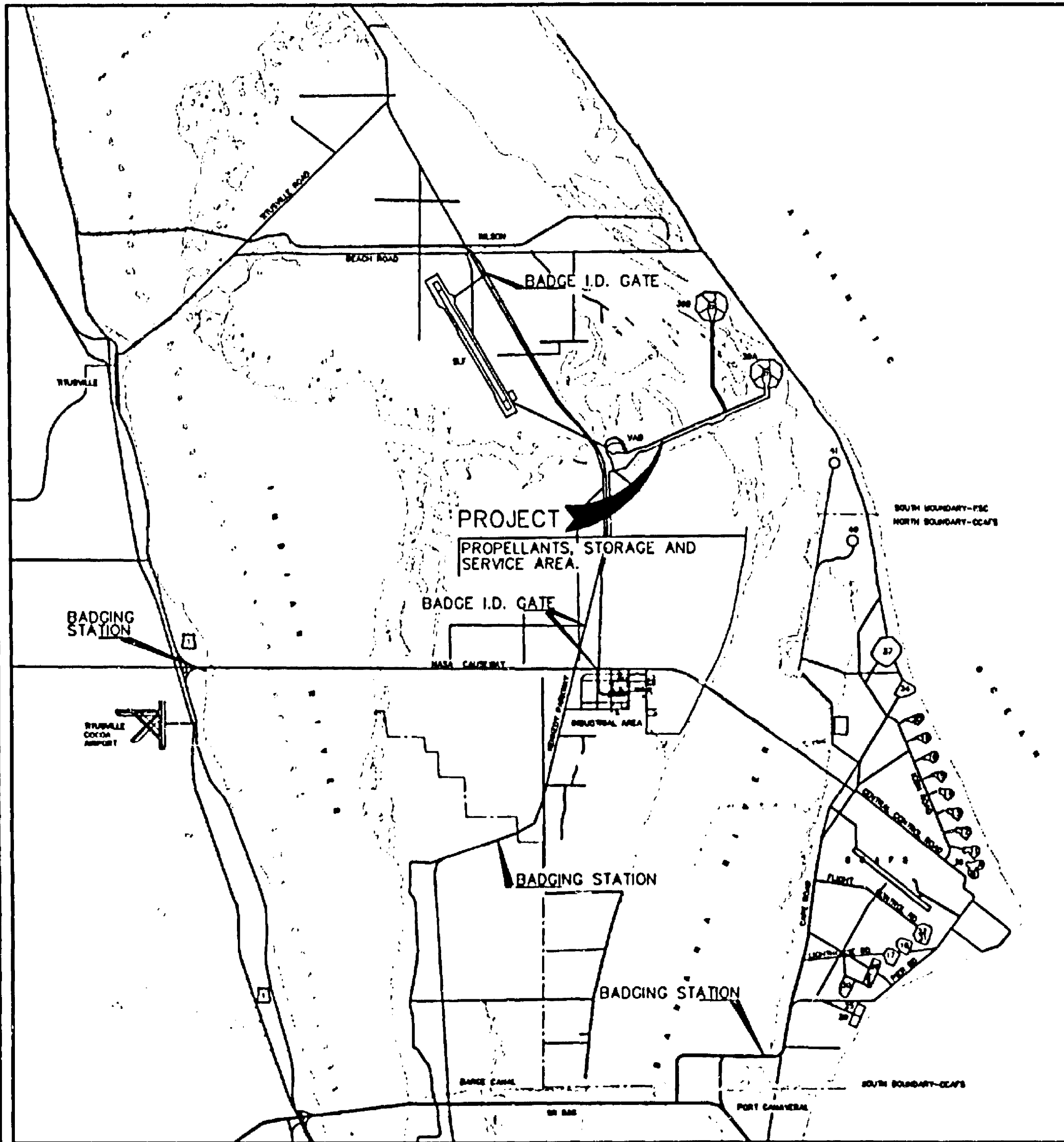


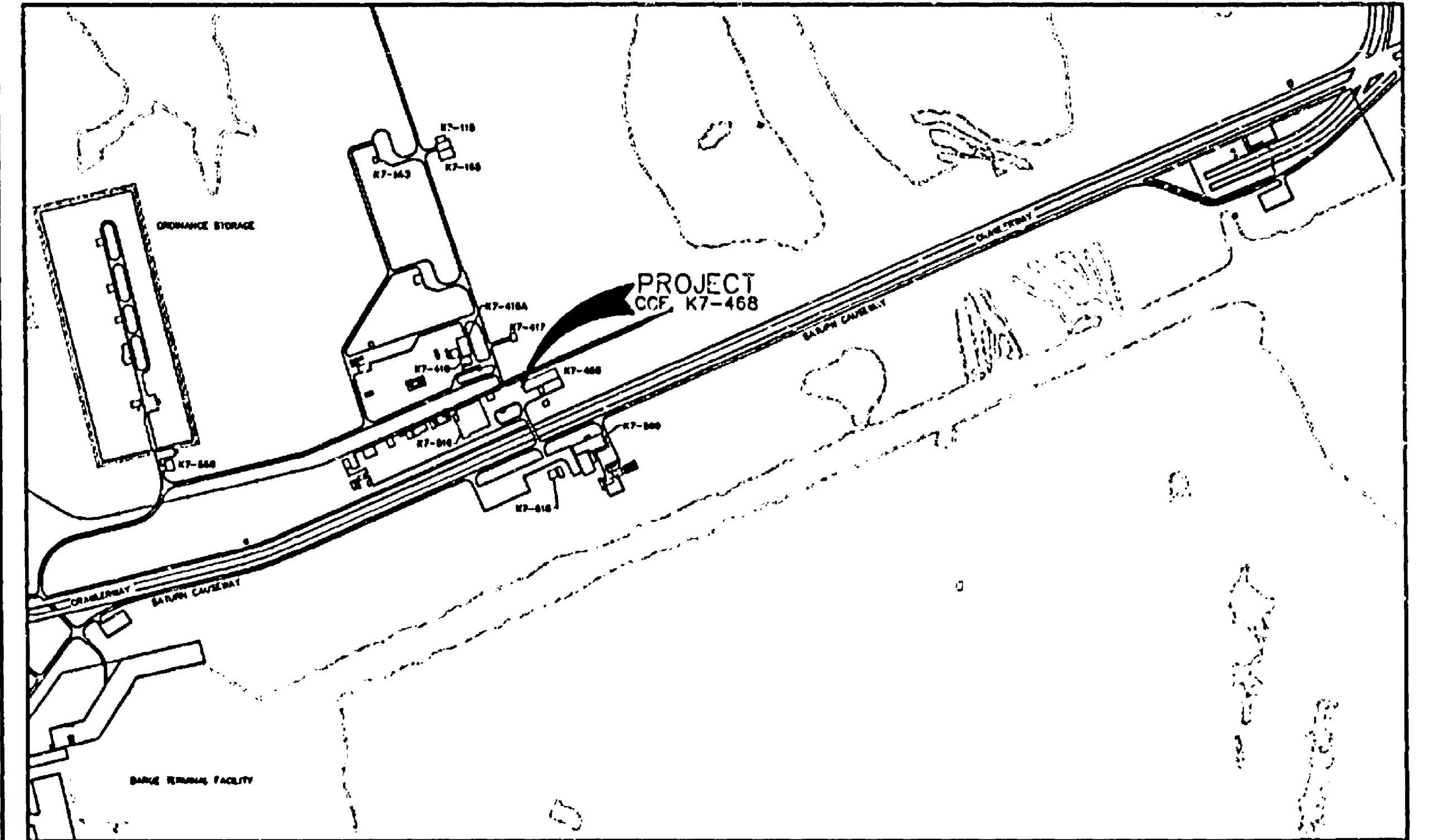
# KSC PROPELLANTS STORAGE AND SERVICE AREA CONVERTER/COMPRESSOR FACILITY K7-468 MODIFICATIONS FOR LIQUID HELIUM STORAGE

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VICINITY MAP  
SCALE: NONE



LOCATION MAP  
SCALE: NONE

**SPECIFICATIONS:**

79K35409 AND 79K35467 ACCOMPANY THIS DRAWING AND ARE A PART THEREOF.

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**JLSD**

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Engineering Business Number: 0069

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	
DRAWN: W.D.W.		7/18/02	JOHN F. KENNEDY SPACE CENTER, SLP	
CHECKED: C.MOSCIWALA		7/18/02	KENNEDY SPACE CENTER, FLORIDA	
ENGINEER: C.MOSCIWALA		7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM	
TITLE, INDEX, VICINITY AND LOCATION MAP				
SUBMITTED: C.MOSCIWALA		DATE	SIZE	ENG. NO.
APPROVED: J.L.S.D.		7/18/02	F	79K35402
TITLE BRANCH CHIEF		PROJ. NO. 980381	SHEET 1 OF 63	

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**GENERAL MECHANICAL NOTES**

1. VALVES, COMPONENTS, PARTS AND CONNECTIONS SHOWN IN DETAILS ARE REPRESENTATIVE ONLY. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PARTS, LOCATION AND INSTALLING CORRECTLY.
2. ALL VALVES AND COMPONENTS TO BE INSTALLED AND SUPPORTED PER MANUFACTURER'S INSTRUCTIONS. INSTALL TO PREVENT MOMENT LOADS ON PIPING AND TO PREVENT UNTHREADING A CONNECTION.
3. FIELD VERIFY ALL COMPONENT, EQUIPMENT & SITE DIMENSIONS AND CONDITIONS PRIOR TO INSTALLATION.
4. COVERS, CAPS, AND MATING CONNECTIONS SHALL NOT BE REMOVED UNTIL IMMEDIATELY PRIOR TO MAKING THE CONNECTION. (SEE SHEETS M-10 AND M-11)
5. (XXXXXX) DENOTES MECHANICAL "A" NUMBER, ALSO CALLED A MECHANICAL FIND NUMBER.
6. REMOVE BURRS AND BREAK SHARP EDGES, ON SUPPORT STRUCTURE.
7. PARTS, COMPONENTS, EQUIPMENT DEMOLITION, FABRICATION, INSTALLATION AND TESTING SHALL MEET THE REQUIREMENTS OF THE KSC SPECIFICATION 79K35409. IN THE EVENT OF CONFLICT BETWEEN DRAWINGS AND SPECIFICATION, THE REQUIREMENTS OF SPECIFICATION SHALL APPLY.
8. UNINSULATED PIPE SIZES ARE SPECIFIED BY NPS IN INCHES AND SCHEDULE, UNLESS OTHERWISE NOTED. LINE SIZES SHOWN WITHOUT A WALL THICKNESS ARE FOR PIPING. TUBING SIZES ARE SPECIFIED BY OD (IN INCHES) AND NOMINAL WALL THICKNESS (IN INCHES).
9. ALL DIMENSIONS ARE IN FEET AND INCHES.
10. ALL TIE-INS AND WORK AFFECTING THE EXISTING CCF SYSTEMS (I.E., AN OUTAGE AND/OR INTERRUPTION) SHALL BE APPROVED BY THE C.O. BOTH PRIOR TO START OF WORK, AND PRIOR TO THE TIE-IN INSTALLATION. CONTRACTOR SCHEDULE, PROCEDURE, AND METHOD SHALL BE APPROVED BY THE C.O. PRIOR TO WORK AND DURING PROGRESS OF WORK. PRIOR TO TIE IN, PIPING SHALL BE SUCCESSFULLY PRESSURE TESTED, CLEANED, DRIED, LEAK TESTED, AND SHALL HAVE ALL EXTERIOR CONNECTIONS PROTECTED TO MAINTAIN CLEANLINESS LEVEL AND PREVENT MOISTURE INTRUSION. (AS APPLICABLE TO THE TIE-IN). CCF OPERATIONS ACCESS (I.E., COMPLETION OF TIE-IN AND ACCESS TO AREA/SYSTEM) SHALL BE RESTORED WITHIN THE LIMIT SET FORTH IN THE (SPECIAL CONDITIONS TO THE) CONTRACT. (SEE SHEETS M-10 AND M-11)
11. CONTRACTOR SHALL PROMPTLY RETURN ALL UNUSED MATERIALS AND REMOVED MATERIALS TO THE C.O.'S REPRESENTATIVE. EXISTING SYSTEM COMPONENTS THAT HAVE BEEN REMOVED SHALL BE IMMEDIATELY PROTECTED AND TURNED-OVER TO THE C.O.'S, REPRESENTATIVE FOR STORAGE.
12. ELEVATIONS GIVEN: BE = BOTTOM SURFACE ELEVATION; TE = TOP SURFACE ELEVATION; CE = CENTERLINE ELEVATION; ARE APPROXIMATE, PROVIDED FOR THE CONTRACTORS CONVENIENCE, AND SHALL BE FIELD VERIFIED PRIOR TO FABRICATION AND INSTALLATION.
13. THESE DRAWINGS ARE INTENDED TO SHOW THE GENERAL ARRANGEMENT OF PIPING AND EQUIPMENT ONLY AND MAY NOT INDICATE EVERY OFFSET, BEND, FITTING, OR MODIFICATION OF PIPING, AND EQUIPMENT REQUIRED FOR INSTALLATION.
14. DO NOT SCALE DRAWINGS FOR FABRICATION OF PIPING.
15. NO COMPONENT SHALL BE MECHANICALLY MODIFIED EXCEPT TO ADD A BUTT WELD FITTING (SEE 79K35409) AS SPECIFIED IN THE DRAWINGS.
16. INSTALL LINES HORIZONTALLY OR VERTICALLY PLUMB, AND PARALLEL OR PERPENDICULAR TO EXISTING PIPING AND SUPPORTS, AS APPLICABLE UNLESS OTHERWISE SHOWN OR SPECIFIED.
17. PARTS ARE CALLED OUT WITH THE ITEM NUMBER IN A CIRCLE. SEE SHEET M-8 FOR PART NUMBERS. ITEM NO.
18. PROVIDE 1/4" THICK TEFLON PAD AT ALL SUPPORT POINTS WHERE PIPE RESTS ON A SUPPORT MEMBER WHETHER A PIPE CLAMP IS PROVIDED OR NOT. WHERE A PIPE CLAMP IS SHOWN, TEFLON PAD SHALL BE DRILLED AND SECURED TO SUPPORT USING PIPE CLAMP BOLTS. WHERE NO PIPE CLAMP IS SHOWN, TEFLON PAD SHALL BE DRILLED AND BOLTED OR SCREWED INTO SUPPORT MEMBER (USING HARDWARE TO MATCH SUPPORT MATERIAL).
19. PIPING SHOWN WITH A DOUBLE DASH (PHANTOM) LINE IS EXISTING, SHOWN THUS
20. WHERE NEW FLANGES ARE SHOWN, ALSO PROVIDE A NEW SEAL RING OR GASKET, (AS APPLICABLE TO THE CONNECTION) AND PROVIDE NEW STUDS, NUTS, AND WASHERS PER 79K35409.
21. WHERE NEW PIPE CLAMPS AND SUPPORTS ARE SHOWN, PROVIDE A NEW TEFLON PAD, THE WIDTH OF THE SUPPORT AND THE LENGTH OF THE (NEW) CLAMP (EDGE-TO-EDGE).
22. PROVIDE THE APPROPRIATE SST CHANNEL NUTS, BOLTS, AND ACCESSORIES FOR NEW UNISTRUT SUPPORTS.
23. CONTRACTOR SHALL ENSURE ACCESS TO THIS CONNECTION DURING THE ENTIRE CONSTRUCTION PERIOD. ACCESS IS REQUIRED FOR PIPING/FLEX HOSE LINE AND TEMPORARY SUPPORTS (FOR THE LINE) BETWEEN TANKER CONNECTION NO. 1 AND SPECIFIED CONNECTION. LINE ROUTING SHALL BE DETERMINED BY C.O. ON AN AS NEEDED BASIS. CONTRACTOR SHALL ERECT TEMPORARY SUPPORTS FOR THE LINE, AS DIRECTED BY THE C.O. AND CCF SYSTEMS ENGINEER. INTERRUPTIONS TO THE ACCESS OF THESE CONNECTIONS USING THE LINE SHALL BE APPROVED BY THE C.O., WITH ACCESS AND TEMPORARY SUPPORTS (RECONFIGURED AND/OR FABRICATED) RESTORED WITHIN THE LIMIT SET FORTH IN THE (SPECIAL CONDITIONS TO THE) CONTRACT. (SEE SHEET M-12)
24. SEE 79K35409 FOR SUPPORT MATERIAL REQUIREMENTS. FASTENERS, BOLTING, ANCHORS, NUTS AND WASHERS MATERIAL SHALL BE THE SAME AS THE SUPPORT MATERIAL UNLESS OTHERWISE NOTED. IF SUPPORT MATERIAL IS DIFFERENT THAN PIPE/TUBING/COMPONENT MATERIAL (I.E., NOT 304/316 STAINLESS STEEL) THEN USE 1/4" TEFLON PAD FOR PIPE CLAMPS AND SEVERAL WRAPS OF 3 - 4 MIL. TEFLON TAPE ON TUBING CLAMPS. ALL U-BOLTS (USED TO CLAMP PIPING) SHALL BE TEFLON COATED.
25. THE DIMENSIONS SHOWN ON THE DEWAR PIPING SUPPORT FRAMES IN FRONT OF EACH DEWAR ARE CRITICAL AND ARE REQUIRED TO ALLOW THE PIPE SUPPORT CLAMPS TO BE PROPERLY POSITIONED TO PREVENT HIGH PIPING STRESSES.

**SYMBOLS AND ABBREVIATIONS**

- AFF - ABOVE FINISHED FLOOR
- C.O. - CONTRACTING OFFICER
- CON. - CONCENTRIC
- CW - DOMESTIC COLD WATER
- DIA. OR Ø - DIAMETER
- EA - EACH
- FSN - FEDERAL STOCK NUMBER
- GFE - GOVERNMENT FURNISHED EQUIPMENT
- GHe - GASEOUS HELIUM (CRYOGENIC AND/OR AMBIENT)
- GN<sub>2</sub> - GASEOUS NITROGEN (AMBIENT)
- H.D.G. - HOT-DIPPED GALVANIZED
- LHe - LIQUID HELIUM
- LJ - LAF JOINT
- NO. - NUMBER
- NPS - NOMINAL PIPE SIZE
- OD - OUTSIDE DIAMETER
- PL - PLACES
- PS - PRESSURE SWITCH
- PT - PRESSURE TRANSDUCER
- RED. - REDUCING
- REQ'D - REQUIRED
- RF - RAISED FACE (WITH SPIRAL SEERATIONS)
- SE - STUB-END
- SST - STAINLESS STEEL (304 OR 316)
- TYP - TYPICAL
- V.I.P - VACUUM INSULATED PIPING
- VJ - VACUUM JACKETED (PIPING)
- WN - WELD NECK

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 Engineering Business Number: 0069

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE		
DRAWN	GOURTANA		7/18/02	
CHECKED	TREAGAN		7/18/02	
ENGINEER	M.D.'ALA		7/18/02	
SUBMITTED		CROSSFIELD	7/18/02	
APPROVED	J.PORTA			
TITLE		BRANCH	CHIEF	
SIZE		DWG. NO.	REV	
F		79K35402		
PROJ. NO.		06038.1	SHEET	2

**GENERAL MECHANICAL NOTES**

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
 JOHN F. KENNEDY SPACE CENTER, NASA  
 KENNEDY SPACE CENTER, FLORIDA

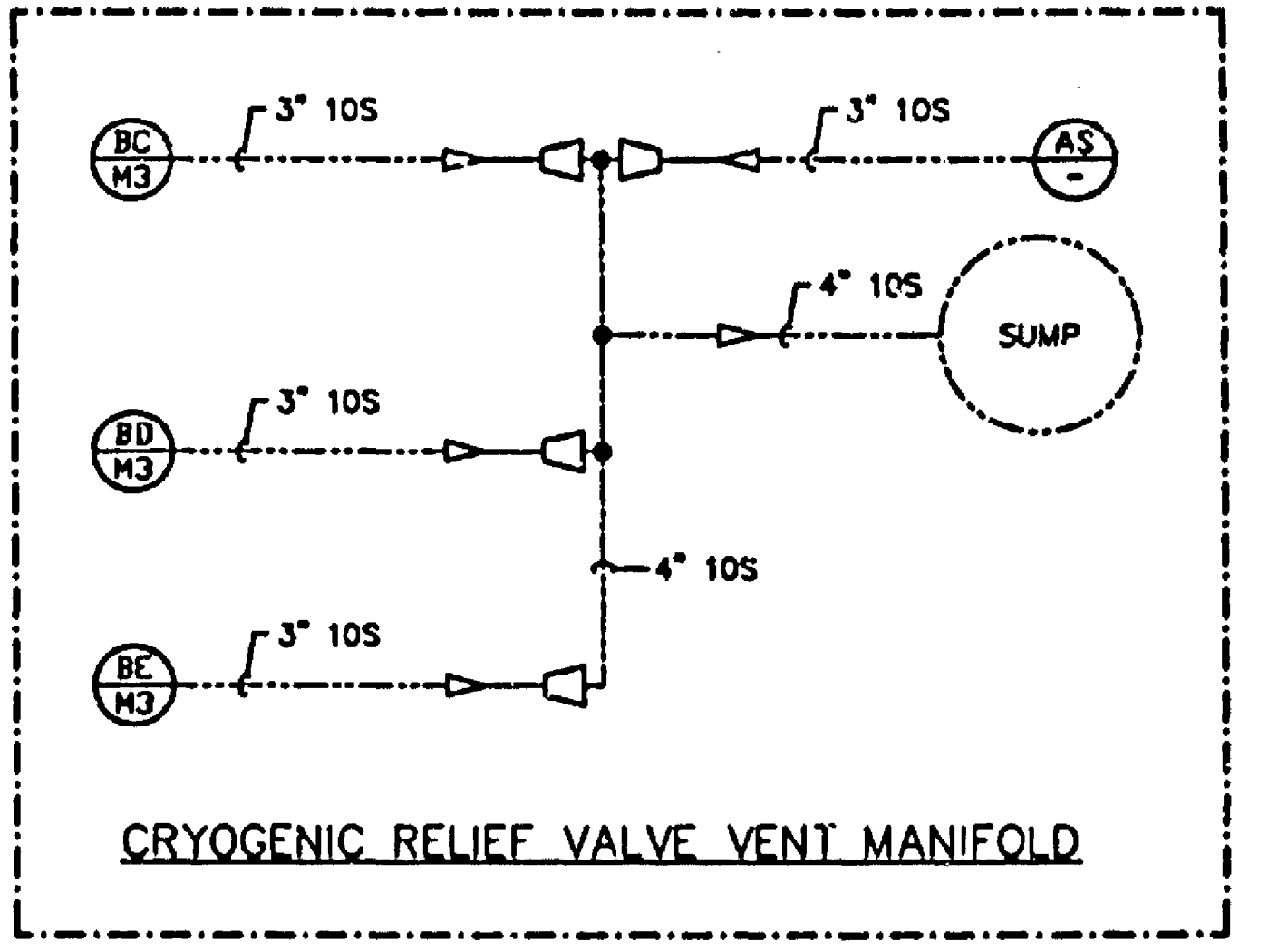
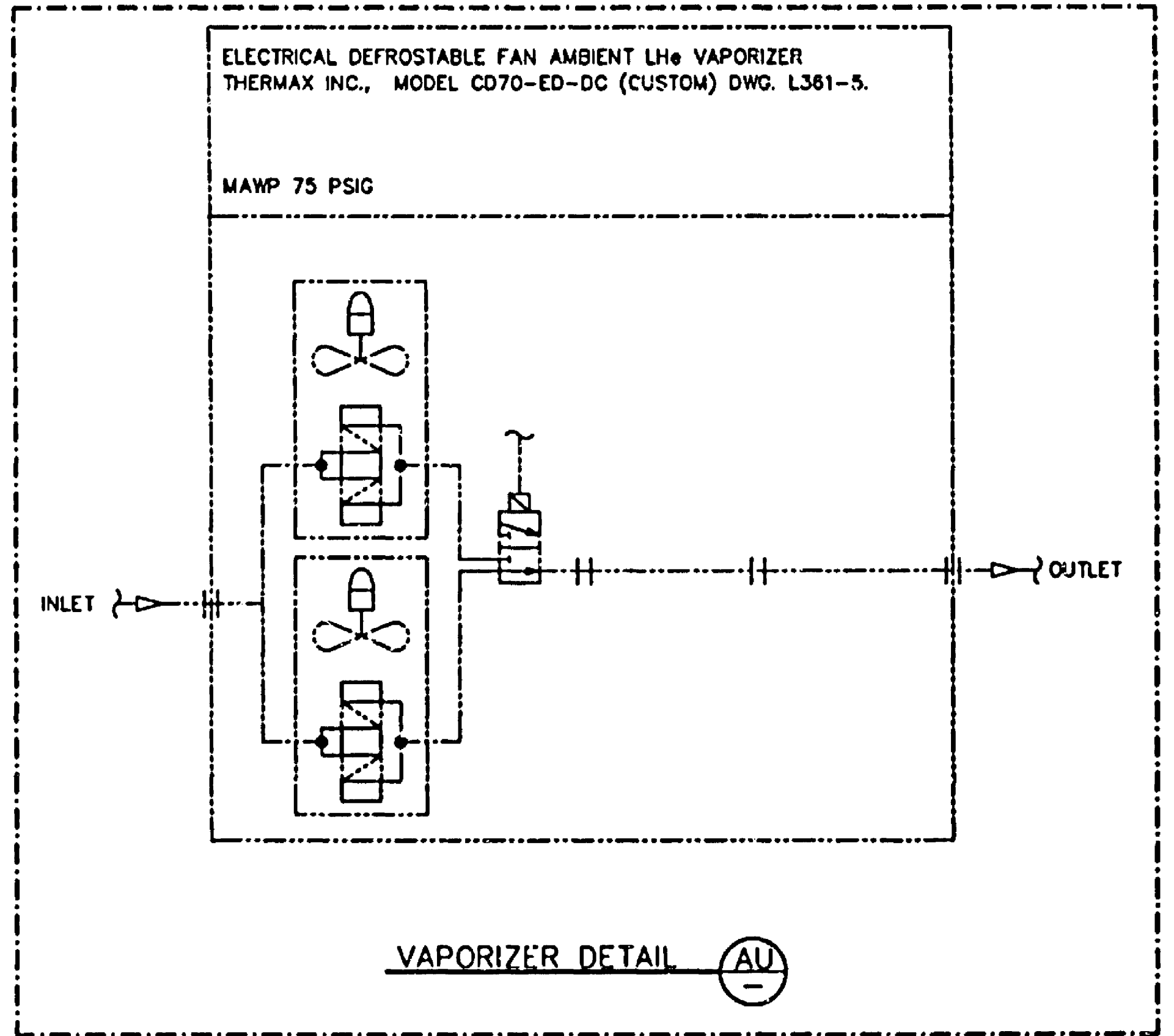
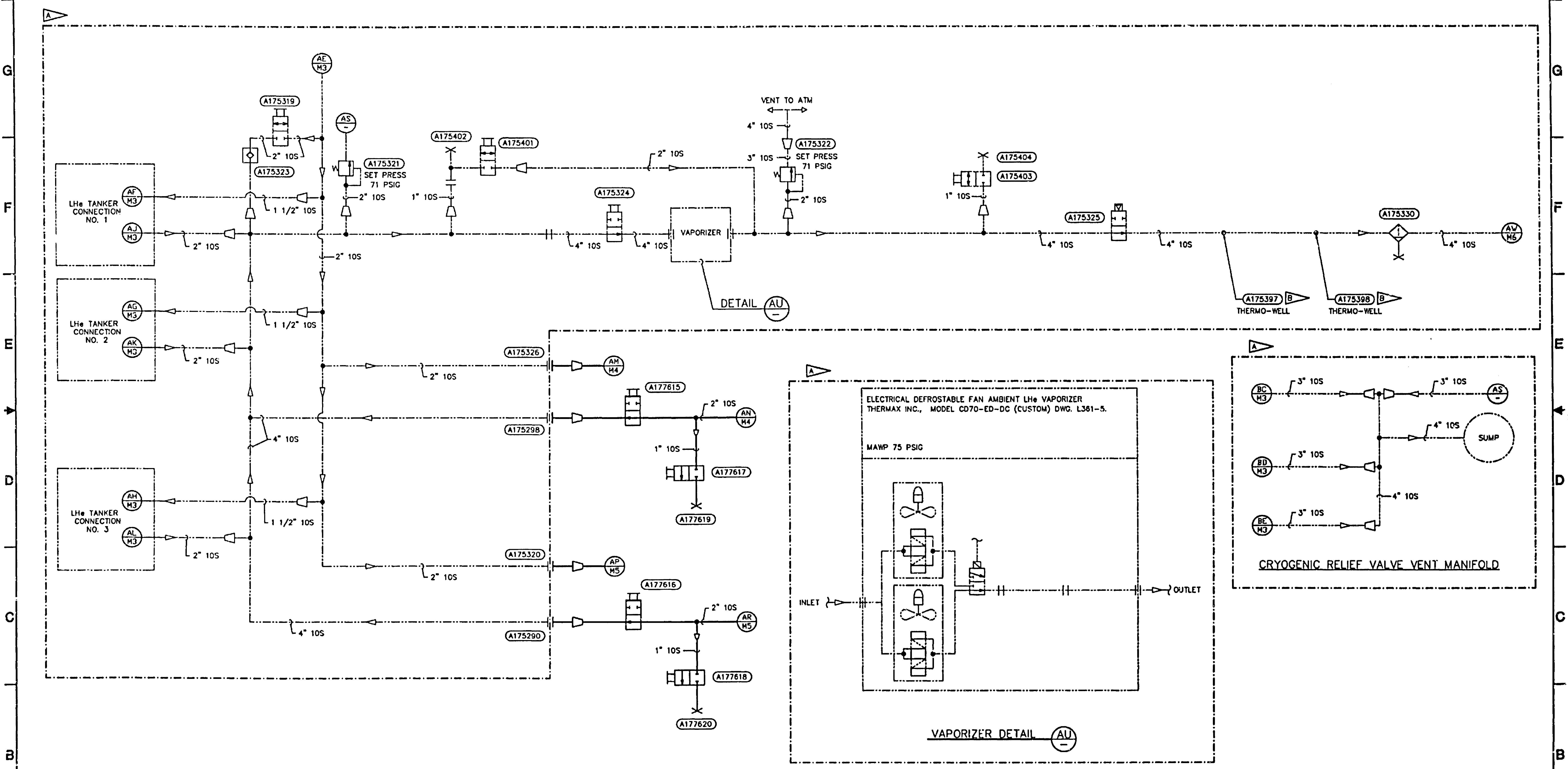
CONVERTER COMPRESSOR FACILITY MODIFICATIONS  
 FOR LIQUID HELIUM STORAGE SYSTEM

PROJ. NO. 06038.1 SHEET 2

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**SPECIFIC NOTES:**

- ▲ EXISTING; NOT IN CONTRACT
- ▢ THERMOWELLS A175397 AND A175398 ARE BLANKED OFF.



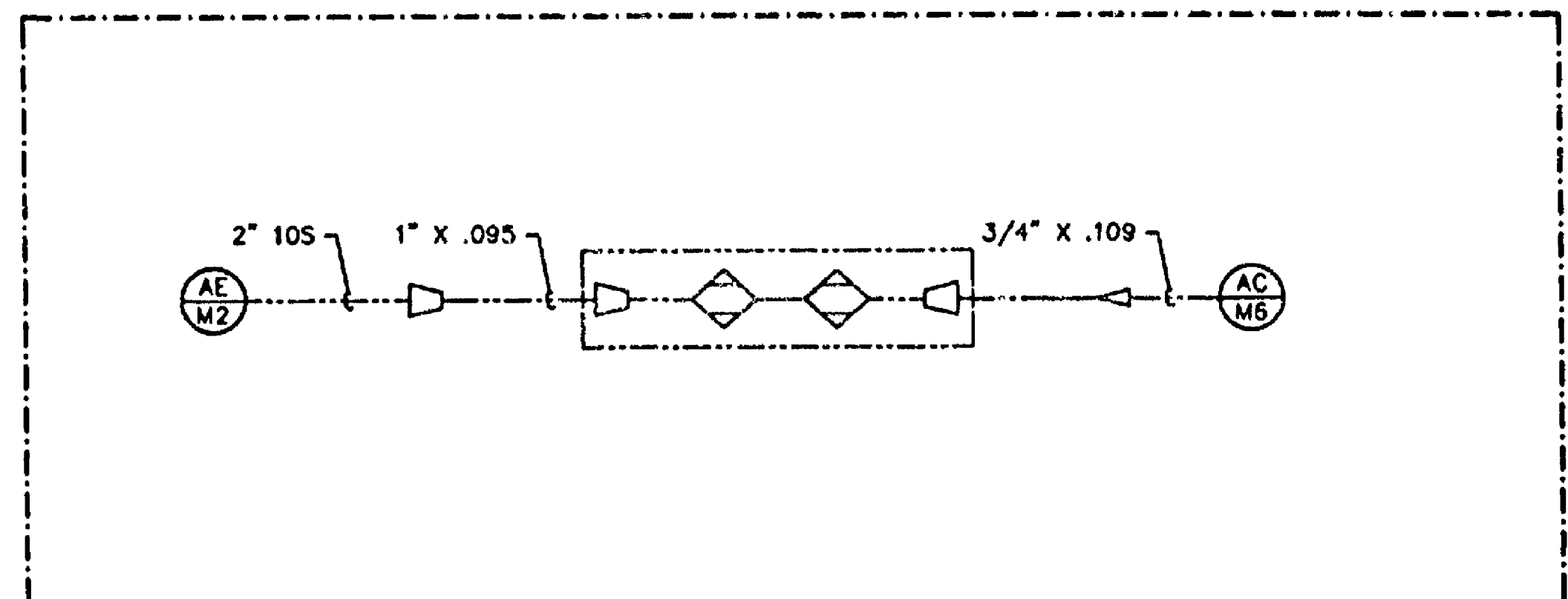
SYN	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE		
DRAWN: W. RILEY		7/18/72		
CHECKED: C. ROBERTS		7/18/72		
ENGINEER: C. ROBERTS		7/18/72		
SUBMITTED: C. ROBERTS		7/21/72		
APPROVED: J. PORTA		DATE: 8/2/72		
TITLE: BRANCH CHIEF		SIZE: Dwg. No. F 78K35402		
		PROJ. NO. 98078.1		
		SHEET 3		

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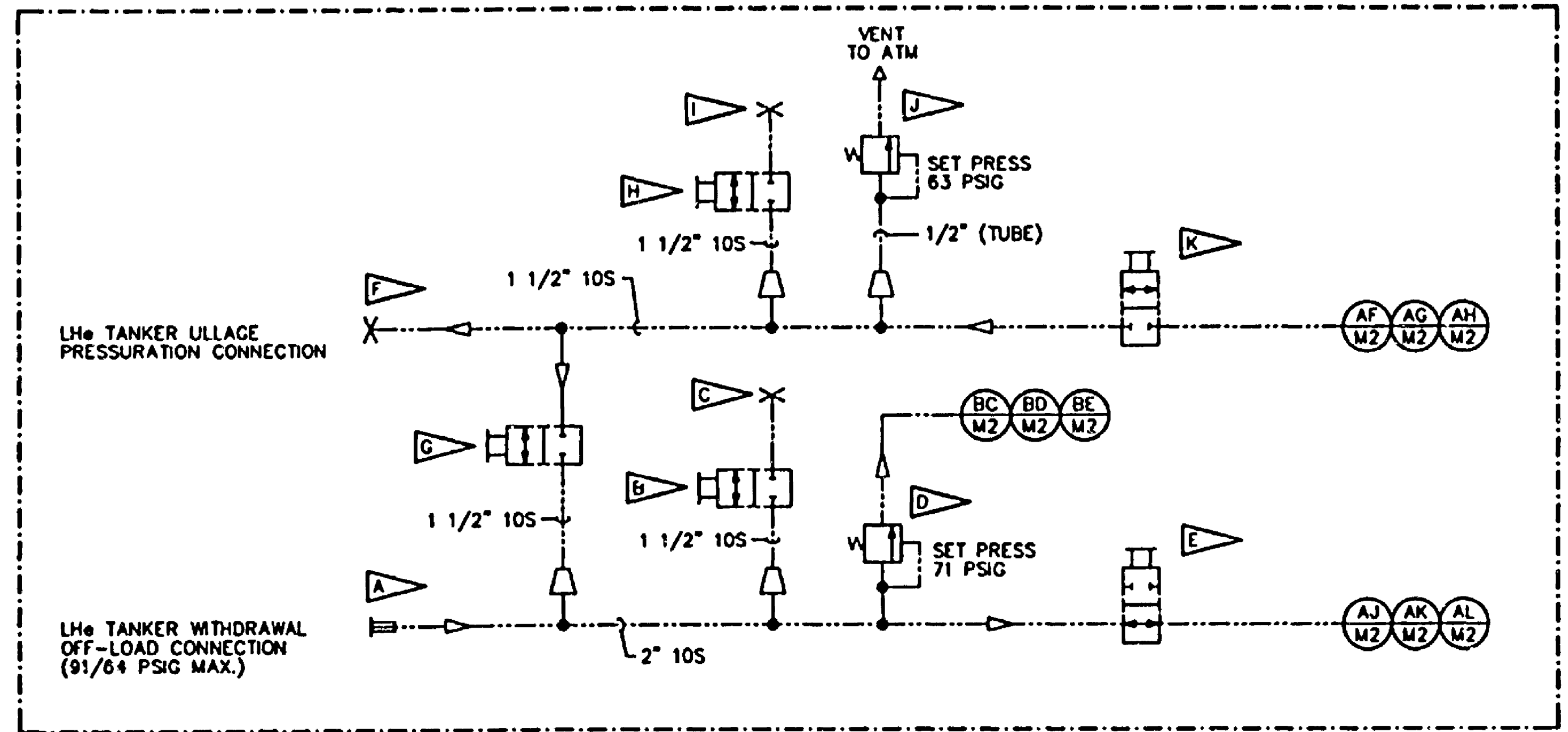
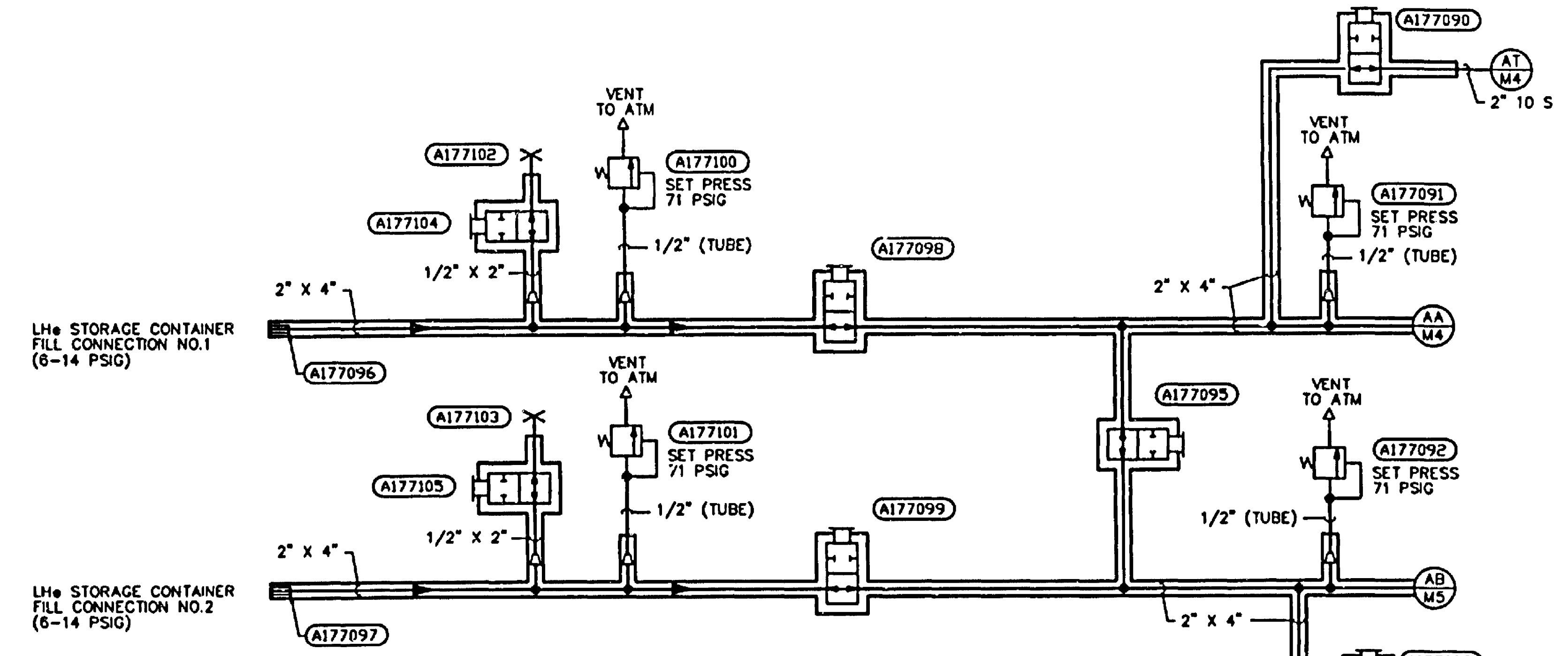
M-2

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SPECIFIC NOTES:  
 ▽ EXISTING; NOT IN CONTRACT.



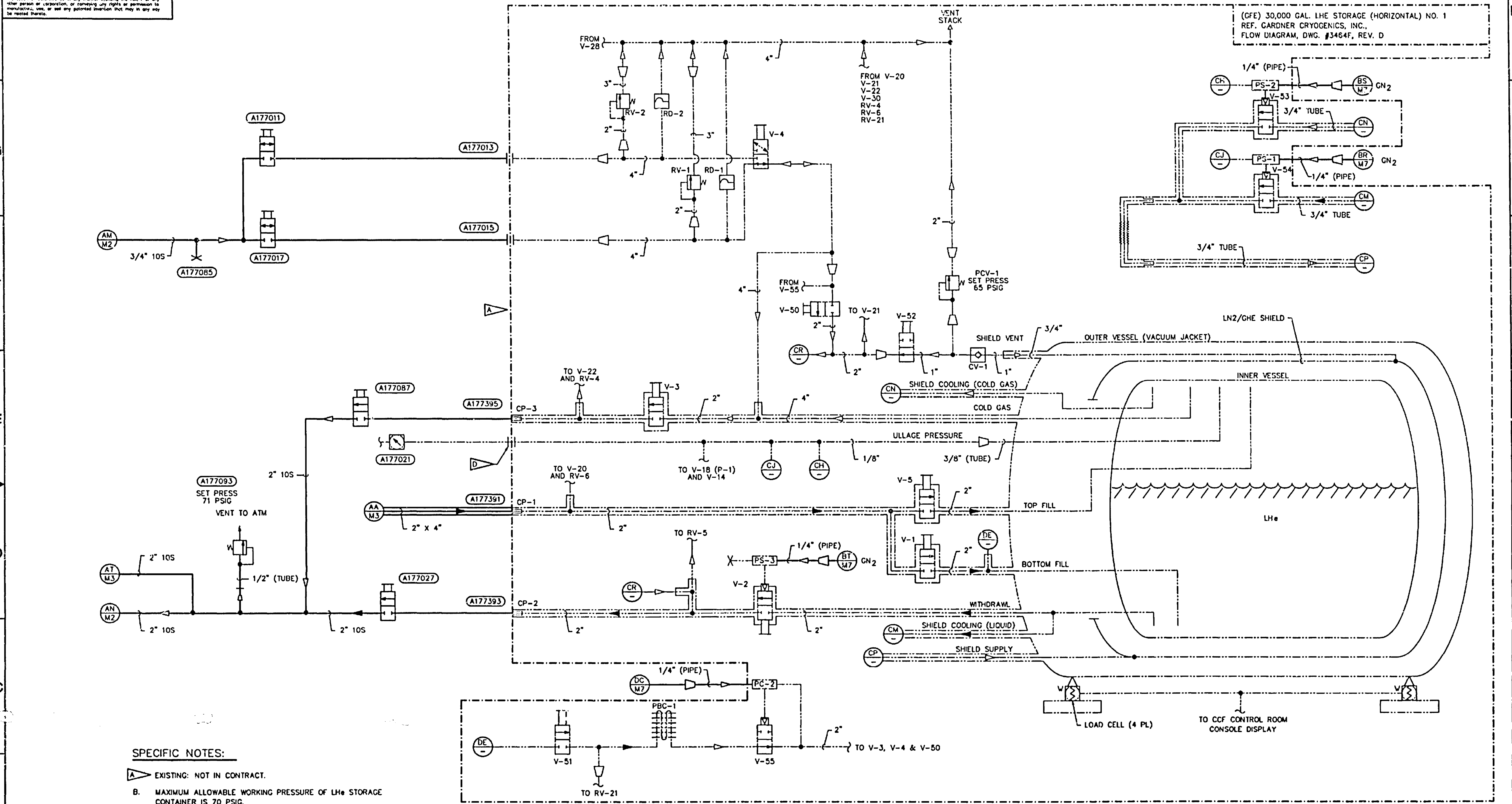
	LHe TANKER CONNECTION NO. 1	LHe TANKER CONNECTION NO. 2	LHe TANKER CONNECTION NO. 3	
A ▽	WITHDRAWAL/OFFLOAD CONNECTION	A175302	A175294	A175288
B ▽	LIQUID PURGE/SAMPLE VALVE	A175305	A175297	A175289
C ▽	LIQUID PURGE/SAMPLE CONNECTION	A175318	A175317	A175316
D ▽	WITHDRAWAL/OFFLOAD RELIEF	A175304	A175296	A175288
E ▽	WITHDRAWAL/OFFLOAD INSULATION	A175303	A175295	A175287
F ▽	ULLAGE PRESSURIZATION CONNECTION	A175306	A175299	A175291
G ▽	ULLAGE TO OFFLOAD BYPASS	A175308	A175301	A175293
H ▽	ULLAGE PURGE/SAMPLE VALVE	A175415	A175413	A175411
I ▽	ULLAGE PURGE/SAMPLE CONNECTION	A175416	A175414	A175412
J ▽	ULLAGE THERMAL RELIEF	A175309	A175311	A175313
K ▽	ULLAGE PRESSURIZATION ISOLATION	A175307	A175300	A175292



SYM	ZONE	DESCRIPTION	DATE	APPROVED
SIGNATURES				
DRAWN	W.D. RILEY	DATE	7/18/02	
CHECKED	C. ROSECPALA	DATE	7/18/02	
ENGINEER	C. ROSECPALA	DATE	7/18/02	
SUBMITTED C. ROSECPALA TEL: 1-813-445-1111				
APPROVED	J. PORTA	DATE	8/2/02	
TITLE		BRANCH CHIEF	SIZE	DWG. NO.
M-3			F	79K35402
PROJ. NO.			000361	SHEET 4

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(GFE) 30,000 GAL. LHe STORAGE (HORIZONTAL) NO. 1  
REF. GARDNER CRYOGENICS, INC.,  
FLOW DIAGRAM, DWG. #3464F, REV. D

- SPECIFIC NOTES:**
- A EXISTING; NOT IN CONTRACT.
  - B MAXIMUM ALLOWABLE WORKING PRESSURE OF LHe STORAGE CONTAINER IS 70 PSIG.
  - C MAXIMUM DESIGN PRESSURE OF VACUUM JACKETED PIPING IS 110 PSIG.
  - D CONNECTION N.I.C.

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION		
DRAWN: WD RILEY	7/18/02	JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA		
CHECKED: CROSCYPHILA	7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM		
ENGINEER: CROSCYPHILA	7/18/02	MECHANICAL SCHEMATIC		
SUBMITTED: CROSCYPHILA	8/14/02	SIZE	DWG. NO.	REV
APPROVED: J. PORTA	8/20/02	F	79K35402	
TITLE: BRANCH CHIEF		PROJ. NO.	98038.1	SHEET 6

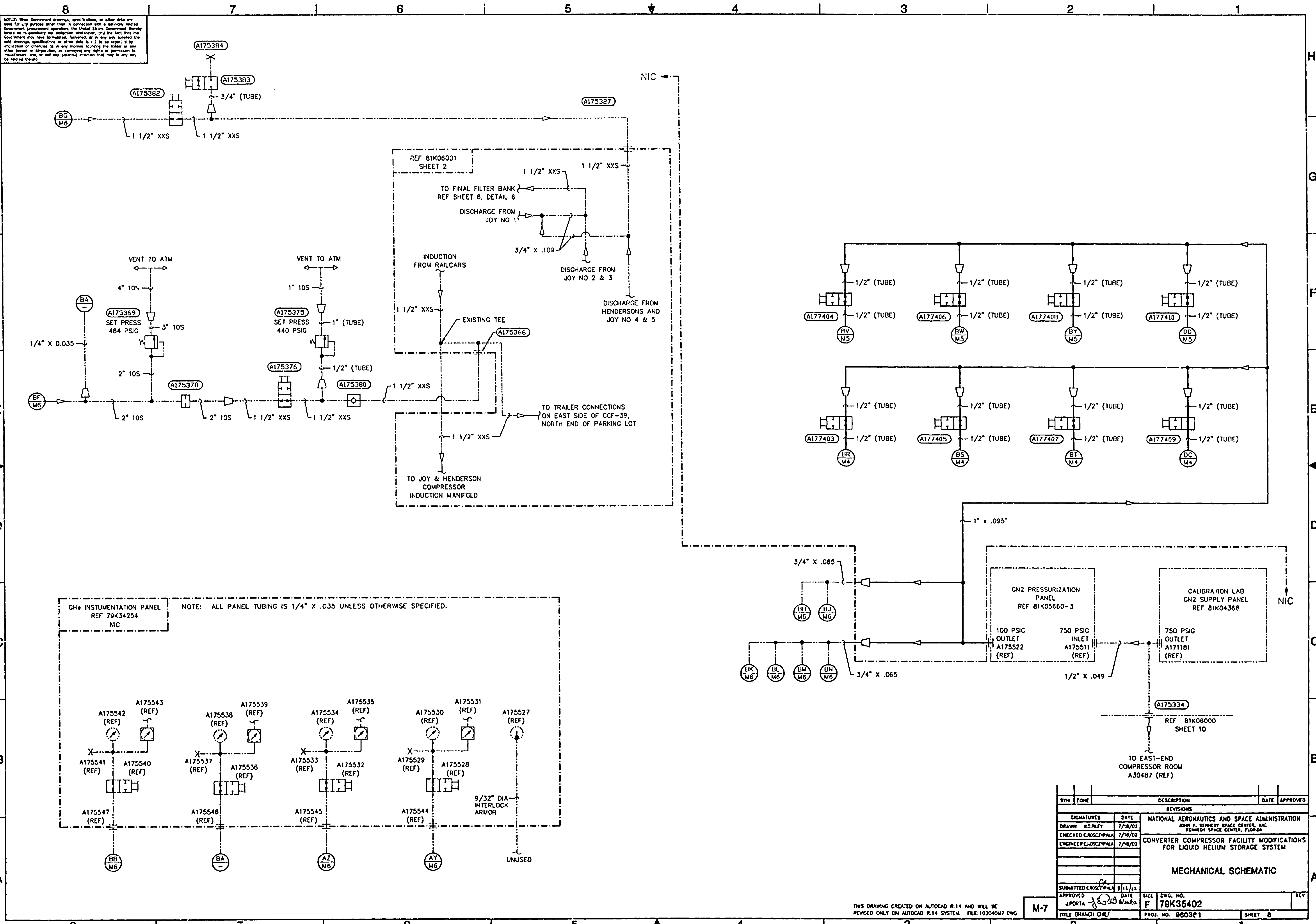
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M-4





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GH INSTRUMENTATION PANEL REF 79K34254 NIC  
 NOTE: ALL PANEL TUBING IS 1/4" X .035 UNLESS OTHERWISE SPECIFIED.

