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Ithaca, New York
28 October 2013

Peggy Ryan Williams Center

Technical Report 1

Executive Summary

The Peggy Ryan Williams Center, formerly known as “The Gateway Building,” is a four story office building located on the Ithaca College campus, Ithaca, New York. The building was originally known as “The Gateway Building” because the college saw the building as a gateway to the campus. At the time, the college was moving into a new era of sustainability and they wanted to show their prospective students, employees, and visitors the strides that they were making towards their goal.

Sustainability and a desire to connect with nature were both driving forces for the building’s architectural features. The large areas of glass, offering vistas to Cayuga Lake, allow the occupants to feel like they are part of the nature around them. Other eco-friendly architectural features include the “V” shaped roof which promotes rainwater collection and the large atrium which extends through the building to stimulate natural ventilation.

The structural system components are fairly common; however, their placement and size variations make the framing irregular. The roof of the building is constructed of roof decking, which spans perpendicular to the beams, girders, and columns. The floor of Level 1 through Level 3 consists of composite decking and wide flanged beams, girders, and columns. Various beams and girders are provided with shear studs for composite action. Sizes and spans of the wide flanges vary greatly throughout the building and even throughout a single floor framing system. At locations where the building cantilevers, moment connections and larger beam/girder sizes make the cantilevers possible.

Columns, piers, and drilled piers support the foundation for the PRWC. The drilled piers range from resting on top of bedrock, to being drilled down 4’-0” below competent bedrock, depending on their location and loading (these loading conditions will be further evaluated in a later technical report).

Another distinctive feature of the Peggy Ryan Williams Center is the pedestrian bridge, which connects the building to the adjacent Dillingham Center. The bridge is a box truss supported in a double cantilever configuration with a 2” expansion joint on either end. I am looking forward to attempting to improve this existing design for the bridge.

Due to its location, the PRWC was designed following the 2002 Building Code of New York State (BCNYS) which adopted the 2000 International Building Code (IBC). In addition to the BCNYS, additional loading and design requirements from American Society of Civil Engineering (ASCE) 7-98 are incorporated by reference into the IBC. In addition, various other codes were used in the design and are discussed in further detail in the following report.

Table of Contents

Building Introduction

Purpose and Scope

The purpose of this technical report is to describe the physical existing conditions of the structural system of the Peggy Ryan Williams Center, located in Ithaca, New York. The contents of this report include the foundation system, gravity system, lateral system, loads and their respective load paths, materials, design codes, and special structural features. While this report only includes a basic overview of the structure, the subsequent technical report will include specific load determinations and calculations.

General Description of Building

With the global push towards sustainability, the Ithaca College decided that it was important to show that their college was moving forward with the times, being eco-friendly, and wanting to incorporate their beautiful surroundings into the campus design. This led to a new era of architecture at Ithaca campus.

The Peggy Ryan Williams Center (PRWC) is a key aspect of fulfilling the new architectural objectives of the college because it is seen as a gateway. The occupants of this 58,200 square foot, 74 foot tall building include the college's admissions staff as well as numerous administrative offices. A typical floor plan may be viewed below in Figure 1. The building is also one of the first sights that visitors see upon arriving to the campus. Therefore, Ithaca College saw the building as a way to show perspective students, employees, and visitors that their college was moving forward to be more "green" and incorporate the surrounding nature.

The architecture of the building was also driven by a desire to allow its occupants to not only view the nature around them; but also, to feel as if they are a part of it. These sensations were achieved by providing many large areas of glass and designing a floor plan at angles other than 90 degrees. The irregular angles help to direct the occupants' eye to the most appealing surroundings, such as the breath-taking view of the nearby Cayuga Lake. The resultant irregular floor plan may be seen on Figures 1 and 2 below.

Another important feature of the PRWC is the pedestrian bridge, which may be viewed in Figure 3 below. The bridge allows its users to go between the PRWC and the adjacent Dillingham Center without going outdoors.

LEED Platinum is the prestigious title that the Peggy Ryan Williams Center was awarded by USGBC. However, this achievement required years of planning and sustainability considerations. Most of the architectural appearance of the building was governed by sustainability. Some examples of sustainability include the main roof taking on a slight "V" shape as to help collect rain water, the atrium being designed to assist with natural ventilation, green roofs, geothermal heat wells, solar shading, and many large areas of glass to allow for day lighting.

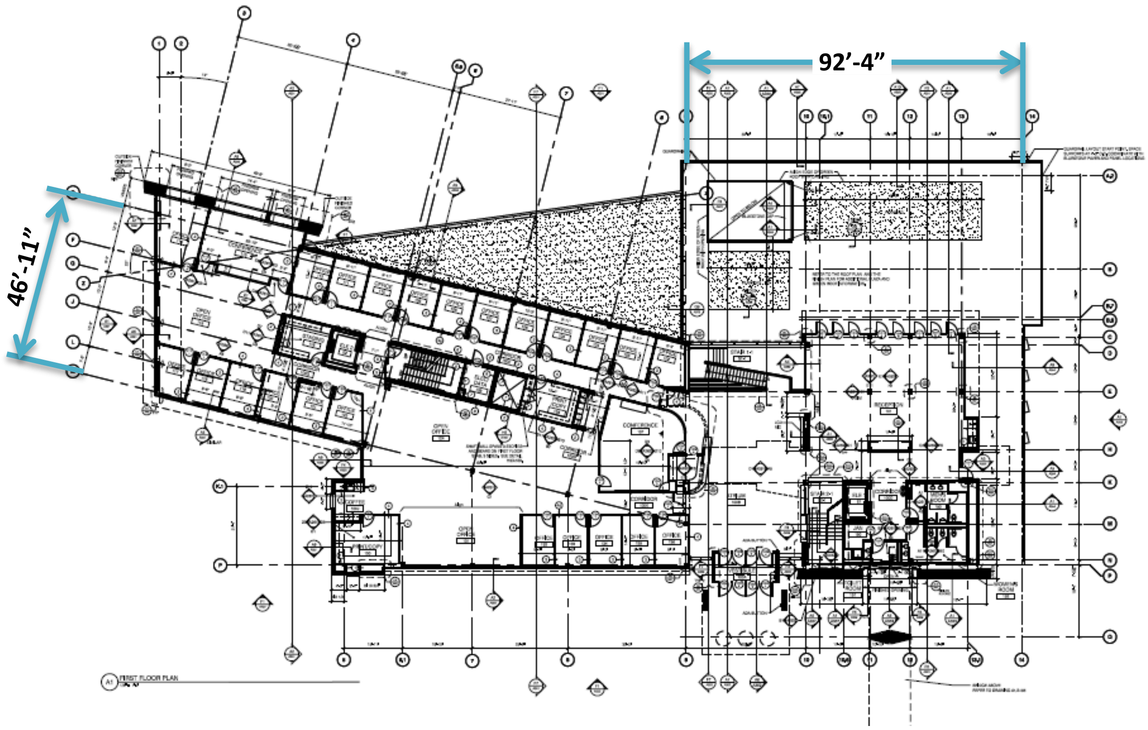


Figure 1: Typical Floor Plan (Level 1)
Drawing A101

Figure 2: View from the North Showing Irregular Façade of the PRWC
Photo provided courtesy of Holt Architects.

