HYDROLOGY

F21/D20

FIRE STATION #16

F21- D20

1 PLAN

PUBLIC WORKS DEPARTMENT
Albuquerque, New Mexico

Fiesta. #16

Jim Tabo

☐	City Manager	FOR YOUR	
☐	Director	☐	Approval
☐	City Engineering Division	☐	Attention
☐	Liquid Waste Division	☐	Comment & Return
☐	Street Maintenance Division	☐	Files
☐	Traffic Engineering Division	☐	Your Handling
☐	Water Division	☐	Information
☐	Other	☐	Investigate & Report

REMARKS

B. Kailish & Kles

I've asked Arch. to forward to Kles a current site plan & also learned via Blumenthal that B. of E. would probably sell city some added land if strong plea is make. Meanwhile, Bob, Arch says he has current street grade from Scanlon — could grade be lowered (a bunch) ?

7-11-75 — Date

Rip — Respectfully, H.R. Orr, Jr. Ass't. Director of Public Works

we still need a City Engr. App'd St. Grade & Drain Scheme.

JUL 22 1975

BARKER • BOL & ASSOCIATES • ARCHITECTS, A.I.A.
6338B COMANCHE ROAD NE, ALBUQUERQUE, N.M. 87110 TELEPHONE 296-4886

July 18, 1975

Chief A. B. Martinez
Albuquerque Fire Department
131 Adams, N.E.
Albuquerque, New Mexico 87102

RE: Fire Station #16
4721 Juan Tabo, N.E.

Dear Chief Martinez:

Enclosed herewith are the five required copies of the Contract Documents, comprised of construction drawings, specifications, and the updated cost estimate. Upon your earliest convenience, would you please distribute them to the proper departments for review.

There are certain items which I think should be brought to special view and will require specific direction from the City.

1. Water Run Off

The site selected is significantly lower than the existing and proposed street grades which presents problems with respect to site run off. The possibilities for solution are as follows:

A. Lower the street grades and allow water to run onto the street.

B. Pond the water, which is not the best solution so close to the building foundation.

C. Pump the water from the holding ponds back up to the street, which will cause an increase in the building budget.

D. Purchase additional land to the west of the present site for ponding reasons. I think this will provide the safest and least expensive method of handling the water run off.

2. Median Cuts

We request a review by Traffic Engineering and specific information as to where and how many median cuts the City will provide for fire truck entrance and exit to the site. Our cost estimate does not include any cost for s[illegible] work.

3. Cooking Equipment

We need a review of the cooking equipment and specific information as to manufacturer and model number on the owner supplied refrigerator and range.

Our cost estimate has been reviewed and revised where recent cost escalation has occurred, and the current project cost is reflected therein.

Would you please request a rapid review so that the project can bid as early as possible, and thus gain a fire station for the City at the earliest possible date.

Sincerely,

Andrew S. Bol

ANDREW S. BOL

cls

BARKER • BOL & ASSOCIATES • ARCHITECTS, A.I.A.
8338 B COMANCHE ROAD NE ALBUQUERQUE N.M. 87110 TELEPHONE 296-4886

July 18, 1975

Chief A. B. Martinez
Albuquerque Fire Department
131 Adams, N.E.
Albuquerque, New Mexico 87102

RE: Fire Station #16
4721 Juan Tabo, N.E.

Dear Chief Martinez:

This letter is written to inform you of a change within the projected project cost.

The original cost estimate was predicated on the street grades being lower than they will actually be built. With the actual street grades now being set, I have revised the estimate to take into account additional fill and extra reinforced stem walls.

The new total project cost with this additional work will be approximately $156,274, which I realize is above the budget the City has for the project (See Recap Sheet 9).

We propose to prepare Item #13 "Grounds Finishing" as a deductive alternate, thereby reducing the project cost to $151,479, which is within the allowable budget (See Recap Sheet 9A).

If I can be of further assistance to you, please call.

Sincerely,

Andrew S. Bol

ANDREW S. BOL

cls

GROSS BUILDING AREA 4382 ♦

Estimate reviewed & up dated July 17, 1975

1

ENGINEERING COST ESTIMATE

DATE 7/6/75 8/17

PROJECT NUMBER AND TITLE: FIRESTATION #16 for City of Albuquerque

BY Barker Bol & Assoc.

PAGE 1 OF 9 PAGES

ITEM NO	DESCRIPTION	QUANTITY ESTIMATED QUANTITY	QUANTITY UNIT	LABOR UNIT PRICE	LABOR ESTIMATED AMOUNT	MATERIAL UNIT PRICE	MATERIAL ESTIMATED AMOUNT	TOTAL ESTIMATED AMOUNT
(1)	SITE DEVELOPMENT							
	clearing & grubbing	.5	Acre.	218	109	162	324	433
	Soil Relocation (remove!)	1670	cu yd.	.55	918	.50	835	1753
	Excavation	60	cy	.75	45	.80	48	93
	Compacted fill 549 under bldg. 366 other.	915	cy.	.25	228	.25	228	456
	Drive way compaction · special density	200	cu yd.	2.85	570	.85	170	740
						total	(1)	3475
(2)	FOUNDATION							
	excavation	246	cy.	1.30	320	1.18	290	610
	Compacted backfill	191	cy.	3.43	655	1.15	220	875
	Concrete @ Building 638 lin ft.	21	cy.	6.72	141	24	504	645
	reinforcing - horiz & vert. #4	1992	lin ft.	.14	278	.26	517	795
	Conc. @ Patio wall & Handrail cut 100 ft.	4	cu yd.	6.72	26	24	96	122
	reinforcing	275	l.f.	.14	38	.26	72	110
	Testing Engineering of Compaction							110
						total	(2)	3069

total tin shed 6544

ENGINEERING COST ESTIMATE

DATE 2/6/75 8/17

PROJECT NUMBER AND TITLE: Fire Station #16 for City of Albuquerque

BY Barter, Bolt & Associates

PAGE 2 OF 9 PAGES

ITEM NR	DESCRIPTION	QUANTITY ESTIMATED QUANTITY	QUANTITY UNIT	LABOR UNIT PRICE	LABOR ESTIMATED AMOUNT	MATERIAL UNIT PRICE	MATERIAL ESTIMATED AMOUNT	TOTAL ESTIMATED AMOUNT
(3)	STEM WALLS 8" cmu.							
	cmu 8"	1476	S.F	1.43	2110	1.00	1476	3586
	Filled cells	10	cu.yd.	6.72	67	24	240	307
	Back fill & Compaction	50	cu.yd.	3.43	171	1.15	58	229
						Total	(3)	4122
(4)	CONC FLOOR SLABS.							
	6" slab	2000	SF	.30	600	.40	800	1400
	4" slab	2200	SF	.30	660	.35	770	1430
	16" integral footing	90	SF	.61	55	.60	54	109
	6x6 6/10 WWF	4148	S.F	.04	165	.34	1410	1575
	horiz steel	180	L.F	.14	25	.26	47	72
	Drainage Pit.							
	#4 reinf. 225 + 135 + 200	560	LF	.14	78	.26	145	223
	conc.	2	CY	6.72	13	24	48	61
	grating	70	SF	.50	35	2.50	175	210
						total	(4)	5080