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE		
DRAWN: R2/PJL		7/8/02		
CHECKED: CROSCYPALA		7/8/02		
ENGINEER: CROSCYPALA		7/8/02		
SUBMITTED: CROSCYPALA		8/11/02		
APPROVED: J.PORTA		8/24/02		
TITLE: BRANCH CHIEF		M-7		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, HALL KENNEDY SPACE CENTER, FLORIDA	
CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM	
MECHANICAL SCHEMATIC	
SIZE: F	DWG. NO.: 79K35402
PROJ. NO.: 860301	SHEET: 6

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MECHANICAL PARTS LIST		
ITEM NO.	DESCRIPTION	SPECIFICATION/MATL/PART NO.
1	TUBING, 1/4" O.D. X .035 WALL 304/316 SST	KSC-SPEC-Z-0007
2	TUBING, 1/2" O.D. X .049 WALL 304/316 SST	KSC-SPEC-Z-0007
3	TUBING 3/4" O.D. X .065 WALL 304/316 SST	KSC-SPEC-Z-0007
4	TUBING, 1" O.D. X .095 WALL 304/316 SST	KSC-SPEC-Z-0007
5	NOT USED	N/A
6	SEAL RING, 1/4"	KC103-4
7	SEAL RING, 1/2"	KC103-8
8	SEAL RING, 3/4"	KC103-12
9	SEAL RING, 1"	KC103-16
10	NOT USED	N/A
11	O-RING, BOSS 1/4"	MS9956-4
12	O-RING, BOSS 1/2"	MS9956-8
13	O-RING, BOSS 3/4"	MS9956-12
14	O-RING, BOSS 1"	MS9956-16
15	NOT USED	N/A
16	REDUCER - ADAPTER, FLARED TUBE FOR SEAL RING	KC106K8-4
17	REDUCER - ADAPTER, FLARED TUBE FOR SEAL RING	KC106K16-8
18	REDUCER - ADAPTER, FLARED TUBE FOR SEAL RING	KC106K16-12
19	NOT USED	N/A
20	ADAPTER, FLARED TUBE & BOSS FOR SEAL RING 1/4"	KC112K4
21	ADAPTER, FLARED TUBE & BOSS FOR SEAL RING 1/2"	KC112K8
22	ADAPTER, FLARED TUBE & BOSS FOR SEAL RING 3/4"	KC112K12
23	ADAPTER, FLARED TUBE & BOSS FOR SEAL RING 1"	KC112K16
24	NIPPLE - FLARED TUBE & THREAD FOR SEAL RING	KC116K4-4
25	NIPPLE - FLARED TUBE & THREAD FOR SEAL RING	KC116K8-4
26	NIPPLE - FLARED TUBE & THREAD FOR SEAL RING	KC116K8-8
27	NIPPLE - FLARED TUBE & THREAD FOR SEAL RING	KC116K16-12
28	ELBOW, 90°, FLARED TUBE FOR SEAL RING	KC118K16
29	TEE, FLARED TUBE FOR SEAL RING - OUTLET 1/4"	KC123K4
30	TEE, FLARED TUBE FOR SEAL RING - OUTLET 1"	KC123K16
31	ELBOW ASSY, 90° FEMALE SWIVEL END 3/4"	KC131K12
32	ELBOW ASSY, 90° FEMALE SWIVEL END 1"	KC131K16
33	REDUCER, ADAPTER, FLARED TUBE 1/2" TO 1/4"	KC133K8-4
34	REDUCER, ADAPTER, FLARED TUBE 3/4" TO 1/4"	KC133K12-4
35	REDUCER, ADAPTER, FLARED TUBE 3/4" TO 1/2"	KC133K12-8
36	REDUCER, ADAPTER, FLARED TUBE 1" TO 1/2"	KC133K16-8
37	REDUCER, ADAPTER, FLARED TUBE 1" TO 3/4"	KC133K16-12
38	REDUCER, ADAPTER, FLARED TUBE 1" TO 1/4"	KC133K16-4
39	ADAPTER, FLARED TUBE TO BOSS FOR SEAL RING	KC134K12
40	NOT USED	N/A
41	NUT COUPLING 1/4"	KC142K4
42	NUT COUPLING 1/2"	KC142K8
43	NUT COUPLING 3/4"	KC142K12
44	NUT COUPLING 1"	KC142K16
45	NOT USED	N/A
46	SLEEVE, FLARED TUBE FITTING, 1/4"	KC143K4
47	SLEEVE, FLARED TUBE FITTING, 1/2"	KC143K8
48	SLEEVE, FLARED TUBE FITTING, 3/4"	KC143K12
49	SLEEVE, FLARED TUBE FITTING, 1"	KC143K16
50	SPUD, BUTTWELD TUBE .035 WALL, 1/4"	KC145K4A
51	SPUD, BUTTWELD TUBE .049 WALL, 1/2"	KC145K8B
52	SPUD, BUTTWELD TUBE .065 WALL, 3/4"	KC145K12D
53	SPUD, BUTTWELD TUBE .095 WALL, 1"	KC145K16F
54	NOT USED	N/A
55	UNION, BUTTWELD TUBE, .035 WALL, 1/4"	KC146K4A

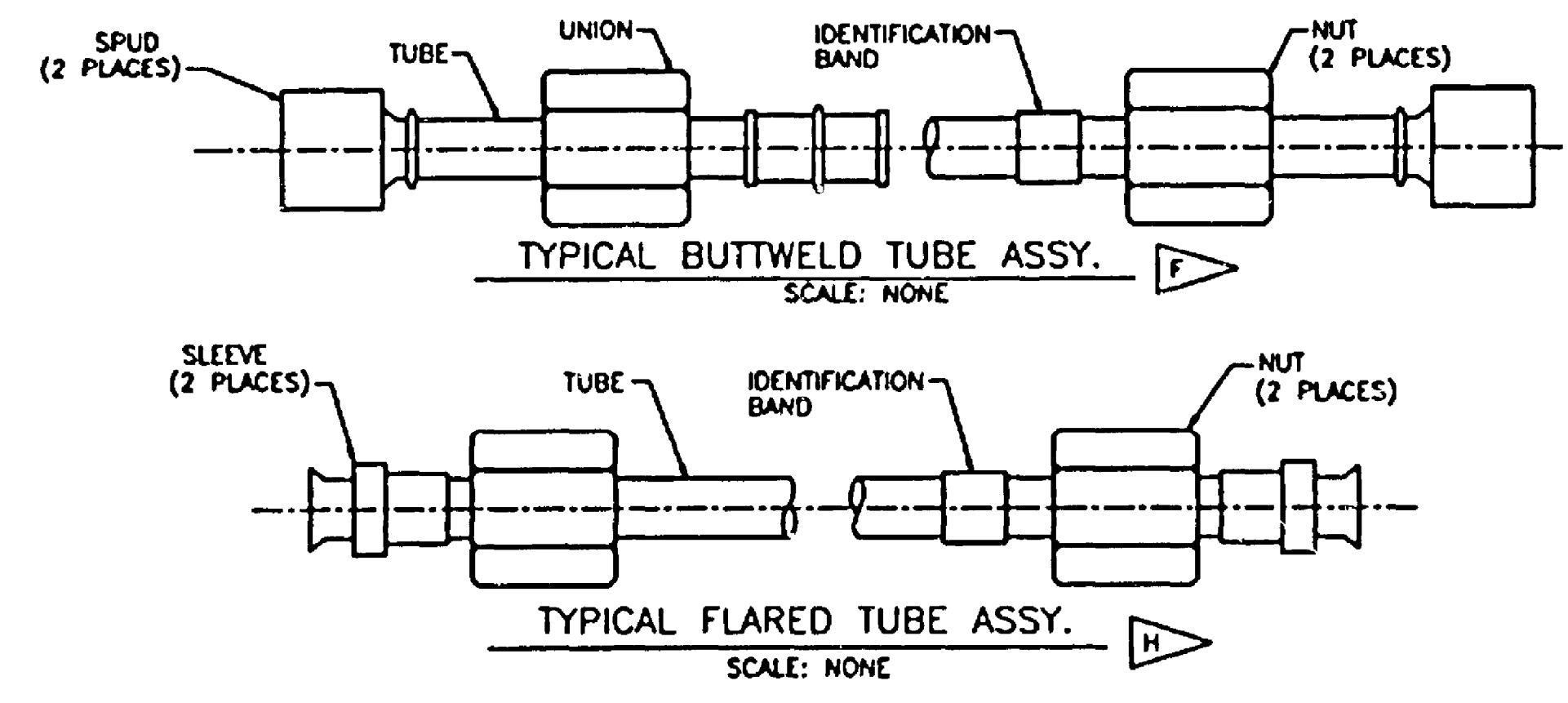
MECHANICAL PARTS LIST		
ITEM NO.	DESCRIPTION	SPECIFICATION/MATL/PART NO.
56	UNION, BUTTWELD TUBE, .049 WALL, 1/2"	KC146K8B
57	UNION, BUTTWELD TUBE, .065 WALL, 3/4"	KC146K12D
58	UNION, BUTTWELD TUBE, .095 WALL, 1"	KC146K16F
59	CAP ASSEMBLY PRESSURE SEAL, 3/4", WITH RETAINER	KC150K12A
60	CAP ASSEMBLY PRESSURE SEAL, 1", WITH RETAINER	KC150K16A
61	UNION, ADJUSTABLE END	KC170K8
62	UNION ASSEMBLY, DOUBLE SWIVEL NUT	KC171K8
63	TUBE VENT CAP ASSY 1" (TF33331V16K-1)	FSN3040-01-367-0372
64	IDENTIFICATION TAG 1/4" TUBING	75M04185-1-15
65	IDENTIFICATION TAG 1/2" TUBING	75M04185-2-8
66	IDENTIFICATION TAG 3/4" TUBING	75M04185-3-2
67	IDENTIFICATION TAG 1" TUBING	75M04185-3-26
68	U - BOLT (4" NPS) 1/2" - 13 UNC PIPE COATED	304/316 SST
69	FLAT WASHER 1/4"	304/316 SST
70	FLAT WASHER 3/8"	304/316 SST
71	FLAT WASHER 1/2"	304/316 SST
72	STAINLESS STEEL CHANNEL NUT 1/4" - 20 UNC	P100RU-1420
73	STAINLESS STEEL CHANNEL NUT 3/8" - 16 UNC	P100BU
74	STAINLESS STEEL CHANNEL NUT 1/2" - 13 UNC	P1010U
75	HEX NUT 1/4" - 20 UNC	304/316 SST
76	HEX NUT 3/8" - 16 UNC	304/316 SST
77	HEX NUT 1/2" - 13 UNC	304/316 SST
78	CHANNEL, 12GA, 1 5/8" x 1 5/8"	P1000
79	NINETY DEGREE ANGLE FITTING	P1026
80	WING SHAPE FITTING	P2341L
81	WING SHAPE FITTING	P2341R
82	WING SHAPE FITTING	P2223
83	POST BASE	P2072A
84	PIPE CLAMP 1/2" PIPE SIZE	P2558-05
85	PIPE CLAMP 3/4" PIPE SIZE	P2558-07
86	PIPE CLAMP 1" PIPE SIZE	P2558-10
87	PIPE CLAMP 1 1/2" PIPE SIZE	P2558-15
88	PIPE CLAMP 2" PIPE SIZE	P2558-20
89	PIPE CLAMP 2 1/2" PIPE SIZE	P2558-25
90	PIPE CLAMP 3" PIPE SIZE	P2558-30
91	PIPE CLAMP 4" PIPE SIZE	P2558-40
92	PIPE CLAMP 5" PIPE SIZE	P2558-50
93	PIPE CLAMP 1/4" TUBE	P2024
94	PIPE CLAMP 3/4" TUBE	P2028
95	PIPE CLAMP 1" TUBE	P2030
96	THREADED ROD, 1/2" DIAMETER, 13 UNC	304/316 SST
97	TEFLON PAD, 1/4" THICK, 25% GLASS FILLED	79K35409
98	FLANGE, ANSI, 1 1/2" 150 #, WELD NECK, RF	304/316 SST
99	FLANGE, ANSI, 4" 150 #, WELD NECK, RF	304/316 SST
100	FLANGE, E-COM, 3/4" 150 #, WELD NECK	304/316 SST
101	FLANGE, E-COM, 1" 150 #, WELD NECK	304/316 SST
102	FLANGE, E-COM, 2" 150 #, WELD NECK	304/316 SST
103	FLANGE, E-COM, 2" 150 #, LJ/SE	304/316 SST
104	FLANGE, E-COM, 4" 150 #, WELD NECK	304/316 SST
105	1/2" BOSS CONNECTION AT VJ TERMINATION	MS33649-8
106	3/4" BOSS CONNECTION AT VJ TERMINATION	MS33649-12
107	NUT, FLARED TUBE	AN924-K16
108	FITTING, TUBE TO BUTT WELD	AAB 1099-16KG 0.75-10
109	FITTING, TUBE TO BUTT WELD	AAB 1099-16KG 1.00-10
110	FITTING, FLARED TUBE SWIVEL TO BUTT WELD	AAB 1072-16K 0.75-10

HOSE REEL ASSEMBLY PARTS LIST		
ITEM NO.	DESCRIPTION	SPECIFICATION/MATL/PART NO.
111	INDUSTRIAL FIRE HOSE NOZZLE, 1" NHT (NATIONAL HOSE THREAD), COMBINATION FOG NOZZLE, FM APPROVED, ULC LISTED - UNITED FIRE SAFETY CO., LTD., HOSE NOZZLE #1030 (OR EQUAL)	UNITED FIRE SAFETY CO., LTD. 55 SHICLAIR AVE., UNIT 6 GEORGETOWN, ONTARIO, CANADA, L7G 4X4
	INDUSTRIAL FIRE HOSE, 1" I.D. BY 100 FT. LENGTH, LOW PRESSURE, SINGLE JACKET, RUBBER LINED, RUBBER COVERED, ROUND HOSE, MALE END CONNECTIONS - AMAZON HOSE & RUBBER CO., 1" x 100' MILL HOSE (OR EQUAL)	AMAZON HOSE & RUBBER CO., 1625 W. PRINCETON STREET ORLANDO, FLORIDA, 32004
	MANUAL REWIND HOSE REEL FOR 100 FT. BY 1" I.D. HOSE, - NORDIC SYSTEMS INC., MGOEL #1010-19-22-10FF (OR EQUAL)	NORDIC SYSTEMS, INC., 1044 RANGEMEADOW ROAD MISSISSAUGA, ONTARIO, CANADA, L5E 1H3

HOSE REEL WATER SUPPLY PIPING SHALL BE SEAMLESS COPPER TUBING CONFORMING TO ASTM B 86, TYPE "L" HARD DRAWN. FITTINGS SHALL BE 150 PSIG WORKING STEAM PRESSURE, WROUGHT COPPER SOLDER JOINT TYPE CONFORMING TO ASTM B 16.22. UNIONS SHALL BE WROUGHT COPPER SOLDER JOINT TYPE CONFORMING TO ASTM B 16.22. SOLDER SHALL BE 93-5 TIN ANTI-MONY CONFORMING TO ASTM B 32. PIPING SHALL BE ISOLATED FROM DISSIMILAR METALS USING TEFLON TAPE OR AS APPROVED BY THE CONTRACTING OFFICER.

FITTING ASSEMBLY SCHEDULE	
PLAN MARK	FITTING ASSEMBLY DESCRIPTION
AA	AAB1099-16KG 0.75-10, AN924-16K, KC150K16A, KC103-16
BB	AAB1072-16K 0.75-10, KC116K16-12, KC103-16
CC	KC116K4-4, KC103-4
DD	INLET: KC133K16-8, KC103-16, MS9956-8; OUTLET: KC112K8, KC103-8, MS9956-8
EE	KC116K8-4, KC103-8
FF	1/2" x .049 TUBING ASSEMBLY, KC116K8-4, KC103-8
GG	MS33649-8 AT VJ TERMINATION. VALVE INLET: KC170K8, MS9956-8. BETWEEN VALVE AND SNUBBER: KC112K8, KC171K8, KC116K8-8, MS9956-8, KC103-8 (2 EA). OUT OF SNUBBER: KC116K8-8, KC106K8-4, KC142K8, KC103-8, KC103-4.
HH	MS33649-12 AT VJ TERMINATION, KC134K12, AN924-12K, KC150K12A, KC103-12, MS9956-12
JJ	KC106K16-8, KC106K8-4, KC142K16, KC142K8, KC103-16, KC103-8, KC103-4
KK	AAB1099-15KG 1.00-10, AN924-16K, KC150K16A, KC103-16
LL	KC123K16, KC106K16-12, KC142K16, KC103-16 (3 EA), KC103-12
MM	DISCHARGE: KC116K16-16, KC131K16, KC103-16.

- SPECIFIC NOTES:**
- A. PARTS IN THIS LIST ARE FOUND ON SHEETS M-10 THRU M-27, AND NOT ALL PARTS AND ASSEMBLIES SHOWN ARE USED.
  - B. ONLY KC FITTINGS, KSC-SPEC-Z-0007 TUBING AND ITEMS WITH A FSN ARE GFE UNLESS OTHERWISE NOTED. THE CONTRACTOR MUST FURNISH ALL OTHER PARTS AND MATERIALS IN THIS LIST. EXACT QUANTITIES SHALL BE DETERMINED BY THE CONTRACTOR.
  - C. UNISTRUT CORP (OR APPROVED EQUAL)  
35660 CLINTON STREET  
WAYNE, MI 48184
  - D. ALLAN AIRCRAFT SUPPLY CO. (OR APPROVED EQUAL)  
11643 VANHORN ST.  
N. HOLLYWOOD, CA. 91609
  - E. RE-FLANGE, INC. (OR APPROVED EQUAL)  
5730 CENTRALCREST  
HOUSTON, TX 77092
  - F. KC146 UNION SHALL BE USED IF LENGTH BETWEEN COMPONENT CONNECTIONS REQUIRES A THREADED UNION. FINISHED LENGTH SHALL BE DETERMINED AT INSTALLATION.
  - G. IDENTIFICATION TAG IS REQUIRED ON EACH TUBE AND PIPE ASSEMBLY. ALL TUBING AND PIPING SHALL BE IDENTIFIED IN ACCORDANCE WITH 79K35409.
  - H. LOCATION OF FLARED TUBED ENDS AND FINISHED LENGTH SHALL BE DETERMINED AT INSTALLATION.



TUBE ASSEMBLY ITEM NUMBERS						
TUBE SIZE	TUBE	NUT	SLEEVE	UNION	SPUD	ID BAND
1/4" x .035	1	41	46	55	50	64
1/2" x .049	2	42	47	56	51	65
3/4" x .065	3	43	48	57	52	66
1" x .095	4	44	49	58	53	67

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**JLSD** Johnson, Lippmann, Elder, Dertke, Inc. CONSULTING ENGINEERS

1000 American Ave South, Suite 201, Fort Palm Beach, FL 33408 • (407) 889-8200 • FAX 889-8802 • www.jlstd.com • Engineering Business Number: 0009

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION		
DRAWN G. QUINLAN	7/18/02	John F. Kennedy Space Center, NASA		
CHECKED T. TEAGANS	7/18/02	Edwards Space Center, Florida		
ENGINEER M. DAVILA	7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM		
<b>MECHANICAL PARTS LIST</b>				
APPROVED	DATE	SIZE	DWG. NO.	REV
J. PORTA	7/18/02	F	70K36402	
TITLE BRANCH CHIEF	PROJ. NO. 980361	SHEET 9		

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definite related Government procurement operation, the United States Government thereby incurs no responsibility for adoption or use, and the fact that the Government may have furnished, furnished, or in any way supplied the said drawings, specifications or other data is not to be regarded as an implication of approval or in any manner favoring the manufacturer, user, or any other person or corporation, or suggesting any liability in any way on the part of the Government.

A-DESIGNATION	COMPONENT DESCRIPTION	MANUFACTURER	PART NO./SPECIFICATION/MATERIAL
A177011	BALL VALVE, 3/4" NPS, LOW TEMP. SERVICE, SA182-316L BODY-BALL-STEM, HOSTAFLOX SEATS/SEALS, SCH. 10 BW CONNECTIONS, ISO CENTER SEC., 6" EXTENDED STEM, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F	A	3/4" SLT 66 HCH BWE S.10 I E6 H
A177012	BALL VALVE, 3/4" NPS, LOW TEMP. SERVICE, SA182-316L BODY-BALL-STEM, HOSTAFLOX SEATS/SEALS, SCH. 10 BW CONNECTIONS, ISO CENTER SEC., 6" EXTENDED STEM, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F	A	3/4" SLT 66 HCH BWE S.10 I E6 H
A177013	PORT, 3/4" FNPT	N/A	N/A
A177014	PORT, 3/4" FNPT	N/A	N/A
A177015	PORT, 3/4" FNPT	N/A	N/A
A177016	PORT, 3/4" FNPT	N/A	N/A
A177017	BALL VALVE, 3/4" NPS, LOW TEMP. SERVICE, SA182-316L BODY-BALL-STEM, HOSTAFLOX SEATS/SEALS, SCH. 10 BW CONNECTIONS, ISO CENTER SEC., 6" EXTENDED STEM, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F	A	3/4" SLT 66 HCH BWE S.10 I E6 H
A177018	BALL VALVE, 3/4" NPS, LOW TEMP. SERVICE, SA182-316L BODY-BALL-STEM, HOSTAFLOX SEATS/SEALS, SCH. 10 BW CONNECTIONS, ISO CENTER SEC., 6" EXTENDED STEM, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F	A	3/4" SLT 66 HCH BWE S.10 I E6 H
A177021	PRESSURE TRANSDUCER, GAUGE TYPE, 0 TO 500 PSIG, SINGLE HEAD, 316 STAINLESS STEEL PROCESS HEADS AND BARRIER DIAPHRAGMS, SILICONE FILL FLUID, SMART METER	E	STG140-E1A-00000-SB-SM-LP-CR-9X
A177022	PRESSURE TRANSDUCER, GAUGE TYPE, 0 TO 500 PSIG, SINGLE HEAD, 316 STAINLESS STEEL PROCESS HEADS AND BARRIER DIAPHRAGMS, SILICONE FILL FLUID, SMART METER	E	STG140-E1A-00000-SB-SM-LP-CR-9X
A177027	BALL VALVE, 2" NPS, LOW TEMP. SERVICE, SA182-316L BODY-BALL-STEM, HOSTAFLOX SEATS/SEALS, SCH. 10 BW CONNECTIONS, ISO CENTER SEC., 6" EXTENDED STEM, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F	A	2" SLT 66 HCH BWE S.10 I F6 H
A177028	BALL VALVE, 2" NPS, LOW TEMP. SERVICE, SA182-316L BODY-BALL-STEM, HOSTAFLOX SEATS/SEALS, SCH. 10 BW CONNECTIONS, ISO CENTER SEC., 6" EXTENDED STEM, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F	A	2" SLT 66 HCH BWE S.10 I E6 H
A177085	PORT, 3/4" KCI05 STYLE (CAPPED)	N/A	N/A
A177086	PORT, 3/4" KCI05 STYLE (CAPPED)	N/A	N/A
A177087	BALL VALVE, 2" NPS, LOW TEMP. SERVICE, SA182-316L BODY-BALL-STEM, HOSTAFLOX SEATS/SEALS, SCH. 10 BW CONNECTIONS, ISO CENTER SEC., 6" EXTENDED STEM, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F	A	2" SLT 66 HCH BWE S.10 I E6 H
A177088	BALL VALVE, 2" NPS, LOW TEMP. SERVICE, SA182-316L BODY-BALL-STEM, HOSTAFLOX SEATS/SEALS, SCH. 10 BW CONNECTIONS, ISO CENTER SEC., 6" EXTENDED STEM, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F	A	2" SLT 66 HCH BWE S.10 I E6 H
A177089	GLOBE VALVE, 2" NPS, LIQUID HELIUM SERVICE, VACUUM JACKETED, MANUAL ON/OFF, 304L STAINLESS STEEL CONSTRUCTION, SCH. 10 BW CONNECTIONS	B	HPV-60-20
A177090	GLOBE VALVE, 2" NPS, LIQUID HELIUM SERVICE, VACUUM JACKETED, MANUAL ON/OFF, 304L STAINLESS STEEL CONSTRUCTION, SCH. 10 BW CONNECTIONS	B	HPV-60-20
A177091	RELIEF VALVE, PLASTIC SEATED, -452 TO 90 F HELIUM LIQUID/GAS SERVICE, 316 SST BODY & TRIM, 1/2" X 1" INLET/OUTLET, MS33649 CONNECTIONS, 0.065 SQ. IN. ORIFICE, PTFE SEAT/SEALS	H	01-1155MS-103MS, 71 PSIG SET PRESSURE
A177092	RELIEF VALVE, PLASTIC SEATED, -452 TO 90 F HELIUM LIQUID/GAS SERVICE, 316 SST BODY & TRIM, 1/2" X 1" INLET/OUTLET, MS33649 CONNECTIONS, 0.065 SQ. IN. ORIFICE, PTFE SEAT/SEALS	H	01-1155MS-103MS, 71 PSIG SET PRESSURE
A177093	RELIEF VALVE, PLASTIC SEATED, -452 TO 90 F HELIUM LIQUID/GAS SERVICE, 316 SST BODY & TRIM, 1/2" X 1" INLET/OUTLET, MS33649 CONNECTIONS, 0.065 SQ. IN. ORIFICE, PTFE SEAT/SEALS	H	01-1155MS-103MS, 71 PSIG SET PRESSURE
A177095	GLOBE VALVE, 2" NPS, LIQUID HELIUM SERVICE, VACUUM JACKETED, MANUAL ON/OFF, 304L STAINLESS STEEL CONSTRUCTION, SCH. 10 BW CONNECTIONS	B	HPV-60-20
A177096	BAYONET, FEMALE, 2" CRYENCO TYPE, INCLUDING ANODIZED ALUMINUM PRESSURE CAP AND V-BAND CLAMP WITH HAND-WHEEL	D	F-BFCYTS16X, F-15442, F-1585
A177097	BAYONET, FEMALE, 2" CRYENCO TYPE, INCLUDING ANODIZED ALUMINUM PRESSURE CAP AND V-BAND CLAMP WITH HAND-WHEEL	D	F-BFCYTS16X, F-15442, F-1585
A177098	GLOBE VALVE, 2" NPS, LIQUID HELIUM SERVICE, VACUUM JACKETED, MANUAL ON/OFF, 304L STAINLESS STEEL CONSTRUCTION, SCH. 10 BW CONNECTIONS	B	HPV-60-20
A177099	GLOBE VALVE, 2" NPS, LIQUID HELIUM SERVICE, VACUUM JACKETED, MANUAL ON/OFF, 304L STAINLESS STEEL CONSTRUCTION, SCH. 10 BW CONNECTIONS	B	HPV-60-20

A-DESIGNATION	COMPONENT DESCRIPTION	MANUFACTURER	PART NO./SPECIFICATION/MATERIAL
A177100	RELIEF VALVE, PLASTIC SEATED, -452 TO 90 F HELIUM LIQUID/GAS SERVICE, 316 SST BODY & TRIM, 1/2" X 1" INLET/OUTLET, MS33649 CONNECTIONS, 0.065 SQ. IN. ORIFICE, PTFE SEAT/SEALS	H	01-1155MS-103MS, 71 PSIG SET PRESSURE
A177101	RELIEF VALVE, PLASTIC SEATED, -452 TO 90 F HELIUM LIQUID/GAS SERVICE, 316 SST BODY & TRIM, 1/2" X 1" INLET/OUTLET, MS33649 CONNECTIONS, 0.065 SQ. IN. ORIFICE, PTFE SEAT/SEALS	H	01-1155MS-103MS, 71 PSIG SET PRESSURE
A177102	PORT, 1/2" KCI05 STYLE (CAPPED)	N/A	N/A
A177103	PORT, 1/2" KCI05 STYLE (CAPPED)	N/A	N/A
A177104	GLOBE VALVE, 1/2" NPS, LIQUID HELIUM SERVICE, VACUUM JACKETED, MANUAL ON/OFF, 304L STAINLESS STEEL CONSTRUCTION, SCH. 10 BW CONNECTIONS	B	HPV-60-05
A177105	GLOBE VALVE, 1/2" NPS, LIQUID HELIUM SERVICE, VACUUM JACKETED, MANUAL ON/OFF, 304L STAINLESS STEEL CONSTRUCTION, SCH. 10 BW CONNECTIONS	B	HPV-60-05
A177106	RELIEF VALVE, PLASTIC SEATED, -452 TO 90 F HELIUM LIQUID/GAS SERVICE, 316 SST BODY & TRIM, 1/2" X 1" INLET/OUTLET, MS33649 CONNECTIONS, 0.065 SQ. IN. ORIFICE, PTFE SEAT/SEALS	H	01-1155MS-103MS, 71 PSIG SET PRESSURE
A177391	BAYONET, MALE, 2" CRYENCO TYPE (CONNECTS TO CP-1 ON THE STORAGE CONTAINER #1)	J	C-02386
A177392	BAYONET, MALE, 2" CRYENCO TYPE (CONNECTS TO CP-1 ON THE STORAGE CONTAINER #2)	J	C-02386
A177393	BAYONET, MALE, 2" CRYENCO TYPE (CONNECTS TO CP-2 ON THE STORAGE CONTAINER #1)	J	C-02386
A177394	BAYONET, MALE, 2" CRYENCO TYPE (CONNECTS TO CP-2 ON THE STORAGE CONTAINER #2)	J	C-02386
A177395	BAYONET, MALE, 2" CRYENCO TYPE (CONNECTS TO CP-3 ON THE STORAGE CONTAINER #1)	J	C-02386
A177396	BAYONET, MALE, 2" CRYENCO TYPE (CONNECTS TO CP-3 ON THE STORAGE CONTAINER #2)	J	C-02386
A177403	BALL VALVE, 1/2" NPS, REGULAR SERVICE, FULL PORT, SA182-316L BODY-BALL-STEM, PCC25 SEATS AND PTFE SEALS, MS33649 CONNECTIONS, ISO CENTER SECTION, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F.	A	1/2" FRS 66 HIT WSN I H
A177404	BALL VALVE, 1/2" NPS, REGULAR SERVICE, FULL PORT, SA182-316L BODY-BALL-STEM, PCC25 SEATS AND PTFE SEALS, MS33649 CONNECTIONS, ISO CENTER SECTION, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F.	A	1/2" FRS 66 HIT WSN I H
A177405	BALL VALVE, 1/2" NPS, REGULAR SERVICE, FULL PORT, SA182-316L BODY-BALL-STEM, PCC25 SEATS AND PTFE SEALS, MS33649 CONNECTIONS, ISO CENTER SECTION, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F.	A	1/2" FRS 66 HIT WSN I H
A177406	BALL VALVE, 1/2" NPS, REGULAR SERVICE, FULL PORT, SA182-316L BODY-BALL-STEM, PCC25 SEATS AND PTFE SEALS, MS33649 CONNECTIONS, ISO CENTER SECTION, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F.	A	1/2" FRS 66 HIT WSN I H
A177407	BALL VALVE, 1/2" NPS, REGULAR SERVICE, FULL PORT, SA182-316L BODY-BALL-STEM, PCC25 SEATS AND PTFE SEALS, MS33649 CONNECTIONS, ISO CENTER SECTION, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F.	A	1/2" FRS 66 HIT WSN I H
A177408	BALL VALVE, 1/2" NPS, REGULAR SERVICE, FULL PORT, SA182-316L BODY-BALL-STEM, PCC25 SEATS AND PTFE SEALS, MS33649 CONNECTIONS, ISO CENTER SECTION, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F.	A	1/2" FRS 66 HIT WSN I H
A177409	BALL VALVE, 1/2" NPS, REGULAR SERVICE, FULL PORT, SA182-316L BODY-BALL-STEM, PCC25 SEATS AND PTFE SEALS, MS33649 CONNECTIONS, ISO CENTER SECTION, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F.	A	1/2" FRS 66 HIT WSN I H
A177410	BALL VALVE, 1/2" NPS, REGULAR SERVICE, FULL PORT, SA182-316L BODY-BALL-STEM, PCC25 SEATS AND PTFE SEALS, MS33649 CONNECTIONS, ISO CENTER SECTION, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F.	A	1/2" FRS 66 HIT WSN I H
A177615	BALL VALVE, 2" NPS, LOW TEMP. SERVICE, SA182-316L BODY-BALL-STEM, HOSTAFLOX SEATS/SEALS, SCH. 10 BW CONNECTIONS, ISO CENTER SEC., 6" EXTENDED STEM, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F	A	2" SLT 66 HCH BWE S.10 I E6 H
A177616	BALL VALVE, 2" NPS, LOW TEMP. SERVICE, SA182-316L BODY-BALL-STEM, HOSTAFLOX SEATS/SEALS, SCH. 10 BW CONNECTIONS, ISO CENTER SEC., 6" EXTENDED STEM, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F	A	2" SLT 66 HCH BWE S.10 I E6 H
A177617	BALL VALVE, 1" NPS, REGULAR SERVICE, FULL PORT, SA182-316L BODY-BALL-STEM, PCC25 SEATS AND PTFE SEALS, MS33649 CONNECTIONS, ISO CENTER SECTION, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F.	A	1" FRS 66 HIT WSN I H
A177618	BALL VALVE, 1" NPS, REGULAR SERVICE, FULL PORT, SA182-316L BODY-BALL-STEM, PCC25 SEATS AND PTFE SEALS, MS33649 CONNECTIONS, ISO CENTER SECTION, HI-RISE HANDLE, 1500 PSIG MAX. @ 175 F.	A	1" FRS 66 HIT WSN I H
A177619	PORT, 1" KCI05 STYLE (CAPPED)	N/A	N/A
A177620	PORT, 1" KCI05 STYLE (CAPPED)	N/A	N/A

TAG# (FOR REF.)	QTY.	COMPONENT DESCRIPTION	MANUFACTURER	PART NO.
V-2	2	PNEUMATIC ACTIVATOR ONLY, SIZE 60, RANGE 3-30 PSIG, 1" STROKE, MAX. AIR 60 PSI, AIR TO OPEN, WITH MANUAL OVERRIDE HANDWHEEL	CPC-CRYOLAB	F-16267
V-53	2	PNEUMATIC ACTIVATOR ONLY, SIZE 36, RANGE 3-15 PSIG, 1/2" STROKE, MAX. AIR 60 PSI, AIR TO OPEN	CPC-CRYOLAB	F-14411
V-54	2	PNEUMATIC ACTIVATOR ONLY, SIZE 36, RANGE 3-15 PSIG, 1/2" STROKE, MAX. AIR 60 PSI, AIR TO OPEN	CPC-CRYOLAB	F-14643
V-55	2	PNEUMATIC ACTIVATOR ONLY, SIZE 60, RANGE 3-15 PSIG, 3/4" STROKE, MAX. AIR 60 PSI, AIR TO OPEN	CPC-CRYOLAB	F-14643
PS-1	2	ADJUSTABLE PRESSURE REGULATOR-TYPE 40, SUPPLY MAX. 250 PSI, RANGE 0-30 PSI, 1/4" NPT PORT	MARSH BELLOFRAM	960064000
PS-1	2	PRESSURE GAUGE, STAINLESS STEEL, TYPE 1009, 2.5" DIAL SIZE, 1/4" NPT BACK CONNECTION, 0-60 PSI	DRESSER/ASHCROFT	251009S02B, 0-60 PSI
PS-2	2	ADJUSTABLE PRESSURE REGULATOR-TYPE 40, SUPPLY MAX. 250 PSI, RANGE 0-30 PSI, 1/4" NPT PORT	MARSH BELLOFRAM	960064000
PS-2	2	PRESSURE GAUGE, STAINLESS STEEL, TYPE 1009, 2.5" DIAL SIZE, 1/4" NPT BACK CONNECTION, 0-60 PSI	DRESSER/ASHCROFT	251009S02B, 0-60 PSI
PS-3	2	ADJUSTABLE PRESSURE REGULATOR-TYPE 40, SUPPLY MAX. 250 PSI, RANGE 0-30 PSI, 1/4" NPT PORT	MARSH BELLOFRAM	960064000
PS-3	2	PRESSURE GAUGE, STAINLESS STEEL, TYPE 1009, 2.5" DIAL SIZE, 1/4" NPT BACK CONNECTION, 0-60 PSI	DRESSER/ASHCROFT	251009S02B, 0-60 PSI
PC-2	2	ADJUSTABLE PRESSURE REGULATOR/FILTER-TYPE 50, SUPPLY MAX. 250 PSI, RANGE 0-60 PSI, 1/4" NPT PORT	MARSH BELLOFRAM	960068000
PC-2	2	PRESSURE GAUGE, STAINLESS STEEL, TYPE 1009, 2.5" DIAL SIZE, 1/4" NPT BACK CONNECTION, 0-60 PSI	DRESSER/ASHCROFT	251009S02B, 0-60 PSI
LI-1	2	DIFFERENTIAL PRESSURE INDICATOR, MODEL 200, 0-25" W.C.	L.T.I. BOSTON	200

NOTE: ALL COMPONENTS INDICATED IN THIS TABLE SHALL BE FURNISHED BY THE CONTRACTOR AND DELIVERED TO THE OWNER FOR OWNER INSTALLATION

**SPECIFIC NOTES:**

- A. MCF VALVES, INC. C/O SOUTHEAST SERVICE CO. 490 ALLISON AVE. LONGWOOD, FL 32750
- B. PHXK TECHNOLOGIES, INC. 525 ENTERPRISE DR., WESTERVILLE, OH 43081
- C. ROSEMOUNT INC., 8200 MARKET BLVD., CHANNASSEN, MN 55317
- D. CPC-CRYOLAB C/O LESLIE CONTROLS, INC. 12501 TELECOM DR., TAMPA, FL 33637
- E. HONEYWELL, 3657 MAGUIRE BLVD., ORLANDO, FL 32803
- F. NOT USED
- G. NOT USED
- H. FLOW SAFE, INC. C/O AERO-INDUSTRIAL SALES, P.O. BOX 541492, MERRIT ISLAND, FL 32954
- I. NOT USED
- J. ADAC CRYOGENICS, INC., P.O. BOX 445, ALLENTOWN, PA 18105
- K. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL O-RINGS AND HOSE SEALS FROM BAYONET MANUFACTURER, NECESSARY FOR THE PROPER INSTALLATION OF THE BAYONET (AS RECOMMENDED BY THE MANUFACTURER).

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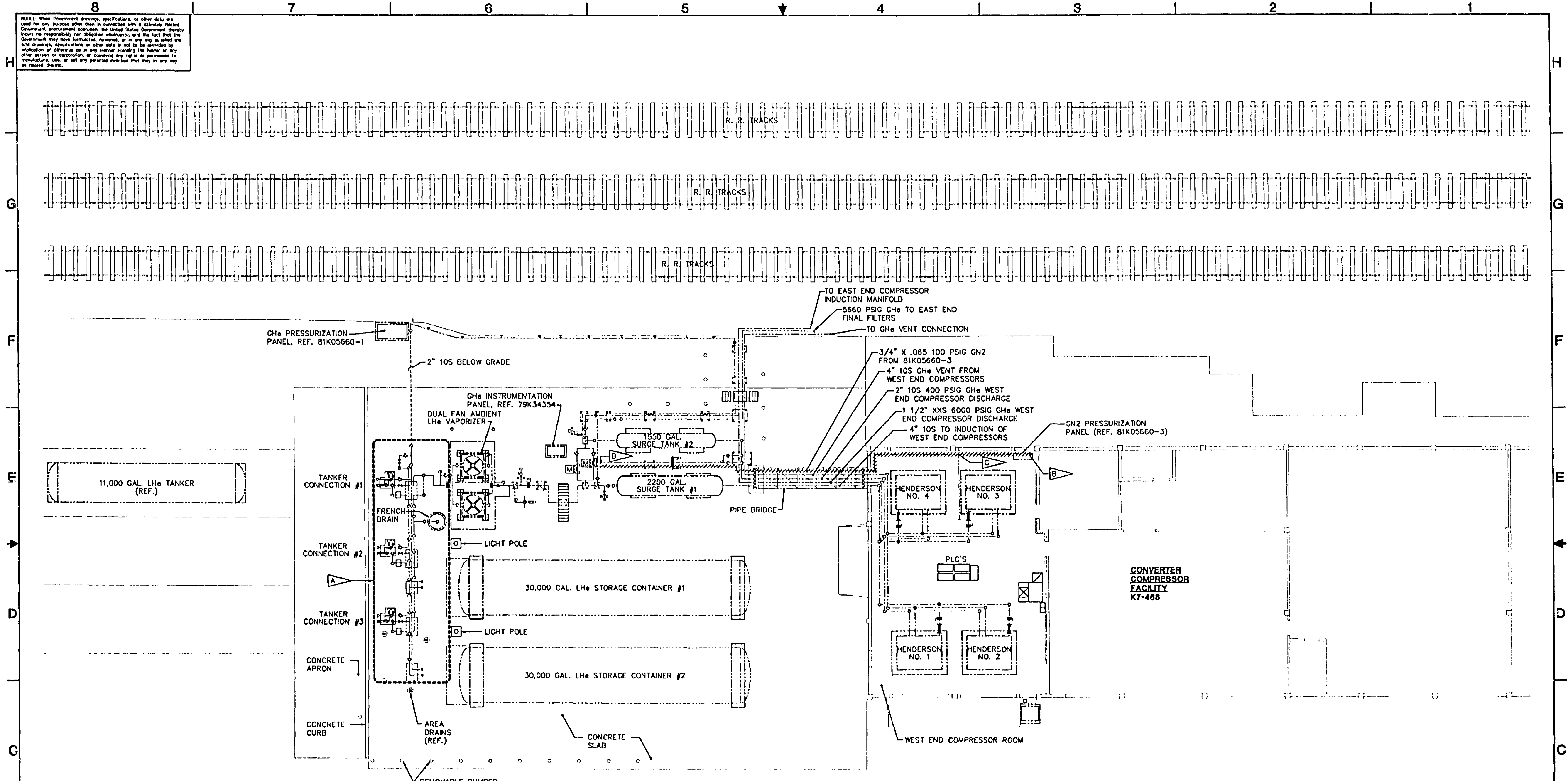
**JLSD**  
Johnson, Lovinson, Sluder, Davis, Inc.  
CONSULTING ENGINEERS  
1800 Australian Ave South, Suite 301, Fort Palm Beach, FL 33484 - 681-1800 - 2000 - Fax 681-1800  
Engineering Business Number: 6069

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE		
DRAWN C. MONTANA		7/18/02		
CHECKED T. FEAGANS		7/18/02		
ENGINEER J. DAVILA		7/18/02		
SUBMITTED C. MONTANA		7/18/02		
APPROVED J. PORTA		8/2/02		
TITLE BRANCH CHIEF		PROJ. NO. 060391		

**PIPING COMPONENT SCHEDULE**

DWG. NO. 78K35402  
SHEET 10

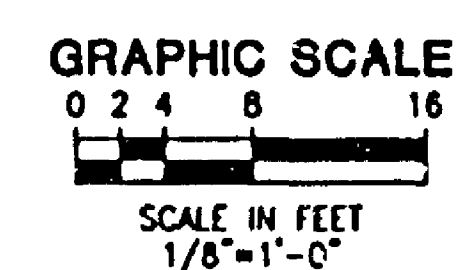
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**EXISTING PIPE ROUTING PLAN - DEMOLITION**  
SCALE: 1/8" = 1'-0" (SEE SHEET M-1)

**SPECIFIC NOTES:**

- A EXISTING TANKER MANIFOLD PIPING AND ALL ASSOCIATED SUPPORTS WITHIN THIS AREA SHALL REMAIN IN PLACE.
- B REMOVE 3/4" STAINLESS STEEL TUBING (SHOWN HATCHED) FROM THE OUTLET CONNECTION OF A175522 ON THE GN2 PANEL (81K05660-3) IN THE WEST END COMPRESSOR ROOM TO THIS POINT.
- C 3/4" GN2 BRANCH LINE AT THIS LOCATION GOING TO A175393, A175394, A175395, AND A175396 ON THE COMPRESSORS SHALL REMAIN AND BE RECONNECTED TO NEW TUBING.



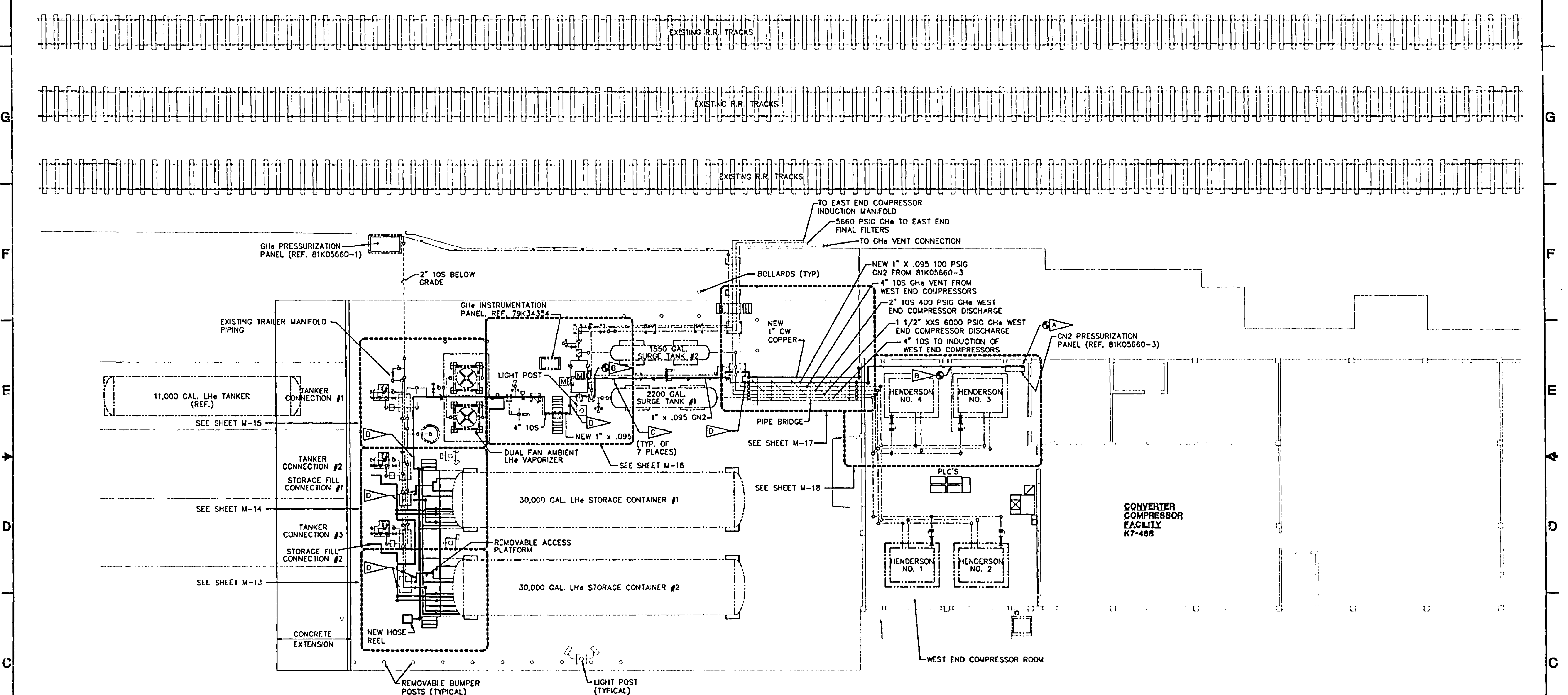
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Engineering Business Number: 6009

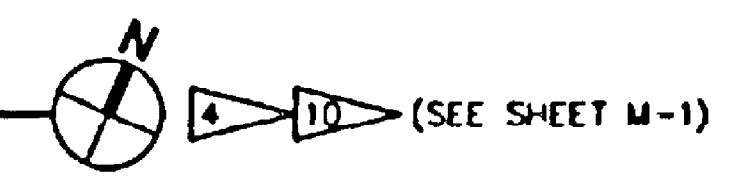
SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		NATIONAL AERONAUTICS AND SPACE ADMINISTRATION		
DRAWN G. QUINTERA		JOHN F. KENNEDY SPACE CENTER, NASA		
CHECKED T. FLORES		KENNEDY SPACE CENTER, FLORIDA		
ENGINEER M. DAVILA		CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM		
SUBMITTED CROSS-CHECK		DEMOLITION PLAN		
APPROVED	DATE	SIZE	DWG. NO.	REV
J. PORTA	7/18/02	F	78K35402	
TITLE BRANCH CHIEF		PROJ. NO.	98038.1	SHEET 11

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- SPECIFIC NOTES:**
- A CONNECT NEW 1" x .095 STAINLESS STEEL TUBING TO EXISTING GN2 PANEL VALVE AT THIS LOCATION
  - B RECONNECT EXISTING 3/4" x .065 STAINLESS STEEL TUBING AT THIS LOCATION.
  - C SECURE NEW 1" x .095 GN2 LINE TO EXISTING VERTICAL UNISTRUT POSTS (WHERE EXISTING 3/4" LINE WAS REMOVED) USING NEW PIPE CLAMP (ITEM 95).
  - D PROVIDE CLAMP AND HARDWARE REQUIRED FOR PIPING SYSTEM GROUNDING AT THIS POINT. REFER TO SPECIFICATION 79K35409 FOR ADDITIONAL REQUIREMENTS. REFER TO "EP" DRAWINGS FOR GROUNDING PLAN AND GROUNDING LOOP CONDUCTOR LOCATIONS.

