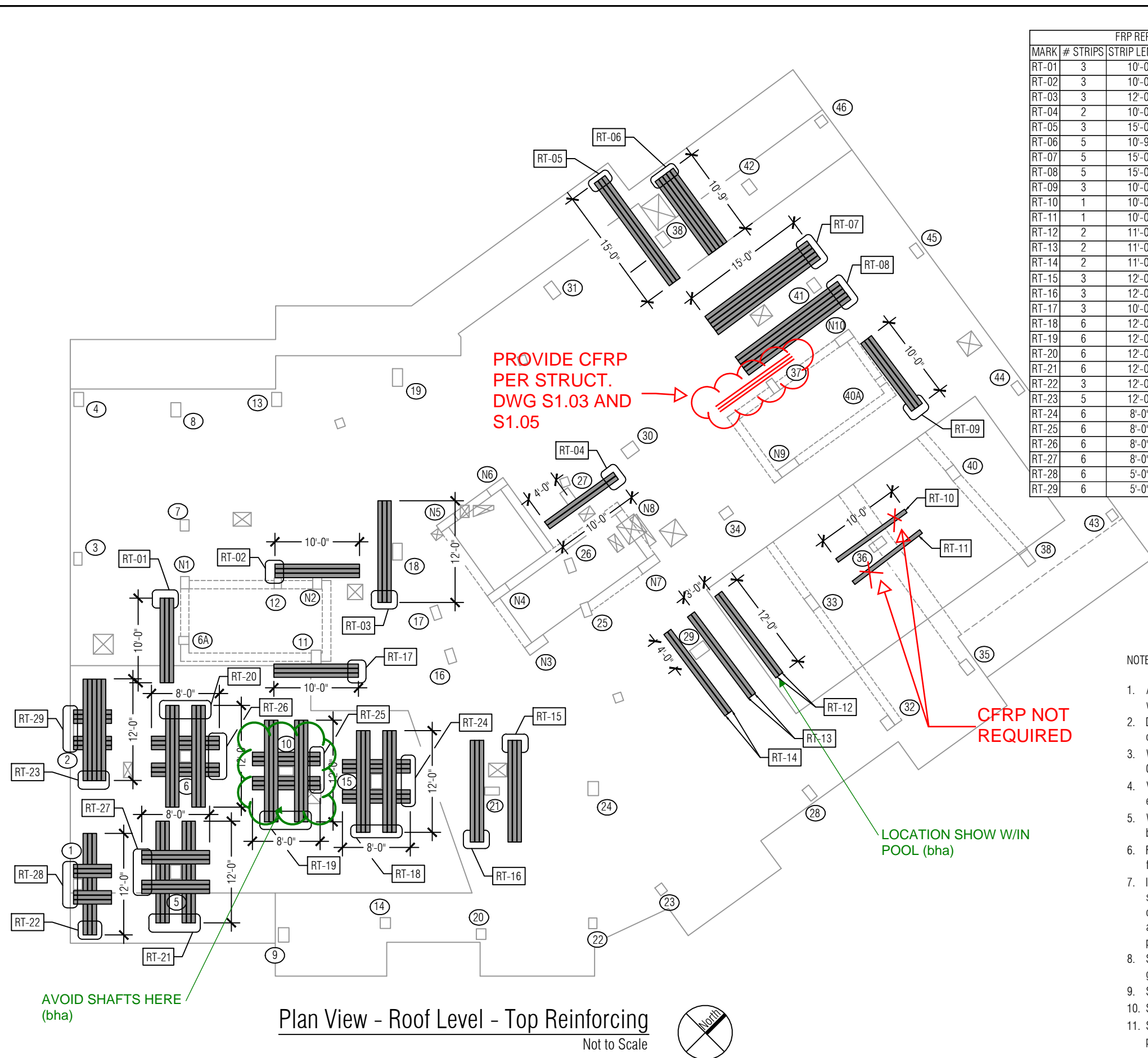
Engineer Stamp

The Concordia Slab Strengthening



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Dwg. No.: 13313 The Concordia 2559-07	
Project No.: 13313	Original Date: 2011/12/22
Drawn by: E. Jimenez	Revised by: E. Jimenez
Engineer: S. Wisotzkey	Revision Date: 2012/01/17
Plan Checker:	Revision Time: 11:00 AM
Approved by:	Sheet: 7 of 11