Figure 3: View from the Southeast Showing the Pedestrian Bridge
Photo provided courtesy of Holt Architects.

Brief Overview of Structural Framing System

The structural gravity system of the Peggy Ryan Williams Center consists of composite decking supported by wide flange beams, girders, and columns. The foundation consists of reinforced concrete grade beams and piers. The lateral system is comprised of concentrically braced structural steel frames. A 100-foot long box truss pedestrian bridge connects the building to the adjacent Dillingham Center. The following sections of this technical report will discuss these components in detail; also material strengths, connections, loadings, locations, and applicable codes will be covered.

Materials

The structural materials used throughout the PRWC are various strengths of steel and concrete. These material strengths may be viewed below in Figures 4 and 5.

Figure 4: Structural and Miscellaneous Steel Strengths (*Drawing S001*)

Steel Shape	Steel Grade
Rolled Steel W Shapes	ASTM A992 Grade 50
Rolled Steel C and MC Shapes	ASTM A36
Rolled Steel Plates, Bars, & Angles	ASTM A36
Hollow Structural Sections (HSS)	ASTM A500, Grade B or C
Pipe	ASTM A53, type E or S, Grade B
*For connections, provide higher grade as required for capacity.	

Figure 5: Concrete Material Strengths (*Drawing S001*)

Concrete Component	Concrete Strength
Footings, Foundation Walls, Piers, Miscellaneous	f'c = 4,000 psi
Interior Slabs on Grade or Slabs on Deck	f'c = 3,500 psi
Retaining Walls, Basement Walls, Exterior Slabs, and Grade Beams	f'c = 4,000 psi
*Reinforcing Steel for Concrete → ASTM A615, Grade 60	

Structural Overview

Geotechnical Report and Recommendations

Through their studies, the Geotechnical Engineer (CME Associates, Inc.) made numerous recommendations for the foundation of the Peggy Ryan Williams Center. On the north side, shale bedrock was found 15 feet below grade with unprepared fill on top. The bedrock stratum is underlain by silt. The 2002 Building Code of New York State (BCNYS) does not allow a foundation to bear on unprepared fill. Therefore, all foundations were required to bear on competent shale bedrock. The competent bedrock was presumed to have a soil bearing pressure of 20,000 psf. There is no need to drill into the exposed bedrock on the south side. In order to have competent bearing, CME Associates, Inc. recommends using drilled piers. This conclusion was drawn due to the variable depth to a competent bearing surface and the risks associated with large excavations close to groundwater. CME also recommended that all drilled piers should have a planned bottom elevation not less than 2'-6" below the top of the shale bedrock and a diameter not less than 2'-0". In regards to the drilled piers, the design and construction should follow ACI 336.3R.

Due to the location, some extra conditions regarding frost and hydrostatic pressure must be met. Because the shale bedrock at the site is frost susceptible; footing foundations, frost walls, exterior grade beams, and pile caps exposed to freezing conditions should be designed with at least a 4’-0” final cover. In order to prevent hydrostatic pressure, subsurface walls that are backfilled on their exterior side only should be waterproofed and drained.

Special precautions must be taken for the slab-on-grade installation. All subgrade areas where the slab-on-grade will be installed must first be proof rolled to ensure that there are no unstable areas within the site. Under the garden level and the mechanical room, the slabs-on-grade should be underlain by a reinforced polyethylene vapor barrier. The barrier should be placed over an under drain system. Design of all concrete slabs-on-grade should be consistent with standards such as ACI 360R, “Design of Slabs-on-Grade.”

Foundation System

Structural Framing System

The PRWC foundation includes a wide variety of structural components ranging from grade beams to drilled piers. The foundation walls themselves range from 1’-0” thick with 3’-0” wide footings to 1’-8.5” thick with 6’-0” wide footings. In areas where the footings cannot reach down to competent bedrock, piers and then drilled piers are used to reach bedrock. Most areas of the building are provided with a 5” concrete slab-on-grade. This slab is depressed in areas where special flooring is used. In various portions of the building, grade beams are utilized to transfer the loads of load bearing walls from above (stairwell and elevator shaft), braced frames, and to help tie back the column supporting the overhang in the north corner of the building. The grade beam sizes range from 12” wide and 36” deep to 51” wide and 48” deep. Their reinforcement typically consists of #8 top and bottom bars and #4 stirrups at 12” on-center. Various locations and sizes of grade beams may be viewed on Figures 6 and 7.