**OVERALL PIPE ROUTING PLAN**  
SCALE: 1/8" = 1'-0"



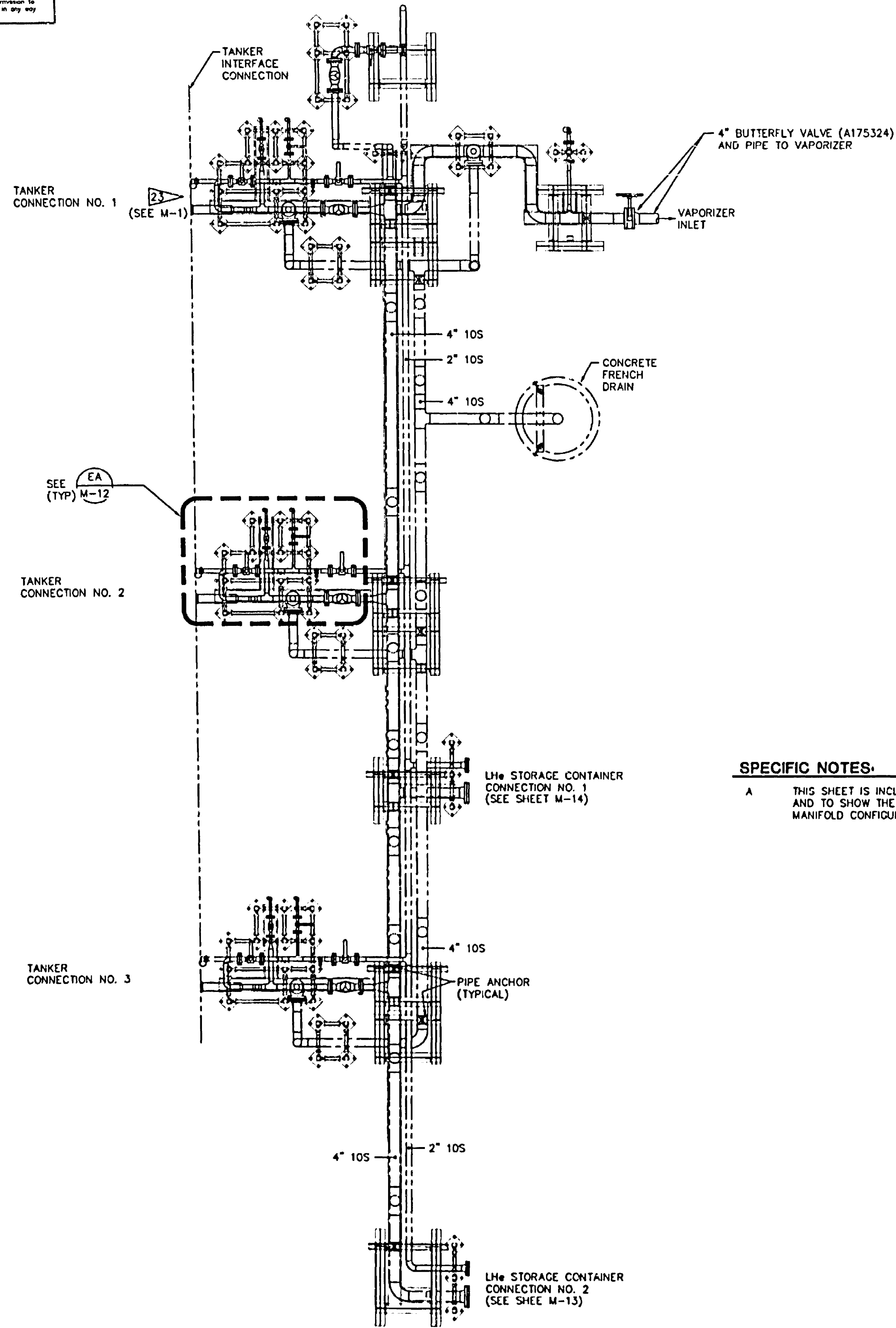
**GRAPHIC SCALE**  
0 4 8 16  
SCALE IN FEET  
1/8" = 1'-0"

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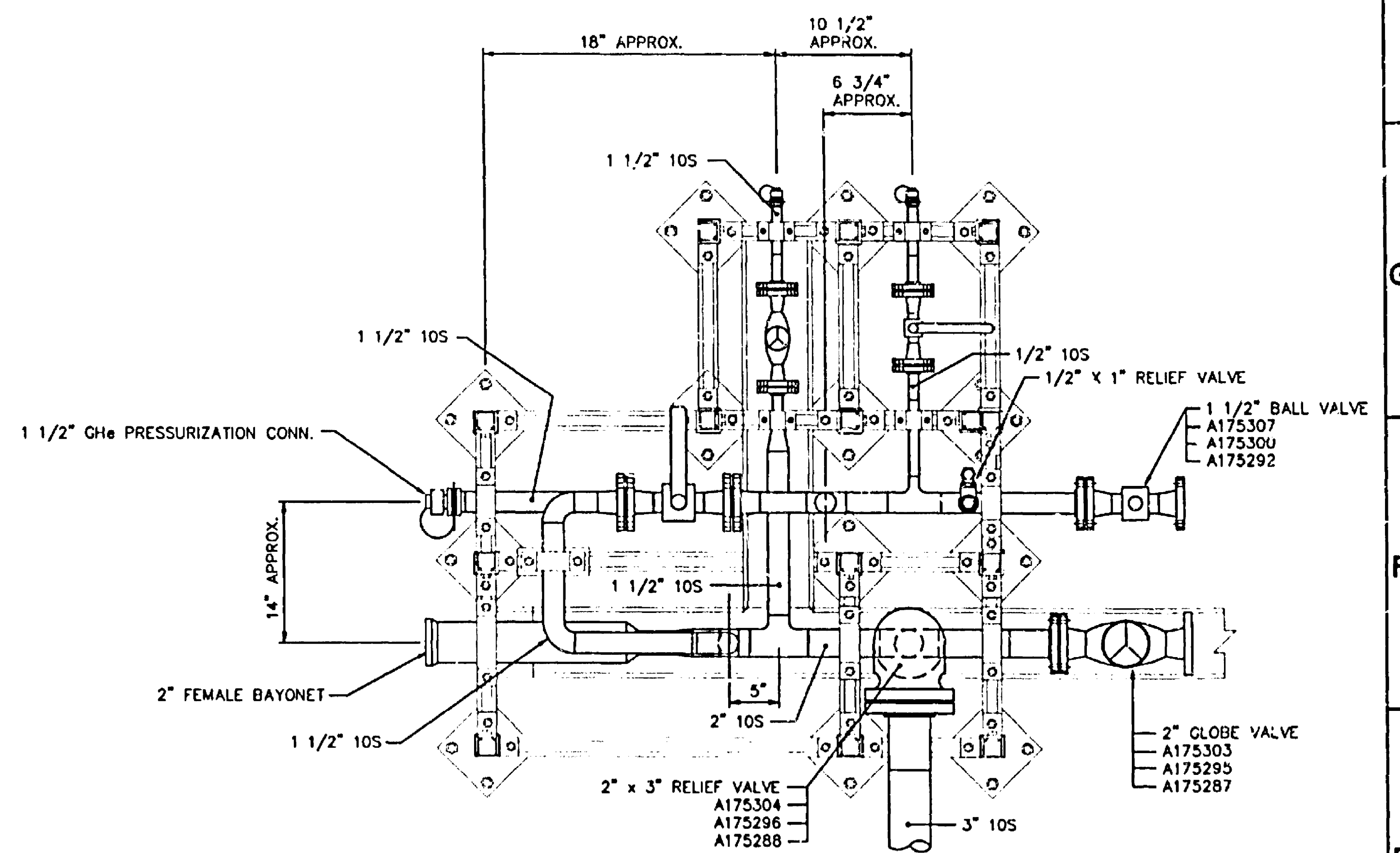
**JLSD**  
Johnston, Lovison, Sider, Davis, Inc.  
CONSULTING ENGINEERS  
2000 Anderson Ave South, Suite 301, East Palm Beach, FL 33461 - (561) 999-2335 - FAX 561-999-2336 - www.jlstd.com  
Engineering Registration Number: 9089

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION		
DRAWN G. OLIVIANA	7/18/02	JOHN F. KENNEDY SPACE CENTER, NASA		
CHECKED T. FAGANS	7/18/02	KENNEDY SPACE CENTER, FLORIDA		
ENGINEER M. DAVILA	7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM		
<b>OVERALL PIPE ROUTING PLAN</b>				
APPROVED	DATE	SIZE	DWG. NO.	REV
J. PORTA	7/18/02	F	78K35402	
TITLE BRANCH CHIEF	PROJ. NO. 98036.1	SHEET 12		

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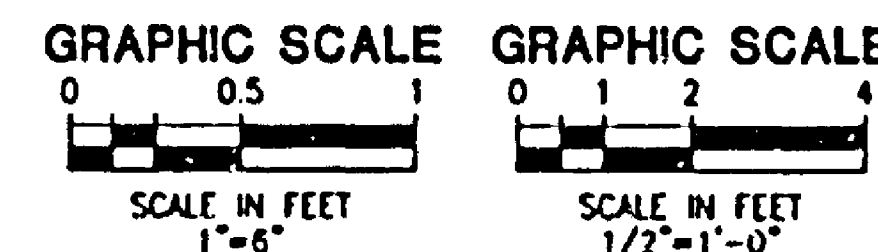
EXISTING TANKER MANIFOLD PIPING PLAN  
SCALE: 1/2" = 1'-0"



EXISTING TANKER CONNECTION ASSEMBLY ENLARGEMENT  
SCALE: 1" = 6"

**SPECIFIC NOTES:**

- A THIS SHEET IS INCLUDED FOR REFERENCE ONLY, AND TO SHOW THE EXTENT OF THE EXISTING PIPING MANIFOLD CONFIGURATION.



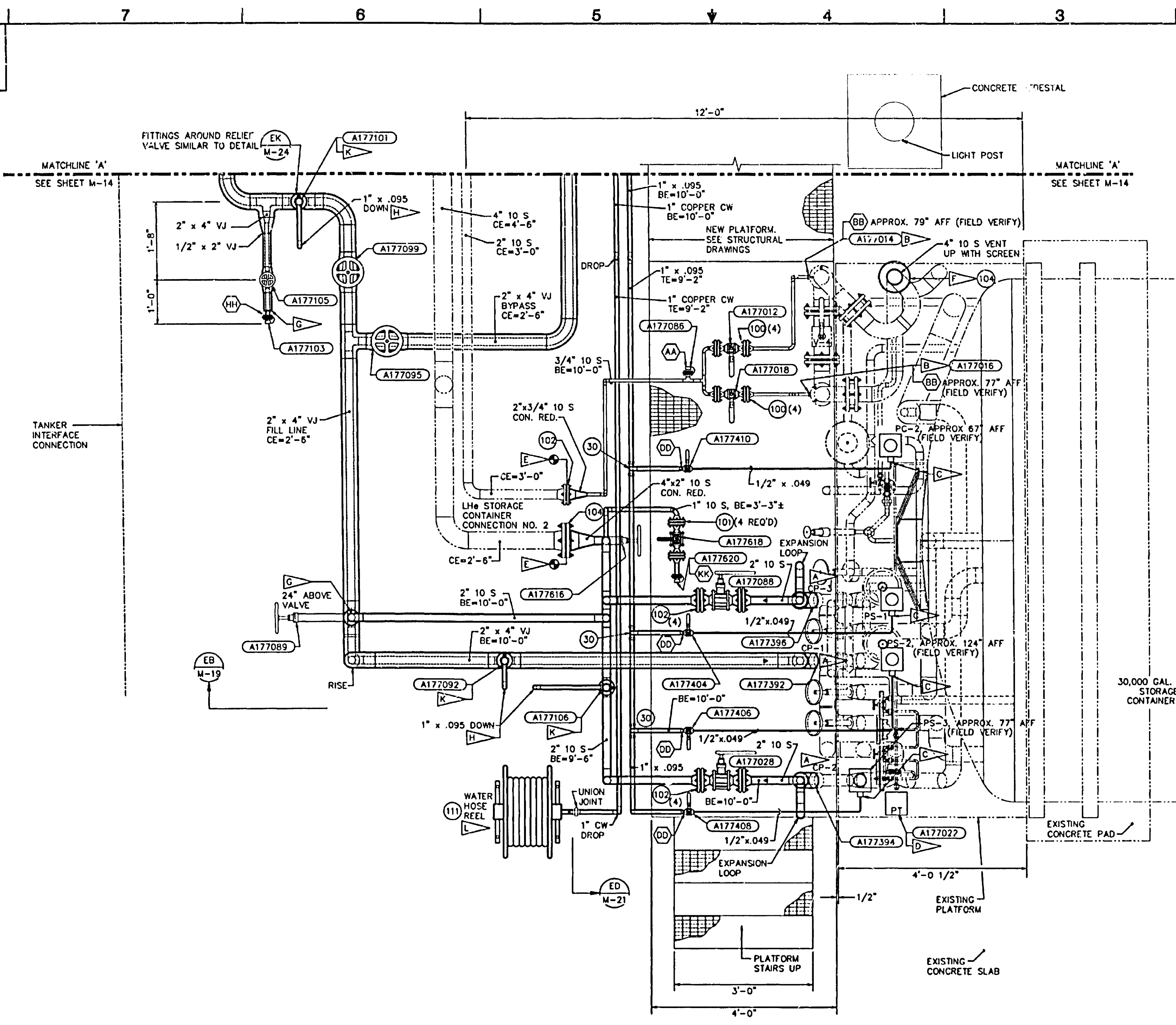
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Engineering Business Number: 9089

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE		
DRAWN T.FEAGANS		7/18/02		
CHECKED T.FEAGANS		7/18/02		
ENGINEER M.DAVILA		7/18/02		
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HYDROGEN STORAGE SYSTEM				
EXISTING LH <sub>2</sub> TANKER MANIFOLD PLANS				
SUBMITTED CROSSING		DATE		
APPROVED J.PORTA		DATE 8/14/02		
TITLE BRANCH CHIEF		DATE		
SIZE	DWG. NO.	REV		
F	76K35402			
PROJ. NO. 86038.1		SHEET 13		

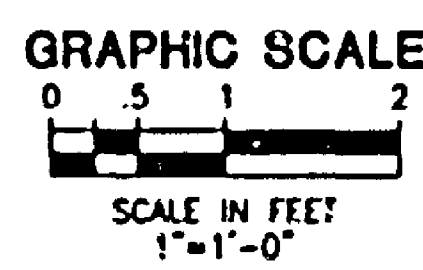
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**SPECIFIC NOTES**

- A REMOVE THE EXISTING DUST CAPS FROM THE LH6 STORAGE CONTAINER No. 2 PIPING CONNECTIONS NOTED AS CP-1, CP-2, AND CP-3. CONNECT NEW PIPING (BAYONETS) AT THIS LOCATION. CP-1 AND CP-3 ARE ANGLED 30 DEGREES FROM HORIZONTAL. CP-2 IS ANGLED 45 DEGREES FROM HORIZONTAL. BAYONET INTERFACE AT 67" AFF (VERIFY).
- B CONNECT NEW 3/4" 10 S PIPE TO EXISTING 3/4" PORT IN LH6 STORAGE CONTAINER PIPING AT THIS LOCATION.
- C CONNECT NEW 1/2"x.049 SST TUBING TO EXISTING PRESSURE SWITCH THREADED CONNECTION USING KC116KB-4 (ITEM 25).
- D INSTALLATION OF SST TUBING FROM THIS PRESSURE TRANSDUCER (PT) TO THE LH6 STORAGE CONTAINER CONNECTION IS N.I.C. MOUNT PT ON EXISTING GAUGE PANEL FRAME AT 110" (APPROX.) AFF (FIELD VERIFY).
- E REMOVE EXISTING BLIND FLANGE. PROVIDE NEW SST WELD NECK FLANGE WITH SEAL RING AND SST STUDS, NUTS, AND WASHERS. PROVIDE SST 10 S BUTTWELD CON. RED. TO THE PIPE SIZE SHOWN.
- F EXISTING 4" DIAMETER STAINLESS STEEL PIPE FLANGE AT 117" AFF. CONNECT TO FLANGE AND RISE 4" DIA. VENT AND TERMINATE WITH SCREENED ELBOWS TURNED HORIZONTAL. SEE SECTIONS ON M-19 AND M-21. PROVIDE NEW FLANGE WITH NEW GASKET AND STAINLESS STEEL STUDS AND NUTS.
- G VACUUM JACKET TERMINATION. END PLATE SHALL BE SUFFICIENT SUCH THAT STRESS SHALL NOT EXCEED THE SPECIFIED REQUIREMENTS.
- H DROP RELIEF LINE TO TERMINATE AT 12 INCHES ABOVE GRADE. SEE EK M-24 FOR INLET AND DISCHARGE FITTINGS TO RELIEF VALVE.
- J SEE SHEET M-22 FOR PIPING SUPPORTS THIS AREA.
- K PROVIDE 18 INCH LENGTH OF 1/2" x 2" VACUUM JACKETED PIPE PRIOR TO THIS COMPONENT.
- L PROVIDE NEW WATER HOSE REEL AND SECURE TO EXISTING CONCRETE SLAB USING 4 - 1/2" DIA. GALVANIZED EXPANSION ANCHORS.

**ENLARGED PIPING PLAN - LH6 STORAGE CONTAINER # 2**  
SCALE: 1" = 1'-0"



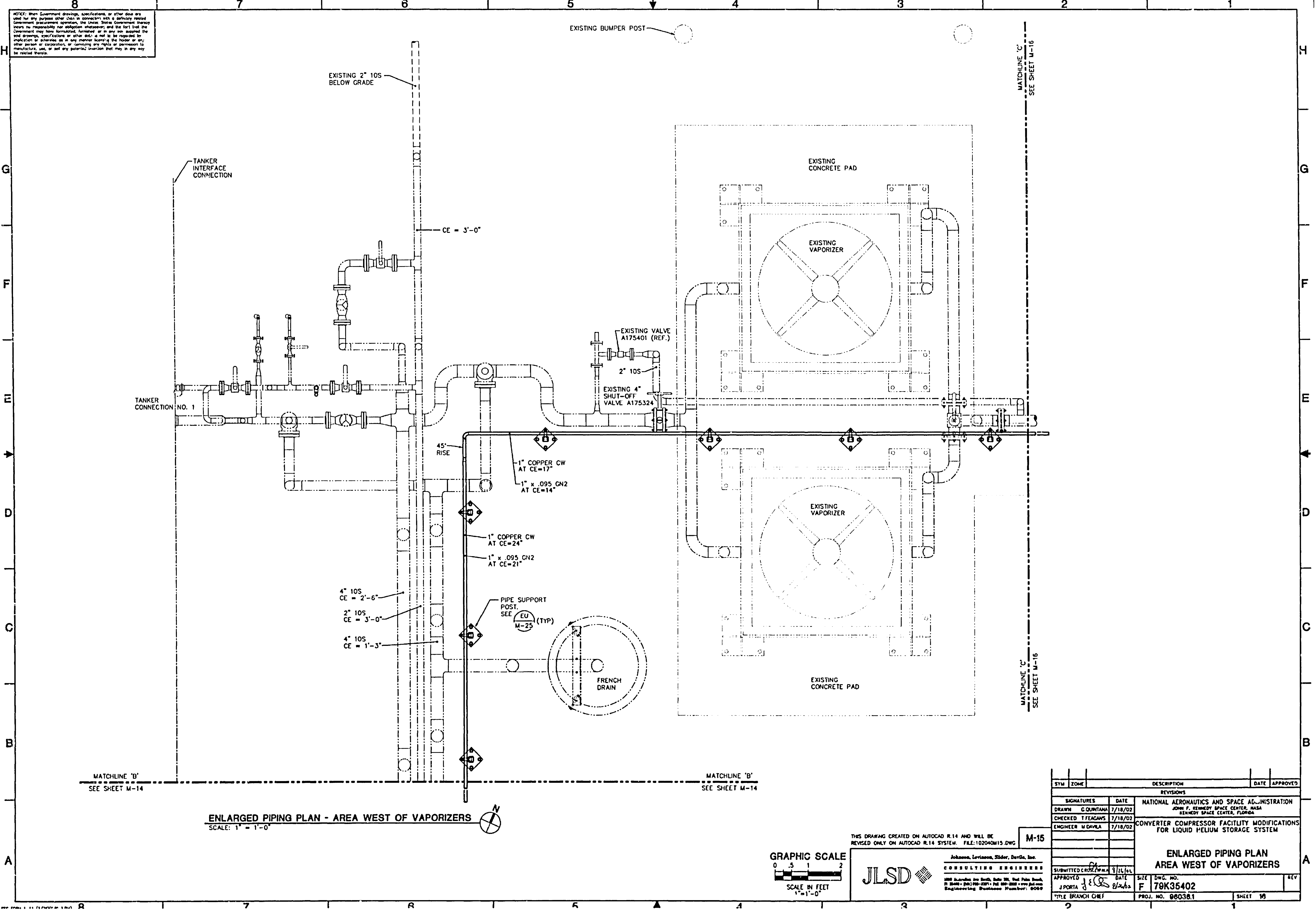
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Engineering Registration Number: 0009

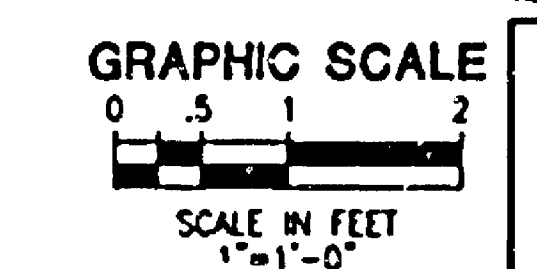
SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE		
DRAWN G. OLIVIERA		7/18/02		
CHECKED T. FAGANS		7/18/02		
ENGINEER M. DAVILA		7/18/02		
SUBMITTED CROSS/PALM		8/16/02		
APPROVED J. PORTA		8/20/02		
TITLE BRANCH CHIEF		PROJ. NO. 96039.1		
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA		ENLARGED PIPING PLAN LH6 STORAGE CONTAINER # 2		
CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM		DWG. NO. F 79K35402		
SHEET 14		REV		





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**ENLARGED PIPING PLAN - AREA WEST OF VAPORIZERS**  
SCALE: 1" = 1'-0"



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**JLS D**

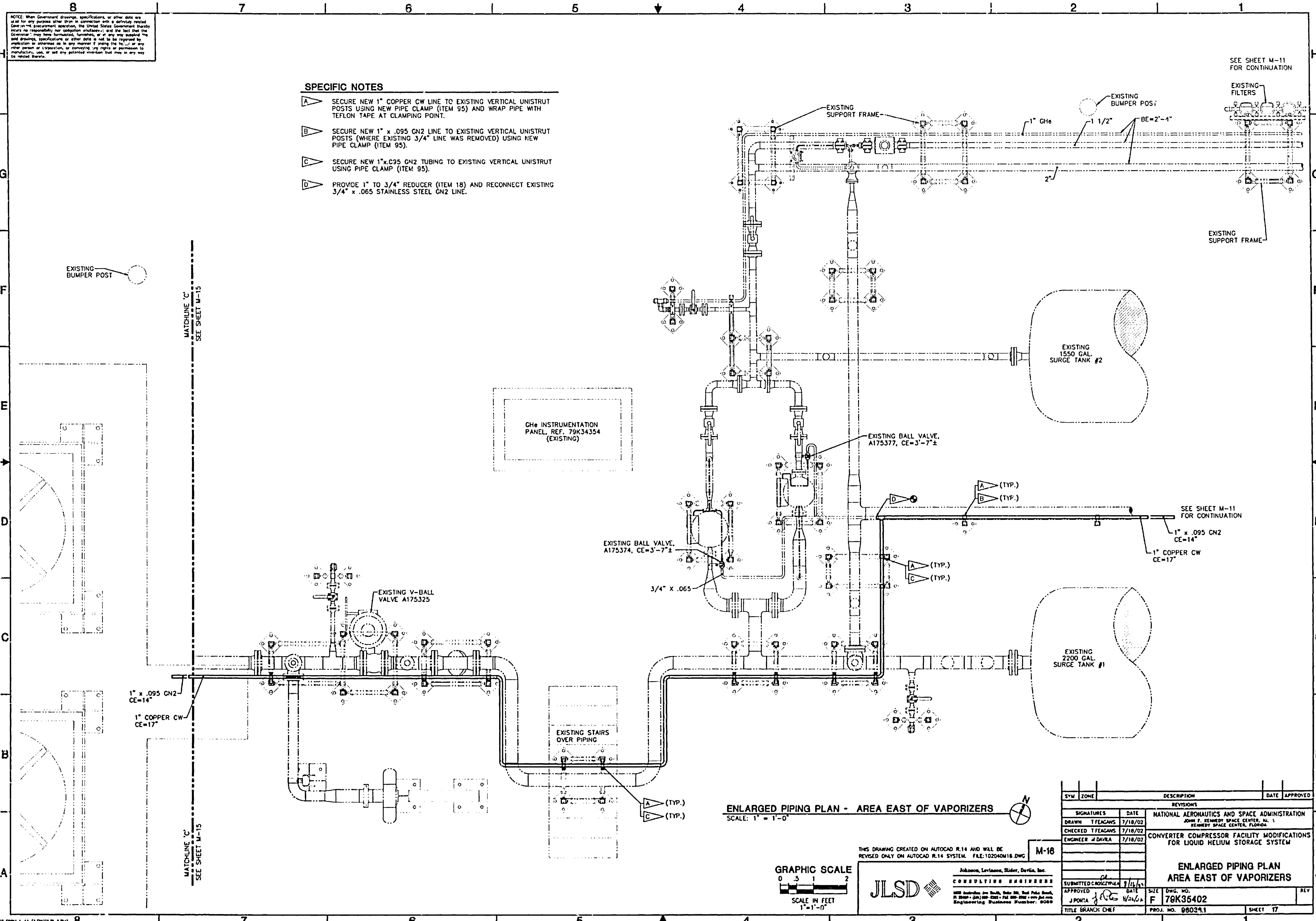
Johnson, Levinson, Sidor, Devlin, Inc.  
CONSULTING ENGINEERS  
180 Alandale Ave South, Suite 200, Red Palm Beach, FL 32909 (407) 638-0271 • Fax 407-638-0222 • www.jlsv.com  
Engineering Business Number: 6089

SYM	ZONE	DESCRIPTION	DATE	APPROVED
SIGNATURES				
DRAWN	C. QUINTANA	7/18/02	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA	
CHECKED	T. FEAGANS	7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM	
ENGINEER	M. DAVILA	7/18/02	ENLARGED PIPING PLAN AREA WEST OF VAPORIZERS	
SUBMITTED CROSSING				
APPROVED	J. PORTA	7/24/02	DATE	SIZE
TITLE BRANCH CHIEF			DWG. NO.	REV
			F 79K35402	
			PROJ. NO. 060381	SHEET 10

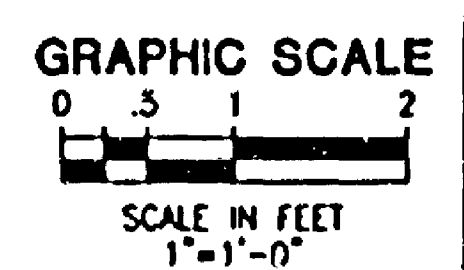


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- SPECIFIC NOTES**
- A SECURE NEW 1" COPPER CW LINE TO EXISTING VERTICAL UNISTRUT POSTS USING NEW PIPE CLAMP (ITEM 95) AND WRAP PIPE WITH TEFLON TAPE AT CLAMPING POINT.
  - B SECURE NEW 1" x .095 GN2 LINE TO EXISTING VERTICAL UNISTRUT POSTS (WHERE EXISTING 3/4" LINE WAS REMOVED) USING NEW PIPE CLAMP (ITEM 95).
  - C SECURE NEW 1" x .095 GN2 TUBING TO EXISTING VERTICAL UNISTRUT USING PIPE CLAMP (ITEM 95).
  - D PROVIDE 1" TO 3/4" REDUCER (ITEM 18) AND RECONNECT EXISTING 3/4" x .065 STAINLESS STEEL GN2 LINE.



**ENLARGED PIPING PLAN - AREA EAST OF VAPORIZERS**  
SCALE: 1" = 1'-0"



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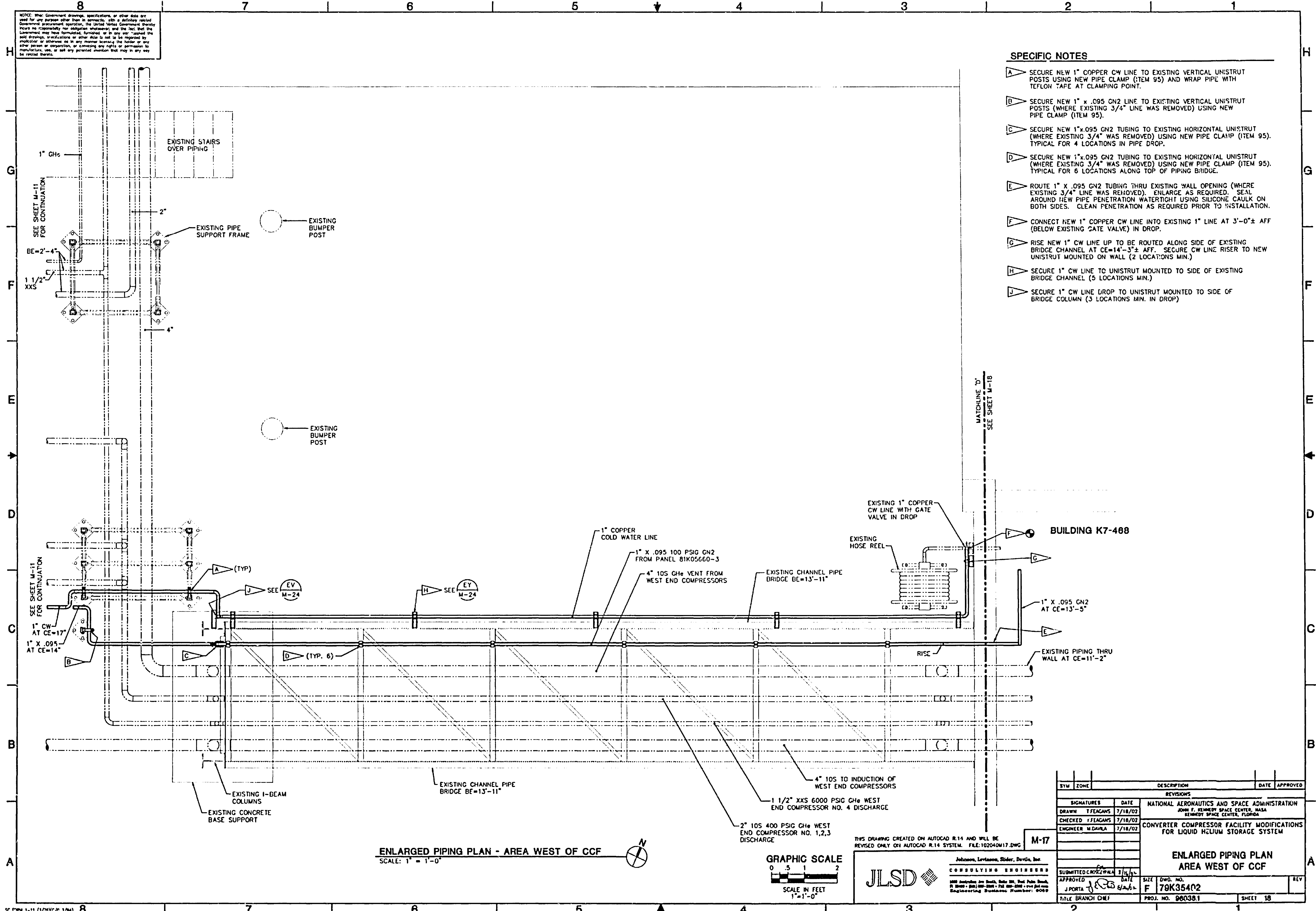
**JLSD**  
Johnson, Levinson, Slider, Davis, Inc.  
CONSULTING ENGINEERS  
1800 Audubon Ave South, Suite 501, Fort Palm Beach, FL 33404-1001 (407) 528-1100 Fax: (407) 528-1101  
Engineering Business Number: 0008

SYM	ZONE	DESCRIPTION	DATE	APPROVED
SIGNATURES				
DRAWN T FEAGANS		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	
CHECKED T FEAGANS		7/18/02	JOHN F. KENNEDY SPACE CENTER, FL 32819	
ENGINEER J DAVILA		7/18/02	RENNETT SPACE CENTER, FLORIDA	
SUBMITTED CROSSFIELD 7/18/02				
APPROVED J PORTA 7/20/02				
TITLE BRANCH CHIEF		DATE	SIZE	DWG. NO.
		7/20/02	F	78K35402
PROJ. NO. 980391			SHEET 17	

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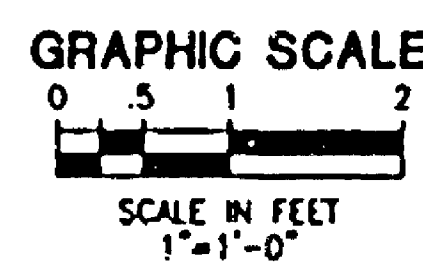
**SPECIFIC NOTES**

- A SECURE NEW 1" COPPER CW LINE TO EXISTING VERTICAL UNISTRUT POSTS USING NEW PIPE CLAMP (ITEM 95) AND WRAP PIPE WITH TEFLON TAPE AT CLAMPING POINT.
- B SECURE NEW 1" x .095 GN2 LINE TO EXISTING VERTICAL UNISTRUT POSTS (WHERE EXISTING 3/4" LINE WAS REMOVED) USING NEW PIPE CLAMP (ITEM 95).
- C SECURE NEW 1" x .095 GN2 TUBING TO EXISTING HORIZONTAL UNISTRUT POSTS (WHERE EXISTING 3/4" WAS REMOVED) USING NEW PIPE CLAMP (ITEM 95). TYPICAL FOR 4 LOCATIONS IN PIPE DROP.
- D SECURE NEW 1" x .095 GN2 TUBING TO EXISTING HORIZONTAL UNISTRUT POSTS (WHERE EXISTING 3/4" WAS REMOVED) USING NEW PIPE CLAMP (ITEM 95). TYPICAL FOR 6 LOCATIONS ALONG TOP OF PIPING BRIDGE.
- E ROUTE 1" x .095 GN2 TUBING THRU EXISTING WALL OPENING (WHERE EXISTING 3/4" LINE WAS REMOVED). ENLARGE AS REQUIRED. SEAL AROUND NEW PIPE PENETRATION WATERTIGHT USING SILICONE CAULK ON BOTH SIDES. CLEAN PENETRATION AS REQUIRED PRIOR TO INSTALLATION.
- F CONNECT NEW 1" COPPER CW LINE INTO EXISTING 1" LINE AT 3'-0"± AFF (BELOW EXISTING GATE VALVE) IN DROP.
- G RISE NEW 1" CW LINE UP TO BE ROUTED ALONG SIDE OF EXISTING BRIDGE CHANNEL AT CE=14'-3"± AFF. SECURE CW LINE RISER TO NEW UNISTRUT MOUNTED ON WALL (2 LOCATIONS MIN.)
- H SECURE 1" CW LINE TO UNISTRUT MOUNTED TO SIDE OF EXISTING BRIDGE CHANNEL (5 LOCATIONS MIN.)
- J SECURE 1" CW LINE DROP TO UNISTRUT MOUNTED TO SIDE OF BRIDGE COLUMN (3 LOCATIONS MIN. IN DROP)



BUILDING K7-488

**ENLARGED PIPING PLAN - AREA WEST OF CCF**  
SCALE: 1" = 1'-0"



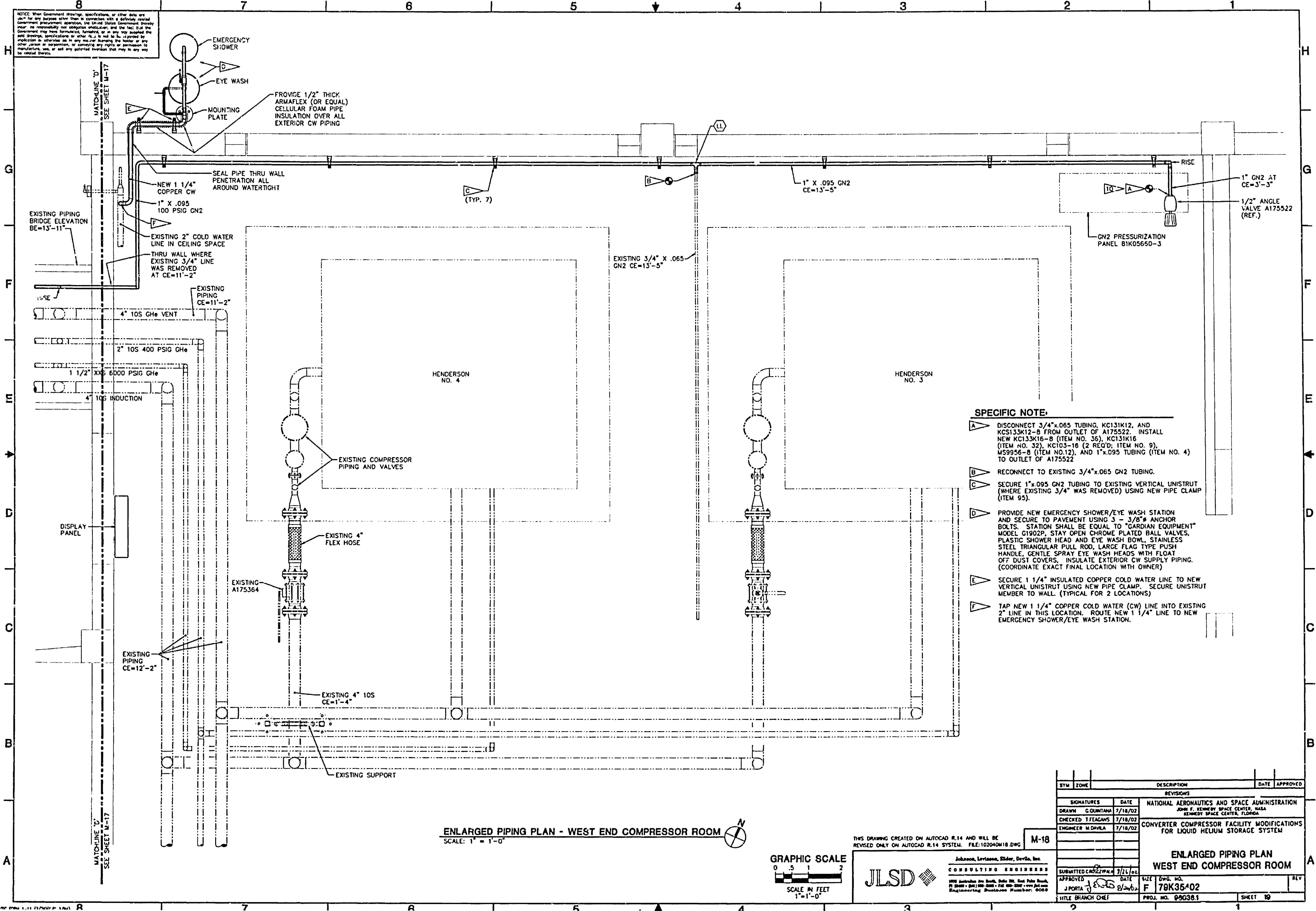
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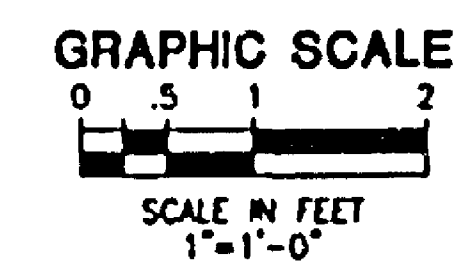
SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES				
DRAWN		T FEAGANS	7/18/02	<b>NATIONAL AERONAUTICS AND SPACE ADMINISTRATION</b> JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA <b>CONVERTER COMPRESSOR FACILITY MODIFICATIONS          FOR LIQUID HELIUM STORAGE SYSTEM</b>
CHECKED		J FEAGANS	7/18/02	
ENGINEER		M DAVILA	7/18/02	
SUBMITTED		CROSSIN	7/18/02	
APPROVED		J PORTA	6/26/02	<b>ENLARGED PIPING PLAN          AREA WEST OF CCF</b>
TITLE		BRANCH CHIEF		PROJ. NO. 96038.1
DATE		SIZE		DWG. NO. 78K35402
DATE		SIZE		SHEET 18

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- SPECIFIC NOTE:**
- A DISCONNECT 3/4"x.065 TUBING, KC131K12, AND KC133K12-B FROM OUTLET OF A175522. INSTALL NEW KC133K16-B (ITEM NO. 36), KC131K16 (ITEM NO. 32), KC103-16 (2 REQ'D; ITEM NO. 9), MS9956-B (ITEM NO.12), AND 1"x.095 TUBING (ITEM NO. 4) TO OUTLET OF A175522
  - B RECONNECT TO EXISTING 3/4"x.065 GN2 TUBING.
  - C SECURE 1"x.095 GN2 TUBING TO EXISTING VERTICAL UNISTRUT (WHERE EXISTING 3/4" WAS REMOVED) USING NEW PIPE CLAMP (ITEM 95).
  - D PROVIDE NEW EMERGENCY SHOWER/EYE WASH STATION AND SECURE TO PAVEMENT USING 3 - 3/8" ANCHOR BOLTS. STATION SHALL BE EQUAL TO "GARDIAN EQUIPMENT" MODEL G1902P, STAY OPEN CHROME PLATED BALL VALVES, PLASTIC SHOWER HEAD AND EYE WASH BOWL, STAINLESS STEEL TRIANGULAR PULL ROD, LARGE FLAG TYPE PUSH HANDLE, GENTLE SPRAY EYE WASH HEADS WITH FLOAT OFF DUST COVERS, INSULATE EXTERIOR CW SUPPLY PIPING. (COORDINATE EXACT FINAL LOCATION WITH OWNER)
  - E SECURE 1 1/4" INSULATED COPPER COLD WATER LINE TO NEW VERTICAL UNISTRUT USING NEW PIPE CLAMP. SECURE UNISTRUT MEMBER TO WALL. (TYPICAL FOR 2 LOCATIONS)
  - F TAP NEW 1 1/4" COPPER COLD WATER (CW) LINE INTO EXISTING 2" LINE IN THIS LOCATION. ROUTE NEW 1 1/4" LINE TO NEW EMERGENCY SHOWER/EYE WASH STATION.

**ENLARGED PIPING PLAN - WEST END COMPRESSOR ROOM**  
SCALE: 1" = 1'-0"

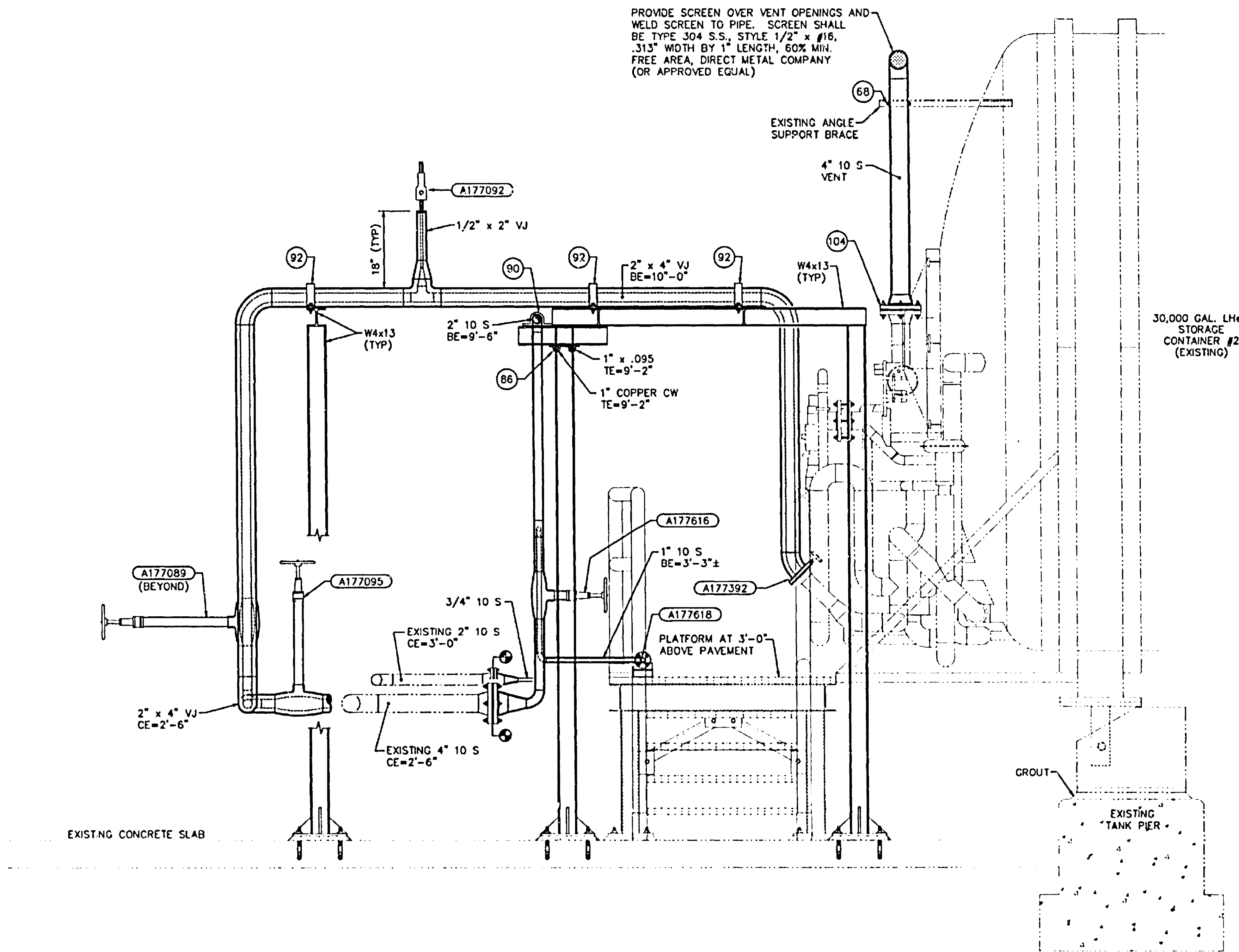


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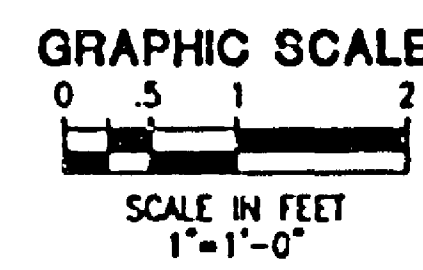
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SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES      DATE      NATIONAL AERONAUTICS AND SPACE ADMINISTRATION				
DRAWN    C.OLMUTANA    7/18/02    JOHN F. HENNINGER SPACE CENTER, NASA				
CHECKED    T.FEAGANS    7/18/02    KENNEDY SPACE CENTER, FLORIDA				
ENGINEER    M.DAVILA    7/18/02    CONVERTER COMPRESSOR FACILITY MODIFICATIONS				
FOR LIQUID HELIUM STORAGE SYSTEM				
<b>ENLARGED PIPING PLAN</b>				
<b>WEST END COMPRESSOR ROOM</b>				
SUBMITTED CAD/2/2/01		DATE	SIZE	DWG. NO.
APPROVED		DATE	SIZE	DWG. NO.
J.PORTA		8/24/02	F	78K36402
TITLE BRANCH CHIEF		PROJ. NO.	99G36.1	SHEET 10

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**SIDE VIEW SECTION - LH6 STORAGE CONTAINER # 2** (EB)  
SCALE: 1" = 1'-0"



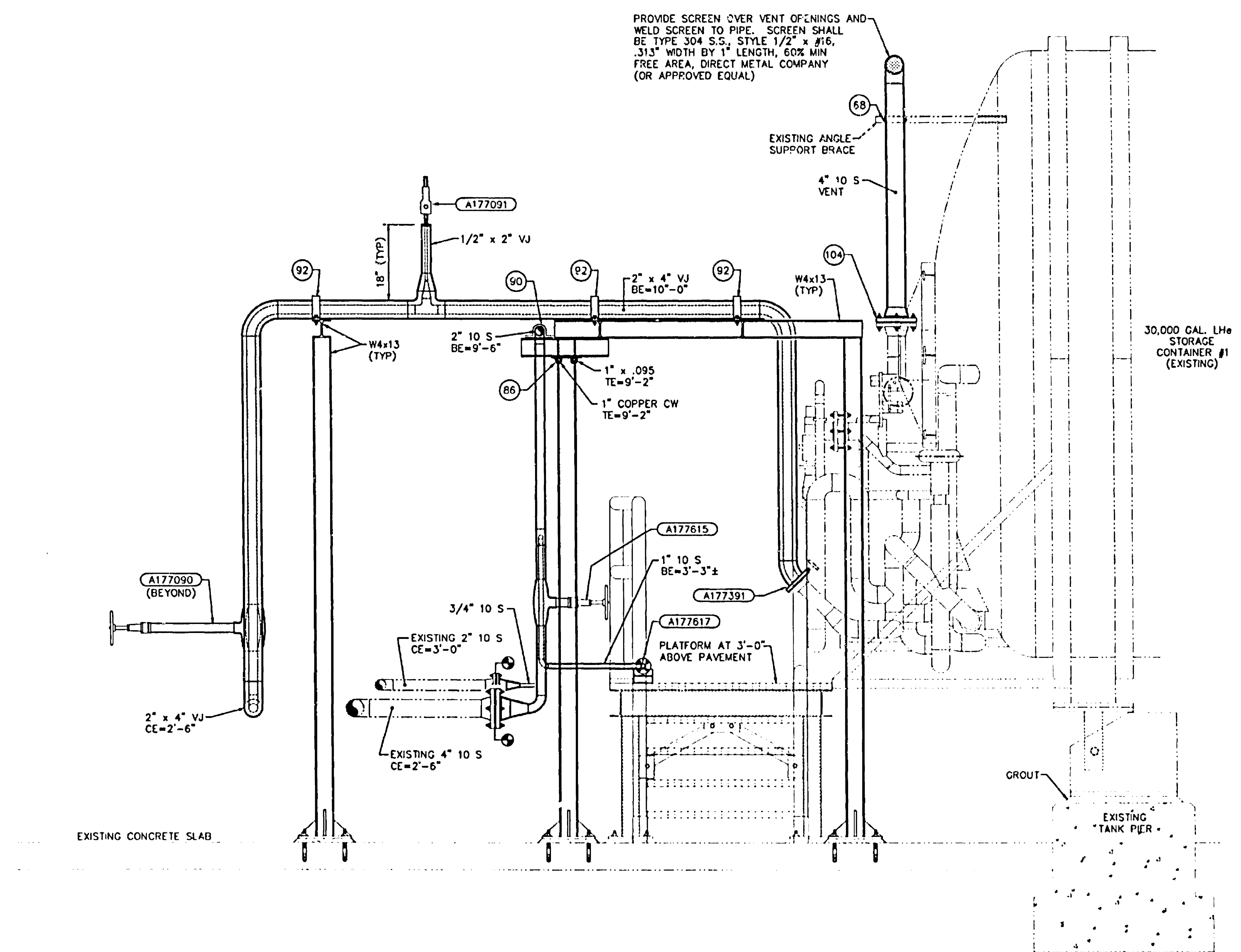
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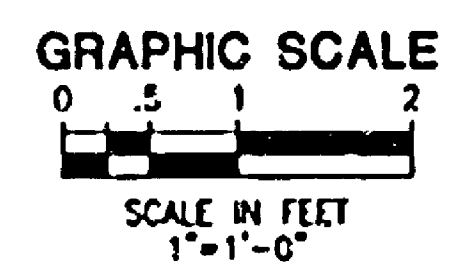
SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE		
DRAWN T.FEAGANS		7/18/02		
CHECKED T.FEAGANS		7/18/02		
ENGINEER M.JAVILA		7/18/02		
SUBMITTED CROSSING		9/11/01		
APPROVED J.PORTA		DATE 8/24/01		
TITLE BRANCH CHIEF		SIZE DWG. NO.		
		F 79K35402		
		PROJ. NO. 06038		
		SHEET 20		

**SIDE VIEW SECTION  
LH6 STORAGE CONTAINER # 2**

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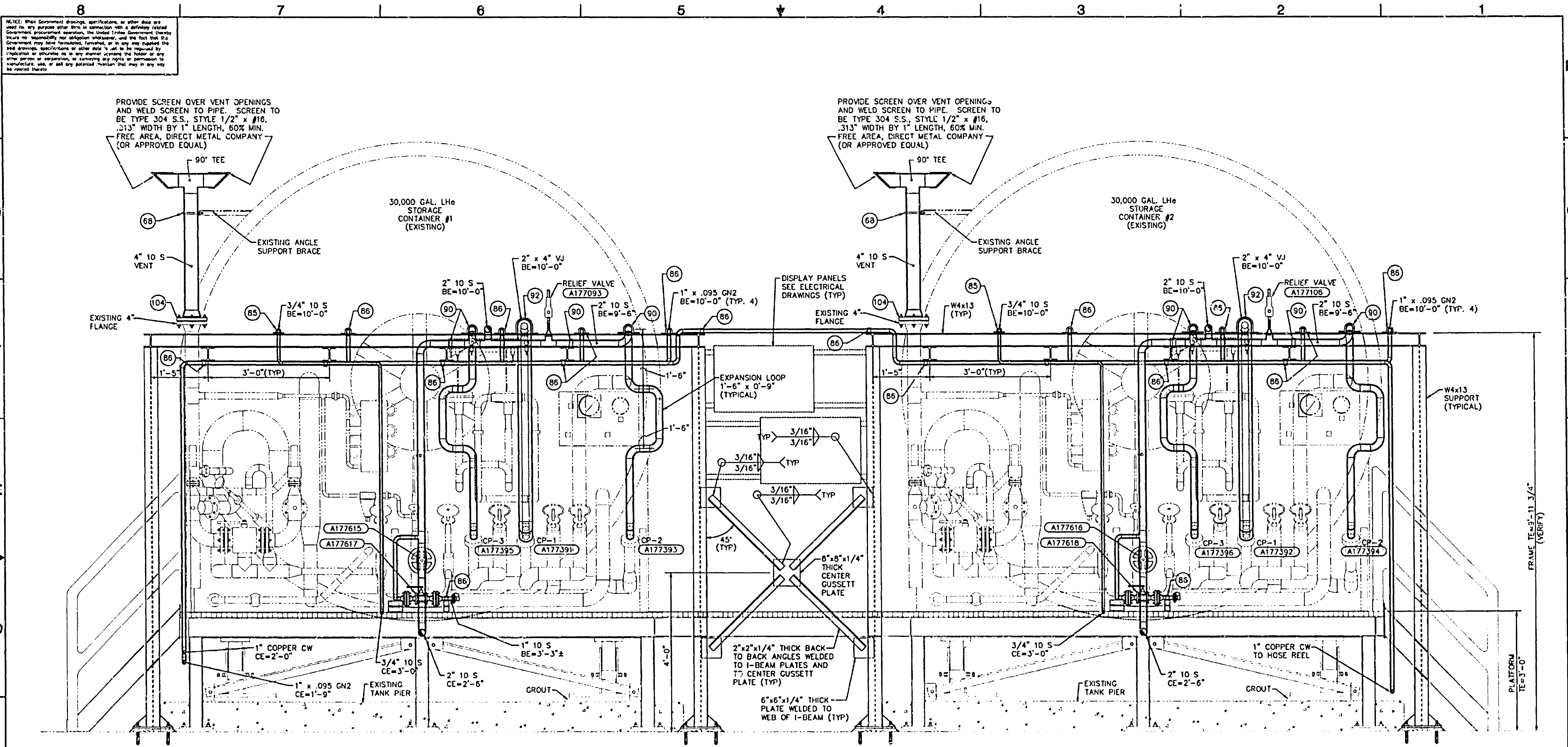
**SIDE VIEW SECTION - LH<sub>6</sub> STORAGE CONTAINER # 1** EC  
SCALE: 1" = 1'-0"



