Ready to Learn!

A NEW ELEMENTARY SCHOOL IN NORTH CLOVIS

BY SAMANTHA WHETTEN (EIT), VICTOR OBANDO, JOSHUA APPARCEL, DAVID DATSKO, MARIELA RODRIGUEZ, LAUREN PHAM, DANIEL SHWIYHAT, AND LUCERO CERVANTES

Clovis, California is growing rapidly with planned development to take place in north Clovis as part of the Heritage Grove Community. Heritage Grove is a planned 4 square-mile community expected to accommodate approximately 30,000 people.[1] With the growth in the community, there is a need for an elementary school to provide the children with a place to learn, play, and grow.

The school is expected to accommodate 600 students and 48 staff members. The school site will include three classroom buildings with eight classrooms each, a multipurpose room, a gymnasium, an administration building, and adequate parking with parent and bus drop off areas.

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Elite Engineering Group, a consulting firm located in Fresno, California, was contracted to provide the design of various elements of the elementary school project. The design of the multipurpose room, gymnasium, a classroom wing, the storm water drainage system, a potable water distribuition system, parking, and access roads will be completed.

The structural design will include a multipurpose room, gymnasium, and a classroom wing. The multipurpose room will serve as a place for meals, performances, and other large gatherings. The structure includes a large open area to accommodate removable tables and chairs, various storage rooms, a large kitchen with a serving counter, and a stage.

The multipurpose room is 10,080 square-feet with a 19-foot ceiling height. The stage makes up approximately 1,400 square feet of the total area and is elevated 4 feet above the finish floor. A commercial wheelchair lift will be provided along with a staircase to access the stage.

The multipurpose room will utilize steel and masonry construction. The structure will be designed to withstand the forces of earthquakes and wind common to the Central Valley in California.

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[1] City of Covis. 2018. *Clovis Planning Division*.

A proposed site plan for the elementary school

The gymnasium will serve as a home to the school's basketball team and provide the space required for the school to meet the physical education regulations. The structure includes a large area that will have a basketball court sized to standard regulations for basketball games, multiple retractable basketball hoops for P.E. classes, and telescoping bleachers. The structure will also include restrooms, two offices for the coaches, a storage room and an electrical room.

The gymnasium is 8,400 square-feet with a 25-foot ceiling height. The large area for the basketball court is 5,600 square-feet, giving the children plenty of space to play the sport of their choice as well as provide room for large assemblies, promotion ceremonies, and games where families could come and support their kids. The restrooms for the kids will include locker rooms for the player when they need to store their equipment and clothes.

The gymnasium will be composed of a steel frame system and concrete masonry construction. The steel frame system will be designed to fully support the gravity loads while the masonry walls will act as a lateral resistant system to support wind and earthquake loads. The steel frame system will consist of purlins, tapered girders, and columns. The structure will be designed based on the publications by ASCE, ACI, AISC, and CMACN.

The design for the classroom wing is a timber structure, made of Douglas Fir, with a 20-foot walkway between eight classrooms, four on each side. Each classroom will have enough space for the children to learn. The classrooms area individually designed for each room to be over 960 ft², which is the building code minimum for elementary schools in California. Each wing will also include restrooms for each gender. The kindergarten

classrooms will have their own restrooms, so the children will not leave strict supervision.

The roofing system will span over the classrooms and 20-foot hallway to allow weather protection for children leaving and entering classrooms. This structure could also be a home to the growing part of California schools moving towards solar energy. The roof will be able to hold the necessary weight to carry solar panels.

The foundation design for the multipurpose room and gymnasium will accommodate the masonry structures, and the foundation for the administration building and classrooms will accommodate the timber structural design. The purpose of the foundation is to safely transfer structural loading into the ground. The type of foundation was chosen to accommodate the type of structure and soil properties.

The soil on the proposed school site consisted mostly of silty sand with a trace of clay. This is common in the Valley and provides suitable conditions for a shallow foundation. The multipurpose room and gymnasium will be steel frame and concrete masonry buildings with columns supporting the structure. A shallow continuous foundation will be supporting the structures.

The foundation is to provide support beyond the structural loadings. Designing to a higher factor of safety will yield a safer and long-lasting foundation. This is critical because the structures will be used in providing quality education for generations to come. The key is to balance the factor of safety and cost. The soil properties, structure, and factor of safety was used to determine the dimensions and material for the foundation.