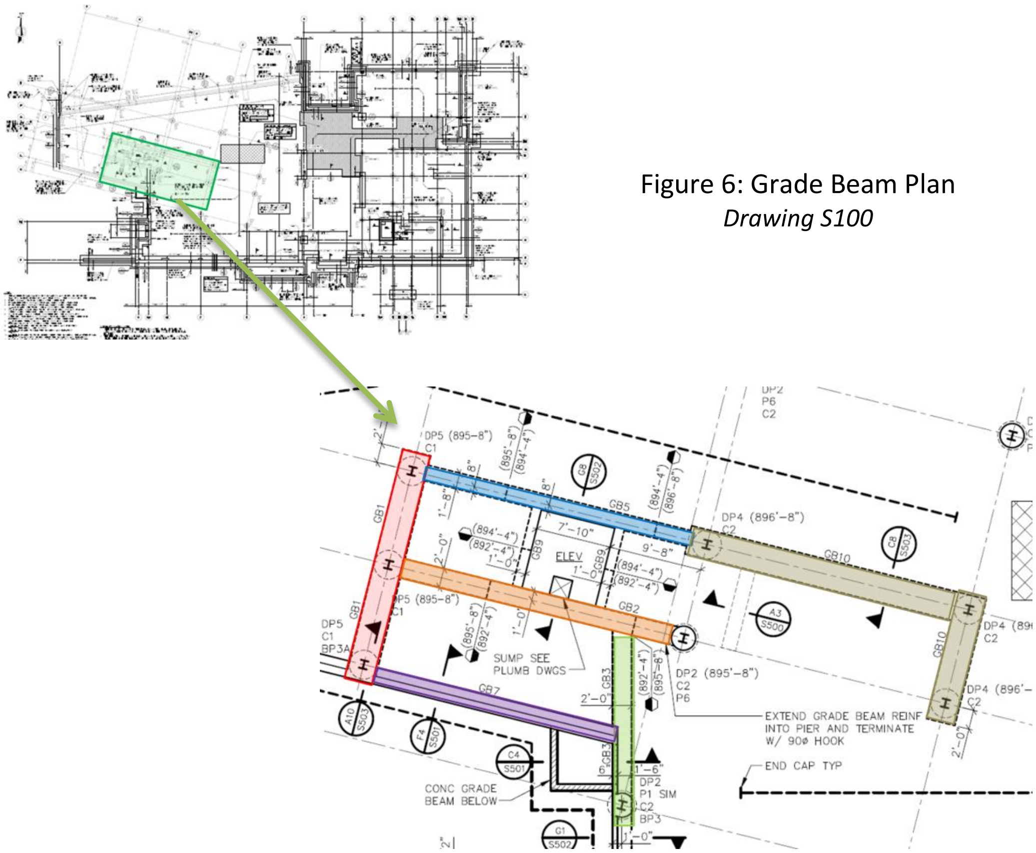


Figure 6: Grade Beam Plan
Drawing S100

Figure 7: Concrete Grade Beam Schedule
Drawing S503

CONCRETE GRADE BEAM SCHEDULE

MARK	SIZE W	SIZE D	REINFORCING BOTTOM BARS	REINFORCING TOP BARS (FULL LENGTH)	STIRRUPS SIZE	STIRRUPS SPACING	REMARKS
GB1	36"	48"	(5)#9	(5)#9	#4	12"OC	
GB2	24"	VARIES	(4)#8	(4)#8	#4	12"OC	
GB3	24"	48"	SEE G1/S502				
GB4	36"	32"	(5)#8	(5)#8	#4	12"OC	
GB5	20"	VARIES	(4)#8	(4)#8	#4	12"OC	
GB6	51"	48"	(10)#8 (2) LAYERS	(10)#8 (2) LAYERS	#4	12"OC	
GB7	20.5"	48"	SEE F4/S501				
GB8	12"	36"	(2)#8	(2)#8	#4	12"OC	
GB9	12"	VARIES	(2)#8	(2)#8	#4	12"OC	
GB10	36"	36"	(5)#8	(5)#8	#4	12"OC	

NOTES:
1. PROVIDE 90° HOOK AT ENDS OF ALL HORIZONTAL REINFORCEMENT IN GRADE BEAMS (TYPICAL).
2. LAP SPLICE HORIZONTAL REINFORCING 48 BAR DIAMETER FOR GRADE BEAMS AT BRACED FRAMES.
3. FOR GRADE BEAM SECTION SEE C8/S503.
4. PROVIDE #5 HORIZONTAL AT 12"OC EACH FACE IN GRADE BEAMS BETWEEN TOP AND BOTTOM REINFORCING, UNLESS NOTED OTHERWISE.

Loads from the grade beams are then transferred to piers and in turn to the drilled piers in order to finally reach competent bedrock. The piers range in size and shape depending on the location. Two examples may be viewed below in Figure 8. The typical pier reinforcement is #6 vertical rebar and #4 ties. The loads from these piers are then transferred to the drilled piers. All of the drilled piers are 3’-0” in diameter with #8 vertical reinforcement and #4 ties at 12” on-center. Pier depths range from simply resting on top of the bedrock to being drilled 4’-0” below the surface of the bedrock. A typical drilled pier section may be viewed in Figure 9 below.

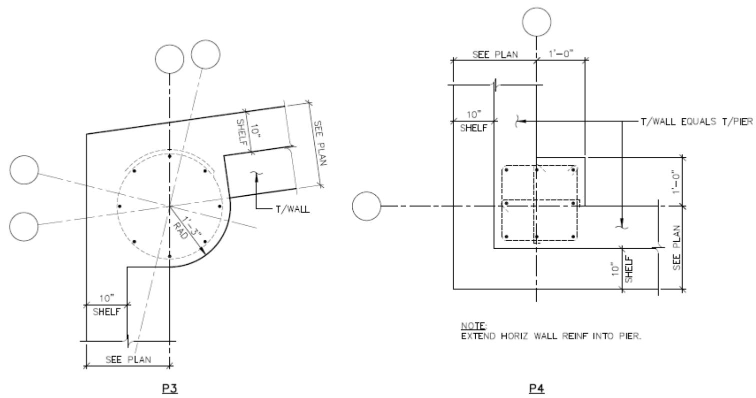


Figure 8: Example of Pier Sections
Drawing S503

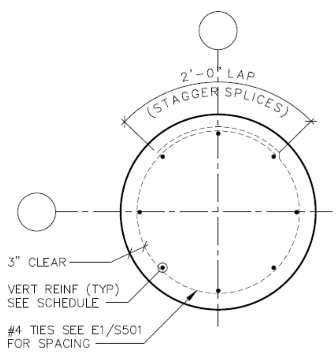


Figure 9: Typical Drilled Pier Section
Drawing S503

Column Description

Columns in the foundation and throughout the building range from W8x28 to W10x60, while some HSS5x5x5/16 are also present. Column type 2 (W10x49) is the most commonly used size throughout the superstructure of the building. The column schedule may be viewed in Figure 10 below. These columns have a pinned connection at their base which allows no moment transfer to the pier below. Figure 11 below shows the column being connected to a 1" thick base plate and in turn the pier using anchor bolts.

COLUMN SCHEDULE

MARK	SIZE	BASE PLATE TYPE
C1	W10x60	BP1
C2	W10x49	BP1
C3	W10x39	BP2
C4	W8x48	C1/S559
C5	W8x31	C1/S559
C6	HSS5x5x5/16	BP6
C7	W8x28	BP3

NOTE:
BASE PLATE TYPES ARE TYPICAL FOR COLUMNS INDICATED IN SCHEDULE UNLESS NOTED OTHERWISE ON PLAN. SEE F1/S555 FOR BASE PLATE DETAILS.