total this sheet ~~5175~~ 9202

Chuck Parker
344-3611

3

ENGINEERING COST ESTIMATE								DATE 2/6/75 8/17
PROJECT NUMBER AND TITLE: Fire station #16 for City of Albuquerque						BY Parker Bolt Associates		PAGE 3 OF 9 PAGES
ITEM NO.	DESCRIPTION	QUANTITY: ESTIMATED QUANTITY	QUANTITY: UNIT	LABOR: UNIT PRICE	LABOR: ESTIMATED AMOUNT	MATERIAL: UNIT PRICE	MATERIAL: ESTIMATED AMOUNT	TOTAL ESTIMATED AMOUNT
(5)	MASONRY WALLS.							
	8" cmu unit	7035	S.F.	1.43	10,000	.32	2251	12,311
	Dwo wall	3651	L.F.	.04	146	.15	547.	693
	Vert. reinf. & horiz e/Bond Beam.	2500	L.F.	.14	350	.26	650	1000
	Bond Beam Conc + Vert Fill.	15	CY	6.72	100	24	360	460
	Vermiculite	2800	C.F.	.15	420	.45	1260	1680
	Set metal door Frames & W.W.		ea. → see doors item # 9					15244
						total 5		15244
(6)	INTERIOR FRAMING							
	2x4 stud walls or 3/4 2x4x8'	1672	B.F.	.23	385	.14	234	619
	4x6 ledgers 140' of 4x6	280	B.F.	.20	56	.37	104	160
	2x10 ledgers 150' of 2x10	250	B.F.	.70	175	.31	78	253
	Bolts. @ 4x6 } 124 5/8" ϕ							
	Bolts @ 2x10 }	124	EA	.65	81	.50	62	143
						total	(6)	1175

total this sheet. $16,419

Dave Standfier & George Hy

ENGINEERING COST ESTIMATE

DATE 2/6/75

PROJECT NUMBER AND TITLE: FIRESTATION #16 for City of Albuquerque.

BY Barker Bold & Associates

PAGE 4 OF 9 PAGES

ITEM NR	DESCRIPTION	QUANTITY ESTIMATED QUANTITY	QUANTITY UNIT	LABOR UNIT PRICE	LABOR ESTIMATED AMOUNT	MATERIAL UNIT PRICE	MATERIAL ESTIMATED AMOUNT	TOTAL ESTIMATED AMOUNT
(7)	ROOF FRAMING							
	2" sloped TJL 28@30' each.	2190 S.F.	S.F. covering.	.50	1095	.72	1576	2671
	2x10 joists w.t. cost for. 1500 lin ft.	2290	BF	.40	916	.31	710	1626
	2x4 soffit & blocking.	200	B.F.	.40	80	.14	28	108
						total (7)		3880
(8)	ROOF							
	1/2" Plywood sheathing	4862	S.F.	.25	1215	.32	1555	2770
	2x4 blocking 400 L.F.	266	BF	.40	106	.14	37	143
	Rigid insulation	2242	S.F	.20	448	.20	448	896
	Batt insulation	2620	S.F.	.08	210	.06	157	367
	4" cant strip	572	LF	.10	57	.10	57	114
	Built up Roof	4862	S.F	.30	1458	.20	972	2430
	Flashing 26 ga GI.	572	L.F.	.50	286	.70	400	686
	Cannales	10	EA	25	250	15	150	400
	Equip Surrounds.		Allowance					350
						total 8		8156

total this sheet $12036

ENGINEERING COST ESTIMATE

DATE 2/6/75 9/17

PROJECT NUMBER AND TITLE: Fire Station #16 for City of Albuquerque

BY Parker · Pool & Associates

PAGE 5 OF 9 PAGES

ITEM NR	DESCRIPTION	QUANTITY: ESTIMATED QUANTITY	QUANTITY: UNIT	LABOR: UNIT PRICE	LABOR: ESTIMATED AMOUNT	MATERIAL: UNIT PRICE	MATERIAL: ESTIMATED AMOUNT	TOTAL ESTIMATED AMOUNT
(9)	CLOSE UP							
	Ext. doors. 3' 6" wide.	3	EA	50	150	90	270	420
	Garage Doors 4	4	EA	350	1400	900	3600	5000
	Sdg. Gl. door.	1	EA	75	75	150	150	225
	H.M. window wall.	200	S.F.	see below glass & glazing.		—		
	Hardware ext. set.	3	EA	→		100	300	300
	Glass & Glazing.	200	S.F.	included →		7.00	1400	1400
	Caulking.	468	L.F.	.37	173	.20	94	267
	Skylites	8	EA	30	240	45	360	600
						total	(9)	8212
(10)	INTERIOR WORK							
	Hang doors	18	EA	32	576	50	900	1476
	Hardware.	18	EA	6.50	117	30	540	657
	Sheetrock tape & texture walls & 5024 clg. 2300	7324	SF	.13	952	.27	1977	2929
	Painting. 7324 sheetrock, 6700 cmu & 2084 ppr + door 400	16800	SF	.12	1980	.06	990	2970
	Flooring.	2300	SF	.18	414	.45	1035	1449
	Base boards.	640	LF	incl pb .20	128	.11	70	198
	Bifold Doors. Accordion. 120 (8x15)	120	SF	.80	96	2.50	300	396
							Sub	10075

total this sheet 18,287

ENGINEERING COST ESTIMATE

DATE 2/7/75

PROJECT NUMBER AND TITLE: Fire Station #16 for City of Albuquerque

BY Barker, Pol & Associates

PAGE 6 OF 9 PAGES

ITEM NR	DESCRIPTION	QUANTITY: ESTIMATED QUANTITY	QUANTITY: UNIT	LABOR: UNIT PRICE	LABOR: ESTIMATED AMOUNT	MATERIAL: UNIT PRICE	MATERIAL: ESTIMATED AMOUNT	TOTAL ESTIMATED AMOUNT
10	Interior Work Continued.					total from sheet 5		10075
	Mirrors 6x4 5.00/sq ft 120	2	EA	—	—	120	240	240
	Misc. equip. PTD. T.P.H. etc. Shower doors.	1st/wc 4 sh. 4	per pt EA	30	120	30	120	240
	Toilet Partitions	4	EA	41	164	82	328	492
	Benches	2	EA	35	70	40	80	150
	Steel Grating	80	SF	.80	64	1.20	96	160
	Misc steel Bumpers.	14	EA	25	350	16	224	574
	Bathroom cabinets. 20 @ 12	12	LF	20	240	30	360	600
	Tools & shelving.	1st.	EA	12	12	14	14	26
	Utility shelving.	46	LF	7.20	331	5.20	240	571
	Control Counter.	9	LF	5	45	10	90	135
	Thresholds	7	EA	12	84	6	42	126
	Shower doors	4	EA	30	120	25	100	220
	Graphics	allowance						1700
						total (10)		14309

