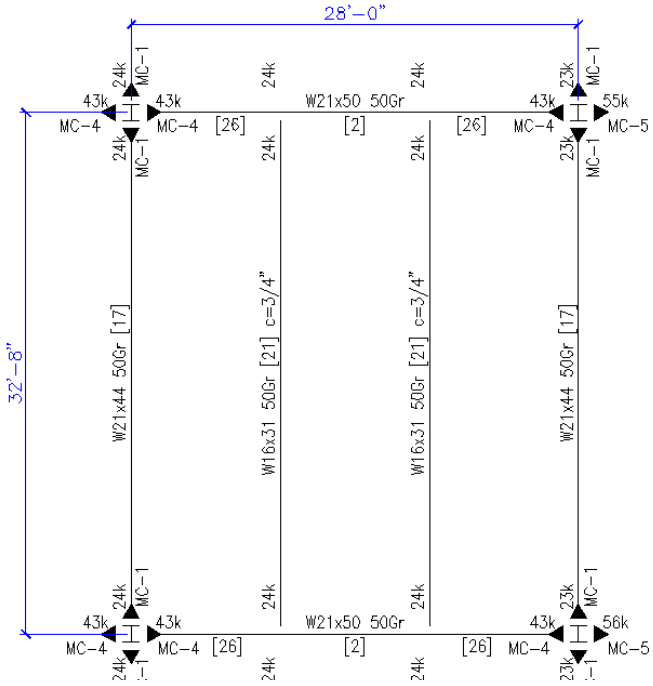
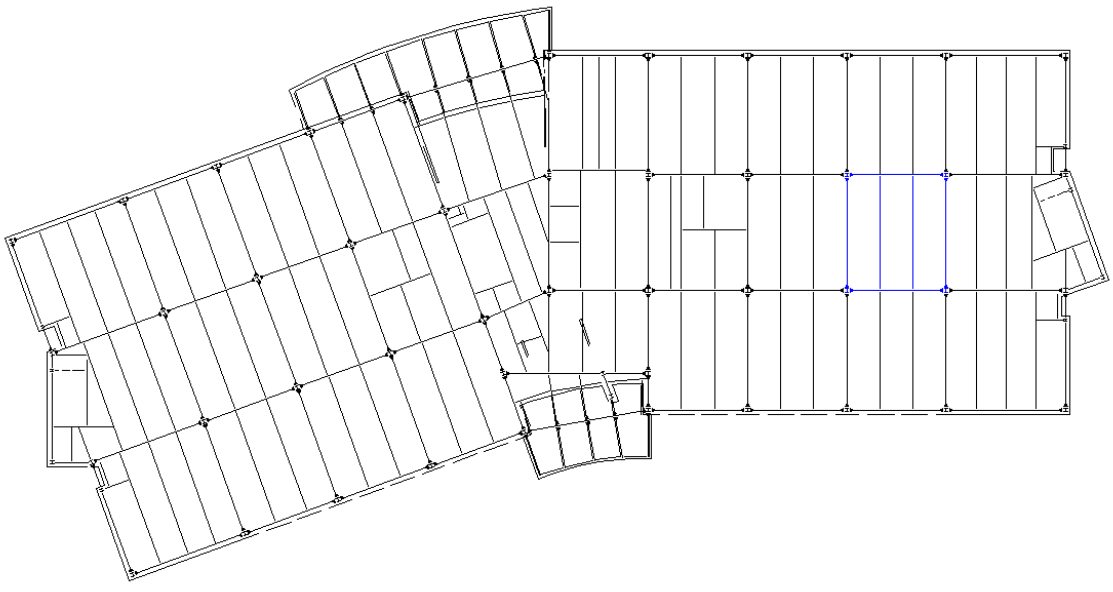
Structural System Information

Floor System

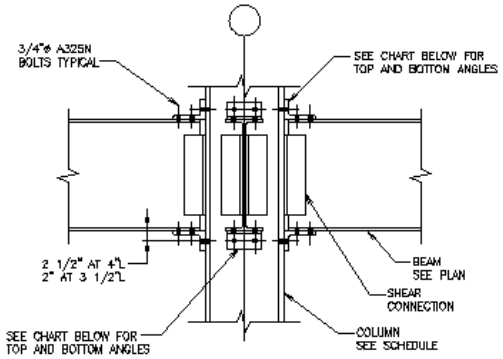
The floor system at the Hershey Academic Support Center utilizes a composite beam floor framing system with 3" 20 gage Vulcraft galvanized steel metal decking and 6x6 W1.4xW1.4 Welded Wire Fabric between the steel members and the concrete. The 2.5" Lightweight concrete along with the decking give an overall slab thickness of 5.5" and a total system depth at the girder of 26.5". To hold together the decking and concrete slab, 0.75" ø x 4.5" long headed steel studs were used. Shear connections are used between the beam flanges and columns to hold the gravity loads on the building. Each typical bay is 28' by 32'-8" and consists of W21x50 and W21x44 girders with W16x31 interior beams that have a ¾" camber. Material strength is given as 4000 psi for the concrete slab and Fy = 50 ksi ASTM A-572 steel in the beams and girders. The floor framing plan and a typical interior bay are shown below in blue.





Lateral System

The main lateral system for the Hershey Academic Support Center is varying moment connections located at almost every column with a total of 617 moment connections used in the building. These connections extend to all 5 floors of the buildings and brace the building in both the N-S and the E-W conditions. The top floor does not utilize moment connections in the E-W direction, but uses Cross Bracing to help prevent the lateral load instead due to the excess weight of the Mechanical Penthouse. Also, the floor system is of composite design which takes a small portion of the lateral load. There are 3 different moment connection types used but with size and bolt combinations, it comes to 16 total types. The three types of connections used are top & bottom angles, top & bottom plates, and top angles & bottom plates. These connections use different bolt numbers and sizes to add strength where needed and the most common connection used in a typical bay is a L6 x 4 x 7/8 x 0'7" steel angle with 4 bolts to a girder and 2 bolts to a column. A typical connection is shown.



WIND MOMENT CONNECTION–
TOP AND BOTTOM ANGLES
MC–1 THRU MC–10

SEE PLAN FOR LOCATIONS

DETAIL A
NOT TO SCALE

Foundation Design

The foundation for this structure is a deep foundation system consisting of caissons and grade beams. The concrete slab on grade is 4" thick and reinforced by WWF. Footings are placed under the columns and step footings were used at the corners of the building for extra support. All exterior footings must extend 3'-6" below the finished grade to protect from frost. Footings have been designed for a net soil bearing pressure of 6,500 psf. Geopiles could have been used in place of spread footings for the same criteria instead if desired.

Roof Design

This building utilizes an EPDM membrane roofing system with rigid insulation placed on a 3" lightweight concrete slab with 3" deep 20 gauge composite steel metal deck underneath. Girder size is increased slightly to W18x40 and W21x76 and the moment connections at the columns were increased in strength with more bolts. The Mechanical Penthouse is located on the roof and houses all the major mechanical components for the entire building.