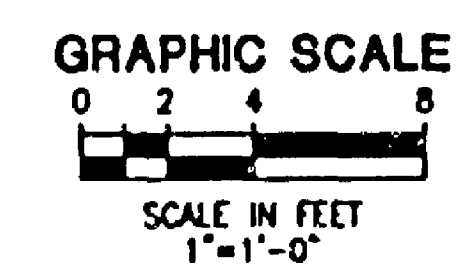
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SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	
DRAWN TFEAGANS		7/18/02	JOHN F. KENNEDY SPACE CENTER, NASA	
CHECKED TFEAGANS		7/18/02	KENNEDY SPACE CENTER, FLORIDA	
ENGINEER M DAVILA		7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM	
SUBMITTED CROSSING		7/18/02	SIDE VIEW SECTION	
APPROVED J PORTA		DATE	SIZE	DWG. NO.
TITLE BRANCH CHIEF			F	79K35402
PROJ. NO. 08038.1			SHEET 21	



END VIEW SECTION - LH<sub>2</sub> STORAGE CONTAINERS ED ED  
 SCALE: 1" = 1'-0" M-13 M-14



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SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE		
DRAWN T. TEAGANS		7/18/02		
CHECKED T. TEAGANS		7/18/02		
ENGINEER M. DAVILA		7/18/02		
SUBMITTED CROSSING		7/18/02		
APPROVED J. PORTA		7/18/02		
TITL. BRANCH CHIEF		DATE		

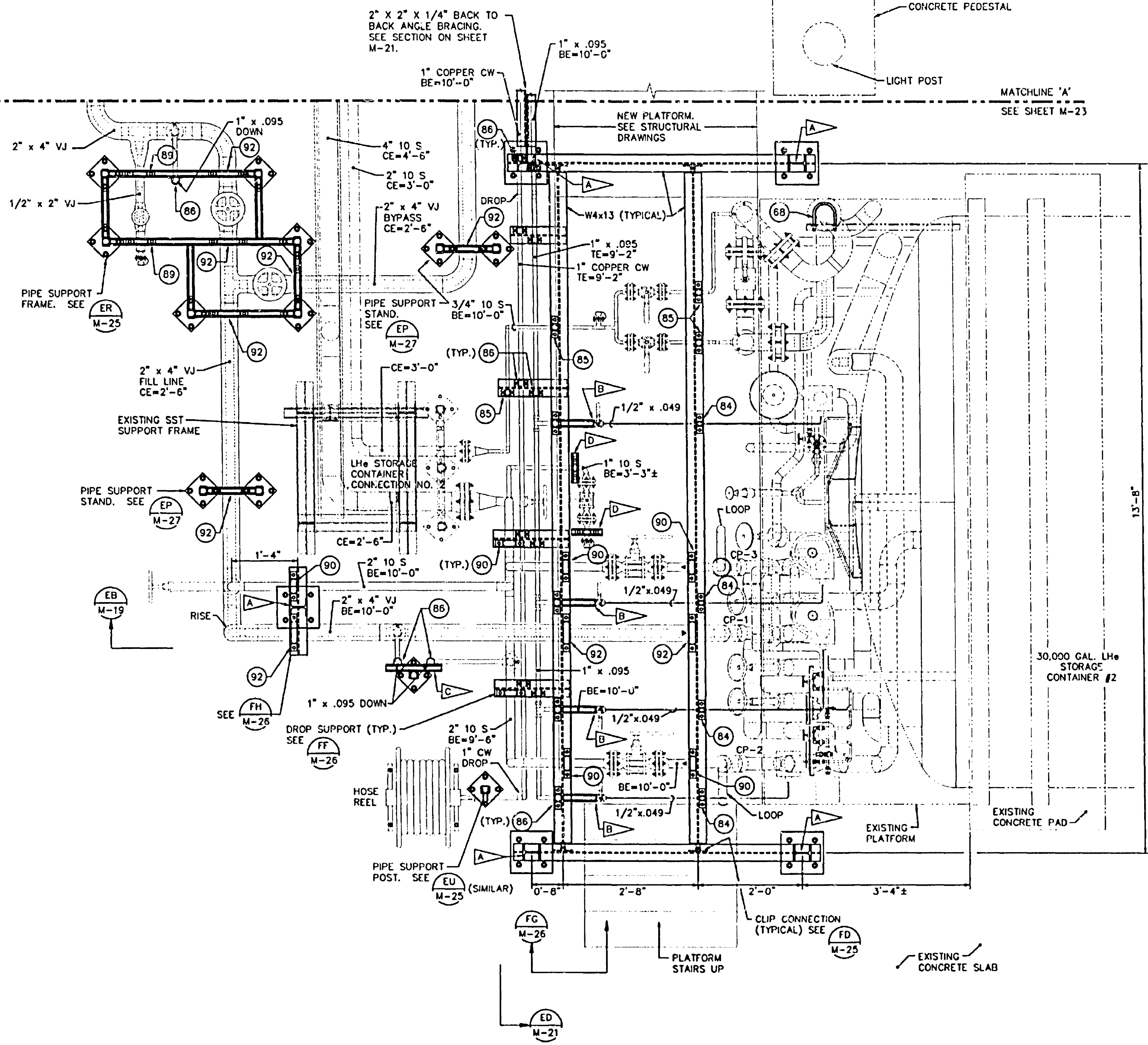
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA	
CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM	
END VIEW SECTION LH <sub>2</sub> STORAGE CONTAINERS	
SIZE	DWG. NO.
F	79K35402
PROJ. NO.	SHEET
990361	22

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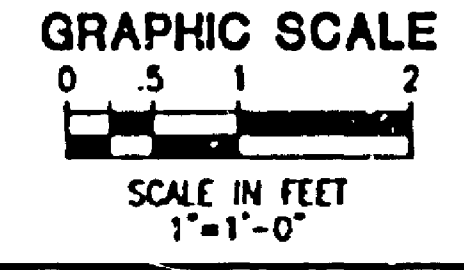
MATCHLINE 'A'  
SEE SHEET M-23

TANKER  
INTERFACE  
CONNECTION



- SPECIFIC NOTES**
- A W4x13 SUPPORT POST WITH 10x10x3/4 PLATE WITH GUSSETS ON 1 INCH THICK NON-SHRINK GROUT ANCHORED INTO SLAB USING 3/4" EXPANSION ANCHORS (4 REQUIRED PER POST TYPICAL) WITH 4" EMBED.
  - B SECURE UNISTRUT TO I-BEAM AND SECURE BALL VALVE TO UNISTRUT (TYPICAL). SEE (FB) M-24
  - C SECURE HORIZONTAL UNISTRUT TO VERTICAL UNISTRUT POST (IN 3 LOCATIONS) AND SECURE 1 INCH RELIEF VALVE DISCHARGE LINE TO UNISTRUT. SEE (FM) M-27
  - D SUPPORT PIPE, FROM PLATFORM, ON DUAL UNISTRUT MEMBER. SEE (FE) M-25
  - E ALL PIPE CLAMPS INCLUDE TEFLON SLIDE PLATE (ITEM 97).

PIPING SUPPORT PLAN - LH<sub>2</sub> STORAGE CONTAINER # 2  
SCALE: 1" = 1'-0"

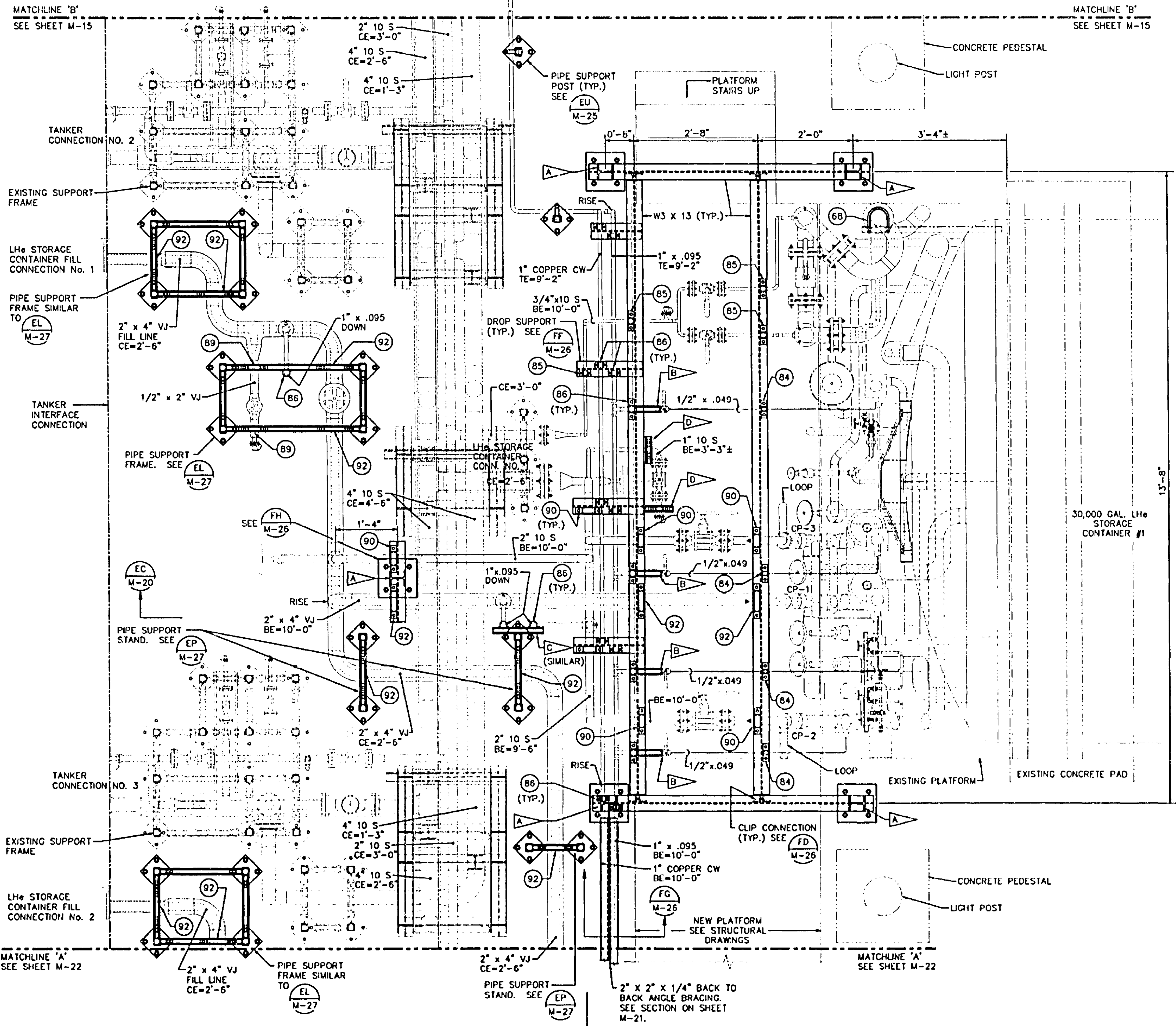


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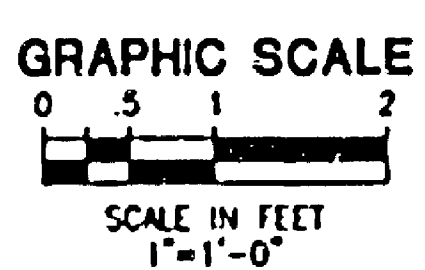
SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE		
DRAWN	TFLAGMS	7/18/02	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA	
CHECKED	TFLAGMS	7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM	
ENGINEER	M DAVILA	7/18/02		
SUBMITTED		CROSSFIELD	7/18/02	
APPROVED	J.P. PORTA	7/18/02	SIZE	DWG. NO.
TITLE	BRANCH CHIEF		F	79K35402
PROJ. NO. 060361			SHEET 23	

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- SPECIFIC NOTES**
- A. W4x13 SUPPORT POST WITH 10x10x3/4 PLATE WITH GUSSETS ON 1 INCH THICK NON-SHRINK GROUT ANCHORED INTO SLAB USING 3/4\"/>
  - B. SECURE UNISTRUT TO I-BEAM AND SECURE BALL VALVE TO UNISTRUT (TYPICAL). SEE (FB) M-24
  - C. SECURE HORIZONTAL UNISTRUT TO VERTICAL UNISTRUT POST (IN 3 LOCATIONS) AND SECURE 1 INCH RELIEF VALVE DISCHARGE LINE TO UNISTRUT. SEE (FM) M-27
  - D. SUPPORT PIPE, FROM PLATFORM, ON DUAL UNISTRUT MEMBER. SEE (FE) M-25
  - E. ALL PIPE CLAMPS INCLUDE TEFLON SLIDE PLATE (ITEM 97).

**PIPING SUPPORT PLAN - LH6 STORAGE CONTAINER # 1**  
 SCALE: 1" = 1'-0"



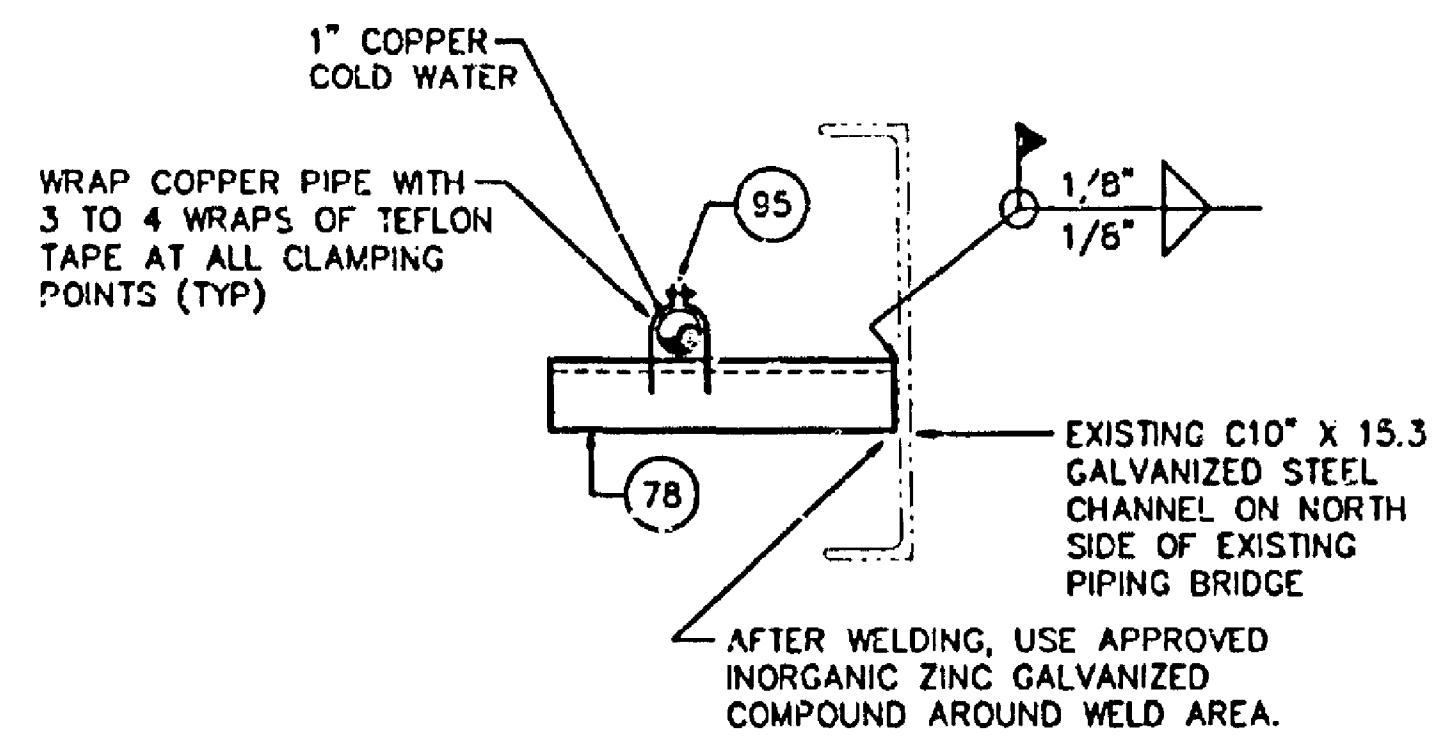
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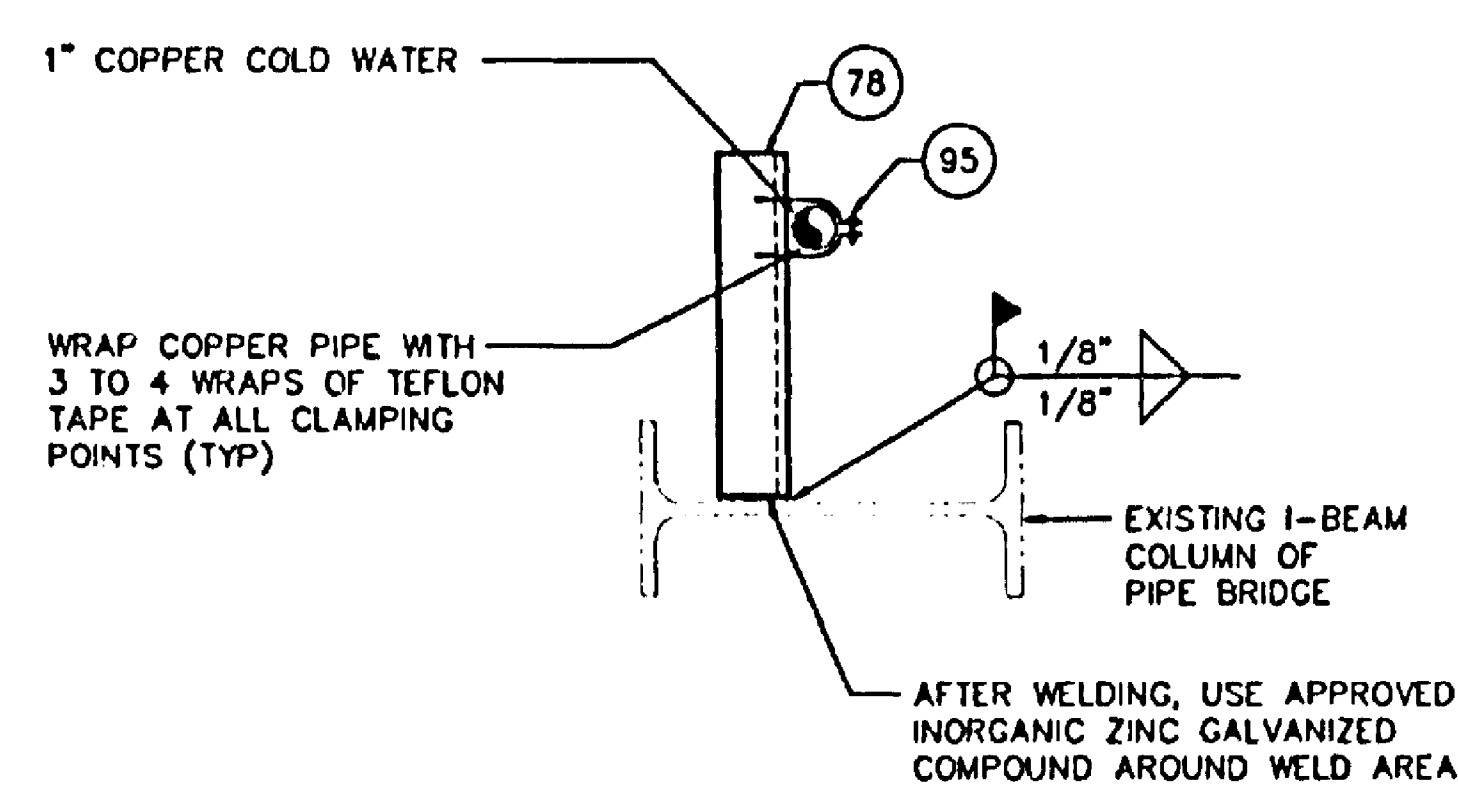
SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		NATIONAL AERONAUTICS AND SPACE ADMINISTRATION		
DRAWN TTAGANS		JOHN F. KENNEDY SPACE CENTER, NASA		
CHECKED TTAGANS		KENNEDY SPACE CENTER, FLORIDA		
ENGINEER M DAVILA		CONVERTER COMPRESSOR FACILITY MODIFICATIONS		
		FOR LIQUID HELIUM STORAGE SYSTEM		
<b>PIPING SUPPORT PLAN</b>				
<b>LH6 STORAGE CONTAINER # 1</b>				
SUBMITTED CAGZ/PHN		DATE	SIZE	DWG. NO.
APPROVED J PORTA		DATE	F	78K35402
TITLE BRANCH CHIEF		PROJ. NO.	08038.1	SHEET 24



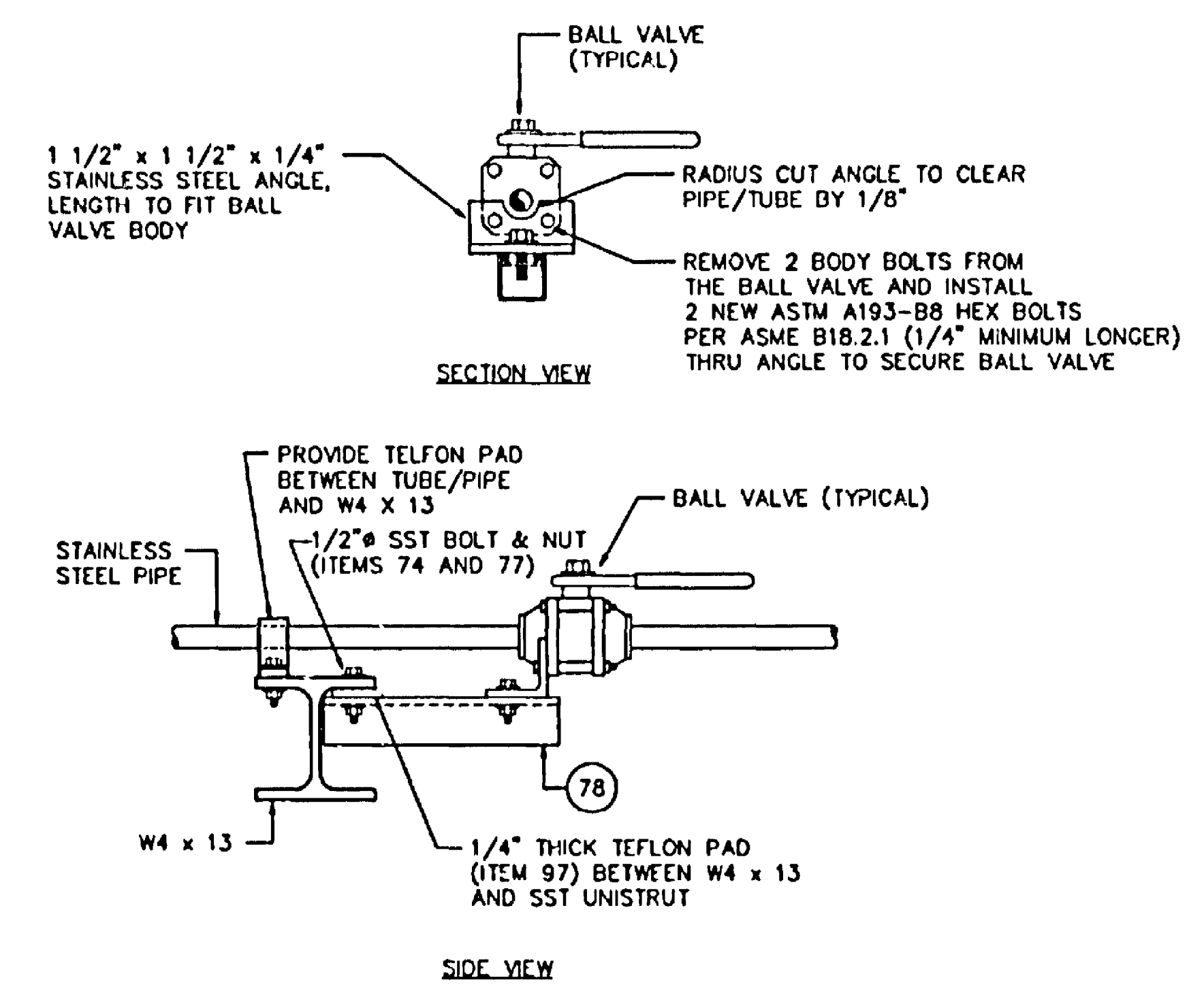
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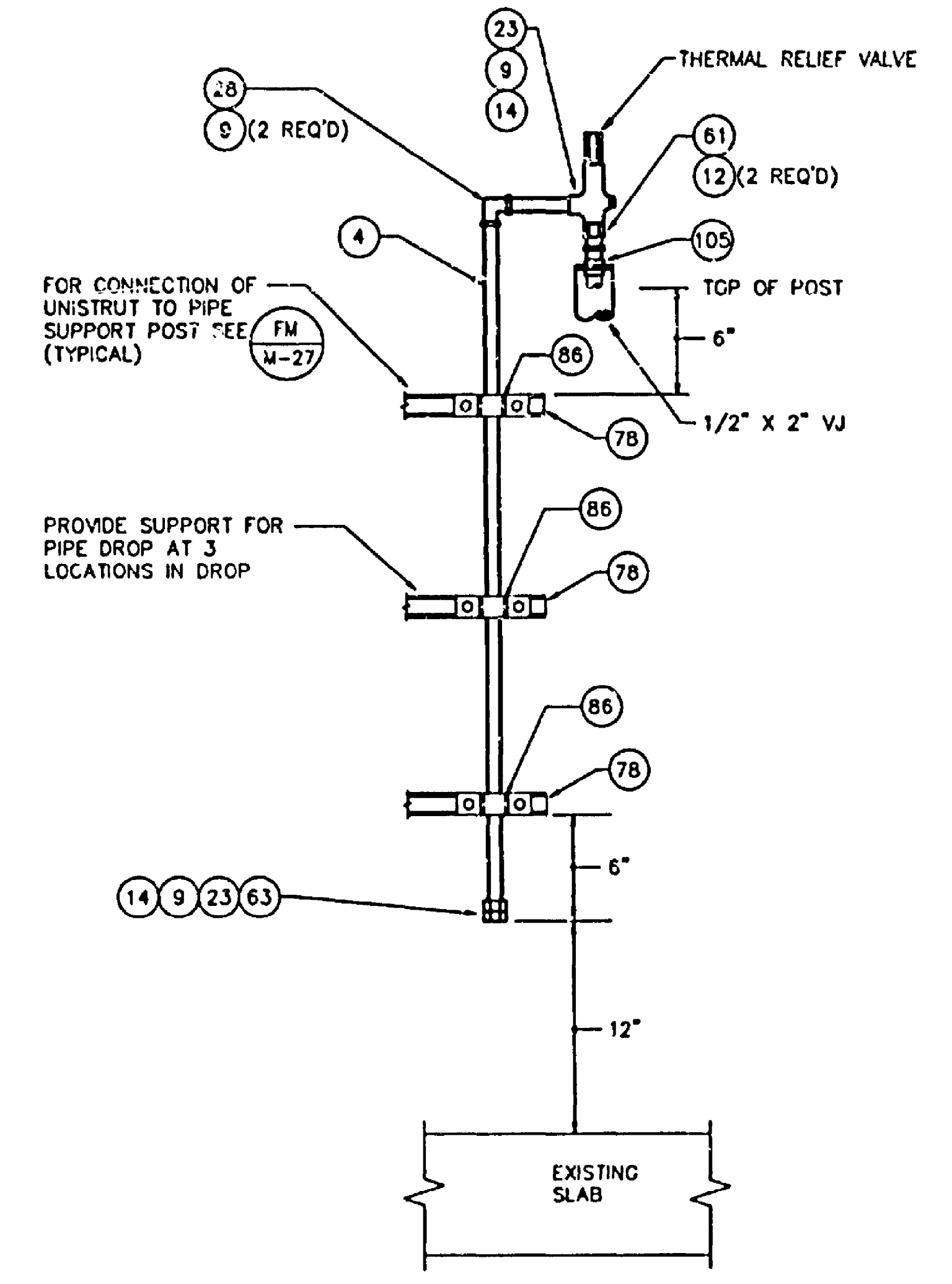
**PIPE SUPPORT AT EXISTING PIPE BRIDGE CHANNEL** (EY M-17)  
SCALE: 3" = 1'-0"



**PIPE SUPPORT AT EXISTING PIPE BRIDGE COLUMN** (EV M-17)  
SCALE: 3" = 1'-0"



**TYPICAL BALL VALVE SUPPORT DETAIL** (FB M-22) (FB M-23)  
SCALE: 3" = 1'-0"



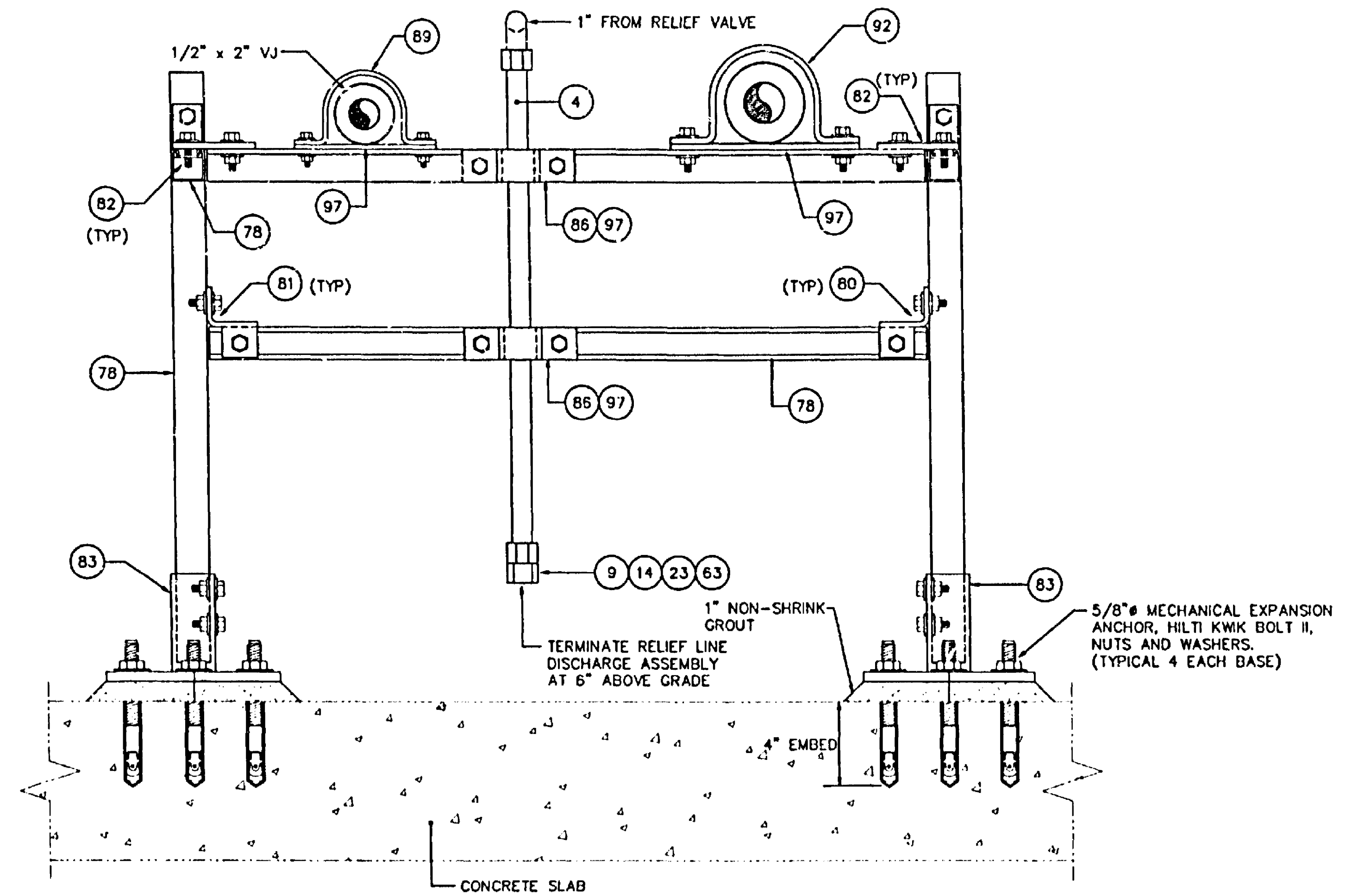
**RELIEF VALVE DISCHARGE LINE FITTING DETAIL** (EK M-13) (EK M-14)  
SCALE: 1" = 6"

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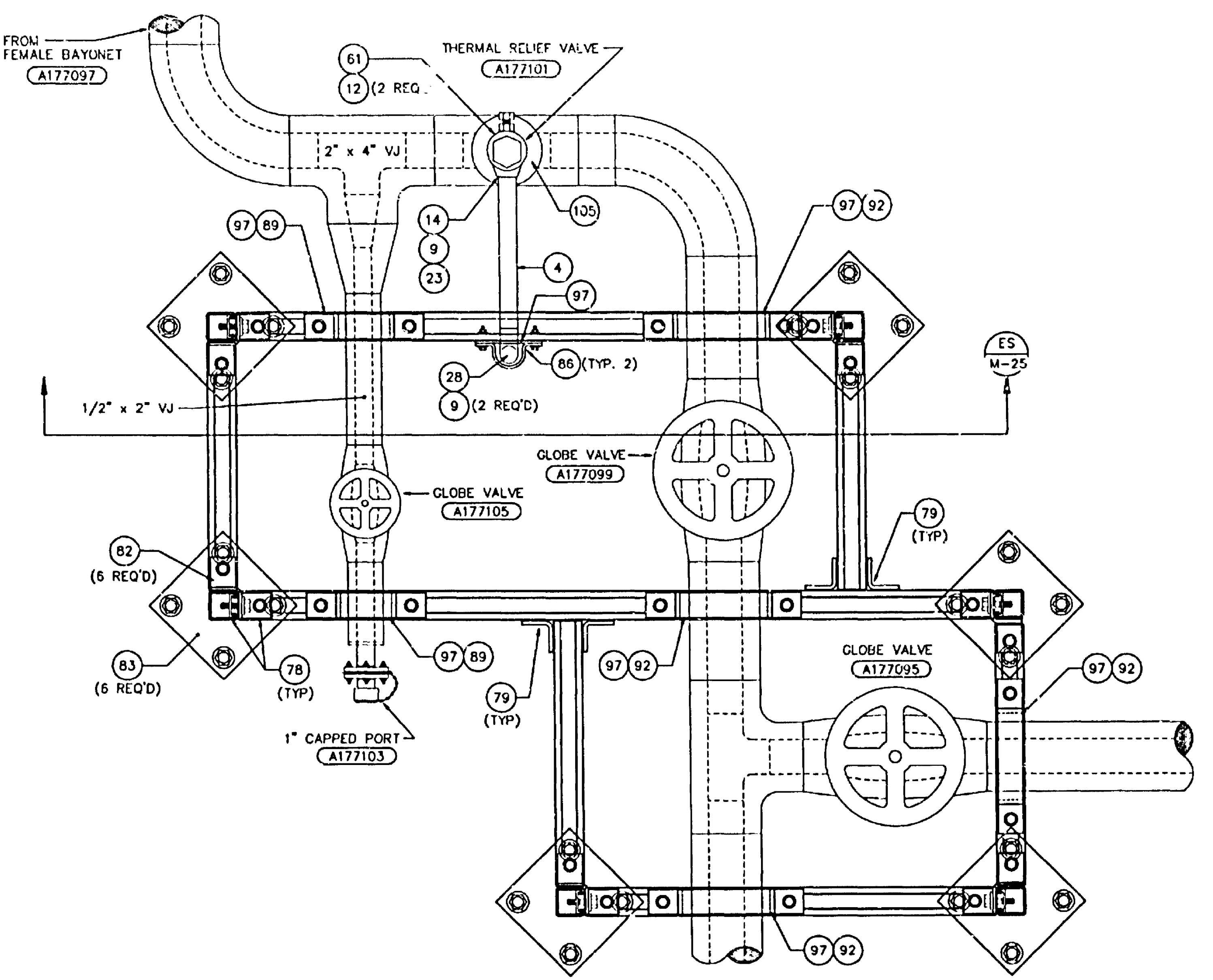
SYM	ZONE	DESCRIPTION	DATE	APPROVED
SIGNATURES				
DRAWN	C OUMTANA	DATE	7/18/02	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, FLORIDA KENNEDY SPACE CENTER, FLORIDA
CHECKED	T YEAGANS	DATE	7/18/02	
ENGINEER	M DAVILA	DATE	7/18/02	
ENGINEER	M DAVILA	DATE	7/18/02	
SUBMITTED FOR APPROVAL				
APPROVED	J PORTA	DATE	8/11/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM
TITLE	BRANCH CHIEF	SIZE	DWG. NO.	
			F 70K35402	REV
			PROJ. NO. 060301	SHEET 25

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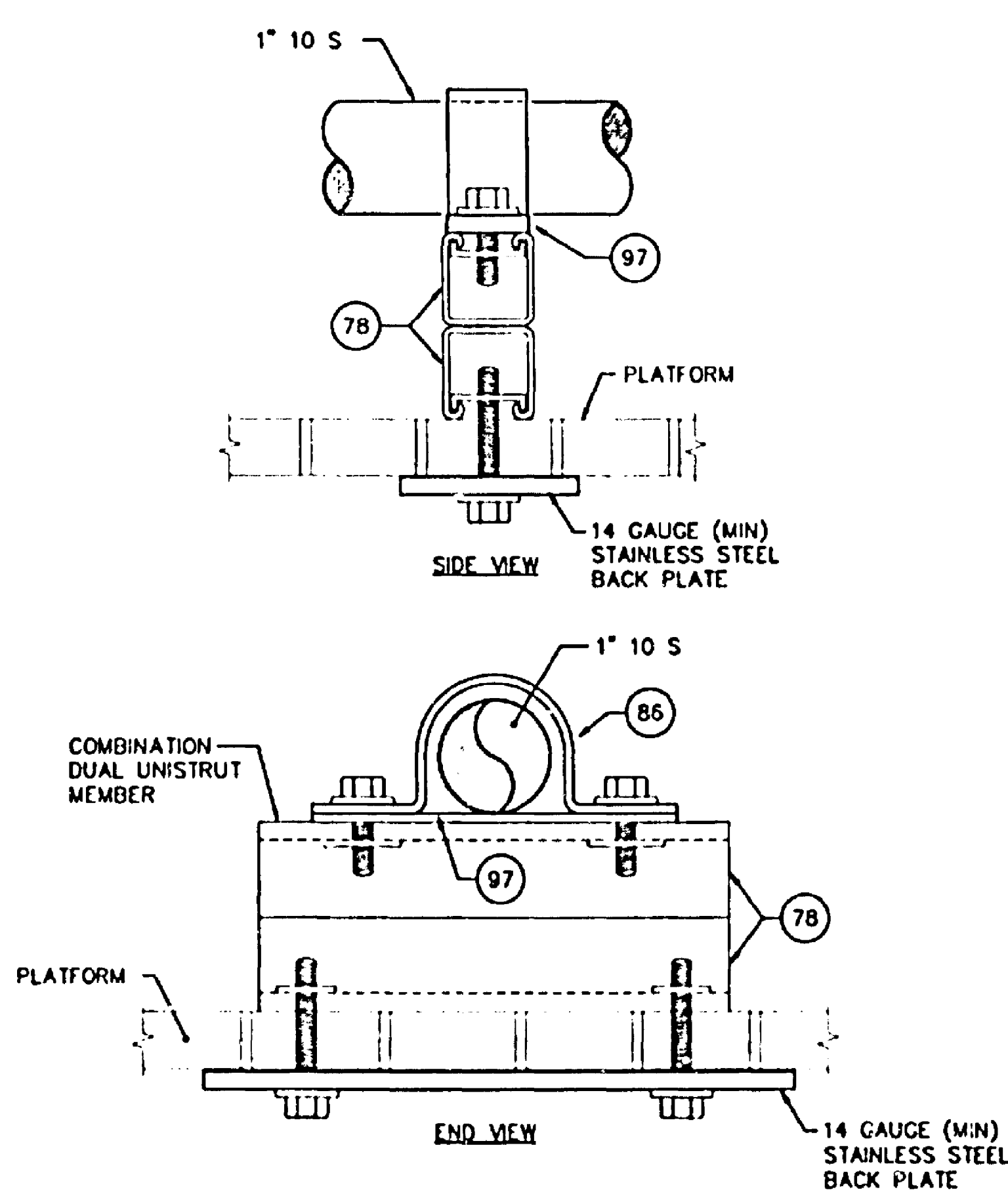
PIPE SUPPORT SECTION  
SCALE: 3" = 1'-0"

ES  
M-25



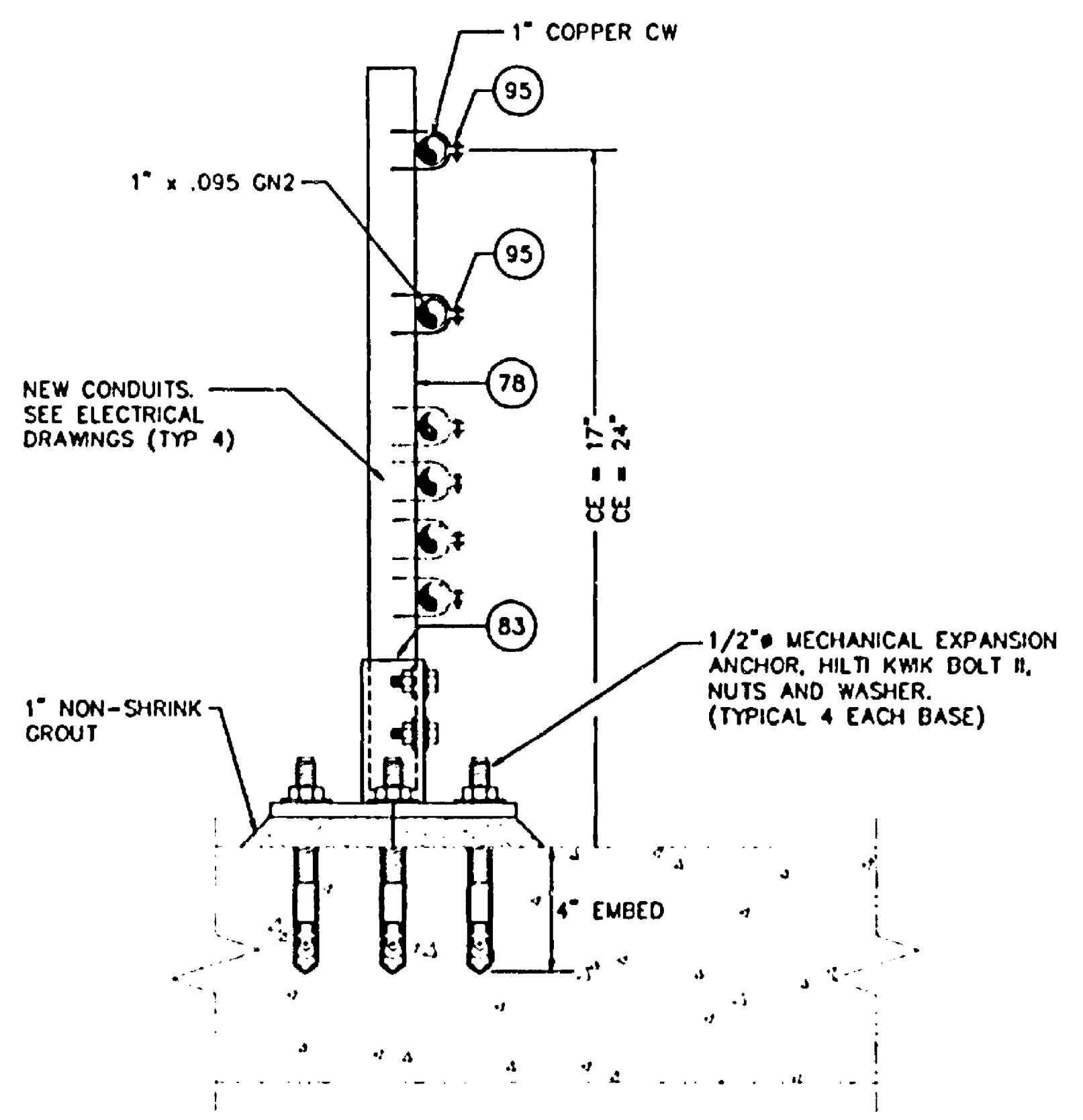
PIPE SUPPORT DETAIL - CONTAINER 2  
SCALE: 3" = 1'-0"

ER  
M-22



PIPE SUPPORT ON PLATFORM DETAIL  
SCALE: 6" = 1'-0"

FE  
M-22



PIPE SUPPORT DETAIL  
SCALE: 3" = 1'-0"

EU  
M-15

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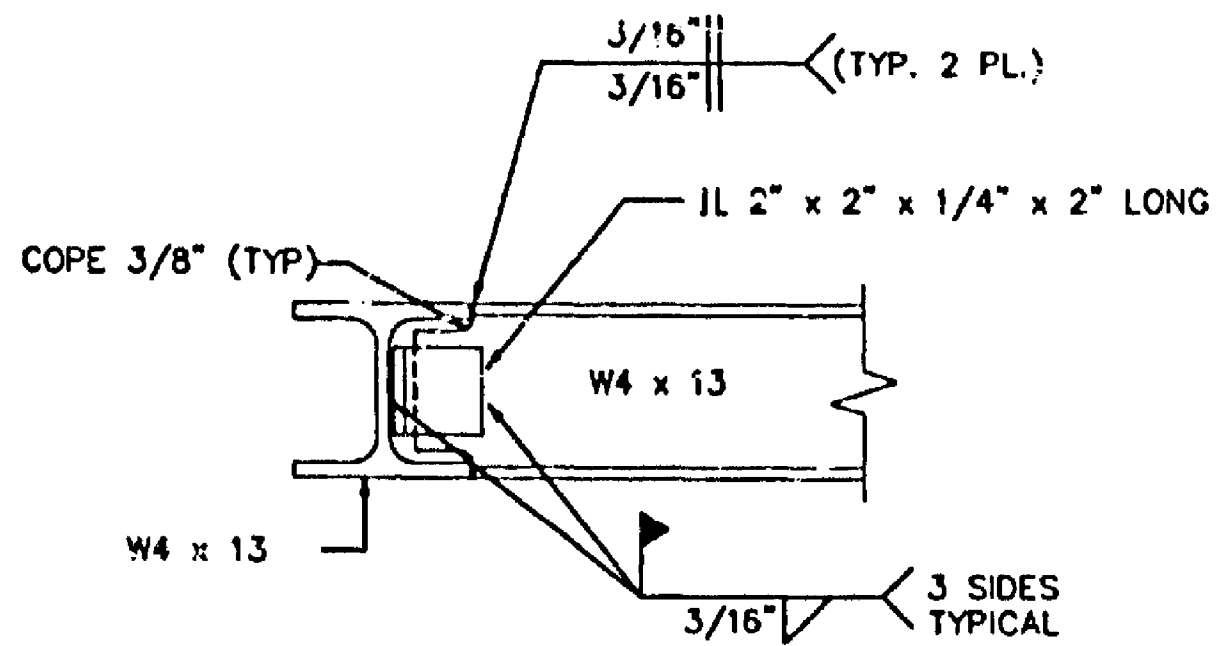
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CONSULTING ENGINEERS  
1000 Providence Ave South, Suite 200, Fort Palm Beach, FL 33448-0001  
TEL: 561-990-8200 FAX: 561-990-8202  
Engineering Business Number: 6009

M-25

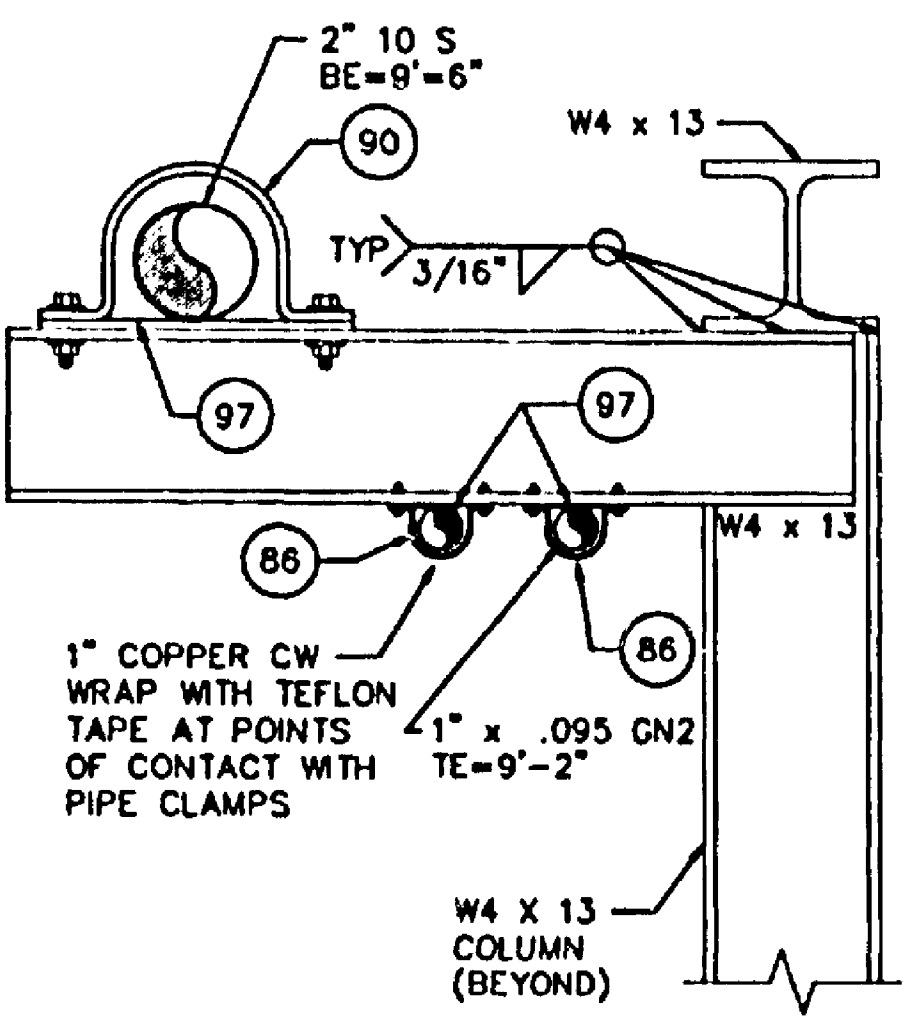
SYM	ZONE	DESCRIPTION	DATE	APPROVED
SIGNATURES				
DRAWN		C OLIVIANA	7/18/02	
CHECKED		T FEAGANS	7/18/02	
ENGINEER		M DAVILA	7/18/02	
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA WASHINGTON, DC 20546-0001				
CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM				
PIPING SUPPORT DETAILS				
APPROVED		J PORTA	7/18/02	
TITLE		BRANCH CHIEF		
SIZE	DWG. NO.	REV		
F	78K36402			
PROJ. NO.	880381	SHEET 28		