total this sheet. 4234

ENGINEERING COST ESTIMATE

DATE 2/7/75 9/17

PROJECT NUMBER AND TITLE: Fire Station #16 for City of Albuquerque

BY Barber, Pool & Associates

PAGE 9 OF 9 PAGES

ITEM NR	DESCRIPTION	QUANTITY ESTIMATED QUANTITY	QUANTITY UNIT	LABOR UNIT PRICE	LABOR ESTIMATED AMOUNT	MATERIAL UNIT PRICE	MATERIAL ESTIMATED AMOUNT	TOTAL ESTIMATED AMOUNT
(11)	EXTERIOR FINISH WORK							
	Stucco ~~5.10/sy~~ 6.15	640	SY	3.25	2080	2.90	1856	3936
	Painting special exterior graphics	210	SF	.50	105	.12	25	130
	Paving sidewalks & patio	256	SF	.40	102	.40	102	204
	Parking asphalt w/base course	155	SY	1.00	155	1.00	155	310
	Drive asphalt w/base course	471	SY	2.00	942	3.00	1413	2355
	Curb cuts & aprons	50	LF	2.00	100	1.00	50	150
	sidewalk, curb & gutter	150	LF	3.00	450	2.00	300	750
	Flagpole	1	EA					300
	BB backstop	1	EA					300
	~ ~ BB & Handball & Entry drive.	2400	S.F.	.30	720	.30	720	1440
	Parking Paint & striping @ curb.		allow.					150
						Total	(11)	10025
(12)	FURNISHINGS.							
	Wardrobe cabinets 7	7	EA	90	630	65	455	1085
	Kitchen Unit	1	EA					1100
		1	EA					—
						total	(12)	2335

total this sheet. ~~$7,665~~ 12,360

(2)

ENGINEERING COST ESTIMATE

DATE 2/7/75 8/17

PROJECT NUMBER AND TITLE: FIRESTATION #16 for City of Albuquerque

BY Barber Pool & Associates

PAGE 8 OF 9 PAGES

ITEM NR	DESCRIPTION	QUANTITY: ESTIMATED QUANTITY	QUANTITY: UNIT	LABOR: UNIT PRICE	LABOR: ESTIMATED AMOUNT	MATERIAL: UNIT PRICE	MATERIAL: ESTIMATED AMOUNT	TOTAL ESTIMATED AMOUNT
13	GROUNDS FINISHING							
	cleanup							200
	Landscaping Trees bushes	allowance.						300
	Sprinkler	allowance		17 per head @ 20		heads.		340
	Sod	allowance		10,000 sq ft x .21				2100
	Sign	allowance.						200
							total 13	3140
14	GENERAL CONDITIONS							
	PERMITS							75
	INSURANCES							2130
	Laboratory Tests.							700
							total 14	2905
	Architectural Costs.	Total items		(13) Item	(14)			$ ~~82100~~
						new July 17 75		5127

total this sheet 6045

Recap Sheet Aug 17, 1975 9

ENGINEERING COST ESTIMATE

DATE 8/17/75

PROJECT NUMBER AND TITLE

BY

PAGE 9 OF 9 PAGES

ITEM NR	DESCRIPTION	QUANTITY ESTIMATED QUANTITY	QUANTITY UNIT	LABOR UNIT PRICE	LABOR ESTIMATED AMOUNT	MATERIAL UNIT PRICE	MATERIAL ESTIMATED AMOUNT	TOTAL ESTIMATED AMOUNT
	ARCHITECTURAL							85127
	MECHANICAL							26875
	ELECTRICAL							13,975
	+ labor & Insurance.							2600
							$	129,325
	CONTRACTORS 7% O&P							9052
								138377
	1% Bond							1383
								139760
	4% Tax							5590
	4382 □' @ 33.10 /sq.ft.			Total	Construction Cost		$	145,350
	Architect Fee.							10174
	Soils Investigation							750
	TOTAL PROJECT COST							156274

Recap Sheet in deductive alternate is selected. GROUNDS & FINISHING estimate Item # 13

ENGINEERING COST ESTIMATE								DATE
PROJECT NUMBER AND TITLE						BY		PAGE ____ OF ____ PAGES
ITEM NR	DESCRIPTION	QUANTITY		LABOR		MATERIAL		TOTAL ESTIMATED AMOUNT
		ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT	UNIT PRICE	ESTIMATED AMOUNT	
	ARCH.							81987
	MECH							26,875
	ELEC.							13,975
	Labor & Insurance							2500
	TOTAL CONSTRUCTION							125,337
	CONTRACTORS 7% O&P							8773
								# 134,110
	1% Bond.							1341
								135,451
	4% Tax							5418
	4302 ft @ $32.14/sq.ft.		TOTAL CONSTRUCTION COST					140869
	Architects Fee.							9860
	Soils Investigation							750
		TOTAL PROJECT COST.						151,479

Fire station 16. on Juan Tabo Blvd.

To comply with drainage resolution 1972-2, 1900 cubic feet of ponding needs to be available. This can be provided along the west property line by using grading and or walls. Most of the property from the front of the building, including roof drainage, should be graded to drain to the ponding area. Ideally the west 50 feet of the property will be grassed or landscaped to allow ponding and infiltration.

Firestation 16
Juan Tabo.

Historical Flow

$A = \frac{150 \times 150}{43560} = .52$ ac.

$I = 5.4$ from master plan chart 1
$C = 0.30$ from master plan.

$Q = (0.30)(5.4)(.52) = .84$

Developed Flow:

Area of bldg & parking $100 \times 150 = .35$ ac.
area of parking, grass or? $50 \times 150 = .17$ ac
C of parking 0.80 master plan

$Q = (.30)(5.4)(.17) = .27$
$Q = (.80)(5.4)(.35) = 1.51$

Total 6 hour storm ~~volume~~ rainfall 3"
Total volume $\frac{3''}{12''}$ (~~[illegible]~~) $(150)(150) = 5625$ ft^3

natural runoff $(.3)(5625) = .1688$
developed runoff $\frac{(.83 \times .7 + .15 \times .3)}{.52}(5625) = 3580$

storage 1893 ft^3

Firestation 16
Juan Tabo

$$\frac{(.35)(.8) + (.17)(.3)}{.52} = .64$$

$CA = (.64)(.52) = .3328$

Time	T	Q
10	5.4	1.8
15	4.6	1.5
20	4.2	1.4
25	3.8	1.3
30	3.4	1.1
35	3.2	1.1
40	2.9	1.0
50	2.5	0.8
60	2.2	0.7

JAN 22 1975

BARKER • BOL & ASSOCIATES • ARCHITECTS, A.I.A.
8338 B COMANCHE ROAD, N.E., ALBUQUERQUE, N.M. 87110 TELEPHONE 298-4898

Jerry D.