Plan View - Roof Level - Top Reinforcing
Not to Scale

FRP REPAIR SCHEDULE - ROOF LEVEL TOP REINFORCING			
MARK	# STRIPS	STRIP LENGTH	NOTES
RT-01	3	10'-0"	CENTER LENGTH WITH COL 6A
RT-02	3	10'-0"	CENTER LENGTH WITH COL N2
RT-03	3	12'-0"	CENTER LENGTH WITH COL 18
RT-04	2	10'-0"	
RT-05	3	15'-0"	
RT-06	5	10'-9"	
RT-07	5	15'-0"	
RT-08	5	15'-0"	
RT-09	3	10'-0"	CENTER LENGTH WITH COL 40A
RT-10	1	10'-0"	CENTER LENGTH WITH COL 36
RT-11	1	10'-0"	CENTER LENGTH WITH COL 36
RT-12	2	11'-0"	
RT-13	2	11'-0"	
RT-14	2	11'-0"	
RT-15	3	12'-0"	
RT-16	3	12'-0"	
RT-17	3	10'-0"	CENTER LENGTH WITH COL 11
RT-18	6	12'-0"	CENTER LENGTH WITH COL, 3 STRIPS EACH SIDE OF COL
RT-19	6	12'-0"	CENTER LENGTH WITH COL, 3 STRIPS EACH SIDE OF COL
RT-20	6	12'-0"	CENTER LENGTH WITH COL, 3 STRIPS EACH SIDE OF COL
RT-21	6	12'-0"	CENTER LENGTH WITH COL, 3 STRIPS EACH SIDE OF COL
RT-22	3	12'-0"	CENTER LENGTH WITH COL
RT-23	5	12'-0"	CENTER LENGTH WITH COL
RT-24	6	8'-0"	CENTER LENGTH WITH COL, 3 STRIPS EACH SIDE OF COL
RT-25	6	8'-0"	CENTER LENGTH WITH COL, 3 STRIPS EACH SIDE OF COL
RT-26	6	8'-0"	CENTER LENGTH WITH COL, 3 STRIPS EACH SIDE OF COL
RT-27	6	8'-0"	CENTER LENGTH WITH COL, 3 STRIPS EACH SIDE OF COL
RT-28	6	5'-0"	3 STRIPS EACH SIDE OF COL, EXTEND TO BACK OF COL FACE
RT-29	6	5'-0"	3 STRIPS EACH SIDE OF COL, EXTEND TO BACK OF COL FACE

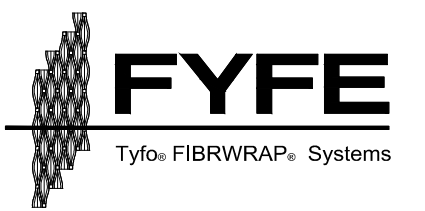
NOTE: Coordinate all CFRP installation with interior walls - do not install strips lengthwise at wall locations.

- NOTE:
- All strips are 1 layer of the Tyfo® SCH-41H System, 6" wide applied to top of specified slab.
 - Dimensions taken from column are to centerline of column.
 - Where FRP strips are shown adjacent to column, provide a 0-6" gap.
 - Verify with contractor location of new penetrations to ensure FRP will not interfere.
 - Where FRP strips are butted, there shall be a 0-1/2" gap between FRP strips.
 - FRP strips spacing labeled 'tp' may be adjusted $\pm 3"$ to fit required number of strips for a given strip group.
 - If existing conditions prevent the application of the FRP strips in the specified layout, FRP strips may be stacked to decrease the width. No more than 2 strips may be stacked and the specified number of strips must remain. Wherever possible apply FRP strips as specified.
 - See Detail 'A' on sheet 10 for typical section view and general notes.
 - See Detail 'C' on sheet 10 for typical section at slab edge.
 - See repair schedule for further notes.
 - See Detail 'D' on sheet 11 for FRP layout at core drilled penetrations not shown.

