

CONSTRUCTION SPECIFICATIONS

FOR

16TH STREET BRIDGE AT THE ARIZONA CANAL DIVERSION CHANNEL
AND
SANITARY SEWER LIFT STATION

FCD CONTRACT NO. 89-46

CONSTRUCTION SPECIAL PROVISIONS

Prepared By:

ENTRANCO ENGINEERS, INC.
2400 West Dunlap, Suite 100
Phoenix, Arizona 85021

Property of
Flood Control District of MC Lib...
Please Return to
2801 W. Elvango
Phoenix, AZ 85009



(Engineer's
Seal)

PREPARED FOR:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Recommended By: Nick Karan Date: 11-16-89
Nicholas P. Karan, P.E.
Chief, Engineering Division

Approved By: Stanley L. Smith Date: 11-16-89
STANLEY L. SMITH JR., P.E.
DEPUTY CHIEF ENGINEER
D.E. Sagramoso, P.E.
Chief Engineer and General Manager

SUPPLEMENTARY TO MARICOPA ASSOCIATION OF GOVERNMENTS UNIFORM STANDARD
SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION EDITION OF 1979 AND
REVISIONS AND SUPPLEMENTS THERETO.



FLOOD CONTROL DISTRICT
of
Maricopa County

3335 West Durango Street • Phoenix, Arizona 85009
Telephone (602) 262-1501

BOARD OF DIRECTORS

Betsy Bayless
James D. Bruner
Carole Carpenter
Tom Freestone
Ed Pastor

D. E. Sagramoso, P.E., Chief Engineer and General Manager

JAN 10 1990

Mr. Robert R. Murch
MGC Contractors, Inc.
411 South Mill, Suite 205
Tempe, Arizona 85281

SUBJECT: Contract FCD 89-46, 16th Street Bridge at the
Arizona Canal Diversion Channel

Dear Mr. Murch:

Enclosed is a copy of the subject contract documents, as executed by the
Chairman of the Board on January 5, 1990.

In accordance with contract specifications, Section 108.1(A) this letter is
your Notice to Proceed and complete the work under the contract within Two
Hundred Ten (210) calendar days starting January 11, 1990.

Please acknowledge receipt of this Notice on the copy attached and return it
to my attention.

Sincerely,

Leanna Cumberland
Chief, Contracting Branch

Copy to: Chief, Construction & Operations
Chief, Planning & Project Management
Chief, Inspection Branch

HO
RECEIPT ACKNOWLEDGED:

MGC CONTRACTORS, INC.

By: _____

Title: _____

Date: _____

COORD:

INFO: ~~KVH~~ KVH
JER *[Signature]* 1/15

~~EAB~~ EAB

RCP

File: FCD 89-46

Sanitary Sewer Lift Station

Pay Item No.	Description	Unit	Engineers Estimate		MGC Contractors		Hunter Contracting		Stacey Construction**		
			Bid Qty	Unit Price	Bid Total	Unit Price	Bid Total	Unit Price	Bid Total	Unit Price	Bid Total
206-1	Structural Excavation Bridge, Lift Sta. & Underpass (Approx. Qty. 6000 CY)	LS	1	60,000.00	60,000.00	35,802.00	35,802.00	23,000.00	23,000.00		
206-2	Structural Backfill Bridge & Lift Sta. (Approx. Qty. 220 CY)	LS	1	3,300.00	3,300.00	5,000.00	5,000.00	11,700.00	11,700.00		
206-3	Special Backfill Underpass (AB Slurry) (Approx. Qty. 600 CY)	LS	1	12,000.00	12,000.00	16,000.00	16,000.00	14,400.00	14,400.00		
310-1	Aggregate Base Course (Temporary)	TON	250	20.00	5,000.00	18.00	4,500.00	6.30	1,575.00		
321-1	Asphalt Concrete (C-3/4")	TON	700	40.00	28,000.00	45.00	31,500.00	40.00	28,000.00		
336-1	AC Pavement Replacement	SY	150	50.00	7,500.00	45.00	6,750.00	28.00	4,200.00		
340-1	Concrete Curb & Gutter (Det. 220, Type A, H=6")	LF	304	8.00	2,432.00	5.75	1,748.00	9.00	2,736.00		
340-2	Concrete Sidewalk (Det. P-1230)	SF	1,450	2.00	2,900.00	1.70	2,465.00	1.40	2,030.00		
340-3	Concrete Driveway (Det. P-1255)	SF	640	6.00	3,840.00	2.25	1,440.00	2.50	1,600.00		
350-1	Demolish & Remove Structures (ACDC R/W Demolition)	LS	1	20,000.00	20,000.00	10,000.00	10,000.00	12,000.00	12,000.00		
350-2	Remove Concrete Curb & Gutter	LF	475	2.00	950.00	2.00	950.00	1.60	760.00		
350-3	Remove Conc. Sidewalk Driveway & Slabs	SF	2,375	1.00	2,375.00	2.00	4,750.00	0.35	831.25		
350-4	Remove Asphalt Concrete Pavement	SY	1,600	2.00	3,200.00	2.50	4,000.00	1.60	2,560.00		
350-5	Misc. Removal & Other Work	LS	1	50,000.00	50,000.00	17,500.00	17,500.00	15,800.00	15,800.00		
401-1	Traffic Control	LS	1	50,000.00	50,000.00	22,600.00	22,600.00	7,000.00	7,000.00		
401-2	Uniformed Off-Duty Law Enforcement Officer	HRS	1,000	22.00	22,000.00	22.60	22,600.00	21.00	21,000.00		
505-1	Class "A" Concrete (f'c=3000 psi) (Bridge, Underpass & Lift Station)	CY	170	300.00	51,000.00	250.00	42,500.00	220.00	37,400.00		
505-2	Class "AA" Concrete (f'c=4000 psi)	CY	420	400.00	168,000.00	120.00	50,400.00	150.00	63,000.00		
505-3	Steel Reinforcement (Bridge, Lift Sta.)	LBS	110,000	0.50	55,000.00	0.43	47,300.00	0.34	37,400.00		
505-5	Drilled Shaft Foundation (36" Dia.)	LF	3,870	125.00	483,750.00	130.00	503,100.00	140.00	541,800.00		
505-6	Precast Box Culvert Underpass	LF	240	600.00	144,000.00	450.00	108,000.00	560.00	134,400.00		
506-1	Precast, Prestressed Conc. Box Girders	EA	75	5,000.00	375,000.00	3,750.00	281,250.00	4,000.00	300,000.00		
510-1	7' Masonry Block Wall (incl. Reinf. Conc. Footing)	SF	1,260	20.00	25,200.00	7.50	9,450.00	4.00	5,040.00		
515-1	Miscellaneous Metal & Aluminum Grating (Approx. 2500 Lbs)	LS	1	5,000.00	5,000.00	2,000.00	2,000.00	6,500.00	6,500.00		
515-2	Special Aluminum Hatches	LS	1	5,000.00	5,000.00	2,750.00	2,750.00	3,200.00	3,200.00		

** Bid amount unknown - too many errors

Pay Item No.	Description	Unit	Bid Qty	Engineers Estimate		MGC Contractors		Hunter Contracting		Stacey Construction**	
				Unit Price	Bid Total	Unit Price	Bid Total	Unit Price	Bid Total	Unit Price	Bid Total
520-1	Ornamental Iron Fence	LF	88	30.00	2,640.00	30.00	2,640.00	28.00	2,464.00		
610-1	8" MJDIP Waterline With Fittings	LF	195	40.00	7,800.00	52.00	10,140.00	46.00	8,970.00		
610-2	6" MJDIP Waterline With Fittings	LF	12	30.00	360.00	55.00	660.00	18.00	216.00		
610-3	8"x6" Tapping Sleeve V B & C Type "A"	EA	1	500.00	500.00	1,500.00	1,500.00	1,000.00	1,000.00		
610-4	Relocate Existing Fire Hydrant	EA	1	3,000.00	3,000.00	1,050.00	1,050.00	600.00	600.00		
610-5	Cut and Plug 8" or 6" Waterline										
	(MAG Std. Det. 472)	EA	2	500.00	1,000.00	60.00	120.00	200.00	400.00		
615-1	8" PVC Pipe Sleeve	LF	440	20.00	8,800.00	5.00	2,200.00	6.00	2,640.00		
615-2	8" VCP Sanitary Sewer Pipe	LF	120	40.00	4,800.00	50.00	6,000.00	28.00	3,360.00		
615-3	12" VCP Sanitary Sewer Pipe	LF	893	50.00	44,650.00	60.00	53,580.00	50.00	44,650.00		
615-4	8" MJDIP Sanitary Force Main										
	(restrained joints)	LF	260	50.00	13,000.00	30.00	7,800.00	40.00	10,400.00		
615-5	Sanitary Sewer Pipe Plug										
	(MAG Std. Det. 427)	EA	4	200.00	800.00	115.00	460.00	100.00	400.00		
615-6	Fill and Abandon Manhole	EA	4	600.00	2,400.00	925.00	3,700.00	350.00	1,400.00		
625-1	San. Sewer Manhole (MAG Std. Det. 420)	EA	8	2,500.00	17,500.00	1,750.00	14,000.00	1,250.00	10,000.00		
1200-1	Pumps, Submersible	EA	2	10,250.00	20,500.00	3,800.00	7,600.00	8,500.00	17,000.00		
1407-1	Odor Control	EA	1	2,200.00	2,200.00	9,000.00	9,000.00	3,200.00	3,200.00		
1407-2	JIB Crane	EA	1	10,800.00	10,800.00	2,850.00	2,850.00	2,100.00	2,100.00		
1500-1	Piping Valves, Gates & Specialties										
	(Within Lift Station Site)	LS	1	23,800.00	23,800.00	24,000.00	24,000.00	29,000.00	29,000.00		
1600-1	Standby Generator	EA	1	25,250.00	25,250.00	34,000.00	34,000.00	20,800.00	20,800.00		
1600-2	Control Panel	EA	1	12,000.00	12,000.00	1,150.00	1,150.00	9,700.00	9,700.00		
1600-3	Switchboard	EA	1	15,000.00	15,000.00	2,250.00	2,250.00	11,800.00	11,800.00		
1600-4	Underground Conduit & Wire	LS	1	3,600.00	3,600.00	600.00	600.00	16,200.00	16,200.00		
1600-5	Incidental Wiring, Fittings & Devices	LS	1	7,000.00	7,000.00	12,000.00	12,000.00	2,100.00	2,100.00		
1600-6	Service Conduit	LS	1	3,800.00	3,800.00	600.00	600.00	2,100.00	2,100.00		
1700-1	Circular Chart Recorder	EA	1	3,000.00	3,000.00	3,000.00	3,000.00	1,000.00	1,000.00		
1700-2	8" Magnetic Flowmeter	EA	1	6,500.00	6,500.00	5,650.00	5,650.00	3,200.00	3,200.00		
	Bid Total				1,826,147.00		1,440,905.00		1,482,632.25		
	Difference, Dollars										
	From Engineer's Estimate				N/A		<385,242.00>		<343,514.75>		
	From Lowest Bidder				385,242.00		N/A		41,727.25		

** Bid amount unknown - too many errors

Sanitary Sewer Lift Station

Pay Item No.	Description	Unit	Enginers Estimate		Grammer Construction		JWJ Contracting		CS Construction		
			Bid Qty	Unit Price	Bid Total	Unit Price	Bid Total	Unit Price	Bid Total	Unit Price	Bid Total
206-1	Structural Excavation Bridge, Lift Sta. & Underpass (Approx. Qty. 6000 CY)	LS	1	60,000.00	60,000.00	50,000.00	50,000.00	10,000.00	10,000.00	100,000.00	100,000.00
206-2	Structural Backfill Bridge & Lift Sta. (Approx. Qty. 220 CY)	LS	1	3,300.00	3,300.00	15,000.00	15,000.00	10,000.00	10,000.00	20,000.00	20,000.00
206-3	Special Backfill Underpass (AB Slurry) (Approx. Qty. 600 CY)	LS	1	12,000.00	12,000.00	20,000.00	20,000.00	15,000.00	15,000.00	20,000.00	20,000.00
310-1	Aggregate Base Course (Temporary)	TON	250	20.00	5,000.00	18.00	4,500.00	10.00	2,500.00	26.00	6,500.00
321-1	Asphalt Concrete (C-3/4")	TON	700	40.00	28,000.00	30.00	21,000.00	40.00	28,000.00	36.00	25,200.00
336-1	AC Pavement Replacement	SY	150	50.00	7,500.00	50.00	7,500.00	40.00	6,000.00	36.00	5,400.00
340-1	Concrete Curb & Gutter (Det. 220, Type A, H=6")	LF	304	8.00	2,432.00	9.00	2,736.00	10.00	3,040.00	9.00	2,736.00
340-2	Concrete Sidewalk (Det. P-1230)	SF	1,450	2.00	2,900.00	2.00	2,900.00	5.00	7,250.00	3.00	4,350.00
340-3	Concrete Driveway (Det. P-1255)	SF	640	6.00	3,840.00	4.00	2,560.00	5.00	3,200.00	4.00	2,560.00
350-1	Demolish & Remove Structures (ACDC R/W Demolition)	LS	1	20,000.00	20,000.00	25,000.00	25,000.00	40,000.00	40,000.00	70,000.00	70,000.00
350-2	Remove Concrete Curb & Gutter	LF	475	2.00	950.00	1.00	475.00	20.00	9,500.00	5.00	2,375.00
350-3	Remove Conc. Sidewalk Driveway & Slabs	SF	2,375	1.00	2,375.00	1.00	2,375.00	1.00	2,375.00	5.00	11,875.00
350-4	Remove Asphalt Concrete Pavement	SY	1,600	2.00	3,200.00	2.00	3,200.00	2.00	3,200.00	5.00	8,000.00
350-5	Misc. Removal & Other Work	LS	1	50,000.00	50,000.00	75,000.00	75,000.00	10,000.00	10,000.00	35,000.00	35,000.00
401-1	Traffic Control	LS	1	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	50,000.00	12,000.00	12,000.00
401-2	Uniformed Off-Duty Law Enforcement Officer	HRS	1,000	22.00	22,000.00	24.00	24,000.00	22.00	22,000.00	18.00	18,000.00
505-1	Class "A" Concrete (f'c=3000 psi) (Bridge, Underpass & Lift Station)	CY	170	300.00	51,000.00	250.00	42,500.00	300.00	51,000.00	350.00	59,500.00
505-2	Class "AA" Concrete (f'c=4000 psi)	CY	420	400.00	168,000.00	250.00	105,000.00	300.00	126,000.00	150.00	63,000.00
505-3	Steel Reinforcement (Bridge, Lift Sta.)	LBS	110,000	0.50	55,000.00	0.40	44,000.00	0.50	55,000.00	0.31	34,100.00
505-5	Drilled Shaft Foundation (36" Dia.)	LF	3,870	125.00	483,750.00	137.00	530,190.00	140.00	541,800.00	142.50	551,475.00
505-6	Precast Box Culvert Underpass	LF	240	600.00	144,000.00	425.00	102,000.00	620.00	148,800.00	500.00	120,000.00
506-1	Precast, Prestressed Conc. Box Girders	EA	75	5,000.00	375,000.00	3,650.00	273,750.00	4,000.00	300,000.00	4,000.00	300,000.00
510-1	17' Masonry Block Wall (incl. Reinf. Conc. Footing)	SF	1,260	20.00	25,200.00	7.00	8,820.00	7.00	8,820.00	10.00	12,600.00
515-1	Miscellaneous Metal & Aluminum Grating (Approx. 2500 Lbs)	LS	1	5,000.00	5,000.00	5,000.00	5,000.00	4,000.00	4,000.00	3,500.00	3,500.00
515-2	Special Aluminum Hatches	LS	1	5,000.00	5,000.00	5,000.00	5,000.00	4,000.00	4,000.00	4,000.00	4,000.00

and Sanitary Sewer Lift Station

Pay Item No.	Description	Unit	Bid Qty	Engineers Estimate		Grammer Construction		JWJ Contracting		CS Construction	
				Unit Price	Bid Total	Unit Price	Bid Total	Unit Price	Bid Total	Unit Price	Bid Total
520-1	Ornamental Iron Fence	LF	88	30.00	2,640.00	22.00	1,936.00	50.00	4,400.00	30.00	2,640.00
610-1	18" MJDIP Waterline With Fittings	LF	195	40.00	7,800.00	40.00	7,800.00	30.00	5,850.00	25.00	4,875.00
610-2	6" MJDIP Waterline With Fittings	LF	12	30.00	360.00	40.00	480.00	20.00	240.00	15.00	180.00
610-3	18"x6" Tapping Sleeve V B & C Type "A"	EA	1	500.00	500.00	1,200.00	1,200.00	1,000.00	1,000.00	1,000.00	1,000.00
610-4	Relocate Existing Fire Hydrant	EA	1	3,000.00	3,000.00	500.00	500.00	500.00	500.00	400.00	400.00
610-5	Cut and Plug 8" or 6" Waterline (MAG Std. Det. 472)	EA	2	500.00	1,000.00	150.00	300.00	200.00	400.00	200.00	400.00
615-1	18" PVC Pipe Sleeve	LF	440	20.00	8,800.00	12.00	5,280.00	10.00	4,400.00	7.00	3,080.00
615-2	18" VCP Sanitary Sewer Pipe	LF	120	40.00	4,800.00	100.00	12,000.00	30.00	3,600.00	27.00	3,240.00
615-3	12" VCP Sanitary Sewer Pipe	LF	893	50.00	44,650.00	120.00	107,160.00	60.00	53,580.00	50.00	44,650.00
615-4	18" MJDIP Sanitary Force Main (restrained joints)	LF	260	50.00	13,000.00	60.00	15,600.00	50.00	13,000.00	47.00	12,220.00
615-5	Sanitary Sewer Pipe Plug (MAG Std. Det. 427)	EA	4	200.00	800.00	200.00	800.00	200.00	800.00	150.00	600.00
615-6	Fill and Abandon Manhole	EA	4	600.00	2,400.00	200.00	800.00	600.00	2,400.00	600.00	2,400.00
625-1	San. Sewer Manhole (MAG Std. Det. 420)	EA	8	2,500.00	17,500.00	1,200.00	9,600.00	2,000.00	16,000.00	2,000.00	16,000.00
1200-1	Pumps, Submersible	EA	2	10,250.00	20,500.00	15,000.00	30,000.00	20,000.00	40,000.00	8,500.00	17,000.00
1407-1	Odor Control	EA	1	2,200.00	2,200.00	7,500.00	7,500.00	3,000.00	3,000.00	3,500.00	3,500.00
1407-2	JIB Crane	EA	1	10,800.00	10,800.00	1,500.00	1,500.00	2,000.00	2,000.00	2,500.00	2,500.00
1500-1	Piping Valves, Gates & Specialties (Within Lift Station Site)	LS	1	23,800.00	23,800.00	18,000.00	18,000.00	30,000.00	30,000.00	30,000.00	30,000.00
1600-1	Standby Generator	EA	1	25,250.00	25,250.00	18,000.00	18,000.00	25,000.00	25,000.00	37,000.00	37,000.00
1600-2	Control Panel	EA	1	12,000.00	12,000.00	5,000.00	5,000.00	5,000.00	5,000.00	10,000.00	10,000.00
1600-3	Switchboard	EA	1	15,000.00	15,000.00	5,000.00	5,000.00	10,000.00	10,000.00	12,000.00	12,000.00
1600-4	Underground Conduit & Wire	LS	1	3,600.00	3,600.00	6,000.00	6,000.00	15,000.00	15,000.00	16,000.00	16,000.00
1600-5	Incidental Wiring, Fittings & Devices	LS	1	7,000.00	7,000.00	12,000.00	12,000.00	5,000.00	5,000.00	2,500.00	2,500.00
1600-6	Service Conduit	LS	1	3,800.00	3,800.00	2,500.00	2,500.00	2,000.00	2,000.00	2,200.00	2,200.00
1700-1	Circular Chart Recorder	EA	1	3,000.00	3,000.00	2,500.00	2,500.00	2,000.00	2,000.00	1,200.00	1,200.00
1700-2	18" Magnetic Flowmeter	EA	1	6,500.00	6,500.00	5,000.00	5,000.00	7,000.00	7,000.00	3,200.00	3,200.00
	Bid Total				1,826,147.00		1,698,962.00		1,713,655.00		1,720,956.00
	Difference, Dollars										
	From Engineer's Estimate				N/A		<127,185.00>		<112,492.00>		<105,191.00>
	From Lowest Bidder				385,242.00		258,057.00		272,750.00		280,051.00

Sanitary Sewer Lift Station

Pay Item No.	Description	Unit	Bid Qty	Engineers Estimate		Nesbitt Contracting		FNF Construction		Unit Price	Bid Total
				Unit Price	Bid Total	Unit Price	Bid Total	Unit Price	Bid Total		
206-1	Structural Excavation Bridge, Lift Sta. & Underpass (Approx. Qty. 6000 CY)	LS	1	60,000.00	60,000.00	65,000.00	65,000.00	80,000.00	80,000.00		
206-2	Structural Backfill Bridge & Lift Sta. (Approx. Qty. 220 CY)	LS	1	3,300.00	3,300.00	14,500.00	14,500.00	6,000.00	6,000.00		
206-3	Special Backfill Underpass (AB Slurry) (Approx. Qty. 600 CY)	LS	1	12,000.00	12,000.00	20,000.00	20,000.00	48,000.00	48,000.00		
310-1	Aggregate Base Course (Temporary)	TON	250	20.00	5,000.00	30.00	7,500.00	16.00	4,000.00		
321-1	Asphalt Concrete (C-3/4")	TON	700	40.00	28,000.00	42.00	29,400.00	26.00	18,200.00		
336-1	AC Pavement Replacement	SY	150	50.00	7,500.00	45.00	6,750.00	20.00	3,000.00		
340-1	Concrete Curb & Gutter (Det. 220, Type A, H=6")	LF	304	8.00	2,432.00	7.00	2,128.00	11.00	3,344.00		
340-2	Concrete Sidewalk (Det. P-1230)	SF	1,450	2.00	2,900.00	2.00	2,900.00	2.00	2,900.00		
340-3	Concrete Driveway (Det. P-1255)	SF	640	6.00	3,840.00	7.50	4,800.00	3.00	1,920.00		
350-1	Demolish & Remove Structures (ACDC R/W Demolition)	LS	1	20,000.00	20,000.00	50,000.00	50,000.00	150,000.00	150,000.00		
350-2	Remove Concrete Curb & Gutter	LF	475	2.00	950.00	2.00	950.00	3.00	1,425.00		
350-3	Remove Conc. Sidewalk Driveway & Slabs	SF	2,375	1.00	2,375.00	2.00	4,750.00	1.00	2,375.00		
350-4	Remove Asphalt Concrete Pavement	SY	1,600	2.00	3,200.00	4.00	6,400.00	6.00	9,600.00		
350-5	Misc. Removal & Other Work	LS	1	50,000.00	50,000.00	45,000.00	45,000.00	65,000.00	65,000.00		
401-1	Traffic Control	LS	1	50,000.00	50,000.00	65,000.00	65,000.00	75,000.00	75,000.00		
401-2	Uniformed Off-Duty Law Enforcement Officer	HRS	1,000	22.00	22,000.00	25.00	25,000.00	22.00	22,000.00		
505-1	Class "A" Concrete (f'c=3000 psi) (Bridge, Underpass & Lift Station)	CY	170	300.00	51,000.00	250.00	42,500.00	240.00	40,800.00		
505-2	Class "AA" Concrete (f'c=4000 psi)	CY	420	400.00	168,000.00	130.00	54,600.00	240.00	100,800.00		
505-3	Steel Reinforcement (Bridge, Lift Sta.)	LBS	110,000	0.50	55,000.00	0.35	38,500.00	0.34	37,400.00		
505-5	Drilled Shaft Foundation (36" Dia.)	LF	3,870	125.00	483,750.00	153.00	592,110.00	140.00	541,800.00		
505-6	Precast Box Culvert Underpass	LF	240	600.00	144,000.00	490.00	117,600.00	500.00	120,000.00		
506-1	Precast, Prestressed Conc. Box Girders	EA	75	5,000.00	375,000.00	4,100.00	307,500.00	3,300.00	247,500.00		
510-1	7' Masonry Block Wall (incl. Reinf. Conc. Footing)	SF	1,260	20.00	25,200.00	10.00	12,600.00	9.00	11,340.00		
515-1	Miscellaneous Metal & Aluminum Grating (Approx. 2500 Lbs)	LS	1	5,000.00	5,000.00	3,300.00	3,300.00	6,000.00	6,000.00		
515-2	Special Aluminum Hatches	LS	1	5,000.00	5,000.00	3,300.00	3,300.00	3,000.00	3,000.00		

Pay Item No.	Description	Unit	Bid Qty	Engineers Estimate		Nesbitt Contracting		FNF Construction		Unit Price	Bid Total
				Unit Price	Bid Total	Unit Price	Bid Total	Unit Price	Bid Total		
520-1	Ornamental Iron Fence	LF	88	30.00	2,640.00	32.00	2,816.00	30.00	2,640.00		
610-1	18" MJDIP Waterline With Fittings	LF	195	40.00	7,800.00	35.00	6,825.00	40.00	7,800.00		
610-2	16" MJDIP Waterline With Fittings	LF	12	30.00	360.00	25.00	300.00	90.00	1,080.00		
610-3	18"x6" Tapping Sleeve V B & C Type "A"	EA	1	500.00	500.00	1,000.00	1,000.00	1,100.00	1,100.00		
610-4	Relocate Existing Fire Hydrant	EA	1	3,000.00	3,000.00	750.00	750.00	600.00	600.00		
610-5	Cut and Plug 8" or 6" Waterline (MAG Std. Det. 472)	EA	2	500.00	1,000.00	250.00	500.00	100.00	200.00		
615-1	18" PVC Pipe Sleeve	LF	440	20.00	8,800.00	15.00	6,600.00	8.00	3,520.00		
615-2	18" VCP Sanitary Sewer Pipe	LF	120	40.00	4,800.00	40.00	4,800.00	60.00	7,200.00		
615-3	12" VCP Sanitary Sewer Pipe	LF	893	50.00	44,650.00	75.00	66,975.00	70.00	62,510.00		
615-4	18" MJDIP Sanitary Force Main (restrained joints)	LF	260	50.00	13,000.00	65.00	16,900.00	60.00	15,600.00		
615-5	Sanitary Sewer Pipe Plug (MAG Std. Det. 427)	EA	4	200.00	800.00	150.00	600.00	200.00	800.00		
615-6	Fill and Abandon Manhole	EA	4	600.00	2,400.00	600.00	2,400.00	1,200.00	4,800.00		
625-1	San. Sewer Manhole (MAG Std. Det. 420)	EA	8	2,500.00	17,500.00	2,000.00	16,000.00	1,900.00	15,200.00		
1200-1	Pumps, Submersible	EA	2	10,250.00	20,500.00	5,000.00	10,000.00	8,000.00	16,000.00		
1407-1	Odor Control	EA	1	2,200.00	2,200.00	3,300.00	3,300.00	3,000.00	3,000.00		
1407-2	JIB Crane	EA	1	10,800.00	10,800.00	2,750.00	2,750.00	2,000.00	2,000.00		
1500-1	Piping Valves, Gates & Specialties (Within Lift Station Site)	LS	1	23,800.00	23,800.00	35,000.00	35,000.00	27,000.00	27,000.00		
1600-1	Standby Generator	EA	1	25,250.00	25,250.00	24,000.00	24,000.00	35,000.00	35,000.00		
1600-2	Control Panel	EA	1	12,000.00	12,000.00	6,500.00	6,500.00	9,000.00	9,000.00		
1600-3	Switchboard	EA	1	15,000.00	15,000.00	6,500.00	6,500.00	11,000.00	11,000.00		
1600-4	Underground Conduit & Wire	LS	1	3,600.00	3,600.00	13,500.00	13,500.00	15,000.00	15,000.00		
1600-5	Incidental Wiring, Fittings & Devices	LS	1	7,000.00	7,000.00	2,200.00	2,200.00	2,000.00	2,000.00		
1600-6	Service Conduit	LS	1	3,800.00	3,800.00	2,200.00	2,200.00	2,000.00	2,000.00		
1700-1	Circular Chart Recorder	EA	1	3,000.00	3,000.00	7,000.00	7,000.00	1,000.00	1,000.00		
1700-2	18" Magnetic Flowmeter	EA	1	6,500.00	6,500.00	8,000.00	8,000.00	3,000.00	3,000.00		
	Bid Total				1,826,147.00		1,769,504.00		1,850,454.00		
	Difference, Dollars										
	From Engineer's Estimate				N/A		< 56,643.00 >		24,307.00		
	From Lowest Bidder				385,242.07		328,599.00		409,549.00		

16TH STREET BRIDGE AT THE
ARIZONA CANAL DIVERSION CHANNEL
FCD CONTRACT NO. 89-46

Pre-Bid Meeting Minutes
December 6, 1989

The meeting began with introductions of Flood Control District Staff involved in the contract administration, project management and staff that will be involved in the inspection of the project.

A brief description of the location of the project and major items of construction were reviewed. The following items were reviewed in detail:

1. Contractors are encouraged to closely review the following Sections in the Construction Special Provisions: Contract Time; 104.1.2; 106.3; 108.5; 350, especially subsections Q through W.
2. Traffic Control - Temporary barricades are to be used on the detours as noted on Sheets 4 and 5 of 23. A vellum base map will be provided to contractor.
3. General - This project is subject to the provisions passed in the last legislative session regarding prompt payment to the contractors. The Flood Control District will not have any problem complying to the 14 day payment to the prime contractor. However, the contractor has the responsibility to pay its subcontractors in accordance with the statutes.
- MBE/WBE participation is a desired goal, not a mandatory goal.
4. Addendum - An addendum will be issued. The items of the addendum are as follows:
 - A. Invitation to Bids:
Revise Item 625-1, approximate quantity from 7 each to 8 each.
 - B. Construction - Special Provisions:
Delete the sixth paragraph on page 18 of 129. Revise Section 350 adding a sentence to Item "U" and adding Items "X" and "Y".
Replace the second paragraph of page 32 of 129.
Replace Section 150130, Lining and Coating.
Replace the fifth paragraph on page 52 of 129.
 - C. Construction Plans:
Revise a portion of Sheet 17 showing that Manhole #9 is new instead of existing.

Questions:

1. What is contract time:

The project is schedule for 210 calendar days.

2. Traffic Control is always changed during construction. Can anything be done to minimize changes during construction?

The Engineer will work closely with Contractor and City to minimize Traffic Control.

16TH STREET BRIDGE
FCD 89-46

PRE-BID SIGN-IN

	Name	Company	Telephone
1	BILL KANTOR	EET	264-1228
2	FRED FULLER	FCD	262-1501
3	TICK CARPENTIER	FNF CONSTRUCTION	345-7546
4	CLIFFORD HANT	"	"
5	MICHAEL SUMNER	BCS ENTERPRISES (DEMO)	969-5272
6	W. THOMPSON	R.G. JOHNSON	874-0746
7	BILL STACEY	STACEY CONST INC.	9564510
3	BILL HEIK	STATEWIDE EXCAVATING INC.	956-2240
?	E. Bisthrow	Flood Control	262-1501
0	Kumar Hanumaiah	FCD	262-1501
1	Ed Rafeigh	"	" "
2	LEANNA UMBERLAND	FCD CONTRACTING, BRICK	262-1501

ADDENDUM NO. 2

DATE: DECEMBER 14, 1989

FCD CONTRACT NO. 89-46

Page 1 of 2

To Contract Documents

ENTITLED: 16TH STREET BRIDGE AT THE ARIZONA CANAL DIVERSION CHANNEL
AND SANITARY SEWER LIFT STATION

OWNER: Flood Control District of Maricopa County

The above documents are herein modified. The provisions of said documents applicable to these modifications remain unchanged unless specifically indicated otherwise herein. This addendum forms a part of the contract documents and modifies them as follows:

TO INVITATION TO BID AND BIDDING SCHEDULE:

INVITATION TO BID, remove and replace page 3 of 27. Note specifically the following changes:

Revise 205 CY of 3000 psi concrete TO 170 CY.

Revise 700 CY of 4000 psi concrete TO 420 CY.

Add the following item: 700 Ton Asphalt Concrete (C-3/4)

BIDDING SCHEDULE, remove and replace page 6 and 7 of 27. Note specifically:

Page 6 of 27

Revise Item No. 310-1, from 600 Ton Aggregate Base Course (Temporary) TO 250 Ton.

Revise Item No. 321-1, from 70 Ton of Asphalt Concrete C-3/4 TO 700 Ton.

Page 7 of 27

Revise Item No. 505-1, from 205 CY of Class "A" Concrete TO 170 CY.

Revise Item No. 505-2, from 700 CY of Class "AA" Concrete TO 420 CY.

Delete Item No. 505-4 in its entirety.

ADDENDUM NO. 2

DATE: DECEMBER 14, 1989

FCD CONTRACT NO. 89-46

Page 2 of 2

TO CONSTRUCTION SPECIAL PROVISIONS:

SECTION 505 - CONCRETE BRIDGE STRUCTURES: Page 27 of 129

Delete the last paragraph of the page which continues on page 28 of 129 in its entirety.

Page 28 of 129

Delete the first paragraph of the page which reads, "Payment for this item...REINFORCED CONCRETE STREET PAVEMENT." in its entirety.

TO CONSTRUCTION DRAWINGS:

Plan Sheet 5 of 23

Revise "TRANSITION DETAIL" for Phase 4 - Weekend Traffic Closure (A) as shown on a portion of Sheet 5 of 23, see attached revised TRANSITION DETAIL.

Plan Sheet 6 of 23

Remove plan sheet 6 and replace with revised plan sheet 6, attached.

Plan Sheet 8 of 23

Revise "Primary Reinf. #9 bars at 8" or 5" O.C." as shown on APPROACH SLAB DETAILS, sheet 8 of 23 TO "Primary Reinf. #9 bars at 7 1/2" or 5" O.C.". See attached revised detail, a portion of sheet 8 of 23.

Plan Sheet 11 of 23

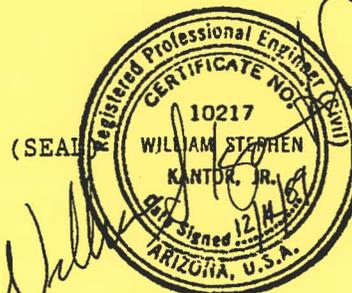
Revise "Concrete Overlay (f'c = 4000) with/#4 at 18" B.W., 2 1/2" Clear" as shown on BRIDGE SECTION, Sheet 11 of 23, TO "AC Overlay MAG C-3/4".



D.E. Sagramoso, P.E.
Chief Engineer and General Manager
Flood Control District of Maricopa County



William S. Kantor, Jr.
Entranco Engineers, Inc.



PRINCIPLE ITEMS AND APPROXIMATE QUANTITIES

<u>QUANTITY</u>	<u>UNIT</u>	<u>DESCRIPTION</u>
170	CY	3,000 psi Concrete
420	CY	4,000 psi Concrete
110,000	LBS	Steel Reinforcement
75	EA	Prestressed Concrete Box Girders
3,870	LF	Drilled Shaft Foundation (36" Diameter)
893	LF	12" VCP Sanitary Sewer Pipe
240	LF	10'x10' CBC Underpass
700	TON	Asphalt Concrete (C-3/4)

BIDDING SCHEDULE

PROJECT: 16th Street Bridge at the ACDC and Sanitary Sewer Lift Station

CONTRACT: FCD 89-46

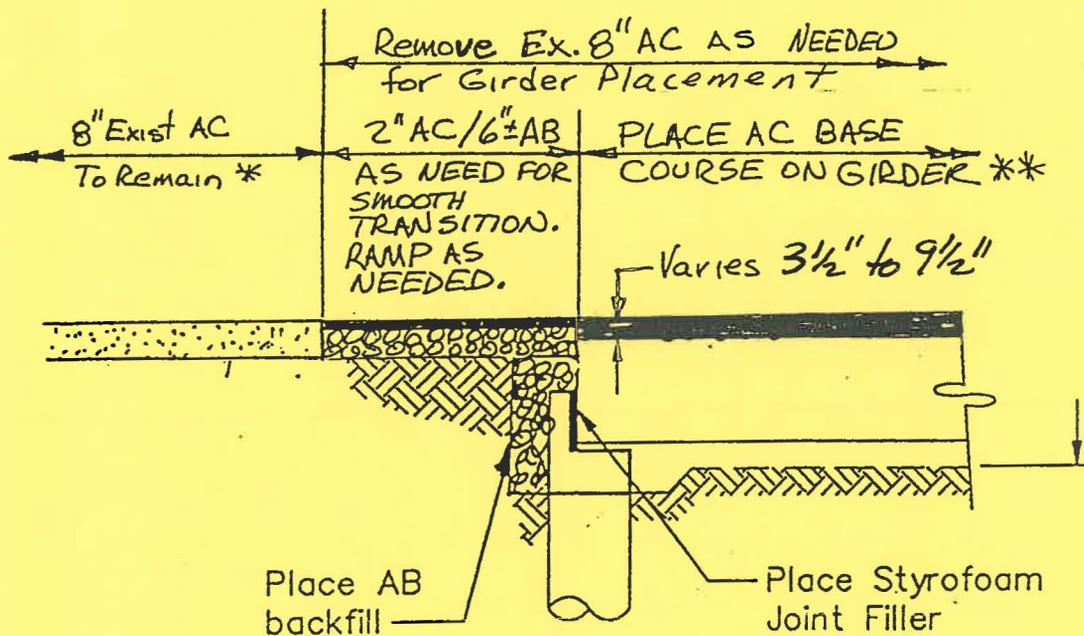
ITEM NO.	DESCRIPTION	APPROXIMATE QUANTITY	UNIT	UNIT COST (IN WRITING) AND /100 DOLLARS	UNIT COST (NUMBERS)	EXTENDED AMOUNT
206-1	Structural Excavation Bridge, Lift Station & Underpass (Approx. Quantity 6000 CY)	1	LS			
206-2	Structural Backfill Bridge & Lift Station (Approx. Quantity 220 CY)	1	LS			
206-3	Special Backfill Underpass (AB Slurry) (Approx. Quantity 600 CY)	1	LS			
310-1	Aggregate Base Course (Temporary)	250	TON			
321-1	Asphalt Concrete (C-3/4")	700	TON			
336-1	AC Pavement Replacement	150	SY			
340-1	Concrete Curb & Gutter (Det. 220, Type A, H=6")	304	LF			
340-2	Concrete Sidewalk (Det. P-1230)	1,450	SF			
340-3	Concrete Driveway (Det. P-1255)	640	SF			
350-1	Demolish & Remove Structures (ACDC R/W Demolition)	1	LS			
350-2	Remove Concrete Curb & Gutter	475	LF			
350-3	Remove Concrete Sidewalk Driveway & Slabs	2,375	SF			
350-4	Remove Asphalt Concrete Pavement	1,600	SY			
350-5	Misc. Removal & Other Work	1	LS			
401-1	Traffic Control	1	LS			

BIDDING SCHEDULE

PROJECT: 16th Street Bridge at the ACDC and Sanitary Sewer Lift Station

CONTRACT: FCD 89-46

ITEM NO.	DESCRIPTION	APPROXIMATE QUANTITY	UNIT	UNIT COST (IN WRITING) AND /100 DOLLARS	UNIT COST (NUMBERS)	EXTENDED AMOUNT
401-2	Uniformed Off-Duty Law Enforcement Officer	1,000	HRS			
505-1	Class "A" Concrete (f'c=3000 psi) (Bridge, Underpass & Lift Station)	170	CY			
505-2	Class "AA" Concrete (f'c=4000 psi)	420	CY			
505-3	Steel Reinforcement (Bridge, Lift Station)	110,000	LBS			
505-5	Drilled Shaft Foundation (36" Diameter)	3,870	LF			
505-6	Precast Box Culvert Underpass	240	LF			
506-1	Precast, Prestressed Concrete Box Girders	75	EA			
510-1	7' Masonry Block Wall (including Reinf. Conc. Footing)	1,260	SF			
515-1	Miscellaneous Metal & Aluminum Grating (Approx. 2500 lbs)	1	LS			
515-2	Special Aluminum Hatches	1	LS			
520-1	Ornamental Iron Fence	88	LF			
610-1	8" MJDIP Waterline With Fittings	195	LF			
610-2	6" MJDIP Waterline With Fittings	12	LF			
610-3	8"x6" Tapping Sleeve V B & C Type "A"	1	EA			

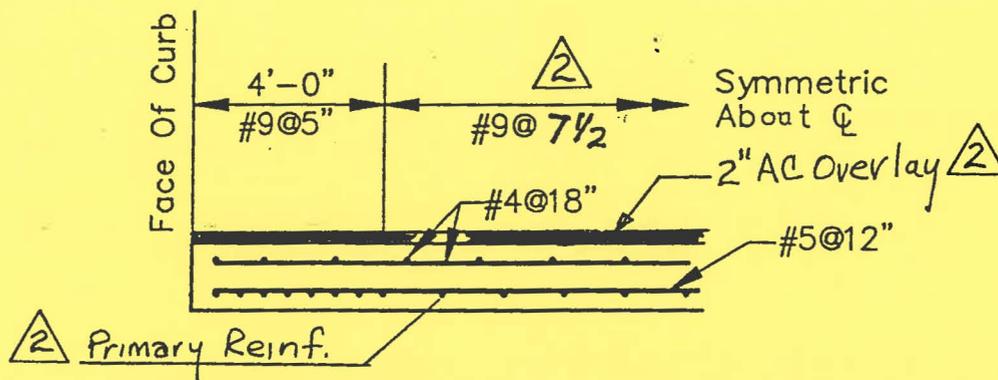


2 Transition Detail
 N.T.S.

* Maintain as much existing AC as possible until underpass is installed. After underpass is complete replace AC to AZ Canal bridge with 8", MAG C-3/4, asphalt pavement. 2" AC over 6" AB transition pavement shall be installed and maintained in the approach slab areas until the concrete approach slabs are installed.