January 22, 1974

Mr. Rip Orr
Department of Public Works
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

RE: Fire Station #16
Juan Tabo, N.E.

Dear Rip:

Enclosed herewith is the soils report for the referenced project.

Sincerely,

Andrew S. Bol/cls

ANDREW S. BOL

cls
Enclosure

J Kim - the attached soils report is for your review & comment.

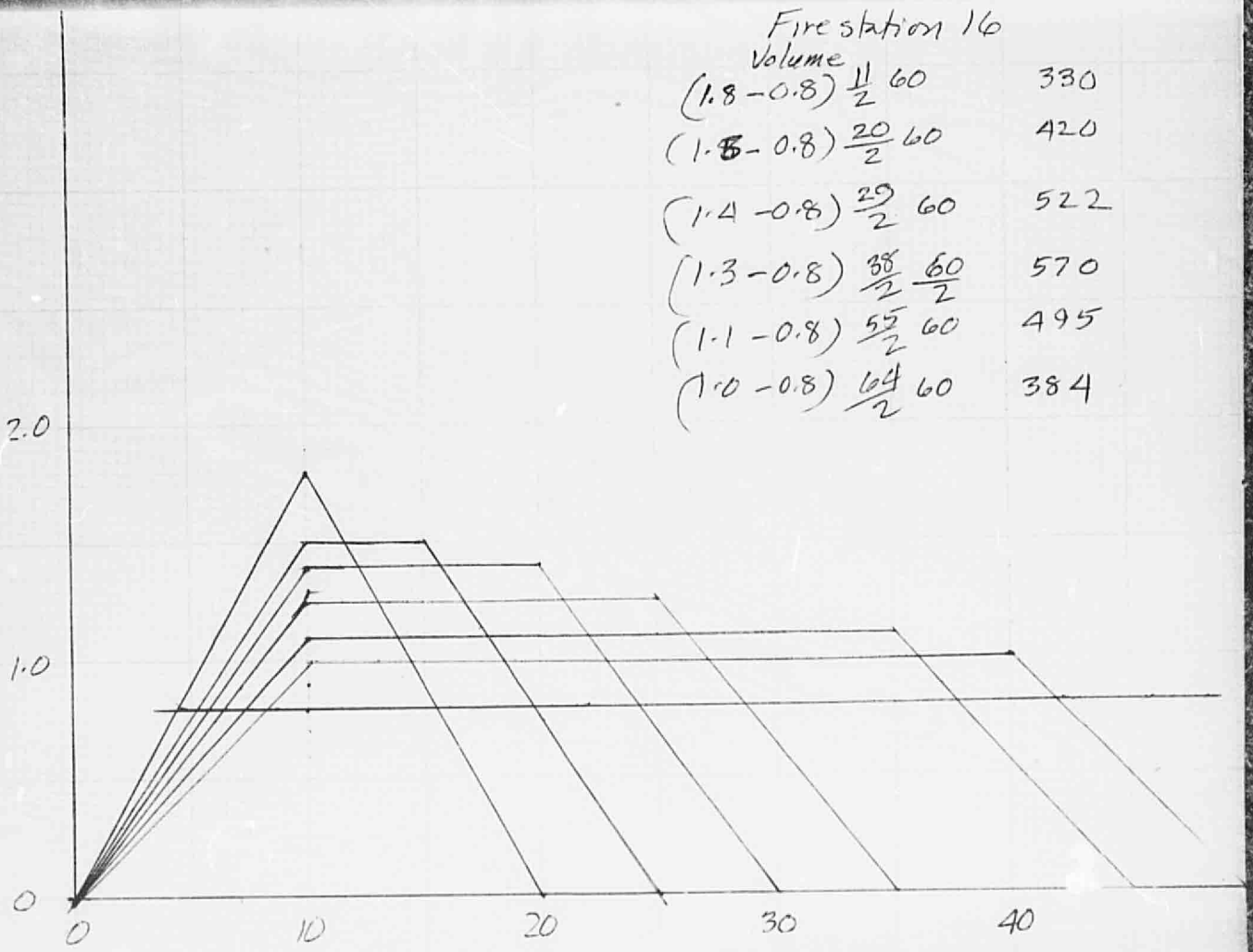
Rip
1-22-75

Bob - See page 5 especially.

Jim

Fire station 16

Volume	
$(1.8-0.8)\frac{11}{2}60$	330
$(1.5-0.8)\frac{20}{2}60$	420
$(1.4-0.8)\frac{29}{2}60$	522
$(1.3-0.8)\frac{38}{2}\frac{60}{2}$	570
$(1.1-0.8)\frac{55}{2}60$	495
$(1.0-0.8)\frac{64}{2}60$	384



SERGENT, HAUSKINS & BECKWITH CONSULTING SOIL AND FOUNDATION ENGINEERS

APPLIED SOIL MECHANICS • ENGINEERING GEOLOGY • MATERIALS ENGINEERING

B. DWAINE SERGENT, P.E.
DALE V. BEDENKOP, P.E.
JOHN J. MORAN, P.E.
JOHN B. HAUSKINS, P.E.
ROBERT D. BOOTH, P.E.
DONALD G. METZGER, GEOL.
GEORGE H. BECKWITH, P.E.
BRUCE J. LEISER, P.E.
BUD WOODWARD

January 17, 1975

City of Albuquerque
c/o Barker, Bol & Associates,
Architects
8338-B Comanche Road, N.E.
Albuquerque, New Mexico 87111

Job No. E74-1114

Re: Fire Station No. 16
Juan Tabo Boulevard, N.E.
Just South of Manitoba
Albuquerque, New Mexico

Gentlemen,

Our Soil and Foundation Investigation Report on the referenced project is herewith submitted. The report includes the results of test drilling, laboratory analysis and recommended criteria for foundation design and slab support. The investigation was made in conjunction with McMillan & Associates, Inc., Consulting Materials Engineers, who collaborated with us on the field investigation and laboratory testing.

Should any questions arise concerning this report, we would be pleased to discuss them with you.

Respectfully submitted,
Sergent, Hauskins & Beckwith Engineers

By Robert D. Booth
Robert D. Booth, P.E.

Reviewed by George H. Beckwith
George H. Beckwith, P.E.

REGISTERED PROFESSIONAL ENGINEER GEORGE H. BECKWITH 4506 NEW MEXICO

Copies: Addressee (4)
Robert D. Krause Engineering (1)

REPLY TO: 2501 CANDELARIA ROAD, N.E., ALBUQUERQUE, NEW MEXICO 87107

PHOENIX (602) 272-6848 FLAGSTAFF (602) 774-4433 EL PASO (915) 591-8186 ALBUQUERQUE (505) 344-9940

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Job No. E74-1114

Fire Station No. 16
Albuquerque, New Mexico
Job No. E74-1114

INTRODUCTION

This report presents the results of a soil and foundation investigation made by this firm of the site of the proposed Fire Station No. 16 located on the west side of Juan Tabo Boulevard, N.E., just south of Manitoba in Albuquerque, New Mexico. The object of the investigation was to evaluate the physical properties of subsoils underlying the site to provide recommendations for foundation design and slab support.

