

LUIS S. FARAKLAS, P.E.

December 13, 2007

Board of Trustees
Carrizo Springs Consolidated I.S.D.
Carrizo Springs, Texas
Dr. Cecelia May Moreno, Superintendent of Schools

RE: An Interim Structural Engineering Report on the foundation for the:
Existing High School Facility
Carrizo Springs Consolidated I.S.D.
Carrizo Springs, Texas

Dear Board Members & Dr. Moreno:

Pursuant with your instructions, we hereby submit an interim structural engineering report on the foundation for the High School.

The report includes, but is not limited to the following items:

- Item #A:** Floor elevations of the entire school facility at 1st floor only.
- Item #B:** Visual Survey (review) of all exterior (perimeter) walls, as well as the interior walls.
- Item #C:** Preparation of about 12 sheets of drawings.
- Item #D:** Review & study of American Leak Detection report performed in August 2007.
- Item #E:** Preparation of a topographic survey of the entire building perimeter except where asphalt or concrete cover occurs.
- Item #F:** Seek out and point to any problems that adversely affect the foundation of the facility.
- Item #G:** Review and comment on the Shilstone Engineering Testing Laboratory, Inc. report dated 12-08-82.

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We have studied and reviewed the conditions of the six buildings and in conjunction with the items listed above, we have prepared this report, using the same sequence, item by item, for ease of presentation.

Item #A: Floor elevations of the entire facility were taken at the 1st floor only in November 2007, and these were compared to the elevation readings taken by us in 1993.

The new readings show appreciable increase throughout the facility, the severest changes have occurred at Building "A" at the west end, this rise has resulted in wall damages in the area, a similar condition has developed at the east end of the same building, but not as severe.

We note that appreciable increases have occurred at Building B, C, D and E, but not as high in Building "F".

Item #B: Visual Survey of all perimeter exterior walls, as well as interior walls.

Exterior Walls: Did not reveal any cracked damage; movement was noted only at expansion joints between buildings.

Interior Walls: Show "buckling" of the wall paneling on the wall between corridor and classroom at the west end of Building "A". The risen slab has compressed the corridor wall between 1st and 2nd floor resulting in the "buckling" of the wall panels.

A similar, but not as severe condition has developed at the east end of Building "A".

The other cracked wall damages occur at the Band Hall Office of Building "E" and at the Girls Dressing Room adjacent to the double doors at the west entry of Building "F".

Item #C: We have prepared 12 sheets of drawings to record our findings and for use in conjunction with the report. We are also able to make comparisons of floor elevations taken in 1993 and those taken in 2007.

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Item #D: We have reviewed and studied the American Leak Detection Report and from it, we note plumbing leaks occur at the south elevation of Building "A" at the west elevation of Building "B". Also, severe leaks occur at the Girls and Boys Showers at Building "F". During our surveys, we noted moisture spots on the outside brick walls, where the showers are located. They appear at the west and north elevations.

The plumbing leaks probably contribute some moisture to the soils supporting the foundations, but we suspect the majority of moisture comes from ponded (standing) water adjacent to the building, which has seeped into the soils supporting the foundation, causing the soils to expand in volume.

Item #E: We have prepared a topographic survey of the entire building facility except where concrete or asphalt cover exists. The survey verifies our suspicions that poor surface drainage around most of the building has resulted in surface water ponding (standing) adjacent to buildings and eventually seeping into the soils supporting the foundations, the soils expand in volume and upheaval results.

Item #F: During our frequent inspections, we have sought and are pointing out some aspects that we believe to be the main cause of the slab upheavals. The terrain around most buildings drains poorly, if any at all. The south side of Building "A" has what appears to be a "soft berm" along the three line for the 267' distance, when rains occur or irrigation takes place, water stands permanently, having no way to drain. The drainage between buildings A, B and C between C & D also have poor drainage. The only appreciable drainage, apparent to the eye, occurs at Building "F" and Building "E", as well as the east side of Building "B".

The southside of Building "A" has 13 - 4" x 4" downspouts one at each column - the west end has 2 and north end adjacent to Building "B" has 3 downspouts all of them empty into a 6" or 8" line that empties onto FM 1586.

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Item #F: The main 6 or 8" line is not big enough to carry the water. Our estimate calls for at least a 20" round pipe. Water is going (leaking) everywhere thru the pipe joints.

The swales that were indicated in the 1993 drawings are all missing with some exceptions.

The only appreciable swales occur at the west elevation of Building "F" at east elevation of Building "F" and north elevation of Building D & E.

The boots at the west, north, and east elevations of Building "F" are all broken, some totally disconnected, but because of the swales surface water still drains away.

The downspouts on north elevation of Building "D" are usable, but at the northside of Building "E" the downspouts are emptying onto concrete splash blocks.

The swales at both side of Bulding "F" empty onto culverts that appear to be clogged up, or the drainage impeded by vegetation and debris.

Most of the downspouts empty into a 6" rubber boot and into a 6" PVC drain. The boot is clamped to the 4 x 4 downspout and this connection is not well sealed, when rains occur, water shoots out from this source into the ground. The clamp at the 6" line is sealed.

Item #G: We have reviewed and studied the Shilstone Engineering Testing Laboratory, Inc. soils report dated 12-08-82, we note various factors and they are;

1. Plasticity indices range from 11 to 32 (the cutoff is about 15, TXDOT).

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2. The High School structure can be founded on a stiffened slab and beam foundation with thickened slabs at column and wall locations (slab on grade). Consideration must also be given to the uplift forces on the slab due to potentially expansive soils.