** Place 1-1/2" to 7-1/2", AC MAG C-3/4, on girders after installation. Place final 2" AC, MAG C-3/4, overlay on approach slabs after the concrete approach slabs are installed.

A PORTION OF SHEET 5 of 23



Approach Slab Detail per ADOT Standard
No. B-19.11 (Modified) See Det Above

Modifications:

- A) Thickness = 1'-4"
- B) Length = 24'-0"
- C) Primary Reinf. #9 Bar @ 7 1/2" or 5" O.C.
- D) Top Steel Shall Be Supported at 4'-0" in Both Directions.

△ 2 APPROACH SLAB DETAILS

A PORTION OF SHEET 8 of 23

DATE: DECEMBER 11, 1989

FCD CONTRACT NO. 89-46

Page 1 of 5

To Contract Documents

ENTITLED: 16TH STREET BRIDGE AT THE ARIZONA CANAL DIVERSION CHANNEL
AND SANITARY SEWER LIFT STATION

OWNER: Flood Control District of Maricopa County

The above documents are herein modified. The provisions of said documents applicable to these modifications remain unchanged unless specifically indicated otherwise herein. This addendum forms a part of the contract documents and modifies them as follows:

TO INVITATION TO BID AND BIDDING SCHEDULE:

BIDDING SCHEDULE, remove and replace page 8 of 27. Note specifically Item 625-1, change approximate quantity from 7 to 8.

TO CONSTRUCTION SPECIAL PROVISIONS:

SECTION 350 - REMOVAL OF EXISTING IMPROVEMENTS:

Page 18 of 129

Delete the sixth paragraph on page 18 of 129 in its entirety.

Add the following sentence to the end of the paragraph entitled "U":

"The decomposed granite shall be 2" thick and covers approximately 2,000 square yards."

Page 19 of 129

Add Item X.

"X. The Contractor shall be responsible for and pay all costs for the production, printing and distribution of notices in connection with Traffic Control on this project. The Contractor shall notify all affected businesses and residences in the area of the project site at least 14 days prior to a complete closure of 16th Street. A reminder notice shall again be delivered three days prior to the complete closure."

Add Item Y.

"Y. The Contractor shall restore the pavement markings which are removed during construction of the bridge. Pavement markings shall comply with the City of Phoenix Traffic Barricade Manual and City Specification for Paint for Pavement Markings."

DATE: DECEMBER 11, 1989

FCD CONTRACT NO. 89-46

Page 2 of 5

SECTION 505 - CONCRETE BRIDGE STRUCTURES: Page 32 of 129

Delete the second paragraph from the top of the page in its entirety and replace with the following:

"The Contractor shall exercise care so that no damage to a complete caisson will occur. The Contractor shall not begin drilling caissons adjacent to caissons which have not had at least 48 hours of concrete cure time."

SECTION 615 - SEWER LINE CONSTRUCTION: Page 52 of 129

Delete the fifth paragraph from the top of the page and replace with:

"Coal tar epoxy shall conform to the specification in SECTION 150130 of these Special Provisions."

SECTION 150130 - LINING AND COATING: Page 80 of 129

Delete section in its entirety and replace with the following:

"SECTION 150130 - LINING FOR DUCTILE IRON PIPE FOR GRAVITY SEWER LINES

Coal Tar Epoxy Lining:

Coal tar epoxy lining compound must be a catalyzed two-component coal tar epoxy compound capable of at least 40 mils dry film thickness in an application process whereby delamination will not occur. The material must also meet the following minimum performance requirements:

- a. A direct impact resistance as measured by ASTM D 2794 at 35 mils dry film thickness on ductile iron panels. The material shall pass 60 inch-pounds of impact.
- b. An abrasion resistance of 25 liters of sand per mil as measured by ASTM D 968.
- c. The coal tar epoxy used shall meet the requirements of Military Specification DOD-P-23236A (SH), Type I, Class 2.

All coal tar epoxy lining shall be done by the pipe manufacturer at the location of manufacture of the pipe, or by a qualified applicator selected and inspected by the pipe manufacturer to do the lining. In the latter case, the applicator may do the coal tar epoxy lining at his place of business and shall have a five-year history of doing this particular type of lining for ductile iron or steel pipe.

The pipe manufacturer shall be solely responsible for both the quality of the pipe and the quality of the lining.

DATE: DECEMBER 11, 1989

All surface areas which will be exposed to sewer liquids and/or gases shall be cleaned so as to remove all deleterious materials. After cleaning, the lining compound shall be applied to all surface areas which will be exposed to the sewer liquids and/or gases. The lining compound shall be applied so as to obtain a continuous and relatively uniform and smooth integral lining.

The lining in the barrel area shall have a nominal thickness of 40 mil and a minimum thickness of 35 mils. However, the lining in the bell area may transition from a 35 mil minimum thickness at the edge of the barrel area to a 10 mil minimum thickness at the edge of the gasket socket. The 10 mil lining shall extend into the gasket socket area to a point where the gasket would overlap the lining when it is compressed due to pipe assembly during construction. The 10 mil lining shall also continue from inside the barrel area, around the spigot end of the pipe and along the outside of the pipe to a point where the center of the gasket of the next pipe section would contact the edge of the lining on the spigot end of the previous pipe section. This is a minimum requirement. The thickness of linings shall be determined by using a dry film thickness magnetic gauge at four quadrants.

Because of the extremely rough profile of ductile iron pipe and to insure adequate protection, the amount of material required to achieve the desired film thickness shall be calculated and that amount shall be applied to the surface.

Lining material must pass the following immersion tests (35 mil minimum dry film thickness) without disintegration, blistering, or cracking:

<u>Test</u>	<u>Temperature</u>	<u>Duration Hours</u>	
		<u>Polyethylene</u>	<u>Coal Tar Epoxy</u>
10% Sulfuric Acid	70 F	432	2,160
36% Hydrochloric Acid	70 F	720	432
3% Sulfuric Acid	112 F	---	384
25% Sodium Hydroxide	112 F	---	1,560

Each piece of pipe shall be tested and shall have an absence of holidays when tested by a suitable holiday detector. In all cases, the barrel area of the pipe shall be tested using both a voltage of 7500 volts and a dry conductive probe.

Where coal tar epoxy is used in the bell area or on the exterior of the spigot end, that area shall be tested using both a voltage of 67.5 volts and wet sponge.

DATE: DECEMBER 11, 1989

The pipe manufacturer shall issue a certification that states that the lining meets the Specifications. This certification shall state specifically the following items:

- a. All ductile iron pipe and fittings have a coal tar epoxy interior lining of 40 mils (35 mils minimum) in the barrel area, 10 mils minimum in the bell area and 10 mils minimum on the exterior of the spigot end.
- b. Each piece of pipe and each fitting have been checked for holidays utilizing a testing voltage of 7500 volts with a dry conductive probe in the barrel area and a testing voltage of 67 1/2 volts with a wet sponge in both the bell area and the exterior of the spigot end, and no holidays were found.
- c. The coal tar epoxy lining shall extend from the bottom of the gasket socket in the bell to a point on the exterior of the spigot end of the pipe where the next pipe gasket would overlap the lining.
- d. All coal tar epoxy used meets the current Specifications.

When pipe is supplied that cannot meet the certification requirements for holiday testing and minimum lining thickness in the bell area or on the exterior of the spigot end, neoprene caulking will be required when the pieces of pipe are assembled during construction.

This caulking must be applied in sufficient quantity and at the proper location such that when the spigot end of the pipe is inserted into the bell end of another pipe, an impermeable seal is developed between the spigot end of one pipe section and the barrel to bell transition point of the other pipe section. The use of this caulking is only a substitute for certifications dealing with holidays and lining thickness in the bell area and the exterior spigot end. All other certification requirements must be complied with. It should also be noted that the Engineer may require the use of neoprene caulking during construction of all DIP when deemed appropriate.

If the contractor makes a field cut of coal tar epoxy lined pipe, he shall comply with the recommendations of the pipe manufacturer in applying a coal tar epoxy coating to the pipe end and in allowing proper drying time before pipe assembly. In all cases, as a minimum, a 10 mil coating of coal tar epoxy shall be applied to the pipe end and shall overlap the coal tar epoxy lining by four inches and extend around the end of the pipe and along the outside of the pipe a minimum of ten inches. The coating shall be allowed to dry before assembly. In addition, the overlapped surface of the coal tar epoxy lining shall be roughed up to produce a 3 to 5 mil profile over the entire surface. The end result of this process is to secure proper adhesion for the coal tar epoxy.

DATE: DECEMBER 11, 1989

Holiday testing may be required by the Engineer after pipe assembly when deemed appropriate. The testing and repair requirements shall follow the procedures called for in these specifications.

Repair:

Repair of the damaged sections of the coal tar epoxy lining shall be in accordance with the lining manufacturer's recommendations or as specified above so that the repaired area is equal to the undamaged lined area in all respects. All damaged lined areas and holidays shall be repaired immediately.

There will be no other provisions for repair of DIP."

TO CONSTRUCTION DRAWINGS:

Plan Sheet No. 6

Correct sheet 6 of 23, BRIDGE QUANTITIES TABLE (APPROXIMATE):

- A. Cast-in-Place Concrete f'c = 3000 psi: from 205 CY TO 145 CY
- B. Cast-in-Place Concrete f'c = 4000 psi: from 700 CY TO 540 CY
- C. Reinforcing Steel: from 110,000 lbs TO 99,600 lbs.

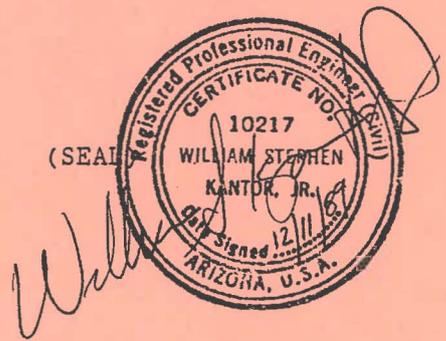
Plan Sheet No. 17

Revise a portion of plan sheet 17 of 23 showing existing manhole number 9 as a new manhole to be installed on this project. See the attached revised portion of sheet 17 of 23.

Stanley L. Smith Jr.
 STANLEY L. SMITH JR., P.E.
 DEPUTY CHIEF ENGINEER

D.E. Sagramoso, P.E.
 Chief Engineer and General Manager
 Flood Control District of Maricopa County

William S. Kantor, Jr.
 William S. Kantor, Jr.
 Entranco Engineers, Inc.



BIDDING SCHEDULE

PROJECT: 16th Street Bridge at the ACDC and Sanitary Sewer Lift Station

CONTRACT: FCD 89-46

ITEM NO.	DESCRIPTION	APPROXIMATE QUANTITY	UNIT	UNIT COST (IN WRITING) AND /100 DOLLARS	UNIT COST (NUMBERS)	EXTENDED AMOUNT
610-4	Relocate Existing Fire Hydrant	1	EA			
610-5	Cut and Plug 8" or 6" Waterline (MAG Std. Det. 472)	2	EA			
615-1	8" PVC Pipe Sleeve	440	LF			
615-2	8" VCP Sanitary Sewer Pipe	120	LF			
615-3	12" VCP Sanitary Sewer Pipe	893	LF			
615-4	8" MJDIP Sanitary Force Main (restrained joints)	260	LF			
615-5	Sanitary Sewer Pipe Plug (MAG Std. Det. 427)	4	EA			
615-6	Fill and Abandon Manhole	4	EA			
625-1	Sanitary Sewer Manhole (MAG Std. Det. 420)	8	EA			
1200-1	Pumps, Submersible	2	EA			
1407-1	Odor Control	1	EA			
1407-2	JIB Crane	1	EA			
1500-1	Piping, Valves, Gates & Specialties (Within Lift Station Site)	1	LS			
1600-1	Standby Generator	1	EA			
1600-2	Control Panel	1	EA			

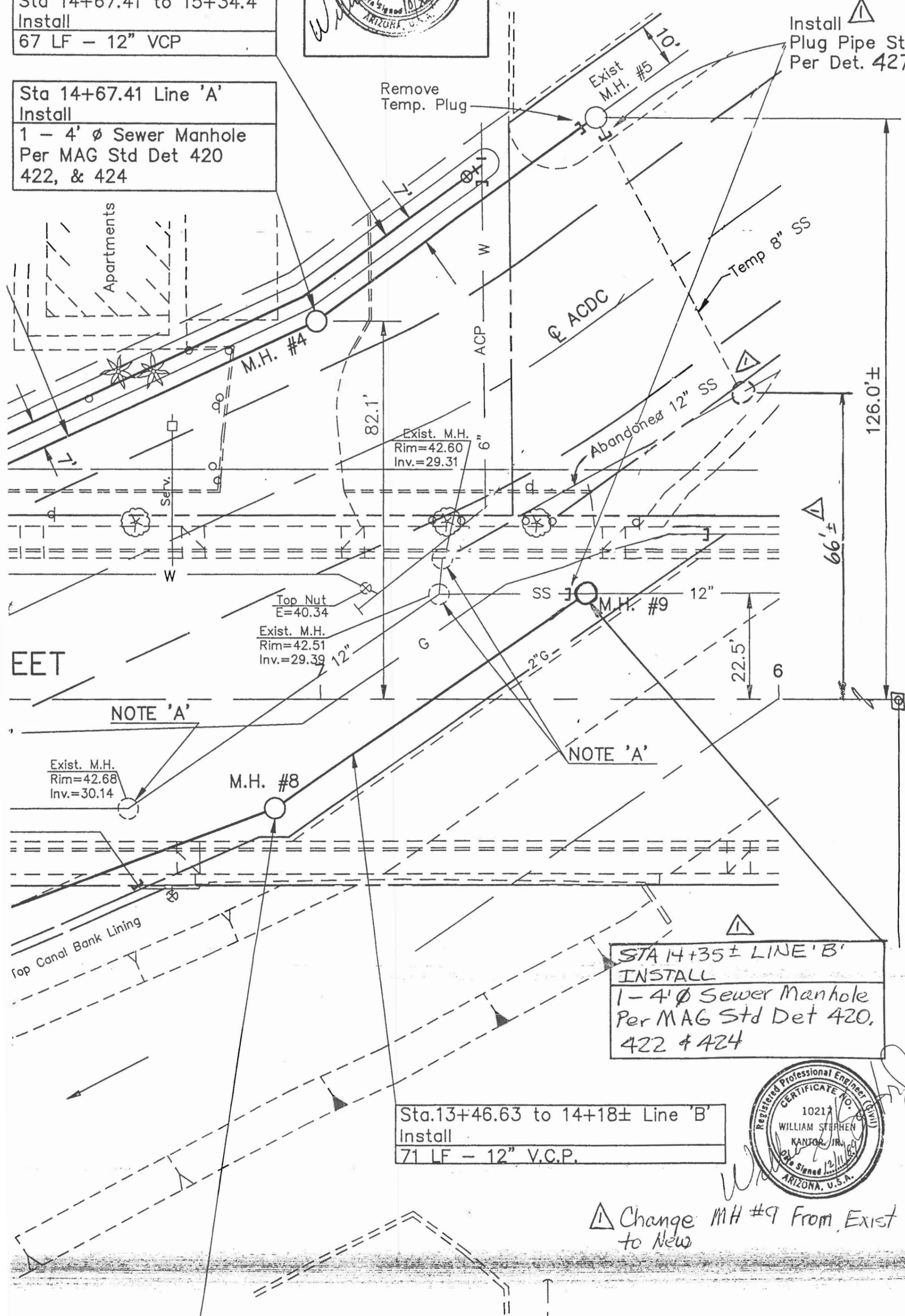


PROJ. NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
FCD-89-46	17	23	
ENTRANCO ENGINEERS, INC ENGINEERS ENVIRONMENTAL SCIENTISTS PLANNERS CONSULTING ENGINEER			
DES: JMG	DR: DWB	CK: WSK	DATE: 8/89

Sta 14+67.41 to 15+34.4
Install
67 LF - 12" VCP

Sta 14+67.41 Line 'A'
Install
1 - 4' ϕ Sewer Manhole
Per MAG Std Det 420
422, & 424

Install 
Plug Pipe Std.
Per Det. 427



NOTE 'A'

NOTE 'A'

STA 14+35± LINE 'B'
INSTALL
1 - 4' ϕ Sewer Manhole
Per MAG Std Det 420,
422 & 424

Sta. 13+46.63 to 14+18± Line 'B'
Install
71 LF - 12" V.C.P.



 Change MH #9 From Exist
to New

16TH STREET BRIDGE AT THE
ARIZONA CANAL DIVERSION CHANNEL
FCD CONTRACT NO. 89-46

Pre-Bid Meeting Minutes
December 6, 1989

The meeting began with introductions of Flood Control District Staff involved in the contract administration, project management and staff that will be involved in the inspection of the project.

A brief description of the location of the project and major items of construction were reviewed. The following items were reviewed in detail:

1. Contractors are encouraged to closely review the following Sections in the Construction Special Provisions: Contract Time; 104.1.2; 106.3; 108.5; 350, especially subsections Q through W.
2. Traffic Control - Temporary barricades are to be used on the detours as noted on Sheets 4 and 5 of 23. A vellum base map will be provided to contractor.
3. General - This project is subject to the provisions passed in the last legislative session regarding prompt payment to the contractors. The Flood Control District will not have any problem complying to the 14 day payment to the prime contractor. However, the contractor has the responsibility to pay its subcontractors in accordance with the statutes.
- MBE/WBE participation is a desired goal, not a mandatory goal.
4. Addendum - An addendum will be issued. The items of the addendum are as follows:
 - A. Invitation to Bids:
Revise Item 625-1, approximate quantity from 7 each to 8 each.
 - B. Construction - Special Provisions:
Delete the sixth paragraph on page 18 of 129. Revise Section 350 adding a sentence to Item "U" and adding Items "X" and "Y".
Replace the second paragraph of page 32 of 129.
Replace Section 150130, Lining and Coating.
Replace the fifth paragraph on page 52 of 129.
 - C. Construction Plans:
Revise a portion of Sheet 17 showing that Manhole #9 is new instead of existing.

Questions:

1. What is contract time:

The project is schedule for 210 calendar days.

2. Traffic Control is always changed during construction. Can anything be done to minimize changes during construction?

The Engineer will work closely with Contractor and City to minimize Traffic Control.

16TH STREET BRIDGE
FCD 89-46

PRE-BID SIGN-IN

	Name	Company	Telephone
1	BILL KANTOR	EET	264-1228
2	FRED FULLER	FCD	262-1501
3	TICK CARPENTIER	FNF CONSTRUCTION	345-7546
4	CLIFFORD HANT	"	"
5	MICHAEL SUMNER	BCS ENTERPRISES (DEMO)	969-5272
6	W. THOMPSON	R.G. JOHNSON	874-0746
7	BILL STACEY	STACEY CONST. INC.	9564510
	BILL HEIK	STATEWIDE EXCAVATING INC.	956-2240
	E. BIRTHROW	Flood Control	262-1501
8	KUMAR HANUMANTH	FCD	262-1501
	Ed Raleigh	"	" "
2	LEANNA UMBELIANO	FCD CONTRACTING, BRANCH	262-1501

MESSAGE DISPLAY

To ALL

From: Helen Ortiz
Postmark: Oct 23,89 11.29

Host: POLLUX
Delivered: Oct 23,89 11.30

Subject: Approved Agenda Items 10/23/89

Message:

The following were approved today: Easement from Maricopa County to the FCD conveying easement rights along existing storm drain R/W in the Agua Fria River channel (Item No. A-131191-FL); Joint Funding Agreement for Investigation of Water Resources; IGA FCD-89018 with the U.S. Geological Survey; IGA FCD-89017 with the National Weather Service; Advertisement of the Invitation for Bids Contract FCD 89-48, 83rd Avenue Bridge; Increase in the fiscal authority of Contract FCD 88-10 with Warner, Angle, Roper, and Hallam PC; PVSP project FY 89/90 and a budget adjustment for PVSP; IGA FCD-89012 for the City of Peoria to reimburse the FCD for utility relocation costs; Award Contract FCD 89-59 to ASU Lab of Climatology; FCD Chief Engineer and General Manager to continue with the new FCD Administrative Building project under the guidance of the Facilities dept.; Advertisement of the Invitation for Bids Contract FCD 89-65, Mesa-Buckhorn Landscaping and Erosion Control project; Advertisement of the Invitation for Bids for Contract FCD 89-46, 16th Street Bridge/ACDC.

-----X-----

ATTENTION

ALL PROSPECTIVE BIDDERS

Some of the Bid Bonds previously received with bids for construction projects have not been in complete compliance with Arizona Revised Statutes (A.R.S.).

A.R.S. Sec. 34-201(A)(3) requires that every bid be accompanied by a certified check, cashier's check or surety bond for five percent (5%) of the amount of the bid.

In some cases the bond limit the five percent (5%) to the difference between the low bid and that of the next lowest responsible bidder, to whom a contract could be awarded, in the event that the low bidder failed to enter into contract within the specified time.

Bids received with limitation on the five percent (5%) will be considered as nonresponsive bids and will not be accepted or considered for award of contract.

Please take note and submit your bids accordingly.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FCD CONTRACT 89-46

16TH STREET BRIDGE AT THE ARIZONA CANAL DIVERSION CHANNEL
AND SANITARY SEWER LIFT STATION

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18. Drawings: 16th Street Bridge at the ACDC and Sanitary Sewer Lift Station, 23 sheets	Separate

(Area to left
reserved for
Engineer's Seal)



**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
INVITATION TO BID**

BID OPENING DATE: December 20, 1989

LOCATION:

This project is located in Phoenix, Arizona, on 16th Street at the Arizona Canal Diversion Channel, approximately 1/8 mile north of Glendale Avenue and immediately north of the Arizona Canal.

PROPOSED WORK:

The work includes three segments:

1. Relocation of a 12" Sanitary Sewerline.
2. Construction of a bridge.
3. Construction of a Sanitary Sewer Lift Station.

BIDS:

SEALED BIDS for the proposed work will be received by the Flood Control District of Maricopa County, 3335 West Durango Street, Phoenix, Arizona 85009 until 2:00 p.m. (Phoenix time) on the above date and then publicly opened and read at 3335 W. Durango St., Phoenix, AZ 85009. No bids will be received after the time specified for bid opening. All bids must be submitted on proposal forms furnished by the Flood Control District and included in the Proposal Pamphlet. The Board of Directors reserves the right to reject any and all bids and to waive any informality in any bid received.

ELIGIBILITY OF CONTRACTOR:

It is the policy of Flood Control District of Maricopa County to endeavor to ensure in every way possible that minority and women-owned business enterprises have every opportunity to participate in providing professional services, purchased goods, and contractual services without being discriminated against on the grounds of race, religion, sex, age, or national origin.

The bidder shall be required to certify that it is appropriately licensed as a Contractor in the State of Arizona for performing the before-mentioned type of work. Verification shall be on the form provided herein.

The bidder may be required to furnish an affidavit as evidence of previous satisfactory performance in the above-mentioned type of work.

In order to determine if bidder is entitled to the provisions of A.R.S. Sec. 34-241, all bidders shall submit, as a part of their proposal, an affidavit stating whether or not taxes have been paid for two successive years as provided in A.R.S. Sec. 34-241. The affidavit shall be in the form provided herein.

In the event a bidder challenges compliance with the tax provision, the successful bidder will be required to provide proof of compliance.

CONTRACT TIME:

All work on this Contract is to be completed within Two Hundred Ten (210) calendar days after date of Notice to Proceed.

MBE/WBE PARTICIPATION:

For this project, a goal of fifteen (15) percent is desired for Minority/Women-Owned Business Enterprises. Instructions and required forms are included in the Minority and Women-Owned Business Enterprise Program Section.

PRE-BID CONFERENCE:

A pre-bid conference will be held on December 6, 1989, at 10:00 a.m. in the Flood Control District conference room, 3335 W. Durango Street, Phoenix, Arizona 85009. It is in the best interest of prospective bidders to attend the Pre-bid Conference.

Questions or items for clarification may be addressed to the Chief, Contracts Branch, in writing, at least ten (10) days prior to bid opening date. Where appropriate, any answers or clarifications affecting the cost may be addressed to all bidders in an addendum. Under no circumstances will verbal interpretations or clarifications be given to individual contractors.

PROJECT PLANS, SPECIAL PROVISIONS AND CONTRACT DOCUMENTS:

Plans and Construction Specifications may be obtained from Flood Control District of Maricopa County, 3335 West Durango Street, Phoenix, Arizona 85009 upon payment of \$40.00 by check, payable to the FLOOD CONTROL DISTRICT of MARICOPA COUNTY. This payment will not be refunded. Mail orders for project documents must include an additional \$7.50 for first class U.S. postage and handling. The total \$47.50 will not be refunded. Regardless of circumstances, we cannot guarantee mail delivery. Each bid must be accompanied by a Bid Bond, cashier's or certified check or postal money Order equal to 5 percent (5%) of the bid, made payable to the FLOOD CONTROL DISTRICT OF MARICOPA COUNTY as a guarantee that if the work is awarded to the bidder, the bidder will within ten (10) days of receipt of the Proposal Acceptance, enter into proper contract and bond condition for the faithful performance of the work, otherwise, said amount may be forfeited to the said BOARD OF DIRECTORS as liquidated damages.

All bids are to be marked in accordance with Section 102.9 of the Uniform Standard Specifications and addressed to the Chief Engineer and General Manager, Flood Control District of Maricopa County, 3335 West Durango Street, Phoenix, Arizona 85009.

As provided for in the Agenda Information Form authorizing the Invitation to Bid.

PRINCIPLE ITEMS AND APPROXIMATE QUANTITIES

<u>QUANTITY</u>	<u>UNIT</u>	<u>DESCRIPTION</u>
205	CY	3,000 psi Concrete
700	CY	4,000 psi Concrete
110,000	LBS	Steel Reinforcement
75	EA	Prestressed Concrete Box Girders
3,870	LF	Drilled Shaft Foundation (36" Diameter)
893	LF	12" VCP Sanitary Sewer Pipe
240	LF	10'x10' CBC Underpass

PROPOSAL

TO THE BOARD OF DIRECTORS
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
PHOENIX, ARIZONA

Gentlemen:

The following Proposal is made for constructing FCD Contract 89-46; 16th Street Bridge at the Arizona Canal Diversion Channel and Sanitary Sewer Lift Station in the County of Maricopa, State of Arizona.

The following Proposal is made on behalf of

and no others. Evidence of authority to submit the Proposal is herewith furnished. The Proposal is in all respects fair and is made without collusion on the part of any person, firm, or corporation mentioned above, and no member or employee of the Board of Directors is personally or financially interested, directly or indirectly, in the Proposal, or in any purchase or sale of any materials or supplies for the work in which it relates, or in any portion of the profits thereof.

The Undersigned certifies that the approved Plans, Special Provisions, Forms of Contract, and Bond authorized by the Board of Directors and constituting essential parts of this Proposal, have been carefully examined and also that the site of the work has been personally inspected.

The Undersigned declares that the amount and nature of the work to be done is understood and that at no time will misunderstanding of the Plans, Construction Specifications, Special Provisions, or conditions to be overcome, be pled. On the basis of the Plans, Construction Specifications, Special Provisions, the Forms of Contract, and the Bond proposed for use, the Undersigned proposes to furnish all the necessary machinery, equipment, tools, apparatus, and other means of construction, to do all the work and to furnish all the materials in the manner specified and to finish the entire project within the time hereinafter proposed and to accept, as full compensation therefore, the sum of various products obtained by multiplying each unit price, herein bid for the work or materials, by the quantity thereof actually incorporated in the complete project, as determined by the Engineer or Architect.

The Undersigned understands that the quantities mentioned herein are approximate only and are subject to increase or decrease and hereby proposes to perform all quantities of work, as either increased or decreased, in accordance with the provisions of the Specifications, at the unit price bid in the Bidding Schedule.

The Undersigned further proposes to perform all extra work that may be required on the basis provided in the Specifications and to give such work personal attention and to secure economical performance.

The Undersigned further proposes to execute the Contract Agreement and furnish satisfactory Bond within ten (10) days of receipt of Notice of Proposal acceptance, TIME BEING OF THE ESSENCE. The Undersigned further proposes to begin work as specified in the Contract attached hereto, and to complete the work within 210 calendar days from the effective date specified in the Notice to Proceed, and maintain at all times a Contract Bond, approved by the Board of Directors, in an amount equal to one hundred percent of the total bid. This Bond shall serve not only to guarantee the completion of the work on the part of the Undersigned, but also to guarantee the excellence of both workmanship and material and the payment of all obligations incurred, said Bond to be in full force and effect until the work is finally accepted and the provisions of the Plans, Specifications, and Special Provisions fulfilled.

A Proposal Guaranty in the amount and character named in the Invitation to Bid is enclosed amounting to not less than five (5) percent of the total bid, which Proposal Guaranty is submitted as a guaranty of the good faith of the Bidder and the Bidder will enter into written contract, as provided, to do the work, if successful in securing the award thereof; and it is hereby agreed that if at any time other than as provided in the Proposal requirements and conditions the Undersigned should withdraw his Proposal, if the Proposal is accepted and there should be failure on the part of the Undersigned to execute the Contract and furnish satisfactory Bond as herein provided, the Flood Control District of Maricopa County in either of such events, shall be entitled and is hereby given the right to retain the said Proposal Guaranty as liquidated damages.

The Undersigned acknowledges receipt of the following addenda and has included their provisions in the proposal:

Addendum No.	<u>1</u>	Dated	<u>12/11/89</u>
Addendum No.	<u>2</u>	Dated	<u>12/14/89</u>
Addendum No.	_____	Dated	_____
Addendum No.	_____	Dated	_____
Addendum No.	_____	Dated	_____

The Undersigned has enclosed the required bid security and subcontractor listing to this Proposal.

BIDDING SCHEDULE

PROJECT: 16th Street Bridge at the ACDC and Sanitary Sewer Lift Station

CONTRACT: FCD 89-46

ITEM NO.	DESCRIPTION	APPROXIMATE QUANTITY	UNIT	UNIT COST (IN WRITING) AND /100 DOLLARS	UNIT COST (NUMBERS)	EXTENDED AMOUNT
206-1	Structural Excavation Bridge, Lift Station & Underpass (Approx. Quantity 6000 CY)	1	LS			
206-2	Structural Backfill Bridge & Lift Station (Approx. Quantity 220 CY)	1	LS			
206-3	Special Backfill Underpass (AB Slurry) (Approx. Quantity 600 CY)	1	LS			
310-1	Aggregate Base Course (Temporary)	600	TON			
321-1	Asphalt Concrete (C-3/4")	70	TON			
336-1	AC Pavement Replacement	150	SY			
340-1	Concrete Curb & Gutter (Det. 220, Type A, H=6")	304	LF			
340-2	Concrete Sidewalk (Det. P-1230)	1,450	SF			
340-3	Concrete Driveway (Det. P-1255)	640	SF			
350-1	Demolish & Remove Structures (ACDC R/W Demolition)	1	LS			
350-2	Remove Concrete Curb & Gutter	475	LF			
350-3	Remove Concrete Sidewalk Driveway & Slabs	2,375	SF			
350-4	Remove Asphalt Concrete Pavement	1,600	SY			
350-5	Misc. Removal & Other Work	1	LS			
401-1	Traffic Control	1	LS			

BIDDING SCHEDULE

PROJECT: 16th Street Bridge at the ACDC and Sanitary Sewer Lift Station

CONTRACT: FCD 89-46

ITEM NO.	DESCRIPTION	APPROXIMATE QUANTITY	UNIT	UNIT COST (IN WRITING) AND /100 DOLLARS	UNIT COST (NUMBERS)	EXTENDED AMOUNT
206-1	Structural Excavation Bridge, Lift Station & Underpass (Approx. Quantity 6000 CY)	1	LS	THIRTY FIVE THOUSAND EIGHT HUNDRED TWO DOLLARS	35,802	35,802
206-2	Structural Backfill Bridge & Lift Station (Approx. Quantity 220 CY)	1	LS	FIVE THOUSAND DOLLARS	5,000	5,000
206-3	Special Backfill Underpass (AB Slurry) (Approx. Quantity 600 CY)	1	LS	SIXTEEN THOUSAND DOLLARS	16,000	16,000
310-1	Aggregate Base Course (Temporary)	250	TON	EIGHTEEN DOLLARS	18-	4,500-
321-1	Asphalt Concrete (C-3/4")	700	TON	FOETY FIVE DOLLARS	45-	31,500-
336-1	AC Pavement Replacement	150	SY	FOETY FIVE DOLLARS	45-	10,750-
340-1	Concrete Curb & Gutter (Det. 220, Type A, H=6")	304	LF	FIVE Dollars and ⁷⁵ / ₁₀₀	5.75	1,748-
340-2	Concrete Sidewalk (Det. P-1230)	1,450	SF	ONE Dollars and ⁷⁰ / ₁₀₀	1.70	2,465-
340-3	Concrete Driveway (Det. P-1255)	640	SF	TWO Dollars and ²⁵ / ₁₀₀	2.25	1,440-
350-1	Demolish & Remove Structures (ACDC R/W Demolition)	1	LS	TEN THOUSAND DOLLARS	10,000	10,000-
350-2	Remove Concrete Curb & Gutter	475	LF	TWO Dollars	2.00	950-
350-3	Remove Concrete Sidewalk Driveway & Slabs	2,375	SF	TWO DOLLARS	2.00	4,750-
350-4	Remove Asphalt Concrete Pavement	1,600	SY	TWO DOLLARS and ⁵⁰ / ₁₀₀	2.50	4,000-
350-5	Misc. Removal & Other Work	1	LS	SEVENTEEN THOUSAND FIVE HUNDRED	17,500	17,500-
401-1	Traffic Control	1	LS	TWENTY TWO THOUSAND SIX HUNDRED	22,600	22,600-

BIDDING SCHEDULE

PROJECT: 16th Street Bridge at the ACDC and Sanitary Sewer Lift Station

CONTRACT: FCD 89-46

ITEM NO.	DESCRIPTION	APPROXIMATE QUANTITY	UNIT	UNIT COST (IN WRITING) AND /100 DOLLARS	UNIT COST (NUMBERS)	EXTENDED AMOUNT
401-2	Uniformed Off-Duty Law Enforcement Officer	1,000	HRS			
505-1	Class "A" Concrete (f'c=3000 psi) (Bridge, Underpass & Lift Station)	205	CY			
505-2	Class "AA" Concrete (f'c=4000 psi)	700	CY			
505-3	Steel Reinforcement (Bridge, Lift Station)	110,000	LBS			
505-4	12" Reinf. Conc. Pavement	160	CY			
505-5	Drilled Shaft Foundation (36" Diameter)	3,870	LF			
505-6	Precast Box Culvert Underpass	240	LF			
506-1	Precast, Prestressed Concrete Box Girders	75	EA			
510-1	7' Masonry Block Wall (including Reinf. Conc. Footing)	1,260	SF			
515-1	Miscellaneous Metal & Aluminum Grating (Approx. 2500 lbs)	1	LS			
515-2	Special Aluminum Hatches	1	LS			
520-1	Ornamental Iron Fence	88	LF			
610-1	8" MJDIP Waterline With Fittings	195	LF			
610-2	6" MJDIP Waterline With Fittings	12	LF			
610-3	8"x6" Tapping Sleeve V B & C Type "A"	1	EA			

BIDDING SCHEDULE

PROJECT: 16th Street Bridge at the ACDC and Sanitary Sewer Lift Station

CONTRACT: FCD 89-46

ITEM NO.	DESCRIPTION	APPROXIMATE QUANTITY	UNIT	UNIT COST (IN WRITING) AND /100 DOLLARS	UNIT COST (NUMBERS)	EXTENDED AMOUNT
401-2	Uniformed Off-Duty Law Enforcement Officer	1,000	HRS	TWENTY TWO DOLLARS AND ⁶⁰ /100	22.60	22,600-
505-1	Class "A" Concrete (f'c=3000 psi) (Bridge, Underpass & Lift Station)	170	CY	TWO HUNDRED FIFTY DOLLARS	250-	42,500-
505-2	Class "AA" Concrete (f'c=4000 psi)	420	CY	ONE HUNDRED TWENTY DOLLARS	120-	50,400-
505-3	Steel Reinforcement (Bridge, Lift Station)	110,000	LBS	FORTY THREE CENTS	0.43	47,300-
505-5	Drilled Shaft Foundation (36" Diameter)	3,870	LF	ONE HUNDRED THIRTY DOLLARS	130-	503,100-
505-6	Precast Box Culvert Underpass	240	LF	FOUR HUNDRED FIFTY DOLLARS	450-	108,000
506-1	Precast, Prestressed Concrete Box Girders	75	EA	THREE THOUSAND SEVEN HUNDRED FIFTY DOLLARS	3750-	281,250-
X 510-1	7' Masonry Block Wall (including Reinf. Conc. Footing)	1,260	SF	SEVEN DOLLARS AND ⁵⁰ /100	7.50	9,450
X 515-1	Miscellaneous Metal & Aluminum Grating (Approx. 2500 lbs)	1	LS	TWO THOUSAND DOLLARS	2,000-	2,000-
X 515-2	Special Aluminum Hatches	1	LS	TWO THOUSAND SEVEN HUNDRED FIFTY DOLLARS	2,750	2,750-
X 520-1	Ornamental Iron Fence	88	LF	THIRTY DOLLARS	30-	2,640-
X 610-1	8" MJDIP Waterline With Fittings	195	LF	FIFTY TWO DOLLARS	52-	10,140-
X 610-2	6" MJDIP Waterline With Fittings	12	LF	FIFTY FIVE DOLLARS	55-	660-
X 610-3	8"x6" Tapping Sleeve V B & C Type "A"	1	EA	ONE THOUSAND FIVE HUNDRED	1500-	1,500-

BIDDING SCHEDULE

PROJECT: 16th Street Bridge at the ACDC and Sanitary Sewer Lift Station

CONTRACT: FCD 89-46

ITEM NO.	DESCRIPTION	APPROXIMATE QUANTITY	UNIT	UNIT COST (IN WRITING) AND /100 DOLLARS	UNIT COST (NUMBERS)	EXTENDED AMOUNT
610-4	Relocate Existing Fire Hydrant	1	EA			
610-5	Cut and Plug 8" or 6" Waterline (MAG Std. Det. 472)	2	EA			
615-1	8" PVC Pipe Sleeve	440	LF			
615-2	8" VCP Sanitary Sewer Pipe	120	LF			
615-3	12" VCP Sanitary Sewer Pipe	893	LF			
615-4	8" MJDIP Sanitary Force Main (restrained joints)	260	LF			
615-5	Sanitary Sewer Pipe Plug (MAG Std. Det. 427)	4	EA			
615-6	Fill and Abandon Manhole	4	EA			
625-1	Sanitary Sewer Manhole (MAG Std. Det. 420)	7	EA			
1200-1	Pumps, Submersible	2	EA			
1407-1	Odor Control	1	EA			
1407-2	JIB Crane	1	EA			
1500-1	Piping, Valves, Gates & Specialties (Within Lift Station Site)	1	LS			
1600-1	Standby Generator	1	EA			
1600-2	Control Panel	1	EA			

BIDDING SCHEDULE

PROJECT: 16th Street Bridge at the ACDC and Sanitary Sewer Lift Station

CONTRACT: FCD 89-46

ITEM NO.	DESCRIPTION	APPROXIMATE QUANTITY	UNIT	UNIT COST (IN WRITING) AND /100 DOLLARS	UNIT COST (NUMBERS)	EXTENDED AMOUNT
X 610-4	Relocate Existing Fire Hydrant	1	EA	ONE THOUSAND FIFTY DOLLARS	1,050-	1,050-
X 610-5	Cut and Plug 8" or 6" Waterline (MAG Std. Det. 472)	2	EA	SIXTY DOLLARS	60-	120-
615-1	8" PVC Pipe Sleeve	440	LF	FIVE DOLLARS	5-	2,200-
Y 615-2	8" VCP Sanitary Sewer Pipe	120	LF	FIFTY DOLLARS	50-	6,000-
X 615-3	12" VCP Sanitary Sewer Pipe	893	LF	SIXTY DOLLARS	60-	53,580-
X 615-4	8" MJDIP Sanitary Force Main (restrained joints)	260	LF	THIRTY DOLLARS	30-	7,800-
X 615-5	Sanitary Sewer Pipe Plug (MAG Std. Det. 427)	4	EA	ONE HUNDRED FIFTEEN DOLLARS	115-	460-
Y 615-6	Fill and Abandon Manhole	4	EA	NINE HUNDRED TWENTY FIVE DOLLARS	925-	3,700-
X 625-1	Sanitary Sewer Manhole (MAG Std. Det. 420)	8	EA	ONE THOUSAND SEVEN HUNDRED FIFTY	1,750-	14,000-
X 1200-1	Pumps, Submersible	2	EA	THREE THOUSAND EIGHT HUNDRED	3,800-	7,600-
X 1407-1	Odor Control	1	EA	NINE THOUSAND DOLLARS	9,000-	9,000-
X 1407-2	JIB Crane	1	EA	TWO THOUSAND EIGHT HUNDRED FIFTY	2,850-	2,850-
X 1500-1	Piping, Valves, Gates & Specialties (Within Lift Station Site)	1	LS	TWENTY FOUR THOUSAND DOLLARS	24,000-	24,000-
X 1600-1	Standby Generator	1	EA	THIRTY FOUR THOUSAND DOLLARS	34,000-	34,000-
X 1600-2	Control Panel	1	EA	ONE THOUSAND ONE HUNDRED FIFTY	1,150-	1,150-

IF BY AN INDIVIDUAL:

(NAME - TITLE) (ADDRESS)
DATE _____ (PHONE)

IF BY A FIRM OR PARTNERSHIP:

(FIRM NAME) (FIRM ADDRESS)
BY: _____ DATE _____ (PHONE)
(NAME - TITLE)

** Name and Address of Each Member:

** The name and post office address of each member of the firm or partnership must be shown.

IF BY A CORPORATION:

MGC Contractors, Inc. _____ 411 South Mill, Ste. 205 _____
(CORPORATE NAME) (CORPORATION ADDRESS)

BY: Robert R. Murch _____ DATE: Dec. 20, 89 _____
(PHONE)

TITLE: Sec/TREAS _____

* Incorporated under the Laws of Arizona _____

Names and Addresses of Officers:

Thomas B. Cross _____ 411 S. Mill, Ste. 205, Tempe, AZ 85281 _____
(PRESIDENT) (ADDRESS) "
Robert R. Murch _____ " (ADDRESS) "
(SECRETARY) "
Robert R. Murch _____ (ADDRESS) _____
(TREASURER) (ADDRESS)

* The name of the State under which the laws of the Corporation was chartered and names, title, and business address of the President, Secretary, and Treasurer must be shown.