Revision No.	Revised By	Revision Date

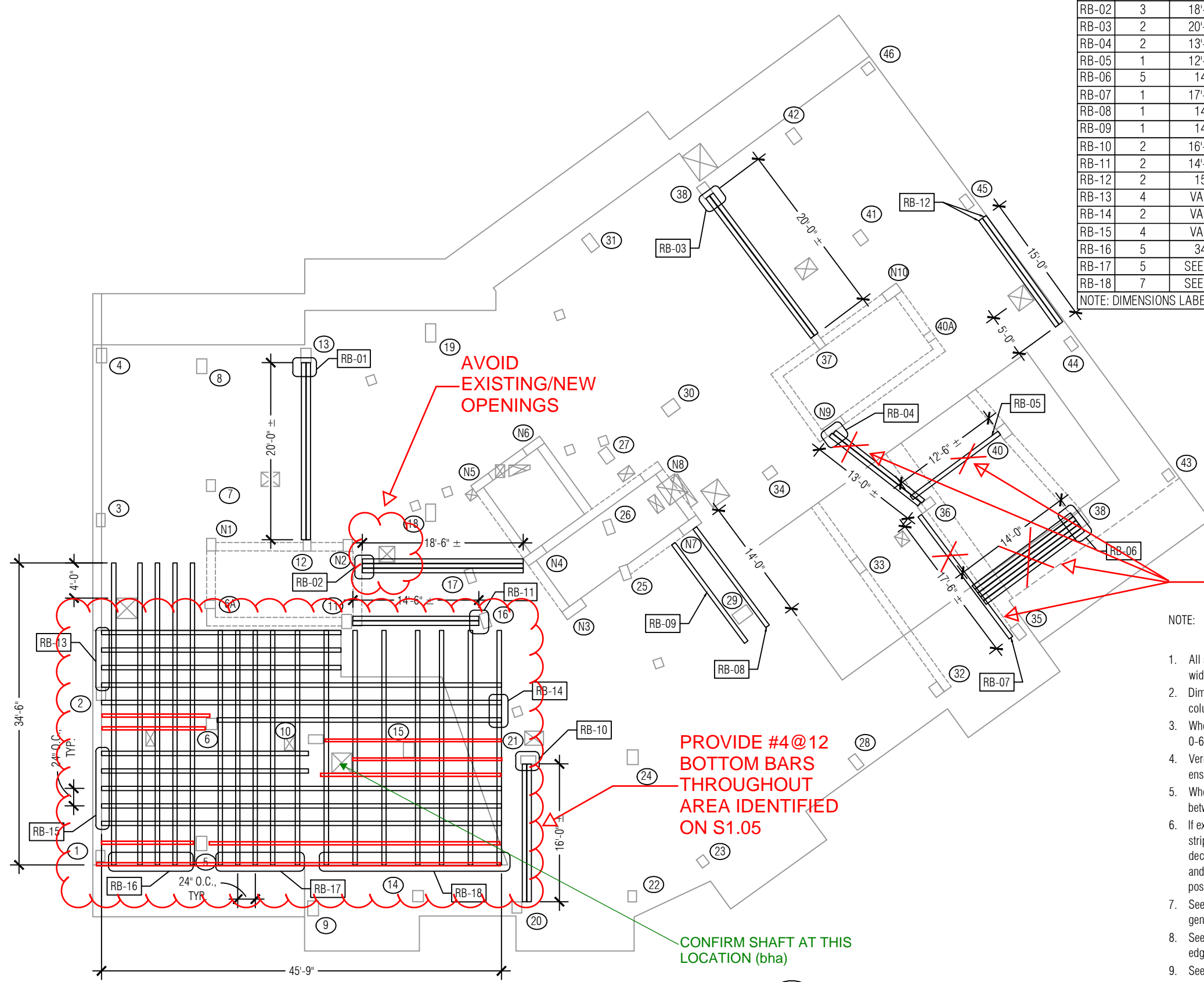
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Dwg. No.: 13313 The Concordia 2559-08	
Project No.: 13313	Original Date: 2011/12/22
Drawn by: E. Jimenez	Revised by: E. Jimenez
Engineer: S. Wisotzkey	Revision Date: 2012/01/17
Plan Checker:	Revision Time: 11:00 AM
Approved by:	Sheet: 8 of 11



FRP REPAIR SCHEDULE - ROOF LEVEL BOTTOM REINFORCING			
MARK	# STRIPS	STRIP LENGTH	NOTES
RB-01	2	20'-0"±	EXTEND COL-COL
RB-02	3	18'-6"±	EXTEND FROM COL N4 TO BEAM
RB-03	2	20'-0"±	EXTEND COL-COL
RB-04	2	13'-0"±	EXTEND COL-COL
RB-05	1	12'-6"±	CENTER STRIP WITH COL 40
RB-06	5	14'-0"	CENTER STRIPS WITH COL 39
RB-07	1	17'-6"±	EXTEND COL-COL
RB-08	1	14'-0"	EXTEND TO BEAM, APPLY 0-6" FROM COL 29
RB-09	1	14'-0"	EXTEND TO BEAM, APPLY 0-6" FROM COL 29
RB-10	2	16'-0"±	EXTEND COL-COL
RB-11	2	14'-6"±	EXTEND FROM COL 16 TO BEAM
RB-12	2	15'-0"	CENTER BETWEEN COLS
RB-13	4	VARIABLES	EXTEND TO FACE OF COL 11
RB-14	2	VARIABLES	TERMINATE 1 STRIP AT COL 6
RB-15	4	VARIABLES	TERMINATE 2 STRIPS AT FACE OF COL 10
RB-16	5	34'-6"	
RB-17	5	SEE PLAN	EXTEND TO BEAM
RB-18	7	SEE PLAN	EXTEND TO FACE OF COL 11

NOTE: DIMENSIONS LABELED '±' SHOULD BE FIELD VERIFIED

NOTE: Coordinate all CFRP installation with interior walls - do not install strips lengthwise at wall locations.

CFRP NOT REQUIRED

NOTE:

- All strips are 1 layer of the Tyfo® SCH-41H System, 6" wide applied to bottom of specified slab.
- Dimensions taken from column are to centerline of column.
- Where FRP strips are shown adjacent to column, provide a 0-6" gap.
- Verify with contractor location of new penetrations to ensure FRP will not interfere.
- Where FRP strips are butted, there shall be a 0-1/2" gap between FRP strips.
- If existing conditions prevent the application of the FRP strips in the specified layout, FRP strips may be stacked to decrease the width. No more than 2 strips may be stacked and the specified number of strips must remain. Wherever possible apply FRP strips as specified.
- See Detail 'B' on sheet 10 for typical section view and general notes.
- See Detail 'C' on sheet 10 for typical section view at slab edge.
- See repair schedule for further notes.
- See Detail 'D' on sheet 11 for FRP layout at core drilled penetrations not shown.