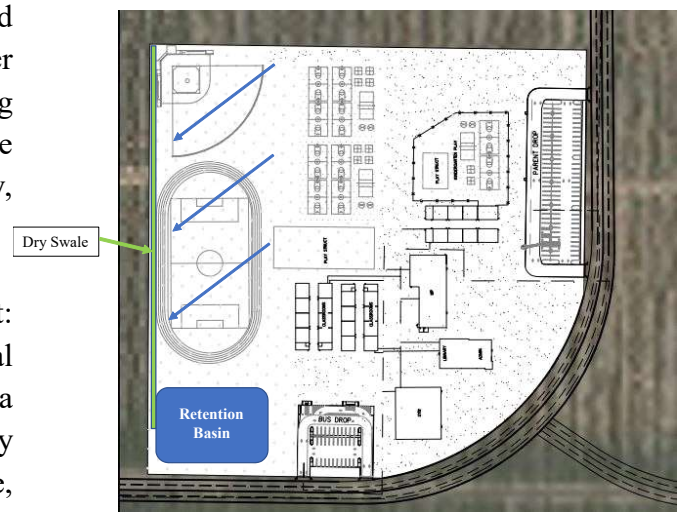
A continuous footing foundation will support the multipurpose room, which has 14 columns and concrete masonry walls. A total of 1,302 cubic feet of concrete and 1984 feet of rebar. The gymnasium will have 12 columns concrete masonry walls. A continuous footing foundation will support the gymnasium. It will consist of a total of 258 cubic feet of concrete and 84 feet of rebar. This will provide the necessary strength to support the structures and meet specifications.

The classrooms building will have two 159-foot shallow continuous footings that will support the timber structural wall loads. The footing will require a total of 1,590 cubic feet of concrete and 1,988 feet of rebar to provide shear strength. The administration building will also have a continuous footing supporting the wall loads. The lengths of the walls are 55 feet and 113 feet which will require a total amount of 1,680 cubic feet of concrete. The footing will also have 2,100 feet of rebar. The foundations will provide the necessary strength to support the loads transferred to the ground surface.

The design will include two separate water systems: a potable water system and a stormwater drainage system. The stormwater system will collect storm water from the school site and route it to a basin in the southeast corner of the project site.

The stormwater drainage system will be a temporary fix until permanent lines are installed by the Fresno Metroplolitan Flood Control District when the housing development is constructed.

The stormwater (or runoff) will be collected by inlets, which are boxes that can hold water for a time before it is drained into a connecting pipe. Since the system is only temporary, the pipes will be made of PVC to save on money, since they will be abandoned in the future. Aside from the piping, there is also another form of water conveyance used in this project: a dry swale. A dry swale is like a small canal that is lined with rocks, not to mistake it for a grass swale which is lined with grass. A dry swale is optimal for this project because, unlike its grass counterpart, it does not require water to keep it alive in the many dry months that it may be out of commission. It is well known that the Fresno/Clovis area does not see a large amount of rain, so saving a little irrigation water by constructing a dry swale is just another step towards conserving more of our precious water.



The stormwater drainage system will include a total of 2588 ft of PVC pipe, 9 inlets, 7 cleanouts, 2 valley gutters (one in each parking lot), and one dry swale measuring a whopping 935 ft in length. In addition, the site will be graded (sloped) to a minimum of 2%, with the inlets being the lowest points. We all know that water always flows towards the lowest point due to the effects of gravity, so grading the land will make it easier for the water to flow where we want it to go with minimal effort on our part.

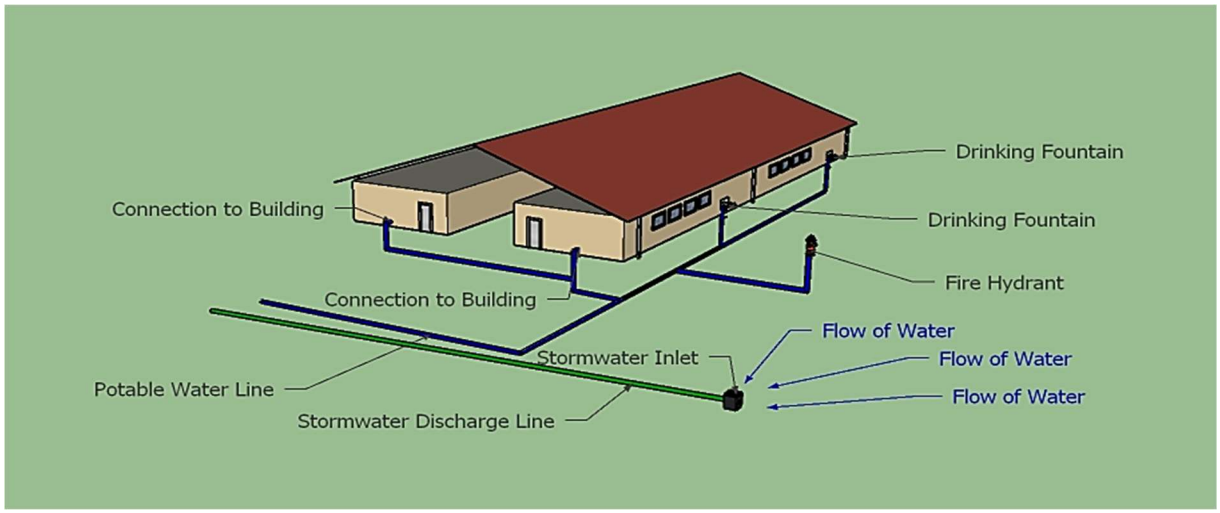
"…make it easier for the water to flow where we want it to go…"

The deisgn will provide water service for a fire sprinkler system, landscape irrigation demands, drinking fountains, and bathrooms. To provide the school with the needed water supply, a pressurized water distribution system was designed, keeping in mind that it also had to be sustainable in its layout and make-up. Pipelines were also sized to meet the water demands of the school, while ensuring the water system meets the pressure requirements of the City of Clovis. The desired pressure range is between 30 and 40 psi, with the maximum pressure being no higher than 60 psi.