SURETY BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, _____, as Principal, (hereinafter called the Principal), and the _____, a corporation duly organized under the laws of the State of _____, as Surety, (hereinafter called the Surety), are held and firmly bound unto the Flood Control District of Maricopa County as Obligee, in the sum of ___ percent (___%) of the total amount of the bid of Principal, submitted by him to the Flood Control District of Maricopa County, for the work described below, for the payment of which sum, well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, and administrators, successors and assigns, jointly and severally, firmly by these presents, and in conformance with A.R.S. Sec. 34-201(A)(3).

WHEREAS, the said Principal is herewith submitting its proposal for FCD Contract 89-46: 16th Street Bridge at the Arizona Canal Diversion Channel and Sanitary Sewer Lift Station in the County of Maricopa, State of Arizona.

NOW, THEREFORE, if the Flood Control District of Maricopa County shall accept the proposal of the Principal and the Principal shall enter into a contract with the Flood Control District of Maricopa County in accordance with the terms of such proposal and give such Bonds and Certificates of Insurance as specified in the Standard Specifications with good and sufficient Surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter into such contract and give such Bond and Certificates of Insurance, if the Principal shall pay to the Flood Control District of Maricopa County the sum of money set forth above as liquidated damages for failure of the Principal to enter into the contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____ day of _____, A.D., 1989.

Principal

Title

Witness:

Surety

Title

Witness:

SURETY BOND

KNOW ALL MEN BY THESE PRESENTS:

That we, MGC Contractors, Inc., as Principal, (hereinafter called the Principal), and the The Hartford Fire Insurance Company, a corporation duly organized under the laws of the State of Connecticut, as Surety, (hereinafter called the Surety), are held and firmly bound unto the Flood Control District of Maricopa County as Obligee, in the sum of Five percent (5%) of the total amount of the bid of Principal, submitted by him to the Flood Control District of Maricopa County, for the work described below, for the payment of which sum, well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, and administrators, successors and assigns, jointly and severally, firmly by these presents, and in conformance with A.R.S.

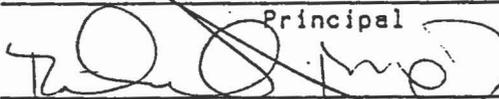
WHEREAS, the said Principal is herewith submitting its proposal for 16th Street Bridge at the ACDC and Sanitary Sewer Lift Station FCD 89-46

NOW, THEREFORE, if the Flood Control District of Maricopa County shall accept the proposal of the Principal and the Principal shall enter into a contract with the Flood Control District of Maricopa County in accordance with the terms of such proposal and give such Bonds and Certificates of Insurance as specified in the Standard Specifications with good and sufficient Surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter into such contract and give such Bond and Certificates of Insurance, if the Principal shall pay to the Flood Control District of Maricopa County the sum of money set forth above as liquidated damages for failure of the Principal to enter into the contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this 20th day of December, A.D., 1989.

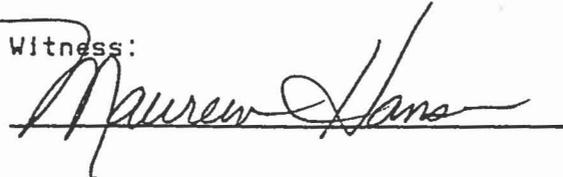
MGC CONTRACTORS, INC.

Principal



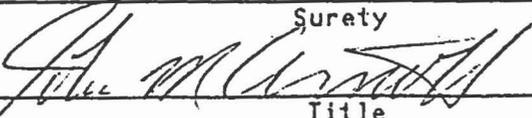
Robert R. Murch, Sec'y/Treas.

Witness:



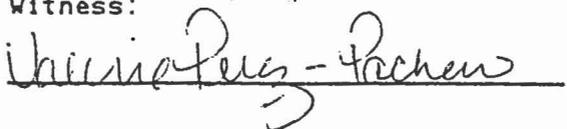
THE HARTFORD FIRE INSURANCE COMPANY

Surety



John M. Arnott, Attorney-in-Fact

Witness:



HARTFORD FIRE INSURANCE COMPANY

Hartford, Connecticut

POWER OF ATTORNEY

Know all men by these Presents, That the HARTFORD FIRE INSURANCE COMPANY, a corporation duly organized under the laws of the State of Connecticut, and having its principal office in the City of Hartford, County of Hartford, State of Connecticut, does hereby make, constitute and appoint

590267

BARRY R. FARR, JOHN M. ARNOTT and KRISTINA I. LOSMAN
of TEMPE, ARIZONA

its true and lawful Attorney(s)-in-Fact, with full power and authority to each of said Attorney(s)-in-Fact, in their separate capacity if more than one is named above, to sign, execute and acknowledge any and all bonds and undertakings and other writings obligatory in the nature thereof on behalf of the Company in its business of guaranteeing the fidelity of persons holding places of public or private trust; guaranteeing the performance of contracts other than insurance policies; guaranteeing the performance of insurance contracts where surety bonds are accepted by states and municipalities, and executing or guaranteeing bonds and undertakings required or permitted in all actions or proceedings or by law allowed,

and to bind the HARTFORD FIRE INSURANCE COMPANY thereby as fully and to the same extent as if such bonds and undertakings and other writings obligatory in the nature thereof were signed by an Executive Officer of the HARTFORD FIRE INSURANCE COMPANY and sealed and attested by one other of such Officers, and hereby ratifies and confirms all that its said Attorney(s)-in-Fact may do in pursuance hereof.

This power of attorney is granted by and under authority of the following provisions:

(1) By-Laws adopted by the Stockholders of the HARTFORD FIRE INSURANCE COMPANY at a meeting duly called and held on the 9th day of March, 1971.

ARTICLE IV

SECTION 8. The President or any Vice-President, acting with any Secretary or Assistant Secretary, shall have power and authority to appoint, for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, one or more Resident Vice-Presidents, Resident Assistant Secretaries and Attorneys-in-Fact and at any time to remove any such Resident Vice-President, Resident Assistant Secretary, or Attorney-in-Fact, and revoke the power and authority given to him.

SECTION 11. Attorneys-in-Fact shall have power and authority, subject to the terms and limitations of the power of attorney issued to them, to execute and deliver on behalf of the Company and to attach the seal of the Company thereto any and all bonds and undertakings and other writings obligatory in the nature thereof, and any such instrument executed by any such Attorney-in-Fact shall be as binding upon the Company as if signed by an Executive Officer and sealed and attested by one other of such Officers.

(2) Excerpt from the Minutes of a meeting of the Board of Directors of the HARTFORD FIRE INSURANCE COMPANY duly called and held on the 11th day of June, 1976:

RESOLVED: Robert N. H. Sener, Assistant Vice-President, shall have as long as he holds such office the same power as any Vice-President under Sections 6, 7 and 8 of Article IV of the By-Laws of the Company.

This power of attorney is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Directors of the HARTFORD FIRE INSURANCE COMPANY at a meeting duly called and held on the 6th day of August, 1976.

RESOLVED, that, whereas Robert N. H. Sener, Assistant Vice-President, acting with any Secretary or Assistant Secretary, has the power and authority, as long as he holds such office, to appoint by a power of attorney, for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, one or more Resident Vice-Presidents, Assistant Secretaries and Attorney-in-Fact:

Now, therefore, the signatures of such Officers and the seal of the Company may be affixed to any such power of attorney or to any certificate relating thereto by facsimile, and any such power of attorney or certificate bearing such facsimile signatures or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by facsimile signatures and facsimile seal shall be valid and binding upon the Company in the future with respect to any bond or undertaking to which it is attached.

In Witness Whereof, the HARTFORD FIRE INSURANCE COMPANY has caused these presents to be signed by its Assistant Vice-President, and its corporate seal to be hereto affixed, duly attested by its Secretary, this 18th day of March 1988.

Attest:

HARTFORD FIRE INSURANCE COMPANY

Robert J. Mathieu

Robert J. Mathieu
Secretary



Robert N. H. Sener

Robert N. H. Sener
Assistant Vice-President

STATE OF CONNECTICUT, }

ss.

COUNTY OF HARTFORD, }

On this 18th day of March, A.D. 1988, before me personally came Robert N. H. Sener, to me known, who being by me duly sworn, did depose and say: that he resides in the County of Hartford, State of Connecticut; that he is the Assistant Vice-President of the HARTFORD FIRE INSURANCE COMPANY, the corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to the said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation and that he signed his name thereto by like order.

STATE OF CONNECTICUT, }

ss.

COUNTY OF HARTFORD, }



CERTIFICATE

Jacqueline T. Derosiers, Notary Public
My Commission Expires April 1, 1993

Jacqueline T. Derosiers

I, the undersigned, Assistant Secretary of the HARTFORD FIRE INSURANCE COMPANY, a Connecticut Corporation, DO HEREBY CERTIFY that the foregoing and attached POWER OF ATTORNEY remains in full force and has not been revoked; and furthermore, that the Resolutions of the Board of Directors, set forth in the Power of Attorney, are now in force.

Signed and sealed at the City of Hartford.

Dated the 20th

day of

December 1989



David A. Johnson
David A. Johnson
Assistant Secretary

VERIFICATION OF LICENSE

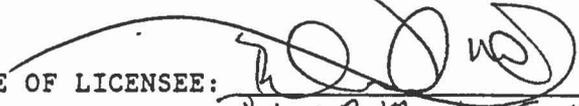
Pursuant to A.R.S. Sec. 32-1169, I hereby state that I hold a current contractor's license, duly issued by the office of the Registrar of Contractors for the State of Arizona, said license has not been revoked, that the license number is: ~~4-069944~~ ⁷⁻⁰¹⁻⁰⁷¹⁴⁴¹; that my privilege license number (as required by A.R.S. Sec. 42-1305) is: 83003444; and that, -if any exemption to the above licensing requirements is claimed;

(1) The basis for the claimed exemption is: _____ and;

(2) The names(s) and license number(s) of any general, mechanical, electrical, or plumbing contractor(s) to be employed on the work are:

IT IS UNDERSTOOD THAT THE FILING OF AN APPLICATION CONTAINING FALSE OR INCORRECT INFORMATION CONCERNING AN APPLICANT'S CONTRACTOR'S LICENSE OR PRIVILEGE LICENSE WITH THE INTENT TO VOID SUCH LICENSING REQUIREMENTS IS UNSWORN FALSIFICATION PUNISHABLE ACCORDING TO A.R.S. SEC. 13-2704.

DATE: ^(RM) 70 Dec. 89

SIGNATURE OF LICENSEE: 

Robert R. Murch, Sec'y/Treas.

COMPANY: MGC Contractors, Inc

MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISE PROGRAM

- A. The following conditions will apply in the calculation of the percentage attainment:
1. All MBE/WBE firms used in attainment of the goal must be certified with the Maricopa County Minority Business Office which is located in the Maricopa County Highway Department building, 3325 West Durango Street, Phoenix. In addition, only those firms certified at least seven calendar days prior to the bid opening will be considered in the attainment of the goal.
 2. Prime contractor subcontracts to MBE or WBE:
The MBE/WBE amount to be applied to the goal will be based on that portion (dollar value) of the contract that the MBE/WBE performs. For example, if a prime contractor subcontracts work amounting to \$100,000 of a contract for which the total project cost is \$1,000,000. the MBE/WBE participation will be credited as 10 percent.
 3. Prime Minority Contractor:
An MBE/WBE prime contractor will be credited with the MBE/WBE participation for that portion of the contract which they themselves perform plus that portions subcontracted to other MBE/WBE firms. For example, if an MBE/WBE prime contractor proposes to perform 50 percent of a project quoted at \$1,000,000 and subcontracts 25 percent to an MBE firm and 25 percent to a non-MBE/WBE firm, MBE/WBE participation will be credited as 75 Percent, or \$750,000.
 4. Minority-Non-Minority Joint Venture:
A joint venture consisting of MBE/WBE participation and non-MBE/WBE business enterprises, functioning as a prime contractor, will be credited with minority participation on the basis of the percentage of profit accruing to the MBE/WBE firm. For example, if a MBE/WBE and non-MBE/WBE joint venture proposes to perform 50 percent of a \$1,000,000 project and 50 percent of the joint venture profits (\$500,000) are to accrue to the MBE/WBE partner in the joint venture, MBE/WBE participation will be credited at 25 percent or \$250,000.
 5. Lower Tier Non-MBE/WBE Participation:
MBE/WBE subcontractors proposing to further subcontract to non-MBE/WBE contractors shall not have that portion of subcontracting activity considered when determining the percentage of MBE/WBE participation.

6. MBE/WBE Suppliers:

Any MBE/WBE supplier that manufactures or substantially alters the material or product it supplies will have that portion of activity considered when determining the percentage of MBE/WBE participation. Any MBE/WBE Wholesaler, Distributor, or Jobber that does not manufacture or substantially alter the materials or product it sells will be limited to 20 percent of the sale price when determining the percentage of MBE/WBE participation.

B. Required forms:

An affidavit is included as part of this section. The form must be completed within seven calendar days after the Notice of Award of Contract. The low bidder is required to submit a Minority/Women-Owned Business Enterprise Program MBE/WBE Participation Affidavit listing the MBE/WBE participation by MBE/WBE firm and the related dollar value of the MBE/WBE contract.

C. Requests for Pay:

Each Request for Pay must be accompanied by a Maricopa County Minority/Women-Owned Business Enterprise Program MBE/WBE Participation Report. The final pay request shall include a listing of total contract MBE/WBE participation.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
MINORITY/WOMEN-OWNED BUSINESS ENTERPRISE PROGRAM

MBE/WBE PARTICIPATION ASSURANCES
AFFIDAVIT

The undersigned, fully cognizant of the Flood Control District of Maricopa County MBE/WBE Program requirements and of the goal established, hereby certifies that in the preparation of this bid,

MGC Contractors, Inc.

(the entity submitting the bid)

(CHECK ONE)

Will meet the established goal for participation by Minority/Women-Owned Business Enterprises.

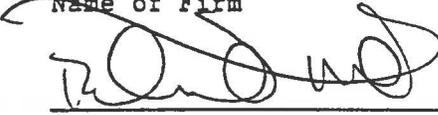
Will provide the necessary documentation to Minority Business Office to establish that a good faith effort was made.

Will not participate in the MBE/WBE Program.

The bidder will specify its MBE/WBE participation on the Intended Participation Affidavit or provide documentation of its good faith efforts not later than 4:00 p.m., the seventh calendar day following the bid opening. The required affidavit shall be obtained by the apparent first and second low bidders from the Minority Business Office, Maricopa County Highway Department Building, 3325 West Durango Street, Phoenix, Arizona 85009, following the opening and reading of bids; a sample affidavit form for reference purposes follows.

MGC Contractors, Inc.

Name of Firm


Signature

Robert R. Murch, Secy/Treas.
Title

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
MINORITY-OWNED BUSINESS ENTERPRISE PROGRAM

MBE/WBE PARTICIPATION AFFIDAVIT
(To be submitted within seven calendar days of Notice of Award)

Flood Control District of Maricopa County Contract No. FCD 89-46

1. Intended Minority/Women-Owned Business Enterprise Participation (attach additional papers, if necessary.)

Name of Firm	Principal	Address	Item Number(s) or Work Description	Dollar Value of Subcontract
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

MBE/WBE Contract Goal _____ Total Dollar Value of Proposed Subcontract(s) _____
Contract Bid Total _____
Percent of Contract Bid to be Subcontracted _____

2. Substitution

I understand that if a Maricopa County certified MBE/WBE (sub)contractor is unable to perform for any part of the intended work, my company should make sufficient efforts to (sub)contract either the same, or other work to an alternative Maricopa County certified MBE/WBE equal to the amount to attain the MBE/WBE goal and that I must document such efforts.

SAMPLE

Name of Firm

Signature

Title

cc: Minority Business Office
Maricopa County Highway Building
3325 West Durango Street
Phoenix, Arizona 85009

MARICOPA COUNTY
MINORITY/WOMEN-OWNED BUSINESS ENTERPRISES PROGRAM

MBE/WBE PARTICIPATION REPORT
(To be attached with Request for Pay)

Date: _____

Contractor: _____

Contact Person: _____

Address: _____

Telephone: _____

Project: 16th Street Bridge at the ACDC and

Sanitary Sewer Lift Station

Contract Number: FCD 89-46

For Pay Period of: _____

Subcontractor: _____

Person to Contact: _____

Address: _____

Telephone Number: _____

Type of Firm: _____

Class of Work: _____

Subcontract Amount: _____

Amount Earned _____

(Commission) This Period: _____

Total Earned by This Subcontractor: _____

Total MBE/WBE Contract Goal, %: 15

Total Cumulative MBE/WBE

Participation on This Contract, %: _____

MBE/WBE subcontract payment made
during this reporting period (yes or no): _____

cc: Minority Business Office
Maricopa County Highway Building
3325 West Durango Street
Phoenix, Arizona 85009

CONTRACT AGREEMENT

THIS AGREEMENT, made and entered into this 5th day of January, 1989, by and between FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, hereinafter called the OWNER, acting by and through its BOARD OF DIRECTORS, and

MGC Contractors, Inc.

hereinafter called the CONTRACTOR.

WITNESSTH: That the said CONTRACTOR, for and in the consideration of the sum of One Million Four Hundred Forty Thousand Nine Hundred Five and no/100 (\$1,440,905.00) to be paid to him by the OWNER, in the manner and at the times hereinafter provided, and of the other covenants and agreements herein contained, hereby agrees for himself, heirs, executors, administrators, successors, and assigns as follows:

ARTICLE I - SCOPE OF WORK: The CONTRACTOR shall construct, and complete in a workmanlike and substantial manner and to the satisfaction of the Chief Engineer and General Manager, a project for the Flood Control District of Maricopa County, designated as FCD Contract 89-46; 16th Street Bridge at the Arizona Canal Diversion Channel and Sanitary Sewer Lift Station, and furnish at his own cost and expense all necessary machinery, equipment, tools, apparatus, materials, and labor to complete the work in the most substantial and workmanlike manner according to the Plans and Construction Specifications on file with the Flood Control District of Maricopa County, 3335 West Durango Street, Phoenix, Arizona, and such modifications of the same and other directions that may be made by the Flood Control District of Maricopa County as provided herein.

ARTICLE II - CONTRACT DOCUMENTS: The Construction Specifications (Invitation to Bid, Plans, Standard Specifications and Details, Special Provisions, Addenda, if any, Proposal, Affidavits, Performance Bond, Payment Bond, Certificates of Insurance, and Change Orders, if any,) are by this reference made a part of this Contract and shall have the same effect as though all of the same were fully inserted herein.

ARTICLE III - TIME OF COMPLETION: The CONTRACTOR further covenants and agrees at his own proper cost and expense, to do all work as aforesaid for the construction of said improvements and to completely construct the same and install the material therein, as called for by this agreement free and clear of all claims, liens, and charges whatsoever, in the manner and under the conditions specified within the time, or times, stated in the proposal pamphlet.

ARTICLE IV - PAYMENTS: For and in consideration of the faithful performance of the work herein embraced as set forth in the Contract Documents, which are a part hereof and in accordance with the directions of the OWNER, through its Engineer and to his satisfaction, the OWNER agrees to pay the said CONTRACTOR the amount earned, computed from actual quantities of work performed and accepted or materials furnished at the unit bid price on the Proposal made a part hereof, and to make such payment in accordance with the requirements of A.R.S. Sec. 34-221, as amended. The CONTRACTOR agrees to discharge its obligations and make payments to its subcontractors and suppliers in accordance with A.R.S. Sec. 32-1129.

ARTICLE V - TERMINATION: The OWNER hereby gives notice that pursuant to A.R.S. Sec. 38-511(A) this contract may be cancelled without penalty or further obligation within three years after execution if any person significantly involved in initiation, negotiation, securing, drafting or creating a contract on behalf of the OWNER is, at any time while the contract or any extension of the contract is in effect, an employer agent of any other party to the contract in any capacity or a consultant to any other party of the contract with respect to the subject matter of the contract. Cancellation under this section shall be effective when written notice from the Chief Engineer and General Manager of the OWNER is received by all of the parties to the contract. In addition, the OWNER may recoup any fee for commission paid or due to any person significantly involved in initiation, negotiation, securing, drafting or creating the contract on behalf of the OWNER from any other party to the contract arising as a result of the contract.

ARTICLE VI - NEGOTIATION CLAUSE: Recovery of damages related to expenses incurred by the CONTRACTOR for a delay for which the OWNER is responsible, which is unreasonable under the circumstances and which was not within the contemplation of the parties to the contract, shall be negotiated between the CONTRACTOR and the OWNER. This provision shall be construed so as to give full effect to any provision in the contract which requires notice of delays, provides for arbitration or other procedure for settlement or provides for liquidated damages.

ARTICLE VII - COMPLIANCE WITH LAWS: The CONTRACTOR is required to comply with all Federal, State and local ordinances and regulation. The CONTRACTOR's signature on this contract certifies compliance with the provisions of the I-9 requirements of the Immigration Reform Control Act of 1986 for all personnel that the CONTRACTOR and any subcontractors employ to complete this project. It is understood that the OWNER shall conduct itself in accordance with the provisions of the Maricopa County Procurement Code.

ARTICLE VIII - MBE/WBE PROGRAM: Flood Control District of Maricopa County will endeavor to ensure in every way possible that minority and women-owned business enterprises shall have every opportunity to participate in providing professional services, purchased goods, and contractual services to the Flood Control District of Maricopa County without being discriminated against on the grounds of race, religion, sex, age, or national origin.

ARTICLE IX - ANTI-DISCRIMINATION PROVISION: The CONTRACTOR agrees not to discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, or handicap and further agrees not to engage in any unlawful employment practices. The CONTRACTOR further agrees to insert the foregoing provision in all subcontracts hereunder.

IN WITNESS WHEREOF: Five (5) identical counterparts of this Contract, each of which shall for all purposes be deemed an original thereof, have been duly executed by the parties hereinabove named, on the date and year first above written.

MGC CONTRACTORS, Inc
PARTY OF THE FIRST PART

BY: Robert R. Murch
Printed Name

BY: [Signature]
Signature

Sec'y / Treas.
Title

DATE: 28 DEC 89

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
PARTY OF THE SECOND PART

BY: [Signature]
CHAIRMAN, BOARD OF DIRECTORS

DATE: 1/5/90

RECOMMENDED BY:

[Signature] STANLEY L. SMITH JR., P.E.
DEPUTY CHIEF ENGINEER
CHIEF ENGINEER AND GENERAL MANAGER
FLOOD CONTROL DISTRICT OF
MARICOPA COUNTY

DATE: 1-5-90

ATTEST:

[Signature]
CLERK OF THE BOARD

LEGAL REVIEW

Approved as to form and within the powers and authority granted under the laws of the State of Arizona to the Flood Control District of Maricopa County

BY: [Signature]
GENERAL COUNSEL, FLOOD CONTROL
DISTRICT OF MARICOPA COUNTY

DATE: 1-3-90

STATUTORY PAYMENT BOND PURSUANT TO TITLE 34
CHAPTER 2, ARTICLE 2, OF THE ARIZONA REVISED STATUTES
(Penalty of this bond must be 100% of the Contract amount)

KNOW ALL MEN BY THESE PRESENTS:

That, MGC Contractors, Inc.
(hereinafter called the Principal), As Principal, and The Hartford Fire
Insurance Company

a corporation organized and existing under the laws of the State of Connecticut
with its principal office in the City of Hartford (hereinafter called the
Surety), as Surety, are held and firmly bound unto the Flood Control District
of Maricopa County, in the County of Maricopa, State of Arizona (hereinafter
called the Obligee), in the amount of One million four hundred forty thousand
nine hundred five and No/100 dollars (\$1,440,905.00),
for the payment whereof, the said Principal and Surety bind themselves, and
their heirs, administrators, executors, successors and assigns, jointly and
severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with
Flood Control District of Maricopa County, dated the 5th day of January, 1989,
for 89-46: 16th Street Bridge at the Arizona Canal Diversion Channel and
Sanitary Sewer Lift Station, which contract is hereby referred to and made a
part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the
said Principal shall promptly pay all monies due to all persons supplying labor
or materials to him or his subcontractors in the prosecution of the work
provided for in said contract, then this obligation shall be void, otherwise to
remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions
of Title 34, Chapter 2, Article 2, of the Arizona Revised Statutes, and all
liabilities on this bond shall be determined in accordance with the provisions
of said Title, Chapter, and Article, to the extent as if it was copied at length
herein.

The prevailing party or any party which recovers judgement on this bond
shall be entitled to such reasonable attorney's fees as may be fixed by the
court or a judge thereof.

Witness our hands this 29th day of December, 1989.

John M. Arnott
Constructors Bonding, Inc.

AGENCY OF RECORD

3923 S. McClintock, #402, Tempe, AZ
AGENCY ADDRESS 85282

BOND NUMBER. 508 07 38

MGC CONTRACTORS, INC.
PRINCIPAL SEAL

BY: Robert E. Murch
Robert E. Murch, Sec'y/Treas.

THE HARTFORD FIRE INSURANCE COMPANY
SURETY SEAL

BY: John M. Arnott
John M. Arnott

POWER OF ATTORNEY SEAL

BY: John M. Arnott

HARTFORD FIRE INSURANCE COMPANY

Hartford, Connecticut

POWER OF ATTORNEY

Know all men by these Presents, That the HARTFORD FIRE INSURANCE COMPANY, a corporation duly organized under the laws of the State of Connecticut, and having its principal office in the City of Hartford, County of Hartford, State of Connecticut, does hereby make, constitute and appoint

590264

BARRY R. FARR, JOHN M. ARNOTT and KRISTINA I. LOSMAN
of TEMPE, ARIZONA

its true and lawful Attorney(s)-in-Fact, with full power and authority to each of said Attorney(s)-in-Fact, in their separate capacity if more than one is named above, to sign, execute and acknowledge any and all bonds and undertakings and other writings obligatory in the nature thereof on behalf of the Company in its business of guaranteeing the fidelity of persons holding places of public or private trust; guaranteeing the performance of contracts other than insurance policies; guaranteeing the performance of insurance contracts where surety bonds are accepted by states and municipalities, and executing or guaranteeing bonds and undertakings required or permitted in all actions or proceedings or by law allowed.

and to bind the HARTFORD FIRE INSURANCE COMPANY thereby as fully and to the same extent as if such bonds and undertakings and other writings obligatory in the nature thereof were signed by an Executive Officer of the HARTFORD FIRE INSURANCE COMPANY and sealed and attested by one other of such Officers, and hereby ratifies and confirms all that its said Attorney(s)-in-Fact may do in pursuance hereof.

This power of attorney is granted by and under authority of the following provisions:

(1) By-Laws adopted by the Stockholders of the HARTFORD FIRE INSURANCE COMPANY at a meeting duly called and held on the 9th day of March, 1971.

ARTICLE IV

SECTION 8. The President or any Vice-President, acting with any Secretary or Assistant Secretary, shall have power and authority to appoint, for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, one or more Resident Vice-Presidents, Resident Assistant Secretaries and Attorneys-in-Fact and at any time to remove any such Resident Vice-President, Resident Assistant Secretary, or Attorney-in-Fact, and revoke the power and authority given to him.

SECTION 11. Attorneys-in-Fact shall have power and authority, subject to the terms and limitations of the power of attorney issued to them, to execute and deliver on behalf of the Company and to attach the seal of the Company thereto any and all bonds and undertakings and other writings obligatory in the nature thereof, and any such instrument executed by any such Attorney-in-Fact shall be as binding upon the Company as if signed by an Executive Officer and sealed and attested by one other of such Officers.

(2) Excerpt from the Minutes of a meeting of the Board of Directors of the HARTFORD FIRE INSURANCE COMPANY duly called and held on the 11th day of June, 1976:

RESOLVED: Robert N. H. Sener, Assistant Vice-President, shall have as long as he holds such office the same power as any Vice-President under Sections 6, 7 and 8 of Article IV of the By-Laws of the Company.

This power of attorney is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Directors of the HARTFORD FIRE INSURANCE COMPANY at a meeting duly called and held on the 6th day of August, 1976.

RESOLVED, that, whereas Robert N. H. Sener, Assistant Vice-President, acting with any Secretary or Assistant Secretary, has the power and authority, as long as he holds such office, to appoint by a power of attorney, for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, one or more Resident Vice-Presidents, Assistant Secretaries and Attorney-in-Fact:

Now, therefore, the signatures of such Officers and the seal of the Company may be affixed to any such power of attorney or to any certificate relating thereto by facsimile, and any such power of attorney or certificate bearing such facsimile signatures or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by facsimile signatures and facsimile seal shall be valid and binding upon the Company in the future with respect to any bond or undertaking to which it is attached.

In Witness Whereof, the HARTFORD FIRE INSURANCE COMPANY has caused these presents to be signed by its Assistant Vice-President, and its corporate seal to be hereto affixed, duly attested by its Secretary, this 18th day of March 1988.

Attest:

HARTFORD FIRE INSURANCE COMPANY

Robert J. Mathieu

Robert J. Mathieu
Secretary



Robert N. H. Sener

Robert N. H. Sener
Assistant Vice-President

STATE OF CONNECTICUT, }
COUNTY OF HARTFORD, } ss.

On this 18th day of March, A.D. 1988, before me personally came Robert N. H. Sener, to me known, who being by me duly sworn, did depose and say: that he resides in the County of Hartford, State of Connecticut; that he is the Assistant Vice-President of the HARTFORD FIRE INSURANCE COMPANY, the corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to the said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation and that he signed his name thereto by like order.

STATE OF CONNECTICUT, }
COUNTY OF HARTFORD, } ss.

CERTIFICATE

I, the undersigned, Assistant Secretary of the HARTFORD FIRE INSURANCE COMPANY, a Connecticut Corporation, DO HEREBY CERTIFY that the foregoing and attached POWER OF ATTORNEY remains in full force and has not been revoked; and furthermore, that the Resolutions of the Board of Directors, set forth in the Power of Attorney, are now in force.

Signed and sealed at the City of Hartford. Dated the _____ day of _____ 19 89



Jacqueline T. Derosiers, Notary Public
My Commission Expires April 1, 1993

David A. Johnson
David A. Johnson
Assistant Secretary

STATUTORY PERFORMANCE BOND PURSUANT TO TITLE 34
CHAPTER 2, ARTICLE 2, OF THE ARIZONA REVISED STATUTES
(Penalty of this bond must be 100% of the Contract amount)

KNOW ALL MEN BY THESE PRESENTS:

That, MGC Contractors, Inc.
(hereinafter called the Principal), As Principal, and The Hartford Fire Insurance Company

a corporation organized and existing under the laws of the State of Connecticut, with its principal office in the City of Hartford (hereinafter called the Surety), as Surety, are held and firmly bound unto the Flood Control District of Maricopa County, in the County of Maricopa, State of Arizona, in the amount of One million four hundred forty thousand nine hundred five and No/100^{ths} dollars (\$1,440,905.00), for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with Flood Control District of Maricopa County, dated the 5th day of January 1989, for 89-46; 16th Street Bridge at the Arizona Canal Diversion Channel and Sanitary Sewer Lift Station, which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extension thereof, with or without notice to the Surety, and during the life of any guaranty required under the contract, and shall also perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety being hereby waived; then the above obligation shall be void, otherwise to remain in full force and effect;

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Title 34, Chapter 2, Article 2, of the Arizona Revised Statutes, and all liabilities on this bond shall be determined in accordance with the provisions of said Title, Chapter, and Article, to the extent as if it was copied at length herein.

The prevailing party in a suit on this bond shall be entitled to such reasonable attorney's fees as may be fixed by a judge of the court.

Witness our hands this 29th day of December, 1989.

Constructors Bonding, Inc.

AGENCY OF RECORD
3923 S. McClintock, #402, Tempe, AZ
AGENCY ADDRESS 85282

BOND NUMBER 508 07 38

John M. Arnott

POWER OF ATTORNEY SEAL

BY: John M. Arnott

MGC CONTRACTORS, INC.

-- PRINCIPAL SEAL

BY: Robert R. Murch Sec'y Treas.
THE HARTFORD FIRE INSURANCE COMPANY

SURETY SEAL

BY: John M. Arnott

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CERTIFICATE OF INSURANCE

CONTRACT FCD 89-46

PROJECT TITLE 16th Street Bridge at the Arizona Canal
 Diversion Channel & Sanitary Sewer Lift Station

NAME AND ADDRESS OF INSURANCE AGENCY	INSURANCE COMPANIES AFFORDING COVERAGES
	Company Letter A
	Company Letter B
	Company Letter C
	Company Letter D
	Company Letter E
	Company Letter F

THIS IS TO CERTIFY THAT POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE AND ARE IN FORCE AT THIS TIME.