PROPOSED CONSTRUCTION

It is understood the proposed structure will be single story of masonry bearing wall construction. No basement is proposed and slab-on-grade construction will be utilized. It is assumed that wall loads will be relatively light.

Should details involved in final design vary significantly from those outlined above, this firm should be notified for review and possible revision of recommendations.

INVESTIGATION

Subsurface Exploration

Three exploratory borings were drilled to depths varying between 21 and 26 feet below existing grade. Standard penetration testing and open-end drive sampling were performed at selected intervals in the borings. Results of the field investigation are presented in Appendix A which includes a brief description of test drilling and sampling equipment

and procedures, a site plan showing boring locations and logs of the test borings.

Laboratory Analysis

Moisture content determinations were made on all tube samples recovered while dry densities were determined for the 2.42 inch diameter open-end drive samples. The results of these tests are shown on the boring logs.

Grain-size analysis and Atterberg Limits tests were performed on selected samples to aid in classification. In addition, a consolidation test was performed on a selected sample. The results of these tests are presented in Appendix B along with a brief description of consolidation testing procedures.

SITE CONDITIONS & GEOLOGIC PROFILE

The site slopes slightly downward toward the west. A portion of the site has been excavated in the past; apparently for use as borrow. In addition, some contaminated end-dumped fill is present on the site.

As indicated by the exploratory borings, the soils underlying the site consist predominantly of silty sands with lesser amounts of clayey sands and sandy silts. These soils are generally very loose in the upper 3 to 4 feet, becoming medium dense to dense below that depth.

No free ground water was encountered in the borings and soil moisture contents were very low throughout their extent.

The consolidation test data indicates that many of the near surface soils underlying the site are weakened and their compressibility increased upon moisture increase.

DISCUSSION & RECOMMENDATIONS

Analysis of Results

The near surface soils underlying the site are considered too soft and compressible to provide reliable support for spread-type footings. Moreover, excessive settlements would take place upon moisture increase even with the use of very low bearing pressures. Overexcavation and recompaction of the soft moisture sensitive surface soils beneath the structure and the use of shallow spread-type footings bearing in the fill would provide safe support of the structure. Vibratory compaction of the cut surface in the building area is also recommended to minimize the potential for settlements. The type of vibratory compaction recommended has been shown to have some effect to as deep as 8.0 feet.

Detailed recommendations for this type of foundation system and required site grading are presented in following sections of this report.

Deep drilled foundations or rigid structural slabs would also provide safe support of the structure. These more costly systems do not appear to be economically feasible for the project. However, recommendations for these types of systems can be provided upon request.

Foundations

Provided a minimum of site grading is carried out, as recommended in a following section of this report, a safe soil bearing pressure of 2,000 psf is recommended for the design of shallow spread-type footings. Minimum depths of footings should be 2.0 feet below finished exterior grade for perimeter footings and 1.5 feet below finished floor elevation for interior footings.

The bearing pressure presented above applies to full dead plus realistic live loads and can be safely increased by one-third for total loads including wind or seismic forces.

Two feet and 1.33 feet are the minimum recommended widths of square and continuous footings, respectively. Maximum estimated settlements of foundations designed in accordance with the above criteria are $\frac{3}{4}$ inch for the soil moisture contents encountered at the time of test drilling.

Site Grading & Slab Support

Guide specifications for site grading are presented in Appendix C. These recommended specifications should apply to the building and footing areas, pavements, exterior slabs and any other areas of the site where surface subsidence would be objectionable.

The building area subgrades prepared in accordance with the recommended guide specifications will provide adequate structural support for office and other lightly loaded floor slabs

cast-on-grade so that no granular base will be necessary in these areas. However, if desired as a working surface, a 4-inch course of granular base can be placed beneath these floor slabs.

Six inches of granular base is recommended beneath floor slabs which are subjected to heavy wheel loads. With this support condition, a modulus of subgrade reaction of 300 pci is recommended for structural design of concrete floor slabs. The granular base will tend to act as a capillary barrier to moisture, but will not provide a positive barrier against the rise of moisture through slabs. If the moisture sensitivity of floor coverings is considered critical, an impervious membrane vapor barrier should be placed beneath floor slabs.

Site Drainage & Moisture Protection

Positive surface drainage should be provided during construction and maintained thereafter. Where possible, concrete slabs or asphaltic pavement should immediately adjoin the structure. Where they do not adjoin the structure, the ground surface should be sloped at a 2 percent grade or steeper for at least 20.0 feet away from its perimeter with positive drainage being provided from that point onward.

Roof runoff should be conveyed away from the structure by nonerosive devices at the ground surface. In no case should long-term ponding of water be allowed in the vicinity of the structure or exterior slabs. The possibility of moisture infiltration beneath the structure, in the event of plumbing leaks, should be considered in the design and inspection of underground water and sewer conduits.

TEST DRILLING EQUIPMENT & PROCEDURES

Drilling Equipment Truck mounted CME-55 drill rigs powered with 4 or 6 cylinder Ford Industrial Engines are used in advancing test borings. The 4 cylinder and 6 cylinder engines are capable of delivering about 4350 and 6500 ft. lbs. torque to the drill spindle, respectively. The spindle is advanced with twin hydraulic rams capable of exerting 12,000 pounds downward force. Drilling through soil or softer rock is performed with 6½" O.D. 3¼" I.D. hollow stem auger or 4½" continuous flight auger. Carbide insert teeth are normally used on the auger bits so they can often penetrate rock or very strongly cemented soils which require blasting or very heavy equipment for excavation. Where refusal is experienced in auger drilling, the holes are sometimes advanced with tricone gear bits and NW rods using water or air as a drilling fluid.

Sampling Procedures Dynamically driven tube samples are usually obtained at selected intervals in the borings by the ASTM D1586 procedure. Two inch O.D. 1-3/8" I.D. samplers are used in many cases to obtain the standard penetration resistance. "Undisturbed" samples of firmer soils are often obtained with 3" O.D. samplers lined with 2.42" I.D. brass rings. Driving energy is generally recorded as the number of blows of a 140 pound 30 inch free fall drop hammer required to advance the samplers in 6 inch increments. However, in stratified soils driving resistance sometimes is recorded in 2 or 3 inch increments so that soil changes and the presence of scattered gravel or cemented layers can be readily detected and realistic penetration values obtained for consideration in design. These values are expressed in blows per foot on the logs. "Undisturbed" sampling of softer soils is sometimes performed with thin walled Shelby tubes (ASTM D1587). Where samples of rock are required, they are obtained by NX Diamond Core Drilling (ASTM D2113). The tube samples are labeled and placed in watertight containers to maintain field moisture contents for testing. When necessary for testing, larger bulk samples are taken from auger cuttings.