The school will receive its potable water from the City of Clovis via a line that runs along east Shepherd Avenue. The elevation of the water connection is at 368.8 ft. and the topography of the school is at an average elevation of 375 ft., resulting in the need for a pump station to provide the school with drinking water.

The number of plumbing fixtures was calculated based on the California Building Codes. The total demand of the water fixtures is 214 gpm and the fire flow rate is 3250 gpm for every 3 hours. The irrigation demands were calculated by using the equation below.

$$\frac{Eto * PF * SF * 0.62}{IE} = Demand\ (\frac{gallo}{day})$$



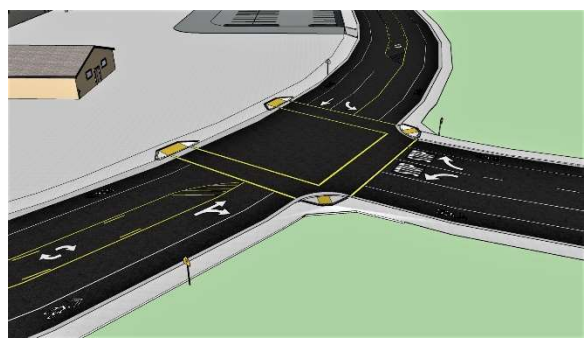
Where Eto refers to the evapotranspiration, PF is the Plant factor, SF is the area in units of square feet, 0.62 is a costant value of conversion, and IE is the irrigation efficiency. The irrigation demand was calculated to be 40 gpm.

In the picture above, the stormwater pipes are represented by the green PVC lines and the potable drinking water pipes are shown as the blue PVC lines.

Safety was the number one priority when designing the intersection and roads closest to the school campus. The sidewalks connected to the campus are ten feet wide to ensure enough space for the crowded rush hour during pick up and drop off time. Crosswalks are also ten feet wide and painted yellow to ensure oncoming vehicles are aware that it is a school crosswalk and children will be crossing either alone or accompanied with an adult. Each crosswalk ends with an ADA curb ramp to ensure access for people with disabilities. Each ADA curb ramp ensures four-foot landings behind the ramps.

The roads near the school campus consist of three lanes. Each lane is twelve feet wide with a turning lane in the middle lane. This turning lane was implemented to accommodate the traffic that the school will be generating before and after school. The parents who will be using the drop off and pick up areas with their vehicles will be able to queue in the turning lane while not blocking through traffic. The roads also contain a two-foot gutter and eight-foot bike lane. Including a bike lane was an important part to the project to promote commuting on bikes to reduce carbon emissions from vehicles.

The intersection is one-way stop controlled as shown in the image below:



These vehicles have an option to turn right or left after stopping to check for oncoming traffic, pedestrians, and bicycles. Since the through road intersection is uncontrolled, a school crossing traffic sign has been implemented on both sides fifty-feet from the

crosswalk for oncoming traffic to be aware of the school crosswalk ahead.

The safety of students, staff, residents, and vehicles has been implemented in the design of the roads and intersection near campus, as was the reduction of traffic during the drop off and pick up time for the students and everyone else to experience a smooth and safe commute.

Elite Engineering Group would like to thank the following individuals for their time and guideance: Bob Parrish, SE with Parrish Hansen; Mark Weaver, SE with Cornerstone Engineering Group; Dr. Ching Chiaw Choo, California State University, Fresno; Dr. Lalita Oka, California State University, Fresno; Dr. Jesus Lerralde, California State University, Fresno; Wendell Lum and Rory Crockett with the Fresno Metropolitan Flood Control Distirct; Heather Bashian, VP at Provost and Pritchard Consulting Group; Dr. Fayzul Pasha, California State University, Fresno; Dr. William Wright, California State Univeristy, Fresno; Steven McDonald, PE; and Dr. Aly Tawfik, California State University, Fresno

Meet the team, Elite Engineering Group:

Samantha Whetten

Project Manager, Structural Design

Victor Obando

Project Secretary, Structural Design

Joshua Apparcel

Structural Design

David Datsko

Geotechnical Design

Mariela Rodriguez

Geotechnical Design

Lauren Pham

Water Design

Daniel Shwiyhat

Water Design

Lucero Cervantes

Transportation Design