COMPANY LETTER	TYPE OF INSURANCE	POLICY NUMBER	EXPIRATION DATE	LIMITS OF LIABILITY IN \$1,000 MINIMUM each occurrence	
	COMMERCIAL GENERAL <input checked="" type="checkbox"/> LIABILITY FORM <input checked="" type="checkbox"/> PREMISES OPERATIONS <input checked="" type="checkbox"/> CONTRACTUAL <input checked="" type="checkbox"/> BROAD FORM PROPERTY DAMAGE <input checked="" type="checkbox"/> EXPLOSION & COLLAPSE <input checked="" type="checkbox"/> PRODUCTS/COMPLETED OPERATIONS HAZARD <input checked="" type="checkbox"/> UNDERGROUND HAZARD <input checked="" type="checkbox"/> INDEPENDENT CONTRACTORS <input checked="" type="checkbox"/> PERSONAL INJURY			BODILY INJURY per person	2,000
	COMPREHENSIVE AUTO <input checked="" type="checkbox"/> LIABILITY & NON-OWNED			SAME AS ABOVE	
	<input checked="" type="checkbox"/> EXCESS LIABILITY			NECESSARY IF UNDERLYING NOT ABOVE MINIMUM	3,000
	<input checked="" type="checkbox"/> WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY			STATUTORY each accident	\$100
	<input type="checkbox"/> OTHER				
	<input checked="" type="checkbox"/> OTHER Entranco Engineers, Inc., Maricopa County, and the City of Phoenix, Arizona shall also be named as Additional Insured and Certificate Holder				

Except for Workers' Compensation Insurance, the Flood Control District of Maricopa County is added as an additional insured in respect to liability arising in any manner out of the performance of any contract entered into between the insured and the Flood Control District or liability arising out of any services provided or duty performed by any party as required by statute, law, purchase order, or otherwise required. It is agreed that any insurance available to the named insured shall be primary of other sources that may be available. It is further agreed that no policy shall expire, be cancelled, or materially changed to effect the coverage available to the District without thirty (30) days written notice to the District. THIS CERTIFICATE IS NOT VALID UNLESS COUNTERSIGNED BY AN AUTHORIZED REPRESENTATIVE OF THE INSURANCE COMPANY.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
 3335 West Durango Street
 Phoenix, Arizona 85009

DATE ISSUED _____

AUTHORIZED REPRESENTATIVE _____

ACORD CERTIFICATE OF INSURANCE

ISSUE DATE (MM/DD/YY)

12-28-89

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW

PRODUCER
CORROON & BLACK
 7310 NO. 16TH ST., STE 300
 PHOENIX, AZ 85020-5299
 (602)870-7000

COMPANIES AFFORDING COVERAGE

- COMPANY LETTER **A** AETNA CASUALTY & SURETY
- COMPANY LETTER **B**
- COMPANY LETTER **C**
- COMPANY LETTER **D**
- COMPANY LETTER **E**

CODE -- -- SUB-CODE

INSURED
M G C CONTRACTORS, INC.
 411 S. MILL, S#205
 TEMPE, AZ 85281

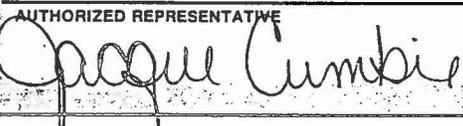
COVERAGES
 THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED, NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

TR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	ALL LIMITS IN THOUSANDS
	GENERAL LIABILITY <input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS MADE <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> OWNER'S & CONTRACTOR'S PROT.	ACM5202382	10-1-89	10-1-90	GENERAL AGGREGATE \$ 2,000, PRODUCTS-COMP/OPS AGGREGATE \$ 2,000, PERSONAL & ADVERTISING INJURY \$ 1,000, EACH OCCURRENCE \$ 1,000, FIRE DAMAGE (Any one fire) \$ 50, MEDICAL EXPENSE (Any one person) \$ 5,
	AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> NON-OWNED AUTOS <input type="checkbox"/> GARAGE LIABILITY	FJ941389	10-1-89	10-1-90	COMBINED SINGLE LIMIT \$ 1,000, BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE \$
	EXCESS LIABILITY <input checked="" type="checkbox"/> OTHER THAN UMBRELLA FORM WORKER'S COMPENSATION AND EMPLOYERS' LIABILITY OTHER	UMB555799	10-1-89	10-1-90	EACH OCCURRENCE \$ 5,000, AGGREGATE \$ 5,000, STATUTORY \$ (EACH ACCIDENT) \$ (DISEASE-POLICY LIMIT) \$ (DISEASE-EACH EMPLOYEE)

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/RESTRICTIONS/SPECIAL ITEMS
 RE: CONTRACT FCD NO. 89-46, 16TH STREET BRIDGE AT THE ARIZONA CANAL DIVERSION CHANNEL AND SANITARY SEWER LIFT STATION.
 SEE ATTACHED - PAGE 2 (ENDORSEMENT CG 2010 11-85)

CERTIFICATE HOLDER
 FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
 3336 WEST DURANGO STREET
 PHOENIX, AZ 85009

CANCELLATION
 SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO MAIL SUCH NOTICE SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE COMPANY, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE




COVERAGE PART NUMBER: 67 CO 5202382 CCA

COMMERCIAL GENERAL LIABILITY

EFFECTIVE DATE: 10/01/89

ENDORSEMENT #:

NAMED INSURED: M G C CONTRACTORS, INC.

AGENT: CORROON & BLACK-4735

10/25/89 DC

THIS ENDORSEMENT CHANGES THE POLICY PLEASE READ IT CAREFULLY

ADDITIONAL INSURED - OWNERS, LESSEES OR CONTRACTORS
(FORM B)

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

WHO IS AN INSURED (Section 11) is amended to include as an insured the person or organization shown in the Schedule, but only with respect to liability arising out of "your work" for that insured by or for you.

THE INSURANCE AFFORDED TO SUCH IS PRIMARY AND SHALL NOT CONTRIBUTE IN ANYWAY WITH ANY OTHER INSURANCE WHICH SUCH ADDITIONAL INSURED MAY HAVE.

SCHEDULE

NAME OF PERSON OR ORGANIZATION:

THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

EFFECTIVE DATE: 10/01/89

ENDORSEMENT #:

NAMED INSURED: M G'C CONTRACTORS, INC.

AGENT: CORROON & BLACK-4735

10/25/89 DC

THIS ENDORSEMENT CHANGES THE POLICY PLEASE READ IT CAREFULLY

ADDITIONAL INSURED - OWNERS, LESSEES OR CONTRACTORS
(FORM B)

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

WHO IS AN INSURED (Section 11) is amended to include as an insured the person or organization shown in the Schedule, but only with respect to liability arising out of "your work" for that insured by or for you.

SCHEDULE

NAME OF PERSON OR ORGANIZATION:

ENTRANCO ENGINEERS, INC., MARICOPA COUNTY, AND THE CITY OF PHOENIX, ARIZONA

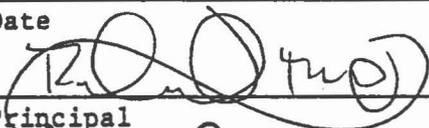
It is further agreed that:

The Contractor hereby agrees to indemnify and save harmless the FLOOD CONTROL DISTRICT OF MARICOPA COUNTY, ENTRANCO ENGINEERS, INC., MARICOPA COUNTY, AND THE CITY OF PHOENIX or any of its departments, agencies, officers or employees, from and against all loss, expense, damage or claim of any nature whatsoever which is caused by any activity, condition or event arising out of the performance or nonperformance of any of the provisions of this Agreement. The Flood Control District of Maricopa County, Entranco Engineers, Inc., Maricopa County, and the City of Phoenix shall in all instances be indemnified against all liability, losses and damages of any nature for or on account of any injuries to or death of persons or damages to or destruction of property arising out of or in any way connected with the performance or nonperformance of this Agreement, except such injury or damage as shall have been occasioned by the negligence of the Flood Control District of Maricopa County, Entranco Engineers, Inc., Maricopa County, and the City of Phoenix. The above cost of damages incurred by the Flood Control District of Maricopa County, Entranco Engineers, Inc., Maricopa County, and the City of Phoenix or any of its departments, agencies, officers or employees, or others aforesaid shall include in the event of an action, court costs, expenses for litigation and reasonable attorney's fees.

Firm MGC Contractors, Inc.

29 Dec 89

Date


Principal

Robert R. Murch, Sec'y/Treas.
Title

SUBCONTRACTOR LISTING

Following is a listing of Subcontractors and material suppliers that are to be used in the event the undersigned should enter into contract with the Owner. This is not an exhaustive or inclusive list.

(Signature) _____

**CONSTRUCTION SPECIAL PROVISIONS
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
FCD CONTRACT NO. 89-46
FOR
16TH STREET BRIDGE AT THE ACDC
AND
SANITARY SEWER LIFT STATION**



PROPOSED WORK: The work includes 3 segments:

1. Relocation of a 12" Sanitary Sewerline.
2. Construction of a bridge.
3. Construction of a Sanitary Sewer Lift Station.

LOCATION OF WORK: This project is located in Phoenix, Arizona, on 16th Street at the Arizona Canal Diversion Channel, approximately 1/8 mile north of Glendale Avenue and immediately north of the Arizona Canal.

A. SPECIFICATIONS: The work embraced herein and as shown on the plans for the construction of this project shall be done in accordance with the Maricopa Association of Governments Uniform Standard Specifications for Public Works Construction dated 1979 and the current revisions thereto, and the Construction Special Provisions contained herein and City of Phoenix 1986 Supplement to the MAG Uniform Standard Specifications.

PRECEDENCE OF CONTRACT DOCUMENT: The City of Phoenix Supplements to MAG Specifications and Details will govern over the MAG Standard Specifications and Details. In case of a discrepancy or conflict, Project Plans will govern over both the City of Phoenix Supplements and MAG Standard Specifications and Details. These Construction Special Provisions will govern over the City of Phoenix Supplements and MAG Standard Specifications and Details and the Project Plans.

WORK STANDARDS: The Contractor shall comply with Sections 103 and 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 327-330) as supplemented by Department of Labor Regulations (29 CFR Part 5).

CONTRACT TIME: The Contractor shall commence work within seven (7) calendar days after the date of the notice to proceed and complete all work within 210 (two hundred and ten) days after receipt of the Notice to Proceed.

In the event the Contractor elects to schedule overtime, second shifts, weekend work, not required by the Project Plans and these Special Provisions, and generally all work as specified in Section 108.5 of these specifications in order to complete the project, the Contractor is reminded that the costs associated with additional testing time, additional test cost, additional inspection, survey, engineering or other work by the construction administration and/or the Flood Control District of Maricopa County shall be borne by the Contractor in accordance with Section 108.5. These costs shall be deducted from the money due to the Contractor by the Flood Control District of Maricopa County. The cost associated with the items above shall be incidental to the unit price of items in the bid schedule.

B. NEGOTIATION CLAUSE: Recovery of damages related to expenses incurred by the Contractor for a delay for which the Flood Control District of Maricopa County is responsible, which is unreasonable under the circumstances and which was not within the contemplation of the parties to the contract, shall be negotiated between the Contractor and the Flood Control District of Maricopa County. This provision shall not be construed to void any provision in the contract which requires notice of delays, provides for arbitration or other procedure for settlement or provides for liquidated damages.

WATER, LIGHT, POWER, HEAT TELEPHONE: All water for construction purposes, drinking water, lighting, temporary electric power, heat and telephone service shall be arranged for and provided for the requirements of the work by the Contractor at his expense.

PROGRESS SCHEDULE: The Contractor shall submit his proposed work progress schedule to the Engineer for approval before starting the work. Weekly updates to the schedule shall be submitted to the inspector at the weekly coordination meeting.

MATERIAL SOURCES: Concrete, Aggregate Base, Steel Products and Pipe shall be obtained from commercial sources. The Contractor shall pay all royalties, or any other charges or expenses, incurred in connection with the securing and hauling of the material.

The Contractor will be required to furnish the Engineer with a list of his proposed commercial sources prior to use, and shall present certificates stating that the material produced from commercial sources is in accordance with the Uniform Standard Specifications and these Special Provisions.

SUBSECTION 101.2 - DEFINITIONS AND TERMS: Change the definition of Budget Project to read as follows: A project financed by funds set aside in the annual budget or otherwise approved by the Board of Directors of the Flood Control District of Maricopa County.

Change the definition of Engineer to read as follows: The Chief Engineer and General Manager of the **Flood Control District of Maricopa County (FCD/MC)** acting directly or through his authorized representative.

Change the definition of Owner to read as follows: The Flood Control District of Maricopa County, acting through its legally constituted officials, officers, or employees.

SECTION 102 - ADDENDA & SUBMISSION OF BIDDING SCHEDULE: It shall be the responsibility of prospective bidders to determine, prior to submission of a bid, if any addenda have been issued. This may be accomplished by calling 602-262-1501. Any addendum issued, if not already bound into the Special Provisions, must be included as a part of the Special Provisions, and any quantities on the Bidding schedule requiring change shall be adjusted by pen and ink to the new figure.

Bids that do not include appropriate addenda and show appropriate changes to the Bidding Schedule shall be invalid.

SECTION 102.4 - EXAMINATION OF SITE:

The contractor shall visit the site and be familiar with the existing conditions and the proposed construction items of special note.

1. It is anticipated that concurrent with this project's schedule, the Squaw Peak Parkway Project P-856344 will also be under construction. The Contractor shall coordinate with the Resident Engineer and Construction Superintendent in order to avoid any conflict in work area schedule and traffic control.

SECTION 102.5 - PREPARATION OF PROPOSAL: The bidder's Arizona State Contractor's license number and classifications shall be shown on the proposal. The Contractor shall be appropriately licensed as a Contractor in the State of Arizona for performing the work in this project.

SECTION 103.6 - CONTRACTOR'S INSURANCE: Concurrently with the execution of the contract, the Contractor shall furnish a Certificate of Insurance using the included Certificate or one of equal working that names the additional insureds as set out in the included Certificate and in 103.6.1(D) below. The certificates shall also name the additional insureds as Certificate Holders. The types of insurance and the limits of liability shall be as indicated on the included form.

SECTION 103.6.1 (D): Add Entranco Engineers, Inc., Maricopa County, City of Phoenix, and other entities as mentioned on the included Certificate of Insurance as additional insureds.

SECTION 103.6.2: The Contractor shall also indemnify and hold harmless the Owner, the Consultant, the Owner's Representative, any jurisdiction or agency issuing permits for any work involved in the project, and their consultants, and each of their directors, officers, employees, and agents from and against all losses, expenses, damages (including damages to the work itself), attorneys' fees, and other costs, including costs of defense which any of them may incur with respect to the failure, neglect, or refusal of Contractor to faithfully perform the work and all of the Contractor's obligations under the contract. Such costs, expenses, and damages shall include all cost, including attorneys' fees, incurred by the indemnified parties in any lawsuit to which they are a party.

SECTION 104 - SCOPE OF WORK: 104.2.1 General: The cost of all work required under this contract, as shown on the plans, for which there are no specific items shown on the Bidding Schedule, shall be included in the prices bid for related items.

SECTION 104.1.2 - TRAFFIC REGULATIONS:

- A. The following shall be considered major streets:
Glendale Avenue
16th Street

- B. All traffic and/or traffic control devices on this project shall be provided, maintained and/or controlled as specified in the City of Phoenix Traffic Barricade Manual, latest revision.
- C. Permission to restrict City streets, sidewalks, and alleys (street closure permits) shall be requested as specified in Section III of the Traffic Barricade Manual.
- D. Unless otherwise provided for in the following "Special Traffic Regulations" and SECTION 401, all traffic on this project shall be regulated as specified in Section IV of the Traffic Barricade Manual.

SPECIAL TRAFFIC REGULATIONS: 16th Street from Glendale Avenue to Dreamy Draw Drive: 16th Street can be reduced as shown during the time indicated when construction requires:

2 lanes (1 each way) 7 p.m. to 6 a.m. Monday thru Thursday nights and from 9 p.m. Friday to 6 a.m. the following Monday.

4 lanes (2 each way) from 8:30 a.m. to 4 p.m. weekdays.

During other times, 6 lanes (3 each way) with left-turn lanes shall be maintained open to thru traffic at the 16th Street and Glendale intersection.

16th Street From Glendale Avenue to Myrtle Avenue, Sanitary Sewer Relocation: 16th Street can be reduced to 4 lanes (2 each way) from 9 p.m. Friday to 6 a.m., the following Monday on one or more consecutive weekends for manhole installation. During other times, all lanes shall be open to thru traffic.

Pedestrian Access and Bike Path Requirements: Contractor shall provide and maintain clean, safe and adequate pedestrian walkways, sidewalks and crosswalks free of dirt, mud, dust, debris, equipment and material storage at all times.

Contractor shall provide "bike path" detour signing and maintain the bike path open and free of obstructions at all times. A bike path detour plan shall be submitted for approval prior to implementation.

Police Officer Requirements: Contractor shall provide one off-duty police officer at 16th Street and Glendale signalized intersection to assist with traffic control when 16th Street is reduced to less than 6 lanes at the intersection.

Two additional officers are required to assist the contractor when it is necessary to flag traffic to allow men and equipment into or out of the work area.

SECTION 104.2 - BORING LOGS AND SOILS REPORT: The soil boring logs are included in the project for the Contractor's information only. No guarantee is made of the accuracy of the boring logs in the soils report. The Contractor shall make his own determination as to soil and subsurface conditions and shall complete his work in whatever material and under whatever condition he may encounter or create, without extra cost (except as modified in MAG). Existing moisture conditions shall be no basis for claim for additional monies or time extensions. The Contractor shall manipulate the existing soil as required to achieve stable soil conditions and the required densities.

SECTION 104.2.2: Due to Physical Conditions: Paragraph *B). In the first sentence delete the following words:
"backfill or bedding"

SUB-SECTION 105.2 - PLANS AND SHOP DRAWINGS: Sub-Section 105.2 of the MAG Standard Specifications is amended to include the following:

The number of copies of plans/shop drawings required for review and/or approval shall be as follow:

Initial submittal: Three (3) copies. One (1) copy will be returned to the Contractor.
Final submittal: Seven (7) copies. Two (2) copies will be returned to the Contractor.

The Contractor shall furnish the Engineer with these copies of shop drawings, pipe layout diagrams, manufacturer's catalog data, and detailed information, in sufficient detail to show completed compliance with all specified requirements, covering, but not limited to, the following items:

- A. Fabricated Pipe and Design Data
- B. Pre-cast Manhole Risers
- C. Reinforcing Steel
- D. Castings
- E. Field Closures
- F. Concrete Mix Designs
- G. Structural Steel
- H. Precast Girders
- I. Metal Railing
- J. False Work Plans and Design Calculations

- K. Structural Design Calculations and Details for All Concrete Structures, as Required.
- L. Utility Protection Plans
- M. Detailed Sequence of Construction for Structures

Review: The Contractor, at his own expense, shall make such changes in the drawings as may be necessary to conform to the plans and specifications. Prior to return of such drawings, marked "Furnish as Submitted" or "Furnish as Noted", any work which the Contractor may do on the fabrications covered by the same shall be at his own risk, as the FCD/MC will not be responsible for any expense or delays incurred by the Contractor for changes required to make the same conform to the drawings as finally reviewed.

One copy of submitted drawings will be returned to the Contractor marked "Furnish as Submitted" or "Furnish as Noted". If the submittal is marked "Revise and Resubmit" or "Rejected", a new submittal shall be made in the same manner as the original submittal. All drawings will be reviewed and returned to the Contractor within 14 days.

When submitted for the Engineer's review, shop drawings, line layouts, etc. shall bear the Contractor's certification that he has reviewed, checked, and approved the shop drawings, etc. and that they are in conformance with the requirements of the Contract Documents. The Engineer will not review any submittals which do not bear the Contractor's certification.

After the review has been completed, the above drawings, lists, samples, design calculations, and other data shall become part of the Contract documents, and the fabrications furnished shall conform to the submittal.

Review of material and layout drawings consists of review for general conformity to plans and specifications, and in no way relieves the Contractor or the supplier from responsibility for the correctness of the drawings.

Deviations or changes from plans or specifications must be called out as such and will require review by the Engineer for approval or rejection.

Construction of this project shall not begin until the shop drawings and line layouts have been reviewed and approved.

Corrections required on the shop drawings will not constitute a valid reason for delay in the project schedule.

SECTION 105.6 - COOPERATION WITH UTILITIES: An attempt has been made to determine the locations of all underground utilities and drainage pipes, culverts, and structures. The Contractor shall comply with the requirements of the ARS 40-360 21 through 40-360-29 in notification to the interested utility owners prior to the start of construction and shall ascertain the approximate locations of the various underground utilities shown on the plans and as may be brought to his attention. The exact locations of these underground utilities shall be determined by excavations made by the Contractor prior to any trenching operations. It shall be the Contractor's responsibility to cooperate with the pertinent utility companies, so that any obstructing utility installation may be adjusted. Should the Contractor's operations result in damage to any utility, the location of which has been brought to his attention, he shall assume full responsibility for such damage.

Any facility or work which may be performed for the accommodation of any utility shall be paid for by the utility owner. The Contractor shall make all arrangements that may be necessary for the construction, and any financial agreement shall be solely between the Contractor and the utility owner.

Existing 2 and 4" high pressure gas line will be relocated by Southwest Gas prior to the Contractor's commencement of work.

Existing overhead electrical will be relocated by APS prior to the Contractor's commencement of work.

The following phone numbers, as indicated, should place the Contractor in contact with proper personnel:

- Mountain Bell Telephone Company, Ron Catlett.....842-7750
- Salt River Project (Overhead Power).....236-8888 or 273-2202
- S.R.P. Water Operational Support, Bob Maurer.....236-2962
- Arizona Public Service, Lois Winkler.....271-2014
- Location Staking (APS, Mountain Bell, SRP).....263-1100
- City of Phoenix (Water), Steve Schebler.....262-4709
- (Sewer), Bob Rentfro.....262-1864
- (Lift Station), John Shepard.....262-7695
- City of Phoenix (Streets & Traffic).....262-6565
- Maricopa County Highway Department.....262-3631
- Flood Control District of Maricopa County.....262-1501
- Southwest Gas Corporation.....271-4277
- Dimension Cable Services.....866-0072..Ext. 243

The Contractor shall notify the appropriate entities at the beginning of the job to coordinate any sleeves or inserts provided by the utility.

SECTION 105.8 - CONSTRUCTION STAKES, LINES AND GRADES: The project control line and bench mark elevation are shown on the drawings and will be established by the Engineer. The Contractor shall establish offset stakes and temporary bench marks for referencing the designated construction lines and grades. The Contractor shall provide all rough grade, fine grade, and structural reference lines and shall be responsible for their conformance to the plans and specifications.

Survey work shall be performed by a qualified and experienced surveyor under the supervision of a licensed land surveyor or licensed Civil Engineer and/or their bona fide employees working under their direct supervision.

The Contractor shall furnish field books to be used for recording survey data and field notes. These books shall be available for inspection by the Engineer at any time and shall become the property of the Engineer upon completion of the work.

The Engineer reserves the right to make inspections and random checks of any portion of the staking and layout work. If, in the Engineer's opinion, the work is not being performed in a manner that will assure proper control and accuracy of the work, he will order any or all of the staking and layout work redone at no additional cost.

No separate payment will be made for construction surveying, and the cost thereof shall be included in the price bid for related items of work.

SECTION 105.10 - INSPECTION OF WORK: Work will be subject of City of Phoenix inspection and acceptance prior to final acceptance by the Engineer. City inspectors have the right to visit the site at any time, without notice. All requests or comments from the City will be made to the Engineer and the Contractor will then be notified by the Engineer.

SECTION 105.12 - MAINTENANCE DURING CONSTRUCTION: The Contractor shall maintain the work during construction and until the project is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces to the end so that the roadway or structures are kept in satisfactory conditions at all times.

SECTION 106 - CONTROL OF MATERIALS:

106.1 Source of Materials and Quality: The Contractor shall guarantee the construction work for one year against faulty materials, faulty workmanship and failure to meet the requirements of the specifications. Said guarantee by the Contractor shall not apply to damage caused by earthquakes or other acts of god, land subsidence, or faulty operations or any abuse of the structures by others.

SECTION 106.3 - PLANT INSPECTION:

Off-Site Inspection: The Contractor shall be responsible for all expenses, including but not limited to travel and per diem expenses, for required inspections by the Engineer and/or the cost of inspection and testing by an independent testing laboratory as required by and at the discretion of the Engineer for any inspection of precast concrete girders manufactured outside of a fifty-mile radius from the City limits of Phoenix, Arizona.

Costs associated with the above work will be deducted from the money due the Contractor as noted in Section 108.5.

Within a fifty mile radius from the City limits of Phoenix, Arizona, costs for inspection of precast concrete girders shall be included in the regular construction contract of the Inspector.

SECTION 106.5 - CONTRACTOR'S MARSHALING YARDS: Contractor shall obtain approval of the Engineer when using vacant property to park and service equipment and store material for use.

- A. The Contractor shall notify adjacent property owners/residents of this proposed use.
- B. Any use of vacant property adjacent to or near the project for parking or servicing equipment and/or storing material will require the Contractor to obtain written approval from the property owner. This approval shall contain any requirements which are a condition of this approval.
- C. A signed letter with the property owner's approval shall be submitted along with the Contractor's request to the Engineer for approval for use of the marshaling yard in connection with the project. An appropriate distance from adjacent property will be set by the Engineer on a case by case basis

based on the size and type of equipment to be used on the project.

- D. The yard shall be fenced and adequately dust-proofed in a manner as to preclude tracking of mud onto paved City streets.
- E. Work in yard shall be scheduled so as to comply with the City Noise ordinance.
- F. Equipment, materials, etc., shall be located so as to minimize impact on adjacent properties. A sound barrier may be required if deemed necessary by the Engineer.
- G. The Contractor shall clean up property promptly upon completion of the use.
- H. Contractor's request for approval shall specify in detail how he or she proposes to comply with D through G above.

In the event the Contractor uses Flood Control Property for these uses, he shall obtain a license from FCD/MC.

SECTION 107.2 - PERMITS: The Contractor shall be responsible for obtaining all permits and licenses, pay all charges, fees, taxes, and give all notices necessary and incidental to the due and lawful execution of the work. Permits for earth moving may be obtained from the Bureau of Air Pollution Control, Maricopa County Department of Health Services, 1845 East Roosevelt, telephone number 258-6381.

A no charge permit is required from the City of Phoenix. The City of Phoenix Project Review Number (Project No. or FN) is DIS 32455.

A permit from the Salt River Valley Water Users Association for work in their right-of-way will be supplied by the Flood control District.

SECTION 107.10 - CONTRACTOR'S RESPONSIBILITY FOR WORK: The Contractor shall properly guard, protect, and take every precaution necessary against injury or damage to all finished or partially finished work, by the action of the elements or from any other cause until the entire project is completed and accepted by the Engineer. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work before final acceptance at no cost to the Contracting Agency. Partial payment for completed portions of the work shall not release the Contractor from such responsibility.

In case of suspension of the work for any cause whatever, the Contractor shall be responsible for the project and shall take such precautions as may be necessary to prevent damage to the project and shall erect any necessary temporary structures, signs, or other facilities at no cost to the Contracting Agency.

SECTION 108.4 - SEQUENCE OF CONSTRUCTION:

Construction of the 12 inch sewerline shall precede the bridge construction to avoid disruption of service and conflict with the bridge.

Construction of the bridge will be phased as illustrated on the plans. The bridge structure will be constructed in two sections in a manner that will permit traffic to be maintained at all times in accordance with Section 104.1.2 - TRAFFIC REGULATIONS, SECTION 401 TRAFFIC CONTROL and the traffic control shown on the project plans.

SECTION 108.5 - LIMITATION OF OPERATIONS: Should the Contractor or subcontractor elect to perform any work before or after regular working hours, on weekends, or legal holidays, any charges incurred by the district for inspection of the work, surveys, or tests of materials will be deducted from monies due or to become due to the Contractor, including cost included in SECTION 106.3.

Work performed by the consultant under Section 108.5 shall be subject to an overtime billing rate.

Rates for inspection by the consultant and his subs are on file with the District. Both regular and overtime rates are listed for each class of consultant employee. Rates for subconsultants shall include an additional administration fee of 15%.

SECTION 108.9 - FAILURE TO COMPLETE ON TIME: The actual cost per calendar day incurred by the District for Consultant Administrative and Inspection Services on this project will be added to the daily charges as indicated by TABLE 108, LIQUIDATED DAMAGES, as shown in the MAG Uniformed Standard Specifications (not in the Phoenix Supplement), and will be deducted from monies due or to become due to the Contractor for each and every calendar day that work shall remain incompleated after the time specified for the completion of the work in the proposal, or as adjusted by the Engineer. Nothing contained in this provision shall prohibit the District from deducting from monies due or to become due to the Contractor any other costs incurred by the District directly attributable to the delay in completing this contract.

SECTION 201 - CLEARING & GRUBBING: The work under this item consists of removal and disposal of all trees, stumps, asphaltic pavement, and structures within the limits of the roadways and easements, as designated on the plans. Materials shall be disposed of off-site.

No separate payment will be made for clearing and grubbing, and the costs thereof shall be included in the price bid for related items of work.

SECTION 206 - STRUCTURE EXCAVATION AND BACKFILL: Structure excavation and backfill shall conform to Section 206 of the Uniform Standard Specifications.

Structure backfill behind the abutments and wing walls shall be compacted in accordance with Table 601-2, Type III of the Uniform Standard Specifications.

All backfill behind the bridge abutments and wing walls shall consist of free-draining granular material with not more than 5% passing a #200 sieve and a PI less than 7. Backfill shall be placed in horizontal lifts consistent with the maximum material size and type of compaction equipment in use and compacted to a minimum of 95% of the maximum density at the optimum moisture content plus or minus 3% as determined in accordance with ASTM D-2922 and D-3017. Compaction equipment should be maintained at least two (2) feet away from the structure.

Backfill against front face of abutment walls and wing walls may consist of selected native soils.

Special backfill AB slurry shall conform to Section 702 of the Uniform Standard Specification. The slurry shall be mixed with sufficient water to be fluid when placing and shall be consolidated and compacted by vibration and Mechanical Contractors.

Structure excavation shall be paid for at the lump sum contract price bid for **ITEM 206-1 - STRUCTURE EXCAVATION**. **Structure backfill** shall be paid for at the lump sum contract price for **ITEM 206-2 -STRUCTURE BACKFILL**. **Special backfill** (AB Slurry) shall be paid for at the lump sum contract price bid for **Item 206-3**.

SECTION 211 - FILL CONSTRUCTION: The work under this section consists of constructing embankments for the Traffic Control detours, temporary sidewalks, approach roadways and raising the grade in and around the sanitary sewer lift station. The material required for the construction of the fill shall be suitable material obtained from the ACDC Right-of-Way, the structure excavation or backfill material shall be as defined in SECTION 206. All material shall be free of all debris and vegetation.

Prior to the placement of fill material, all loose soil, vegetation, any roadside debris, concrete, pavement, and existing

structures within the proposed fill areas shall be completely removed. Depressions and ditches shall be cleaned of all loose or wet soils and widened to accommodate compaction equipment. Sloping surfaces shall be benched to provide a level surface for fill placement.

All exposed subgrade surfaces shall be scarified, brought to the proper moisture content and compacted for a minimum depth of eight (8) inches.

The fill shall be compacted in horizontal lifts to subbase level. The depth of the uncompacted lifts shall not exceed eight (8) inches.

Compaction shall be to a minimum of 95% of the maximum density as determined in accordance with ASTM D-2922 and D-3017 within a moisture content range of plus or minus 3% of optimum.

No separate payment will be made for fill construction and the cost of these items shall be included in the contract price bid for related items.

SECTION 225 - WATERING: The work under this item shall be in accordance with section 225 of the MAG Standard Specifications.

SECTION 310 - UNTREATED BASE: **ITEM 310-1 AGGREGATE BASE** shall conform in their entirety to the requirements of Section 310 of the Uniform Standard Specifications. Aggregate Base shall be crushed in accordance with Section 702.2.

The Contractor will be required to furnish the Engineer certified weight tickets covering all of the Aggregate Base placed on the project. Final pay quantities will be based upon the scale tickets accepted by the Engineer.

SECTION 321 - ASPHALT CONCRETE PAVEMENT: Asphalt concrete pavement shall consist of furnishing and placing a plant-mixed asphalt concrete road surfacing material to the compacted thickness shown on the plans and in accordance with Section 321 of the Uniform Standard Specifications.

The mineral aggregate shall meet the grading requirements within the range of the specified tolerances for Mix-Designation C-3/4 in accordance with Section 710 of the Uniform Standard Specifications and the City of Phoenix Supplement to the Uniform Standard Specifications.

The Contractor shall furnish certified weight tickets covering all plant-mixed asphalt concrete placed on the project.

Payment for item will be made at the contract unit price bid per ton for **ITEM 321-1 C-3/4 - ASPHALT CONCRETE COURSE**.

SECTION 336 - PAVEMENT REPLACEMENT: **Item 336-1** shall conform in its entirety to Section 336 of MAG Uniform Standard Specifications.

SECTION 340 - CONCRETE CURB & GUTTER, SIDEWALKS, DRIVEWAYS AND ALLEY ENTRANCES: **ITEM 340-1, 340-2 and 340-3** of this project shall conform in its entirety to Section 340 of the MAG Uniform Standard Specifications.

SECTION 350 - REMOVAL OF EXISTING IMPROVEMENTS: **Item 350-1** through **350-5** of this project shall conform in its entirety to Section 350 of the MAG Standard Specifications. In addition to the items listed in the MAG Standard Specifications, Section 350.3 Miscellaneous Removal and Other Work, the following shall be included:

- K. Restoration of Right-of-way and/or Temporary Construction Easements: The Contractors shall leave the easements in as good condition, or better, after work is completed, special care must be taken to replace any asphalt, trees, sprinklers, lights, walls, fences, etc., which were disturbed as a result of construction. Where grass is located within the easement, such as a lawn, the Contractor shall remove the sod which would be in the path of any construction, store it, keep it moist, and replace it immediately after construction is complete.
- L. Any and all items not specifically set forth as a separate pay item.
- M. Sawcutting and matching existing pavements and curbs, gutters, etc.
- N. Relocating positions of existing signs to be staked by the Inspector.
- O. Relocating positions of existing plants within the right-of-way to be staked by the Inspector.
- P. Removing existing AC, concrete curb and gutter and adjust any existing improvements, if required, and water meter adjustment as directed by the Engineer.

- Q. Remove and replace all damaged concrete sidewalk along the Arizona Canal, now designated as a bike path, including those areas removed for sewer construction on the bike path and along 16th Street.
- R. Provide and install 1 - 8" (approximately 112 LF) and 1-4" (approximate) PVC pipe sleeves for gas lines; and 6 - 5" (approximately 890 LF) PVC pipe sleeves, as detailed in the Project Plans in the ACDC Bridge Sidewalks.
1. All work to comply with the APS Underground Distribution Construction Standards (U.D.C.S.) Manual.
 2. Backfill and compaction per APS specifications as defined in the UST01 section of the APS U.D.C.S. Manual.
 3. Five inch E.B. Conduit (UBC1LB) and/or 3" D.B. Conduit (UBC1HA) shall be encased in concrete as specified in the UST01 section of the APS U.D.C.S. Manual.
 4. Minimum 3" concrete envelope required around ducts. Concrete to be per the UST01 section of the APS U.D.C.S. Manual unless otherwise noted.
 5. Maintain minimum 1 foot vertical separation between all APS facilities (i.e., duct bank, conduit and cable) and any underground conflicts.
 6. All conduit to be mandrelled and cleared of all obstructions before installing APS approved, 1/2", woven kevlar, prelubricated, flat strap pull line (UBC7MR) in each conduit run.
 7. Trench depths shown are minimum requirements.
 8. Install spacers and rebar for duct bank per UST90 section of the APS U.D.C.S. Manual.
 9. Trench bottom to be uniformly graded.
 10. Contractor not to trench closer than 2' to APS facilities (except 4' to poles) unless an APS representative is present.
 11. When passing over or under conflicts, trench not to be sloped steeper than 1:12 ratio or minimum radius of 140 times the outside diameter of the conduit.

S. Chain Link Gate

Chain link gates shall be installed as indicated on the Plans and herein specified.

Fencing may be constructed at any time after the earthwork, pipe work, and structures to which the fence is related have been completed.

The gate shall be protected against damage and, if damaged, it shall be repaired prior to final acceptance.

Except where indicated differently on the Plans, gate posts and concrete foundations for gate posts shall be as determined by the following schedules:

<u>Gate Leaf Width,</u> <u>feet</u>	<u>Size OD,</u> <u>inches</u>	<u>Weight,</u> <u>lb/lf</u>	<u>Concrete Foundation</u>	
			<u>Diameter,</u> <u>inches</u>	<u>Depth,</u> <u>feet</u>
0 to 6	2-7/8	5.79	12	4
Over 6 to 13	4	9.11	18	3
Over 13 to 18	6-5/8	18.97	18	4
Over 18	8-5/8	24.70	18	4.5

Gate posts shall have vertical extension arms with three strands of barbed wire.

All posts, rails, and appurtenances shall be hot dipped zinc coated steel per ASTM A 120, A 121, A 123, or A 153, whichever is applicable. Pipe posts shall have tops which exclude moisture. End corner, pull, and gate posts shall be braced with the same material as top rail and trussed to line posts with 3/8 inch rods and tighteners.

The fabric shall be connected to the line posts with 6-gauge hot dip galvanized wire clips every 14 inches, to terminal, corner, and gate posts by using 1/4 inch by 3/4 inch tension bars ties to posts every 14 inches with 11-gauge, 1-inch wide, hot dip galvanized steel bands and 3/8 inch diameter bolts and nuts, and to tensions wires with 11-gauge hog rings every 24 inches.

Post top fittings shall have galvanized, 45-degree angle extension arms. Three barbed wire strands shall be carried on each extension arm. The top rail shall pas through the extension are fitting.

420.1 Swing Gates

Except as otherwise indicated or specified, all chain link fence gates shall be swing gates.

Swing chain link gates shall be provided where indicated on the Plans. Gate frames shall be made of 1.90-inch OD galvanized pipe weighing 2.72 pounds per linear foot. Corner fittings shall be heavy pressed steel or malleable castings.

Gates shall be provided with 3/8 inch galvanized cross tensioning rods and turnbuckles rigidly attached to the gate frame.

The corners of gate frames shall be fastened together and reinforced with a fitting designed for the purpose or by welding. All welds shall be ground smooth.

Vertical stiffeners shall be provided on gates at 6 feet on center on gates 12 feet and wider and horizontal stiffeners shall be provided for gates over 7 feet in height.

Chain link fence fabric shall be attached to the gate frame by the use of tension bars and tie wires as specified for fence construction, and suitable tension connectors spaced at approximately 16-inch intervals.

Gate shall be provided with a combination steel or malleable iron catch and locking attachment of acceptable design. Stops to hold gates open and a center rest with catch shall be provided where required.

Payment for chain link gate will be made at the unit price bid for **Item 420-1, Chain Link Gate**.

- T. Provide and install approximately 250 LF of 1 1/2" PVC conduit for electric wire on the box culvert underpass. Installation shall include all bends, caps, splices and 4" x 4" cast iron electrical boxes per Kanall Manufacturing Company or approved equal.
- U. Provide and install decomposed granite for dustproofing the area within and around the sanitary sewer lift station and over the non-roadway area of the bridge. Decomposed granite shall comply to Section 702.4 of the MAG, Uniform Standard Specification for Public Works Construction and shall be treated (sterilized) to inhibit the growth of weeds and other vegetation.
- V. Provide and install approximately 200 LF of 1" copper waterline service connection from the existing water meter, near Station 9+80 left, to the hose-bib in the lift station yard.
- W. The contractor shall cooperate with all utility owners while providing service to the sanitary sewer pump station yard. The contractor shall pay all fees and charges in connection with the installation of gas, water, electric, telephone, etc.

Item 350-1 ACDC Right-of-Way Demolition shall conform to the direction and specification shown on the plans and the direction of the land management division of the land control district of Maricopa County.

Payment for this work shall be at the lump sum bid for **Item 350-1, ACDC Right-of-Way Demolition.**

SECTION 401 - TRAFFIC CONTROL:

Items 401-1 and 401-2 shall conform in its entirety to Section 401 of the MAG Standard Specifications.

Add the following to MAG Sub-Section 401.7, Payments:

Payment for **Item 401-1** Traffic Control, will be paid for on a lump sum basis for Traffic Control Devices

401.5 General Traffic Regulations:

- A. Glendale Avenue and 16th Street shall be considered major streets.

Access to local businesses is required at all times.