Figure 10: Column Schedule
Drawing S555

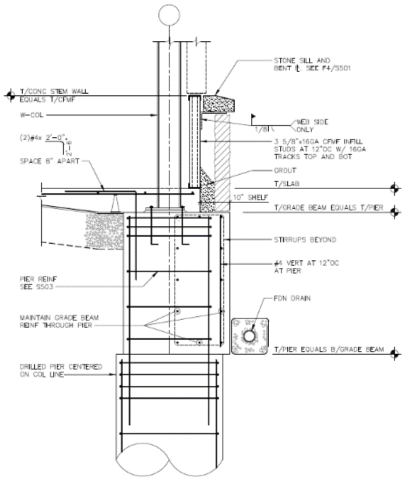


Figure 11: Illustrating Pinned Connection of Column
Drawing S501

Gravity System

Floor System

Structural Framing System

Each level of the PRWC has a 6" concrete slab on a 3"x20 gauge galvanized composite metal deck. However, the first level exhibits some deviation from this typical floor system. One example of this deviation occurs on the plaza deck and green roof areas. These areas are supported by 6" concrete slab on 3"x20 gauge galvanized composite metal deck with #4 epoxy-coated reinforcement at 16" on-center, each way. The reinforcement in this deck system is present to lessen the effects of shrinkage and thermal contraction/expansion. Due to this slab being exposed to the weather, it is prone to the above thermal effects. Another region which is not typical is the northwest section of the building, which is provided with a 7" concrete slab on 3"x20 gauge galvanized composite metal deck. The corrugations of each of the various types of decking run perpendicular to the wide-flange beams. Figure 12 below shows the varying thicknesses and reinforcement areas of the first floor framing system. (Note: The Garden Level floor system (slab-on-grade) was discussed above in the foundation system section.)

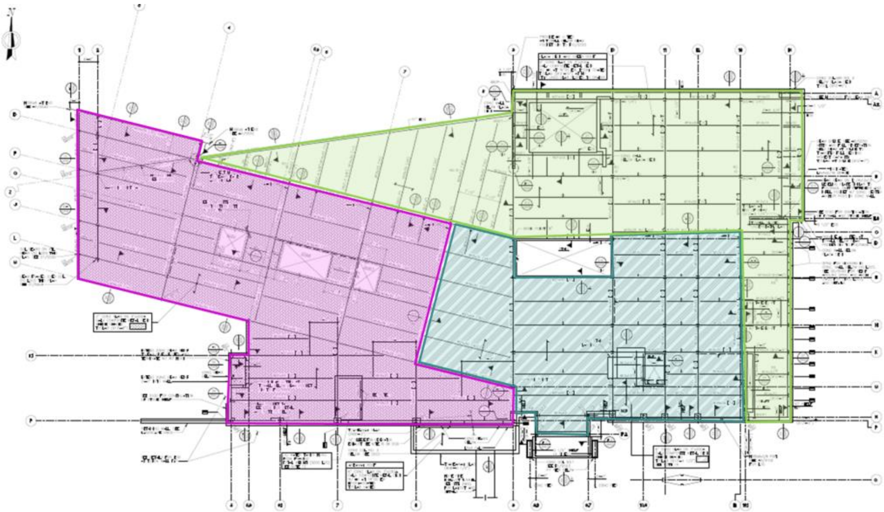


Figure 12: Varying First Floor System
Drawing S101

- 7" concrete slab on 3"x20 gauge galvanized composite metal deck
- 6" concrete slab on 3"x20 gauge galvanized composite metal deck
- 6" concrete slab on 3"x20 gauge galvanized composite metal deck with #4 epoxy-coated reinforcement at 16" on-center each way

Typical Bay

Due to geometry, there does not appear to be a "typical bay" in the PRWC flooring system. Three of the four floors do have a similar region on the northwest end of the building. Two out of the three of these floors have a 6" concrete slab on 3"x20 gauge galvanized composite metal deck; therefore, I will consider this region to be typical. This approximately 38'x 11' bay may be viewed below in Figure 13.

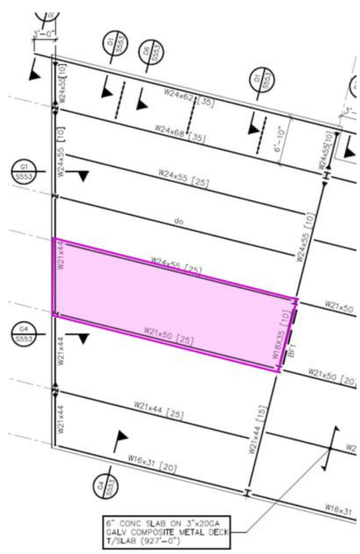


Figure 13: "Typical Bay"
Drawing S102

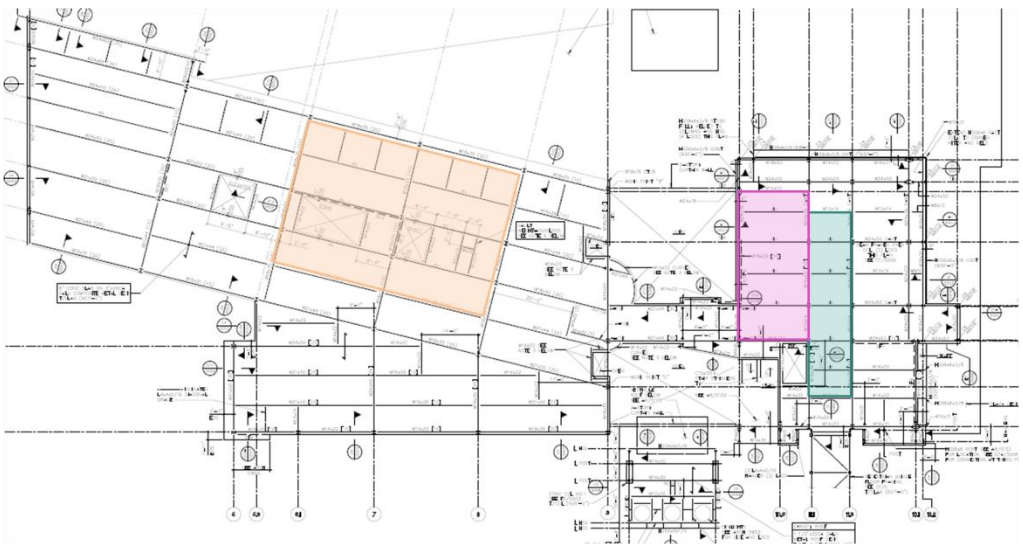
Framing System

Structural Framing System

The structural framing system of the PRWC is very irregular due to changes in geometry, cantilevers, and locations of increased loads (such as adjacent to elevator shafts and stairwells). Levels 1 through 3 include numerous beam and girder sizes and spans.