Continuous Penetration Tests Continuous penetration tests are performed by driving a 2" O.D. blunt nosed penetrometer adjacent to or in the bottom of borings. The penetrometer is attached to 1-5/8" O.D. drill rods to provide clearance and minimize side friction so that penetration values are as nearly as possible a measure of end resistance. Penetration values are recorded as the number of blows of a 140 pound 30 inch free fall drop hammer required to advance the penetrometer in one foot increments or less.

Boring Records Drilling operations are directed by our field engineer or geologist who examines soil recovery and prepares boring logs. Soils are visually classified in accordance with the Unified Soil Classification System (ASTM D2487) with appropriate group symbols being shown on the logs.

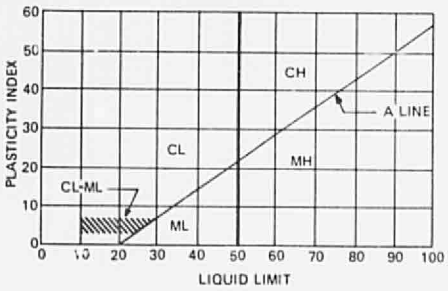
UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified by the Unified Soil Classification system on the boring logs presented in this report. Grain-size analysis and Atterberg Limits Tests are often performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. For a more detailed description of the system, see "The Unified Soil Classification System" Corp of Engineers, US Army Technical Memorandum No. 3-357 (Revised April 1960) or ASTM Designation: D2487-66T.

MAJOR DIVISIONS				GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES
COARSE-GRAINED SOILS (Less than 50% passes No. 200 sieve)	GRAVELS (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
					GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures.
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GM	Silty gravels, gravel-sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 seive)			SW	Well graded sands, gravelly sands.
					SP	Poorly graded sands, gravelly sands.
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures.
			Limits plot above "A" line & hatched zone on plasticity chart		SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS (50% or more passes No. 200 sieve)	SILTS (LIMITS PLOT BELOW "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	SILTS OF LOW PLASTICITY (Liquid Limit Less Than 50)			ML	Inorganic silts, clayey silts with slight plasticity.
		SILTS OF HIGH PLASTICITY (Liquid Limit More Than 50)			MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts.
	CLAYS (LIMITS PLOT ABOVE "A" LINE & HATCHED ZONE ON PLASTICITY CHART)	CLAYS OF LOW PLASTICITY (Liquid Limit Less Than 50)			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		CLAYS OF HIGH PLASTICITY (Liquid Limit More Than 50)			CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity.

NOTE: Coarse grained soils with between 5% & 12% passing the No. 200 sieve and fine grained soils with limits plotting in the hatched zone on the plasticity chart to have double symbol.

PLASTICITY CHART

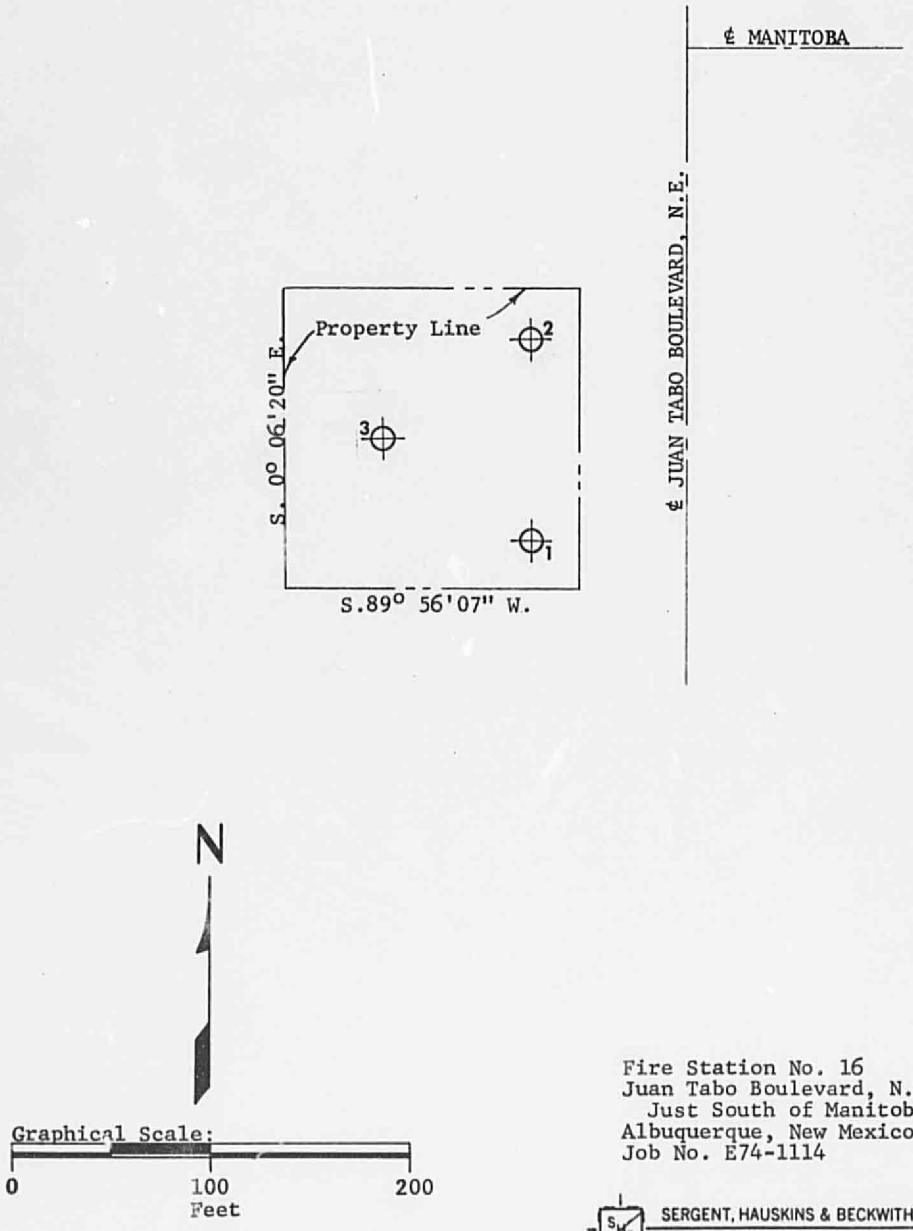


DEFINITIONS OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to ¾ in.
Fine gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve

SITE PLAN

SHOWING LOCATIONS OF TEST BORINGS



Fire Station No. 16
Juan Tabo Boulevard, N.E.
Just South of Manitoba
Albuquerque, New Mexico
Job No. E74-1114