- B. All traffic and/or traffic control devices on this project shall be provided, maintained, and/or controlled as specified in the City of Phoenix Traffic Barricade Manual, latest revision.
- C. Permission to restrict city streets, sidewalks, and alleys (street closure permits) shall be requested as specified in section III of the Traffic Barricade Manual.
- D. Unless otherwise provided all traffic on this project shall be regulated as specified in Section IV of the Traffic Barricade Manual.
- E. Temporary traffic control shall be the responsibility of the Contractor.
- F. The Contractor shall provide a traffic control plan for each barricade installation used for this project.
- G. Special Traffic Requirement - The Engineer shall provide a scaled 24" x 36" base map vellum covering the construction area and traffic control zone. The map will include existing signing, striping and signalization. The Contractor shall

provide the traffic control layout and barricade placement, as provided above, for each phase or subphase. The Contractor shall submit the above layout at least 14 days prior to implementation to the Engineer. The Contractor shall not implement the traffic control plan until approved by the City of Phoenix.

SECTION 505 - CONCRETE BRIDGE STRUCTURES: The work under this section shall consist of furnishing all labor, materials and equipment for the construction of the **cast-in-place concrete** portions of the bridge structure, including the approach slabs, reinforced concrete street pavement, bridge sidewalks, and concrete catch basins in accordance with the plans and Section 505 of the Uniform Standard Specifications for Public Work Construction, except as specified in these Construction Special Provisions.

General: It shall be the Contractor's responsibility to protect the structure and construction site from damage that may occur during the construction period and until final acceptance of the completed bridge by the Flood Control District.

Upon completion of the construction, the Contractor shall clear the work area of all debris.

No vehicular loads will be permitted on the bridges before the lapse of twenty-one (21) days from the date of the last pour of concrete for the bridge deck, unless approval is obtained in writing from the Engineer. In no case shall traffic be allowed on the structure until; the specified concrete strength has been attained. The Contractor shall take special precautions to keep the area around the bridges properly barricaded, lighted and marked to prevent automotive traffic from crossing the new bridge structures prior to the Engineer's approval.

The installation of any necessary conduits, brackets, or piping or any other facility or work which may be performed for the accommodation of any utility, other than as shown on the plans, shall be paid for by the utility owner. The Contractor shall make all arrangements that may be necessary for the construction and any financial agreement shall be solely between the Contractor and the utility owner.

Portland Cement concrete, ITEMS 505-1 and 505-2 shall conform to Section 725 of the MAG Uniform Standard Specifications.

ITEM 505-1 Class "A" Concrete f'c = 3,000 psi
Sidewalk, Barrier Rail, Sanitary
Sewer Lift Station

ITEM 505-2 Class "AA" Concrete f'c = 4,000 psi
Cap Beam,
Approach Slabs, Wing Walls
Deck Topping and Reinf. Conc. Street Pavement

The Contractor shall determine the mix proportions and shall furnish concrete which conforms to the requirements of these specifications. All concrete shall be sufficiently workable, at the slump proposed by the Contractor within the specified range, to allow proper placement of the concrete without harmful segregation, bleeding, or incomplete consolidation. It shall be the responsibility of the Contractor to proportion, mix, place, finish, and cure the concrete properly in accordance with the requirements of these specifications.

Admixtures:

The Contractor shall furnish Certificates of Compliance conforming to the requirements of MAG Subsection 106.2 for each type of admixture furnished. Admixtures containing chlorides will not be acceptable for concrete containing uncoated reinforcing steel or embedded metal items.

All concrete admixtures shall be stored in suitable containers in accordance with the manufacturer's recommendations. All liquid admixtures shall be protected from freezing.

Air-entraining admixtures shall conform to the requirements of AASHTO M 154.

Water reducing admixtures shall conform to the requirements of AASHTO M 194.

Fly ash shall conform to the requirements of ASTM C 618 for Class F, except that the pozzolanic activity index with lime shall be reduced to a minimum of 650 pounds per square inch at seven days. The Blaine fineness shall have an average value of at least 2,800 with a minimum value of 2,600 for any one sample. The average value will be determined on the last five consecutive samples. The loss on ignition shall not exceed 3.0 percent.

Design of Concrete Mix:

Portland Cement Concrete shall comply with SECTION 726 of the MAG Uniform Standard Specifications for Public Works Construction.

A fly ash admixture may be used at the option of the Contractor only when portland cement is used. A maximum of 15 percent of the required weight of portland cement may be replaced with a fly ash admixture. A minimum of 1.2 pounds of fly ash shall replace each 1.0 pound of portland cement removed.

Concrete shall have a compressive strength not less than that shown on the project plans. Unless otherwise shown on the project plans, the (f'c) of Class S concrete shall be the required 28-day compressive strength.

The coarse aggregate size designation for concrete shall be chosen by the Contractor and approved by the Engineer and shall conform to the size designation and grading requirements of AASHTO M 43. In choosing the size designation, the maximum size of coarse aggregate shall not be larger than 1/5 of the narrowest dimension between sides of adjacent forms, or 2/3 of the minimum clear spacing between reinforcing bars, or 1/3 the depth of the slab, whichever is least.

The proposed slump shall be chosen by the Contractor. Concrete at the proposed slumps shall be sufficiently workable to allow proper placement without harmful segregation, bleeding, or incomplete consolidation.

Air-entraining admixtures will be required for all classes of concrete. The amount of entrained air in the concrete mixture shall not be less than four percent nor more than seven percent by volume.

Unless specifically prohibited, water reducing admixtures may be used at the option of the Contractor.

At least two weeks prior to the appropriate concreting operation, the Contractor shall furnish a mix design for each strength of Class S concrete for review and approval. More than one mix design for each strength of Class S concrete may be submitted for approval providing specific items and locations of intended uses accompany the mix design. The Contractor shall substantiate each mix design by furnishing test data and providing all details of the mixtures proposed for use.

The complete solid volume mix designs submitted for approval shall include all weights and volumes of all ingredients. The brand, type, and source of hydraulic cement and admixtures, the coarse aggregate size number designation, source of aggregates, the specific gravities of all ingredients, the proposed slump, a code number to identify the mix design, and the intended use of each mix design shall be an integral part of each mix design.

No changes in the approved mix designs or code numbers shall be made by the Contractor except by the approval of the Engineer. A new mix design shall be submitted for approval any time the Contractor requests a change in materials or proportioning of the materials from that given in each approved mix design. In no case shall the approval of a mix design relieve the Contractor of the responsibility for the results obtained by the use of such approved mix design.

Mix designs from previous or concurrent projects may be submitted for approval. The Engineer may waive trial batches at any time.

The Contractor may obtain concrete for each strength of concrete from an approved commercial source.

For each strength of concrete, the Contractor shall furnish an invoice for each batch of concrete. The minimum items required of each invoice shall be the mix design code number, date, time batched, truck identification or number, and name of identification of batch plant.

Testing for consistency shall be in accordance with the requirements of AASHTO T 119 to determine the consistency in slump. The Contractor shall be responsible for furnishing concrete at the slump shown on the approved mix designs with a permissible variation of ± 1 inch. Concrete that fails to conform to the consistency requirements will be rejected.

Bridge Deck:

The placing of concrete will not be permitted until the Engineer is satisfied that the rate of producing and placing concrete shall be sufficient to complete the proposed pour and finishing operations within the scheduled time, that experienced concrete finishers are available to finish the deck and that all necessary finishing tools and equipment are on hand at the site of the work and are in satisfactory condition for use.

Concrete shall be placed for the full width of the panel to be poured. After the concrete has been placed it shall be

consolidated and then struck off by means of self-propelled screed equipment.

Screed equipment shall be designed to operate as close as practicable to bridge curbs.

Screed equipment shall travel on steel rails. Rails shall be substantially supported by adjustable steel supports of adequate size securely fastened in place and spaced at sufficiently close intervals to prevent any appreciable deflection in the rails. Steel supports shall be of such types and installed in such manner that when the rail and adjustable support have been removed, there will be no void in the concrete.

The steel rails for placing and finishing equipment shall be set to the correct elevation shown on the project plans or as established by the Engineer. The rails shall extend beyond both ends of the scheduled length for placement a sufficient distance that will permit the screed and finishing equipment to reach all areas of the concrete placed.

Screed beams or rollers shall be made of metal, or the bottom of the beam shall be metal clad. Roller screeds shall be so constructed and of such length that there will be no sag or deflection in the screeds.

Screed assemblies equipped with vibrators shall be so designed that the vibrating units do not contact any reinforcing steel. Vibration shall be transmitted to the concrete in such a manner that when the motion of the machine is stopped, all vibration will cease.

A slight excess of concrete shall be maintained in front of the screed at all times during the screeding operation. The screed shall make as many passes over the slab as necessary to obtain a uniform surface.

The Contractor shall furnish a minimum of two transverse work bridges from which floating, straightedging, and curing operations may be accomplished. The work bridges shall be reasonably rigid and free of excessive deflections. The self-propelled mechanical bridge used for texturing the bridge deck may be substituted for one of the required work bridges.

The floating operation shall follow the screeding if required. The float shall have a minimum diameter of three inches and have a minimum length of 12 feet. The float shall be constructed so that the surface will be maintained true at all times.

Prior to placing concrete, the screed shall be traversed the length of the proposed pour and the clearance from the screed to the reinforcing steel and deck thickness shall be checked. The method of determining the clearance shall be approved by the Engineer prior to making such checks. The clearance shall be as indicated on the project plans with a permissible variation of plus or minus 1/4 inch. Deflection of the screed rails as a result of the weight of the screed equipment will not be permitted. All corrections necessary as a result of this operation shall be performed prior to beginning the pour.

The Contractor may submit and alternate for the equipment detailed above. Use of alternate equipment shall not be allowed without approval of the Engineer.

Finishing Bridge Deck:

Bridge sidewalks shall be finished to a light broomed texture.

The bridge deck shall be textured with an artificial turf drag in accordance with the requirements of Section 324.3.7 of the City of Phoenix 1987 supplement to the MAG Uniform Standard Specifications.

Hand brooms shall be provided and available at the job site at all times when texturing plastic concrete.

The finishing operation shall be completed before the water sheen disappears. Water shall not be applied to the deck surface at any time during floating or finishing except in the form of a fog spray.

Fogging equipment shall be capable of applying water to the concrete in form of a fine fog mist in sufficient quantity to curb the effects of rapid evaporation of mixing water from the concrete on the deck resulting from wind, high temperature, or low humidity, or a combination of these factors.

The finished surface of the concrete shall be tested by means of a ten-foot straightedge placed on the deck surface. The surface plane shall not vary more than 1/8 inch, as measured from the bottom of the straightedge, on deck surfaces exposed directly to traffic.

Areas showing deviations greater than those specified shall be corrected in a manner approved by the Engineer. All corrected areas shall be textured to match the finish of the surrounding deck surface.

All areas corrected shall not show deviations in excess of that specified when tested with a ten-foot straightedge.

Concrete curing shall be accomplished with both white pigmented curing compound and water curing in accordance with Section 505 and 726 of the Standard Specifications.

Dimensional Tolerances:

Construction dimensional tolerances shall be in accordance with Section 601-4, Concrete Structures, Tests on Finished Structures, of the Arizona Department of Transportation Standard Specifications for Road and Bridge Construction, Edition of 1982 (revised to date).

Reinforcing Steel:

Reinforcing steel shall be furnished in the sizes, shapes, and lengths shown on the plans and in conformance with the requirements of these Special Provisions. Certificates of Compliance conforming to the requirements of MAG Subsection 106.2 shall be submitted.

When reinforcing steel is delivered to the site of the work, the Contractor shall furnish the Engineer with three copies of all shipping documents. Each shipping document shall show the sizes, lengths and weights of the reinforcing steel separately for each structure.

Steel bars used as reinforcement in concrete shall be deformed and shall conform to the requirements of ASTM A 615.

Where shown on the plans, the bars shall be Grade 60.

Where the Grade of steel is not specified on the plans, Grade 60 shall be used. If Grade 40 is specified but not immediately available, Grade 60 may be used exclusively or in combination with Grade 40 provided that the conditions under which the grades are used in combination are acceptable to the Engineer and further provided that there is no additional cost to the Owner.

Shop drawings and lists showing the bending of reinforcement bars shall be submitted by the Contractor to the Engineer for approval, but such approval shall not relieve the Contractor of responsibility for the correctness of such drawings and lists.

Any discrepancy or error found by the Contractor in checking a bending diagram shown on the project plans or in preparing shop

drawings or lists shall be reported immediately to the Engineer, and the discrepancy or error shall be corrected in advance of fabrication and delivery of materials.

When bending is required, it shall be done without the use of heat, and bars having cracks or splits at the bends will be rejected.

Reinforcement shall be accurately fabricated and placed as shown on the plans and shall be firmly held in place by wire ties at all intersections and splices with 16 gauge or heavier tie wire and by using precast mortar blocks or ferrous metal chairs, spacers, metal hangars, supporting wires or other approved supports. Where reinforcement spacing is less than 12 inches in each direction alternate intersections may be tied. Tack welding of reinforcement will not be permitted unless approved in writing by the Engineer.

Distances from the forms shall be maintained so that the reinforcement does not vary from the position indicated on the plans by more than 1/4 inch. Reinforcement in any member shall be placed, inspected and approved before any concrete is placed.

All reinforcement shall be furnished in the full lengths indicated on the project plans. Splicing of bars, except as shown on the plans, will not be permitted without the Engineer's approval. Splices shall be staggered as far as possible. The type and method of splices or connections shall be approved by the Engineer.

In lapped splices, the bars shall be placed in contact with one another and wired together in such a manner as to maintain a clearance of not less than the minimum clear distance to other bars and the minimum distance to the surface of the concrete, as specified in the AASHTO Standard Specifications for Highway Bridges. Lap lengths shall be as shown on the plans.

Structural steel items embedded in the concrete are incidental to concrete unit prices.

Payment for all work under this section will be made at the unit price bid per cubic yard for **ITEMS 505-1 CLASS "A" CONCRETE** and **ITEM 505-2 CLASS "AA" CONCRETE** and the unit price bid per pound for **ITEM 505-3 - REINFORCING STEEL**.

No separate payment will be made for reinforcing steel Grade 40 and Grade 60.

REINFORCED CONCRETE STREET PAVEMENT: **Item 505-4** Reinforced Concrete Street Pavement shall consist of furnishing and placing portland cement concrete pavement to the thickness and details shown on the

plans and in accordance with Section 505 of the City of Phoenix Supplement of the Uniform Standard Specifications.

Payment for this item will be made at the unit price bid per cubic yard for **ITEM 505-4 - REINFORCED CONCRETE STREET PAVEMENT.**

Payment for bridge approach slabs will be in accordance with the appropriate item listed in SECTION 505 - CONCRETE BRIDGE STRUCTURES.

DRILLED SHAFT FOUNDATIONS: **Item 505-5** of the Bidding Schedule shall conform to the following:

Description: The work under this section consists of furnishing all materials and equipment necessary to construct reinforced concrete columns formed within a drilled excavation in reasonably close conformity with the details, dimensions, and locations shown on the project plans and the requirements of these special provisions. These Special Provisions contain requirements for the use of drilling slurry and metal casing. Neither the slurry or the casing is required, unless caving of the shaft occurs.

When the terms "caisson" and "shaft" are used hereinafter or on the project plans, they shall be construed to mean drilled shaft foundation and drilled excavation, respectively.

General Requirements: Prior to constructing any caissons, including any test caissons, the Contractor shall submit to the Engineer a list of all major equipment, with respective capacities, that will be used to construct the caissons and the proposed construction procedure. The submission shall indicate, in detail, the techniques to be used in drilling the shaft and inspecting the completed excavation and reinforcing and concreting the caissons.

The Engineer will review the submission. If at any time during the construction of caissons or test caissons, the Engineer determines that the equipment, materials or procedures, either singly or in combination, are such that defects in the work may occur, the Engineer may stop the work until appropriate changes are made by the Contractor. In no case shall the Contractor be relieved of his responsibility for constructing acceptable caissons.

After constructing one or more caissons or test caissons, the Contractor may make minor modifications to the equipment, materials or procedures, either singly or in combination, and shall advise the Engineer of the changes in writing. The Engineer will review the proposal and may require the Contractor to construct another test caisson in order to test the proposed changes prior to constructing any additional bridge foundation caissons.

An acceptable test caisson (if a test caisson is required) or an acceptable bridge foundation caisson shall be constructed prior to the construction of any other caissons for the bridge foundation.

The decision of the Engineer as to the acceptability of completed caissons is final.

Materials:

Concrete: Concrete shall be Class "AA" ($f'c = 4,000$ psi) conforming to the requirements of Section 725 for the strength of portland cement concrete shown on the project plans. Where concrete is placed in shafts containing bentonite slurry or water, the cement content of the concrete shall be between 658 and 752 pounds per cubic yard and the size of the coarse aggregate shall not exceed one inch. Water reducing and air entraining agents may be used.

Reinforcing Steel: Reinforcing steel shall conform to the requirements of Section 727.

Metal Casing: Casing shall be of unit or sectional construction and shall prevent seepage of water. Casing shall be of sufficient strength to withstand handling stresses, the pressure of concrete and of the surrounding earth. Casings are not required except as a temporary measure if caving of the shaft should occur.

Shaft Forms: If the size of the shafts adjacent to the channel cannot be maintained within 2" of the shaft diameter as shown on the plans for the depth of the proposed channel or if over drilling will narrow the channel width, sonotube or an approved method shall be used to control the shaft diameter and location shown on the plans.

Construction Requirements:

Excavation: The Contractor shall perform all excavation required for the shafts, rock sockets or belled footings, through whatever substances encountered, to the dimensions and elevations shown on the project plans or required by the site conditions. The maximum deviation from plumb, the maximum variation of the center axis of any shaft at the top, and the maximum deviation in diameter shall be as specified on the project plans.

The anticipated subsurface conditions and depths where satisfactory bearing material may be encountered are indicated on the project plans; however, no warranty of the subsurface conditions and depths

where satisfactory bearing material may be encountered shall be inferred.

The bottom elevation of a caisson may be raised or lowered from that shown on the project plans as ordered by the Engineer. No reinforcing steel or concrete shall be placed in a shaft until the final elevation has been determined.

The Contractor shall protect the shaft from caving in at the surface either by constructing a concrete slab or by placing a temporary casing or by other methods as approved by the Engineer. The Contractor shall either drill or form a circular opening at the center of the slab. The slab shall be broken up and removed at the completion of the caisson construction. If a casing is used, it shall be removed after the concreting of the shaft is completed and while the concrete is still fluid. Casing shall not be left in place except as indicated on the project plans or as approved by the Engineer.

Casing specified on the project plans or approved by the Engineer to remain in place shall be installed in such a manner that there will be no voids between the earth and the casing.

When caving conditions are encountered, drilling shall cease until modifications to the equipment, materials or procedures are made that will prevent such caving. If a steel casing is used, it shall be clean and shall extend to the top of the shaft. The inside diameter of the casing shall not be less than the specified size of the caisson.

Material excavated from shafts and bells and not used elsewhere on the project shall be disposed of as approved by the Engineer.

When the project plans indicate that shafts are to be drilled within embankments, the embankments shall be constructed as shown on the project plans and thoroughly compacted in accordance with the requirements of Section 206 prior to drilling, except as otherwise approved by the Engineer.

Open excavations that are deemed to be potentially hazardous by the Engineer shall be covered at the end of each shaft in a manner approved by the Engineer.

Reinforcing Steel: The reinforcing steel cage shall consist of the longitudinal bar and spiral hoop reinforcement. The cage shall be completely assembled and placed into the shaft as a unit.

Unless otherwise indicated on the project plans, or approved by the Engineer, splicing of reinforcing steel will not be permitted. Lap splices in spiral hoop reinforcement shall be in accordance with the details shown on the project plans or as approved by the Engineer and only at locations approved by the Engineer.

The reinforcing steel cage shall not be placed until immediately before concreting operations are to be started and shall be placed in accordance with the details shown on the project plans.

The cage shall be adequately supported and anchored from the top to prevent movement during the concrete placement and for at least four hours thereafter. The exact length of time will be determined by the Engineer. The support shall be concentric and shall support at least one-half of the vertical bars. Spacers shall be at sufficient intervals along the shaft to insure minimum concrete cover for the entire length of the caisson. The type of spacer used shall be approved by the Engineer.

If the shaft is deepened and the project plans indicate full depth reinforcement, the bars in the lower portion of the caisson shall be extended accordingly, as directed by the Engineer, to the bottom of the shaft. These bars shall be lap spliced, spliced by butt welding or by other connecting procedures approved by the Engineer to the proper length in accordance with the requirements of Section 605. If the project plans indicate spiral or tie reinforcement for the full depth of the caisson, the spiral or the reinforcement shall also be extended to the bottom of the shaft as directed by the Engineer.

Concrete:

General: Concrete shall be placed as soon as possible after completion of the shaft and the placement of the reinforcing steel cage. Any sloughage or other loose material shall be machine cleaned from the shaft prior to placing reinforcing steel and concrete. An accumulation of loose soils, muck, etc., at the bottom of the shaft will not be allowed at the time of placing steel or concrete. A flight auger shall not be used for cleaning purposes.

Concrete placement shall be continuous in the shaft to the top elevations or to construction joint shown on the project plans and shall be in accordance with the requirements of Section 505 and as specified herein. Concrete in drilled shafts shall be consolidated by vibration.

Prior to the placing of concrete, the Contractor shall have made all the necessary arrangements to assure the uninterrupted delivery of concrete so that each caisson will be constructed without cold joints.

The Contractor shall exercise care so that no damage to a completed caisson will occur. The Contractor shall not begin construction of the footings, formed columns or cap beams or remove the concrete pad until at least 48 hours after the concreting of the shaft is completed for the respective adjacent caisson.

Placement in Dry Excavations: Concrete shall be placed through a suitable tube or tremie to prevent segregation of materials.

Concrete may be placed by the free-fall method provided that water is not standing in the bottom of the shaft and that the fall does not exceed eight feet. The delivery chute shall be positioned so that the concrete does not strike the sides of the shaft or the reinforcing steel. Concrete in drilled shafts shall be consolidated by vibration.

Casing Removal: During removal of any casing, a sufficient head of not less than five feet of fluid concrete shall be maintained above the bottom of the casing except at the top of the shaft. All contaminated concrete below the top of the caisson shall be removed.

If the removal of the casing causes an upward movement of the concrete and/or reinforcing steel cage of one inch or less, the casing may continue to be pulled provided no further movement occurs and if the concrete is vibrated or rodded to reconsolidate the concrete. Vibration or rodding of the concrete shall not be used to attempt to break the casing loose for extraction.

If the upward movement is greater than one inch, the casing shall be left in place as a permanent sleeve at the Contractor's expense. A load test may be required by the Engineer to determine the adequacy and acceptability of the caisson.

Test Caisson: Unless otherwise directed by the Engineer, a test caisson is not required.

Inspection and Tests: After completion of a shaft and prior to placement of the reinforcing steel cage and concrete, the shaft will be inspected by the Engineer. The Contractor shall provide suitable equipment for the Engineer to inspect the completed excavation.

Caisson Repair: If after inspection the Engineer determines that the integrity of the bridge foundation has been compromised, the Engineer will order the Contractor to make such repairs as are deemed necessary by the Engineer.

Method of Measurement: Caissons will be measured by the linear foot. Measurement will be made from the top of the accepted caisson to the bottom, as indicated on the project plans or as directed by the Engineer.

Basis of Payment: The accepted quantities of caissons, including test caissons, if required, measured as provided above, will be paid for at the contract unit price per linear foot for the diameter designated in the bidding schedule, complete in place, including excavation, drilling slurry, metal casing, steel reinforcing, portland cement concrete, concrete slabs, and any needed forming, curing and finishing. No additional payment will be made for metal casing that is to remain in place.

The contract unit price shall also include the cost of exposing, by excavation, the upper length of the test caissons, the drilling and/or backfilling of any additional shafts and the construction of any additional test caissons.

The contract unit price shall also include the cost of the core drilling or exposing of concrete and the subsequent repair of caissons as hereinbefore specified under "Caisson Repairs" for caissons which are deemed to be unacceptable.

The contract unit price shall also include the cost of furnishing all materials, equipment and labor necessary for the splicing of reinforcing steel and for the radiographic testing of welds and the testing of butt splices and threaded splices.

If the Contractor is ordered by the Engineer to core drill or otherwise expose the caisson for inspection and no voids, unconsolidated concrete or other condition that will compromise the integrity of the bridge foundation is determined by the Engineer to exist, the cost of such work and the cost of the subsequent repairs will be paid for in accordance with the requirements of Subsection 109.04.

No measurement or direct payment will be made for the reinforcing steel extending from the top of the drilled shaft foundation into the cap, the price being considered as included in the cost of the respective drilled shaft foundation.

When load tests are required by the Engineer to determine the adequacy and acceptability of drilled shafts, payment for load tests for drilled shafts determined to be adequate and acceptable will be made in accordance with the provisions of Subsection 109.04.

Load tests for drilled shafts determined to be inadequate and unacceptable will be at the Contractor's expense.

PVC Liner Plate for the Sanitary Sewer Lift Station and Manholes:

Liner plate material for interior faces of concrete structures and manholes shall conform to Section 741 of MAG and shall be installed on surfaces indicated on the drawings. All PVC liner plate shall be white in color. Installation shall conform to Section 741 of MAG, where applicable, and the manufacturer's recommendations. The Contractor shall have a technical representative of the PVC liner manufacturer present during initial placement of the liner to ensure that proper application procedures and materials are used. Section 741 shall be amended to include the following paragraphs:

741.4 Application to Cast-in-Place Concrete Structures: Special Requirements

741-4-1 Liner plate sheets shall be closely fitted and properly secured to the inner forms. Sheets shall be cut to fit curved and warped surfaces, using a minimum number of separate pieces. If liner plate joints are to be Type C-3 joints, as described below, the adjacent sheets shall be butted with not more than 1/8" opening between the sheets. A welding strip shall be fusion-welded on the backs of butt joints to prevent wet concrete from flowing around the edges.

Unless otherwise indicated on the plans, liner plate shall be returned 4" at the surfaces of contact between the concrete structure and items not of concrete. The same procedure shall be followed at joints where the type of protective lining is changed or the new work is built to join existing unlined concrete. AT each return, the returned liner plate shall be sealed to the adjacent surface in contact with the plastic-lined concrete using Amercoat NO. 19Y adhesive, or equal. If the joint space is too wide or the joint surfaces are too rough to allow satisfactory sealing with this adhesive, the joint space shall be filled with 2" of densely-caulked lead wool or other approved caulking material.

741.4.2 Joints in Liner Plate for Cast-in-Place Concrete Structures

Liner plate at joints shall be free of all mortar and other foreign material and shall be clean and dry before joints are made.

Field joints in the liner plate shall be of the following described types, used as prescribed:

Type C-1: The joint shall be made with a separate 4-inch joint strip and two welding strips. The width of the space between adjacent liner plate sheets shall not exceed 2". The 4" joint strip shall lap over each liner plate a minimum of 1". It may be used at any transverse or longitudinal joint.

Type C-2: The joint shall be made by lapping sheets not less than 1 inch. One welding strip is required. The upstream sheet shall overlap the one downstream.

Type C-3: The joint consists of one welding strip applied to the face of the liner plate sheets butted together, with one welding strip applied on the back of the joint. It will not be permitted if the gap between the sheets exceeds 1/8".

All welding is to be in strict conformance with liner plate manufacturer's specifications.

No separate payment will be made for PVC Liner Plate and the cost of this item shall be included in the contract price bid for related items.

BOX CULVERT UNDERPASS: **Item 505-6** Box Culvert Underpass shall consist of furnishing and placing a 10' x 10' ADOT Concrete Box Culvert as shown and detailed on the project plans and in accordance with Section 505 of the Uniform Standard Specifications of Public Works Construction.

Payment for this item will be made at the unit price bid per linear foot for **Item 505-6 - Precast Box Culvert Underpass.**

SECTION 506 - PRECAST PRESTRESSED CONCRETE GIRDERS: The work under this section shall consist of furnishing and erecting the bridge girders as shown on the plans and in accordance with AASHTO Standard Specifications for Highway Bridges dated 1983 and Section 106.3 of these Special Provisions.

All materials and construction of prestressed bridge girders shall conform to Section 506 of the Uniform Standard Specifications, except as modified by these Construction Special Provisions.

Portland Cement Concrete for Prestressed Girders shall be Class S concrete and shall conform to Section 505 of the Uniform Standard Specifications and these Construction Special Provisions.

Class "S" Concrete $f'c = 6,000$ psi

The elastomeric bearing pads shall meet the requirements of Section 25 - Elastomeric Bearings of the AASHTO Standard Specifications for Highway Bridges dated 1983 (revised to date). Bearing pads shall have a durometer hardness of not less than 60. The structural steel anchors shall conform to Section 515 of the Standard Specifications.

No separate payment will be made for the elastomeric bearing pads, structural steel, anchor bolts, prestressing or post-tensioning steel, reinforcing steel or other embedded items necessary to the furnishing of the girders complete-in-place.

Payment will be made at the unit price bid per each for:

ITEM 506-1- PRECAST CONCRETE BOX GIRDERS (PRETENSIONED)
AASHTO TYPE B-1 (D = 27") (Length = 46'-2")

SECTION 510 - MASONRY:

This Specification shall be used for all masonry work in lieu of MAG Section 510, Concrete Block Masonry.

510.1 - GENERAL: All work shall be executed in a workmanlike manner and in full compliance with all applicable codes and ordinances.

All sills, ledges, offsets, and other projections shall be protected from droppings or mortar, and all construction by other trades shall be protected from effects of masonry work.

All concrete masonry walls shall be laid in uniform and true courses, level, plumb and without projection or offset of adjacent block. The foundation shall be thoroughly cleaned of all laitance, grease, oil, mud, dirt, mortar droppings, or other objectionable matter by means of a bush hammer or heavy sandblasting before placing the first course of masonry units. Full mortar bedding shall be used for the first course on the foundation. Full mortar coverage shall be provided on all face shells and webs. Vertical head joints shall be buttered well for a thickness equal to the face shell of the masonry unit, and these joints shall be shoved tightly so that the mortar bonds will to both masonry units. Joints shall be solidly filled from the face of the masonry units to the depth of the face shell.

Masonry units shall be laid in the wall to the desired height with joints of uniform thickness. Units shall be leveled, plumb, and straightened before the mortar has stiffened. Bond shall be plumb throughout.

All masonry units shall be laid to preserve the unobstructed vertical continuity of the cells to be filled. Walls and cross webs forming such cells to be filled shall be full-bedded in mortar to prevent leakage of ground or insulation. All head joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells.

Masonry units shall be laid in such a way that cracks are not formed at the time the masonry unit is placed in the wall.

Each masonry unit shall be adjusted to its final position in the wall while the mortar is still soft and plastic enough to insure a good bond. If the position of the masonry unit is shifted after the mortar has stiffened, or bond is broken or cracks are formed, the masonry unit shall be relaid in new mortar.

Masonry units shall be cured and dried before being used and surface shall be clean and free from dirt when laid in the walls. Masonry units shall not be wetted before being used but shall be laid dry.

510.2 - MORTAR JOINTS: Mortar joints shall be straight, clean, smooth, and uniform in thickness and, unless otherwise noted or indicated on the Plans, shall be tooled slightly concave. Joint thickness to be 3/8-inch both vertical and horizontal unless otherwise shown. Where fresh masonry joins totally or partially set masonry, the set masonry shall be cleaned and roughened before laying new work.

510.3 - JOINT REINFORCEMENT: Longitudinal wire joint reinforcement shall be lap spliced 75 wire diameters.

Longitudinal wires shall rest in the approximate centers of the mortar beds and shall have not less than 5/8-inch mortar cover on the exposed face.

Intersecting masonry walls shall be provided with prefabricated joint wire reinforcement tees. Intersecting wall joints shall be raked 1/2-inch and caulked.

510.4 - BOND PATTERN: Bond pattern shall be as indicated on the Plans. Where no bond pattern is shown, the wall shall be laid up in a straight, uniform course with regular running bond.

510.5 - GROUTING AND VERTICAL REINFORCEMENT: All spaces and cells containing vertical bar reinforcement shall be filled solidly with grout. Vertical cells containing bar reinforcement shall be filled solidly with grout in lifts not exceeding 8 feet in height. When the grouting is stopped for one hour or longer, horizontal construction joints shall be formed by stopping the pour of grout 1-1/2 inches below the top of the uppermost unit.

Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear, unobstructed continuous vertical cell measuring not less than 2 inches by 3 inches. Cleanout openings shall be provided at the bottoms of all cells to be filled at each lift or pour of grout where such lift or pour of grout is in excess of 4 feet in height. Any overhanging mortar or other obstruction or debris shall be removed from the insides of such cell walls. The cleanouts shall be sealed after inspection and before grouting. Vertical reinforcement shall be held in position at top and bottom and at intervals not exceeding 192 diameters of the reinforcement. Bars shall be held in position by steel wire bar positioners or tied to dowels with wire ties.

Vertical reinforcing bars shall be centered in the cells. Where bars are spliced, the splice shall not be less than 50 bar diameters and footing dowels shall lap the vertical reinforcing bars 50 bar diameters. After grout has been placed, it shall be consolidated by rodding or by use of an immersion vibrator designed for the purpose.

Reinforcing steel shall be in place and reviewed by the Engineer before grouting shall begin.

510.6 - BOND BEAMS: Bond beam units shall be installed where indicated on the Plans. Bond beams shall be made up of special bond beam block with horizontal bar reinforcement. Horizontal bar reinforcement shall be solidly grouted in place. Bar reinforcement shall be continuous through control joints. Openings in the bottom of bond beams shall be provided with wire mesh to support the grout.

510.7 - CUTTING OF MASONRY UNITS: All necessary cutting of concrete masonry units to form chases, etc. for anchorage or other appurtenances shall be required. All cutting and fitting of exposed block units shall be done with a power driven carborundum or diamond disc blade saw.

510.5 - CONTROL JOINTS: Control joints shall be as indicated in the Plans or as specified. They shall be full height and continuous in appearance, although bond beams and bond beam reinforcing bars shall be continuous through the joint. The control joint shall be caulked and shall be mortar joint in appearance. Fill material for control

joints shall be premolded, wide flange control joint filler as specified elsewhere herein. Caulking shall also be as specified elsewhere herein. All joints shall be caulked to produce a weathertight structure.

510.9 - ANCHOR BOLTS: A 6-inch minimum width of grouted hollow masonry shall be provided all around anchor bolts and other attachment locations. Anchor bolts shall be held in place by a template to assure precise alignment of anchor bolts. Cutting, reaming or other means of accommodating misaligned anchor bolts in support angles will not be accepted.

510.10 - HANDLING OF MASONRY UNITS: - All masonry units shall be transported and handled in such manner as to prevent chipping and breakage. Storage piles, stacks, or bins shall be located to protect materials from heavy traffic. Chipped, cracked, or otherwise defective units shall be removed from the work. Any unit that is chipped, cracked, broken, or otherwise defective, whether before or after setting, will be rejected and shall be removed and replaced.

510.11 - TIES: Where two or more units are used to make up the thickness of a wall, the units shall be bonded with 3/26 -inch diameter galvanized steel rods or meter ties of equivalent stiffness embedded in the horizontal joints. Rods shall be bent in a rectangular shape. There shall be one metal tie for not more than each 4-1/2 square feet of wall area. Ties in alternate courses shall be staggered and the maximum vertical distance between ties shall not exceed 18 inches and the maximum horizontal distance shall not exceed 36 inches.

510.12 - ENCLOSURES: Where concrete masonry is to enclose conduits, pipes, stacks, ducts, and similar items; chases, cavities, and similar spaces shall be constructed as required, whether indicated on the Plans or not. Openings around flush mounted electrical outlet boxes including the flush joint above the box, shall be pointed with mortar. No such work shall be covered until advised that work has been inspected and tested.

510.13 - PATCHING: Patching of exposed concrete masonry units shall be done at the conclusion of the general work and shall be done in such a manner that the patching will be indistinguishable from similar surroundings or adjoining work.

510.14 - PROTECTION OF MASONRY: Temporary protection shall be provided for all exposed masonry corners subject to injury. Concrete scum and grout stains on masonry shall be removed immediately. The wall shall be adequately braced against wind and

other forces during construction, and bracing shall remain in place until the roof has been erected. When rain or snow is imminent. The tops of unfinished walls shall be fully covered and protected with waterproof paper, polyethylene, or other means accepted by the Engineer.

510.15 - WATER CURING: Masonry shall be protected against too rapid drying by frequently fogging or sprinkling so that walls will always be visibly damp for a period of not less than three days.

510.16 - MISCELLANEOUS: All items as required, including all anchors, flashings, sleeves, frames, structural steel, loose lintels, anchor bolts, miscellaneous iron, and all other items required shall be built in for a complete job.

510.17 - CONTROL JOINT FILLER: Premolded joint filler shall be wide flange Rapid Poly-Joint manufactured by Dur-O-Wall; wide flange Vert-A-Joint manufactured by Vert-A-Joint Company; or equal.

510.18 - CAULKING: All caulking for masonry control joints, around door jambs, window frames, at roof decks, and at other locations in masonry construction shall be done with a 1 part, nonsag, high performance, polysulfide base sealant. Caulking shall conform to requirements of Interim Federal Specification TT-S-00230C, Type 2, Class A, and shall be Chem Calk 100 by Woodmont Products, Inc.; PRC 7000 by Products Research and Chemical Corp.; or equal. Color shall be selected by the Engineer for manufacturer's standard colors.

Application, including necessary primer and backer rod, shall be per manufacturer's recommendations. Sealant shall not be applied on wet or frosty surfaces or when surface temperature is above 130 degrees F. The depth of sealant in a joint shall not be greater than its width nor less than 1/4-inch. Sealant depths shall be as follows:

<u>Joint Width</u>	<u>Sealant Depth</u>
1/4 inch to 3/8 inch	1/3 inch
1/2 inch to 1 inch	3/8 inch

510.19 - PAYMENT: Payment for concrete block masonry will be made in conformity with the terms of the Contract and will be made at the unit price bid for **Item 510-1, Masonry Block Wall.**

The Contract price paid for concrete block masonry shall be full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all work involved in constructing and furnishing concrete block masonry complete in place as indicated on the Plans, and as specified.

SECTION 515 - STRUCTURAL AND MISCELLANEOUS METALS

This Specification shall be used for all nonbridge metal work in lieu of MAG Section 515, Steel Structures.

515.1 - GENERAL: This part of the Specifications includes but is not limited to the following items:

- Aluminum and miscellaneous nonferrous metals
- Anchors and anchor bolts
- Bolts
- Cast iron frames and covers
- Grating and frames
- Hatches
- Ladders
- Manhole frames and covers
- Metal roof decking
- Miscellaneous aluminum
- Miscellaneous cast iron
- Miscellaneous metal items shown on the Plans or specified
- Miscellaneous structural steel
- Pipe handrails, pipe sleeves, inserts, and gates
- Structural Steel
- Sheet metalwork
- Stairs and treads
- Stop plank grooves
- Supports for mechanical equipment
- Tread plates and frames

515.2 - MATERIALS: Unless otherwise specified or indicated on the Plans or Typical Details, structural and miscellaneous metals shall conform to the standards of the American Society for Testing and Materials (ASTM), latest revision, including but not limited to the following:

<u>Item</u>	<u>ASTM Standard No.</u>	<u>Glass, Grade, Type or Alloy No.</u>
<u>Cast Iron</u>		
Cast Iron	A 48	Class 40B
<u>Steel</u>		
Galvanized sheet iron or steel	A 446 A 525 A 526	Coating G90 (min.)

Structural steel	A 36	
Standard bolts, nuts, and washers	A 307	
High strength bolts, nuts, and washers	A 325	
Tubing, cold-formed	A 500	
Tubing, hot-formed	A 501	
Black steel, sheet or strip	A 569	
Coil (plate)	A 635	
Steel pipe	A 53	Grade B

515.2 - STRUCTURAL ALUMINUM: The Contractor shall furnish and install all structural aluminum items in accordance with the Plans and Typical Details, and as specified. He shall provide all supplementary parts necessary to complete each item even though such work is not definitely covered by the Plans and Specifications. Their size, form, attachment, and location shall be such as to conform to the best of current practice.