Typical Bay

On Levels 1 through 3 there are three different regions which utilize consistent beam shapes and sizes up through the levels. These regions may be viewed in Figure 14 below.



W12x14

W14x22

W18x35

Figure 14: Typical Bays for Levels 1 Through 3
Drawing S102

Columns

The vast majority of the columns from the foundation (Garden Level) continue up through the building, *see Columns in Foundation System above for more details*. On Level 1, various W10x39 columns were added along the southern perimeter of the building. These columns bear on the load bearing foundation with a pinned connection at the base (as seen in Figure 11 above in the Foundation System section). A few columns are also added to the cantilevered regions in upper levels of the building. These columns are typically W8x48 or W8x31.

Note: The Column Schedule may be viewed in Figure 10
(Of the Foundation System section)

Roof Gravity System

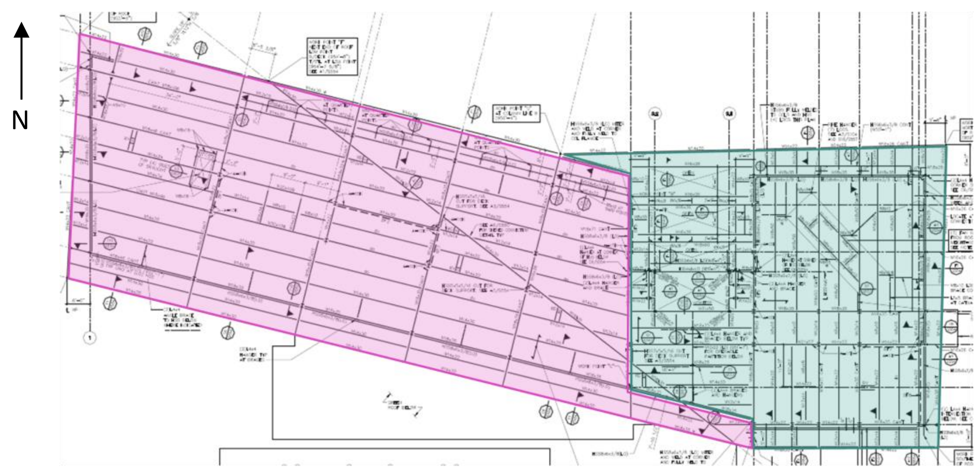
Structural Framing System

The roof system of the PRWC follows the same basic structural system of the floors below; decking, wide-flange beams, girders, and columns. However, the roof is not supported by a composite deck. Instead, since the roof does not support as large of a load, a much lighter 1.5”x20 gauge galvanized metal roof deck is used. The deck is then supported by wide flange steel beams and girders. A tapered HSS8x6x3/8 sits on top of the wide-flange girders along the perimeter of the building. The HSS is tapered to match the slope of the roof deck which it supports. A roof cantilever (5’-10”) is formed from wide-flange beams spaced at 5’-3”.

The western side of the building has a similar roof framing plan to that of the floor framing plans below it. On the other hand, the eastern side of the building displays a much more intricate framing design. The intricacies are due to such things as voids in the roof (to allow sunlight to pass through), the atrium, and HVAC fans which are hung from the roof framing.

Typical Bay

Due to the intricacies of the eastern side of the building mentioned above, that region of the building does not possess a typical bay. On the western side of the building, a W14x30 was used unless the spans decreased or the girder acted as a cantilever. *Please see Figure 15 below which illustrates the different regions of the roof framing system.*



Eastern End of the Building – Intricate Framing

Western End of the Building – Framing Similar to Floors Below

Figure 15: Different Regions of the Roof Framing System

Drawing S104

Lateral System

In both the North-South and the East-West directions, concentrically braced structural steel frames resist the lateral load. The braced frames are located throughout the building and may be seen on the plan below (Figure 16). Braced frame columns are typically W10s, while HSS6x6x3/8 are commonly used for the diagonal braces. A typical braced frame and its connections may be viewed below in Figure 17. The connection detail illustrates the pinned connection from the base of the braced frame columns down to its support (foundation wall, footer, or pier). This connection is not a moment connection because the flange motion is not restricted (thus moment may not be transferred across the connection).

Various braced frames are provided in the north-south direction to resist the lateral loads. However, in the east-west direction, there is a lack of effective braced frames. In order to resist unbalanced loads there should be at least two (staggered) frames in each direction.