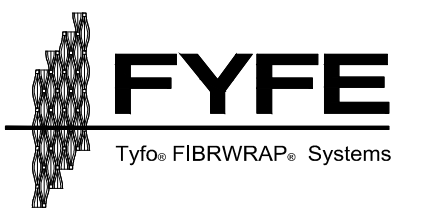
Plan View - Roof Level - Bottom Reinforcing
Not to Scale



Revision No.	Revised By	Revision Date

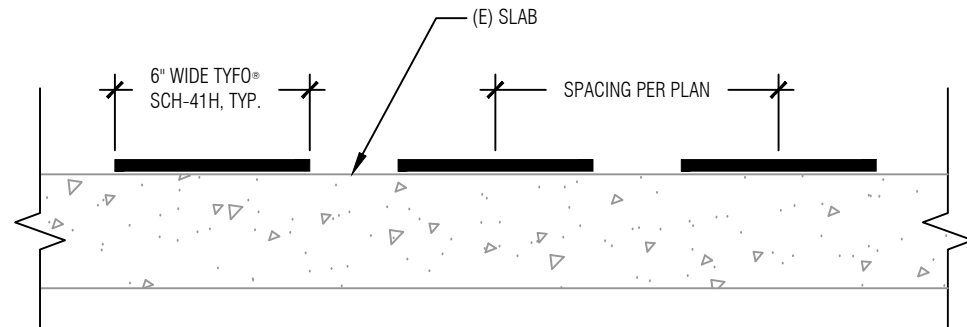
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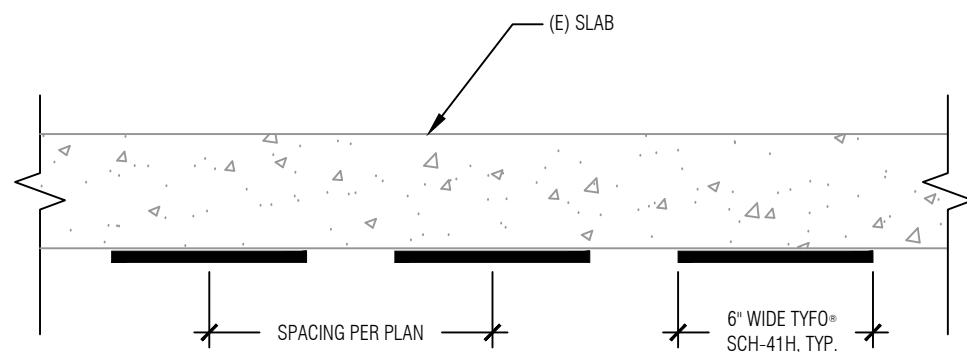
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Dwg. No.:	13313 The Concordia 2559-09	
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Engineer:	S. Wisotzkey	Revision Date: 2012/01/17
Plan Checker:		Revision Time: 11:00 AM
Approved by:		Sheet: 9 of 11



A Typical Section At Top Reinforcing
N.T.S.

Note:
Where no spacing is provided, strips shall be butted with a 0-1/2" gap.

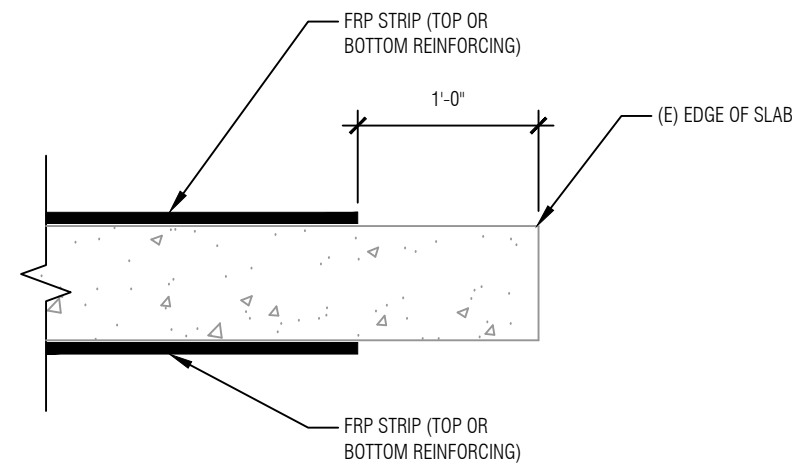


B Typical Section At Bottom Reinforcing
N.T.S.

Note:
Where no spacing is provided, strips shall be butted with a 0-1/2" gap.

GENERAL NOTES:

1. Mark perimeter of areas to be strengthened. The perimeter line should extend beyond the exact limits to ensure that all required areas are roughened.
2. Prepare all surfaces to receive composite strengthening by grinding, shot blasting or other means of abrasive methods to remove the existing laitance and expose aggregate.
3. Remove dust and debris from surfaces using compressed air, brooms or vacuum.
4. Clearly mark all locations.
5. Apply one prime coat of Tyfo® S epoxy to all areas to receive composite strengthening (epoxy may be thickened with cab-o-sil based on the site conditions as determined by the on site Fibrwrap® technician).
6. Immediately apply the pre-cut and pre-saturated Tyfo® Fibrwrap® System to the required locations as detailed.
7. Finish all seams and edges with thickened Tyfo® S epoxy.
8. Allow approximately 12-hours (time may be adjusted by the on site Fibrwrap® technician) of cure time prior to finish coating.
9. Finish as required.



C Typical Section At Edge Of Slab
N.T.S.