515.3.1 - ALUMINUM LAYOUT: Hole centers may be center punched and cutoff lines may be punched or scribed. Center punching and scribing shall not be used where such marks would remain on fabricated material.

515.3.2 - CUTTING ALUMINUM: Material 1/2-inch thick or less may be sheared, sawed, or cut with a router. Material more than 1/2-inch thick shall be sawed or routed. Cut edges shall be true and smooth, and free from excessive burrs or ragged breaks. Edges of plates carrying calculated stresses shall be planed to a depth of 1/40-inch, except in the case of sawed or routed edges of a quality equivalent to a planed edge. Reentrant cuts shall be avoided wherever possible. If used, they shall be filleted by drilling prior to cutting. Flame cutting of aluminum alloys is not permitted.

Rivet or bolt holes may be punched or drilled to finished size before assembly. The finished diameter of holes for unfinished bolts shall be not more than 1/16-inch larger than the nominal bolt diameter. All holes shall be cylindrical and perpendicular to the principal surface. Holes shall not be drifted in such a manner as to distort the metal.

515.2.2 - ALUMINUM FORMING AND ASSEMBLY: Structural material shall not be heated, with the following exceptions:

Aluminum material may be heated to a temperature not exceeding 400 degrees F for a period not exceeding 30 minutes to facilitate bending or welding. Such heating shall be done only when proper temperature controls and supervision are provided to insure that the

limitations on temperature and time are observed.

All chips lodged between contacting surfaces shall be removed before assembly.

515.3.4 - BOLTS FOR ALUMINUM: All bolts, nuts, and washers for bolting aluminum shall be Type 304 or Type 316 stainless steel of sizes indicated on the Plans, coated as specified herein.

515.3.5 - WELDING ALUMINUM: This Specification shall apply to both field and shop welding operations. The general recommendations and regulations specified in the American Welding Society Specification D1.1, "Structural Welding Code," apply as well to 6061-T6 structures. Detail requirements in the above Specifications apply only to steel structures. Detail requirements for welding aluminum alloy 6061-T6 shall be as specified in the following paragraphs.

Filler rod metal for welding shall be aluminum alloy welding rods conforming to the requirements of AWS A 5.10 and shall be AWS classification ER 4043, ER 5654, ER 5554, ER 5183, ER 5356, or ER 5556.

Welding of any structure which is to be anodized shall be done using filler alloy rods which will not discolor when anodized. ER 5654, ER 5554, ER 5183, ER 5356, or ER 5556 filler alloy rods shall be used.

The welding process and welding operators shall both meet a qualification test. The method of qualification shall conform to the method described in the ASME Boiler and Pressure Vessel Code, Section IX, "Welding Qualifications," Part B. Aluminum alloy 6061-T6 shall be used for the qualification test plates. Operators shall be qualified on the basis of bend tests and a fillet weld soundness test.

Dirt, grease, forming or machining lubricants, or any organic materials shall be removed from the areas to be welded by cleaning with a suitable solvent or by vapor degreasing. Additional operations to remove the oxide coating just prior to welding shall be required when the inert gas tungsten arc welding method is used. This may be done by etching or by scratch brushing. The oxide coating may not need to be removed if the welding is done with the automatic or semiautomatic inert gas shielded metal arc.

Suitable edge preparation to assure 100 percent penetration in butt welds shall be used. Oxygen cutting shall not be used. Sawing, chipping, machining, or shearing may be used.

Any welding of aluminum shall be done using a nonconsumable tungsten electrode with filler metal in an inert gas atmosphere (TIG) or using a consumable filler metal electrode in an inert gas atmosphere (MIG). No welding process that requires the use of a welding flux shall be used.

515.4 - GRATINGS: Except as otherwise specified or indicated on the Plans, grating shall be aluminum grating supported on aluminum shelf angles as indicated on the Plans. All surfaces or shelf angles, rebates, and anchors in contact with concrete shall be coated in accordance with these Specifications.

Grating shall cover the areas indicated and detailed on the Plans. Where grating is indicated over an opening, it shall cover the entire opening, unless specifically noted or detailed otherwise. The top surfaces of grating sections adjacent to each other shall be in the same plane.

Aluminum plate or angles shall be installed where required to fill openings at changes in elevation and at openings between equipment and grating. Angle stops shall be installed at ends of grating to prevent grating from sliding out of rebate.

There shall be not more than 1/8-inch clearance between the ends of the grating and the inside face of the vertical leg of the shelf angles. The horizontal bearing leg of the shelf angle shall not be less than 2 inches. Ends of grating and cutouts shall be banded. The width of the end band of the grating shall be 1/4-inch less than the depth of the grating with the top of the grating and the top edge of the banding flush. The width of cutout banding shall be full-depth of grating.

Cutouts in the grating shall be provided where required for equipment access or protrusion, including valve operators or stems, and gate frames. Edges of cutouts shall be banded with aluminum material similar to end banding.

Where an area requires more than one grating section to cover the area, adjacent grating sections shall be clamped together at the 1/4 points with acceptable fasteners.

The Contractor shall furnish to the Engineer calculations from the grating manufacturer showing that the grating will meet the load-bearing and deflection provisions of the specifications for each size of grating and for each span. The Contractor shall, if requested by the Engineer, test under full load one section of each size of grating for each span length involved on the job, to show compliance with these Specifications. A suitable dial gauge shall

be provided by the Contractor for measuring deflections. Grating shall be fabricated in units which do not exceed 50 pounds each.

515.4.1 - ALUMINUM GRATING: Aluminum grating shall be supported on aluminum shelf angles as indicated on the Plans.

Gratings, shelf angles, and anchors shall be of 6061-T6 or 6-63-T6 aluminum alloy, except that cross bars may be of 6064-T5 aluminum alloy.

Aluminum grating shall be of such bar size and spacing that, as determined by the manufacturer, the grating will support a uniform loading of 180 pounds per square foot on the entire area of the grating, using an extreme fiber stress of not more than 12,000 pounds per square inch, and 1/240 of the clear span of the grating. The spacing of the main grating bars shall not be more than 1-1/8 inches clear between bars. Minimum depth of grating shall be 2 inches.

Grating shall be Irving Aluminum I-Bar manufactured by IKG Industries, Nashville, Tennessee; I-Bar as manufactured by Seidelhuber Metal Products, Inc., San Carlos, California; or equal.

515.5 - ANCHOR BOLTS AND INSERTS: Anchor bolts shall be cast in place when concrete is placed, wherever feasible. Anchor bolts, concrete anchors, and flush shells embedded in concrete shall be accurately spaced with bolts truly normal to the surfaces from which they project.

All anchor bolts and nuts which will at any time be submerged in water or, in the case of structures customarily containing water, where they are located below the tops of the walls, even if above water level, or in ceilings or overheads, anchor bolts in the dry side of water bearing walls, and anchor bolts securing aluminum to steel or concrete equipment anchor bolts shall be Type 316 stainless steel. Other anchor bolts not required to be of stainless steel shall be stainless steel or galvanized carbon steel conforming to ASTM A 307 or ASTM A 36, at the Contractor's option.

Concrete anchors and flush shells shall be as specified in the following paragraphs.

Anchor bolts shall not touch reinforcing steel. Where anchor bolts are within 1/4-inch of reinforcing steel, anchor bolts shall be insulated with not less than three wraps of 10-mil PVC tape in the area adjacent to the reinforcing steel.

In anchoring machinery bases submit to heavy vibration, two nuts shall be used, one serving as a locknut. All bolts, when indicated for future use, shall be first coated thoroughly with nonoxidizing wax, followed by turning nuts down to the full depth of thread. Exposed thread shall then be neatly wrapped with a waterproof polyvinyl tape.

515.5.1 - INSTALLATION: Unless indicated otherwise on the Plans, anchor bolts shall be embedded not less than 12 diameters and shall have a head or a hook not less than 4 diameters in length. Where indicated on the Plans, anchor bolts shall be set in metal sleeves having an inside diameter approximately 2 inches greater than the bolt diameter and not less than 12 bolt diameters in length. Sleeves shall be filled with grout when the machine or other equipment is grouted in place.

515.5.2 - CONCRETE ANCHORS: Concrete anchors, where indicated on the Plans or specified, shall mean drilled in place anchors with integral anchor bolts. Concrete anchors shall be ITT-Phillips Red Head "Wedge Anchors" with integral anchor bolts; Expansion Products Company "Wej-It" concrete anchors with integral anchor bolts; or equal.

The material of each concrete anchor, including its integral anchor bolt, washer, and nut, shall be stainless steel Type 304 or Type 316.

Concrete anchors shall have the following minimum embedment lengths:

<u>Size, Inches</u>	<u>Embedment Length, Inches</u>
1/4	1-3/4
3/8	1-7/8
1/2	2-1/4
5/8	2-3/4
3/4	3-1/4

Prior to installation or use of anchor bolts, the Contractor shall perform the following test with the test results subject to review and acceptance by the Engineer. The Contractor shall furnish not less than four Type 304 or Type 316 stainless steel anchor bolts, 5/8-inch size of type proposed to be used, and install the anchor bolts in a test block of concrete to the specified embedment length. After the concrete has set, the Contractor shall furnish and install one 5/8-inch nut on each anchor bolt. Each nut shall be tightened with an applied torque of 10 foot-pounds. Any visible evidence of turning of any of the anchor bolts shall be cause for rejection of the concrete anchors by the Engineer.

Anchor bolts may be cast in the concrete in lieu of using concrete anchors.

Cast iron, lead cinch, or slug-in anchors will not be accepted as substitutes for concrete anchors.

515.6 - FLOOR ACCESS DOORS: Exterior type floor access doors shall be Type JF-AL Special, as manufactured by the Bilco Company; GT or AM, as manufactured by Babcock-Davis Associates, Inc.; or equal.

Door lead shall be aluminum diamond plate capable of withstanding a live load of 300 pounds per square foot. Channel frame shall be 1/4 inch aluminum with an anchor flange around the perimeter. An extruded neoprene membrane shall be provided to provide a weathertight seal. Doors shall be equipped with a minimum of two heavy forged stainless steel hinges with stainless steel pins, spring operators to afford each operation, and an automatic hold-open arm with release handle. A snap lock with removable handle shall be provided. A 1-1/2 inch drainage coupling shall be located in the channel frame. Factory finish shall be mill finish with shop coating applied to exterior to the frame in accordance with these Contract Documents. Size and location shall be per Plans. Installation shall be in accordance with manufacturer's instructions.

515.8 - PAYMENT:

Unless otherwise provided in the proposal, the basis of payment for steel and miscellaneous metal shall be as follows:

Payment of all miscellaneous metal and special aluminum grating will be made at the lump sum price bid for Item 515-1, Miscellaneous Metal.

Payment for special aluminum hatches will be made at the lump sum price bid for Item 515-2, Special Aluminum Hatches.

Full compensation for furnishing and placing sheet piling, preformed fabric pads, elastomeric or elastic bearing pads, and red lead paste, and for grouting masonry or bearing plates as indicated on the Plans shall be considered as included in the price paid for structural and miscellaneous metal and no separate payment will be made therefore. Where the Specifications or Plans require metal to be galvanized, the price paid, shall be considered as full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing the galvanized metal complete in place, as indicated on the Plans,

and as specified in the Specifications and the Special Provisions, and as directed by the Engineer.

SECTION 520 - PEDESTRIAN HANDRAIL: The work under this section consists of the construction of a pedestrian railing on the bridge decks and abutments as shown on the plans in accordance with

Section 520 of the Uniform Standard Specifications. The railing shall be painted with dull black enamel paint after fabrication in accordance with Section 530 and 790 of the Standard Specifications.

Payment for this item will be made at the contract unit price bid per lineal foot for **ITEM 520-1 - PEDESTRIAN HANDRAIL.**

SECTION 601 - TRENCH EXCAVATION, BACKFILLING, AND COMPACTION:

A. CITY OF PHOENIX SUPPLEMENT SUB-SECTION 601.2.1 GENERAL: is amended to add the following paragraph:

"No extra compensation or additional time will be authorized for claims that soil conditions differ from those anticipated or those indicated by soil logs and/or reports. It is the Contractor's responsibility to make his own determination as to actual existing conditions."

B. SUB-SECTION 601.2.2 TRENCH WIDTH: is amended to add the following paragraph:

"If the Contractor elects to slope the trench walls in lieu of shoring, sheeting or other wall support measures, he shall be responsible for any and all problems encountered and costs incurred as a result of the increased trench width. Furthermore, no increase in contract time will be allowed as a result of sloping trench walls."

C. SUB-SECTION 601.2.5 OVER EXCAVATION: is amended to add the following paragraph:

"When the Engineer determines that over excavation and backfilling, below the normal foundation and bedding depth, are required as a result of unsuitable material, it will be considered extra work. Payment and construction time extension will be negotiated with the Contractor or as otherwise provided for in these contract documents. As a condition of the Contractor receiving payment, agreement on method of payment and construction time extension shall be reached prior to start of work unless otherwise authorized in writing by the Engineer."

- D. SUB-SECTION 601.2.8 GRADING AND STOCKPILING: Add the following paragraph:

"Excavated material shall not be considered as unsuitable due to an excessive moisture content or an inadequate moisture content for proper compaction. The Contractor shall take whatever measures are required at his own expense to add or remove moisture from material to be used as backfill in order that proper compaction can be obtained within the limits set in Section 601 4.

The Contractor may elect, at no cost to the Contracting Agency, to haul off and dispose of excessively wet or dry material and replace it with material conforming to the specifications for backfill.

In either event, the proper compaction shall be obtained. There will be no additional payment or time extension for this work."

- E. SUB-SECTION 601.4.3 BACKFILL: Delete the fourth paragraph in its entirety, and substitute the following:

"When mechanical compaction is to be used, the Contractor will provide a test section demonstrating his proposed method and equipment to be used. Upon agreement with the Engineer as to the acceptability of the Contractor's proposed method and equipment, they shall not be changed without prior approval of the Engineer. Mechanical compacted lifts in excess of one foot will not be allowed without the express written consent of the Engineer."

- F. SUB-SECTION 601.4.3 BACKFILL: is amended to add the following paragraphs:

"Backfill material shall be within the range of +2% to -4% of the optimum moisture content, prior to placing the material in the trench. The moisture content shall be uniform throughout the backfill material. Material not meeting these requirements may be required to be removed from the trench and moisture added or removed to correct the deficiencies prior to replacement, all at no increase in cost to the contract."

It shall be the Contractor's responsibility to blend excavated material, removing or adding moisture as may be necessary to meet the requirements of the specifications, all at no increase in cost to the contract.

Excavated material when used for backfill shall meet the requirements of the preceding paragraph.

The moisture content requirements contained herein are waived when granular material is used and water settled.

The Engineer may require all or any part of the trench to be lead tested for stability with Contractor's equipment prior to placement of asphalt or Portland cement concrete pavement. Unstable areas as determined by the Engineer shall be corrected by the Contractor at no increased in cost to the contract."

LIMITS OF BACKFILL TYPE

Type I : Canal right-of-way, street right-of-ways and to 10' above pipes in the ACDC right-of-way.
Type II : Will not be used.
Type III: For all structures.

- G. SUBMITTAL: The Contractor shall submit his plan, methods, and procedures for protecting existing utilities prior to beginning construction. Approval of the plan does not limit the Contractor's responsibility for utility protection, and the Contractor shall implement all additional utility protection measures as determined to be necessary in the field.

SECTION 610 - WATER LINE CONSTRUCTION - **Item 610-1** through **610-5** on the Bidding Schedule of this project shall conform in their entirety to Section 610 of the MAG Standard Specification and City of Phoenix Supplements.

SECTION 615 - SEWER LINE CONSTRUCTION: **Items 615-1** through **615-5** of this project shall conform in their entirety to section 615 of the MAG Standard Specifications.

The trenching, bedding and backfilling of the foregoing items shall be in accordance with Section 601 of the Standard Specifications and the amendments in these special provisions.

ITEM 615-1 8" PVC Pipe Sleeve as detailed on the project plans, shall be PVC sewer pipe, conforming to the following specifications:

P.V.C. (Polyvinylchloride) sewer Pipe: P.V.C. pipe and fittings shall meet the requirements of ASTM Specification D3034 for SDR35.

Prior to installation of the pipe, the Contractor shall obtain and submit a manufacturer's certification that the pipe meets the foregoing specifications and passes the tests described in this section.

Pipe shall be suitable for use as a gravity sewer conduit. Provisions must be made for contraction and expansion at each joint with rubber ring. The bell shall consist of an integral wall section with a solid cross-section rubber ring, factory assembled, securely locked in place to prevent displacement during assembly.

The pipe (6" long section) shall be subjected to impact from a free-falling tup (20-lb Tup A.) in accordance with ASTM Method of Test D2444. No shattering nor splitting shall be evident when impacted with an energy of 220 ft-lbs. (Denting is not a failure.)

All fittings and accessories shall be as manufactured and furnished by the pipe supplier, or approved equal, and have been and/or spigot configurations compatible with that of the pipe.

One full length of P.V.C. pipe selected from 20 lengths shall be subjected to the following tests, which shall be conducted at 73 degrees F. (+-3 degrees F.):

a. Pipe Stiffness

Minimum "pipe stiffness" (F y) at 5% deflection shall be 46 psi when tested in accordance with ASTM Method of test D2411, "External Loading Properties of Plastic Pipe by Parallel-Plate Loading".

b. Joint Tightness

Two sections of pipe shall be assembled in accordance with the manufacturer's recommendation. Joints shall be tested in accordance with ASTM D3212, "Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals".

c. Flattening

There shall no evidence of splitting, cracking, or breaking when the pipe is tested as follows: Flatten specimen of pipe, six inches long, between parallel plates in a suitable press until the distance between the plates is forty percent of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is completed within two to five minutes.

Trenching, bedding, and backfilling of P.V.C pipe shall be in accordance with Section 601 of the Standard Specifications and the amendments in these special provisions.

All pipe for the PVC pipe sleeve shall be measured by the linear foot, parallel to the central axis, and shall include lengths of fittings.

The accepted quantities of pipe, measured as provided above, will be paid for at the contract unit price complete-in-place. No measurement or direct payment will be made for furnishing and fittings, collars, bands, or couplings joining the various sections of pipe.

Item 615-4 as detailed on the project plans shall be lined with Coal Tar Epoxy and all coated on the outside within manholes conforming to the following Specifications:

Coal Tar Epoxy: Koppers 300M, or equal, applied in two or more coats for a total dry film thickness of 16 mils, in accordance with manufacturer's application instructions; metal surfaces shall be prepared in accordance with Steel Structures Painting Council (SSPC) Specification SP-10 not more than 12 hours before painting.

SECTION 625 - MANHOLE CONSTRUCTION: **Items 625-1** shall conform in their entirety to Section 625 of the MAG Standard Specifications for Public Works Construction.

The brick work and mortar for **Item 615-5, Sanitary Sewer Pipe Plugs**, shall be constructed in accordance with Section 625 of the MAG Standard Specifications.

Construction of **Item 615-6, Fill and Abandon Manhole and Plug Pipe**, shall be undertaken after the new sanitary sewer pipes have been placed into service and accepted by the Engineer. Prior to installation of any plugs, filling in, removing, or abandoning any manholes, the abandoned sewer lines will be dewatered and aerated by the Contractor as will not cause damage to public property nor constitute any nuisance or menace to the public. The Contractor shall plug all pipes entering and exiting the manhole, remove and salvage the frame and covers, fill and compact all manholes with aggregate base up to the frame and cover base.

The aggregate base used shall comply with Table 702 in the MAG Standard specifications.

Removed frame and covers shall become the property of the City of

Phoenix, and the Contractor shall load, haul, and stockpile the frame and covers, as directed, at the City of Phoenix Maintenance Yard 2301 W. Durango Avenue.

Measurement and payment will be on a unit basis for each manhole filled and will include surface replacement, salvaging of frames and covers, delivery to the City, and plugging pipes.

DIVISION 12 - PUMPS

120000 GENERAL

The Contractor shall furnish, install, and test all pumps as indicated on the Plans, or as specified herein. It is the intent of these Specifications to obtain pumps of heavy-duty construction for heavy-duty continuous service or for intermittent service, whichever imposes the most severe service on the pump. Pumps will be installed at an elevation of approximately 1,200 feet above sea level.

Each pump shall be furnished as a complete, ready-to-install unit by a single supplier, including but not limited to pump, motor, mountings, and (if so specified and equipped) variable speed drive, engine, and/or drive shaft assembly.

Pumps that have mechanical defects or do not meet the range of head-capacity characteristics, horsepower, efficiency, and vibration requirements will be rejected after testing and shall be replaced without additional cost to the Owner for furnishing, removal, reinstallation, and retesting. Mechanical defects shall include excessive vibration, improper balancing of any rotating parts, improper tolerances, binding, excessive bearing heating, defective materials, including materials that do not conform to the Specifications, improper fitting of parts, and any other defect which will in time damage the pump or unreasonably impair the efficiency of the pump.

120001 CONSTRUCTION

No pump will be approved by the Engineer for construction until the Contractor has submitted to the Engineer for approval sufficient literature, detailed specifications, and drawings indicating dimensions, make, style, speed, size, type, horsepower, full-load amps, head-capacity, efficiency, NPSH curves, specific materials used, design features, weights, and any other information required.

Any bronze used in the manufacture of any pump shall not contain more than 2 percent aluminum nor more than 6 percent zinc.

power, and equipment required for making tests. Field tests and manufacturers' tests shall be conducted in accordance with the latest requirements of the Hydraulic Institute Standards.

120005 VIBRATION

Vibration shall be tested with a Starret vibrometer or a vibrometer acceptable to the Engineer.

The vibration limits of pumps shall be as described in the Hydraulic Institute Standards except that peak-to-peak vibration amplitude shall not exceed 2 mils, unless otherwise specified, for any frequency at any distance from base to point of measurement. It shall be the responsibility of the manufacturer to dynamically balance the pump and motor, to reinforce, stiffen, or support the pump casing, frame, pedestal, or shafting to keep vibration within the limits as described herein.

120560. NONCLOG CENTRIFUGAL PUMPS - SUBMERSIBLE

The Contractor shall furnish and install, complete in place in operable condition, submersible type nonclog centrifugal wastewater pumps. The pumps shall be installed as indicated on the Plans, and as specified herein.

The pumps shall be as manufactured by Davis EMU, Flygt Corporation, Gorman-Rupp Corporation, or equal.

Each pump shall be rated to deliver not less than 590 gpm at 19 feet total head, with efficiency not less than 60 percent and speed not more than 1,800 rpm. Each pump shall be capable of operation at all points on its curve between 300 gpm and the flow corresponding to 11 feet total head, with available net positive suction head (NPSHA) of 30 feet. The pump shall operate over this range without excessive noise or vibration, without exceeding motor horsepower rating, and free of cavitation or any other mechanical defects.

Each pump unit shall be designed for operation for not less than 30 minutes with the motor completely unsubmerged, without damage or overheating of any kind. Each pump unit shall be designed for intermittent operation of 10 starts per hour without harmful effect.

The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 60 feet.

The pump casing, motor housing, bearing housing and impeller shall be constructed of cast iron. All exterior fasteners shall be stainless

The pump motor shall be sparkproof and explosion-proof for Class 1, Group D, Division 1 hazardous location.

Pump motor cable shall be suitable for submersible wastewater pump applications. Cable sizing shall conform to National Electric Code Specifications for pump motors, and shall be of adequate size to allow motor voltage conversion without replacing cable.

A sliding guide bracket shall be provided to allow the pump unit to be raised or lowered on guide rails to automatically be connected and disconnected from its mating discharge connection permanently installed in the wet well. The pump shall be easily removed and installed for inspection and service. Each pump shall be furnished with lifting stainless steel cable of adequate strength and length. Each pump shall be furnished with upper guide holder and liquid sensor cable holder. Lower guide holders shall be firmly and rigidly connected to discharge connection. Guide bars shall be stainless steel, 2-inch diameter Schedule 40 pipe or 2-inch "T" bar, and shall not support any weight of the pump. Guide bars shall be stabilized with intermediate supports of heavy-gauge stainless steel attached to the discharge risers or wet well structure at not greater than 8'-0" centers.

Pump controls shall be as specified in the electrical division.

Payment for pumps will be made at the unit price bid for Item 1200-1, Pumps.

DIVISION 14 - MECHANICAL EQUIPMENT

140000 GENERAL REQUIREMENTS

Specifications contained in this section shall apply to all items of mechanical equipment the same as if these Specifications were contained in the individual section for the equipment in this Division, or any other Division herein.

All items of equipment shall be the product, modified as specified herein, of a manufacturer experienced in the design, construction, and operation of equipment for the purpose required, and who shall have established a record of successful operation of such equipment manufactured or produced by them. When two or more units of equipment for the same purpose are required, they shall be products of the same manufacturer. Equipment shall be made up of parts which are designed to act as a unit, and the manufacturer shall guarantee that when the component parts are assembled into the final unit, these parts will fit and operate satisfactorily.

shall not deliver any O&M manuals until all required materials have been assembled and bound as specified.

The operation and maintenance manuals shall include, as a minimum, the following data for each item of mechanical, electrical, and instrumentation equipment. Information not applicable to equipment installed in the work shall be excluded.

1. Recommended start-up and trouble shooting procedures
2. Disassembly and reassembly instructions
3. Lubrication schedule
4. Recommended preventative maintenance procedures and schedules
5. Recommended spare parts
6. Parts lists, by generic title and identification number, complete with section views of each assembly
7. Name, address, and telephone number of nearest supplier and spare parts warehouse

In addition, the O&M manuals shall contain reproducible prints of the Contract record wiring diagrams, schematics, and installation drawings required under the Electrical and Instrumentation Specifications.

140013 MATERIALS AND WORKMANSHIP

All equipment shall be designed, fabricated, and assembled in accordance with the best modern practice in the manufacture of high grade machinery.

All parts and components of mechanical equipment shall be designed for satisfactory service under continuous duty without undue wear under the specified and indicated operating conditions for a period of not less than one year. Any part of mechanical equipment that shows undue or excessive wear or that fails due to wear under normal operating conditions within the first year of operation after final acceptance shall be considered as evidence of defective material or defective workmanship, and it shall be replaced by the Contractor with equipment or parts to meet the specified requirements at no cost to the Owner.

Individual parts shall be manufactured to standard sizes and gauges so that repair parts, furnished at any time, can be installed in the

manufacture. Bearings shall be conservatively designed to withstand all stresses of the service specified. Each bearing, except as otherwise noted, shall be rated in accordance with the latest revisions of Anti-Friction Bearing Manufacturer's Association's (AFBMA) Methods of Evaluating Load Ratings of Ball and Roller Bearings for B-10 rating life of 40,000 hours.

All grease lubricated bearings, except those specified to be factory sealed lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings of the standard hydraulic type. Extension tubes shall be provided for easy access.

Oil lubricated bearings shall be equipped with either a pressure lubricating system or a separate oil reservoir type system. Each oil lubrication system shall be of sufficient size to safely absorb the heat energy normally generated in the bearing under a maximum ambient temperature of 40 degrees C and shall be equipped with a filler pipe and an external level gauge. Fittings for pressure lubrication shall be 1/4-inch straight-type.

To avoid work hardening or "Brinelling" damage from vibration, bearings shall be separately packed or otherwise suitably protected during transport.

140014 PROTECTION OF EQUIPMENT

All equipment shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling, and storage. All equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry at all times. Pumps, motors, drives, electrical equipment, and other equipment having anti-friction or sleeve bearings shall be stored in weathertight storage facilities prior to installation.

Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to final acceptance of the work shall be repainted to meet Specification requirements.

140015 INSTALLATION

The Contractor shall take measurements from his work at the installation sites, verify all subcontractor's drawings and be responsible for the proper installation of the equipment within the available space as specified and indicated on the Plans, and he shall secure the acceptance by the Engineer for any variations before making any changes.

140016 BASES AND BEDPLATES

A heavy cast iron or welded steel base shall be provided for each item of equipment which is to be installed on a concrete pad or slab. Equipment assemblies, unless otherwise specified or indicated on the Plans or accepted Shop Drawings, shall be mounted on a single, heavy, cast iron or welded steel bedplate. Bases and bedplates shall be provided with machined support pads, dowels for alignment of mating or adjacent items, adequate openings to facilitate grouting, and openings for electrical conduits. All seams and contact edges between steel plates and shapes shall be continuously welded and ground smooth. The bottom of all bases and bedplates shall have at least two coats of zinc chromate primer before installation or grouting.

140016.10 JACKING SCREWS AND ANCHOR BOLTS

All equipment shall be anchored to supporting members by bolts or other connections to accommodate all operating forces and satisfy the seismic restraint requirements of the Uniform Building Code. Anchors shall provide resistance to a lateral force of at least 0.10 times the weight of the equipment, including its contents. Equipment installed on flexible mounts shall be given special consideration with design calculations including resonance determinations, submitted for review with Shop Drawings.

Jacking screws shall be provided in the heavy equipment bases and bedplates and where required elsewhere to aid in leveling prior to grouting.

Equipment suppliers shall furnish anchor bolts, nuts, washers, and sleeves of adequate design as required for proper anchorage of the bases and bedplates to the concrete bases. Unless otherwise indicated or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1 inch of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed.

All bolts and anchor bolts shall be of Type 316 stainless steel.

140016.20 GROUTING

After assembly and installation on the concrete base, each unit shall be leveled and aligned in place but not grouted until connecting piping has been fitted and aligned. Equipment bases shall not be grouted nor foundation bolts finally tightened until all piping connections are

All sprockets, belts, drive chains, gearing, couplings, and all other moving parts on drive assemblies shall be enclosed in removable safety enclosures in compliance with said safety regulations.

Safety guards shall be fabricated from 16 USS gauge or heavier galvanized or aluminum clad sheet steel or 1/2-inch galvanized expanded metal. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories including bolts, shall be hot-dip galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

140019 PAINTING AND COATING

Prime and finish coating materials and procedures shall be as specified elsewhere herein, except where otherwise specified.

Machined, polished, and other ferrous surfaces and nonferrous surfaces which are not to be painted shall be coated with acceptable rust preventative compound.

140020 NAMEPLATES

Equipment nameplates shall be engraved or stamped on stainless steel and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins. The nameplate shall include manufacturer's name, equipment model number, identification tag number, drive speed, motor horsepower, and rated capacity. Nameplates for pumps shall also include rated total dynamic head and impeller size.

140021 WARNING SIGNS

Permanent warning signs shall be mounted at all mechanical equipment which may be started automatically or from remote locations. Signs shall be in accordance with OSHA regulations and shall be suitable for exterior use. Mounting details shall be in accordance with manufacturer's recommendations; location as acceptable to the Engineer.

Warning signs shall be 7 inches high by 10 inches wide, colored yellow and black, on not less than 18 gauge vitreous enameling stock. Copy shall read:

CAUTION
THIS EQUIPMENT STARTS
AUTOMATICALLY
BY REMOTE CONTROL

All moving parts of equipment and machinery shall be carefully tested for operation, and adjusted so that all parts move freely and function to secure satisfactory operation. Field performance tests of all process and pumping equipment, drive motors, including auxiliaries shall be made in accordance with the appropriate and approved test codes of the American Society of Mechanical Engineers, Hydraulic Institute Standards, NEMA and IEEE, latest editions.

Field testing shall be conducted after the project or system is substantially complete such that each item of equipment is ready for integrated operation with other equipment at the plant. Testing, measuring, and calibrating procedures shall be submitted to the Engineer for review and acceptance prior to start-up and field testing of equipment.

All equipment shall be tested continuously under actual or simulated operating conditions. The manufacturer's representative shall make all necessary field adjustments and correct defects in materials or workmanship during this test period.

The equipment shall be properly filled, by the Contractor, with oil and grease, and the Contractor shall furnish all power, personnel, chemicals, fuels, oil, grease, and auxiliaries necessary for initial testing of the equipment for proper operation, efficiency, and capacity.

After the 7-day acceptance test has been run by the Owner, and the results comply with the Contract requirements, the Contractor shall dowel the equipment in accordance with the manufacturer's recommendations.

The costs of all work performed in this Subsection by factory trained representatives shall be borne by the Contractor. When available, the Owner's operating personnel will provide assistance in the field testing.

The period of inspection, initial start-up operation, and field adjustment shall be as required to achieve satisfactory installation and operation of the items furnished. The period for instruction of the Owner's personnel shall be as called for in the individual Equipment Specifications.

140070 MOTORS, GENERAL

Motors shall be manufactured in accordance with NEMA MG-1 Standards and shall be as specified herein or as specifically excepted in the individual equipment specifications.

The odor control system shall have the following general characteristics:

1. Construction shall be corrosion resistant.
2. Unit shall contain a minimum of 150 pounds of IVP granular activated carbon.
3. Unit shall contain no moving parts.
4. Unit shall provide continuous treatment.
5. Unit shall require no outside energy source.
6. Maximum head loss at 100 cfm shall be 14.0 inches water column.

140700.2. ACTIVATED CARBON

The activated carbon for use in the odor control system shall be virgin granular product, produced from bituminous coal and chemically impregnated with NaOH as manufactured by Calgon Carbon Corporation, or equal, suitable for control of wastewater odors. Approximately 150 pounds of IVP granular activated carbon is required per unit.

The carbon shall have the following performance specifications:

Carbon Substrate

CC14 Number, % by Weight 60
(per ASTM D-3467)

Iodine Number, Minimum 1,000

Mean Particle Diameter, Minimum 3.6 mm

Impregnated Carbon

Apparent Density (1) 0.55 g/cc, Minimum

Hardness Number, Minimum 95

Moisture, Maximum (2) 15%

Maximum Head Loss (W.C.) at 50 fpm 1.9" W.C./Ft. Bed Depth
Linear Velocity (through a dense packed bed) (3)

system manufacturer and removed when the tests are completed. The equipment shall be operated through a complete lift and lowering cycle to determine that the equipment will perform the functions of hoisting and rotating, quietly, smoothly, and safely. Any defects in the equipment shall be corrected. Testing shall be done in the presence of an authorized representative of the crane system manufacturer and the Engineer. No hoisting equipment shall be used to handle any equipment until the load testing is concluded.

Payment for the jib crane will be made at the lump sum bid for Item 1407-2, Jib Crane.

DIVISION 15

PIPING, VALVES, GATES, AND SPECIALTIES

150000. GENERAL

DIVISION 15 applies to those applicable items located within the lift station compound (within the masonry fence).

Piping shall be installed as indicated on the Plans. The Contractor shall submit to the Engineer, for review and acceptance, his detailed proposed piping layouts.

Any pipe which does not meet specifications or has been rejected, shall be removed from the jobsite and disposed of by the Contractor at no extra cost to the Owner.

Where new fittings are to be cut into or attached to existing piping or where connections are to be made to existing piping, the Contractor shall furnish and install the necessary sleeves, flanges, nipples, couplings, fittings, or other devices needed to accomplish the cutting-in or connections, whether indicated on the Plans or not.

Lines under low head shall be laid flat or with a continuous grade so that there will be no air traps or humps in them, except at the ends where means for venting shall be provided.

In no case shall copper or copper alloy pipe or fittings carrying water or water based solutions or slurries be attached to cast-iron or steel pipe except by means of a dielectric coupling expressly made for this purpose and service.

All pipe which will operate under pressure shall be properly blocked at all fittings where the pipeline changes direction, changes size, or

fit shall not be made by springing any piping nor shall orientation alignment be corrected by taking up on any flange bolts. Flange bolts, union halves, flexible connectors, and similar devices shall slip freely into place. If the proper fit is not obtained, the piping shall be altered to fit.

150011. WALL AND SLAB PENETRATIONS

Unless indicated otherwise on the Plans, no pipe shall pass through or be built into any reinforced masonry or concrete wall, floor, ceiling, roof, pilaster, column, pier, or beam, unless it is inside of a sleeve; and such sleeves shall have an inside diameter not less than the outside diameter of the pipe plus 2 inches, except that for pipe smaller than 2 inches the ID of the sleeve shall be not less than twice the OD of the pipe. Such sleeves shall be placed not closer than three diameters center to center, nor shall they impair the strength of construction. The arrangement of sleeves shall be such that pipe can be pulled out of a sleeve and replaced without disturbing the structural member. Ends of sleeves shall be flush with surfaces of concrete, masonry, or plaster.

150020 BURIED PIPING

All pipelines laid in open trenches shall conform to the MAG Uniform Standard Specifications, Part 600.

Gravity pipelines shall be laid to the lines and grades indicated on the Plans, and shall be laid upgrade. Where not otherwise indicated on the Plans, all buried lines shall be laid with a minimum of 3-foot cover without air traps or humps. Where two lines of similar service run parallel to each other, they may be laid in the same trench as close together as possible and still provide adequate room for jointing.

Before excavation is started for any run of underground piping, the Contractor shall locate and expose all existing structures, piping, conduit, etc., which intersect the line of the piping, to avoid possible damage to these during excavation operations and so that it may be determined if there will be any conflicts in location. In the event of conflicts in location or grade or both, between new piping and existing piping, the Contractor shall make adjustments in location or grade of new piping acceptable to the Engineer.

Unless otherwise indicated on the Plans or specified, where pipe of any type is to be encased in concrete, the encasement shall provide a minimum of 6 inches of concrete completely around the pipe, shall fill the bottom of the trench from bank to bank, if not formed, and shall be reinforced with four continuous longitudinal reinforcing bars, one in

Each section of pipe shall be lowered into the trench, utilizing a sling or other device, in a manner that shall prevent injury to the pipe, coating, lining, or joints. Under ordinary conditions of laying, the work shall be so scheduled that the bell end of the pipe faces in the direction of laying. In placing pipe in the trench, the pipe shall be held by the lowering device at the balancing point of the section. It shall not be dragged on the bottom of the trench but shall be supported while being fitted into the adjacent section. Supporting the pipe on blocks, or blocking of any nature, either temporary or otherwise, will not be allowed.

It is the responsibility of the Contractor, when the pipeline and appurtenances are finally laid, to see that all joints are protected and that any damage to the coating or lining of the pipe and fittings has been adequately repaired or replaced in order to preserve their integrity for corrosion protection.

150025. LAYING OF DUCTILE IRON PIPE

Trenching, bedding, and backfill shall be in accordance with MAG Uniform Standard Specifications, Part 600.

The handling, storage, and installation of ductile iron pipe shall be in accordance with the requirements of these Specifications and AWWA C 600.

150027. LAYING OF PVC PIPE OR CPVC PIPE

Trenching and backfill shall be in accordance with the MAG Uniform Standard Specifications, Part 600.

The handling, storage, and installation of PVC pipe shall be in accordance with the manufacturer's recommendations and ASTM D 2774.

150029. LAYING OF VITRIFIED CLAY PIPE

Trenching, bedding, and backfill shall be in accordance with MAG Uniform Standard Specifications, Part 600.

The handling, storage, and installation of vitrified clay pipe shall be in accordance with the requirements of ASTM C 12.

150030 CLEANING AND TESTING

The interior of all pipelines, above or below grade, shall be thoroughly cleaned of all adhering matter and other debris. No testing of any pipeline shall be started until the cleaning is complete and accepted by the Engineer.

Pipe listed as "aboveground" shall include that within buildings, tunnels, or other structures without regard to its elevation. "Underground" piping shall be taken to mean only that piping actually buried in the soil or cast in concrete masonry. "Underwater" piping shall mean piping which extends below tops of walls or concrete deck into basins or concrete tanks containing water.

The Contractor may, at his expense, furnish piping of the same material as shown in the PIPING SCHEDULE but of greater pressure rating than that specified.