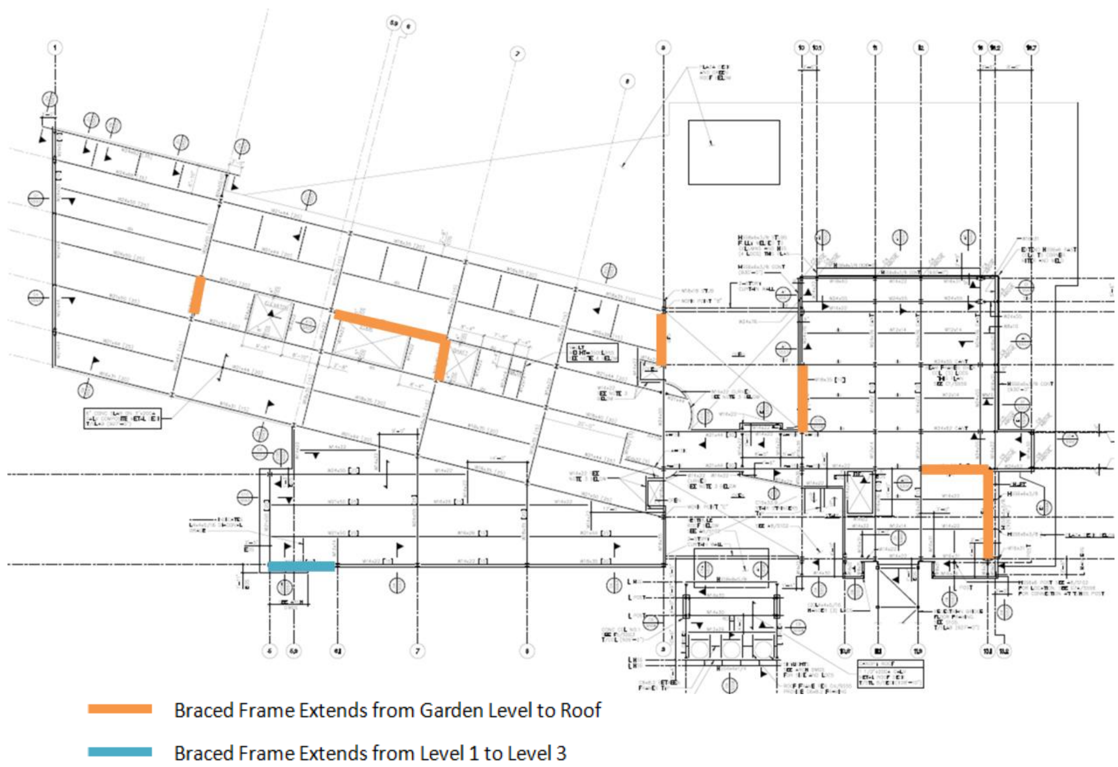


Figure 16: Level 2 Braced Frame Layout

Drawing S102

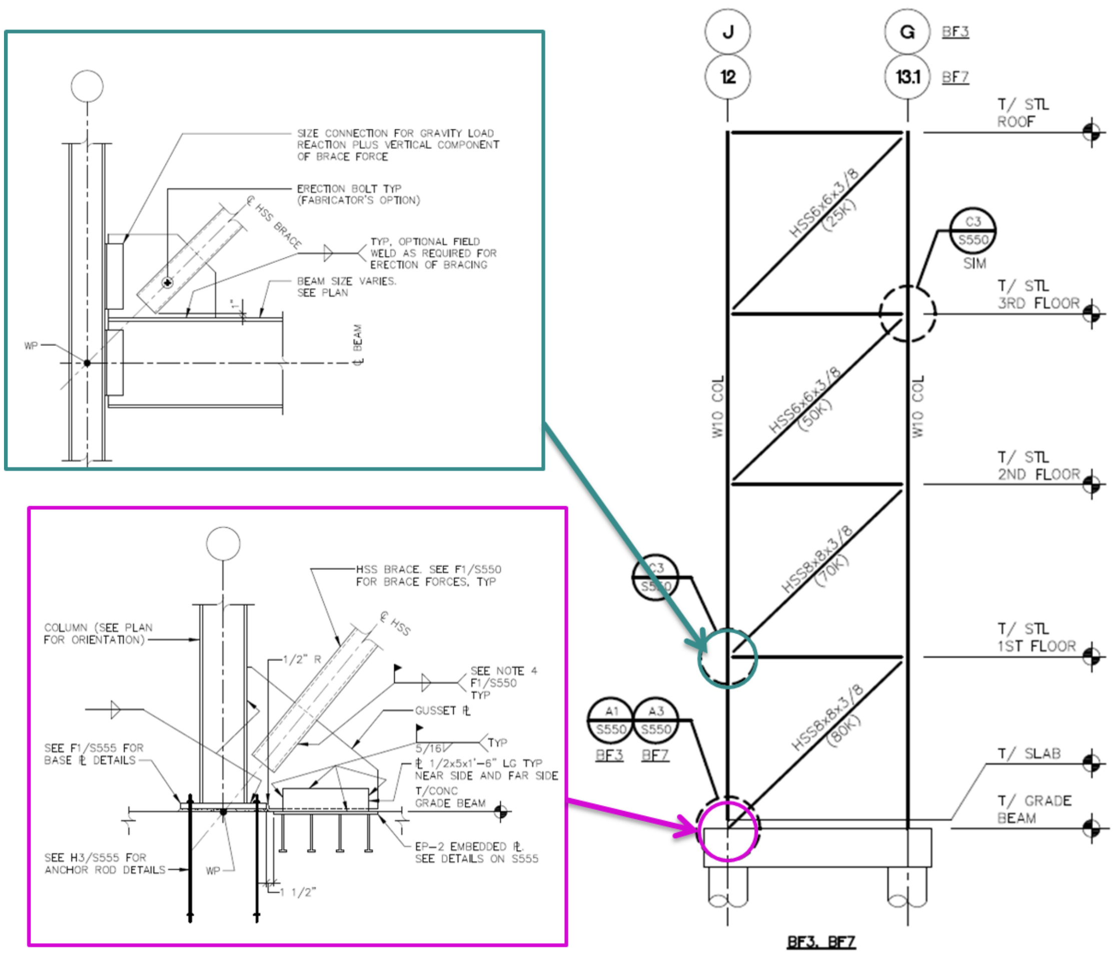


Figure 17: Typical Braced Frame and Connections
Drawing S550

Joint Details

Braced Frames

As previously mentioned (and diagramed in Figure 17 above), the columns of the braced frames are pinned to their respective foundation wall, footer, or pier. The diagonal braces of the upper connections (the blue detail in Figure 17) are simply pinned with an erection bolt. The diagonal brace at the bottom (the pink detail in Figure 17) is connected with a weld on either side of the member, making it a moment connection.

Wide-Flanges

The majority of the beam-to-girder and girder-to-column connections are shear connections (no moment transfer due to flange movement not being restricted). However, a few beam-to-beam and beam/girder-to-column connections are moment connections (with flange movement restricted) and are denoted as such on the structural framing plans in the construction documents. These moment connections occur wherever a wide-flange is cantilevered. Typical beam-to-beam and column moment connections may be viewed below in Figures 18 and 19.

Note: Column base connections are pinned and are explained in the Column sections above.