8 7 6 5 4 3 2 1

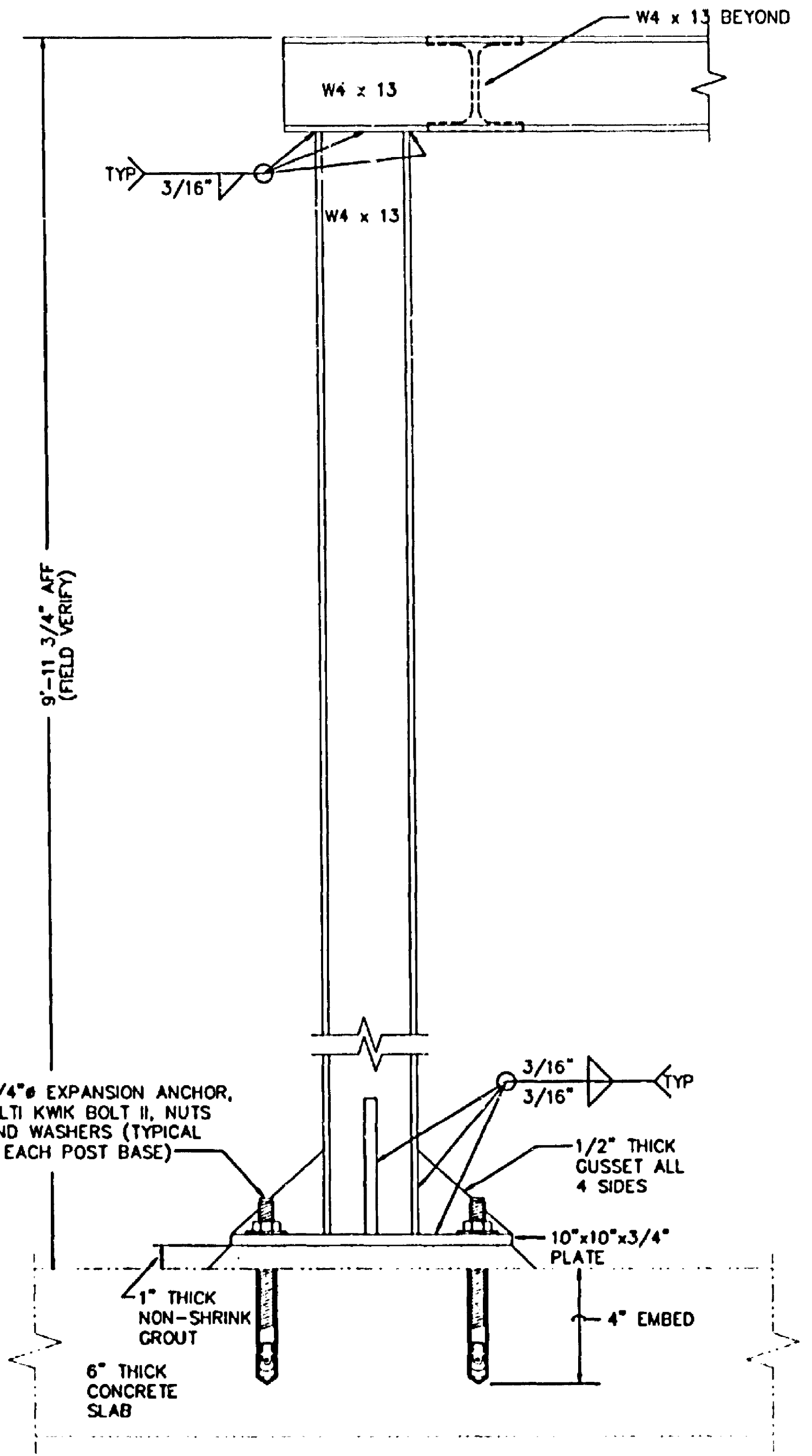
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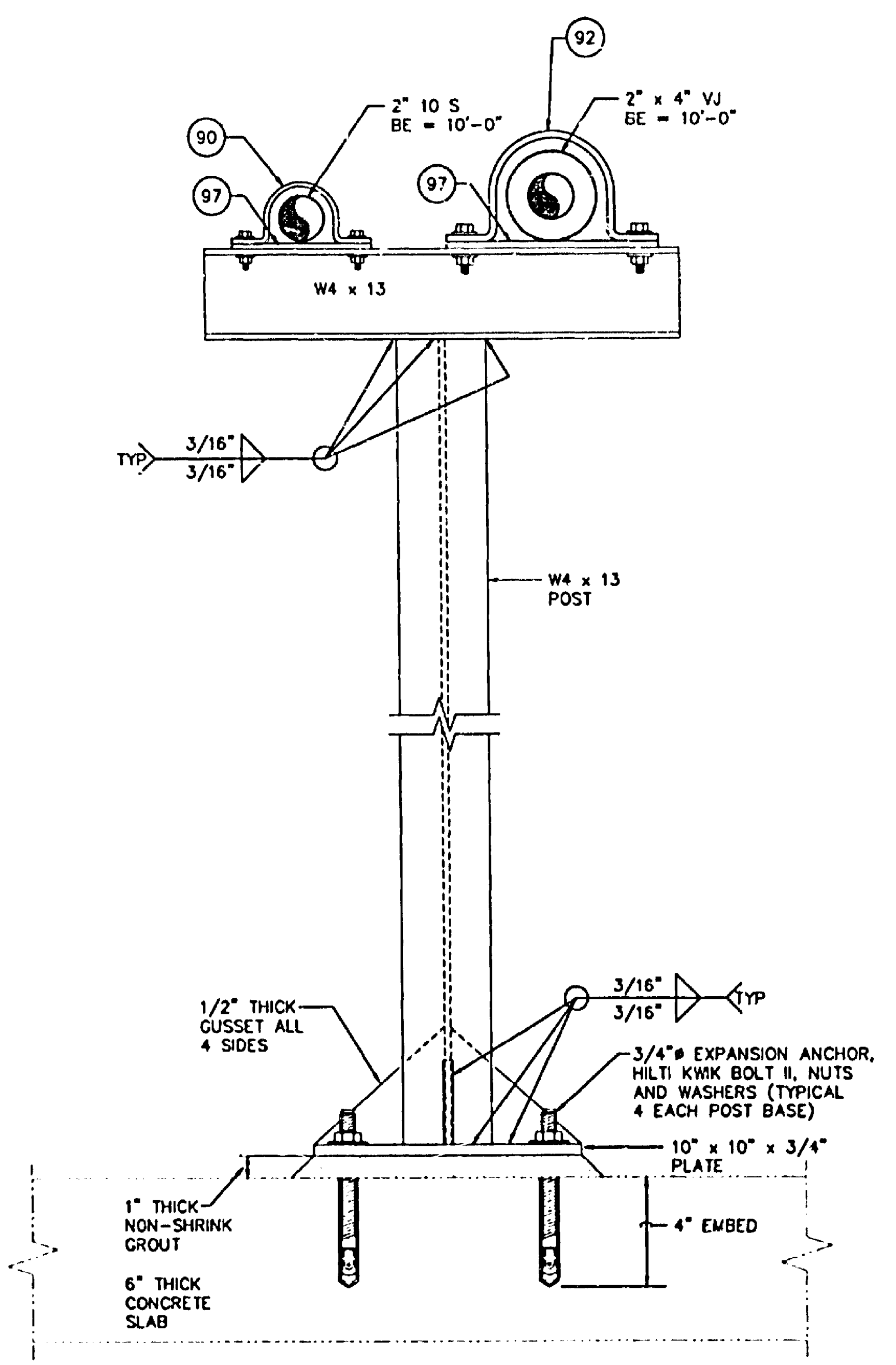
**SUPPORT FRAME CLIP CONNECTION DETAIL**  
SCALE: 3" = 1'-0"  
FD M-22 FD M-23



**DROP SUPPORT DETAIL - WEST END**  
SCALE: 3" = 1'-0"  
FF M-22 FF M-23



**SUPPORT FRAME DETAIL**  
SCALE: 3" = 1'-0"  
FG M-22 FG M-23



**SUPPORT FRAME DETAIL**  
SCALE: 3" = 1'-0"  
FH M-22 FH M-23

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CONSULTING ENGINEERS  
2000 Audubon Ave South, Suite 202, Fort Palm Beach, FL 33480 • (407) 368-2000 • Fax: (407) 368-2000 • www.jlrd.com  
Engineering Discipline: Mechanical

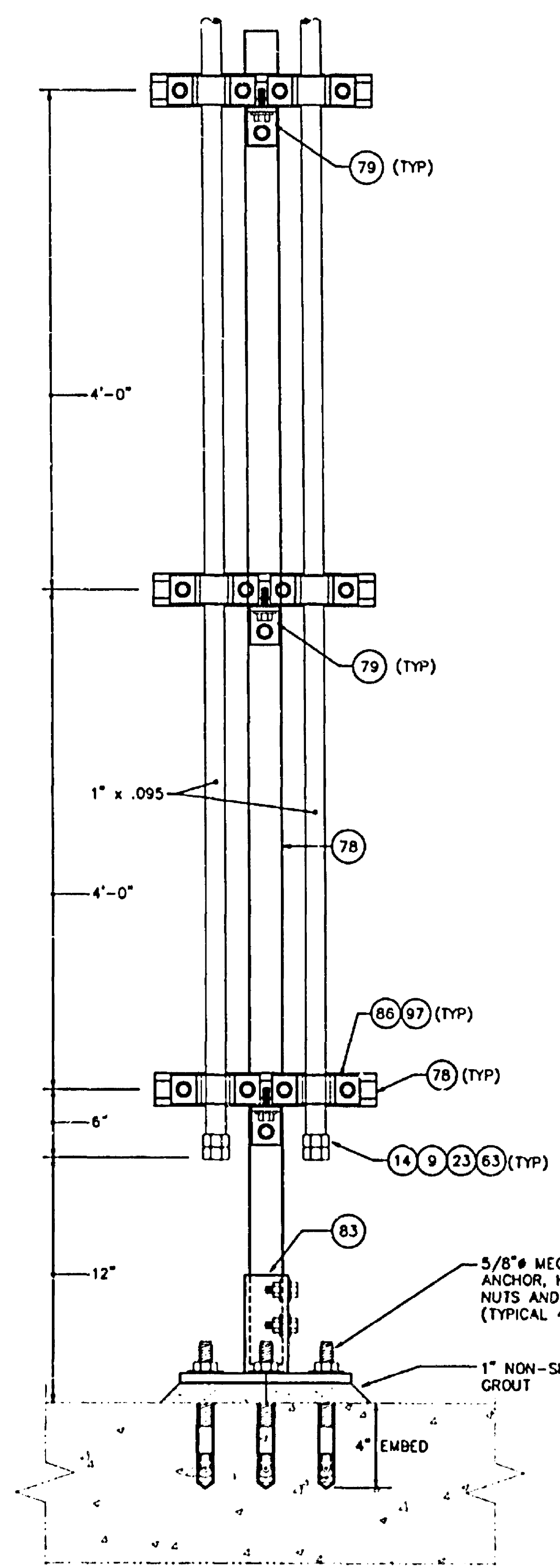
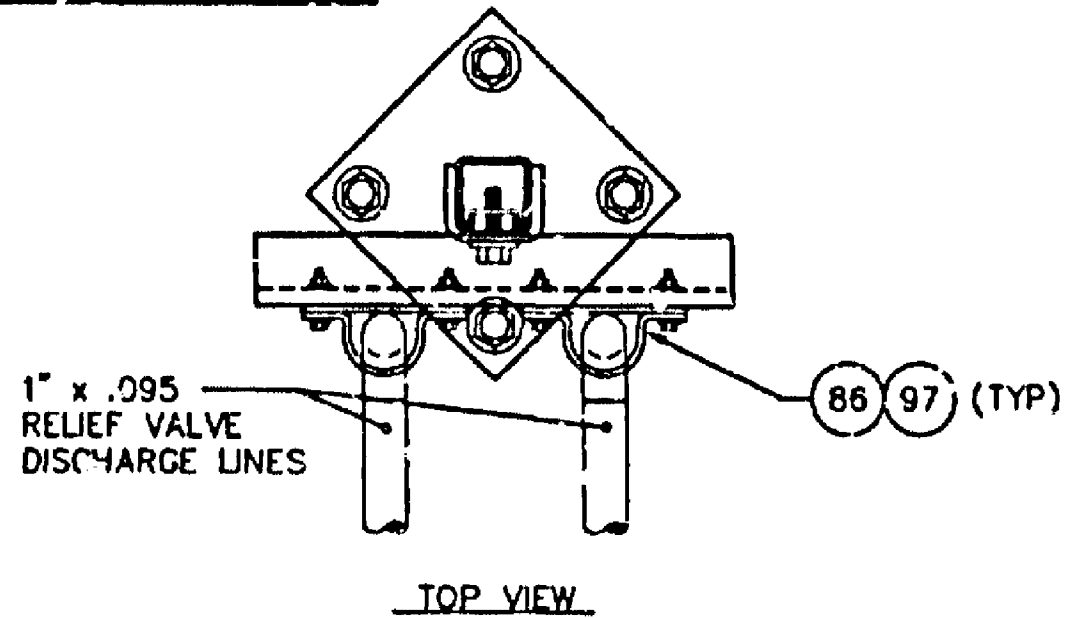
SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES		DATE		
DRAWN: G.QUINTANA		7/18/02		
CHECKED: J.TEAGANS		7/18/02		
ENGINEER: M.DRYLA		7/18/02		
SUBMITTED: CROZIER/PALM		7/18/02		
APPROVED: J.PORTA		7/18/02		
TITLE: BRANCH CHIEF		PROJ. NO. 98036.1		

**PIPING SUPPORT DETAILS**

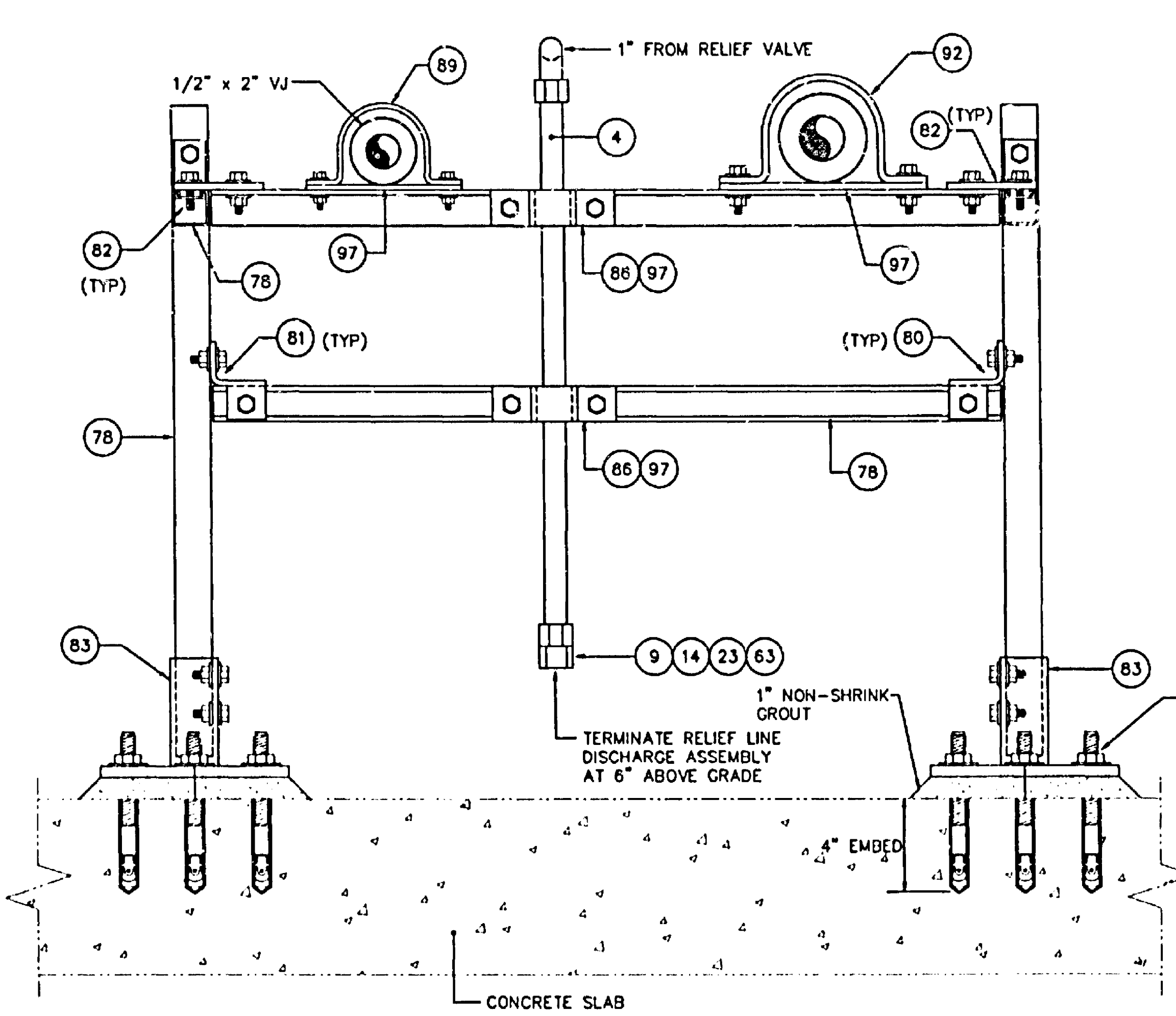
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SHEET 27

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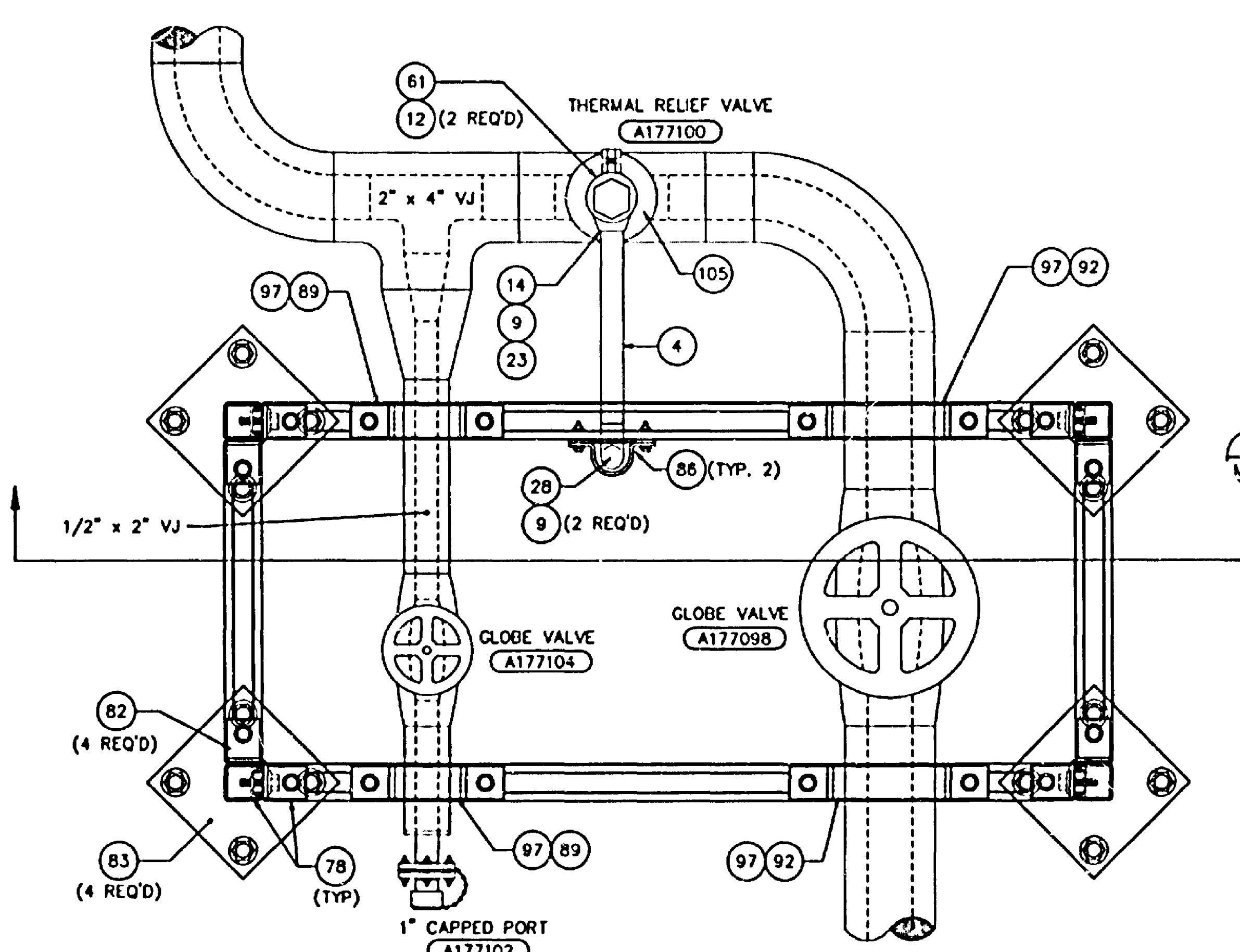
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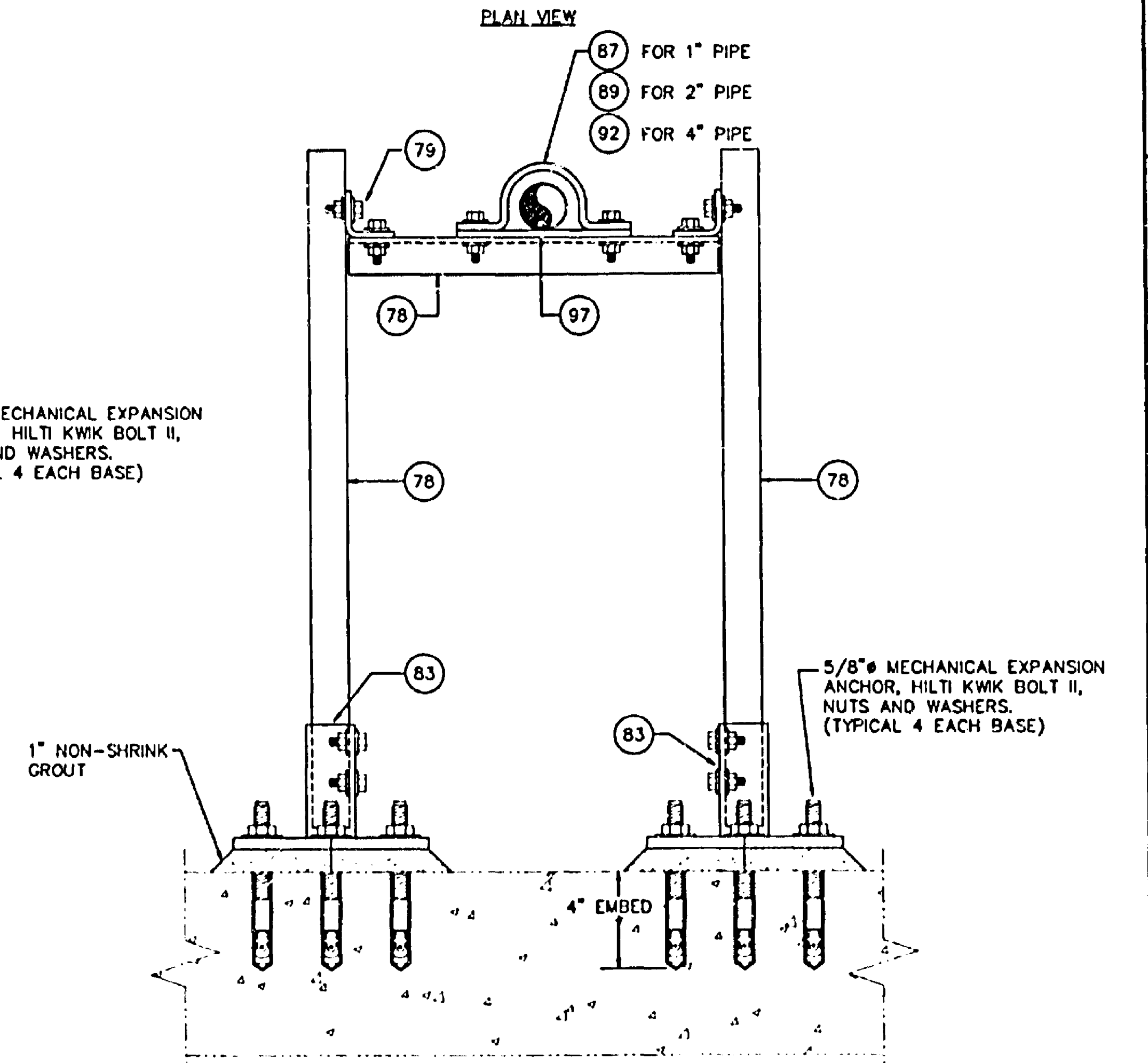
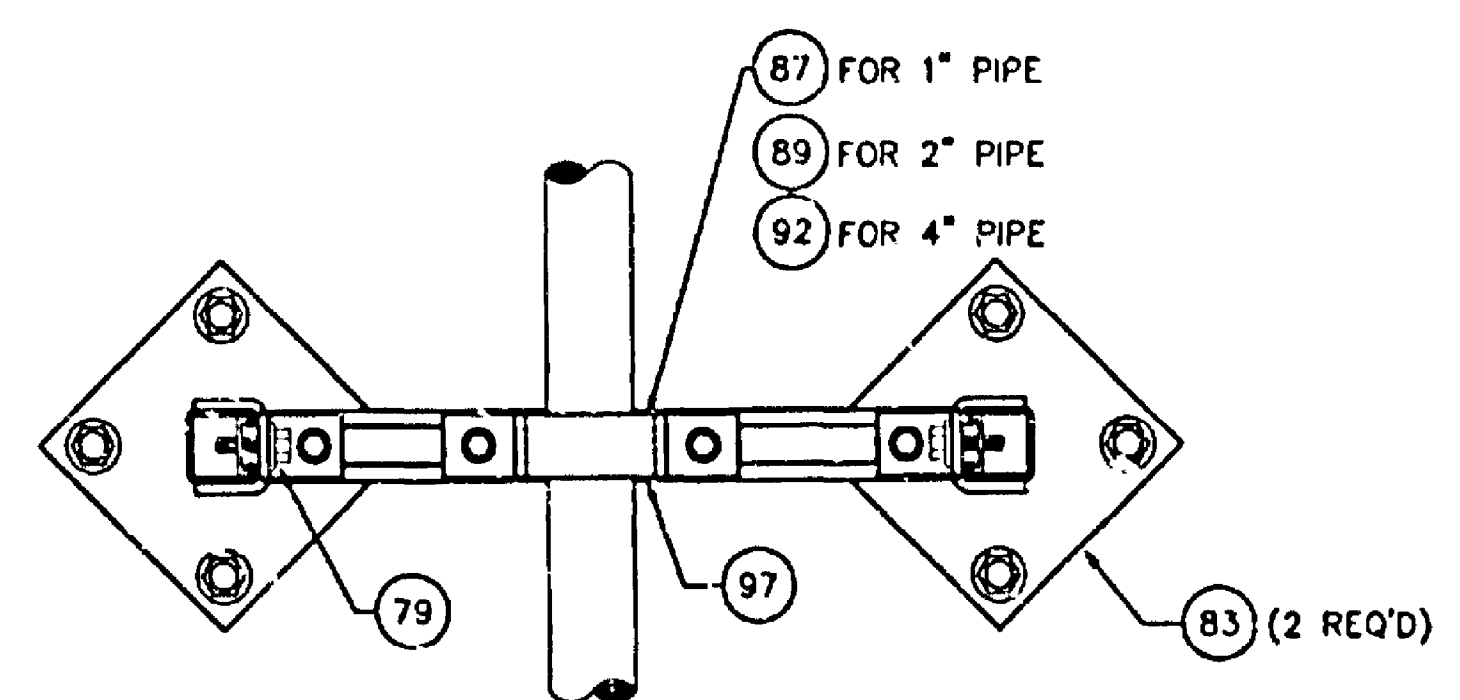
RELIEF VALVE DISCHARGE SUPPORT DETAIL FM M-22 FM M-23 FM M-24  
SCALE: 3" = 1'-0"



PIPE SUPPORT SECTION EM M-27  
SCALE: 3" = 1'-0"



PIPE SUPPORT DETAIL - CONTAINER 1 EL M-23  
SCALE: 3" = 1'-0"



TYPICAL SINGLE PIPE SUPPORT EP EP M-22 M-23  
SCALE: 3" = 1'-0"

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Engineering Business Number: 6089

SYM	ZONE	DESCRIPTION	DATE	APPROVED
SIGNATURES				
DRAWN T.FACANS		7/18/02		
CHECKED T.FACANS		7/18/02		
ENGINEER M.DAVILA		7/18/02		
SUBMITTED FOR REVIEW				
APPROVED J.PORTA		7/18/02		
TITLE BRANCH ONE		PROJ. NO. 98038.1		
SIZE DWG. NO.		F 78K35402		
SHEET		28		

PIPING SUPPORT DETAILS

REV

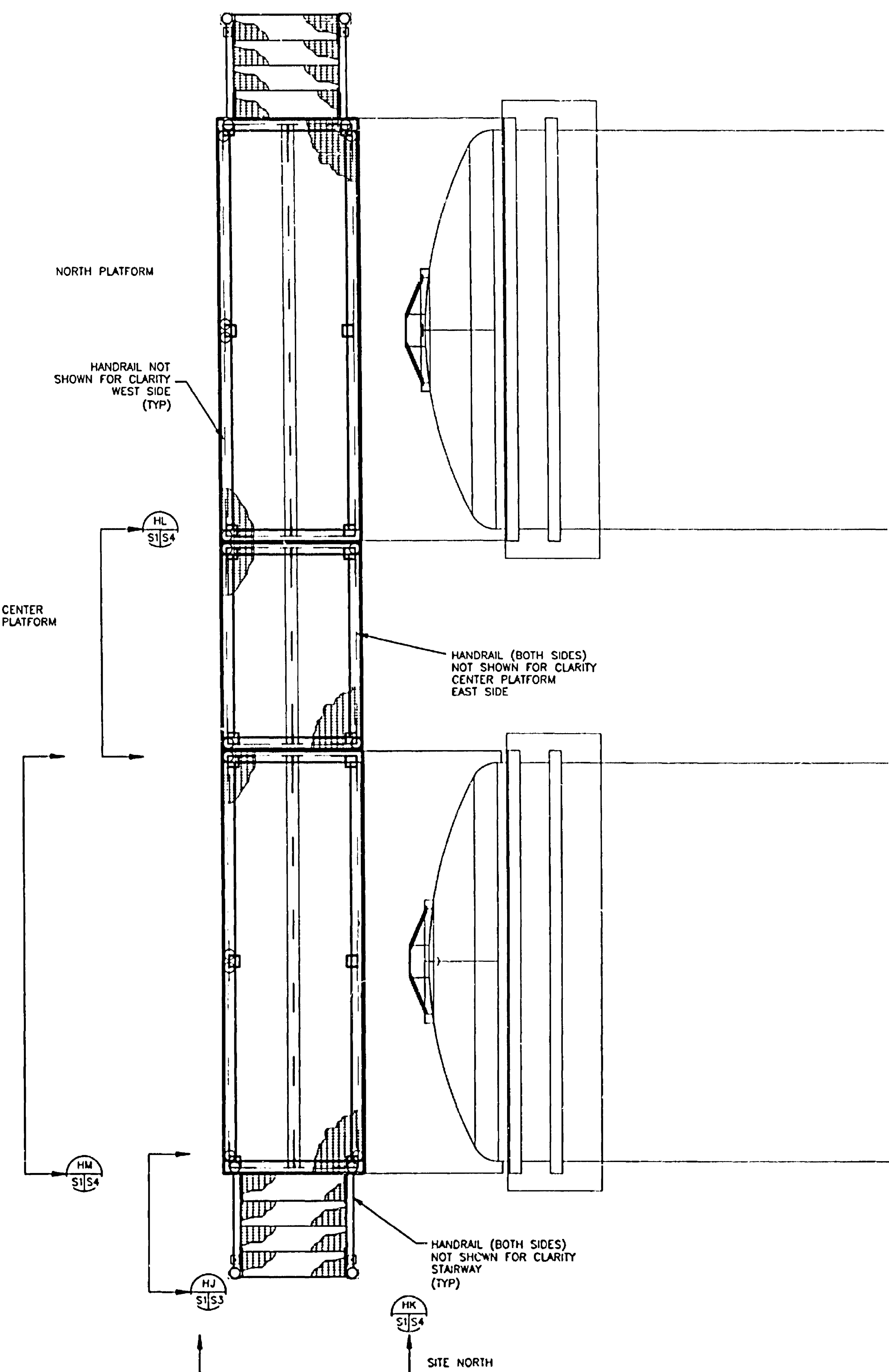
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**GENERAL STRUCTURAL STEEL NOTES:**

1. MATERIALS:
  - 1.1 CARBON STEEL STRUCTURAL STEEL SHAPES AND PLATES: ASTM A36 MIN.
  - 1.2 CARBON STEEL STRUCTURAL TUBING: ASTM A500, GRADE B (F<sub>y</sub>=46 ksi) MIN.
  - 1.3 CARBON STEEL PIPE FOR HAND RAILS: ASTM A-120, SCHEDULE 40, STANDARD WEIGHT; 3" NOMINAL DIAMETER
  - 1.4 WELDING ELECTRODES, E70XX.
  - 1.5 BOLTS FOR STRUCTURAL FRAMING: ASTM A325N, BEARING TYPE CONNECTION WITH HEAVY HEXAGONAL NUT, UNLESS NOTED OTHERWISE.
  - 1.6 GRATING: ALL CARBON STEEL GRATING SHALL BE MIN 3/16", 1" HIGH, CUT TO FIT, NON-SLIP (SERRATED) GRATING, (MICHOLS CO. OR EQUIVALENT), HOT-DIPPED GALVANIZED AND ATTACHED TO STRUCTURAL FRAMING WITH STAINLESS STEEL CLIPS AT 2'-0" ON CENTER.
  - 1.7 STAIR TREADS: 1-1/2" X 3/16" HOT-DIPPED GALVANIZED PREFABRICATED STAIR TREADS WITH NON-SLIP ABRASIVE NOSING. 8-9/16" WIDTH, WELDED TREADS. GRATING CAPACITY 1400 LBS/ LF MIN. STAIR TREADS SHALL COMPLY WITH OSHA STD. 1910.24.
  - 1.8 EXPANSION ANCHORS: "KWIK-BOLTS" BY HILTI (OR APPROVED EQUIVALENT) UNLESS NOTED OTHERWISE.
  - 1.9 GROUT: NON-SHRINK, NON-METALLIC GROUT - MASTERFLOW 713 (OR APPROVED EQUIVALENT).
2. CONNECTIONS:
  - 2.1 SHOP CONNECTIONS SHALL BE WELDED UNLESS SPECIFICALLY SHOWN ON THE DRAWINGS. FIELD CONNECTIONS MAY BE BOLTED.
  - 2.2 MINIMUM CONNECTIONS FOR STRUCTURAL FRAMING SHALL BE (2) - 3/4" DIAMETER A325N BOLTS, UNLESS NOTED OTHERWISE. MINIMUM SIZE OF FILLET WELD SHALL BE 3/16", E70XX, U.N.O. MIN. THICKNESS OF CONNECTING ANGLES SHALL BE 1/4" U.N.O.
  - 2.3 HOLES REQUIRED FOR BOLTING SHALL BE PUNCHED, DRILLED, OR REAMED. THE MAKING OF HOLES OR ENLARGEMENT OF HOLES BY BURNING WILL NOT BE PERMITTED.
3. COLUMNS SHALL BE CONSTRUCTED SO AS TO FULLY BEAR AT BASE.
4. RAIL INSERTS SHALL BE SECURELY WELDED TO PERIMETER ANGLE WITH 3/16" FILLET WELDS.
5. BEFORE FABRICATION, THE CONTRACTOR SHALL VERIFY EXISTING DIMENSIONS AFFECTING FIT, LOCATION, FABRICATION, ERECTION AND CLEARANCE OF STRUCTURAL AND MISCELLANEOUS STEEL.
6. WHERE A DETAIL IS SHOWN FOR ONE CONDITION, IT SHALL APPLY FOR ALL LIKE OR SIMILAR CONDITIONS, EVEN THOUGH NOT SPECIFICALLY CALLED FOR ON THE DRAWINGS.
7. ALL WELDING SHALL BE IN CONFORMANCE WITH AISC "MANUAL OF STEEL CONSTRUCTION" AND AWS STRUCTURAL WELDING CODE-STEEL, D1.1, LATEST EDITION.
8. DETAILING, FABRICATION, AND ASSEMBLY OF STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH THE AISC "MANUAL OF STEEL CONSTRUCTION"
9. ALL CARBON STEEL STRUCTURAL MATERIALS, FASTENERS AND GRATING SHALL BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123 OR A153. FASTENERS UNABLE TO BE HOT DIPPED GALVANIZED SHALL BE ASTM A193-GRADE B8 (STUDS) AND ASTM A194-GRADE B (NUTS).
  - 10 STAIR TREAD, CONNECT TO ANGLE WITH 2 TYPE 316 SS SADDLE CLIPS EACH SIDE.
  - 11 NOTCH TOP AND BOTTOM OF FLANGE WHERE REQUIRED FOR PLACEMENT OF CLIP ANGLE AND CLEARANCE OF RAIL INSERT.
  - 12 NOTCH STEEL GRATING AS REQUIRED TO CLEAR RAIL INSERTS. (TYP)
  - 13 FABRICATE STAIR CLOSURE PLATE TO BE FLUSH WITH TOP OF GRATING.
14. PROCEDURES:
  - 14.1 THE FOLLOWING SUBMITTALS ARE REQUIRED PRIOR TO STARTING THE JOB. MILL CERTIFICATIONS: STRUCTURAL STEEL INCLUDING PLATES, TUBING, STRUCTURAL PIPING AND BOLTS. VENDOR CATALOGS: GRATING, STAIR TREADS WITH NON-SLIP ABRASIVE NOSING AND EXPANSION ANCHORS.
15. SHOP DRAWINGS DETAILING THE JOB SHALL BE SUBMITTED PRIOR TO STARTING THE WORK.
  - 16 STAIR CLOSURE PLATE WITH TACK WELDED BOLTS ATTACHED TO BE SHOP WELDED TO ANGLES PRIOR TO SHIPMENT TO FIELD.
17. SEE DRAWING SHEET M-13 & M-14 FOR LOCATION OF STEEL ACCESS PLATFORMS.
18. MOUNT ANGLES TO INSIDE SURFACE OF CLIPS.
19. ALL SURFACES NOT GALVANIZED SHALL BE PAINTED PER NASA STD-5008
20. DRILL 1/4" WEEP HOLE IN ALL RAIL INSERTS AS NEAR TO BOTTOM AS PRACTICAL.
21. GRIND ALL HANDRAIL WELDS SMOOTH PRIOR TO PAINTING.
22. NORTH AND SOUTH PLATFORMS HAVE HANDRAIL ON WEST SIDE ONLY. STAIRS AND CENTER PLATFORMS HAVE HANDRAIL ON EAST AND WEST SIDES.

**DRAWING ABBREVIATIONS:**

L.L.B.	LONG LEG BOLTER
U.N.O.	UNLESS NOTED OTHERWISE
L.L.H.	LONG LEG HORIZONTAL
L.L.V.	LONG LEG VERTICAL
T.S.	TUBE STEEL
NOM.	NOMINAL
S.L.	SHORT LEG
S.L.V.	SHORT LEG VERTICAL
N.T.S.	NOT TO SCALE
S.L.O.	SHORT LEG OUT



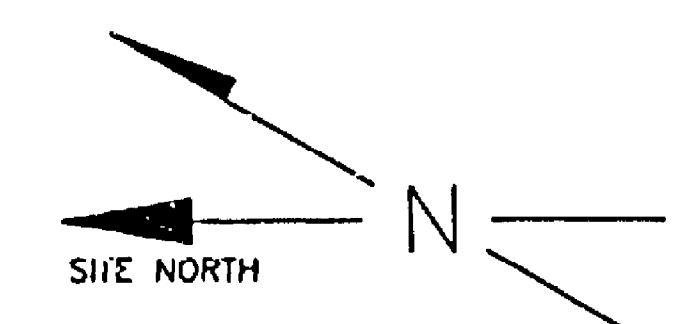
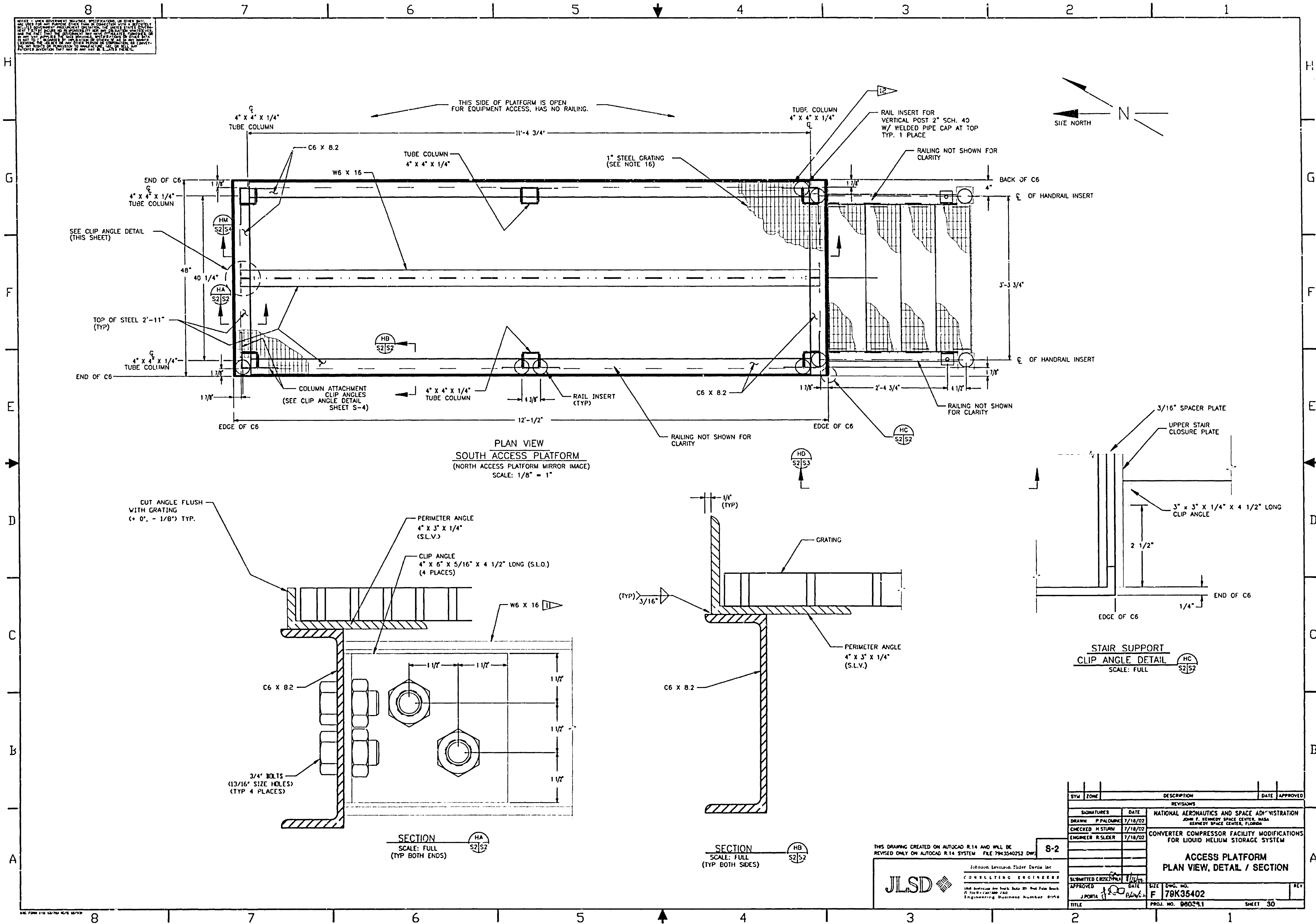
PLAN VIEW  
ACCESS PLATFORM

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CONSULTING ENGINEERS  
1960 Southshore Ave South, Suite 500, West Palm Beach, FL 33409-4000  
Engineering Business Number: 0609

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES				
DRAWN		P. PALOMBE	7/18/02	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM  <b>ACCESS PLATFORM NOTES</b>
CHECKED		M. STURM	7/18/02	
ENGINEER		R. SLICKER	7/18/02	
SUBMITTED		DATE	7/18/02	
APPROVED		J. PORTA	8/14/02	SIZE: DWG. NO. F 79K35402 PROJ. NO. 98038.1 SHEET 29