Revision No.	Revised By	Revision Date

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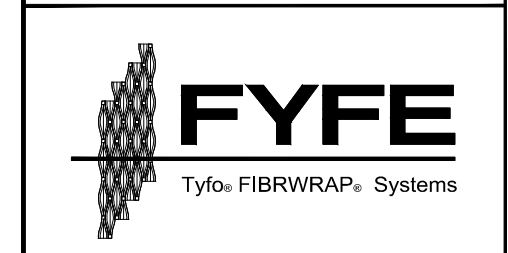
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Approved by:		Sheet: 10 of 11

Revision No.	Revised By	Revision Date

Engineer Stamp

The Concordia Slab Strengthening

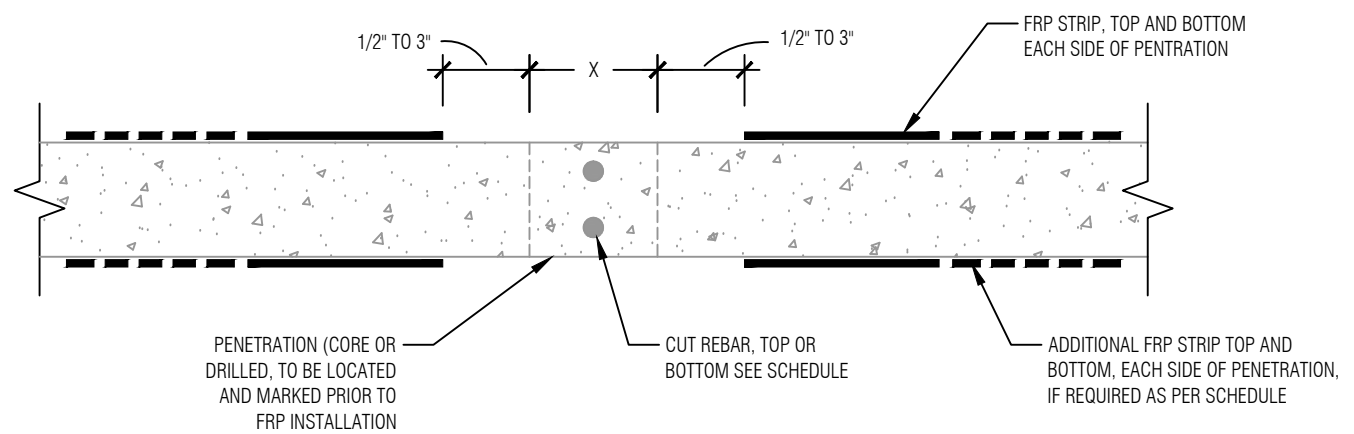
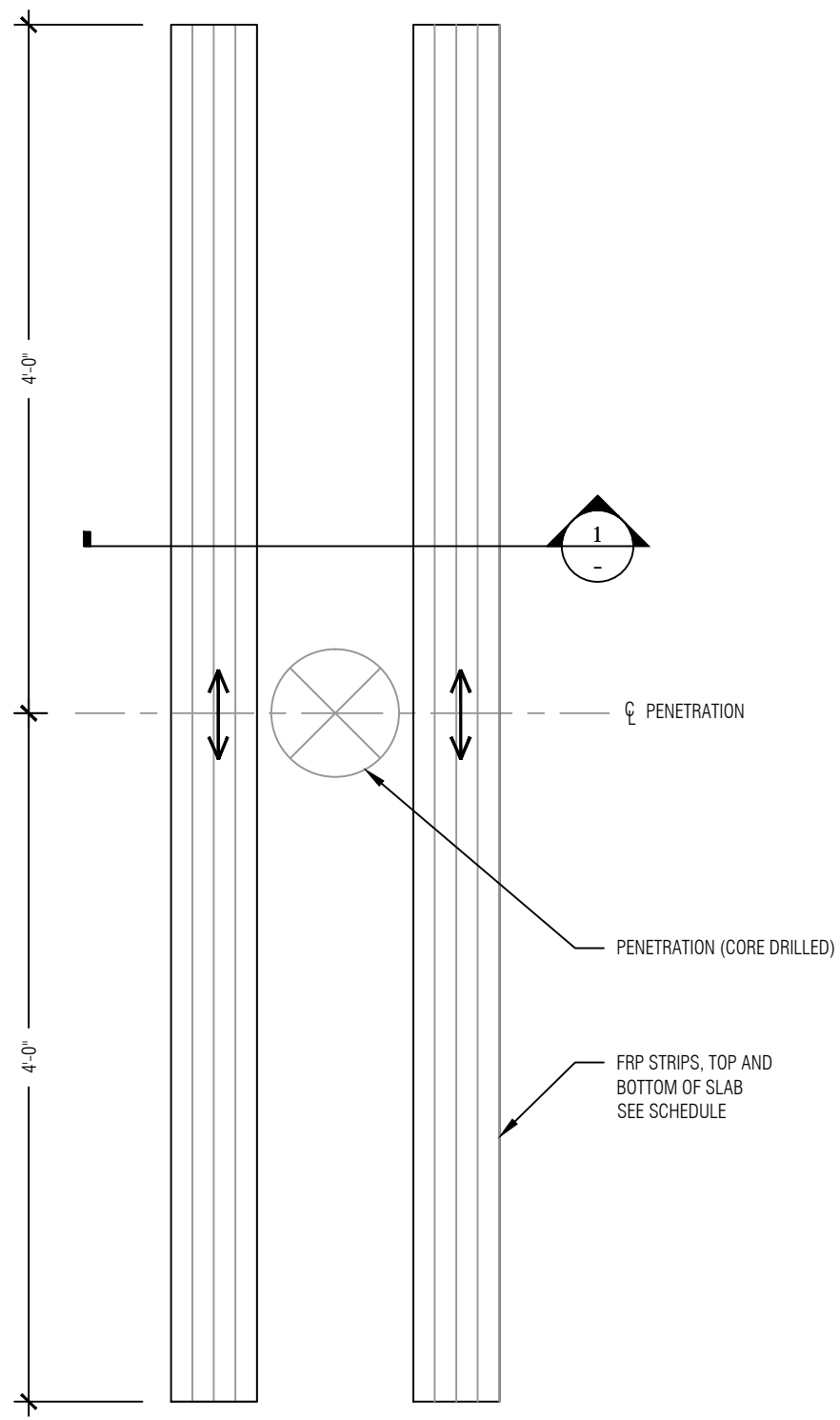