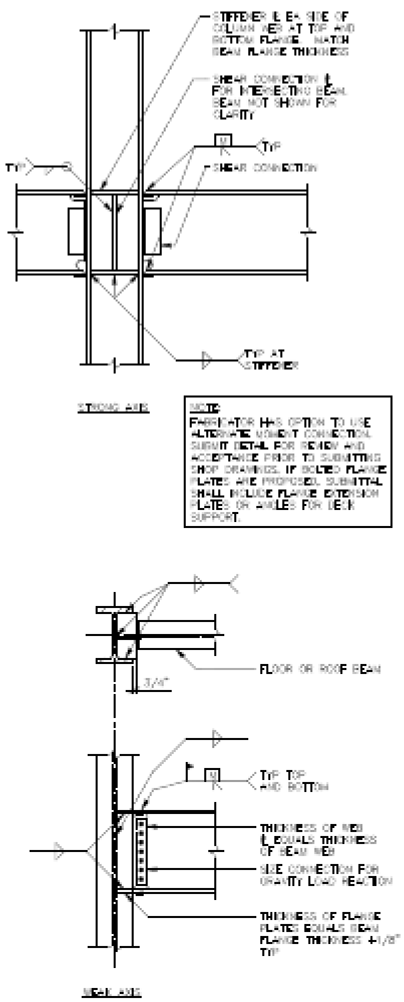


Figure 18: Moment Connection at Column
Drawing S550

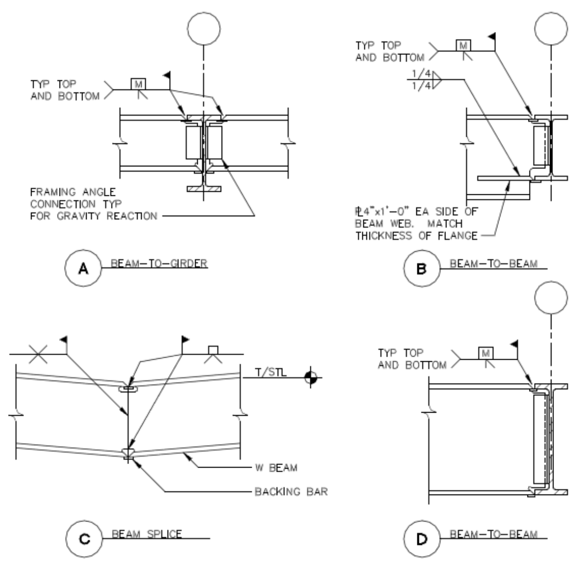


Figure 19: Beam to Beam Moment Connection
Drawing S550

Pedestrian Bridge

Foundation and Columns

The pedestrian bridge has its own independent foundation in which its columns rest on a 5'-0"x13'-0"x1'-6" footing. This moment connection may be viewed in the typical detail below (Figure 20).

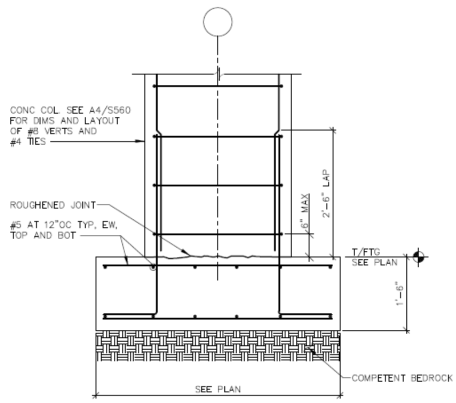


Figure 20: Concrete Footing and Column Detail for the Pedestrian Bridge
Drawing S560

The columns take on a hexagonal shape, roughly 11'-0"x3'-6". They are constructed of concrete with #8 vertical reinforcement and various #4 rebar ties. Figure 21 below shows the bridge column detail.

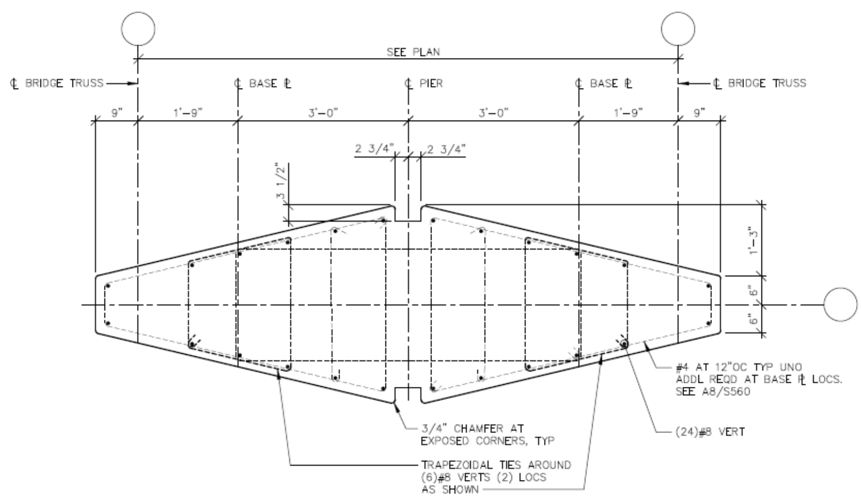


Figure 21: Bridge Column Detail
Drawing S560

Structural Framing

The pedestrian bridge is a box truss which is constructed using various hollow structural steel shapes and pipes. The top and bottom chords are both framed with HSS12x6x3/8 and the horizontal and diagonal braces are typically HSS4x4x1/4. The two side trusses have HSS5x5x5/16 vertical members and 3.5" pipe diagonal braces. Figure 22 below shows the bridge truss schematic.

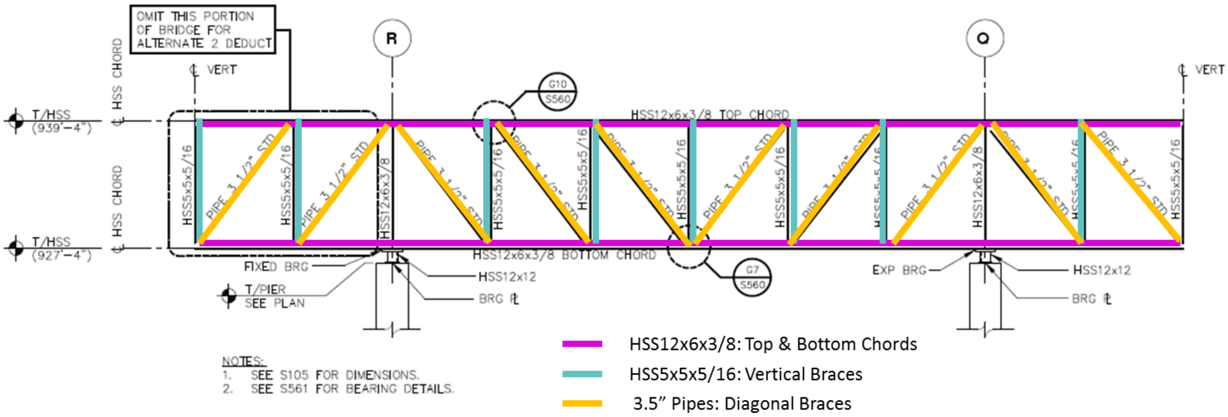


Figure 22: Bridge Truss Schematic
Drawing S560

Connections

There is a 2" expansion joint on either end of the 100' long pedestrian bridge. This allows for expansion and contraction of the bridge due to variations in temperature.