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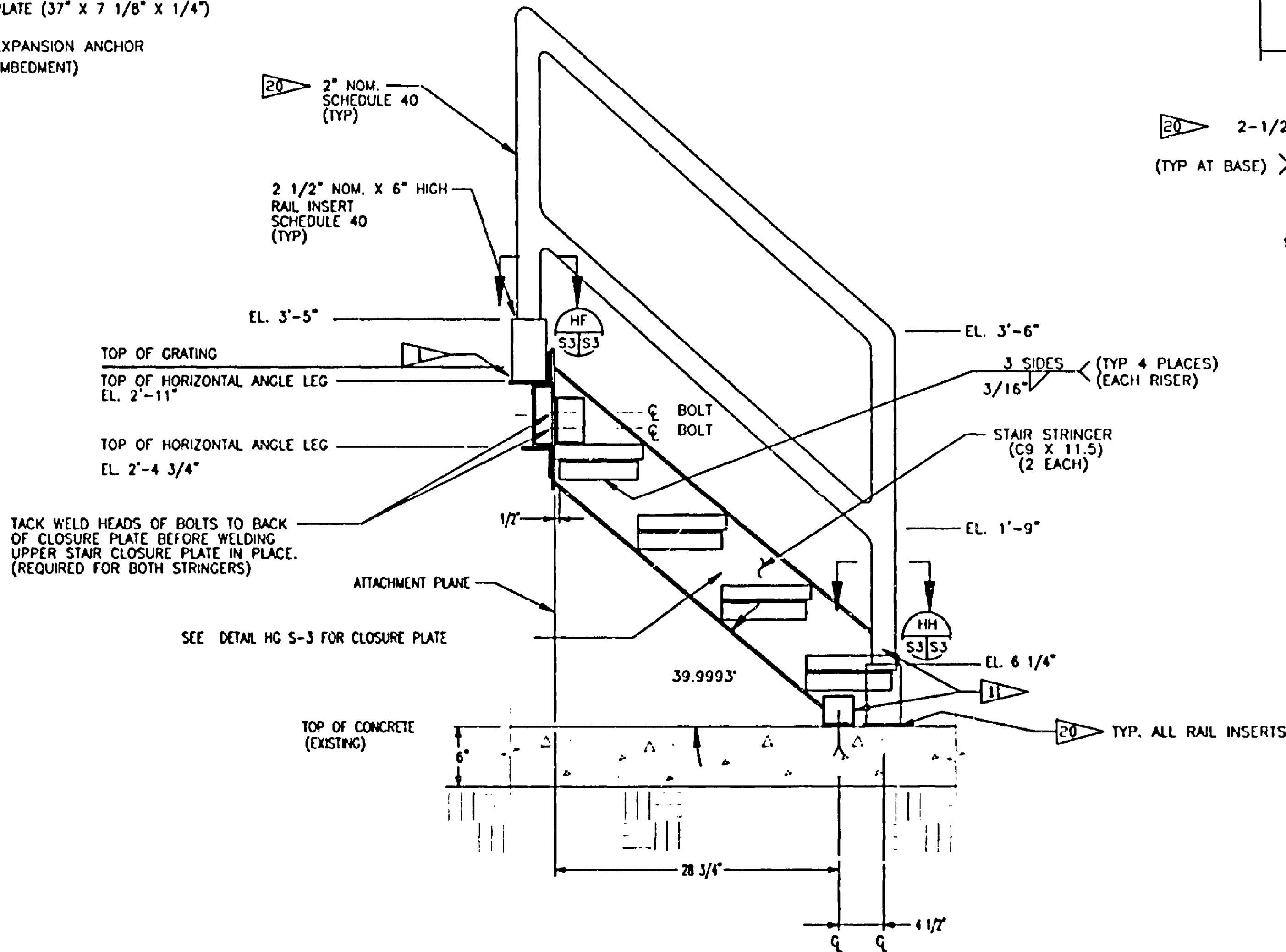
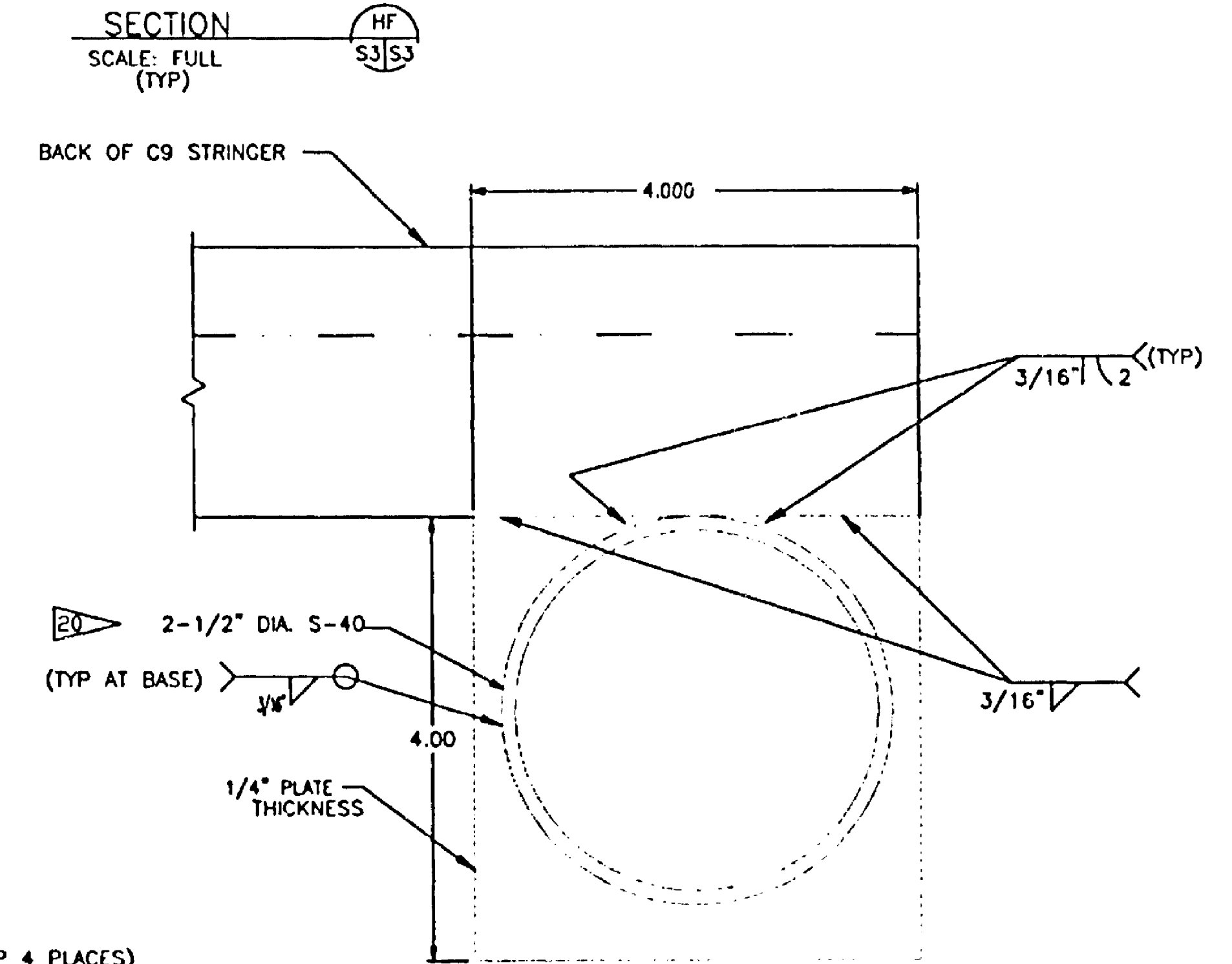
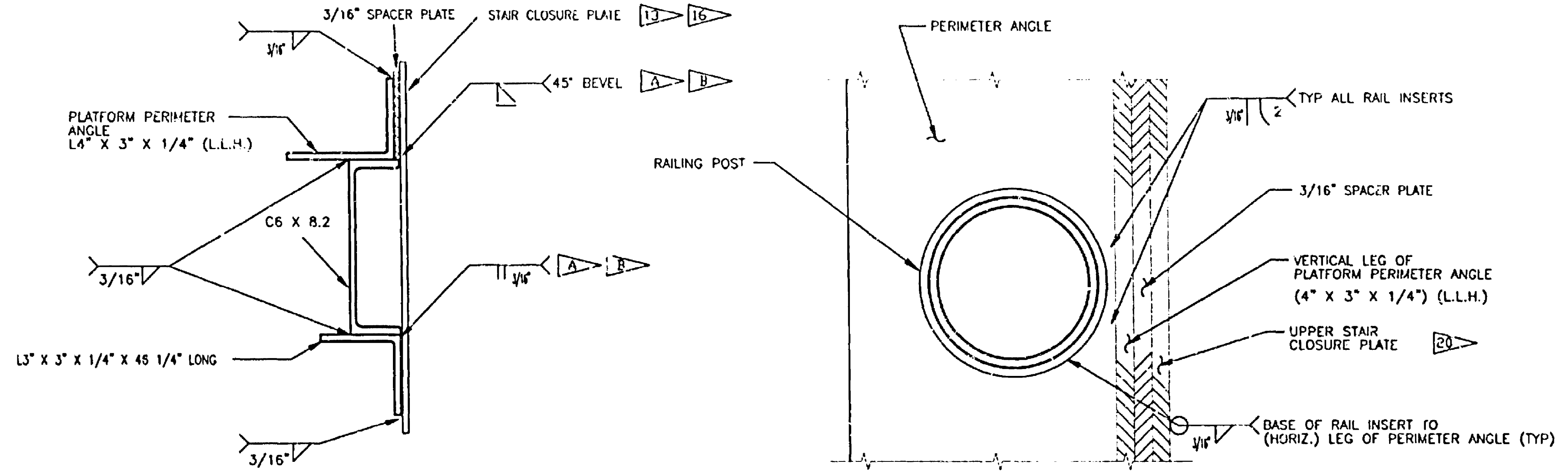
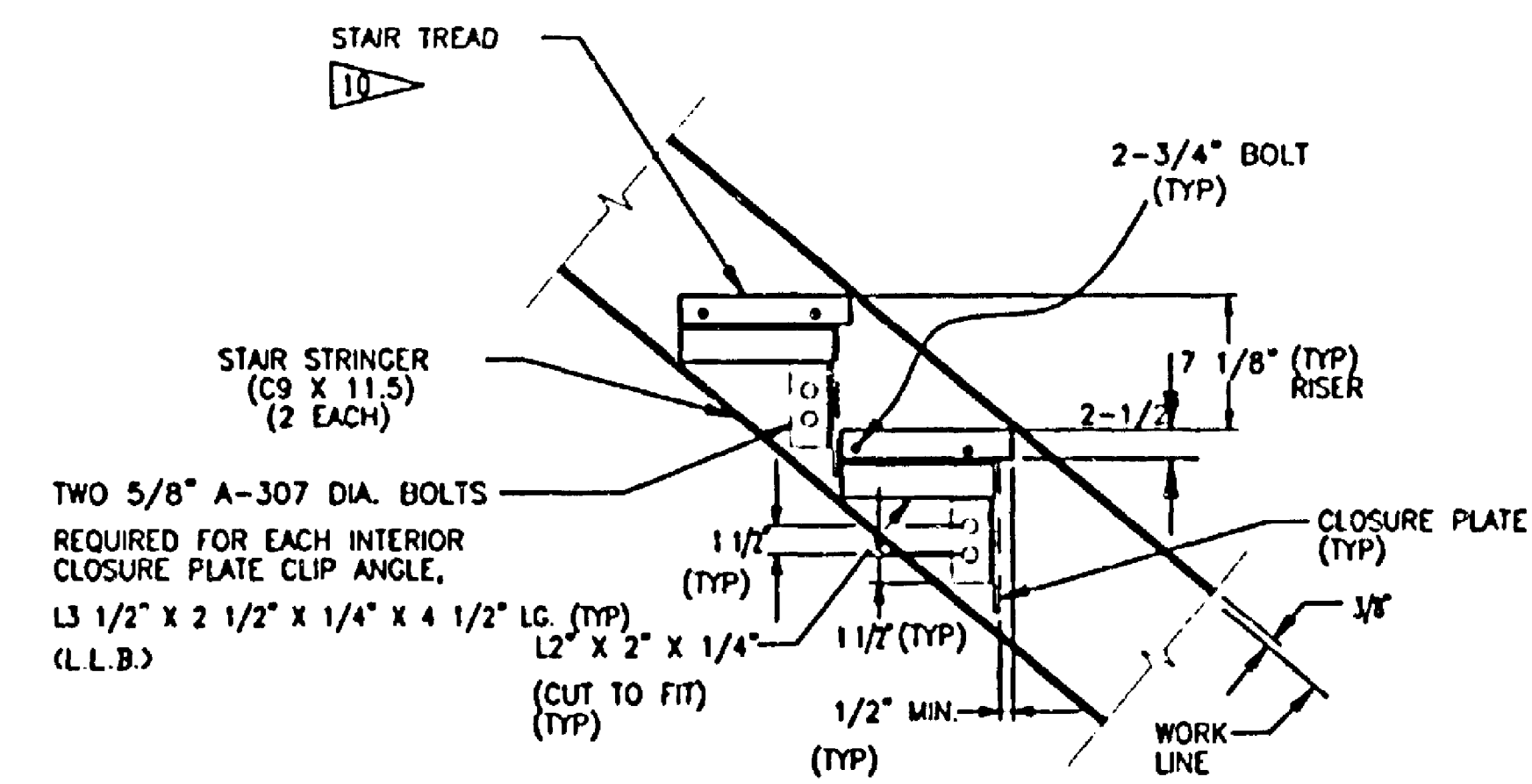
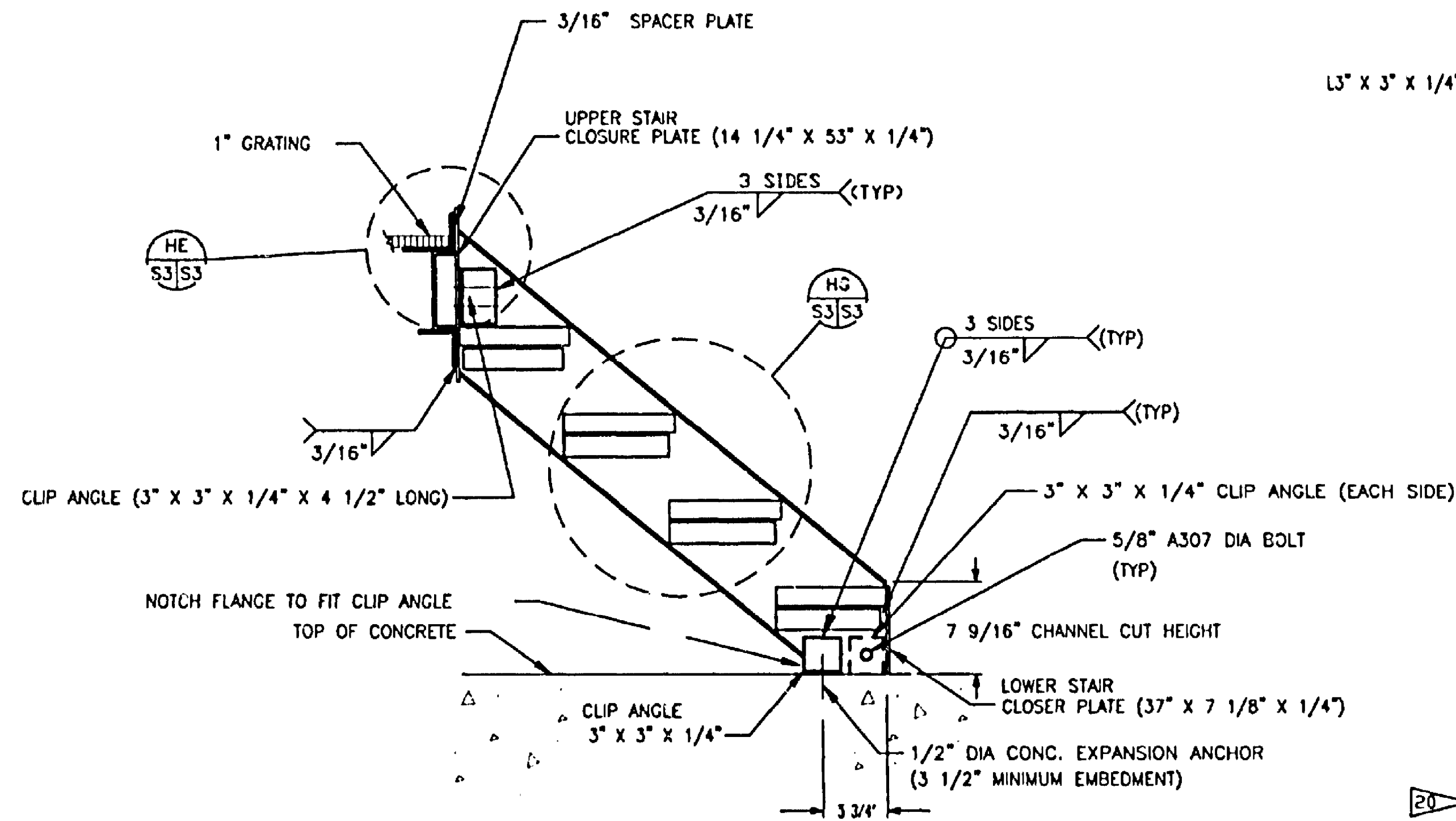
**JLSD**  
JOHNSON LEVITAN SLIDER DESIGN INC.  
CONSULTING ENGINEERS  
1400 SUPERIOR AND SOUTH BAY DR. FT. LAUDERDALE, FL 33309  
TEL: 352-467-8800 FAX: 352-467-8801  
Engineering Business Number: 87948

SYM	ZONE	DESCRIPTION	DATE	APPROVED
SIGNATURES				
DRAWN	P.PALOUNIC	DATE	7/18/02	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA
CHECKED	H.STURM	DATE	7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM
ENGINEER	R.SLIDER	DATE	7/18/02	<b>ACCESS PLATFORM</b> PLAN VIEW, DETAIL / SECTION
APPROVED	J.PORTA	DATE	7/18/02	SIZE: DWG. NO. F 79K35402
TITLE	PROJ. NO. 06029.1		SHEET 30	

NOTES: 1. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE IN INCHES. 2. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE TO FACE UNLESS INDICATED OTHERWISE. 3. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE TO FACE UNLESS INDICATED OTHERWISE. 4. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE TO FACE UNLESS INDICATED OTHERWISE. 5. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE TO FACE UNLESS INDICATED OTHERWISE. 6. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE TO FACE UNLESS INDICATED OTHERWISE. 7. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE TO FACE UNLESS INDICATED OTHERWISE. 8. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE TO FACE UNLESS INDICATED OTHERWISE. 9. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE TO FACE UNLESS INDICATED OTHERWISE. 10. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE TO FACE UNLESS INDICATED OTHERWISE.

**SPECIFIC NOTE:**

- A** AFTER WELDING UPPER STAIR ASSEMBLY TOGETHER, WELD SPACER PLATE IN PLACE.
- B** WELD STAIR CLOSURE PLATE AFTER INSTALLING SPACER PLATE.

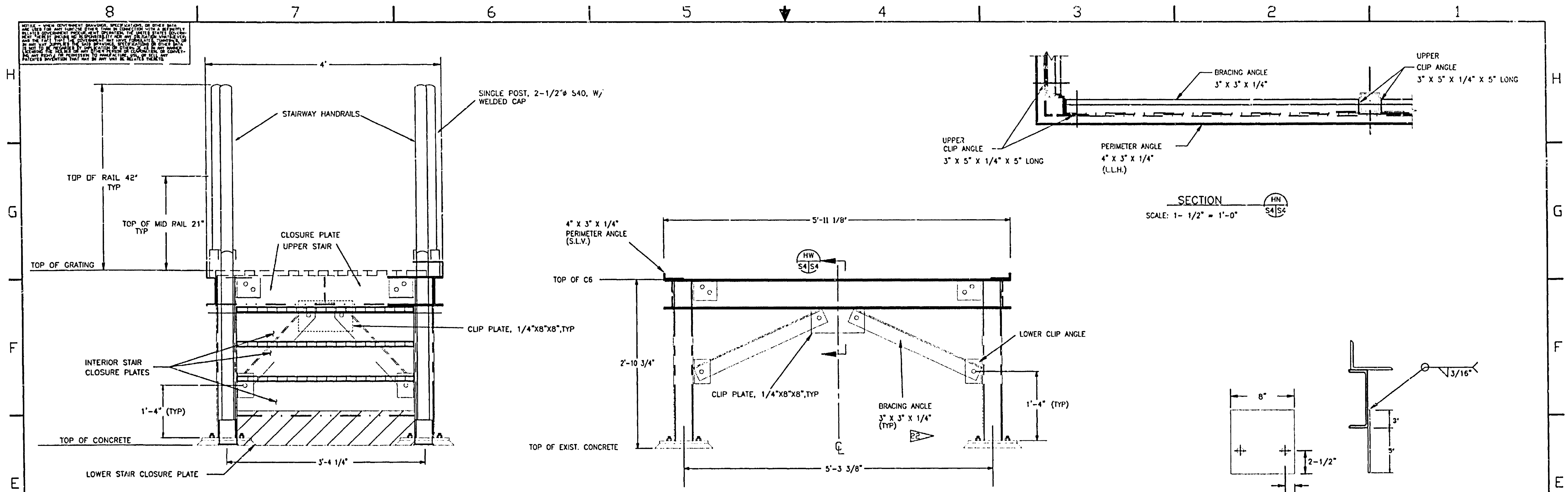


SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION		
DRAWN P PALOMAR	7/18/02	John F. Kennedy Space Center, Bldg. 5 Kennedy Space Center, Florida		
CHECKED H STURM	7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM		
ENGINEER R SLIDER	7/18/02	ACCESS PLATFORM ELEV. VIEWS / SECTIONS		
APPROVED	DATE	SHEET NO.	DWG. NO.	REV
J PORTA	7/18/02	F	79K35402	
TITLE	PROJ. NO.	SHEET	NO.	
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Tel: (561) 838-2200  
Fax: (561) 838-2200  
Engineering Business Number: 0009

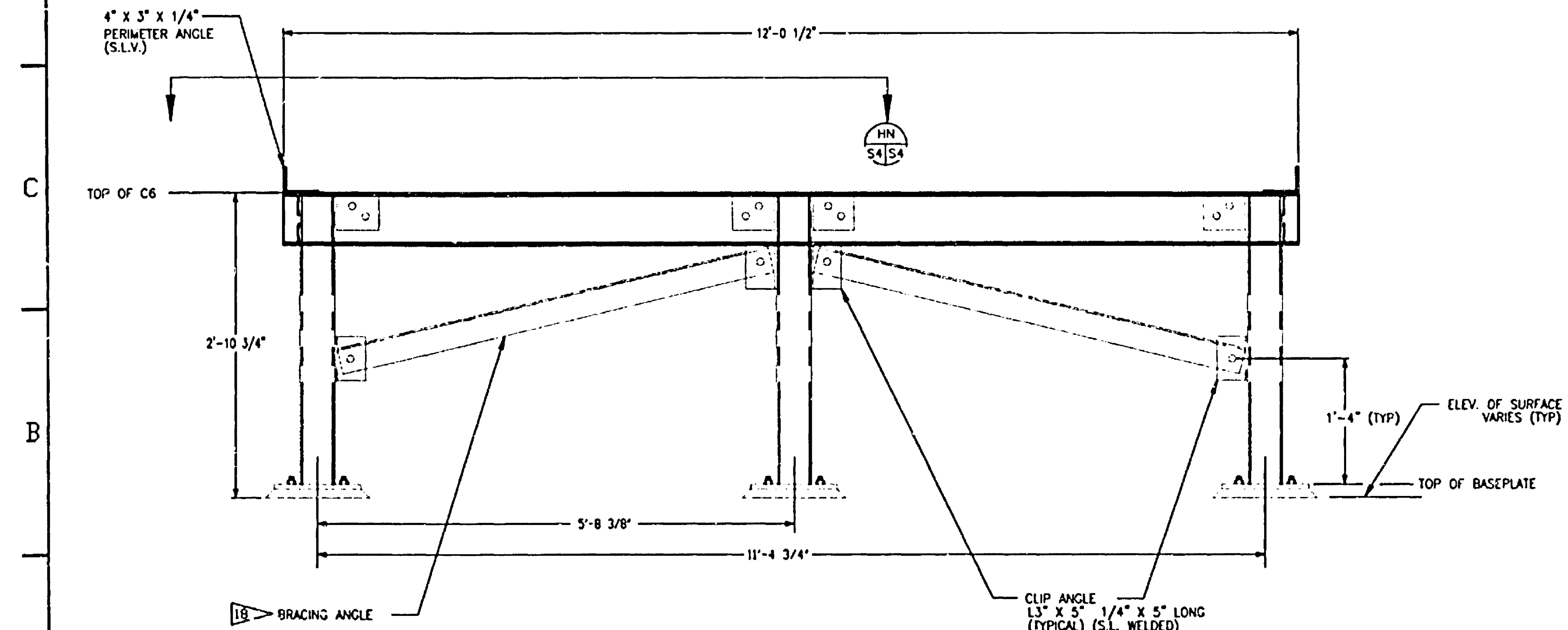
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ELEV. - PLATFORM ACCESS STAIRS  
 LOOKING NORTH SCALE: 1-1/2" = 1'-0"  
 LOOKING SOUTH - MIRROR

ELEV. - CENTER PLATFORM  
 LOOKING WEST SCALE: 1-1/2" = 1'-0"  
 (LOOKING EAST - MIRROR IMAGE)

SECTION  
 SCALE: NONE



ELEV. - ACCESS STAIRS (NORTH SIDE)  
 LOOKING WEST (SOUTH SIDE MIRROR IMAGE)  
 SCALE: 1-1/2" = 1'-0"

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 CONSULTING ENGINEERS  
 3000 American Air South, Suite 500, Fort Palm Beach, FL 33404-1000  
 Engineering Business Number: 8088

SYD	ZONE	DESCRIPTION	DATE	APPROVED
SIGNATURES				
DRAWN		DATE		NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, Bldg. 3600 KENNEDY SPACE CENTER, FLORIDA CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM
CHECKED		DATE		
ENGINEER		DATE		
SUPERVISOR		DATE		
APPROVED		DATE	SCALE	DWG. NO.
TITLE		PROJECT	NO.	REV.

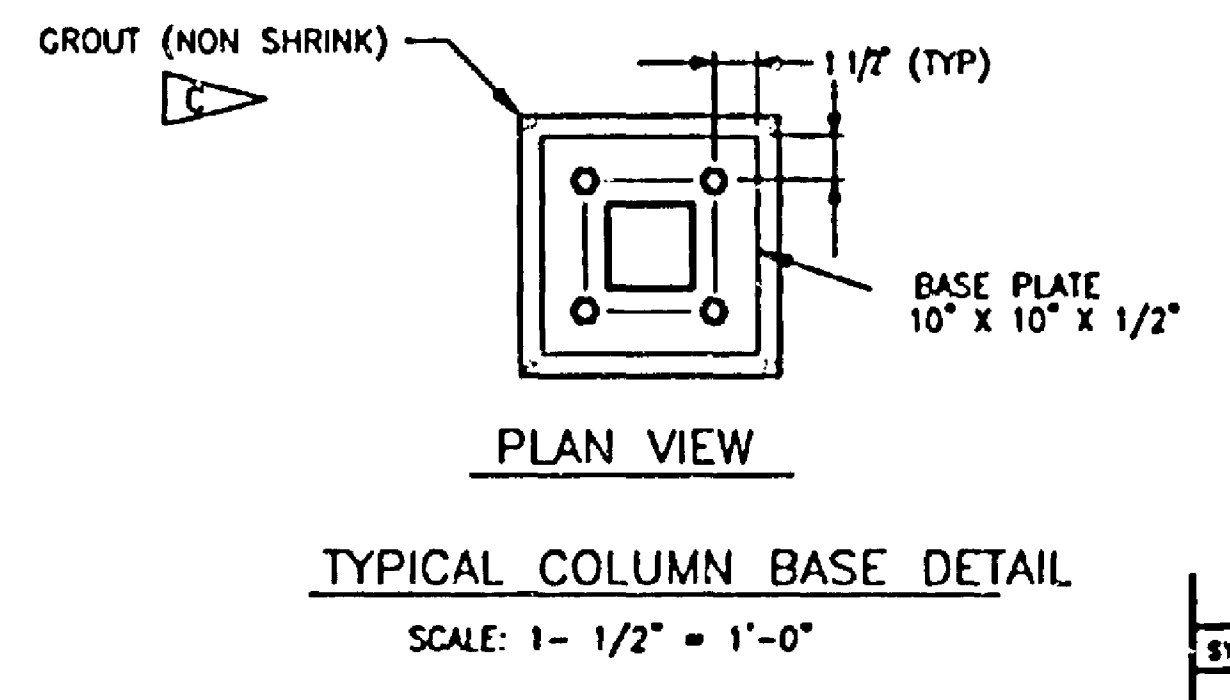
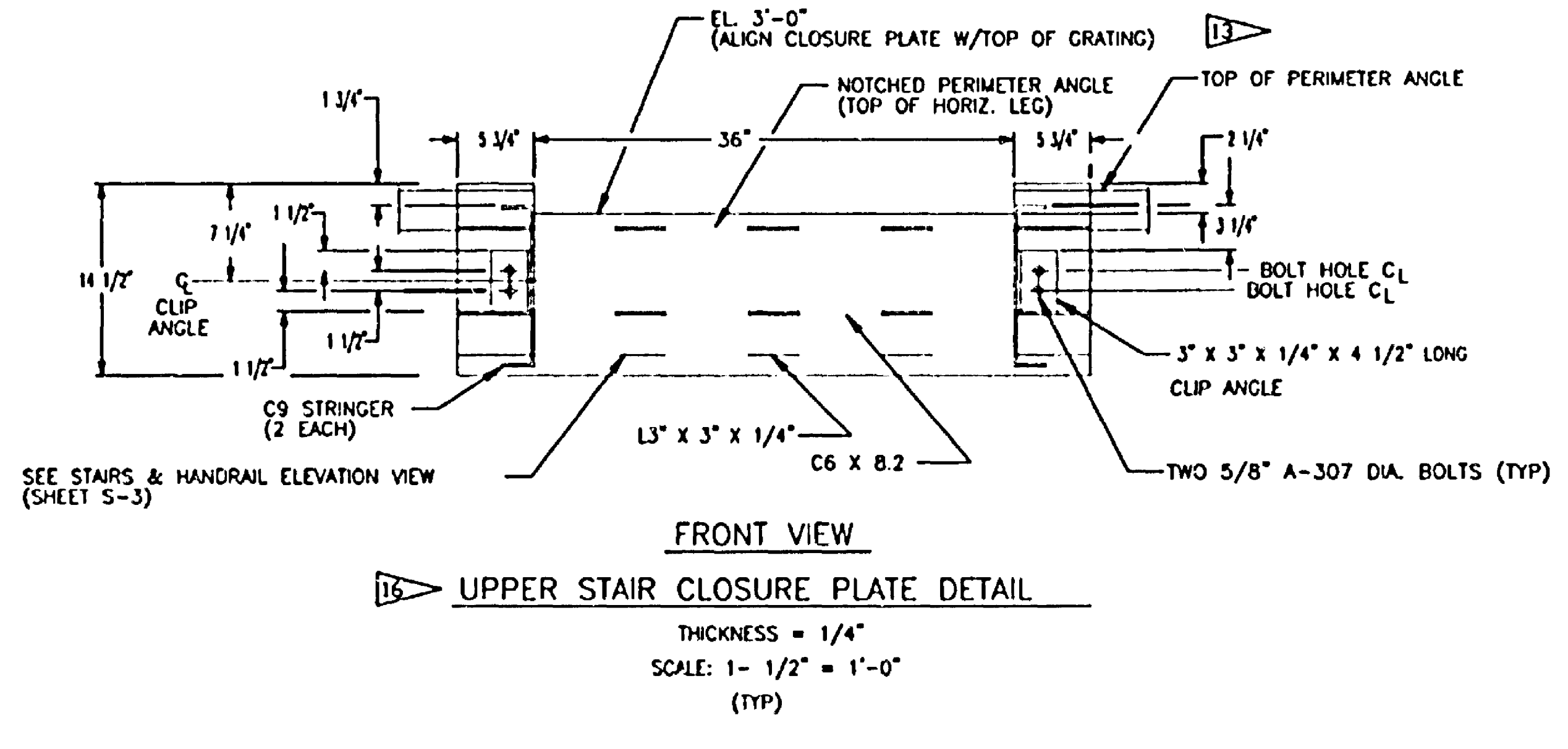
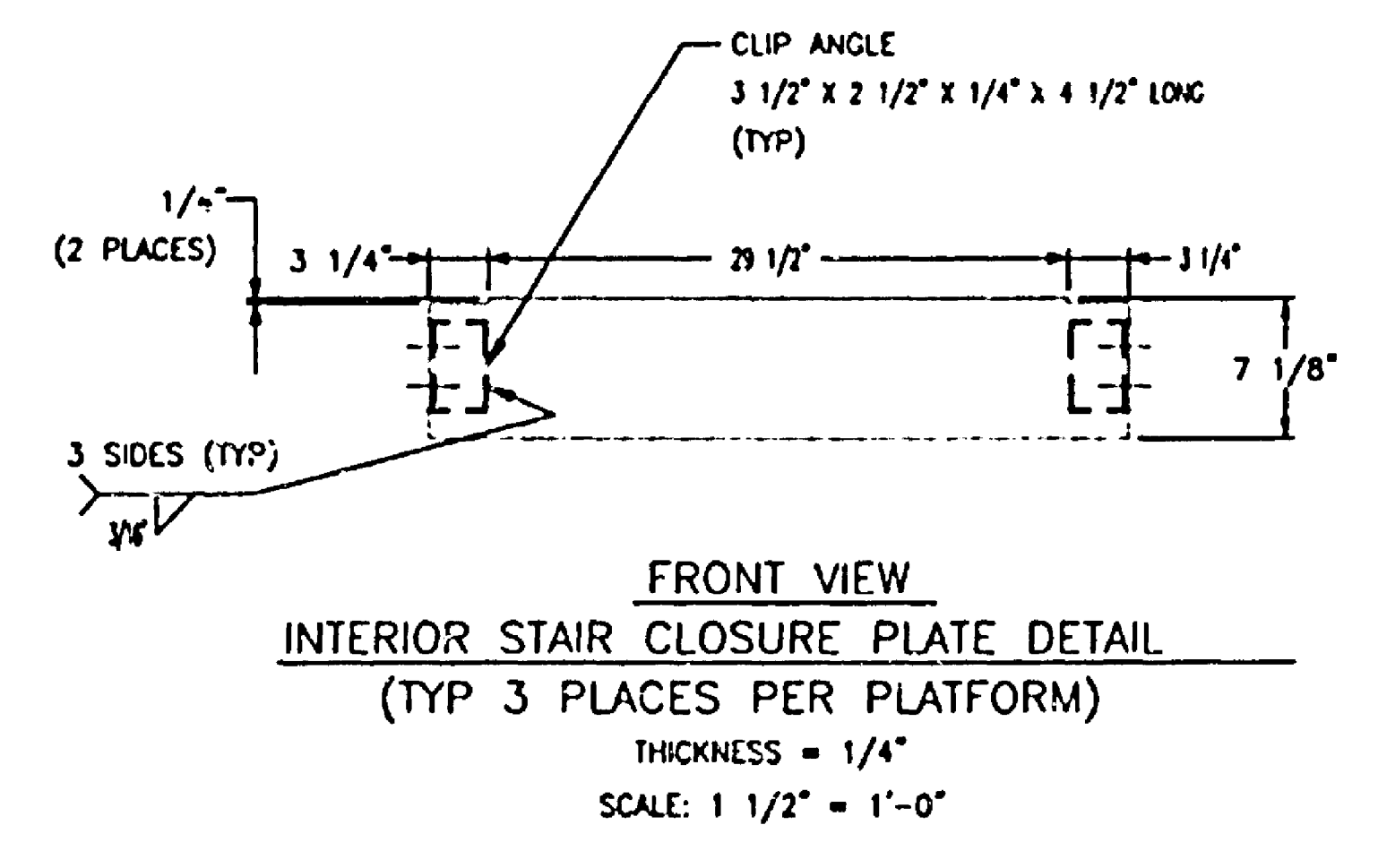
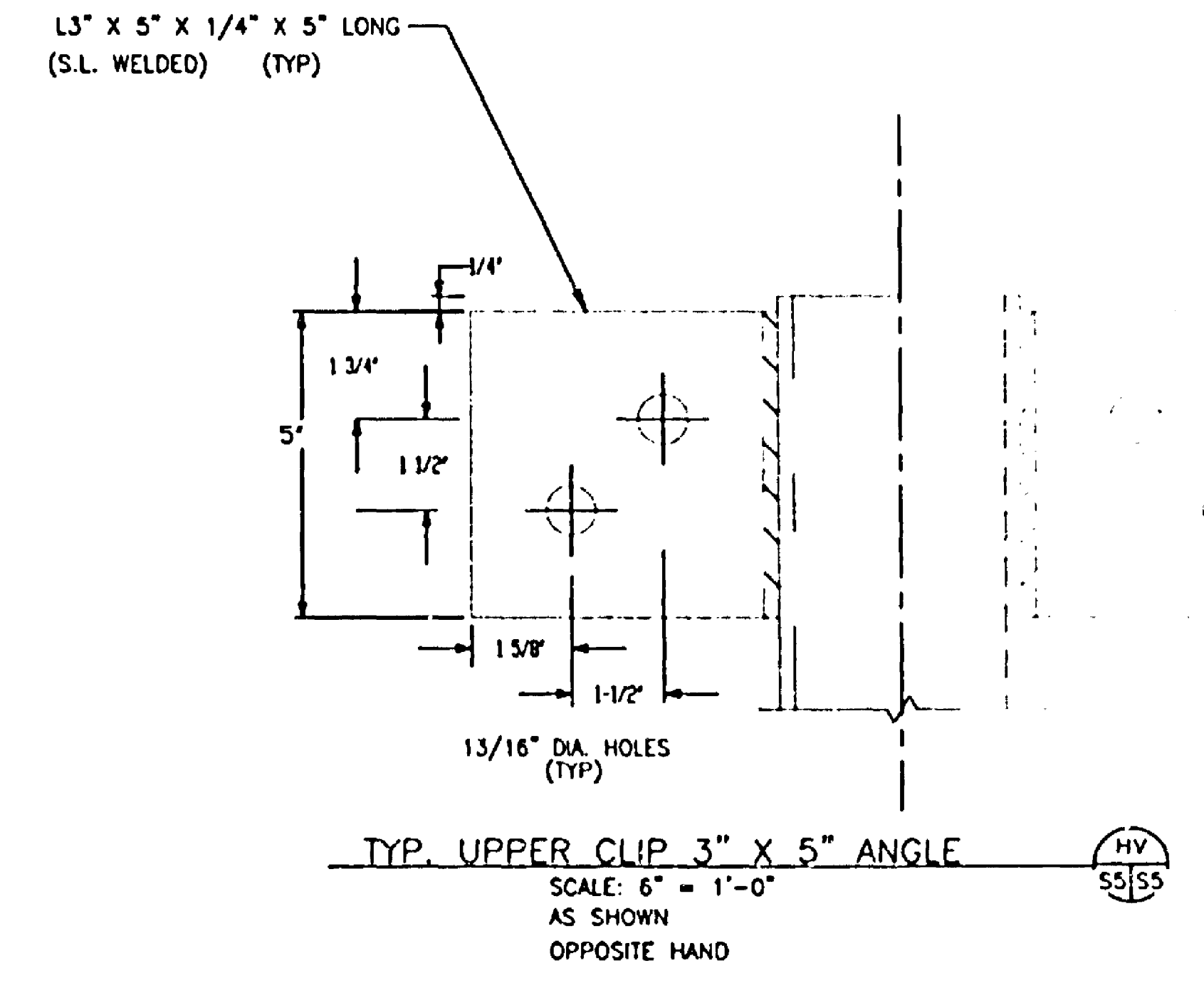
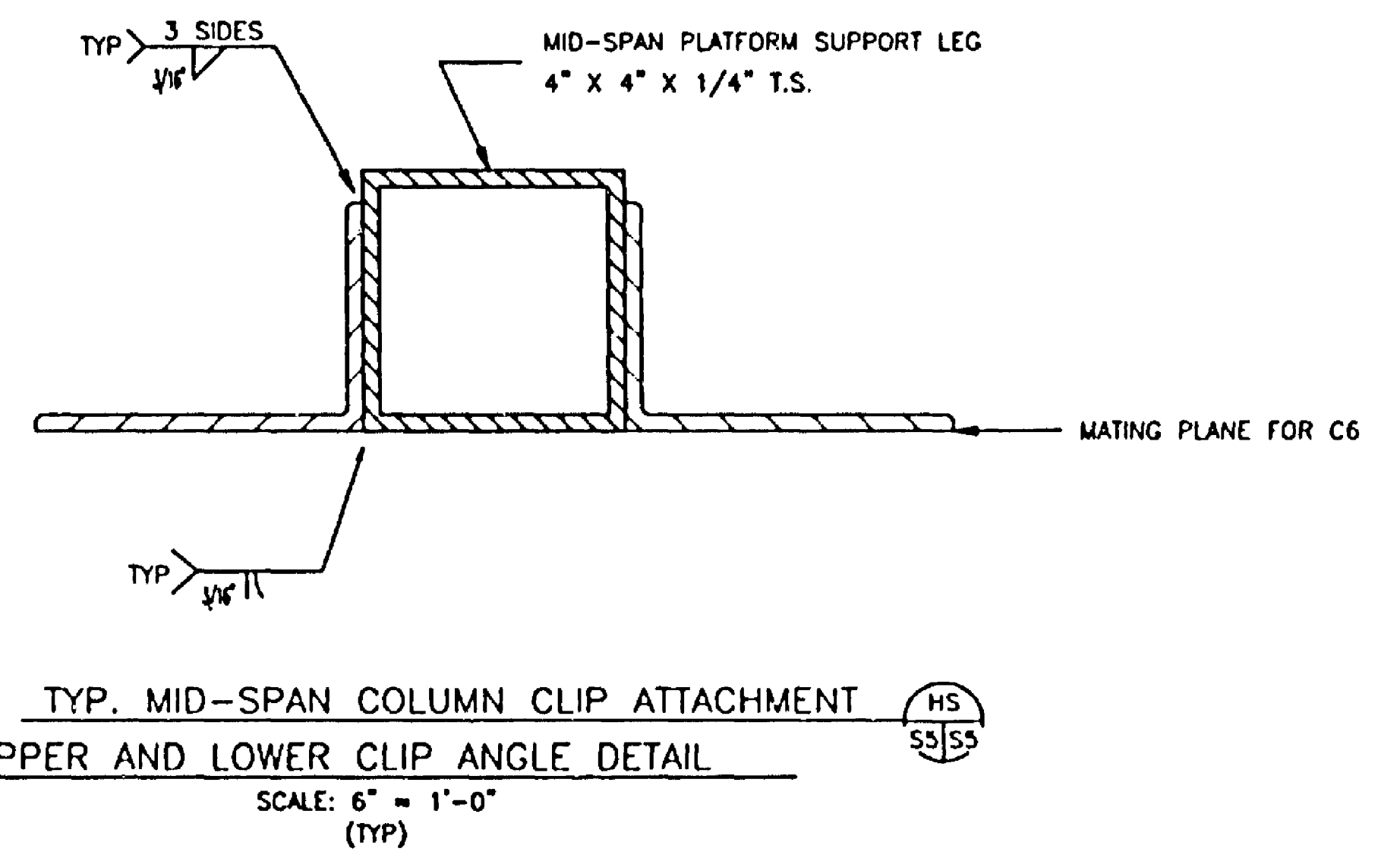
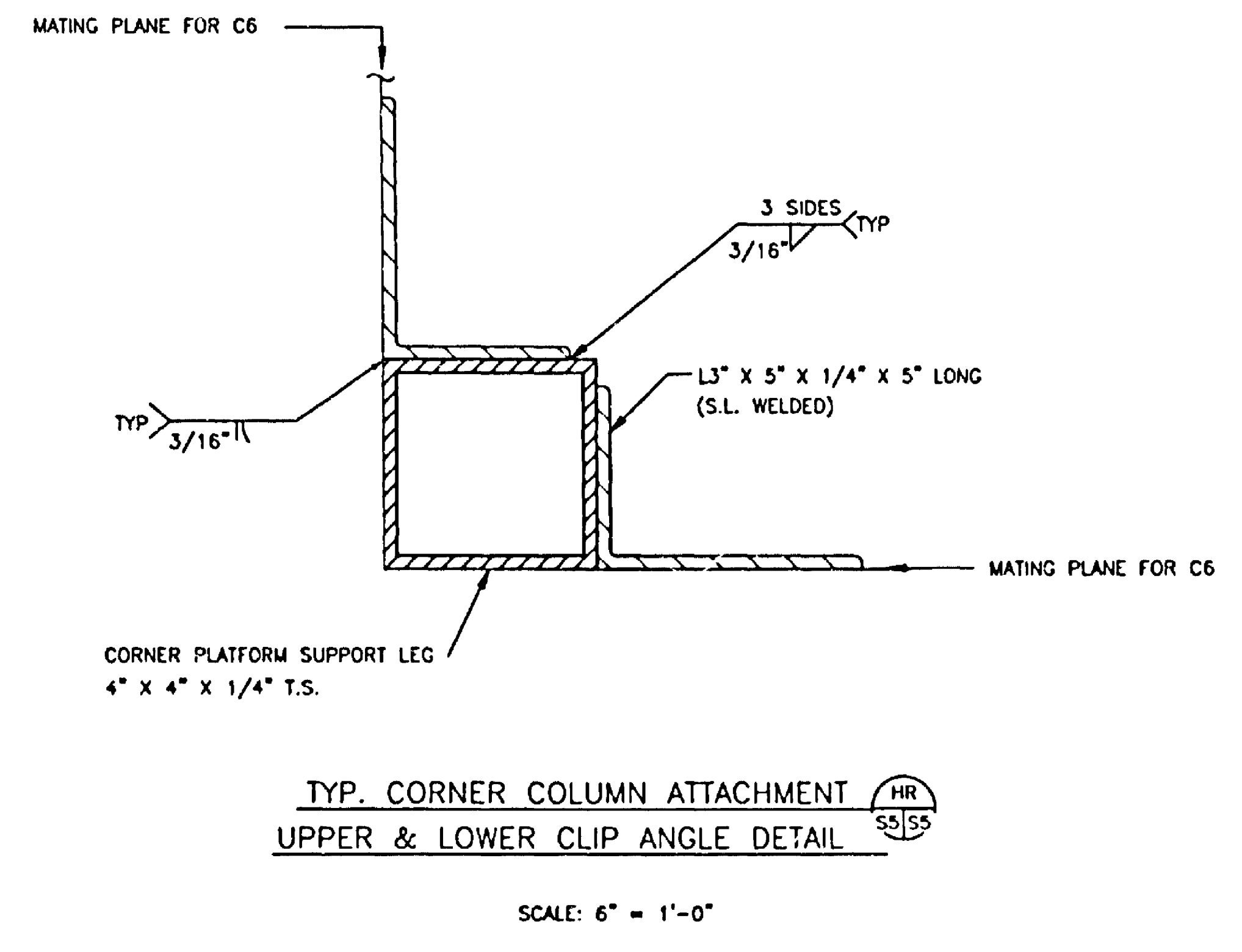
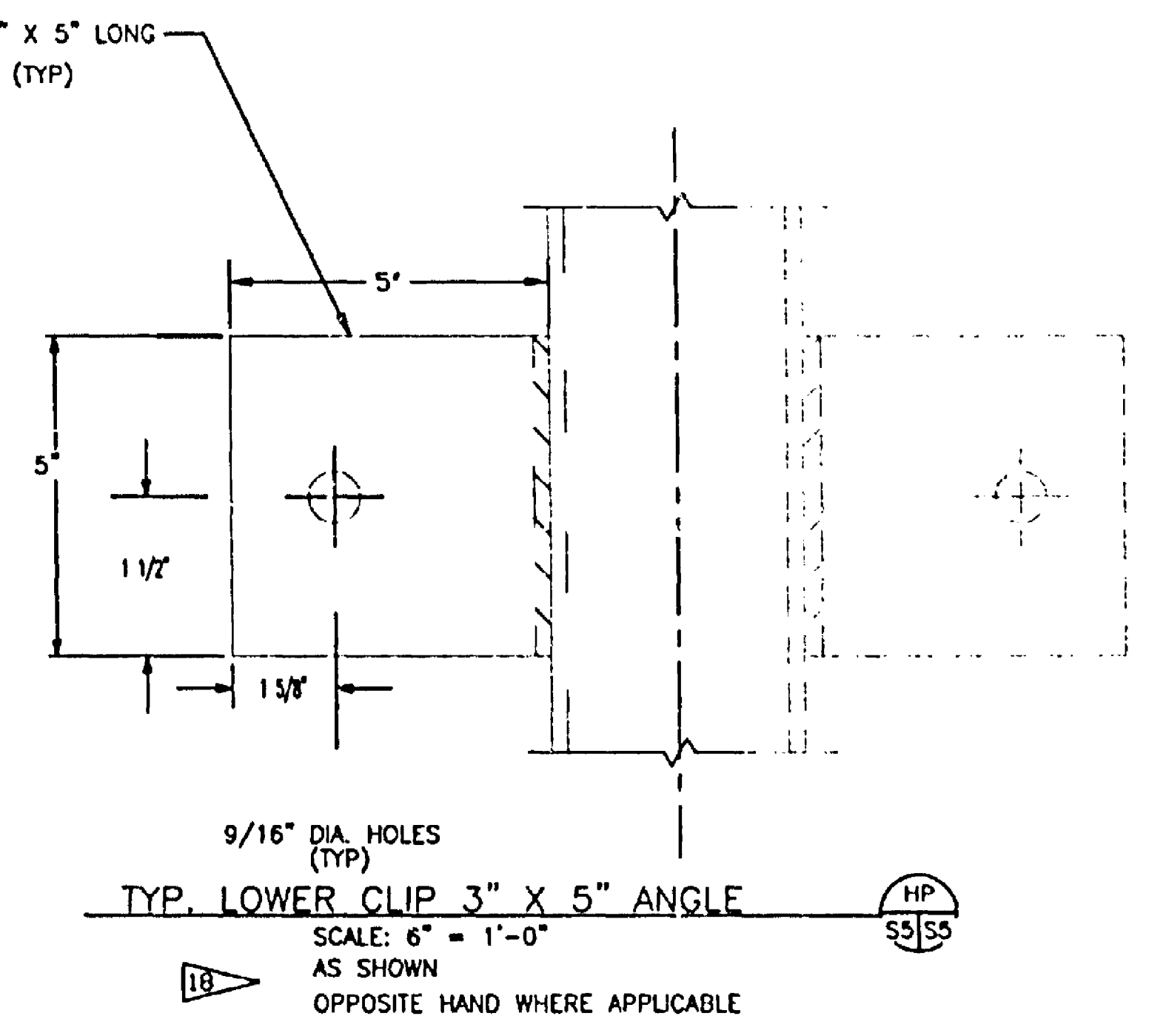
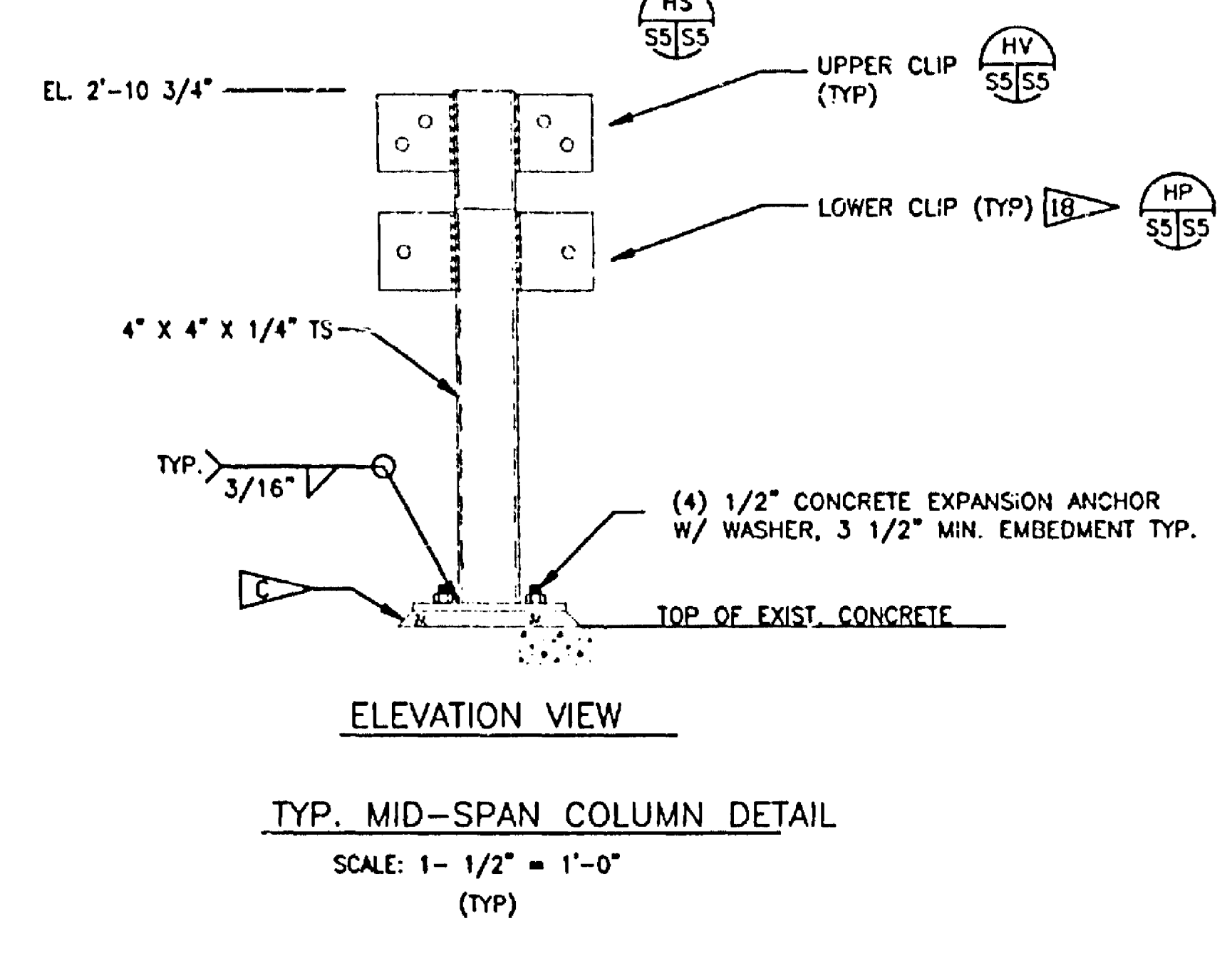
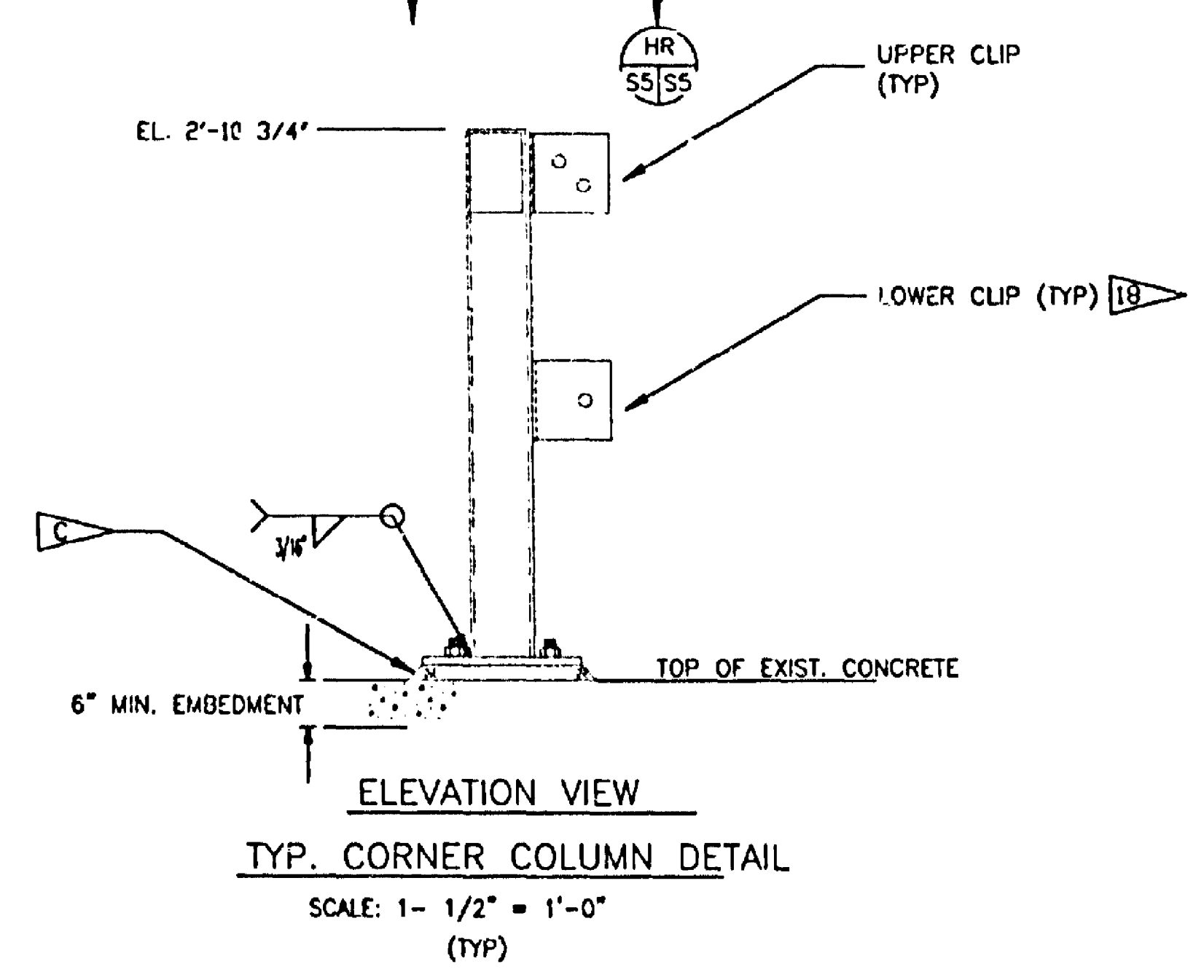
ACCESS PLATFORM  
 DETAILS / SECTION