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Engineer: S. Wisotzkey	Revision Date: 2012/01/17
Plan Checker:	Revision Time: 11:00 AM
Approved by:	Sheet: 11 of 11

GENERAL NOTES:

1. Mark perimeter of areas to be strengthened. The perimeter line should extend beyond the exact limits to ensure that all required areas are roughened.
2. Prepare all surfaces to receive composite strengthening by grinding, shot blasting or other means of abrasive methods to remove the existing laitance and expose aggregate.
3. Remove dust and debris from surfaces using compressed air, brooms or vacuum.
4. Clearly mark all locations.
5. Apply one prime coat of Tyfo® S epoxy to all areas to receive composite strengthening (epoxy may be thickened with cab-o-sil based on the site conditions as determined by the on site Fibrwrap® technician).
6. Immediately apply the pre-cut and pre-saturated Tyfo® Fibrwrap® System to the required locations as detailed.
7. Finish all seams and edges with thickened Tyfo® S epoxy.
8. Allow approximately 12-hours (time may be adjusted by the on site Fibrwrap® technician) of cure time prior to finish coating.
9. Finish as required.



1 Section
N.T.S.

CORE DRILL PENETRATION SCHEDULE			
PENETRATION SIZE (DIMENSION 'X')	# STRIPS	ALLOWABLE TOP OR BOTTOM SIZE AND QUANTITY OF REBAR CUT	NOTES
UP TO 8"	4	6#3, 3#4, 2#5, 1#6	1 STRIP EACH SIDE OF PENETRATION, TOP AND BOTTOM
8.1" TO 16"	8	12#3, 7#4, 5#5, 3#6	2 STRIPS EACH SIDE OF PENETRATION, TOP AND BOTTOM
16.1" OR GREATER	SEE NOTES	VERIFY	CONTACT ENGINEER OF RECORD

NOTES:

1. All frp strips are 1 layer of the Tyfo® SCH-41H System, 6" wide, 8'-0" long centered on center of penetration. Strips to be installed prior to core drilling.
2. General contractor to verify size and number of existing rebar cut from core drilling. If top or bottom size and quantity of rebar cut exceeds allowable per schedule, contact engineer of record.

D Typical Layout At Core Drilled Penetration
N.T.S.

2. MEP Systems

Due to the restrictive ceiling height, typical on many of the floors, and the fact that the clear space between slabs is 8'; it was very challenging to fit all the equipment that requires installation. This major challenge was addressed by employing BIM in order to coordinate the location and construction of these major systems. BIM was also used heavily to assess clashes and to ensure that all of the equipment would fit within the concealed space.