Loadings

National Code for Live Loads and Lateral Loadings

Type of Loading	National Code Used	Section of the Code
Live Loads	ASCE7-98	Chapter 4
Wind Loads	BCNYS 2002 (IBC 2000)	Section 1609.6

Description of Loads

The following is a brief description of the different types of loads and what references were used to determine the loads. This information will prove to be helpful in the next technical report in determining the quantified loads for the PRWC.

Gravity Loads

Live Loads

Live loads such as interior floors, catwalk, and plaza deck were determined using Chapter 4 of ASCE7-98.

Dead Loads

The weight of the structure and estimates of the weights of built-in equipment and finishes were used for the dead loads. These loads were determined using industry standard values for the steel, concrete, roofing materials, etc.

Snow Loads

Snow loads were determined using Chapter 7 of ASCE7-98. Because Ithaca, NY lies in a region in which ASCE7-98 deems it difficult to pinpoint a ground snow load, a case study is recommended. Using the *Structural Building Components Association* map of snow loads for New York, a more precise ground snow load may be determined.

Rain Loads

Chapter 8 of ASCE7-98 may be used to calculate rain loads.

Lateral Loads

Wind Loads

Wind loads were determined using section 1609.6 of the BCNYS 2002, which follows IBC 2000. Section 1609.6 of the IBC 2000 is entitled, "Simplified Provisions for Low-Rise Buildings." Further exploration will need to be done to determine if this method is applicable.

Seismic Loads

Seismic loads were determined using Chapter 9 of ASCE7-98. This chapter includes very extensive information on how to determine the lateral loads due to seismic conditions.

Load Paths

Gravity Loading

The gravity load path for the PRWC follows a fairly direct route down to the foundation. The live load and dead loads on the floor are immediately transferred into the composite deck floor system. From there, the loads are transferred into beams and, in turn, girders. The girder loads are then transmitted into their supporting columns and to the columns on Level 1. There are a couple of different paths that the load may then take, depending on its location. Some columns bear on foundation walls while others bear on either footings or piers. The columns, which are supported by the foundation wall, transfer their load into the wall, then to the footer, and finally into competent bedrock. Those columns that directly rest on footers simply transfer their load into the footer and then to the bedrock. Lastly, (and the most common scenario) the columns which are supported by piers transfer their loads into the pier and then into the drilled pier which directly applies its load to the competent bedrock.

Lateral Loading

Because the PRWC is not in a high seismic region, the governing lateral load is expected to be the wind load. Upon the exterior façade of the building collecting the wind load, the load is then transferred into the floor diaphragm (composite deck). The load then travels through the floor system to various braced frames located throughout the building. Because the diaphragm is discontinuous at the atrium (thus it cannot transmit lateral load), a braced frame is placed on either side of the atrium opening. From there, the load is transferred down through the respective braced frames. The braced frame is then anchored to the foundation wall, a footer, or a pier (depending on the location of the braced frame). If the load is directed into a foundation wall, the load then transfers into the footing and finally the competent bedrock. If the load is transferred directly to a footing, it simply goes from the footing into the bedrock. On the other hand, if the load is transferred into a pier, it then goes into the drilled pier, and finally the competent bedrock. The load path for uplift will be further investigated in a later technical report.

Design Codes and Standards Used in the Design

- Building Code of New York State
  - 2002 BCNYS (IBC 2000 adopted)
- American Concrete Institute
  - ACI 318-95: Building Code Requirements for Structural Concrete
  - ACI 318-99: Building Code Requirements for Structural Concrete
- American Institute of Steel Construction
  - AISC 342 LRFD (1993): Load and Resistance Factor Design for Specification Structural Steel Buildings
- American Iron and Steel Institute
  - AISI: “Specification for the Design of Cold Formed Steel Structural Members”
- American Society of Civil Engineers
  - ASCE 7-98: Minimum Design Loads for Buildings and Other Structures
- American Welding Society, Inc.
  - AWS D1.1-98: “Structural Welding Code – Steel”
  - AWS D1.3-98: “Structural Welding Code – Sheet Steel”
  - AWS D1.4-98: “Structural Welding Code – Reinforcing Steel”
  - AWS C5.4-98: “Recommended Practices for Stud Welding”
- Steel Deck Institute
  - SDI: “Design Manual for Composite Decks, for Decks, and Roof Decks”
  - SDI: “Diaphragm Design Manual”

Conclusion

Throughout this report, the existing conditions of the Peggy Ryan Williams Center in Ithaca, New York were investigated. Particular attention was devoted to the gravity and lateral structural systems, connections, loading, and design codes.

The appearance of the PRWC is not that of a standard office building. Many jagged angles and changes in the façade enable this building to stand out from the rest of the campus (showing a transition to a new era), but also to tie it to the nearby buildings which also play a role in the new era. Therefore, the impact of any redesign will need to be strongly investigated.

While the pedestrian bridge does complement the rest of the building with its large areas of glass, there are no other features of the bridge which directly link it to the PRWC. With this in mind, the bridge lends itself to a possible architectural redesign. However, caution will need to be taken so that the bridge complements both the PRWC and the Dillingham Center.

The structural framing system consists of composite decking; numerous wide flange beams, girders, and columns; structural steel braced frames; and piers. Due to the irregular geometry of the building, there does not appear to be many typical bay regions. The beam and girder sizes also change frequently throughout the framing. A good redesign would be to make the framing more economical and allow for ease of constructability by "standardizing" the sizes and locations. However, this will pose a challenge due to the changing geometry and cantilevers of the building.

Columns, piers, and drilled piers compose the foundation system. The drilled piers range from resting on top of competent bedrock to being embedded 4'-0" into bedrock. This will be important to keep in mind for any changes to the framing system. As columns are added, the depth the pier will need to be drilled into bedrock must be considered in order to avoid increasing the cost of construction.

During the next technical report, the pedestrian bridge may pose a challenge when conducting load calculations. Due to the bridge being exposed to outdoor elements, the large uplift on the bottom chord and the snow load (with drift) on the top chord will need to be considered. The bridge may also require special investigation if a redesign differs from the existing double cantilever design. If the design is altered, the load and other effects it places on the preexisting Dillingham Center will need to be strongly examined.

The Peggy Ryan Williams Center will provide a unique learning experience in which constructability, economy, architectural features, and bridge design may be explored.