SERGENT, HAUSKINS & BECKWITH
CONSULTING SOIL AND FOUNDATION ENGINEERS
PHOENIX • FLAGSTAFF • ALBUQUERQUE • EL PASO

PROJECT FIRE STATION No. 16

JOB NO. E74-1114 DATE 12-23-74

LOG OF TEST BORING NO. 1

RIG TYPE CME-55

BORING TYPE 6½" HOLLOW STEM AUGER

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			X	U	8	106	13	SC	SOFT	CLAYEY SAND, SOME SILT, MEDIUM PLASTICITY, BROWN
			X	S	2		2	SM	VERY LOOSE	SILTY SAND, TRACE OF GRAVEL, WELL GRADED, LOW PLASTICITY, LIGHT BROWN
5			X	S	19 (NO RECOVERY)					
10			X	S	18		1	SM	MEDIUM DENSE	SILTY SAND, PREDOMINANTLY FINE TO MEDIUM, SOME GRAVEL, NONPLASTIC, LIGHT BROWN
15			X	S	14		3	ML	MODERATELY FIRM TO FIRM	SANDY SILT, LOW PLASTICITY, BROWN
20			X	S	27		3			
25										STOPPED AUGER AT 19'6" STOPPED SAMPLER AT 21'

GROUND WATER

DEPTH	HOUR	DATE
	NONE	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT FIRE STATION No. 16
JOB NO. E74-1114 DATE 12-23-74

LOG OF TEST BORING NO. 2

RIG TYPE CME-55
BORING TYPE 6½" HOLLOW STEM AUGER
SURFACE ELEV.
DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			X	S	8		8		LOOSE TO MEDIUM DENSE	SILTY SAND, SOME GRAVEL, WELL GRADED, LOW PLASTICITY TO NONPLASTIC, BROWN
			X	S	8		5			
5			X	S	16		4			
10			X	S	23		1	SM		
15			X	S	23		4			
20			X	S	26		2			
25										STOPPED AUGER AT 19'6" STOPPED SAMPLER AT 21'

GROUND WATER

DEPTH	HOUR	DATE
	NONE	

SAMPLE TYPE
A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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PROJECT FIRE STATION No. 16

JOB NO. E74-1114 DATE 12-23-74

LOG OF TEST BORING NO. 3

RIG TYPE CME-55

BORING TYPE 6½" HOLLOW STEM AUGER

SURFACE ELEV.

DATUM

Depth in Feet	Continuous Penetration Resistance	Graphical Log	Sample	Sample Type	Blows per foot 140 lb. 30" free-fall drop hammer	Dry Density Lbs. per cu. ft.	Moisture Content Per Cent of Dry Wt.	Unified Soil Classification	REMARKS	VISUAL CLASSIFICATION
0			X	S	11		5		MEDIUM DENSE TO DENSE	SILTY SAND, WELL GRADED, LOW PLASTICITY TO NONPLASTIC, BROWN
			X	U	79	105	3	SM		
5			X	S	33		3			
10			X	S	17		2		MEDIUM DENSE	SILTY SAND, SOME GRAVEL, WELL GRADED, NONPLASTIC, BROWN
								SM		
15			X	S	13		3			
20			X	S	21		3		MEDIUM DENSE	SILTY SAND, WELL GRADED, NONPLASTIC, LIGHT BROWN
								SM		
25			X	S	25		2			
30										STOPPED AUGER AT 24'6" STOPPED SAMPLER AT 26'

GROUND WATER

DEPTH	HOUR	DATE
	NONE	

SAMPLE TYPE

A – Auger cuttings. B – Block sample
S – 2" O.D. 1.38" I.D. tube sample.
U – 3" O.D. 2.42" I.D. tube sample.
T – 3" O.D. thin-walled Shelby tube.

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LABORATORY TESTING PROCEDURES

Consolidation Tests. Soiltest or Clockhouse apparatus of the "floating-ring" type are employed for the one-dimensional consolidation tests. They are designed to receive one inch high 2.5 inch O.D. brass liner rings with soil specimens as secured in the field. Procedures for the tests are generally those outlined in ASTM D2435-65T. Loads are applied in several increments to the upper surface of the test specimen and the resulting deformations are recorded at selected time intervals for each increment. For soils which are essentially saturated, each increment of load is maintained until the deformation versus log of time curve indicates completion of primary consolidation. For partially saturated soils, each increment of load is maintained until the rate of deformation is equal or less than 1/10,000 inch per hour. Applied loads are such that each new increment is equal to the total previously applied loading. Porous stones are placed in contact with the top and bottom of the specimens to permit free addition or expulsion of water. For partially saturated soils, the tests are normally performed at in situ moisture conditions until consolidation is complete under stresses approximately equal to those which will be imposed by the combined overburden and foundation loads. The samples are then submerged to show the effect of moisture increase and the tests continued under higher loadings. Generally the tests are continued to about twice the anticipated stress due to overburden and structural loads with a rebound curve then being established by releasing loads.

Expansion Tests. The same type of consolidometer apparatus described above is used in expansion testing. Undisturbed samples contained in brass liner rings are placed in the consolidometers, subjected to appropriate surcharge loads and submerged. The loads are maintained until the expansion versus log of time curve indicates completion of "primary swell".

Fire Station No. 16
Juan Tabo Blvd., just south of Manitoba, N.E.
Albuquerque, New Mexico
Job No. E74-1114

TABULATION OF LABORATORY TEST RESULTS

Material: On site soil
Source: Samples from borings
Date Sampled: December 23, 1974

Hole No.	Depth	Field Moist.	U.S. Class.	L.L.	P.I.	Sieve Analysis - Accum. % Passing #200	# 40	# 10	# 4	3/8"	3/4"
1	3'	2%	SM	24	3	17	33	63	94	100	
	10'	1%									
	15'	3%									
	20'	3%									
2	1'	8%	SM	NV	NP	24	46	70	90	99	100
	3'	5%	SM	NV	NP	15	34	60	81	88	93
	5'	4%									
	10'	1%									
	15'	4%									
	20'	2%									
3	1'	5%									
	5'	3%									
	10'	2%									
	15'	3%									
	20'	3%									
	25'	2%									