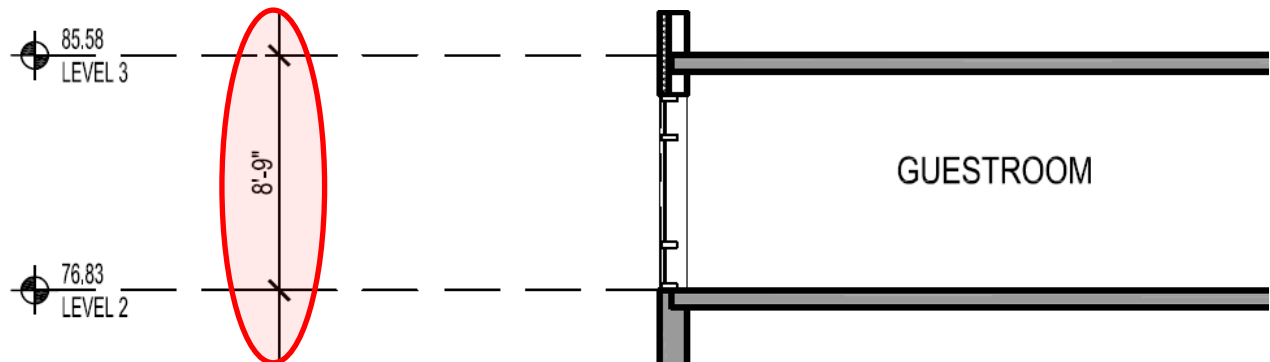
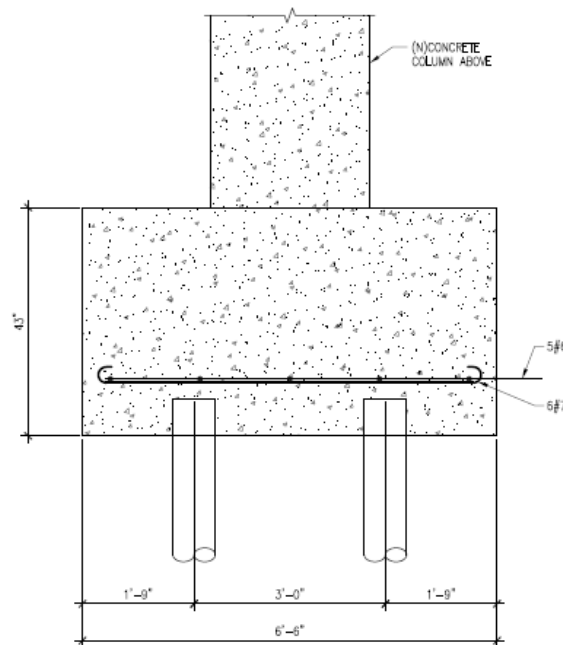


Figure 1 shows the typical clear space height from slab to slab

3. Micro pile Installation

The Micro pile Installation by Hayward Baker required extensive demolition, shoring and coordination in order to install the system. The micro piles were installed in the cellar level of the structure in the main core of the building where the new stair and elevator core will be located. The location of the system installation made for many challenges that required a thorough address in order to successfully complete the installation of the many micro piles. Below are details of a typical micro pile with a pile cap, the floor plans, a zoom in of one of the plans, and lastly several photos to help show the extent of these constructability issues. The main challenges associated with this installation are the number of micro piles, the depth at which they need to be drilled into bedrock, and of course the structural integrity of the building. Hayward Baker solved the challenge of installing the 78 micro piles by installing 4-6 micro piles in one shift. The second challenge of getting to a required depth of 11'-0" into rock was achieved by utilizing an electric/hydraulic powered crawler drill rig well-suited for the tight fit and confined space. The most critical challenge was to maintain the structural integrity of the building while work was being completed in the cellar level. They dealt with the structural integrity of the building by supporting the structure with a large hydraulic jack, as shown in the drawing below. They also installed temporary steel columns and beams to help support the spans as shown in the many photos below.



2 - PILE CAP
3/4" = 1'-0"