The foundation type used on this facility was recommended by the soils report as noted previously, and that is what was used.

This type of foundation generally is known as a slab on grade and consists of a floor slab directly on the soil (or fill) stiffened with exterior and interior beams, and where required, (such as in this case) thickened sections of the slab to form footings, particularly at columns to distribute the concentrated loads; and in this case instead of thickened slabs, they chose drilled concrete footings, some 14'-0" below finished floor.

As noted on the Shilstone Report, the potentially expansive soils should be considered in order to prevent or minimize the uplift forces.

Potentially, expansive soils with P.I.S. ranging from 11 to 32 can and will increase in volume when they receive moisture and shrink in volume when moisture is removed.

Slab on grade foundation such as the type used in the High School have proven to be very successful, if moisture can be kept away from the soils supporting them, or at least minimized. This is due to the fact that the slab is supported by the soil, so water and/or moisture control is critical.

If suspended foundations are used, moisture or water penetration would not be important because the suspended slab never comes in contact with the ground.

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Finally economics also dictates the type of foundation to use, comparing one type over the other we note:

- a. Slab on grade used: 93,241 @ \$5.50 = \$ 512,826.00
+ cost of piers.
- b. Suspended System: 93,241 @ \$14.00 = \$ 1,305,374.00
+ cost of piers
or 792,248 more costly than "a".

In view of our findings, we will make comparisons with options to keep the facility with the existing foundation and/or demolish or abandon the present High School and build new.

OPTION I - KEEPING EXISTING FACILITY WITH PROPER MAINTENANCE:

PROBABLE COST:

1.	Regrade entire building perimeters --	\$ 250,000
2.	Repair wall at Building A, E and F --	\$ 100,000
3.	Repair downspouts boots & install -- new 20" drains & open culverts	\$ 140,000
4.	Repair all plumbing leaks	\$ 65,000
5.	Cosmetics; painting, etc.	\$ 90,000
6.	Clean up & haul away debris	\$ 35,000
	Subtotal:	\$ 680,000
7.	15% Contractor's Overhead	102,000
	Subtotal:	\$ 782,000
8.	10% Contractor's Profit	\$ 78,200
	TOTAL FOR OPTION I:	\$ 860,000

$$\frac{860,200}{140,310 \text{ s.f.}} = 6.13\$/\text{s.f.}$$

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OPTION II - ABANDON HIGH SCHOOL BUILDINGS - ALLOW EXISTING HIGH SCHOOL TO REMAIN WITH MAINTENANCE:

PROBABLE COST:

1.	Abandon Building and leave in place --	\$ -0-
2.	Maintenance --	\$ 250,000
3.	New Site similar in size to exist. --	\$ 500,000
4.	Rebuild new facility -- 140,310 @ 175	\$ 24,554,250
5.	A.E. fees @ 6% of 24,554,250	\$ 1,473,255
	Subtotal:	\$ 26,777,505
6.	15% Contractor's O/H; 15% x 24,554,250	\$ 3,683,137
	Subtotal:	\$ 30,460,642
7.	10% Contractors Profit; 10% x 28,237,387	\$ 2,823,738
	TOTAL FOR OPTION II:	\$ 33,284,380

$$\frac{33,284,380}{140,310 \text{ s.f.}} = 23.22 \$/\text{s.f.}$$

OPTION III - DEMOLISH EXISTING BUILDINGS - REUSE SAME SITE:

PROBABLE COST:

1.	Demolish exis. str./haul away; 140,310 @ 22	\$ 3,086,820
2.	Rebuild new facility: 140,310 @ 175.00	\$ 24,554,250
3.	A.E. fees @ 6% of 24,554,250	\$ 1,473,255
	Subtotal:	\$ 29,114,325
4.	15% Contractor's O/H; 15% x 24,554,250	\$ 3,683,138
	Subtotal:	\$ 29,710,643
5.	10% Contractors Profit; 10% x 28,237,388	\$ 2,823,738
	TOTAL FOR OPTION II:	\$ 35,621,201

$$\text{Cost: } \frac{35,621,201}{140,310 \text{ s.f.}} = 253.87 \$/\text{s.f.}$$

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We can readily see the vast difference between the three options.

We wish to add that any foundation used can develop differential floor elevations. However, we have had very little trouble with suspended systems, but we have had some trouble with slabs on grade, especially with poor maintenance.

We would like for the Board and Dr. Moreno to consider keeping the facility, but installing a Maintenance System as noted in Option I, for at least 5 years.

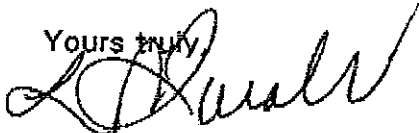
If conditions remain the same or do not increase again, the district has saved approximately \$31,000,000.00.

Finally, the facility except for the foundation is well constructed and is a fine edifice. In our opinion, the building should be kept for another five years or more.

We wish to thank the School Board, as well as Dr. Moreno for allowing us the opportunity to present this report.

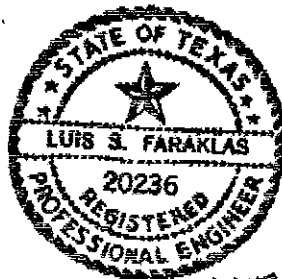
We will be available to answer any questions, should you have any.

Yours truly,



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