Where bell and spigot joints are indicated on the Plans or specified, mechanical joints or push-on joints may be used.

The Contractor is responsible for furnishing and installing all necessary piping to make all equipment and other parts of the plant functional. Should the type of pipe for a given use be not indicated, the following paragraphs shall serve as a guide with the acceptance of the Engineer in the selection of the proper pipe to use for a given service.

Air, oil, and gas piping may be steel pipe. Steel pipe under 4 inches in size shall be galvanized. Steel pipe 4 inches and over in size shall be black. All gas pipe shall be pitched to drain to drip traps as indicated, not less than 1/8 inch per foot where condensate flows against the gas and not less than 1/16 inch per foot where condensate flows with gas. At high points of straight runs, tapered filler pieces between flanges shall be used to secure the reversal of pitch without springing the pipe.

Sewage piping may be ductile-iron pipe, vitrified clay pipe, or concrete pipe.

Sludge piping may be asbestos-cement, vitrified clay pipe, or ductile-iron pipe. Ductile-iron pipe and fittings for sludge lines which may be steam cleaned shall not be cement lined.

Culvert pipe may be corrugated metal pipe or concrete pipe.

Chlorine liquid and gas piping shall be Schedule 80, ASTM A 106, Grade A.

couplings or with mechanical couplings for grooved or shouldered end pipe. Unless otherwise noted, joints that are not buried in the ground and those that are indicated on the Plans or in the Specifications to be flanged shall be flanged joints. All other joints shall be mechanically restrained mechanical joints, or mechanically restrained push-on joints. Concrete thrust blocks shall be used only when specifically detailed or accepted by the Engineer. Mechanical joint, or push-on joint pipelines shall have flanges where necessary for valves and cleanout connections.

150111. FLANGED JOINTS

Flanges may be cast integrally with the pipe, in which case they shall conform to ANSI B 16.1 as to diameter, thickness, drilling, etc., or they may be screwed on the threaded ends of the pipe. Screwed-on flanges shall conform to ANSI B 16.1 as to material, diameter, thickness, drilling, etc., but shall have long hubs threaded specially for ductile-iron pipe. Screwed-on flanges shall be attached to the pipe by the pipe manufacturer, and after attachment the faces of the flanges and the ends of the pipe shall be refaced so that the end of the pipe will be even with the face of the flange and both will be perpendicular to the axis of the pipe. Bolt holes on the 2 flanges on a piece of pipe shall be in perfect alignment. Bolts shall conform to ANSI B 16.1 except that flanges underground, in concrete valve boxes, or in water may be cast-iron bolts and nuts, and all bolts and nuts under these conditions shall be painted with an asphaltic coating as specified in AWWA C 104, of at least 10 mils thickness.

Cast-iron bolts and nuts shall be made of material having at least 50,000 psi tensile strength. The cast-iron bolts used with mechanical joints will be acceptable.

Where cap screws or stud bolts are required, flanges shall be provided with tapped holes for such cap screws or stud bolts.

All flange bolts shall be cut and finished to project not less than two threads, and not more than 1/4-inch beyond outside face of nut after joint is assembled.

150112 MECHANICAL JOINTS

Mechanical joints shall be in accordance with ANSI A 21.11 (AWWA C 111).

150120 FITTINGS

Except as otherwise provided, fittings for ductile-iron pipe shall be as specified in ANSI A 21.10 (AWWA C 110), of the same pressure rating

be tested separately as required in AWWA C 600, and/or as modified in these Specifications, except that any such section less than 500 feet in length may be tested with the adjacent section, if both sections of line have the same pipe class rating. The duration of each test shall be at least 2 hours.

150171. PRESSURE TEST

All pipelines shall be tested by subjecting each section to a pressure, measured at the lowest end of the section, of at least 125 percent of the class rating or design pressure of pipe under test.

The test may be made before or after backfilling. However, if mechanical compaction is to be used in the backfilling operations as spelled out in AWWA C 600, the test shall not be made until the backfilling is completed and compacted. All connections, blowoffs, hydrants, and valves shall be tested with the main as far as is practicable.

The test section shall be slowly filled with potable water, and all air shall be vented from the line. The rate of filling shall be as acceptable to the Engineer, with at least 24-hour notice required before tests are scheduled. While the test section is under test pressure, a visual inspection for leaks shall be made along the pipeline, and all visible leaks repaired. The pressure test shall not begin until the pipe has been filled with water for at least 24 hours to allow for absorption.

See Section 150060, PIPING SCHEDULE, for test pressures.

150172 LEAKAGE TEST

Leakage test shall be made after pressure test has been satisfactorily completed and all backfilling and compaction is completed to top of trench. The Contractor shall furnish the necessary apparatus, and assistance to conduct the test.

To pass the leakage test, the leakage from the pipeline shall not exceed the leakage allowed by the following formula:

$$L = \frac{ND \ll P}{3700}$$

in which L = allowable leakage in gallons per hour.

fitting, if there is one, and the joint completely filled with solder. When the solder has congealed to a plastic state, the excess metal shall be removed with a cloth or brush. Joints shall not be quenched after soldering.

All copper lines shall be cleaned with high-pressure air after first disconnecting piping at instruments, filters, pressure reducers, valve operators, and other special devices.

All copper lines shall be tested in the same manner as the piping system to which they connect, except that instrument air lines may be tested by use of a halide torch or other device after charging the lines with Freon.

150810 ASTM B 88 TUBING

All exposed copper pipe or tubing conforming to ASTM B 88 shall be Type L hard-drawn, rigid, seamless copper water tubing.

Copper tubing buried in the ground or in plastic conduit shall conform to the same specification but shall be Type K soft-annealed.

Fittings shall be Hoke "Gyrolok," Crawford Fitting Company "Swagelok," or equal, or solder type forged or wrought copper. Solder shall be ASTM B 32, Alloy Grade 5A.

Copper pipe connected to ferrous pipe or valves, or other noncopper items shall be connected by means of dielectric insulating unions or fittings.

When making connections to meters or other devices having iron pipe size threaded fittings, special thread to tube adapters shall be used. Such adapters shall be Crawford Fitting Company "Swagelok," Hoke "Gyrolok," or equal.

150830 INSTALLATION

Copper tubing shall be installed in neat, straight runs, supported at close enough intervals to avoid sagging. All details indicated on the Plans shall be followed.

Cuts shall be made with a tubing cutter, or with a 32-tooth hacksaw, and shall be square. The inside of the tube shall be reamed and burrs removed from the outside, holding the end of the tubing downward during these operations so chips or filings cannot fall into the tubing. Flaring shall be done with a flare block and yoke type screw feed flaring tool. After removing the tubing from the block, both surfaces

152100 PIPING SPECIALTIES

The Contractor shall furnish and install, wherever shown on the Plans, as called for in these Specifications, or as required for proper operation of equipment, all items specified under this heading including gaskets, bolts, calking materials, hangers, supports, guides, anchors, and such incidental materials and equipment as are required to make the items complete and ready for use.

152110. FLEXIBLE PIPE COUPLINGS

Where shown on the Plans or specified, or elsewhere as approved by the Engineer for the Contractor's convenience, flexible couplings shall be furnished and installed.

Flexible couplings shall be galvanized when on galvanized pipe or on pipe which is epoxy or cement lined, or when underground. When flexible type couplings are used as expansion joints, the ends of the pipe shall be separated to allow for expansion.

For cast-iron pipes, flexible couplings shall be Dresser; Smith-Blair; Baker; or equal.

For steel pipes, flexible couplings shall be Dresser Style 38; Smith-Blair 411; or equal, except where other Styles are required for special conditions. Where indicated on the Plans, flexible couplings shall be suitable for connecting pipes which have different outside diameters.

Flanged coupling adapters shall have not less than 2 anchor studs each.

Where flexible couplings are installed underground, Type 316 stainless steel bolts shall be used. The entire coupling shall be given a 20-mil coat of T.C. Mastic as manufactured by the Tape Coat Company, Inc.; Bitumastic No. 50 as manufactured by Koppers Company, Inc.; or equal.

Grooved-end couplings, to be used where indicated on the Plans, shall be as manufactured by Victaulic Company of America, Gustin-Bacon Group, or equal. Victaulic couplings for cast-iron pipe shall be Style 31. Couplings for steel pipe shall be Style 77. Gustin-Bacon Group couplings shall be as recommended by the manufacturer for the type of pipe. Adapter bands shall be welded to the ends of the steel pipe as necessary to permit proper installation of couplings.

Gaskets for all couplings except in the air piping system shall be

as called for in these Specifications, or as required for proper operation of the equipment in general. Unless otherwise indicated on the Plans or specified in other sections of these Specifications, valves shall conform to the requirements as specified herein.

All valves installed in a given line shall be designed to withstand the test pressure for that particular line and shall be fabricated with ends to fit the piping.

Valves shall be manufactured by a manufacturer whose valves have had successful operational experience in comparable service.

The valve manufacturer shall furnish detailed technical information as required by the Engineer for evaluating the quality of the valves and as required by the Contractor for proper valve installation. The technical information shall include complete dimensions, weights, and material lists. No valve will be accepted for installation until the required information has been received and reviewed.

The Contractor shall furnish four sets of complete installation operation and maintenance instructions for each type of valve furnished. Instructions shall be bound in a cover.

Wherever stainless steel is specified in this section, it shall be AISI Type 316, or 304 unless otherwise specified.

Bolts shall conform to ANSI B 16.1 except that underground, in concrete valve boxes, or in water may be cast-iron bolts and nuts, and all bolts and nuts under these conditions shall be painted with an asphaltic coating as specified in AWWA C 104, of at least 10 mils thickness. Cast-iron bolts and nuts shall be made of material having at least 50,000 psi tensile strength. The cast-iron bolts used with mechanical joints will be acceptable.

The zinc content of bronze or brass used in any valve parts shall not exceed 6 percent. The aluminum content of bronze shall not exceed 2 percent.

The method of connection of valves to each piping system shall be as detailed on the Plans. In general, unless otherwise indicated on the Plans or specified, all valves 3-inch size and larger shall have flanged ends or shall be designed for bolting to flanged pipe, and all valves less than 3-inch size shall have screwed ends.

The Contractor shall furnish to the pipe supplier, after flanged valves and flanged check valves are selected, the face-to-face dimensions of all flanged valves and check valves to be installed in flanged pipelines so that the pipe may be fabricated to the proper length.

complete installation.

The Contractor shall provide the necessary concrete bases or supports and blocking to support the valves installed underground and aboveground.

Manually operated valves and gates located not more than 6 feet above the operating level shall be provided with tee handles, wrenches, or handwheels as is appropriate. Valves over 5 feet to center line shall be rolled toward the operating side to make the handwheel or wrench more accessible to the operator of average height. Valves located below the operating level or deck shall be provided with extensions for key operation or floor stands and handwheels as appropriate. Valves over 6 feet above the operating level shall be fitted with chain operated handles or valve wheels as appropriate. Chains shall reach to approximately 4 feet above the operating level. If, when not in use, chains constitute a nuisance or hazard to operating personnel, they shall be provided with hold backs or other means of keeping them out of the way. Valves shall be installed in all cases so that handles clear all obstructions when moved from full-open to full-closed position.

153300 ECCENTRIC PLUG VALVES

Plug valves, unless otherwise specified or indicated on the Plans, shall be nonlubricated eccentric plug valves. Valves shall be equipped with a lever operator for valves of 4-inch size and smaller and with a worm gear operator for valves of 6-inch size and larger. Each valve shall be furnished with an operating wrench or worm gear operator.

Eccentric plug valves shall be semi-steel, (ASTM 126, Class B) eccentric type with neoprene or Buna N faced plug. The body seats in all valves of 3-inch size and larger shall have an overlay of not less than 90 percent nickel on all surfaces contacting the plug face. The stem bearing and bottom bearing shall be of stainless steel material. All internal parts except the body and plug shall be 300 Series stainless steel, Monel, or nickel.

Eccentric plug valves shall be designed and constructed for 150 psig working pressure. Eccentric plug valves shall be Dezurik, Homestead "Ballcentric", Dresser X-Centric, or equal.

Eccentric plug valves shall have ends as required by the piping details as indicated on the Plans. Plug valves in screwed pipelines may be screwed or flanged at the Contractor's option. The resilient face of the plug shall be of material which will operate satisfactorily at a temperature of 185 degrees F continuous and 215 degrees F intermittent for all valves except that valves in compressed air service shall be suitable for duty at 250 degrees F continuous. Valves shall be clearly

drainage pocket not less than 2 cubic feet in volume. All hose valves except street washers shall have integral or nozzle type vacuum breakers.

153710 PLAIN HOSE VALVES

Hose valves not otherwise designated shall be Jenkins Figure 112, Crane No. 58, or equal angle hose valves. For yard hydrants they shall be mounted on 1-inch IPS risers with concrete splash blocks as detailed on the Plans. Each valve shall be provided with a nozzle type vacuum breaker.

154500 VALVE AND GATE OPERATORS

All valve operators other than T-wrenches or keys, and portable operators intended for operating more than one valve, or type of valve, shall be furnished by the valve or gate manufacturer as an integral part of the valve or gate. All similar operators shall be of one manufacturer. All gates and hand operating lifts shall be of the same manufacturer. All hydraulic gate lifts shall be of the same manufacturer and shall be furnished with shop drawings through the manufacturer of the gates as completely integrated units.

Similarly all hydraulic valve operators shall be of one manufacturer, and all motorized operators shall be of one manufacturer, etc.

Operators for gates or valves having threaded stems that project above the operator as the gate or valve is opened shall have stem covers to cover the threaded portion of the greased stem. Stem covers shall be aluminum pipe with threaded cap on top and bolted aluminum flange on bottom. Slots, 1 inch wide and 12 inches long at 18 inches on center shall be cut in front and back of pipe. Flange, pipe, and cap shall be given an AA-A31 anodic treatment after fabrication.

After installation of the gate and stem cover, the stem cover shall be marked at the point where the top of the stem is at full-open position and where the top of the stem is at the closed position. Gate stem cover shall be plumb and shall be subject to the Engineer's acceptance.

All other operators shall have a means of determining the valve position. These may be tail rods on hydraulic cylinders, dial indicators calibrated in number of turns or percentage of opening, or other means acceptable to the Engineer. Dial indicators shall have the full-open and full-closed positions clearly indicated.

All manual or power operators shall be sized to deliver the maximum force that may be required under the most severe specified operating

conditions including static and dynamic forces, seat and wedge friction, seating and unseating forces, etc., with a safety factor of 5 unless otherwise specified. All operators shall be capable of supporting the weight of any suspended shafting unless such shafting is carried by bottom thrust bearings. Shaft guides with wall mounting brackets shall be furnished and installed as required.

Where specified or indicated, crank or handwheel operated geared valve operators or lifts, shall be positioned and equipped for alternate operation by means of a tripod mounted portable gate operator.

Operators for all valves and gates shall turn counterclockwise to open and shall have an arrow and legend so indicating cast on the handwheel or chain wheel rim, crank, or other prominent place on the operator. All operators shall have suitable and adequate stops, capable of resisting at least twice the normal operating force, to prevent overrun of the valve or gate in open or closed position.

Buried operator housings for buried valves shall be oil and watertight, shall be specifically designed for buried service, and shall be factory packed with a suitable grease. The space between the operator housing and the valve body shall be completely enclosed such that no moving parts are exposed to the soil. Operators for buried valves shall be furnished with a 2-inch square AWWA operating nut.

Gearing on worm gear operators shall be self-locking, and the gear ratio shall be such that a torque in excess of 160 foot pounds will not have to be applied to operate the valve at the most adverse conditions for which the valve is designed.

Traveling nut operators shall be designed such that a torque in excess of 100 foot pounds will not have to be applied to operate the valve at the most adverse condition for which the valve is designed. Limit stops shall be installed on the input shaft of all manual operators in the OPEN and CLOSED positions. The vertical axis of the operating nut shall not move as the valve is opened or closed.

Gate operators shall be as listed in the GATE SCHEDULE on the Plans.

154530 GEARED VALVE OPERATORS

All manually operated butterfly valves larger than 6 inches on liquid service or 10 inches on gas or air and all plug valves 6 inches and larger shall be provided with geared operators. These operators shall be mounted on the valves at the factory. Valves mounted 6 feet or less above the floor shall have handwheel operators. Valves mounted more than 6 feet to center line above the floor shall have chain wheel operators. Operator shall have cut gears, either spur or worm, and

shall be sized to operate the valve at the most adverse design condition with a pull at the handwheel or chain wheel rim of not more than 40 pounds.

154600. PIPE HANGERS AND SUPPORTS

The plans do not, in all cases, show where or how pipe is supported; however, it is intended that all pipe and fittings shall be properly supported, suspended, or anchored as required to prevent sagging, overstressing, or longitudinal movement of certain piping, and to prevent thrusts or loads on or against pumps, meters, and other equipment.

Exposed piping shall be supported at the base of all risers, at intervals not to exceed 5 feet on all horizontal runs of pipe 2 inches and smaller, and at intervals not to exceed 10 feet on all horizontal runs of pipe larger than 2 inches. Piping 4 inches and larger through fill, backfill, or disturbed ground shall be supported at intervals not to exceed 10 feet with supports as detailed on the Plans. Plastic pipe and tubing, copper pipe and tubing, and rubber hose and tubing shall be supported at close enough intervals to prevent noticeable sagging, or shall be carried in trays.

All elbows to be supported from the floor shall be furnished and installed as base elbows, whether so indicated on the Plans or not. Supports for the base fittings shall be adjustable metal supports or concrete piers as indicated on the Plans. Riser clamps shall be Elcen Figure 29, Grinnell Figure 261, or equal.

Plastic pipe, valves, and headers shall be securely anchored to prevent any apparent movement during operation of valves. Plastic pipe shall be anchored between expansion loops and/or direction changes to provide for uniform expansion. Anchors and supports shall be in accordance with the manufacturer's published instructions.

Concrete pipe supports shall be cast where indicated on the Plans. Vertical corners shall be neatly chamfered. As a minimum of cradling, the concrete shall extend 1/4 of the pipe diameter above the pipe invert and at least 6 inches along the pipe shell.

Hanger rods, supports, clamps, anchors, expansion joints, brackets, and guides shall conform to the requirements of ANSI B 31.1 and the MSS Standard Practice SP-58 and SP-69; and shall be sized in accordance with the manufacturer's recommendation, or as indicated on the Plans.

Supports, clamps, clevises, brackets, or any devices bearing against copper pipe shall be copper plated, copper throughout, or insulated, except trays which shall be galvanized.

Where concrete supports are used under piping, the supports shall be poured 1 inch low, then the next day or later, the pipe grouted in place with nonshrink grout. Nonshrink grout shall be used under floor flanges to give level bearing. Floor flanges shall be bolted to the floor with at least two bolts, or as indicated on the Plans.

Special details are indicated on the Plans for special supports for heavy pipe and specials. Such supports shall be of heavy or sturdy design to carry the loads imposed thereon.

No use shall be made of chains, plumbers' straps, wire, or other such devices for suspending, supporting, or clamping pipe of any size or type.

The Contractor shall submit to the Engineer, for review and acceptance, a schedule of hanger, support, anchor and guide types and where they will be used prior to his assembling of any exposed piping.

154610. ANCHOR BOLTS AND INSERTS

Anchor bolts and concrete anchors shall be in accordance with Section 500 of MAG Standard Specifications.

Where indicated on the Plans, continuous concrete inserts, Unistrut Series P3200, or Elcen "Speed Strut" Figure 1150 of the lengths indicated or specified shall be furnished and installed. Where not otherwise indicated or specified, inserts in concrete ceilings and beam soffits may be malleable iron inserts, Grinnell Figure 152 or 282; Bergen-Patterson Part 108; Unistrut Series P3200; or equal. Wall and side beam inserts shall be Unistrut Series P3200, Elcen "Speed Strut" Figure 1150, or equal.

Support members shall be Unistrut Series P-1000, Elcen "Speed Strut" Figure 600, or equal.

Brackets shall be brackets of the model number as called for on the Plans, and made from Unistrut Series P-1000, Elcen "Speed Strut" Figure 600, or equal.

Channel inserts shall be installed in all tunnels below grade even under buildings at not more than five feet on centers. Channel inserts shall be installed in tunnel ceilings where indicated on the Plans at not more than five feet on centers. Both wall and ceiling inserts shall be placed so that they are in line in tunnels ten feet and greater in width. In tunnels less than ten feet in width, the inserts shall be staggered at the midpoint spacing of the opposite wall. Channel inserts shall extend to within three inches of top of tunnel.

walls. Vertical channel supports installed opposite inserts shall extend to same height as inserts.

Under no circumstances will the use of Slugin or similar anchors relying on the deformation of a lead alloy or similar element for their holding power be permitted.

With the Engineers written permission, power driven studs may be used for the securing of conduit and small pipe to structural metal, but their use will not be permitted in concrete, masonry, and similar materials.

154900. PAYMENT

Payment for work under this section, contained entirely within the lift station compound, will be made at the lump sum bid for Item 1500-1, Piping, Valves, Gates, and Specialties.

DIVISION 16 - ELECTRICAL

160100 GENERAL

It is the intent of this part of the Contract Documents to cover all work and materials necessary for erecting complete, ready for continuous use, a tested and working electrical system, substantially as indicated on the Plans and as hereinafter specified.

160101 GENERAL PROVISIONS

The Contractor shall be responsible for all coordination with U.S. West, Southwest Gas Corporation, and Arizona Public Service for the required electrical, natural gas, and teleco installations and hookups necessary for the sanitary sewer lift station. Contact point for Arizona Public Service is Mr. Clarence Van Der Hart at 371-7028, for U.S. West is Mr. Bob Friess at 842-7748, and for Southwest Gas is Mr. Elton Buell at 484-5294.

Minimum sizes of equipment, electric devices, etc., are indicated but it is not intended to show every offset and fitting, nor every structural or mechanical difficulty that will be encountered during the installation of the work.

All work indicated on the Plans is approximately to scale, but actual dimensions and detailed drawings should be followed as closely as field conditions permit. Field verification of scale dimensions on Plans is directed since actual locations, distances, levels, etc. will be governed by field conditions.

Discrepancies indicated on different Plans, between Plans and actual field conditions, or between Plans and Contract Documents shall be promptly brought to the attention of the Engineer for a decision.

The alignment of equipment and conduit shall be varied due to architectural changes, or to avoid work of other trades, without extra expense to the Owner.

The Contractor shall furnish and install all parts and pieces necessary to the installation of equipment in accordance with the best practice of the trade and in conformance with the requirements of these Contract Documents.

All items not specifically mentioned in these Contract Documents or noted on the Plans or accepted shop drawings, but which are obviously necessary to make a complete working installation, shall be deemed to be included herein.

The Contractor shall lay out and install electrical work prior to placing floors and walls. He shall furnish and install all sleeves and openings through floors and walls required for passage of all conduits. Sleeves shall be rigidly supported and suitably packed or sealed to prevent ingress of wet concrete.

The Contractor shall furnish and install all inserts and hangers required to support conduits and other electrical equipment. If the inserts, hangers, sleeves, etc. are improperly placed or installed, the Contractor shall do all necessary work, at his own expense, to rectify the errors.

All electrical equipment shall be capable of operating successfully at full-rated load, without failure, at an ambient air temperature of 50 degrees C, and specifically rated for an altitude of 1,200 feet.

The Contractor shall submit shop drawings, data and details to the Engineer on all controls, fixtures, wiring, electrical equipment, conduit, etc. for review and acceptance prior to use of any components in the work.

160103 REGULATIONS AND CODES

Electrical work, including connection to electrical equipment integral with mechanical equipment, shall be performed in accordance with the latest published regulations of the National Electrical Code (NEC), National Electrical Safety Code (NESC), State and local codes, and

according to the latest Institute of Electrical and Electronic Engineers (IEEE); American National Standards Institute (ANSI); American Society for Testing and Materials (ASTM); Insulated Cable Engineers Association (ICEA); National Electrical Manufacturers Association (NEMA) Standards; National Electrical Contractors Association (NECA) Standard of Installation; and the latest published regulations of the Federal Occupational Safety and Health Act (OSHA). When applicable, the material used in the performance of the electrical work shall be approved by the Underwriters' Laboratories, Inc. (UL) for the class of service for which they are intended.

160104 SERVICE

The Contractor shall provide and install conduit wire and electrical service metering equipment in accordance with APS's requirements and as indicated on the Plans for 480 volts, 3 phase electrical supply.

160105 TEMPORARY POWER

The Contractor shall furnish, install and maintain all temporary power and lighting systems needed for construction. This temporary system shall include weatherproof panel(s) for the Contractor's main breakers and distribution system. Ground fault interrupting equipment shall be installed. All connections shall be watertight with wiring done with Type SO portable cable. After construction is completed, the Contractor shall remove all temporary power equipment and devices.

160106 CUTTING AND REPAIRING

Where it becomes necessary to cut into existing work for the purpose of making electrical installations, core drills shall be used for making circular holes. Other demolition methods for cutting or removing shall be reviewed by the Engineer prior to starting the work.

The Contractor shall repair all damage caused thereby and restore damaged areas to original condition.

160107 CORROSION PROTECTION

Wherever dissimilar metals, except conduit and conduit fittings, come in contact, the Contractor shall isolate these metals as required with neoprene washers, 9 mil polyethylene tape, or gaskets. Where fastening conduit, electroplated, or equivalent fasteners and stainless steel bolts shall be used.

Factory finishes damaged and/or rusting shall be restored to original new condition.

All electrical panels, switchgear, motor control centers, etc. shall be shipped in sealed dust and moisture-proof plastic sheet enclosures and the seal maintained until units are installed. Said units shall be in new condition, no dirt, dust, water, grease, rust, damaged parts, components, etc. All relay, starter, circuit breaker, switches, etc., contacts, insulators, mechanisms, and buses shall be free of dust, dirt, oil, moisture, metal shavings, etc. before testing and energizing.

Once equipment is installed, it shall be protected at all times with plastic sheet covers until the area is secure from dirt, dust, workers, paint spray, water, etc. Heat shall be provided to eliminate condensation.

160108 COORDINATION OF THE ELECTRICAL SYSTEM

The Contractor shall verify all actual equipment and motor full-load and locked-rotor current ratings. The necessary minimum equipment, wire, and conduit sizes are indicated on the Plans. If the Contractor furnishes equipment of different ratings, the Contractor shall coordinate the actual current rating of equipment furnished with the branch circuit conductor size, the overcurrent protection, the controller size, the motor starter, and the branch circuit overcurrent protection. The branch circuit conductors shall have a carrying capacity of not less than 125 percent of the actual full-load current rating. The size of the branch circuit conductors shall be such that the voltage drop from the overcurrent protection devices up to the equipment shall not be greater than 2 percent when the equipment is running at full-load and rated voltage.

The motor running overcurrent protection devices shall be rated or selected to trip at no more than 125 percent of the motor full-load current rating for motors marked to have a temperature rise not over 40 degrees C or motors marked with a service factor not less than 1.15 and at no more than 115 percent for all other types of motors. The motor controller size shall be coordinated to the current rating and horsepower size of the installed motor.

The motor-branch-circuit overcurrent protection device shall trip open in 30 seconds or less on locked-rotor current of the motor. This device shall also protect the motor-branch-circuit conductors and the motor control apparatus against overcurrent due to short-circuits or grounds. The motor control circuits shall have overcurrent protection of the type indicated on the Plans.

160108.10 COORDINATION

A coordination study shall be made and curves submitted for review and

acceptance by the Engineer. The study shall include all devices from the utility service to and including the secondary devices of medium voltage transformers.

160109 TEST

The electrical work shall be free from improper grounds and from short circuits. The correctness of the wiring shall be verified first by visual comparison of the conductor connections with connection diagrams. Individual circuit continuity checks shall next be made by using electrical circuit testers. Last, the correctness of the wiring shall be verified by the actual electrical operation of the electrical and mechanical devices. Any deviation from the wiring indicated on the Plans or accepted drawings shall be corrected and indicated on the Plans.

160110 CONFORMS TO RECORD DOCUMENTS DRAWINGS

Prior to completion of the Contract, the Contractor shall furnish the Engineer with a set of electrical plans marked with any changes, deviations or additions to any part of the electrical work.

Each conductor shall be identified as required by the Contract Documents. This identification shall be indicated on the record documents drawings to enable rapid and accurate circuit tracing by maintenance personnel.

160111 SINGLE LINE DIAGRAMS

Single line diagrams, as indicated on the Plans, show circuit voltages, (4xx is 480V, 3xx is 277V, 2xx is 240V, 1xx is 120V circuits), wire and conduit sizes, circuit protection rating, and other pertinent data. Where conflicts exist on the Plans the single line diagrams shall take precedence. Grounding conductors are not necessarily indicated. See grounding requirements specified elsewhere herein.

160112 CIRCUIT IDENTIFICATION

The 3-phase wires shall be identified at the switchgear, panelboards and motor control centers as Phases A, B, and C. Phase A shall be red, Phase B shall be black, and Phase C shall be blue. The neutral shall be white.

In addition to color coding all conductors, each conductor shall be identified in each pull box, manhole, panelboard, cable tray, or termination with circuit identification markers. This identification is applicable to all power, control, alarm, and instrumentation conductors and these markings shall be recorded on the Record

Documents. Markers shall be slip-on PVC sleeve type as manufactured by Brady, Seaton, or equal.

Markers for other cabling shall be B-292 vinyl as manufactured by Brady, Seaton, or equal.

Exposed medium voltage conduits shall be labeled at 50-foot intervals with 1-inch letters stating the voltage - example - "12,470 volts". Labels shall be vinyl plastic as manufactured by Brady, Seaton, or equal.

160113 NAMEPLATES

Where indicated on the Plans, the Contractor shall furnish and install nameplates which shall be black lamicaid with white letters. The nameplates shall be fastened to the various devices with round head brass screws. Each disconnect means for service, feeder, branch, or equipment conductors shall have nameplates indicating its purpose.

160114 AUTOMATIC EQUIPMENT WARNING SIGNS

Permanent warning signs shall be mounted at all mechanical equipment which may be started automatically or from remote locations. Signs shall be in accordance with OSHA regulations and shall be suitable for exterior use. The warning signs shall be fastened with round head brass screws or bolts, located and mounted in a manner acceptable to the Engineer.

Warning signs shall be 7 inches high by 10 inches wide, colored yellow and black, on not less than 18 gauge vitreous enameling stock. Sign shall read:

CAUTION
THIS EQUIPMENT STARTS
AUTOMATICALLY
BY REMOTE CONTROL

160115 HIGH VOLTAGE WARNING SIGNS

Permanent and conspicuous warning signs shall be mounted on all equipment, doorways to equipment rooms, pull boxes, manholes, where the voltage exceeds 600 volts.

Signs shall be in accordance with OSHA regulation, and shall be suitable for exterior use. The warning signals shall be fastened with round head brass screws or bolts, located and mounted in a manner acceptable to the Engineer.

Signs shall be 7 inches high by 10 inches wide, colored red and white, on not less than 18 gauge vitreous enameling stock. Sign shall read:

WARNING
HIGH VOLTAGE
KEEP OUT

160116 CONDUCTOR FASTENERS

Glue-on type conductor fasteners shall not be used in any panels, panelboards, switchboards, switchgear, motor control centers, or other enclosures containing electrical devices and/or conductors.

160200 GENERAL MATERIALS AND METHODS

160201 GENERAL

All materials, equipment, and parts comprising any unit or part thereof specified or indicated on the Plans shall be new and unused, of current manufacture, and of highest grade consistent to the state of the art. Damaged materials, equipment and parts are not considered to be new and unused and will not be accepted.

Field verification of scale dimensions on Plans is directed since actual locations, distances, and levels will be governed by actual field conditions. The Contractor shall also review architectural, structural, yard, mechanical and other Plans, and the accepted electrical and mechanical shop drawings, and shall adjust his work to conform to all conditions indicated thereon.

The fabricator of major components, such as distribution panelboards, switchgear, motor control centers, shall also be the manufacturer of the major devices therein.

160202 RACEWAYS

Raceways include rigid metal conduit, rigid nonmetallic conduit, or any other channel for holding wires, cables, or bus bars that is designed for, and used solely for, this purpose.

160202.10 CONDUIT

160202.11 GENERAL

All conduit shall be rigid steel unless specifically indicated otherwise on the Plans. All wiring, except as otherwise noted, shall be in conduit. Conduit size shall not be less than the National

Electrical Code (NEC) size required for the conductors therein and shall not be smaller than 3/4-inch. No underground conduit shall be less than one inch.

Conduit runs are schematic only, and shall be modified as required to suit field conditions, subject to review and acceptance by the Engineer.

Conduit shall run continuously between outlets and shall be provided with junction boxes where connections are made, except in special pull boxes indicated on the Plans.

Conduits entering or exiting concrete shall be PVC coated or equivalent.

Conduit runs shall be straight and true; elbows, offsets, and bends shall be uniform and symmetrical. Changes in direction shall be made with long radius bends or with fittings of the conduit type. Conduit type fittings shall be Crouse-Hinds, Appleton, or equal with wedge nut covers.

Conduit runs in buildings and structures shall be exposed except as specifically noted or accepted by the Engineer.

Conduit runs shall not interfere with the proper and safe operation of equipment and shall not block or interfere with ingress or egress, including equipment removal hatches.

Exposed conduits shall be securely fastened with regulation clamps or straps. All exposed conduit shall be run on the walls and ceiling only and shall be parallel to the planes of the walls or ceiling. No diagonal runs will be permitted. Flexible conduit shall be used only for short lengths required to facilitate connections between rigid conduit and motors or control equipment. The maximum length of flexible conduit shall be 5 feet. Where flexible conduit is used, it shall be grounding type, weatherproof and watertight as manufactured by American Brass Company, General Electric, or equal. All conduits located outdoors or in wet locations shall be weathertight.

Conduit runs on water-bearing walls shall be supported one inch away from the wall on an accepted channel. When channel galvanizing or other coating is cut or otherwise damaged, it shall be field coated to original condition. No conduit shall be run in water-bearing walls, unless specifically designated otherwise.

Underground conduit runs shall be concrete encased, as detailed on the Plans, unless otherwise noted.

All conduit shall be thoroughly reamed after the threads have been cut to remove burrs. All joints shall be made with acceptable sealing compound and shall be watertight. Bushings or conduit fittings shall be used at all conduit terminals. The total of all bends in any run between pull boxes or junction boxes shall not exceed 360 degrees. Pull boxes shall be installed at points acceptable to the Engineer. Conduits brought into pull boxes, condulets, and other openings shall be capped until used to prevent the entrance of moisture. All spare conduits shall be capped and shall contain a suitable plastic pulling tape.

Joints shall be set up tight. Hangers and fastenings shall be secure and of a type appropriate in design and dimensions for the particular application.

After installation of complete conduit runs 2 inches and larger, conduits shall be snaked with a conduit cleaner equipped with a cylindrical mandrel of a diameter not less than 85 percent of the nominal diameter of the conduit. Conduits through which the mandrel will not pass shall not be incorporated as part of the contract.

Conduit runs shall be cleaned and internally sized (obstruction tested) so that no foreign objects or obstructions remain in the conduit prior to pulling in conductors.

Couplings, connectors, and fittings shall be threaded and shall be certified types specifically designed and manufactured for the purpose. They shall be installed expertly to provide a firm mechanical assembly and electrical conductivity throughout.

Expansion fittings shall be installed across all expansion joints and at other locations where necessary to compensate for thermal expansion and contraction. Expansion fittings shall be OZ type AX with jumper for exposed locations and type DX at structural expansion joints, Spring City, or equal.

Shop drawings shall be submitted as requested by the Engineer for review and acceptance showing routing, conduit size, and number and size of wires in each conduit before installation of conduit.

160202.12 RIGID STEEL

Conduit and couplings shall be hot-dipped galvanized with zinc coated threads and outer coating of zinc bichromate as manufactured by Triangle PWC, Inc., Allied Tube & Conduit Corporation, or equal.

Steel conduit shall not be buried in earth without concrete encasement

except in special cases where PVC coating is indicated on the Plans.

160202.14 PVC COATED STEEL

PVC coated conduit shall be installed where shown on the Plans or elsewhere specified and shall conform to NEMA RN-1, Current Edition.

The zinc surface of the conduit shall remain intact and undisturbed on both the inside and the outside of the conduit throughout the preparation and application processing. A Polyvinyl Chloride (PVC) coating shall be bonded to the galvanized outer surface of the conduit. The bond between the PVC coating and the conduit surface shall be greater than the tensile strength of the plastic. The thickness of the PVC coating shall be a minimum of 0.040-inch (40 mil).

A loose coupling shall be furnished with each length of conduit. A PVC coating shall be bonded to the outer surface of the coupling and a PVC sleeve equal to the outside diameter of the uncoated conduit shall extend beyond both ends of the coupling approximately one pipe diameter or 1-1/2 inches, whichever is smaller. The wall thickness of the coating on the coupling and the sleeve shall be a minimum of 0.055-inch (55 mil).

A PVC coating shall be bonded to the outer surface of all conduit bodies and fittings and a PVC sleeve shall extend from all hubs. The wall thickness of the coating on conduit bodies and fittings and the sleeve walls shall be identical to those on couplings in length and thickness. The covers on all conduit bodies shall be coated on both sides and shall be designed to be completely interchangeable. The inside of conduit bodies shall remain undisturbed in the processing and shall retain the manufacturer's cadmium plate-aluminum paint finish.

Stainless steel screws shall be furnished and used to attach the cover to the conduit body. All coated material shall be installed and patched according to the manufacturer's recommended installation and patching instructions.

PVC coated conduit and fittings shall be as manufactured by Kor Kap Corporation, Occidental Coating Company, or equal.

160202.16 RIGID NONMETALLIC - PVC

Where specifically indicated on the Plans, or elsewhere specified, conduit may be high density Schedule 40, 90 degrees C, heavy-duty PVC. The conduit shall be manufactured from virgin polyvinyl chloride compound which meets ASTM standards. Smoke emissions shall be limited

to less than 6 grams per 100 grams of material tested. Encasement shall be reinforced as indicated on the Plans. Conduit supports shall be installed at 2-1/2 foot intervals. PVC conduit shall be manufactured by Carlon, Triangle Conduit & Cable, or equal.

160202.30 METAL PULL BOXES

160202.31 GENERAL

Furnish and install pull boxes as indicated on the Plans and specified herein.

Installation of pull boxes shall be such that access to the pull boxes is not restricted by obstructions such as pipes, valves, ladders, etc. Exact locations and sizes shall be submitted to the Engineer for review and acceptance prior to fabrication and installation.

Additional pull boxes shall be installed as required to meet cable manufacturer's pulling tension requirements.

Covers shall be secured with 316 stainless steel screws or bolts with coated threads.

160202.32 CONSTRUCTION

Pull boxes shall be compatible with the type of conduit systems on which they are used. Pull boxes shall be fabricated from 11-gauge (minimum) steel or aluminum and shall be completely weatherproof with gasketed removable covers. Weatherproof conduit hubs shall be furnished for all conduit connections to pull boxes.

160202.35 SIZING

Pull boxes shall be sized according to code and shall be sized to provide room for the future conduits and cables indicated on the Plans.

160203 CONDUCTORS

160203.01 GENERAL

All wiring shall be as indicated on the Plans. Wires shall be newly manufactured (not more than 12 months old) and shall be soft drawn copper with not less than 97 percent conductivity. The wire and cable shall have size, grade of insulation, voltage, and manufacturer's name permanently marked on the outer covering at not more than 2-foot intervals. All wires shall conform to the latest Standards of the ASTM and ICEA and shall be tested for their full length by these Standards. Insulation thickness shall be not less than that specified by the

National Electrical Code.