7/18/02  
 7/18/02  
 7/18/02  
 11/1/04  
 F 78K35402  
 PROJ. NO. 98038.1 SHEET 3/2



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**SPECIFIC NOTES:**  
 ▸ INSTALL NON-SHRINK GROUT AFTER LEVELING PLATFORM



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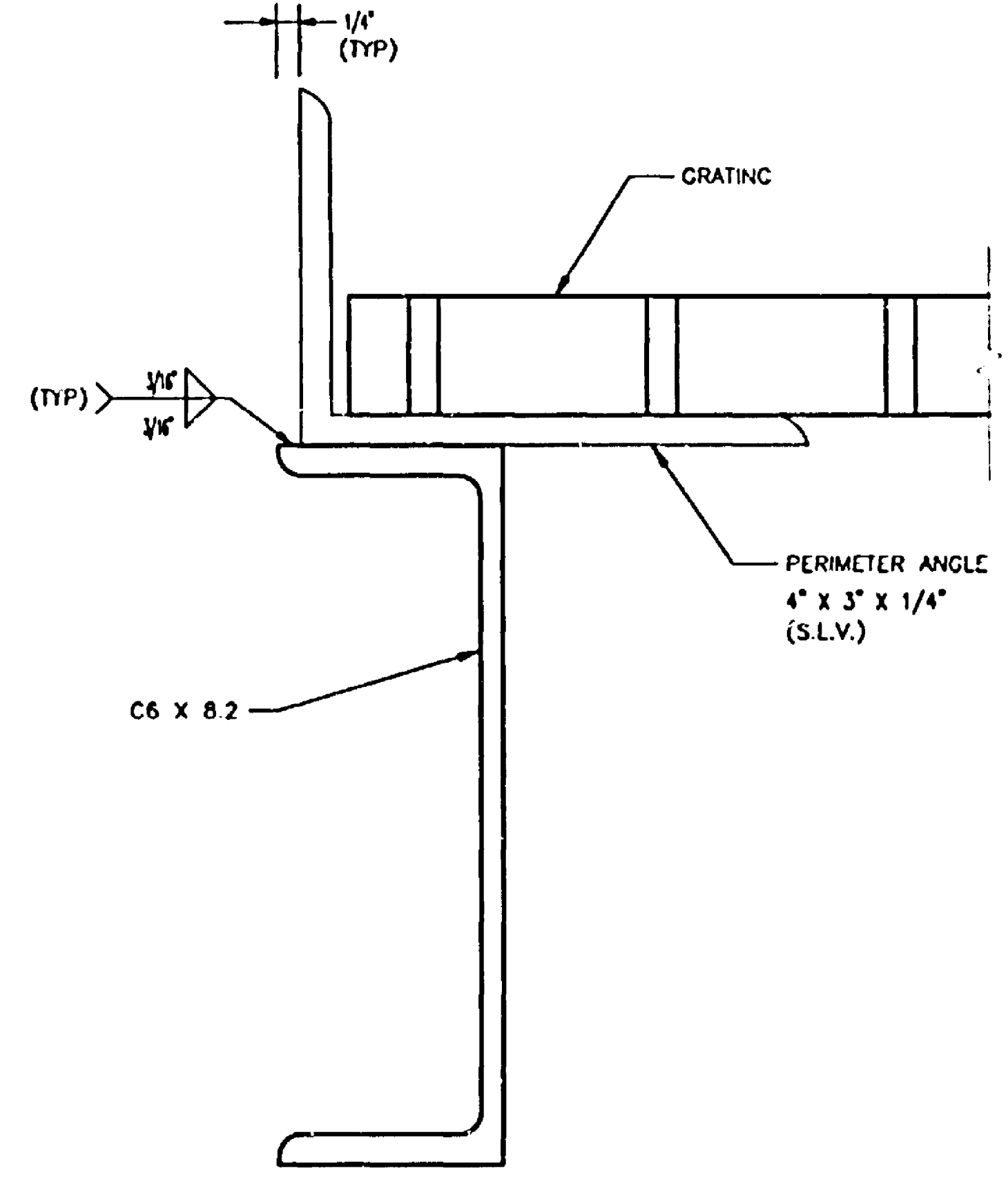
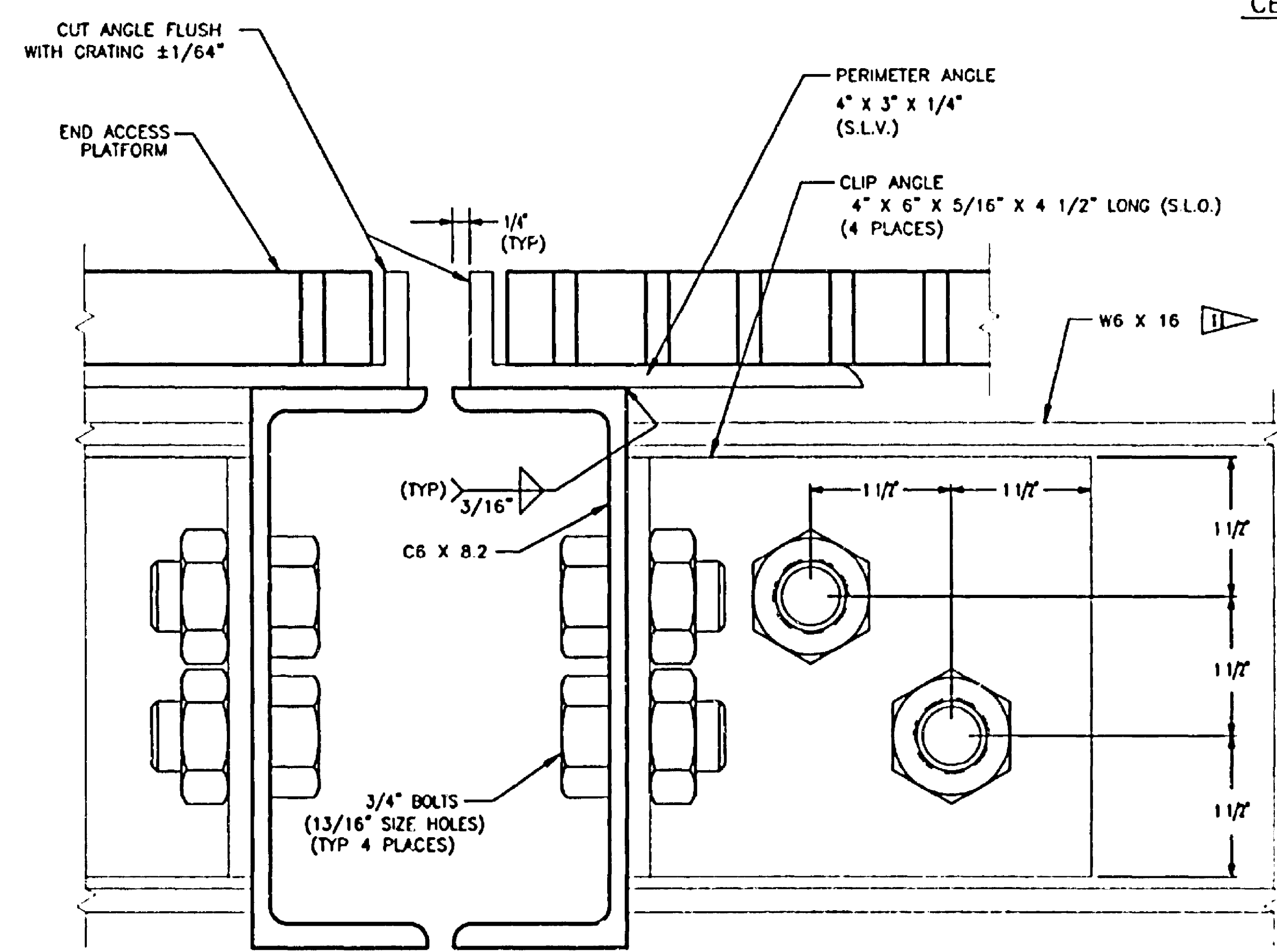
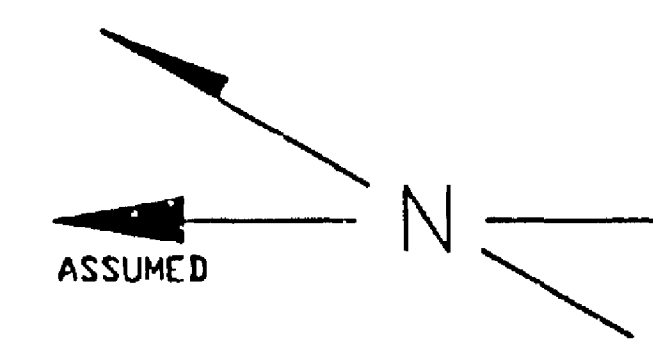
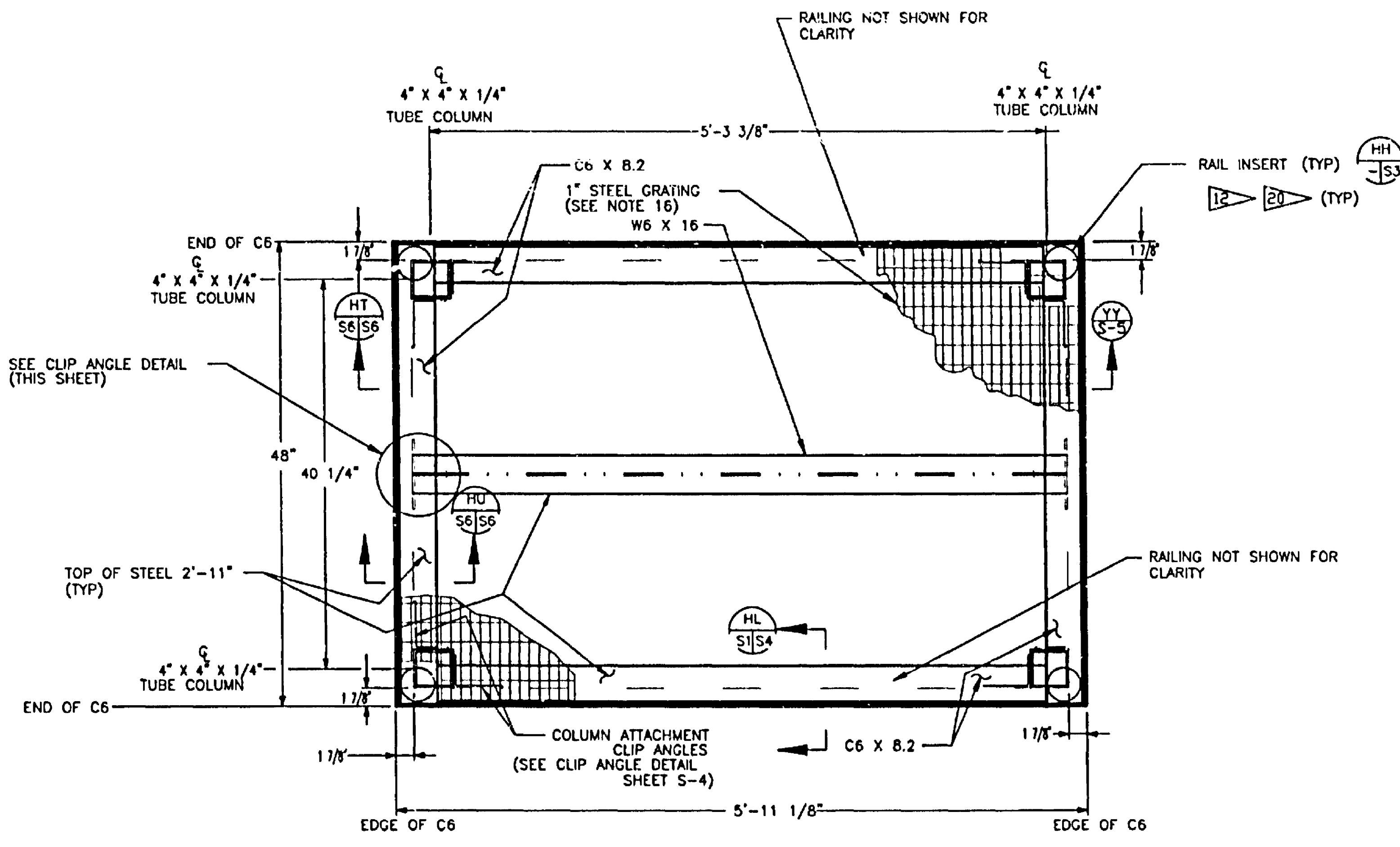
**JLSD**  
 Johnson, Levinson, Elder, Darrin, Inc.  
 CONSULTING ENGINEERS

SYM	ZONE	DESCRIPTION	DATE	APPROVED
SIGNATURES				
DR	P	PALOMINI	7/18/02	
CH	R	MSTURN	7/18/02	
EN	R	SLIDER	7/18/02	
SUBMITTED FOR APPROVAL				
APPROVED	DATE	BY		
JPORTA	7/18/02	F 79K35402		
TITLE		PROJ. NO.	SHEET	
ACCESS PLATFORM DETAILS / SECTIONS		080381	35	

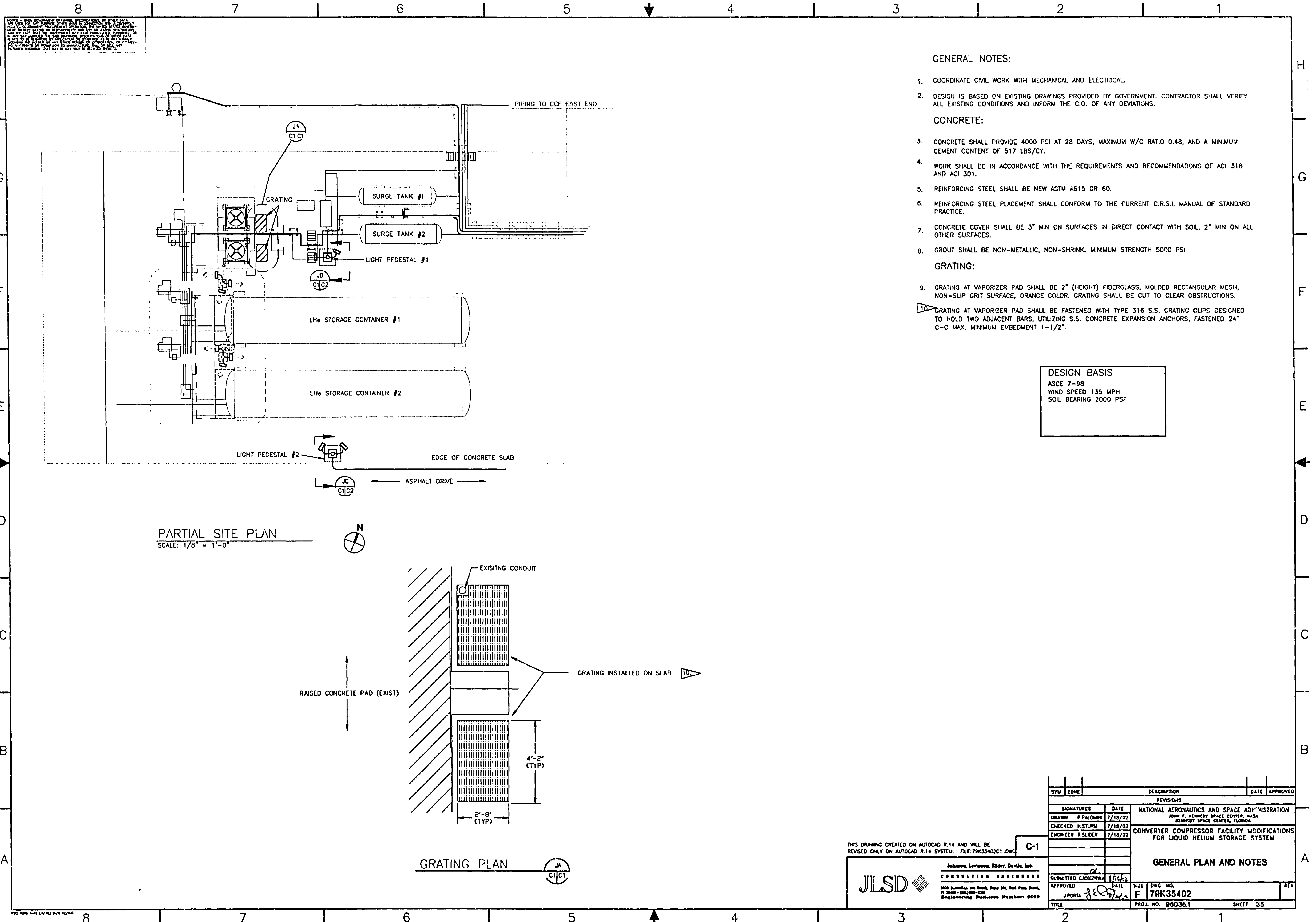
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
 JOHN F. KENNEDY SPACE CENTER, FLORIDA  
 CONVERTER COMPRESSOR FACILITY MODIFICATIONS  
 FOR LIQUID HELIUM STORAGE SYSTEM

**ACCESS PLATFORM**  
 DETAILS / SECTIONS

NOTE - WORK MOVEMENT SHOWING OPERATIONS OF THIS SHEET  
 AND THE TIME AND DATE OF REVISIONS TO THIS SHEET  
 ARE TO BE MAINTAINED IN THE REVISIONS SECTION OF THIS SHEET  
 AND THE FULL TITLE OF THE PROJECT IS TO BE MAINTAINED IN THE  
 REVISIONS SECTION OF THIS SHEET. OPERATIONS OF THIS SHEET  
 ARE TO BE MAINTAINED IN THE REVISIONS SECTION OF THIS SHEET  
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 ARE TO BE MAINTAINED IN THE REVISIONS SECTION OF THIS SHEET  
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 REVISIONS SECTION OF THIS SHEET.



SYM	ZONE	DESCRIPTION	DATE	APPROVED
SEVSKANS				
SIGNATURES DATE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION				
DRAWN P. PALOMAR 7/18/02 JOHN F. KENNEDY SPACE CENTER, FLORIDA				
CHECKED M. STURM 7/18/02 KENNEDY SPACE CENTER, FLORIDA				
ENGINEER R. SLIDER 7/18/02				
CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM				
<b>ACCESS PLATFORM VIEW, DETAIL / SECTION</b>				
S-8				
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JLS&D CONSULTING ENGINEERS				
1000 Northshore Lane South, Suite 200, Fort Palm Beach, FL 33470 • TEL: 561-700-4200 • FAX: 561-700-4201 • Engineering Business Number 41158				
SUBMITTED 8/10/02		DATE 8/16/02	SIZE DWG. NO.	REV
APPROVED [Signature]		DATE	F 79K35402	
TITLE		PROJ. NO. R6038.1	SHEET 34	



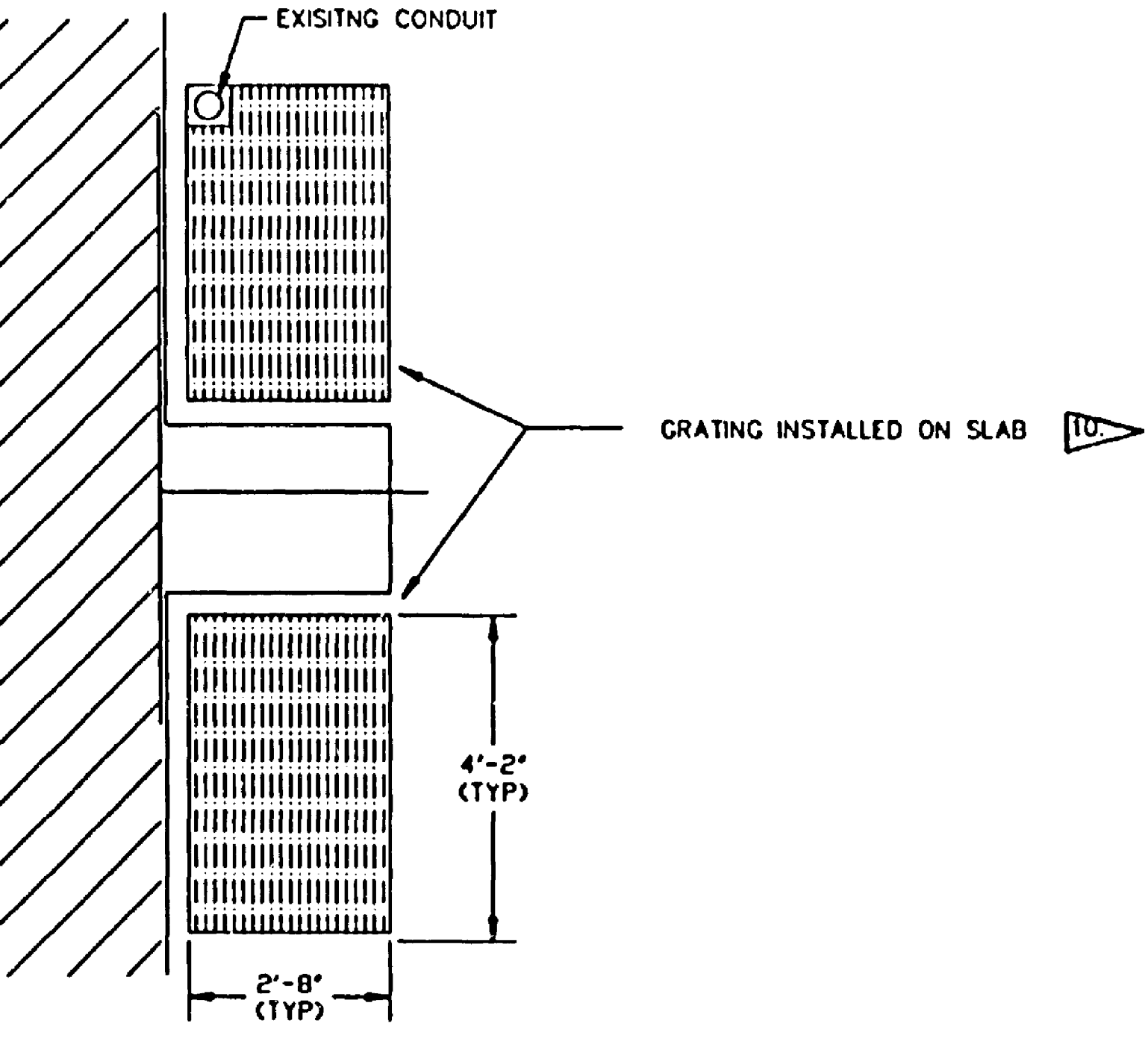
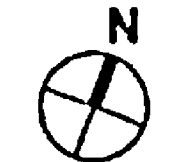
NOTE: ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED ARE IN FEET AND INCHES. DIMENSIONS SHALL BE TO FACE UNLESS OTHERWISE SPECIFIED. ALL DIMENSIONS SHALL BE TO FACE UNLESS OTHERWISE SPECIFIED. ALL DIMENSIONS SHALL BE TO FACE UNLESS OTHERWISE SPECIFIED.

**GENERAL NOTES:**

- COORDINATE CML WORK WITH MECHANICAL AND ELECTRICAL.
  - DESIGN IS BASED ON EXISTING DRAWINGS PROVIDED BY GOVERNMENT. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND INFORM THE C.O. OF ANY DEVIATIONS.
- CONCRETE:**
- CONCRETE SHALL PROVIDE 4000 PSI AT 28 DAYS, MAXIMUM W/C RATIO 0.48, AND A MINIMUM CEMENT CONTENT OF 517 LBS/CY.
  - WORK SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS AND RECOMMENDATIONS OF ACI 318 AND ACI 301.
  - REINFORCING STEEL SHALL BE NEW ASTM A615 GR 60.
  - REINFORCING STEEL PLACEMENT SHALL CONFORM TO THE CURRENT C.R.S.I. MANUAL OF STANDARD PRACTICE.
  - CONCRETE COVER SHALL BE 3" MIN ON SURFACES IN DIRECT CONTACT WITH SOIL, 2" MIN ON ALL OTHER SURFACES.
  - GROUT SHALL BE NON-METALLIC, NON-SHRINK, MINIMUM STRENGTH 5000 PSI
- GRATING:**
- GRATING AT VAPORIZER PAD SHALL BE 2" (HEIGHT) FIBERGLASS, MOLDED RECTANGULAR MESH, NON-SLIP GRIT SURFACE, ORANGE COLOR. GRATING SHALL BE CUT TO CLEAR OBSTRUCTIONS.
  - GRATING AT VAPORIZER PAD SHALL BE FASTENED WITH TYPE 316 S.S. GRATING CLIPS DESIGNED TO HOLD TWO ADJACENT BARS, UTILIZING S.S. CONCRETE EXPANSION ANCHORS, FASTENED 24" C-C MAX, MINIMUM EMBEDMENT 1-1/2".

**DESIGN BASIS**  
 ASCE 7-98  
 WIND SPEED 135 MPH  
 SOIL BEARING 2000 PSF

**PARTIAL SITE PLAN**  
 SCALE: 1/8" = 1'-0"



**GRATING PLAN**

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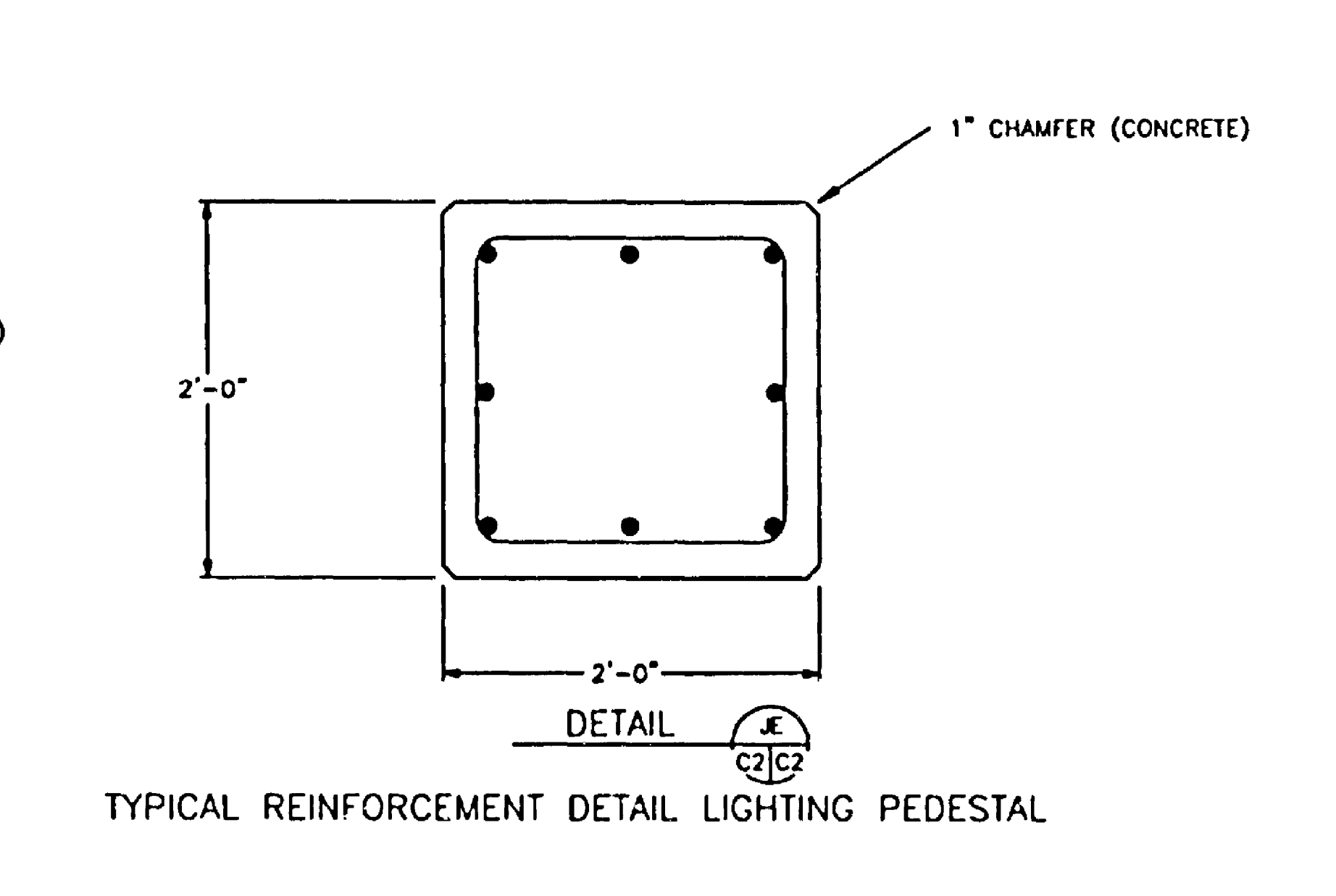
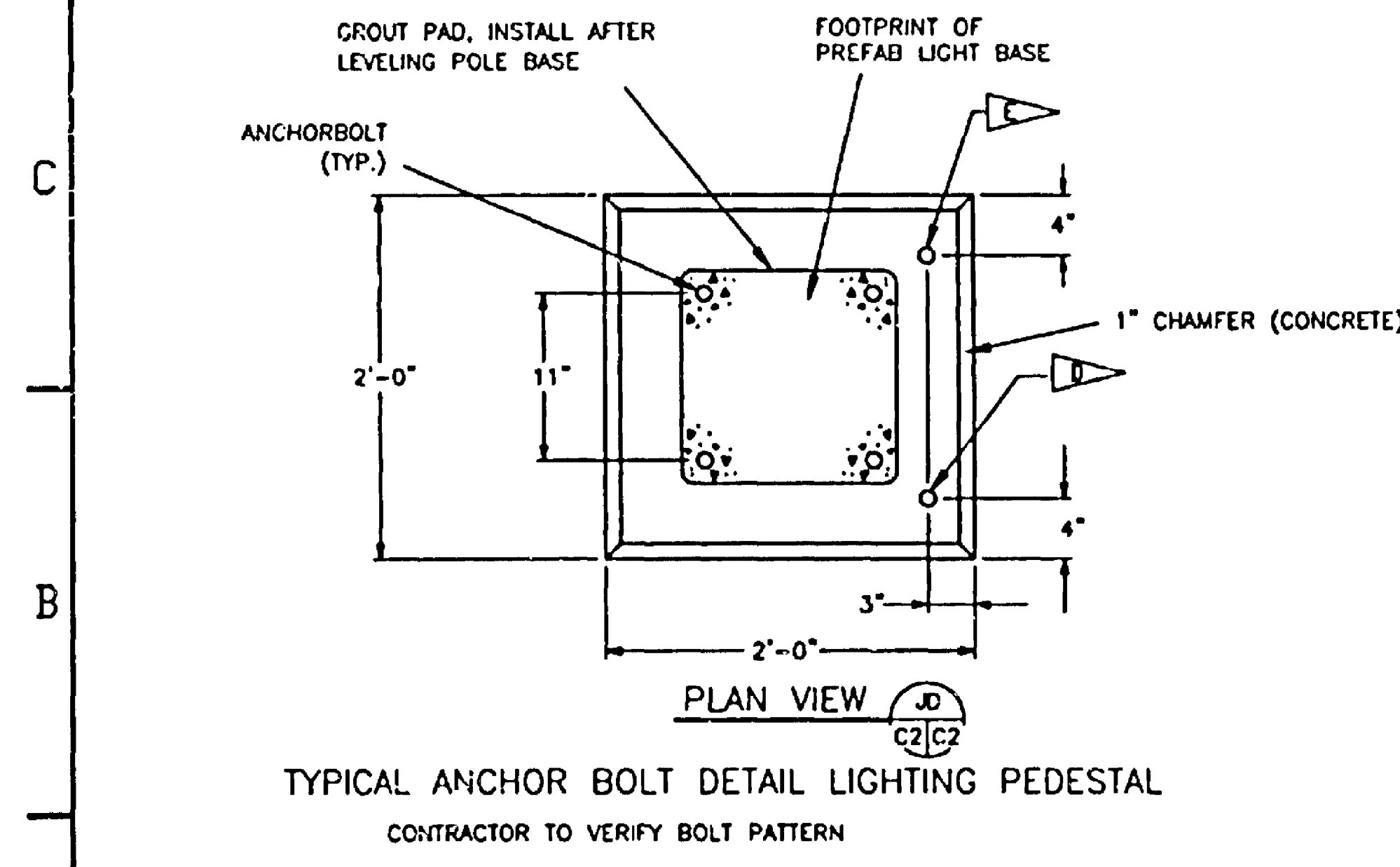
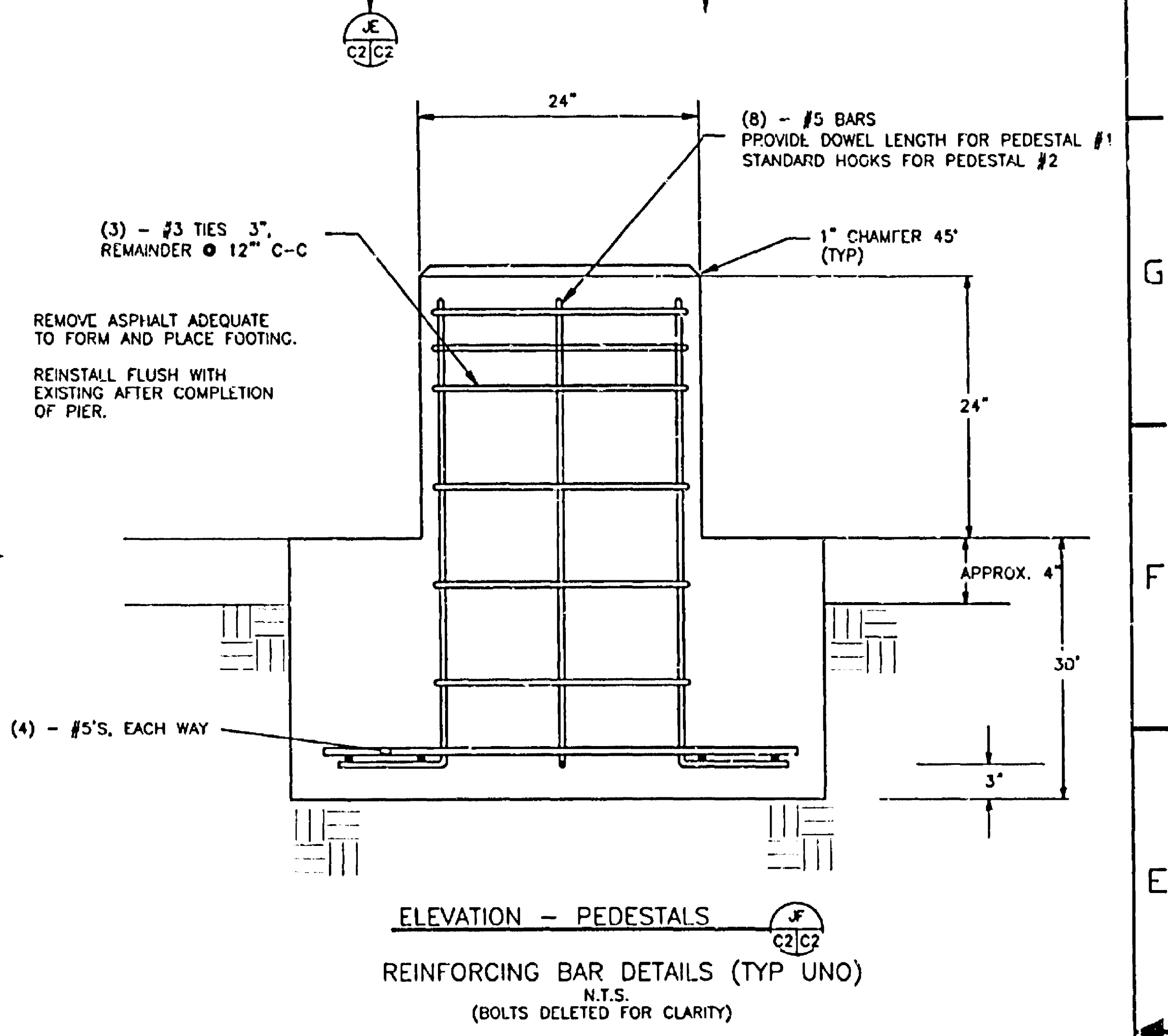
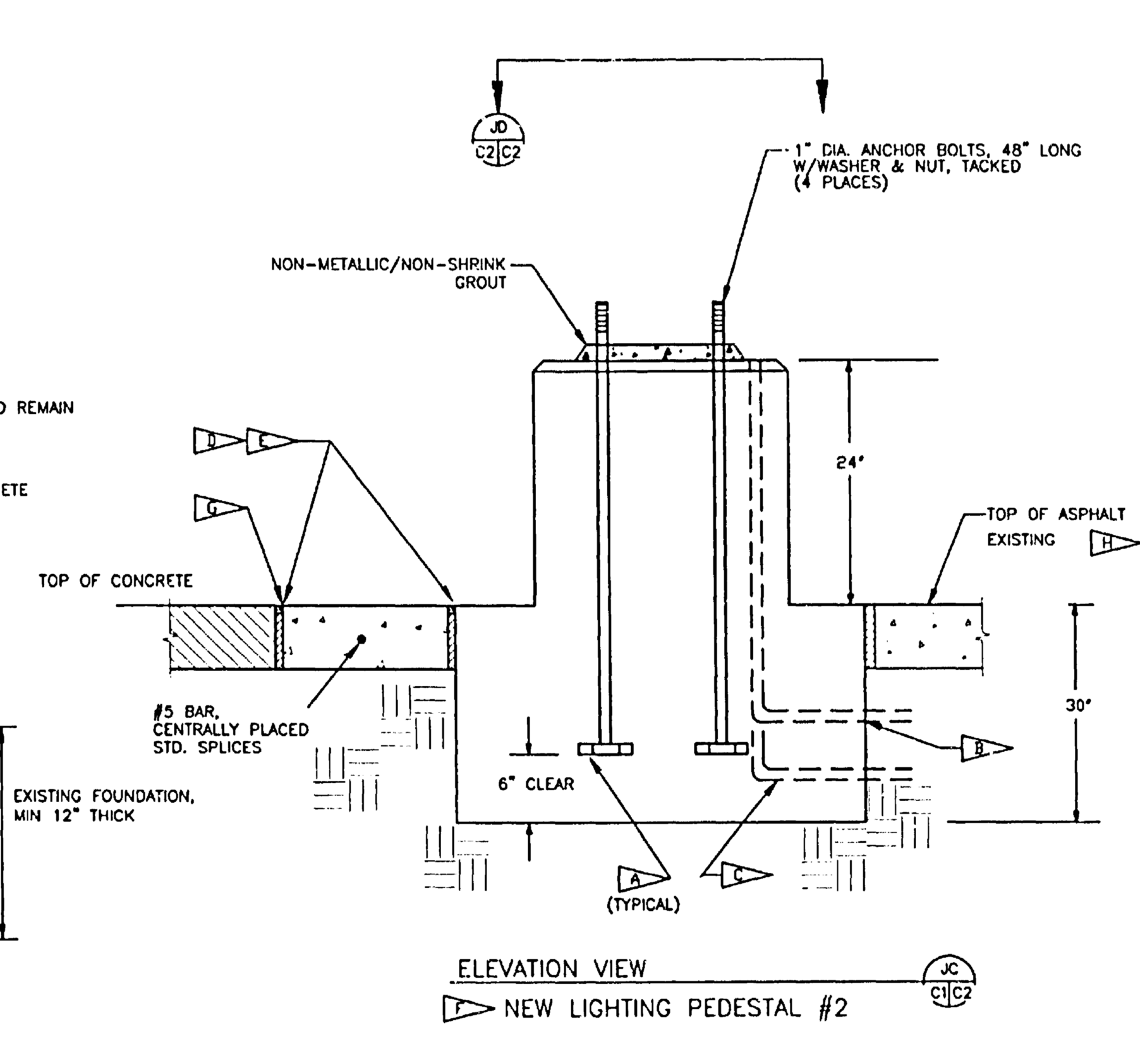
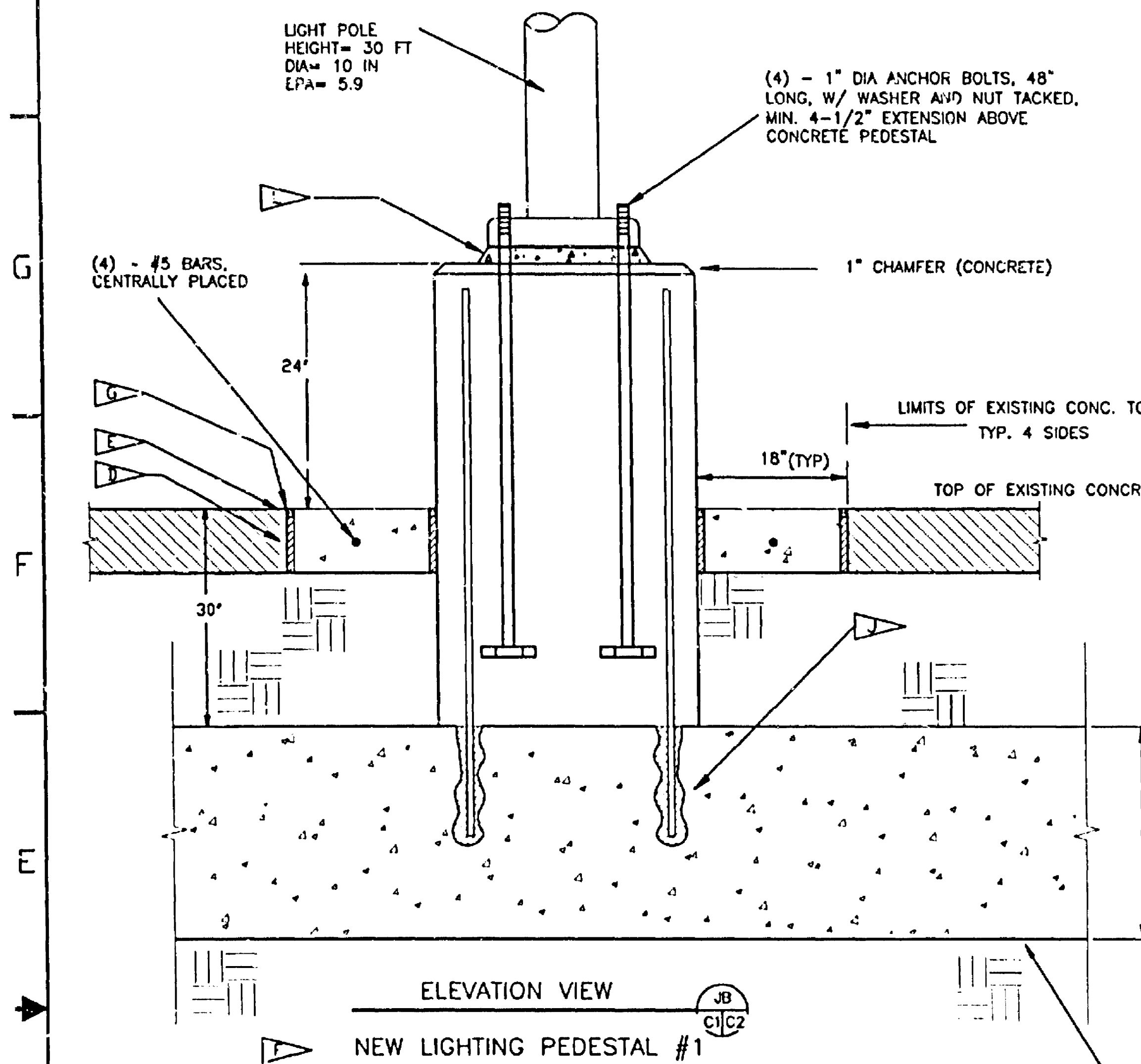
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 Engineering Professional Number: 9009

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION		
DRAWN P.PALOMINI	7/18/02	JOHN F. KENNEDY SPACE CENTER, NASA		
CHECKED H.STURM	7/18/02	KENNEDY SPACE CENTER, FLORIDA		
ENGINEER R.SLEDER	7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM		
<b>GENERAL PLAN AND NOTES</b>				
APPROVED	DATE	SIZE	DWG. NO.	REV
J.PORTA	8/16/02	F	79K35402	
TITLE	PROJ. NO.	SHEET		
	06036.1	36		

NOTICE: THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL, STATE AND FEDERAL AGENCIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL, STATE AND FEDERAL AGENCIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL, STATE AND FEDERAL AGENCIES.

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H G F E D C B A



**SPECIFIC NOTES:**

- A NUT TACK WELDED TO BOLT (TYPICAL).
- B GROUNDING CONDUIT/ 1" SCHEDULE 40 PVC.
- C POWER SUPPLY CONDUIT (1" PVC) TYPICAL.
- D ASPHALT IMPREGNATED 3/4" EXPANSION JOINT/JOINT FILLER (TYPICAL).
- E SONNEBORNE NP-1 SEALANT (OR APPROVED EQUAL) OVER 1/2" BACKER ROD
- F SEE DETAIL (JE/C2/C2) AND SECTION (JE/C2/C2) FOR REINFORCEMENT DETAILS.
- G SAWCUT CONCRETE TO ALLOW FOOTER CONSTRUCTION. EXCAVATE SOIL AS REQUIRED. UPON COMPLETION OF PEDESTAL, RE-INSTALL SOIL, COMPACT SOIL TO ORIGINAL CONDITION. RESTORE CONCRETE AROUND PEDESTAL PER DETAIL (JB/C2/C2)
- H SAWCUT ASPHALT TO ALLOW FOOTER CONSTRUCTION. REPLACE TO ORIGINAL CONFIGURATION AFTER COMPLETION OF LIGHT POLE BASE.
- I DOWEL CORNER BARS (4 TOTAL) INTO FOUNDATION, MILTI HY-150 OR EQUAL, MIN EMBEDMENT 8"
- K PROVIDE STANDARD ACI 90° HOOKS FOR VERTICAL BARS ON PEDESTAL #2.
- L INSTALL NON-METALLIC NON-SHRINK GROUT AFTER LEVELING POLE BASE.

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C-2  
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SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION		
DRAWN P PALOMACE	7/18/02	JOHN F. BISHOP SPACE CENTER, NASA		
CHECKED H STURN	7/15/02	REIMDY SPACE CENTER, FLORIDA		
ENGINEER R SLEDER	7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID NEIUM STORAGE SYSTEM		
DETAILS AND SECTIONS				
SUBMITTED	DATE	SHEET (OF NO.)	REV	
APPROVED	DATE	F 79K35402		
TITLE	PROJ. NO. 000581	SHEET 36		

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NOT TO SCALE UNLESS OTHERWISE SPECIFIED. ALL DIMENSIONS ARE IN FEET AND INCHES. DIMENSIONS ARE TO FACE UNLESS OTHERWISE SPECIFIED. ALL DIMENSIONS ARE TO BE MAINTAINED THROUGHOUT THE CONSTRUCTION OF THE PROJECT. ALL DIMENSIONS ARE TO BE MAINTAINED THROUGHOUT THE CONSTRUCTION OF THE PROJECT.

**GENERAL ELECTRICAL POWER & GROUNDING NOTES:**

- ALL WORK SHALL CONFORM TO THE CURRENT RELEASE OF THE NEC AT THE TIME OF CONTRACT AWARD.
- DRAWINGS ARE DIAGRAMMATIC AND DO NOT SHOW ALL NECESSARY BENDS AND ROUTING. CONTRACTOR SHALL FIELD VERIFY ALL LOCATIONS AND ROUTING. CONTRACTOR SHALL COORDINATE WITH OTHER TRADES TO AVOID CONFLICTS. CONTRACTOR SHALL MODIFY EXISTING OR PROVIDE NEW SUPPORTS AS REQUIRED, FIELD VERIFY.
- DUE TO EXISTING FIELD CONDITIONS, IT IS STRONGLY RECOMMENDED PROSPECTED BIDDERS TO PARTICIPATE IN A PRE-BID SITE TOUR.
- NEW WORK SHALL BE CAREFULLY LAID OUT IN ADVANCE. ANY DAMAGE SHALL BE REPAIRED BY THE CONTRACTOR, AT NO COST TO THE GOVERNMENT, TO THE C.O.'S SATISFACTION. GENERAL TOUCHUP OR REPAINTING OF ITEMS OR STRUCTURES, WHOSE PROTECTIVE COATING IS (OR HAS BEEN) DAMAGED, SHALL BE RESTORED TO THE ORIGINAL FINISH AND COLOR (IN ACCORDANCE WITH KSC-STD-C-0001). ALL PAINTING PROCEDURES SHALL BE APPROVED BY THE CONTRACTING OFFICER.
- UNLESS OTHERWISE SPECIFIED, ROUTE CONDUIT ON CMU (NOT DRY-WALL) AND ON PIPING SUPPORTS, AS APPLICABLE. CONDUIT SHALL BE ROUTED AND SUPPORTED ON TOP OR SIDE (NOT BENEATH) OF THE PIPE BRIDGE STRUCTURE. CONDUIT SHALL BE SUPPORTED BY SUPPORTS ANCHORED TO THE CONCRETE. ROUTE CONDUIT SO AS TO NOT INTERFERE WITH OR RESTRICT ACCESS TO (FOR MAINTENANCE AND/OR OPERATION OF) AND VISIBILITY OF GAUGES/DISPLAYS (ETC.) ON EQUIPMENT/COMPONENTS. NOR CREATE A BUMPING/TRIPPING HAZARD. THERE SHALL BE A MINIMUM OF 3" OF AIR SPACE BETWEEN ADJACENT CONDUIT AND PIPING. CONDUIT RUNS SHALL BE ROUTED WITH EXISTING AND/OR NEW PIPING RUNS WHEREVER POSSIBLE. CONDUIT INSIDE WEST-END COMPRESSOR ROOM SHALL BE ROUTED ABOVE EXISTING LIGHTS AND NOT OVERHEAD OF THE COMPRESSORS. DO NOT ROUTE CONDUIT BENEATH UNJACKETED (NON-VJ) PIPING TO THE WEST (I.E., UPSTREAM) OF THE THERMOWELLS.
- THE CONTRACTOR SHALL SUBMIT A DETAILED LAYOUT DRAWING OF THE CONDUIT TO C.O. FOR APPROVAL PRIOR TO FABRICATION AND INSTALLATION. LAYOUT DRAWING SHALL BE TO SCALE, CLEARLY DEPICT ROUTING DETAILS NEAR EQUIPMENT, SHOW FIELD VERIFIED DIMENSIONS OF ADJACENT PIPING/COMPONENT/EQUIPMENT. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE SUFFICIENT DETAIL AND CLARITY AS DETERMINED NECESSARY BY THE C.O. CONTRACTOR SHALL INDICATE MODIFICATIONS TO EXISTING SUPPORTS OR NEW SUPPORTS NEEDED FOR CONDUIT ROUTING.
- INSULATED CONDUCTORS SHALL BE TYPE THWN, 120/208V BRANCH CIRCUIT CONDUCTORS SHALL HAVE COLORED OUTER COVERINGS AS FOLLOWS:  
PHASE A - BLACK; PHASE B - RED; PHASE C - BLUE; NEUTRAL - WHITE. 277/480V BRANCH CIRCUIT CONDUCTORS SHALL HAVE COLORED OUTER COVERINGS AS FOLLOWS: PHASE A - BROWN; PHASE B - ORANGE; PHASE C - YELLOW; NEUTRAL - WHITE. INSULATED GROUNDING CONDUCTORS SHALL BE GREEN.
- RGS CONDUIT SHALL BE USED IN ALL CONDUIT SYSTEMS. ALL STEEL CONDUIT SHALL BE HOT DIPPED GALVANIZED. CONDUIT INSTALLED OUTSIDE (EXTERIOR TO BUILDING) SHALL BE PVC COATED RGS CONDUIT. CONDUIT SHALL BE INSTALLED PER NEC ARTICLE 348. FIELD MADE BENDS AND OFFSETS SHALL BE MADE WITH AN APPROVED HICKORY OR CONDUIT BENDING MACHINE. CHANGES IN DIRECTION OF RUNS SHALL BE MADE WITH SYMMETRICAL BENDS OR CAST METAL FITTINGS. (THAT HAVE THE SAME CORROSION PROTECTION AS THE CONDUIT IT'S ATTACHED TO).
- RACEWAYS SHALL BE SUPPORTED AND SECURED AT INTERVALS OF NOT MORE THAN TEN FEET AND WITHIN THREE FEET OF EACH OUTLET BOX. JUNCTION BOX, CABINET OR FITTING, EXPOSED RACEWAYS SHALL HAVE RUNS INSTALLED PARALLEL OR PERPENDICULAR TO WALLS, STRUCTURAL MEMBERS OR INTERSECTIONS OF VERTICAL PLANES AND CEILINGS. CRUSHED OR DEFORMED RACEWAYS SHALL NOT BE INSTALLED.
- THE CONTRACTOR SHALL FURNISH AND INSTALL CONDUIT SUPPORTS WHEREVER REQUIRED. SUPPORTS SHALL BE OF STEEL BAR, ANGLE OR CHANNEL OF A SIZE TO PROVIDE A FIRM, RIGID SUPPORT. SUPPORTS SHALL NOT FORM CLOSED POCKETS WHICH CAN RETAIN LIQUID. PIPING AND EQUIPMENT SHALL NOT BE USED TO ANCHOR SUPPORTS. WHERE EXPOSED CONDUIT REQUIRES CLAMPING TO FLAT SURFACES, CLAMPS SHALL CONSIST OF UNISTRUT TYPE RGS STRAPS. SUPPORTING ELEMENTS SHALL BE HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A123 OR A153. FASTENERS/WASHERS SHALL BE 304 SST.
- ALL SIZES OF STANDARD CONDUIT FITTINGS SHALL BE THE THREADED TYPE. ALL FITTINGS WITH BLANK COVERS SHALL HAVE GASKETS. FITTINGS SHALL BE INSTALLED ALLOWING ACCESS AFTER THE WORK IS COMPLETE.
- CONDUIT JOINTS SHALL BE MADE WITH TAPERED THREADS AND SET FIRMLY. EACH LENGTH OF CONDUIT CUT IN THE FIELD SHALL BE REAMED BEFORE INSTALLATION. CORROSION INHIBITING CONDUCTIVE COMPOUND SHALL BE USED ON CONDUIT THREADS.
- PULL AND JUNCTION BOXES SHALL BE NOT LESS THAN THE MINIMUM SIZE REQUIRED BY NEC ARTICLE 370 FOR THE NUMBER OF CONDUCTORS ENCLOSED IN THE BOX AND SHALL BE CONSTRUCTED OF CODE-GAGE - HOT DIPPED GALVANIZED SHEET METAL.
- ALL CONDUCTORS SHALL BE TESTED FOR CONTINUITY AND INSULATION RESISTANCE. INSULATION RESISTANCE SHALL BE TESTED CONDUCTOR TO CONDUCTOR AND CONDUCTOR TO GROUND. CONTINUITY MEASUREMENTS SHALL BE TESTED WITH A MULTIMETER USING THE LOWEST OHM SCALE AVAILABLE. ACCEPTABLE VALUES ARE DETERMINED BASED ON THE PROPERTIES (LENGTH AND SIZE) OF THE WIRE BEING TESTED. INSULATION RESISTANCE MEASUREMENTS SHALL BE MADE AT 500 VDC. CONDUCTOR TO CONDUCTOR RESISTANCE SHALL BE A MINIMUM OF 200 MEGOHMS AND CONDUCTOR TO GROUND RESISTANCE SHALL BE A MINIMUM OF 100 MEGOHMS. READINGS SHALL BE SUBMITTED TO THE C.O. FOR APPROVAL.
- GROUNDING TAPS SHALL BE AS SHORT AS POSSIBLE AND SHALL BE RUN IN CONDUIT WHERE MECHANICAL PROTECTION IS NECESSARY, AND FOR (ABOVE GROUND) RUNS GREATER THAN 1'-6" UNLESS OTHERWISE APPROVED BY THE C.O. (ON A CASE-BY-CASE DETERMINATION).
- FALL-OF-POTENTIAL TESTS PER KSC-STD-E-0012 FOR COUNTERPOISE AND GROUND ROD RESISTANCE CHECKS.