Figure 2 Typical pile cap detail



Figure 3 shows the extent of the micro piles on the structural cellar plan

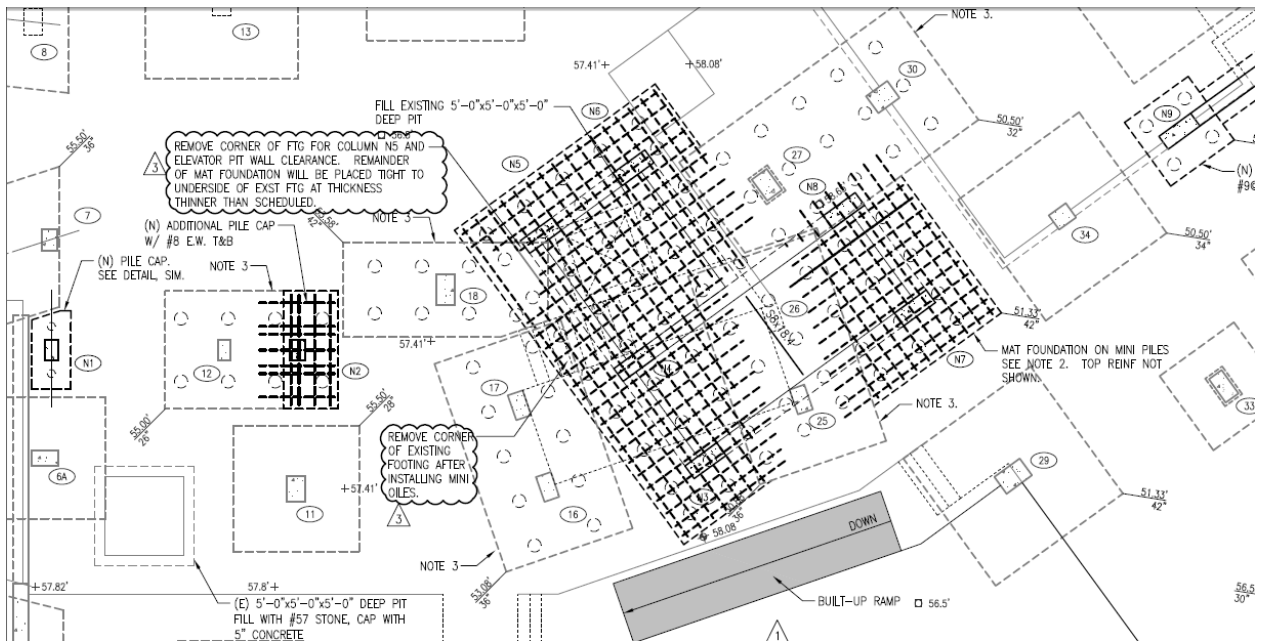
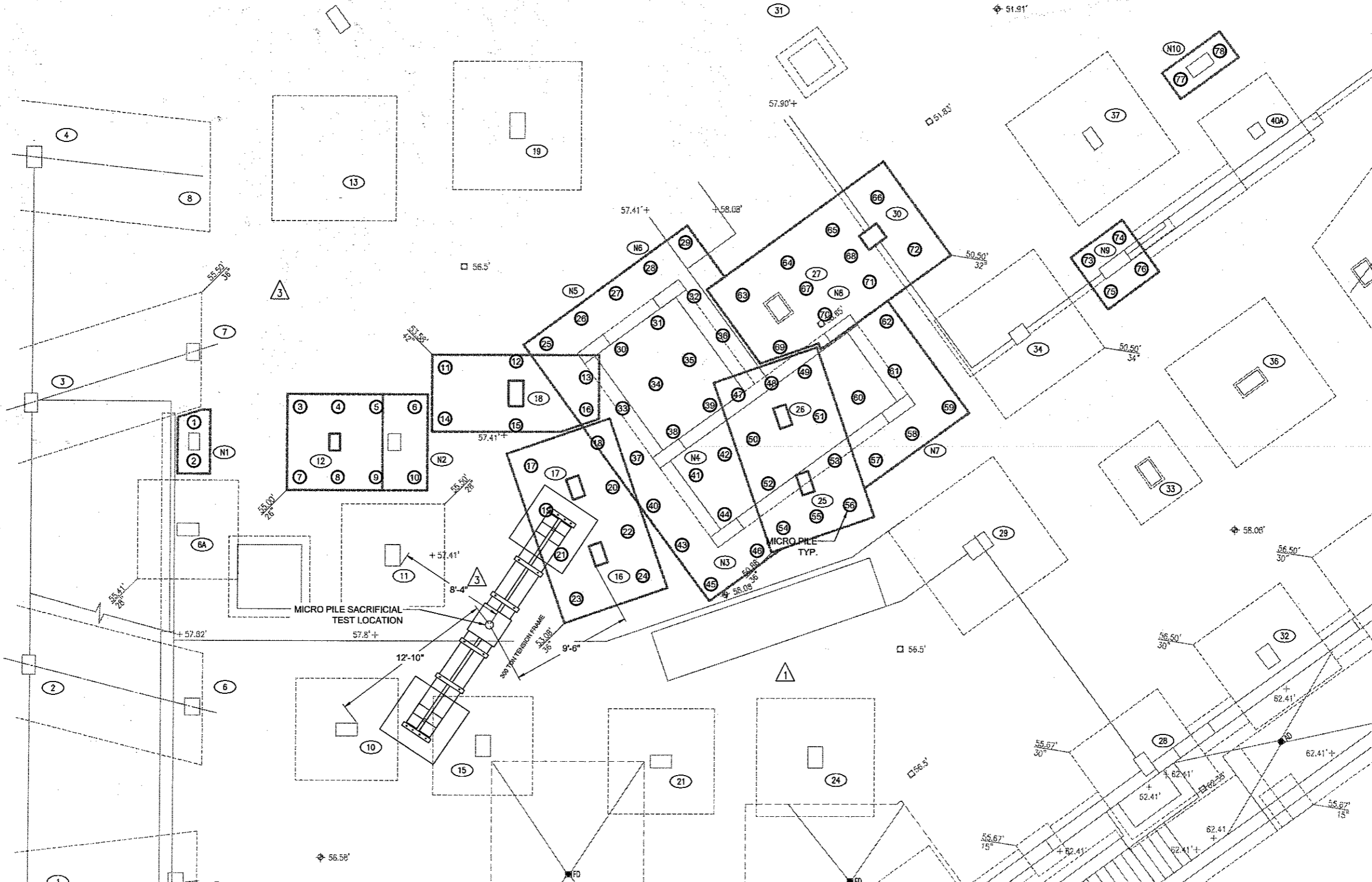
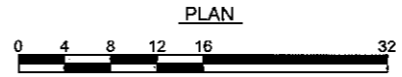


Figure 4 shows a zoom in on figure 1 showing the locations of the installation of micro piles on 42" thick mat slabs located on the cellar level



Figure 5 the photos above show the extent of the Micro pile installation and help convey the challenge of installing a new structural system below an existing building

REFERENCE:
 • CONCORDIA S101_CELLAR-FOUNDATION FOR CONTRACTOR.DWG.



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 PLOT Date: 1/13/2012 10:30 AM
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REV. NO.	DESCRIPTION	DATE

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SHEET TITLE	PROPOSED M-PILE LAYOUT: PLAN
PROJECT NAME	THE CONCORDIA
PROJECT ADDRESS	NEW HAMPSHIRE AVE. WASHINGTON, DC
HBI PROJECT NUMBER	14845
ISSUE DATE	1/13/2012
SCALE	1/8"=1'-0"
DRAWING / SHEET NUMBER	14845-001