Wire sizes shall be American Wire Gauge sizes with Class B stranded construction. No. 12 and No. 10 AWG may be solid conductor.

No. 2 AWG and smaller shall be factory color coded with a separate color for each phase and neutral, which shall be used consistently throughout the system. Larger cables shall be coded by the use of colored tape.

As far as practicable, all circuits shall be continuous from origin to termination without splices in intermediate pull boxes. Sufficient slack shall be left at the termination to make proper connections. In no case shall a splice be pulled into the conduit.

160203.02 PULLING LUBRICANT

All cables shall be properly coated with pulling compound recommended by the cable manufacturer before being pulled into conduits so as to prevent mechanical damage to the cables during installation.

Other lubricants to be substituted must be accompanied by a statement from the cable manufacturer as to its acceptable use with the cable being installed.

160203.12 TERMINATIONS AND SPLICES (MEDIUM VOLTAGE)

Terminations and splices shall be stress cones type single conductor style as manufactured by Bishop Electric, Elastimold, or equal.

160203.20 600 VOLT CLASS CABLE

Individual or multiple conductor cables for power, control, and alarm circuits of 480 volts or less shall be insulated for not less than 600 volts and shall have Type THWN insulation. Cable tray conductors shall have Type TC insulation. Where wire size is not indicated, they shall be of the size required by the NEC, except that no wire external to panels and motor control centers shall be less than No. 12 AWG, unless specifically noted on the Plans. Panel control wiring shall not be less than No. 14 AWG. Wire and cable shall be as manufactured by Okonite Company, Anaconda Wire and Cable Company, or equal.

The pulling tension and side-wall pressures, as recommended by the cable manufacturer, shall not be exceeded.

160203.21 TERMINATIONS AND SPLICES (600 VOLT AND LESS)

Terminations shall be terminal board type with set-screw pressure

connectors. Splicing shall join conductors mechanically and electrically to provide a complete circuit prior to installation of insulation. Conductors, including grounding conductors, of different sizes shall be spliced and then soldered or welded. Splices in wet locations and all splices below grade shall be waterproof heat shrink type as manufactured by Elastimold, Thomas-Betts, or equal.

160203.30 INSTRUMENTATION CLASS CABLE

Instrument cable shall have the number of twisted pairs indicated on the Plans and shall be insulated for not less than 600 volts. Unless otherwise indicated, conductor size shall be No. 18 AWG minimum.

The jacket shall be flame retardant Flamenal or Okoseal, 90 degrees C temperature rating. The cable shield shall be a minimum of 2.3 mil aluminum or copper tape overlapped to provide 100 percent coverage and a tinned copper drain wire.

The conductors shall be bare soft annealed copper, Class B, 7 strand minimum concentric lay with Okoseal or Vulkene, 15 mils nominal thickness, nylon jacket, 4 mil nominal thickness, 90 degrees C temperature rating. One conductor within each pair shall be numerically identified.

Pairs shall be assembled with a nominal 2-inch lay and shall then be group shielded with a minimum of 1.3 mil aluminum or copper tape overlapped to provide 100 percent coverage. All group shields shall be completely isolated from each other.

Instrumentation cables shall be installed in separate raceways. This includes through manholes. Instrumentation cable shall be continuous between instruments or between field devices and instrument enclosures. There shall be no intermediate splices or terminal boards.

The instrumentation cable shall be Type TC as manufactured by General Electric, Okonite, or equal.

160204.11 TELEPHONE PANEL GROUND

An individual ground system shall be installed at the telephone panel(s).

160205 OUTLET, SWITCH, PULL AND JUNCTION BOXES

160205.01 GENERAL

Unless otherwise specified or indicated on the Plans, device boxes,

condulets and junction boxes shall be heavy-duty cast and shall be compatible with the location and conduit system being used, rigid steel or rigid copper free aluminum and shall be as manufactured by Crouse-Hinds, Appleton, or equal, with stainless steel cover screws and with cover gaskets. Device boxes shall be FD type.

160205.10 FASTENERS

Fasteners used with wiring devices shall be aluminum or stainless steel and all screws, nuts, bolts, etc. shall be stainless steel.

160205.20 CONCRETE PULL BOXES

The Contractor shall furnish and install precast concrete pull boxes in the locations indicated on the Plans and as required.

The pull boxes shall be installed on 12 inches of compacted gravel and shall be installed in such a manner that the cover of the pull box will be flush with finished grade.

The pull boxes shall be designed for traffic conditions, and the pull box and cover shall be designed for heavy traffic bridge loading. The pull boxes shall be a minimum of 3' x 2' x 30" deep with 3/4 inch diameter pulling irons located at each end. The pull boxes shall be constructed of reinforced Class A concrete.

The pull boxes shall be Quickset, Utility Vault Co., or equal, with covers. The covers shall be engraved "ELECTRICAL".

160206 LIGHTING SWITCHES

160206.01 GENERAL

Snap switches shall have the number of poles as indicated on the Plans, shall be specification grade, rated at 20 ampere, and shall be as manufactured by Hubbell, General Electric, or equal. Special switches, covers, etc. shall be as specified herein or indicated on the Plans.

160206.10 INDOOR

Stainless steel cover plates shall be utilized.

160206.20 OUTDOOR AND CORROSION RESISTANT

Enclosures shall be weatherproof.

160207 RECEPTACLES160207.01 GENERAL

Duplex receptacles shall be 2-pole, 3-wire grounded, 120 volts, industrial, rated at 20 amperes, and shall be as manufactured by Hubbell, General Electric, or equal. Special receptacles, covers, etc. shall be as specified herein or as indicated on the Plans.

160207.10 INDOOR

Stainless steel cover plates shall be utilized.

160207.20 OUTDOOR AND CORROSION RESISTANT

Enclosures shall be weatherproof with yellow "fiberglass" lift cover plates or accepted equal.

160207.30 GROUND FAULT INTERRUPTER RECEPTACLES (GFI)

GFI outlets shall be rated at 20 amperes at 125 volts AC as manufactured by Leviton, Bryant, or equal.

160207.50 240 VOLT RECEPTACLES

240 volt receptacles shall be of the ampere rating as indicated on the Plans, however, the minimum rating shall be 20 amperes at 250 volts AC and shall be as manufactured by Leviton, Bryant, or equal.

160208 PUSH-BUTTON STATIONS160208.01 GENERAL

Push buttons, selector switches, and pilot lights shall be heavy-duty, oiltight Square D Company, General Electric Company, or equals. Control stations shall be in NEMA 4 enclosures for outdoor and NEMA 12 for indoor installations.

"Start-Lockout-Stop" push-button stations shall be installed adjacent to every motor unless specifically indicated otherwise.

160209 TRANSFORMERS - DRY TYPE160209.10 DISTRIBUTION TRANSFORMERS - LOW VOLTAGE LIGHTING AND POWER

Transformers shall be of the premium high efficiency quiet type and shall be installed where indicated on the Plans. The primary winding of the transformers shall have two 2-1/2 percent taps above and below normal.

The transformers shall have a BIL of 10 kv with a temperature class of 185 degrees C for transformers up to 25 kva and a temperature class of 220 degrees C for transformers rated at 30 kva and larger.

The sound level shall not exceed 44 dba measured at 5 feet from the transformer after installation. Core and coil assemblies 30 kva and larger shall be mounted on rubber vibration isolators designed specifically to reduce 120 HZ sound and multiple harmonics.

Transformer standards shall be submitted to the Engineer prior to purchase and installation.

Transformers shall be of the types manufactured by General Electric Company, Westinghouse Corp., or equal.

160209.20 FERRO RESONANT ISOLATION TRANSFORMERS

Ferro resonant isolation transformers shall be provided for all solid state devices and elsewhere where indicated. Regulation shall be @3 percent for an input range of @10 percent. Common mode noise rejection shall be better than 120 db with transverse mode noise rejection better than 60 db. Voltage spike attenuation shall be better than 250:1.

Isolation transformers shall be as manufactured by Shape Magnetronics, Control Concepts, Inc., or equal.

160210 RELAYS

160210.10 CONTROL RELAYS

Control relays shall be General Electric, Westinghouse, Square D Company, or equal, industrial 600 volt, 10 amperes type with contact arrangement and operating coils of the proper voltage as required by the control circuit sequence. Each relay shall have a minimum of 4 reversible pole contacts. The coils shall be sealed by pressure molding.

160210.11 INTRINSICALLY SAFE RELAYS

Intrinsically safe relays shall allow the use of any type of remote pilot device located in Class 1 hazardous areas by providing a pilot circuit incapable of releasing sufficient electrical energy to ignite

gases and vapors classified in Groups A, B, C, and D.

The unit shall have an output relay with double pole, double throw contacts rated at least 16 amperes at 120 volts AC, resistive load, and 24 volts DC. They shall operate on the AC supply voltage indicated on the Plans.

They shall be Cutler-Hammer, BW Series, or equal.

160211 TIMERS

160211.01 GENERAL

Timers which require pins or other removable trip devices shall be provided with at least one pin or trip device for each possible time setting.

160211.10 RESET TIMERS AND REPEAT CYCLE TIMERS

Timers of this type shall be heavy-duty industrial timers as manufactured by Eagle, Paragon, or equal.

160211.20 TWENTY-FOUR HOUR TIMERS

Timers of this type shall be heavy-duty industrial timers as manufactured by Paragon, Tork, or equal.

160211.30 TIMING RELAYS

Timing relays shall be heavy-duty industrial 600 volt, 10 amperes as manufactured by Square D Company, Westinghouse, or equal.

160212 ENCLOSURES

160212.01. GENERAL

This specification includes enclosures to house electrical controls, instruments, terminal boards, etc. If not indicated otherwise they shall be NEMA 12 for indoor and NEMA 4 for outdoor installations.

160212.10 CONSTRUCTION - STEEL

Enclosures shall be from 14 gauge steel with seams that are continuously welded. Doors shall have full length piano hinges with the door removable by pulling the hinge pin. They shall be as manufactured by Hoffman, Fischer & Porter, or equal.

A rolled lip shall be provided around three sides of the door and

around all sides of the enclosure opening. The gasket shall be attached with oil-resistant adhesive and held in place with steel retaining strips. Exterior hardware, such as clamps, screws, and hinge pins, shall be of stainless steel for outdoor installations. A hasp and staple shall be provided for padlocking. Each enclosure shall have a print pocket.

160212.11 FINISH - STEEL

Finish shall be white enamel interior, light grey enamel, ANSI 61 exterior, over phosphatized surfaces. Special finishes and colors shall be furnished for wet locations. Plans should be checked for special conditions.

160213 SWITCHBOARDS, SWITCHGEAR, PANELBOARDS

160213.10 CIRCUIT BREAKER SWITCHBOARD(S)

160213.11 GENERAL

The switchboard(s) shall be single panel, frame, or assembly of panels, on which shall be mounted on the face or back, or both, circuit breakers and instrumentation as indicated.

160213.12 ENCLOSURE

The switchboard shall be dead-front with front accessibility. Each section shall have individual removable top and bottom plates for installation and termination of raceways. All metal surfaces and structural parts shall be given a phosphatizing, or equal, treatment prior to painting. The switchboard(s) shall then be given a gun-metal gray undercoat, which is equal to zinc chromate. The exterior of the enclosure shall be furnished in a color selected by the Engineer.

160213.13 BUSING

Bus shall be silver or tin plated copper with an ampacity rating as indicated and shall be braced to have a short circuit current rating of 42,000 RMS symmetrical amperes.

160213.14 CIRCUIT BREAKERS

Circuit breakers shall be as specified elsewhere herein.

160213.15 SWITCHBOARD(S)

The switchboard(s) shall be as manufactured by General Electric, Westinghouse, or equal.

160218 TERMINAL BLOCKS

Terminal blocks shall be Square D Co., Buchanan, or equal. Terminal blocks shall be of the size required for conductors therein and a minimum of 50 percent spares shall be provided in each terminal box.

160219 DISCONNECT SWITCHES

Disconnect switches shall be heavy-duty safety switches with a quick-make, quick-break operating mechanism, full cover interlock and indicator handle. The disconnect switches shall be furnished with fuses of the size indicated on the Plans. One set of spare fuses shall be furnished for each fused disconnect switch.

Disconnect switches shall be as manufactured by Square D, Westinghouse, or equal.

161100 CIRCUIT BREAKERS - LOW VOLTAGE161100.01 GENERAL

All circuit breaker frame and trip ratings shall be as indicated on the Plans, except that they shall be coordinated with the ratings of the equipment actually furnished and shall be modified where necessary to suit this equipment. Circuit breakers to be used in motor control centers shall be as indicated on the Plans. Where no indication of type is given on the Plans, the following shall govern:

Circuit breakers protecting motors rated 7.5 horsepower or less shall be motor circuit protectors, all other circuit breakers shall be molded case circuit breakers.

Circuit breakers shall be as manufactured by Westinghouse, General Electric, or equal.

161100.10 MOLDED-CASE CIRCUIT BREAKERS

Circuit breakers for mounting in motor control centers or for separate mounting shall be of the air-break type, quick-make and quick-break, 600 volt, with number of poles as indicated on the Plans. The minimum frame size shall be 100 amperes.

Each pole of these breakers shall provide inverse time delay and instantaneous circuit protection.

The breakers shall be operated by a handle and shall have a quick-make, quick-break switching mechanism that is mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position between the manual ON and OFF positions. All latch surfaces shall be ground and polished. All poles shall be so constructed that they open, close and trip simultaneously.

Breakers must be completely enclosed in a molded case. Noninterchangeable trip breakers shall have their covers sealed; interchangeable trip breakers shall have the trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible. Contacts shall be of nonwelding silver alloy. Arc extinction must be accomplished by means of arc chutes.

The minimum interrupting ratings of the circuit breakers shall be at least equal to the available short circuit at the line terminals.

Circuit breakers shall conform to the applicable requirements of NEMA Standards Publication No. ABl.

Circuit breaker ratings, modifications, etc. shall be as indicated on the Plans.

Molded case circuit breakers shall be ambient compensating that provides inverse time delay overload and instantaneous short circuit protection by means of a thermal magnetic element. Compensation shall be accomplished by a secondary bimetal that will allow the breaker to carry rated current between 25 degrees C and 50 degrees C with tripping characteristics that are approximately the same throughout this temperature range.

On breakers with interchangeable, thermal, adjustable magnetic trip, the accessibility and position of the adjustment knob shall not be changed from those on the standard breaker.

161100.20 MOTOR CIRCUIT PROTECTORS

Electrical circuits shall be protected by motor circuit protectors (MCP) as manufactured by Westinghouse Electric Corporation, General Electric, or equal.

The MCP shall be operated by a handle and shall have a quick-make, quick-break switching mechanism that is mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents. Tripping shall be clearly indicated by

the handle automatically assuming a position between the manual ON and OFF positions. All latch surfaces shall be ground and polished. All poles shall be so constructed that they open, close, and trip simultaneously.

MCP's must be completely enclosed in a molded case. MCP's shall have the trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible. Contacts shall be of nonwelding silver alloy. Arc extinction must be accomplished by means of arc chutes.

Each pole of these MCP's shall provide instantaneous short circuit protection by means of a single adjustable magnetic only element. The single adjustment screw shall adjust all poles simultaneously.

Provision shall be furnished in the MCP for locking the maximum achievable trip setting to values less than maximum obtainable trip setting. Each adjustment shall have 8 main setting points and mid-setting points following a linear scale so that each point has a significant value within calibration tolerances.

MCP's shall be suitable for use with current limiters, having 100,000 ampere interrupting capacity and a built-in trip indicator, that are fully coordinated with the MCP so that the MCP will open all 3 phases if the limiter operates. Current limiters shall be so constructed that they can only be replaced by an identical or similar limiter having the same interrupting capacity.

The minimum interrupting ratings of the MCP shall be at least equal to the available short circuit at the line terminals.

MCP ratings, modifications, etc., shall be as indicated on the Plans.

161100.40 MODULAR OVERLOAD RELAYS

Where called for on the Plans, modular overload relays shall be provided with the motor starters. The modular overload relays shall be 3-pole solid state devices set by one plug-in heater and shall protect all 3 phases of the motor in ambient temperatures ranging from -20 degrees to +70 degrees C.

The jam modules shall plug in the modular overload relays and shall provide for instantaneous trip of the overload relay should the current exceed a preset value at any time after the motor has accelerated. The modules shall be adjustable to any value between 150 percent and 400 percent of the motor full-load current.

The underload modules shall plug in the MOR and shall provide for overload relay trip whenever the current falls below a set value after

the motor has accelerated. The modules shall be adjustable between 50 percent and 90 percent of the full load value of the motor full load current.

Each module shall provide individual trip indication and reset for each trip condition, visible without opening the motor control center compartment door. Each module shall provide an auxiliary contact for remote trip indication.

All solid state circuits shall be completely protected from damage arising from line transients and voltage spikes.

They shall be as manufactured by Westinghouse, Square D Co., or equal.

161200 MOTOR CONTROL - LOW VOLTAGE

161200.01 GENERAL

Starters Size 2 and larger shall have arc quenchers on all load breaking contacts. Starters shall be suitable for the horsepower ratings specified, except the Contractor shall verify the motor ratings and coordinate the starter and overload trip ratings with the actual horsepower ratings of the motors installed. Extended overload reset buttons shall be mounted so as to be accessible for operation without opening the door of the enclosure.

Magnetic contactors shall be factory adjusted and shall be chatter free. Magnetic contactors shall have bimetallic type overload relays in each line conductor as indicated on the Plans.

Starters shall be furnished complete with a 120-volt control transformer unless otherwise noted.

Where above normal ambient temperatures are anticipated, circuit breaker trip elements and starter overload trip elements shall be supplied to meet such conditions and shall be acceptable to the Engineer.

Control fuses shall be furnished where indicated in the schematics.

The magnetic contactors shall not be smaller than the size indicated on the Plans. Starters shall be sized to handle motors furnished even if motors should be larger than indicated on the Plans.

The minimum size starter shall be NEMA Size 1.

161210.20 MAGNETIC STARTERS161210.21 FULL VOLTAGE

Across-the-line full voltage magnetic starters for up to 600V shall have electrical characteristics indicated on the Plans.

Magnetic starters shall have: NEMA 12 enclosures unless otherwise noted; positive, quick-make, quick-break mechanisms; padlockable enclosure doors; 3 overload relays @15 percent adjustment from nominal heater rating on the overload relay; cover mounted reset button; and at least 3 reversible contacts in addition to the hold-in contact.

Magnetic starters shall be built in accordance with the latest NEMA Standards and shall be manufactured by Westinghouse Electric Corporation, General Electric, or equal.

163130. BALLASTS

Ballasts shall be ETL/CBM certified for the purpose intended with built-in thermal protector that disconnects the ballast permanently prior to actual ballast failure.

Ballasts shall be high efficiency, high power factor, constant wattage type and shall be fused.

Ballasts shall be Advance, Universal, or equal.

164000 STANDBY ELECTRICAL GENERATOR(S)164000.10. NATURAL GAS164000.11. GENERAL

The installation of a standby electric generating system shall include a Kohler, Onan, or equal, rated for standby service at a minimum of 25 kw delivered at 0.8 power factor, 480 volt, 3 phase, 3 wire, 60 hertz, 40 degrees C ambient, 1,200-foot elevation, without exceeding NEMA MG-1 - temperature rise limits.

The system shall be a package of:

1. A natural gas engine driven electric plant to provide standby electric power.
2. Engine mounted control system.

3. An automatic load transfer switch for switching of the load and control to provide automatic starting and stopping of the engine generator system.
4. Mounted accessories as specified.
5. Fuel and exhaust systems as specified or indicated on the Plans.
6. A weather-protective housing.
7. All other equipment as required to provide a complete and operable system.

All materials, equipment, and parts comprising the units specified herein, shall be new and unused, of current manufacture and of the highest grade. Engines shall be of heavy-duty, long-life construction, and converted automotive-type engines shall not be acceptable.

The engine, generator and all major items of auxiliary equipment shall be manufactured in the U.S. by manufacturers currently engaged in the production of such equipment. The unit shall be factory assembled and tested by the engine manufacturer and shipped to the jobsite by his authorized dealer having a parts and service facility in the area. The performance of the electric plant shall be certified by manufacturer as to the plant's full power rating, stability, and voltage and frequency regulation, and field load tested at site.

The entire unit shall be for outdoor installation, and shall be housed in a weather-protective noise-attenuating metal enclosure to suit the equipment furnished. The enclosure shall incorporate sufficient louvers to meet the cooling and combustion air requirements of the unit, shall have 2-inch thick insulated walls, and have generously-sized lockable access doors for the control panel and maintenance access. The radiator exhaust shall be fitted with a low-loss air turning vane to discharge cooling air and noise vertically upward.

The units offered under these Contract Documents shall be covered by the manufacturer's standard warranty or guarantee on new machines and shall be a minimum of two years.

Before the equipment is installed, a factory certified test log of the generator set showing a minimum of 3/4 hour testing with 1/2 hour at 100 percent rated load, continuously, shall be submitted to the Engineer. This generating system shall be full-load tested at site in the presence of the Engineer for a period of 8 hours, with supplier

providing necessary resistive load banks. Any defects which become evident during this test shall be corrected by the bidder at his own expense.

On completion of the installation, start-up shall be performed by a factory-trained dealer service representative. Operating and maintenance instruction books shall be supplied upon delivery of the unit and procedures explained to operating personnel.

164000.12. ENGINE

The engine shall be water cooled inline or Vee-type four stroke cycle, internal combustion, naturally aspirated, spark ignited, and designed to use 950 Btu/cf, 1 hour natural gas for fuel. The engine shall be equipped with lube oil and intake air filters; lube oil coolers, fuel pressure regulator, and gear driven water pump.

The engine generator governor shall maintain isochronous frequency regulation from no load to full rated load and shall be equal to Caterpillar 2301/EG3P electronic governor.

The unit shall be mounted on a structural steel subbase and shall be provided with suitable vibration isolators.

Safety shutoffs for high water temperature, low oil pressure, overspeed, and engine overcrank shall be provided. An engine-mounted radiator with blower type fan shall be sized to maintain safe operation at 115 degrees F maximum ambient temperature. The radiator shall be equipped for a duct adapter flange. Air flow restriction from the radiator shall not exceed 0.5 inch H₂O.

The engine cooling system shall be filled with a solution of 50 percent ethylene glycol.

Provide a residential type silencer as manufactured by Kittel, Maxim, or equal, including stainless steel flexible exhaust fitting for remote mounting, properly sized and installed, according to the manufacturer's recommendation. Silencer shall be mounted so that its weight is not supported by the engine. Exhaust pipe size shall be sufficient to ensure that measured exhaust back pressure does not exceed the maximum limitations specified by the generator set manufacturer.

Exhaust piping shall have stainless steel automatic exhaust cap. Exposed exhaust surfaces, including silencer, shall be coated with not less than 6 mils of inorganic zinc after sandblasting to "white metal".

The fuel supply system shall be supplied and installed by the Contractor in accordance with appropriate local codes and regulations.

The fuel supply line shall be fitted with a 2-way, 24 volt DC solenoid operated gas shutoff valve which, when de-energized, shall provide positive shutoff of the fuel supply. A plug valve manual shutoff shall be installed in the line upstream of the solenoid valve.

All gas pipe underground shall be protected against corrosion by a coat of bitumastic paint followed by two wraps of Tapecoat CT as manufactured by Tapecoat Company, Inc.; Scotchrap as manufactured by the Minnesota Mining and Manufacturing Co.; or equal.

An engine-mounted fuel pressure gauge, shall be provided.

A 24-volt DC electric starting system with positive engagement drive shall be furnished.

Fully automatic generator set start-stop controls in the generator control panel shall be provided. Controls shall provide two auxiliary contacts for activating accessory items. Controls shall include a 30 second cranking cycle limit with lockout. (Three 10 second cranks or a single 30 second crank.)

A unit mounted thermal circulation type water heater shall be furnished to maintain engine jacket water to 90 degrees F in an ambient temperature of 30 degrees F. The heater shall be single phase, 60 hertz, 120 volts. Heater shall be Chromalox, General Electric, or equal.

A 24-volt lead-acid storage battery set of the heavy-duty diesel starting type shall be provided. The battery set shall be of sufficient capacity to provide for 1-1/2 minutes total cranking time without recharging and shall be rated no less than 220 amp-hours. A battery rack and necessary cables and clamps shall be provided.

A current limiting battery charger shall be furnished to automatically recharge the batteries. The charger shall float at 2.17 volts per cell and equalize at 2.33 volts per cell. It shall include overload protection, silicon diode full wave rectifiers, voltage surge suppressors, DC ammeter, DC voltmeter and fused AC input. Amperage output shall be no less than 10 amperes.

164000.13 GENERATOR

The generator shall be a 4-pole or 6-pole revolving field type with static exciter and magnetic amplifier or SCR voltage regulator. No commutator or commutator brushes shall be allowed. Class F insulation shall be used on the stator and rotor, and both shall be further protected with 100 percent epoxy impregnation and an overcoat of resilient insulating material to reduce possible fungus and/or abrasive

deterioration. The stator shall be directly connected to the engine flywheel housing, and the rotor shall be driven through a semiflexible driving flange to insure permanent alignment. Voltage regulation shall be within plus or minus 2 percent of rated voltage, from no load to full-load. The instantaneous voltage dip shall be less than 15 percent of rated voltage when full load and rated power factor is applied to the generator. Recovery to stable operation shall occur within 5 seconds. Stable or steady-state operation is defined as operation with terminal voltage remaining constant within plus or minus one percent of rated voltage. A rheostat shall provide a minimum of plus or minus 5 percent voltage adjustment from rated value. Temperature rise at full-load determined by resistance shall be within rating as defined by NEMA MG-1.

The specified standby kw shall be for continuous electrical service during interruption of the normal utility source.

These ratings must be substantiated by manufacturer's standard published curves. Special ratings or maximum ratings are not acceptable.

A generator mounted NEMA 3R type vibration isolated 14 gauge steel control panel shall be provided.

Panel shall contain, but not be limited to the following equipment:

Voltmeter, 3-1/2 inch, 2 percent accuracy
 Ammeter, 3-1/2 inch, 2 percent accuracy
 Voltmeter/Ammeter phase selector switch
 Frequency meter, 3-1/2 inch, dial type
 Automatic starting controls
 Panel illumination lights and switch
 Voltage level adjustment rheostat
 Engine oil pressure gauge
 Engine water temperature gauge
 Dry contacts for remote alarms wired to terminal strips
 Fault indicators for low oil pressure, high water
 ~-temperature, overspeed, and overcrank
 Four position function switch marked AUTO, MANUAL,
 ~-OFF/RESET, and STOP
 Battery charge rate ammeter if not furnished on separate
 ~-charger
 Running time meter

A generator mounted main line molded case circuit breaker shall be installed as a load circuit interrupting and protection device. It

shall operate both manually for normal switching function and automatically during overload and short circuit conditions.

Generator exciter field circuit breakers do not meet the above electrical standards and are unacceptable for line protection.

164040 AUTOMATIC TRANSFER SWITCH

164040.10. GENERAL

Automatic transfer switch(es) shall be furnished and installed, as indicated on the Plans, with full load current rating of 70 amps at 480 volts, 3 phase, 60 hertz. The switch(es) shall be capable of switching all classes of load, and shall be rated for continuous duty when installed in a nonventilated enclosure. Withstand current rating shall be 22,000 A RMS.

The transfer switch shall be double throw, actuated by a single electrical operator momentarily energized with a total transfer time not to exceed one-sixth second. The switches shall be capable of transferring successfully in either direction with 70 percent of rated voltage applied to the terminals.

The normal and standby contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in position in both the normal and standby positions without the use of hooks, latches, or magnets, and shall be silver alloy protected by arcing contacts, with magnetic blowouts on each pole. Parallel main contacts are not acceptable.

The transfer switch(es) shall be equipped with a manual operator that is designed to prevent injury to personnel if the electrical operator should become energized during manual transfer.

The transfer switch(es), including all parts and supports, shall meet a seismic loading equal to their weights multiplied by a force factor, C_p , of 1.00. The directions of force, simultaneously and separately, shall be in any horizontal and vertical planes. The switches shall be capable of normal operation during and after seismic loading. Seismic loading shall not cause false operation. The force factor, C_p , shall be as defined in the Uniform Building Code.

164040.20 ACCESSORIES

The transfer switch(es) shall be equipped with the following:

1. Nominal 1- to 3-second time delay to override momentary outages.

2. Field adjustable 2- to 25-minute time delay to retransfer to normal source with 5-minute unloaded running time of standby plant. A switch shall be provided to bypass this feature with transfer to normal source made manually. Time delay shall be nullified if standby power fails and normal power is available.
3. Differential protection on 3 phases. Dropout and pickup.
4. Test switch.
5. Auxiliary contacts which close when normal source fails.
6. Auxiliary contacts which open when normal source fails.
7. Auxiliary contacts on main contacts, closed on normal.
8. Auxiliary contacts on main contacts, closed on emergency.
9. Voltage and frequency lockout relay.
10. Six indicating lights - each indicating power on phases of normal and/or standby power sources.
11. To avoid excessive inrush currents, an integrally mounted phase monitor shall prevent transfer or retransfer until the phase angle between the power sources is within ten electrical degrees within a frequency differential of two hertz. The monitor shall not require any control wiring to the generator. The monitor shall be bypassed if the load carrying source fails and the alternate power source is available. UPS system(s) are or will be a power source.

164040.30 OPERATIONAL TESTING

A means shall be provided to automatically start and run the standby generating set for a set period of time for the purpose of testing or exercising the complete engine, generator, and load transfer control. After completion of the set period of time for testing and exercising, the standby source shall be automatically shut down. Such periods for testing or exercising shall be adjustable in multiples of 15 minutes per period with the period repeated on any combination of days over a cycle of 7 days before recycling. During the period of testing or exercising, standby power shall not automatically assume its load.

164040.40 TESTING

When conducting temperature rise tests in accordance with UL-1008, the manufacturer shall include post-endurance temperature rise tests to verify the ability of the switches to carry full rated current after completing the overload and endurance tests.

The transfer switch, complete with all accessories, shall be listed by UL under Standard UL-1008.

The manufacturer shall issue a certification of compliance with the Plans and Contract Documents which is signed and sealed by a Registered Professional Engineer.

On completion of the installation, start-up shall be performed by a factory-trained service representative in the presence of the operating personnel and the Engineer.

Prior to acceptance of the installation, the equipment shall be subjected to:

Load tests with all available motor load, but not to exceed generator's nameplate rating.

Any defects which become evident during this test shall be corrected by the Contractor at his own expense.

The transfer switches shall be as manufactured by Automatic Switch Company, R. G. Russell Company, or equal.

167000.1. FLOAT SWITCH

Float switch shall be direct acting and consist of a 316 type stainless steel housing, mounting clamp, a flexible three-conductor cable with a synthetic rubber jacket and a mercury switch. The float housing shall be a sphere of at least 5-1/2 inches in diameter.

The mercury switch shall be embedded in a metal housing inside the float. The cable shall be No. 14 AWG with 105 strands per conductor, made specifically for underwater use and heavy flexing service.

The mercury switch shall be connected to two of the three conductors of the cable. The third conductor shall be an internal ground and shall be colored green. The switch shall have a 20 ampere rating at 115 volts AC. An additional synthetic rubber jacket shall act as a hinge between the float and where the cable is held by the stationary clamp. This clamp shall be stainless steel with an adapting fitting and two

yokes for mounting on a vertical 1-inch pipe.

A liquid rise of 1-inch from the reset position shall operate the float switch, and reset shall occur when the liquid level drops to 1-inch. Operating temperature shall be 0 degrees F to +180 degrees F.

Weight and buoyancy shall be such that contaminants like a cake of grease will not result in the float switch changing operating level more than 1-inch.

The float switches and assembly shall be manufactured by Consolidated Model 9G, or equal.

168000.1. AUTO DIALER

The Contractor shall provide and install an automatic dialing, remote monitoring unit as manufactured by RACO, Chatterbox Model CB-4, compatible with similar units previously provided to the City of Phoenix by RACO.

The unit shall be enclosed in a vandal-proof NEMA 4X enclosure together with padlock and keys (3).

Emergency power batteries shall be provided for 24 hour duration. A local alarm relay output shall be provided. The unit shall accept four dry contact inputs to indicate alarm condition when these remote contacts are in the closed position. A custom extended vocabulary shall be provided. The auto dialer shall operate on 120 volts AC, 60 hertz and be complete with battery charger.

Anti-condensation heaters shall be provided, surge protection equipment shall be provided for phone, power and signal lines. The unit shall operate at a temperature of 20 degrees F to 130 degrees F, 0-95 percent humidity noncondensing. The unit shall operate over a standard telephone leased line. Programming shall be performed by the manufacturer to the City of Phoenix' requirements. Loss of power indication shall be provided.

169000. PAYMENT

Payment for standby generator will be made at the lump sum bid for Item 1600-1, Standby Generator.

Payment for control panel will be made at the lump sum bid for Item 1600-2, Control Panel.

Payment for switchboard will be made at the lump sum bid for Item 1600-3, Switchboard.

Payment for underground conduit and wire will be made at the lump sum bid for Item 1600-4, Underground Conduit and Wire.

Payment for incidental wiring, fittings and devices will be made at the lump sum bid for Item 1600-5, Incidental Wiring, Fittings, and Devices.

Payment for service conduit, wiring and pad for APS, and Bell Telephone conduit will be made at the lump sum bid for Item 1600-6.

DIVISION 17 - INSTRUMENTATION

170002.10. CIRCULAR CHART RECORDER

The circular chart recorder shall be capable of recording up to four points on a 10-inch chart. The chart recorder shall be fully programmable in order that the recorder can be configured to accept DC voltages, thermocouple, RTD inputs and, specifically, a 4-20 mA DC input signal from an associated magmeter. All necessary signal conversion equipment shall be provided. All nonlinear inputs shall be linearized and provision must be supplied for special linearizations. The chart speed must be programmable from 1-4096 hr/revolution. The ranges and span of the input signals must be programmable to give appropriate representation on the applied charts. In addition to the recording function, the recorder shall have provisions for individual 16-character tags and messages per channel. In addition to the chart recording, there shall be a vacuum-fluorescent display that will show the appropriate tag or description and the displayed process variable being measured. The recorder shall also have assignable alarms for each pen. There will also be red LED displays to show the status of the alarms. The recorder shall also have an RS232 RS422 data communications port.

The recorder shall have the capability of integrating and totalizing up to four variables such as in the case of flow measurements. These integrating counters shall be nine digits displayed on the vacuum fluorescent display and shall be selectable as reset or nonreset type.

The recorder shall be suitable for wall mounting and shall be in a NEMA 4X enclosure. The enclosure shall be provided with a hinged clear window front, integral circulating fan with 100 SCFM capacity, inlet and outlet grilles with cleanable dust filters, and all necessary internal wiring and terminal strip.

The Contractor shall provide the services of a fully qualified factory-trained service representative of the recorder manufacturer who shall supervise and inspect the installation, initial start up, and

testing, and to make adjustments as may be necessary for proper operation. The Contractor shall make provisions for the services of the manufacturer's representative for such period of time as may be necessary to place the unit in satisfactory operating condition.

The recorder shall be a Chessell Model 390, compatible with similar units previously provided to the City of Phoenix by Chessell.

All displays shall be in engineering units. The recorder shall have an accuracy of @0.2 percent of span. The recorder shall be powered by 120 volts AC.

One year's supply of charts and ink shall be provided. Electrically isolated inputs and electrical zero and span adjustments shall be provided with no mechanical adjustments. Damping and pen speed response shall be adjustable.

170012.10. MAGNETIC FLOW SENSORS

Magnetic flow sensors shall be furnished and installed as required, complete with associated instrumentation, interfaces, cabling, and, as a minimum, shall consist of the following:

170012.11. MAGNETIC FLOWMETERS

Magnetic flowmeters shall be high impedance pulsed DC type constructed with polyurethane liners and 316 stainless steel electrodes suitable for the intended use and capable of withstanding a partial vacuum of 10 feet negative head. No ultrasonic cleaning equipment shall generally be required. Should the manufacturer require ultrasonic cleaning it shall be of the continuous cleaning type integral with the magmeter.

Unless otherwise indicated on Plans, the power supply to the meters shall be 120 volts, 60 hertz. It shall be installed in accordance with DIVISION 16 of these Contract Documents and in conformity with the recommendations of the manufacturer of the meter.

The meters shall be splashproof and shall be able to withstand accidental submergence in water (30 feet). The meters shall be coated with a corrosion-proof epoxy paint.

The output of the meter shall be linear and directly proportional to the average velocity of the fluid flowing through the meter tube. Neither turbulence nor variation in velocity profile within the flowing fluid shall affect the accuracy of the transmitter in its ability to measure the average flow. The meter shall also not be affected by a concentric buildup of slime which has the same conductivity as the flowing fluid.

The unit shall be self-zeroing with no adjustment necessary or provided.

Each magnetic flowmeter shall be grounded to a 10 foot long by 5/8-inch diameter copper clad ground rod, or an individual concrete encased ground electrode, or an existing grounding electrode conductor.

Stainless steel grounding rings shall be provided to bond liquid to meter, if required by the manufacturer.

Meter sizes and calibrations shall be as shown on Plans and/or elsewhere in these Contract Documents.

The standard calibrated accuracy of the entire system, including readout, shall not be less than @0.5 percent of maximum flow or 1 percent of rate for all metered velocities between 3 and 30 feet per second. The meter shall give no "ghost readings" under a condition of zero flow. The repeatability of the scale reading shall not be less than 0.5 percent of full scale reading and shall not be affected by fluctuations of line voltages of @±10 percent or frequency of @1 percent.

A 4-20 mA DC signal, together with power supply, shall be provided.

A 1/2 percent rate accuracy for scaled pulse signal for high accuracy billing register metering shall be provided as required elsewhere in the Contract Documents.

The flowmeters shall be KROHNE; Fischer & Porter; or equal. The manufacturer shall have had a meter of the same design and similar size continuously metering like fluid for a period of time to the satisfaction of the Engineer.

170012.12. SIGNAL CONVERTERS

The signal converter assemblies shall be mounted in NEMA 4X enclosures or NEMA 4 enclosures with corrosion-proof epoxy paint. They shall have a 4-20 mA DC and pulse output to be used to totalize, indicate, and control. All converters shall be mounted where they are easily accessible for repair and calibration. If it is required that the flowmeter be mounted in an area where accessibility may be difficult, the electronics portion should be remotely located for ease of service.

Where called for on the Plans, a local flow indicator shall be provided, scaled in engineering units.

Cable and conduit between flowmeters and signal converters shall be

furnished and installed. The size and type of cable and conduit shall be in accordance with the meter manufacturer's recommendations.

The signal converters shall be the same manufacturer as the magmeter.

170012.13. CALIBRATOR

One portable secondary calibrator shall be furnished for the magnetic flowmeters. The calibrator shall be a passive device designed to simulate the flow signal from the flowmeter. It shall have a multi-position switch and/or a fully adjustable vernier dial for different flow velocities. An electrical adaptor shall be provided for use with the calibrator, for use with low conductivity systems.

The calibrator shall be of the same make as the flowmeters and shall be specifically designed for the type of flowmeter furnished. It shall be the same manufacturer as the magmeter.

179000. PAYMENT

Payment for circular chart recorder and signal converter will be made at the lump sum bid for Item 1700-1, Circular Chart Recorder.

Payment for magnetic flowmeter will be made at the lump sum bid for Item 1700-2, Magnetic Flowmeter.

No separate pay item shall be contained in the Proposal for magnetic flow sensors or calibrator. These items shall be included in the price bid for Magnetic Flowmeter.