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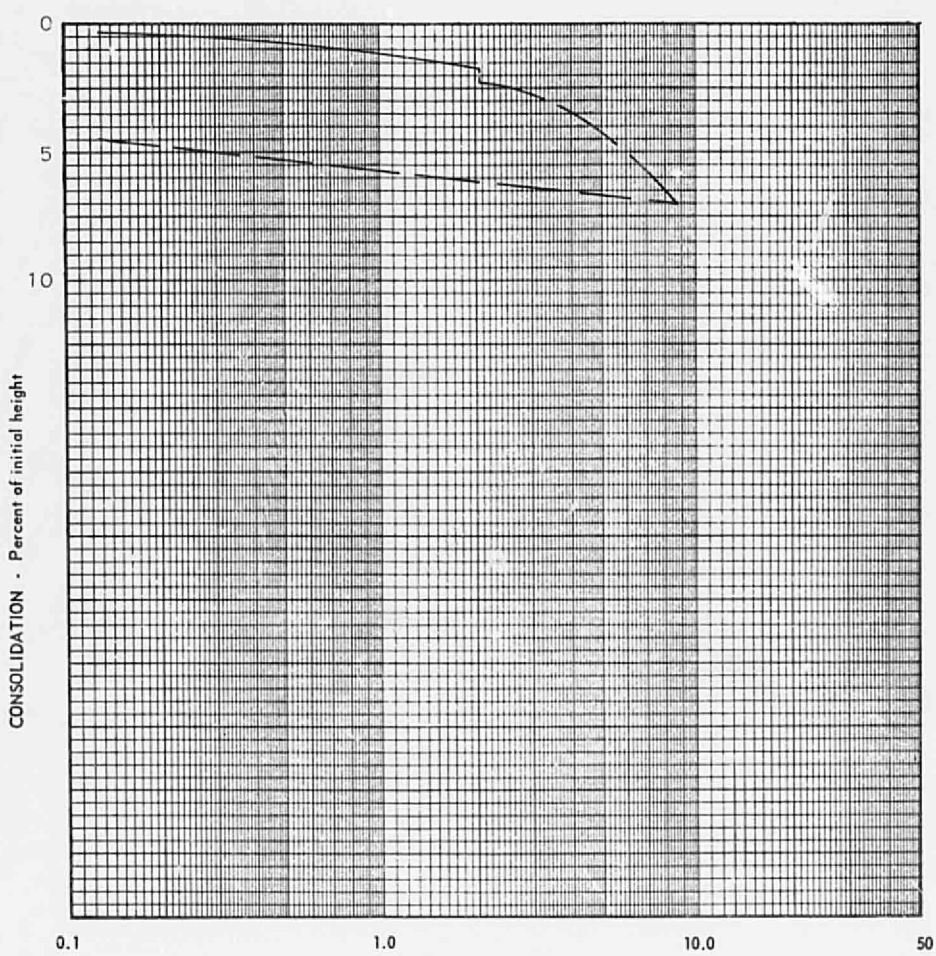
Consulting Materials Engineers

SUMMARY OF CONSOLIDATION TESTS

PROJECT Fire Station No. 16 **JOB NO.** F74-1114



CURVE	SAMPLE	INITIAL DRY DENSITY LBS./CU. FT.	MOISTURE CONTENT % DRY WEIGHT		UNIFIED SOIL CLASSIFICATION
			INITIAL	FINAL	
A	Boring #1 at 6"	105.5	12.7	18.2	SC

SOIL MOISTURE CONDITION
——— INSITU
– – – – SUBMERGED

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B-3

GUIDE SPECIFICATIONS FOR SITE GRADING

1. OBSERVATIONS & TESTS
The soils engineer shall act as the designer's representative and shall make observations of site grading operations and tests as considered necessary for quality control. Where foundations or other critical elements are to be supported on engineered fill, continuous observations and tests of grading operations shall be made by the soils engineer. All tests shall be performed in accordance with procedures set forth in the 1972 Book of Standards of the American Society of Testing and Materials (ASTM).

2. EXTENT OF SURFACE PREPARATION & ENGINEERED FILL
Clearing and stripping, any required overexcavation of existing surface soils, compaction of the surface of the native soils and placement and compaction of the engineered fill material shall extend for a horizontal distance outside of the perimeters of the building, exterior slabs, pavements, etc., equal to the depth of the engineered fill. The perimeter of building shall be considered as being the extreme outer edge of footings in determining the required lateral extent of engineered fill.

3. CLEARING & STRIPPING OF EXISTING FILL
All vegetation, debris and existing man-made fill shall be removed from throughout the building area and any areas to receive fill. Stumps, roots larger than 2 inches in diameter and matted roots shall be removed from within 6 inches of the surface of areas on which fills are to be constructed.

4. BUILDING AREA PREPARATION
The upper 2.0 feet of native soils throughout the building area (and for a distance of 5.0 feet outside its perimeter) shall be overexcavated and removed. The exposed surface of the native soils beneath footings as well as the surface of the native soils beneath slabs shall be watered to bring the moisture content of the upper 5.0 feet as

close as practicable to the optimum moisture content. The ground surface shall then be subjected to 20 passes of a heavy steel drum vibratory roller (10 ton minimum weight). The upper 6 inches of native soils shall then be compacted and the building area brought up to finished base of subgrade elevation with properly compacted engineered fill.

5. COMPACTION METHODS & EQUIPMENT
Mechanical compaction equipment shall be used in all grading operations. In no case shall "water settling" or jetting be employed. Where vibratory compaction equipment is used, it shall be the contractor's responsibility to insure that the vibrations do not damage nearby buildings or other adjacent property.

6. THICKNESS OF LIFTS
Lifts shall have a thickness, when compacted, of no more than 8 inches unless otherwise authorized by the soils engineer. Where the contractor demonstrates the equipment being used effectively compacts lifts thicker than 8 inches, they may be authorized by the soils engineer.

7. GRANULAR BASE QUALITY REQUIREMENTS
Granular base shall be free of vegetation, debris and other deleterious material. It shall meet the following grading requirements as determined by ASTM D422.

Sieve Size (Square Openings)	Percent Passing by Weight
1 inch	100
$\frac{3}{4}$ inch	95-100
$\frac{1}{4}$ inch	35-75
no. 200	0-8

The fraction of material passing the no. 40 sieve shall be nonplastic when tested by ASTM D423 and D424. The coarse aggregate shall have a percent of wear when subjected to the Los Angeles abrasion test (ASTM C131) of no greater than 45.

8. ENGINEERED FILL QUALITY REQUIREMENTS
Engineered fill shall be free of vegetation, debris and other deleterious material and contain no particles larger than 6 inches in diameter. It shall have a plasticity index of no more than 15 when tested by ASTM D423 and D424. The native soils at the site will meet these requirements.

9. REQUIRED DEGREE OF COMPACTION
Maximum density and optimum moisture content of the fill and base materials shall be determined by ASTM D1557. Materials in the various areas of the project shall be compacted to at least the following minimum percentages of maximum density.

Area	Percent of Maximum Density
Fill below the base of footing elevation	95
Slab support fill less than 1.5 feet in depth	90
Slab support fill 1.5 feet or more in depth	95
Upper 8 inches of pavement subgrade	95
Pavement fill below 8 inches	90
Granular base	95

For purposes of acceptance, the in-place density of the fill shall be defined as that determined by the sand cone method (ASTM D1556-64) or by nuclear methods (ASTM D2922).

The upper 6 inches of native soils shall be compacted to the same requirements as outlined above for fill.

Engineered fill compaction requirements shall apply to all utility trench, footing, retaining wall and other backfill in the various areas of the project designated for site grading.

2405