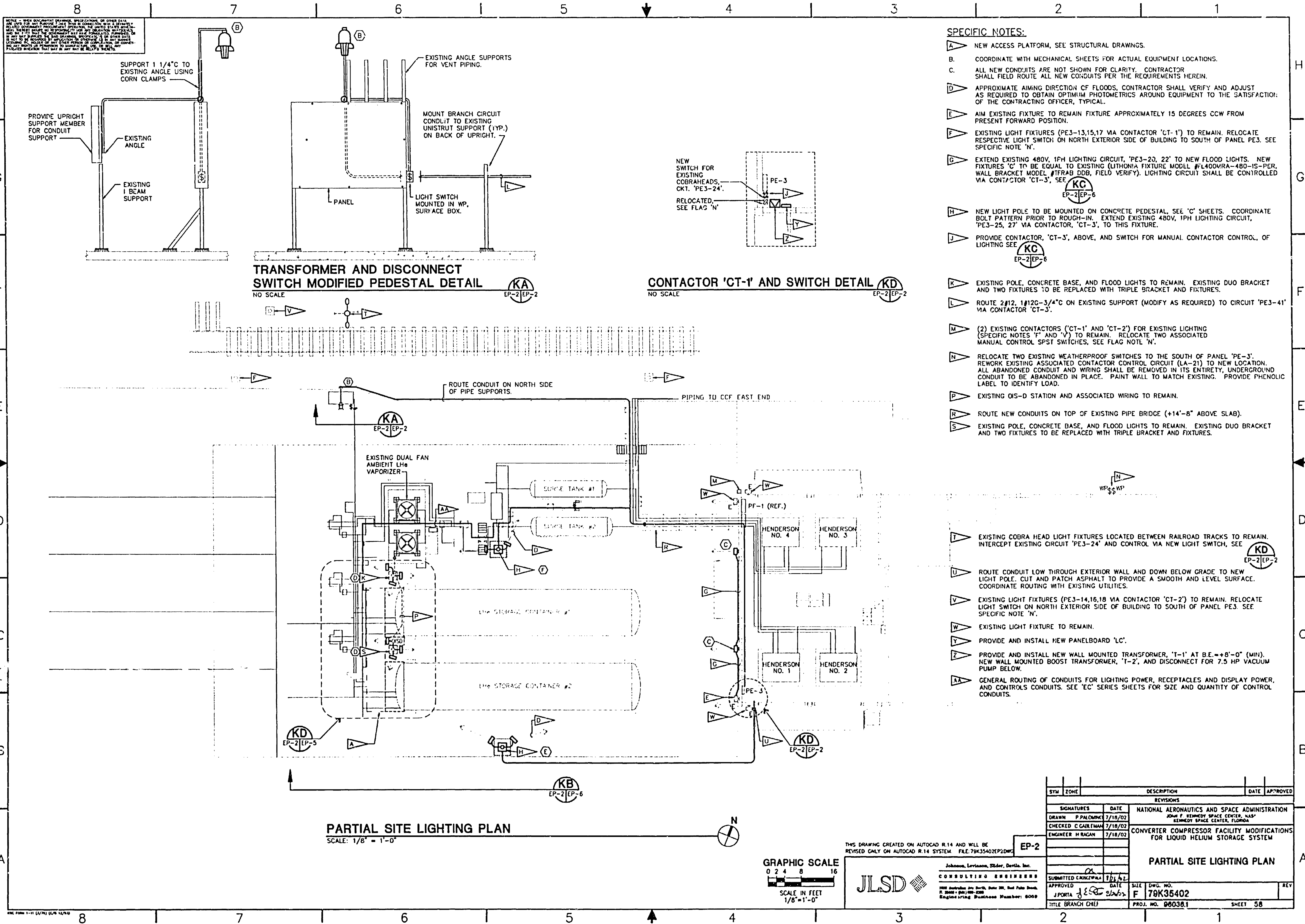
- THE RESISTANCE OF INDIVIDUAL GROUND RODS TO EARTH SHALL BE MEASURED PRIOR TO INTERCONNECTION WITH THE COUNTERPOISE. MAXIMUM RESISTANCE VALUES SHALL NOT EXCEED 25 OHMS. THE RESISTANCE BETWEEN A GROUND ROD AND EARTH SHALL BE DETERMINED BY THE FALL-OF-POTENTIAL TEST METHOD. THIS METHOD UTILIZES A GROUND OHMMETER (WHICH PRODUCES AN ALTERNATING CURRENT THAT IS CLOSE BUT NOT EQUAL TO 60 HZ, SINCE A 60 HZ SOURCE MAY BE INFLUENCED BY OUTSIDE FIELDS AND CURRENTS) AND THREE TEST ELECTRODES. THE THREE ELECTRODES ARE IDENTIFIED AS EARTH ELECTRODE (EE), DRIVEN REFERENCE ELECTRODE (DR) AND POTENTIAL REFERENCE ELECTRODE (PR). THE DR ROD IS PLACED NOT LESS THAN 30 METERS (100 FT) FROM THE EE UNDER TEST. THE PR IS PLACED APPROXIMATELY MIDWAY BETWEEN THE EE AND DR RODS, AND A READING IS MADE OF THE RESISTANCE. (REF. KSC-STD-E-0012).
- THE RESISTANCE FROM ANY POINT ON THE COUNTERPOISE TO EARTH SHALL BE NO GREATER THAN 10 OHMS. THE RESISTANCE BETWEEN A COUNTERPOISE AND EARTH SHALL BE DETERMINED BY THE FALL-OF-POTENTIAL METHOD. THIS DIFFERS FROM THE GROUND ROD TESTING IN THAT THE DISTANCE FROM THE GROUND UNDER TEST (EE) TO THE DRIVEN REFERENCE ELECTRODE (DR) IS DETERMINED BY THE SIZE OF THE COUNTERPOISE; THAT IS, THE GREATER THE SIZE OF THE COUNTERPOISE, THE GREATER THE DISTANCE BETWEEN THE CURRENT ELECTRODES. RESISTANCE READINGS ARE TAKEN AT THESE VARIOUS POINTS. THESE READINGS ARE THEN PLOTTED AND THE TRUE RESISTANCE VALUE IS OBTAINED WHEN THE POTENTIAL ELECTRODE (PR) IS OUTSIDE THE INFLUENCE OF EITHER THE GROUND UNDER TEST (EE) OR THE REFERENCE ELECTRODE (DR) AND IS CONSIDERED TO BE IN THE HORIZONTAL PORTION OF THE CURVE. (REF. KSC-STD-E-0012, SECTION 4.3.4.2, FOR ILLUSTRATION.)
- BOND RESISTANCE. THE RESISTANCE OF ANY BOND CONNECTION SHALL NOT EXCEED 1.0 MILLIOHM.
- SUBMITTALS.
  - LAYOUT DRAWING FOR CONDUIT RUNS.
  - GROUNDING LOCATION AND DETAILS TO LH# STORAGE CONTAINERS (#1, #2) SUPPORT STRUCTURES AND PIPE SUPPORT STRUCTURE.
  - CATALOG DATA AND SPECIFICATIONS FOR CONDUIT, SUPPORTING ELEMENTS, ENCLOSURES, JUNCTION BOXES, CONDUCTORS, WIRING DEVICES, PANELBOARDS, TRANSFORMERS, LIGHT FIXTURES, LIGHT POLES AND BONDING LUGS.
  - SIGNED AND SEALED WIND LOAD CALCULATIONS (PER ASCE 7-98) FOR POLE ASSEMBLY BY AN ENGINEER REGISTERED IN THE STATE OF FLORIDA.
  - TEST PROCEDURE FOR CONDUCTOR CONTINUITY AND INSULATION RESISTANCE CHECK.
  - TEST PROCEDURE FOR GROUND ROD AND COUNTERPOISE RESISTANCE CHECK.
  - TEST REPORT FOR CONDUCTOR CONTINUITY AND INSULATION RESISTANCE CHECK.
  - TEST REPORT FOR GROUND ROD AND COUNTERPOISE RESISTANCE CHECK.
- CHANNEL AND MOUNTING HARDWARE FOR LIGHTS SHALL BE SAME MATERIAL AS PIPING SUPPORTS ATTACHED TO (I.E. EITHER HOT-DIPPED GALVANIZED STEEL PER ASTM A123/A153 OR 304 STAINLESS STEEL). FASTENERS AND WASHERS SHALL BE 304 STAINLESS STEEL.
- BONDING USING LUGS SHALL BE ACCOMPLISHED USING DUAL-RATED LUGS RATED FOR USE FOR EACH CONDUCTOR. REMOVE PAINT WHERE NECESSARY TO ACHIEVE METAL-TO-METAL CONTACT BETWEEN LUG AND SURFACE TO BOND TO, PROVIDING APPROPRIATE ANTI-OXIDANT MATERIAL TO PRESERVE ELECTRICAL CONTINUITY.
- BONDING USING EXOTHERMIC WELDING, INCLUDING BONDING TO CABLE CONNECTIONS, GROUND RODS, SPLICES, CABLE TO STEEL OR IRON, AND CABLE TO LUG TERMINATIONS, SHALL BE OF CADWELD MATERIALS AND METHODS OR APPROVED EQUAL. ALL MATERIALS SHALL BE OF THE SAME SOURCE TO ENSURE COMPATIBILITY.
- PANELBOARDS
  - ALL PANELBOARDS SHALL BE DEAD FRONT SAFETY TYPE EQUIPPED WITH BOLT ON THERMAL MAGNETIC MOLDED CASE CIRCUIT BREAKERS, SOLID NEUTRAL BUS, AND GROUND BUS. (ALL BUSES SHALL BE COPPER).
  - PANELBOARDS SHALL HAVE INTEGRATED SHORT CIRCUIT RATING AND CONTINUOUS CURRENT RATING AS INDICATED ON THE DRAWINGS. RATING SHALL INCLUDE BUS, MAIN CIRCUIT BREAKER, AND BRANCH CIRCUIT BREAKERS AS ASSEMBLED UNIT.
  - APPROVED PANELBOARD MANUFACTURERS GE, CUTLER HAMMER, WESTINGHOUSE, OR IIE.
- DRY TYPE DISTRIBUTION TRANSFORMERS SHALL BE NEMA ST 20, GENERAL PURPOSE, DRY TYPE, SELF COOLED, VENTILATED, UNLESS NOTED OTHERWISE, PROVIDE TRANSFORMERS IN NEMA 1 ENCLOSURE. TRANSFORMER OF 115 DEGREES C TEMPERATURE RISE SHALL BE CAPABLE OF CARRYING CONTINUOUSLY 130 PERCENT OF NAMEPLATE KVA WITHOUT EXCEEDING INSULATION RATING. TRANSFORMERS SHALL BE QUIET TYPE WITH MAXIMUM SOUND LEVEL AT LEAST 3 DECIBELS LESS THAN NEMA STANDARD LEVEL FOR TRANSFORMER RATINGS INDICATED. TRANSFORMER WINDINGS SHALL BE COPPER. TRANSFORMER SHALL BE WALL MOUNTED.

SYMBOLS & ABBREVIATIONS			
-----	EXISTING	CNTL	CONTROL
//////	DEMOLITION	CNTR	CONTROLLER
-----	NEW ELECTRICAL	C.O.	CONTRACTING OFFICER
-----	NEW ELECTRICAL ROUTED UNDERGROUND	CCW	COUNTER CLOCKWISE
(J)	JUNCTION BOX	DISC.	DISCONNECT SWITCH
• g	EXISTING 20' GROUND ROD	E	EXISTING
• b	BOND TO COUNTERPOISE OR STRUCTURE	G	GROUND
XP <sup>0</sup> / YYY / ZZZ	CIRCUIT BREAKER, X INDICATES THE NUMBER OF POLES, YYY INDICATES THE FRAME SIZE, ZZZ INDICATES THE TRIP SIZE	GFE	GOVERNMENT FURNISHED EQUIPMENT
XP <sup>0</sup> / YYY / ZZZ	DRAW OUT CIRCUIT BREAKER, X INDICATES THE NUMBER OF POLES, YYY INDICATES THE FRAME SIZE, ZZZ INDICATES THE TRIP SIZE	GFI	GROUND FAULT INTERRUPTING
•	EXOTHERMIC CONNECTION	GND	GROUND
-----	EXISTING GROUND	GRSC	GALVANIZED RIGID STEEL CONDUIT
-----	NEW GROUND	HPS	HIGH PRESSURE SODIUM
(M)	MOTOR, HP RATING AS SHOWN	J-BOX	JUNCTION BOX
(H)	OVERHEAD CABLE TRAY	LTS	LIGHTS
(Δ)	TRANSFORMER, SIZE AS SHOWN	M.H.	METAL HALIDE
\$	277V, 20A, 1P TOGGLE SWITCH, HOSPITAL GRADE	NF	NON-FUSED
(D)	125V, 1Ø, 3W 20A DUPLEX RECEPTACLE	NEC	NATIONAL ELECTRICAL CCDE
(WT)	120/208V, 3Ø, 5W 30A WEATHERTIGHT RECEPTACLE	PH	PHASE
(WT)	240V, 3Ø, 5W 60A WEATHERTIGHT RECEPTACLE	PLC	PROGRAMMABLE LOGIC CONTROLLER
(X)	LIGHTING FIXTURE TYPE DESIGNATION, WHERE X = A, B, C, D, E OR F	PNL	PANEL
→	APPROXIMATE AIMING DIRECTION OF FLOOD LIGHTS	PVC	-
A.G.	ABOVE GRADE	RCPT	RECEPTACLE
ALUM.	ALUMINUM	RR	RAILROAD
C	CONDUIT	RSC	RIGID STEEL CONDUIT
CLG	CEILING	SSST	SINGLE POLE, SINGLE THROW
CKT	CIRCUIT	SPS	STAINLESS STEEL (304)
		TYP	TYPICAL
		UNO	UNLESS NOTED OTHERWISE
		VAR	VARIABLE
		WP	WEATHERPROOF (SHALL BE A MINIMUM OF NEMA 3R STAINLESS STEEL, U.N.O.)
		XFMR	TRANSFORMER

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SYM	ZONE	DESCRIPTION	DATE	APPROVED
SIGNATURES				
DRAWN	P. PALOMBO	DATE	7/18/02	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION 3000 F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA
CHECKED	C. CARLEW	DATE	7/18/02	
ENGINEER	H. RAGAN	DATE	7/18/02	
SUBMITTED AND APPROVED				
APPROVED	J. PORTA	DATE	8/1/02	GENERAL ELECTRICAL NOTES
TITLE BRANCH CHIEF				
SIZE		DWG. NO.	REV	
F		79K35402		
PROJ. NO.		SHEET		
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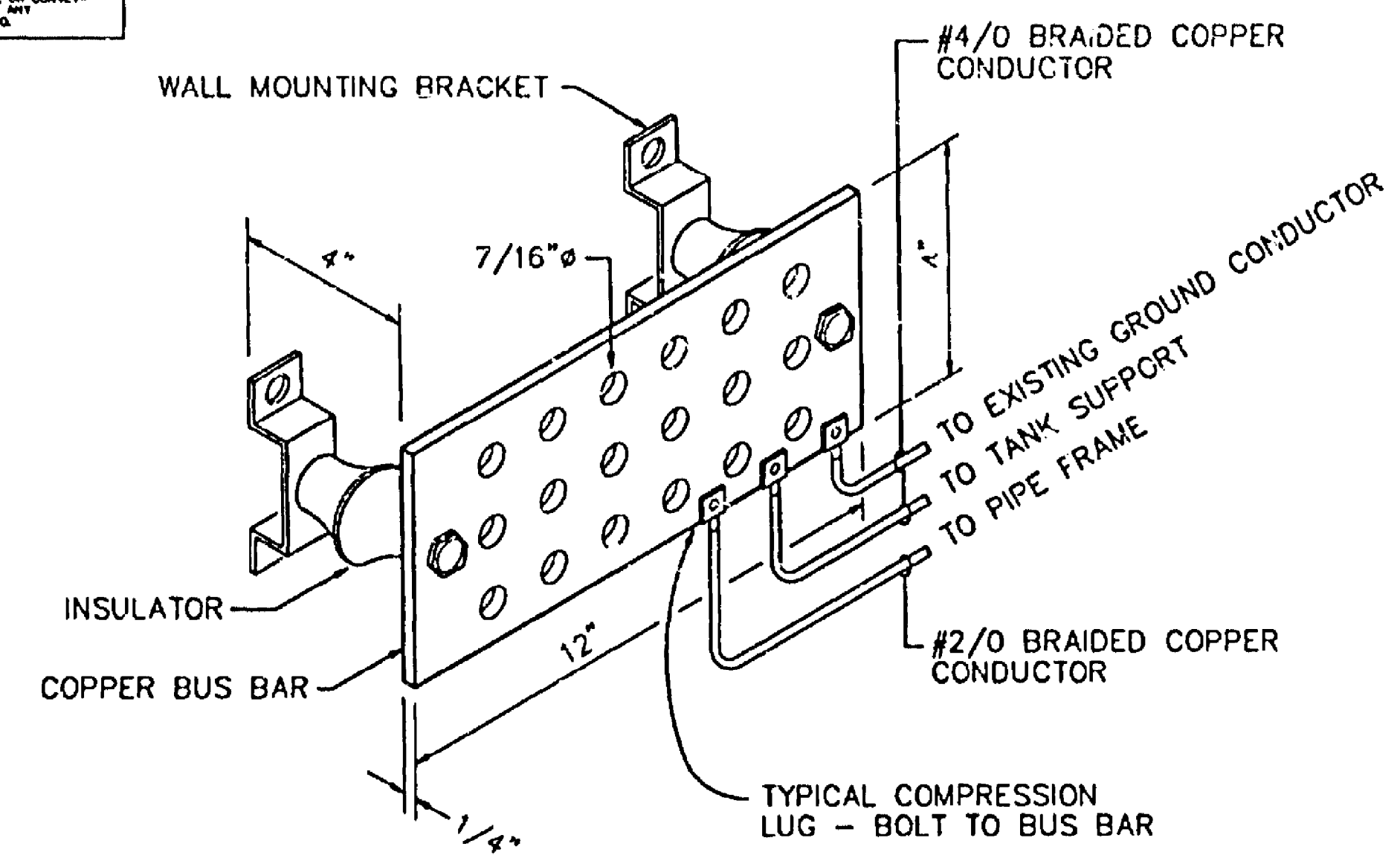
NOTE: THIS DRAWING IS A PRELIMINARY DESIGN. IT IS NOT TO BE USED FOR CONSTRUCTION OR FOR ANY OTHER PURPOSE. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS ON THE JOB SITE. ANY CHANGES TO THIS DRAWING SHALL BE MADE BY THE CONTRACTOR AT HIS OWN RISK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS.

**SPECIFIC NOTES:**

- A NEW ACCESS PLATFORM, SEE STRUCTURAL DRAWINGS.
- B COORDINATE WITH MECHANICAL SHEETS FOR ACTUAL EQUIPMENT LOCATIONS.
- C ALL NEW CONDUITS ARE NOT SHOWN FOR CLARITY. CONTRACTOR SHALL FIELD ROUTE ALL NEW CONDUITS PER THE REQUIREMENTS HEREIN.
- D APPROXIMATE AIMING DIRECTION OF FLOODS. CONTRACTOR SHALL VERIFY AND ADJUST AS REQUIRED TO OBTAIN OPTIMUM PHOTOMETRICS AROUND EQUIPMENT TO THE SATISFACTION OF THE CONTRACTING OFFICER, TYPICAL.
- E AIM EXISTING FIXTURE TO REMAIN FIXTURE APPROXIMATELY 15 DEGREES CCW FROM PRESENT FORWARD POSITION.
- F EXISTING LIGHT FIXTURES (PE3-13,15,17 VIA CONTACTOR 'CT-1') TO REMAIN. RELOCATE RESPECTIVE LIGHT SWITCH ON NORTH EXTERIOR SIDE OF BUILDING TO SOUTH OF PANEL PE3. SEE SPECIFIC NOTE 'N'.
- G EXTEND EXISTING 480V, 1PH LIGHTING CIRCUIT, 'PE3-20, 22' TO NEW FLOOD LIGHTS. NEW FIXTURES 'C' TO BE EQUAL TO EXISTING (LITHONIA FIXTURE MODEL #1400VRA-480-15-PER, WALL BRACKET MODEL #17RAB DOB, FIELD VERIFY). LIGHTING CIRCUIT SHALL BE CONTROLLED VIA CONTACTOR 'CT-3'. SEE (KC) EP-2/EP-6
- H NEW LIGHT POLE TO BE MOUNTED ON CONCRETE PEDESTAL, SEE 'C' SHEETS. COORDINATE BOLT PATTERN PRIOR TO ROUGH-IN. EXTEND EXISTING 480V, 1PH LIGHTING CIRCUIT, 'PE3-25, 27' VIA CONTACTOR, 'CT-3', TO THIS FIXTURE.
- I PROVIDE CONTACTOR, 'CT-3', ABOVE, AND SWITCH FOR MANUAL CONTACTOR CONTROL, OF LIGHTING SEE (KC) EP-2/EP-6
- K EXISTING POLE, CONCRETE BASE, AND FLOOD LIGHTS TO REMAIN. EXISTING DUO BRACKET AND TWO FIXTURES TO BE REPLACED WITH TRIPLE BRACKET AND FIXTURES.
- L ROUTE 2#12, 1#12G-3/4" C ON EXISTING SUPPORT (MODIFY AS REQUIRED) TO CIRCUIT 'PE3-41' VIA CONTACTOR 'CT-3'.
- M (2) EXISTING CONTACTORS ('CT-1' AND 'CT-2') FOR EXISTING LIGHTING (SPECIFIC NOTES 'F' AND 'I') TO REMAIN. RELOCATE TWO ASSOCIATED MANUAL CONTROL SPST SWITCHES, SEE FLAG NOTE 'N'.
- N RELOCATE TWO EXISTING WEATHERPROOF SWITCHES TO THE SOUTH OF PANEL 'PE-3'. REWORK EXISTING ASSOCIATED CONTACTOR CONTROL CIRCUIT (LA-21) TO NEW LOCATION. ALL ABANDONED CONDUIT AND WIRING SHALL BE REMOVED IN ITS ENTIRETY. UNDERGROUND CONDUIT TO BE ABANDONED IN PLACE. PAINT WALL TO MATCH EXISTING. PROVIDE PHENOLIC LABEL TO IDENTIFY LOAD.
- P EXISTING OIS-D STATION AND ASSOCIATED WIRING TO REMAIN.
- R ROUTE NEW CONDUITS ON TOP OF EXISTING PIPE BRIDGE (+14'-8" ABOVE SLAB).
- S EXISTING POLE, CONCRETE BASE, AND FLOOD LIGHTS TO REMAIN. EXISTING DUO BRACKET AND TWO FIXTURES TO BE REPLACED WITH TRIPLE BRACKET AND FIXTURES.
- T EXISTING COBRA HEAD LIGHT FIXTURES LOCATED BETWEEN RAILROAD TRACKS TO REMAIN. INTERCEPT EXISTING CIRCUIT 'PE3-24' AND CONTROL VIA NEW LIGHT SWITCH, SEE (KD) EP-2/EP-2
- U ROUTE CONDUIT LOW THROUGH EXTERIOR WALL AND DOWN BELOW GRADE TO NEW LIGHT POLE. CUT AND PATCH ASPHALT TO PROVIDE A SMOOTH AND LEVEL SURFACE. COORDINATE ROUTING WITH EXISTING UTILITIES.
- V EXISTING LIGHT FIXTURES (PE3-14,16,18 VIA CONTACTOR 'CT-2') TO REMAIN. RELOCATE LIGHT SWITCH ON NORTH EXTERIOR SIDE OF BUILDING TO SOUTH OF PANEL PE3. SEE SPECIFIC NOTE 'N'.
- W EXISTING LIGHT FIXTURE TO REMAIN.
- X PROVIDE AND INSTALL NEW PANELBOARD 'LC'.
- Y PROVIDE AND INSTALL NEW WALL MOUNTED TRANSFORMER, 'T-1' AT B.E. = +8'-0" (MIN). NEW WALL MOUNTED BOOST TRANSFORMER, 'T-2', AND DISCONNECT FOR 7.5 HP VACUUM PUMP BELOW.
- AA GENERAL ROUTING OF CONDUITS FOR LIGHTING POWER, RECEPTACLES AND DISPLAY POWER, AND CONTROL CONDUITS. SEE 'EC' SERIES SHEETS FOR SIZE AND QUANTITY OF CONTROL CONDUITS.

8 7 6 5 4 3 2 1

NOTE: THIS DRAWING IS A SUMMARY OF THE DATA AND INFORMATION PROVIDED TO THE ENGINEER BY THE CLIENT. THE ENGINEER HAS CONDUCTED VISUAL GENERAL VERIFICATION OF THE DATA AND INFORMATION PROVIDED TO THE CLIENT. THE ENGINEER HAS NOT CONDUCTED ANY FIELD SURVEY OR TESTING. THE CLIENT IS RESPONSIBLE FOR THE ACCURACY OF THE DATA AND INFORMATION PROVIDED TO THE ENGINEER. THE ENGINEER'S LIABILITY IS LIMITED TO THE DESIGN AND CONSTRUCTION OF THE ELECTRICAL SYSTEM SHOWN ON THIS DRAWING. THE ENGINEER IS NOT RESPONSIBLE FOR ANY OTHER ASPECTS OF THE PROJECT.

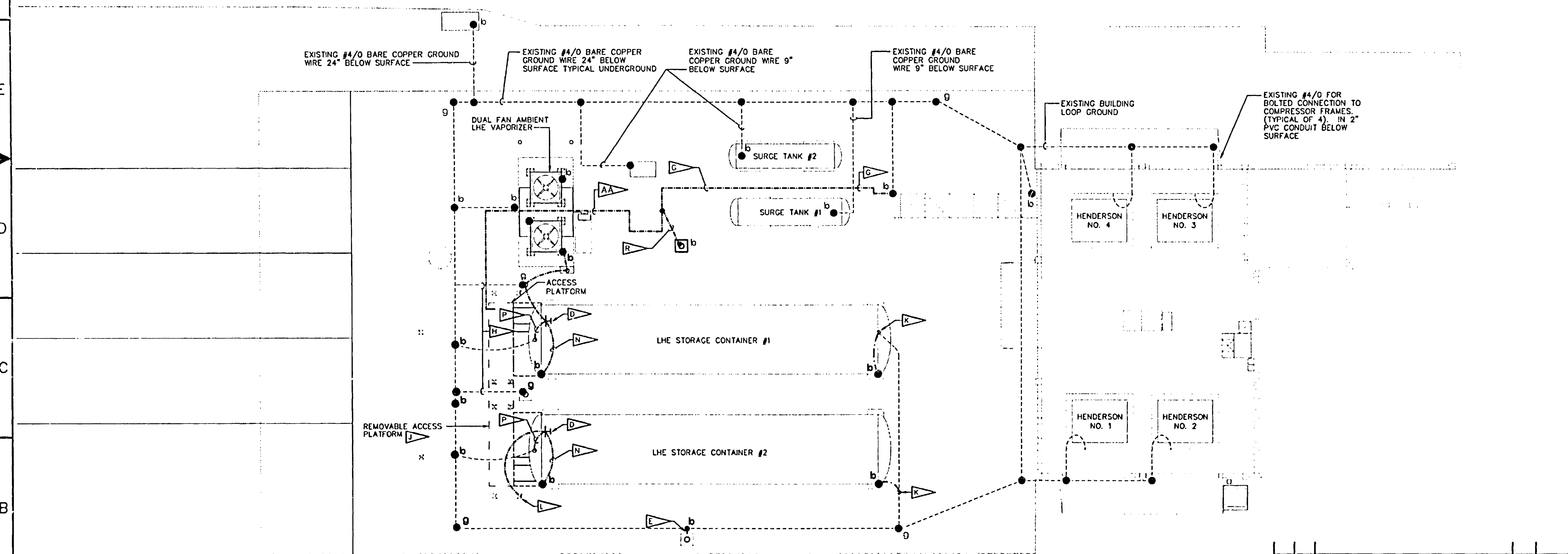


**TYPICAL GROUND PLATE DETAIL**  
NO SCALE

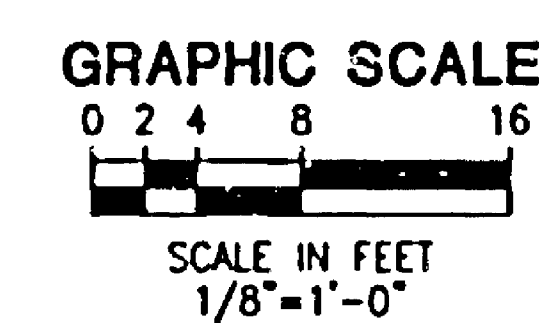
KF  
EP-3

**SPECIFIC NOTES:**

- A. PIPING NOT SHOWN FOR CLARITY. COORDINATE WITH MECHANICAL SHEETS FOR ACTUAL EQUIPMENT LOCATIONS.
- B. GROUNDING LOCATION AND DETAILS FOR PIPING, PIPING SUPPORTS, LIGHT POLES, AND LHe STORAGE CONTAINERS (#1, #2) SHALL BE APPROVED PRIOR TO FABRICATION/INSTALLATION.
- C. GROUND PIPING PER 79K35409 AND AT LOCATIONS IDENTIFIED ON MECHANICAL SHEETS.
- D. PROVIDE GROUND PLATE TO ACCOMMODATE QUANTITY OF GROUNDING CONNECTIONS/CONDUCTORS TO EXISTING GROUND GRID. MOUNT PLATE TO CONCRETE BASE OF DEWAR TANK. SEE DETAIL.
- E. EXOTHERMICALLY WELD #2/0 COPPER TO COUNTERPOISE. ROUTE THRU PVC CONDUIT IN LIGHT PEDESTAL. BOND TO LIGHT USING APPROVED LUGS.
- F. EXISTING GROUND GRID OBTAINED FROM 79K34249.
- G. ROUTE #4/0 COPPER GROUNDING CONDUCTOR IN 1" PVC COATED RGS CONDUIT. CONDUIT SHALL BE SUPPORTED FROM STAINLESS STEEL UNISTRUT PIPE SUPPORT UPRIGHTS USING STAINLESS STEEL UNISTRUT CONDUIT CLAMPS. SEE MECHANICAL SHEETS FOR EXACT ROUTING, COORDINATE WITH PIPING PRIOR TO ROUGH-IN.
- H. EXISTING GROUND TO FLOOD LIGHTS.
- J. BOND #2/0 COPPER TO OPPOSING CORNERS OF THE ACCESS PLATFORM TO THE GROUND PLATE USING APPROVED LUGS.
- K. BOND EXISTING COILED #4/0 TO LHe STORAGE CONTAINER SUPPORT FRAME (TYP. OF 2) USING APPROVED LUGS.
- L. EXOTHERMICALLY WELD #2/0 COPPER COUNTERPOISE. BOND #2/0 COPPER FROM THE GROUND PLATE TO PIPE SUPPORT BEAM USING APPROVED DUAL RATED LUGS. (TYPICAL FOR 4 PIPE SUPPORT COLUMNS.) PIPE SUPPORTS FOR LHe STORAGE CONTAINER NOT SHOWN FOR CLARITY.
- M. REFER TO MECHANICAL SHEET M-11 FOR REQUIRED PIPE GROUNDING POINTS. BOND PIPE TO MAIN GROUNDING CONDUCTOR WITH #2/0 COPPER. REFER TO SPECIFICATIONS AND 'M' SERIES DRAWINGS FOR METHOD OF BONDING TO PIPE.
- N. BOND #4/0 TO LHe STORAGE CONTAINER SUPPORT FRAME (TYP OF 2) TO GROUND PLATE USING APPROVED LUGS.
- P. EXOTHERMICALLY BOND EXISTING COILED #4/0 TO GROUND PLATE TO EXISTING GROUND GRID.
- R. BOND #2/0 COPPER TO NEW LIGHT POLE USING APPROVED DUAL RATED LUGS.



**NEW GROUNDING PLAN**  
SCALE: 1/8" = 1'-0"



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**JLSD**  
 Johnson, Lortz, Eder, Davis, Inc.  
 CONSULTING ENGINEERS  
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 Engineering Business Number: 0059

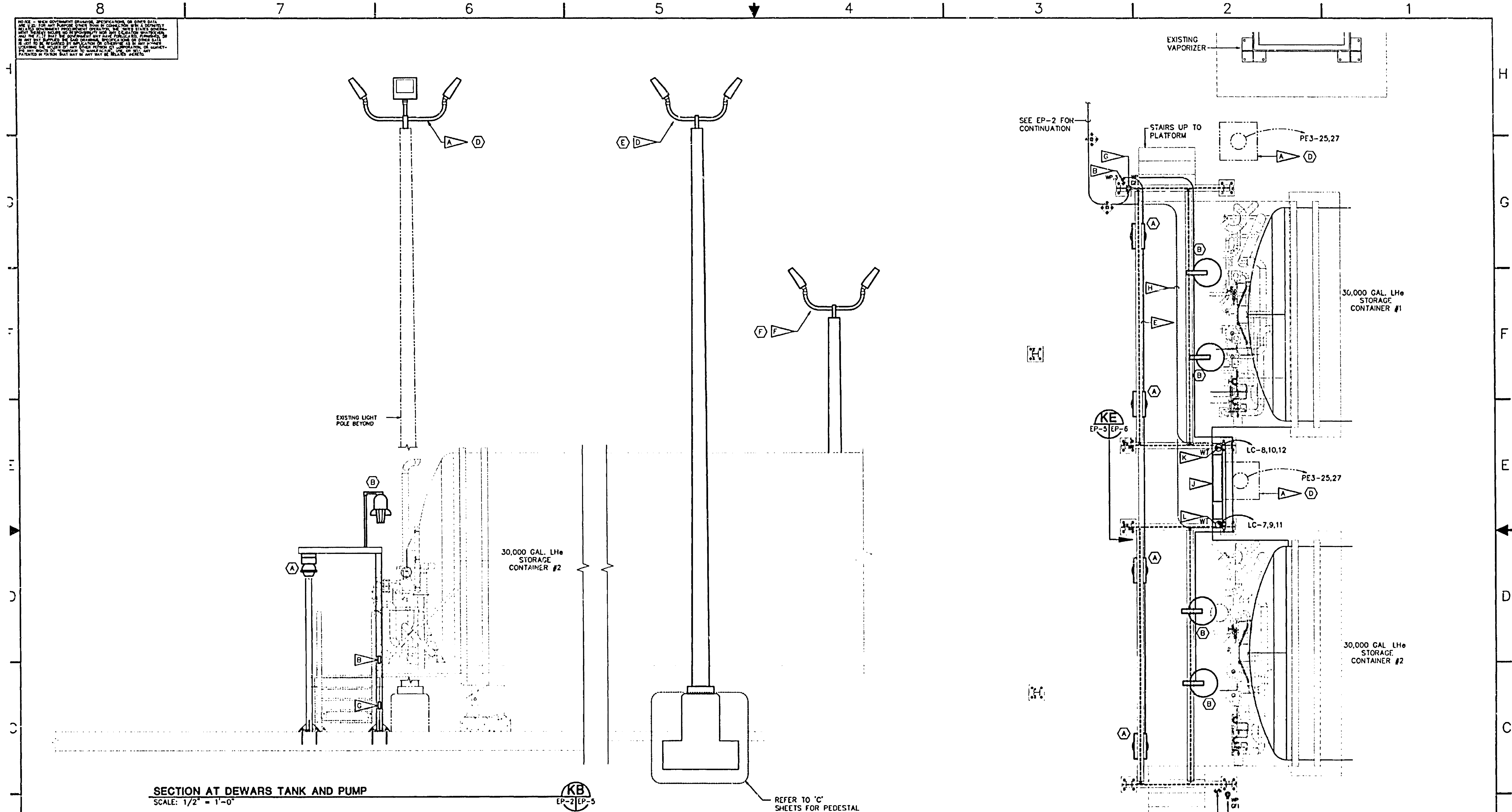
SYN	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA		
DRAWN P. PALOMO	7/18/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM		
CHECKED C. CARLEMAN	7/18/02	<b>ELECTRICAL PLAN AND DETAILS</b>		
ENGINEER M. RAGAN	7/18/02	SUBMITTED TO NASA 11/1/02		
APPROVED	DATE	SHEET	DWG. NO.	REV
J. PORTA	8/24/02	F	79K35402	
TITLE SHEET CHIEF		PROJ. NO.	980361	SHEET 39

8 7 6 5 4 3 2 1





NOTE - WHEN GOVERNMENT SPECIFICATIONS OR OTHER DATA ARE USED IN THE DESIGN OF THIS DRAWING, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING THE LATEST EDITIONS OF SUCH SPECIFICATIONS AND FOR VERIFYING THAT THE REQUIREMENTS OF THIS DRAWING ARE MET BY THE SPECIFICATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING THE LATEST EDITIONS OF SUCH SPECIFICATIONS AND FOR VERIFYING THAT THE REQUIREMENTS OF THIS DRAWING ARE MET BY THE SPECIFICATIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING THE LATEST EDITIONS OF SUCH SPECIFICATIONS AND FOR VERIFYING THAT THE REQUIREMENTS OF THIS DRAWING ARE MET BY THE SPECIFICATIONS.

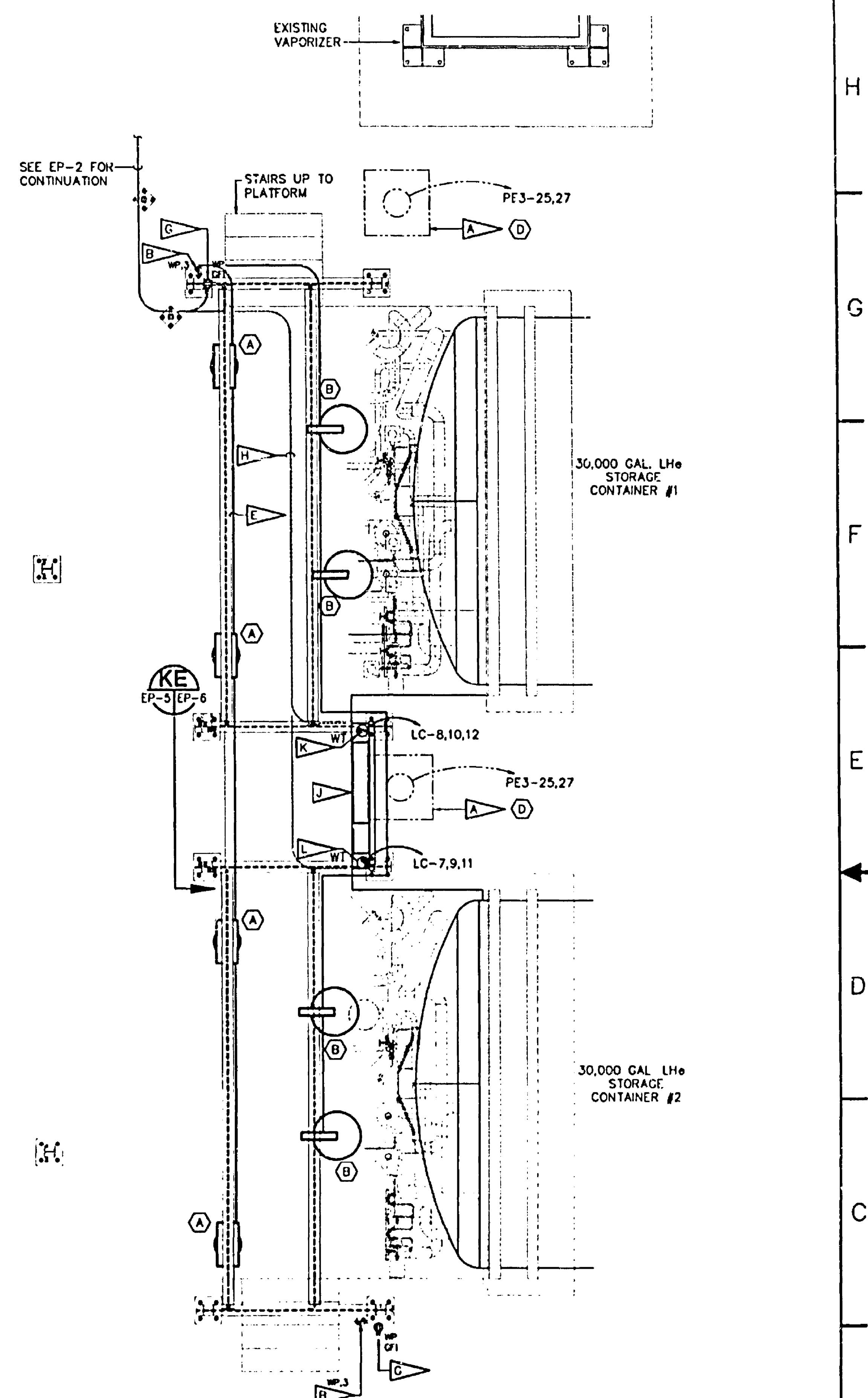


**SECTION AT DEWAR'S TANK AND PUMP**  
SCALE: 1/2" = 1'-0"

KB  
EP-2/EP-5

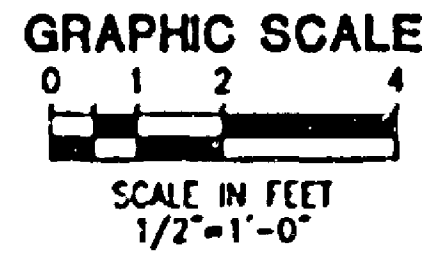
**SPECIFIC NOTES:**

- A EXISTING POLE AND CONCRETE BASE TO REMAIN. EXISTING DUO BRACKET AND TWO FIXTURES TO BE REPLACED WITH TRIPLE BRACKET AND THREE FIXTURES.
- B WEATHERPROOF THREE-WAY LIGHTING SWITCHES IN CAST P'S BOX FOR FIXTURES 'A' AND 'B'. ROUTE CONDUIT TO FIXTURES 'A' AND 'B' ON PIPE FRAME. COORDINATE CONDUIT ROUTING WITH PIPING PRIOR TO ROUGH-IN.
- C ALL EXPOSED CONDUIT RUNS SHALL BE PVC COATED RGS. COORDINATE ALL FIXTURES AND CONDUIT ROUTING WITH PIPING AND REQUIRED CLEARANCES PRIOR TO ROUGH-IN. CONDUITS AND FIXTURES 'A' SHALL BE MOUNTED TO BOTTOM SIDE OF I-BEAM PIPE SUPPORT STRUCTURE, LHe PIPING ROUTED ON TOP OF I-BEAM STRUCTURE.
- D 30' ROUND ALUMINUM POLE, TYPE 'E' FIXTURE, WITH (2) 400W M.H. FLOOD LIGHTS. TYPICAL FOR 1.
- E ROUTE BRANCH CIRCUIT CONDUIT ON PIPE SUPPORT TO SWITCH AND LIGHTING FIXTURES. RUN 2#12, 1#12G-3/4"C TO CIRCUIT PE3-41 VIA CONTACTOR 'CT-1' (FIXTURES 'A' AND 'B').
- F 20' ROUND ALUMINUM POLE, TYPE 'E' FIXTURE, WITH (2) 400W M.H. FLOOD LIGHTS. TYPICAL FOR 1.
- G 125V, 20A, 1PH DUPLEX GFI RECEPTACLE MOUNTED WITHIN CAST, WEATHERPROOF ENCLOSURE ON PIPE SUPPORT COLUMN AT 18" ABOVE SLAB, U.N.O. RUN 2#10, 1#10G-3/4"C TO CIRCUIT 'LC-1'. CONDUIT ROUTING SHALL FOLLOW NEW LIGHT CIRCUIT HOMERUNS, SEE THIS SHEET AND EP-2.
- H ROUTE POWER AND CONTROL CONDUITS FOR THE TANK DISPLAYS BELOW THE PLATFORM.
- J DEWAR TANK DISPLAYS MOUNTED TO PIPE FRAME.
- K 240V, 60A, 3PH WEATHERTIGHT POWER RECEPTACLE (7.5 HP VACUUM PUMP) MOUNTED ON PIPE SUPPORT COLUMN AT 18" ABOVE PLATFORM. CONDUIT ROUTING SHALL FOLLOW NEW LIGHT CIRCUIT HOMERUNS, SEE THIS SHEET AND EP-2. PROVIDE ADDITIONAL STAINLESS STEEL MOUNTING HARDWARE AS REQUIRED.
- L 208V, 30A, 3PH WEATHERTIGHT POWER RECEPTACLE (1.0 HP VACUUM PUMP) MOUNTED ON PIPE SUPPORT COLUMN AT 18" ABOVE PLATFORM. CONDUIT ROUTING SHALL FOLLOW NEW LIGHT CIRCUIT HOMERUNS, SEE THIS SHEET AND EP-2. PROVIDE ADDITIONAL STAINLESS STEEL MOUNTING HARDWARE AS REQUIRED.



**ENLARGED LIGHTING PLAN**  
SCALE: 1/2" = 1'-0"

KD  
EP-5

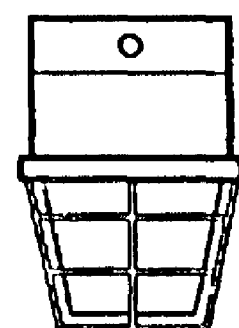


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Engineering Business Number: 6009

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES      DATE				
DRAWN P.PALOMPO 7/18/02				
CHECKED C.WARLEMAN 7/18/02				
ENGINEER M.HAGAN 7/19/02				
SUBMITTED CROSSPALL 8/2/02				
APPROVED J.PORTA 8/2/02				
TITLE BRANCH ORE				
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA				
CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM				
SITE LIGHTING PLANS AND ELEVATIONS				
SIZE	DWG. NO.	REV		
F	79K3540?			
PROJ. NO. 66036.1		SHEET 41		

NOTE: THIS DRAWING IS A PRELIMINARY DESIGN. IT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL DIMENSIONS AND CONDITIONS OF THE SITE PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES AND STRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ACCESS TO ALL ADJACENT PROPERTIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING UP ALL DEBRIS AND WASTE MATERIALS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SAFETY OF ALL PERSONNEL AND THE PUBLIC. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY INSURANCE AND BONDING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY REFERENCES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY REFERENCES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY REFERENCES.

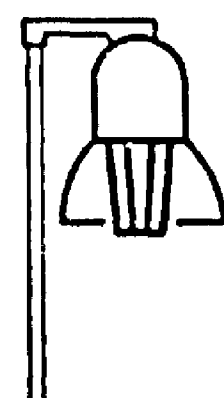


**LUMINAIRE REQUIREMENTS**

1. CAST ALUMINUM OR 3.2MM MIN. THICKNESS EXTRUDED ALUMINUM HOUSING FOR HIGH PRESSURE SODIUM (HPS) AND METAL HALIDE (M.H.) LUMINAIRES. CEILING MOUNT WITH MULTIPLE CONDUIT ENTRIES.
2. UL LISTED FOR WET LOCATION AND OUTDOOR SALT WATER MARINE.
3. GLASS GLOBE WITH GUARD LENS.
4. LAMP: 1-175W M.H., 277V
5. PROVIDE ALUMINUM REFLECTOR, CORROSION RESISTANT HARDWARE, PAF, POWDER COAT.
6. BALLAST SHALL BE HIGH POWER FACTOR TYPE (.85) WITH CHARACTERISTICS AS INDICATED.
7. PROVIDE INTERNAL GROUNDING PROVISIONS.
8. PROVIDE CHANNEL AND HARDWARE FOR MOUNTING OF FIXTURE TO BOTTOM OF PIPING SUPPORT I-BEAMS AS REQUIRED.

**LIGHTING FIXTURE 'A'**

INDUSTRIAL AREA LIGHT, CLG. MOUNT - 175W M.H.

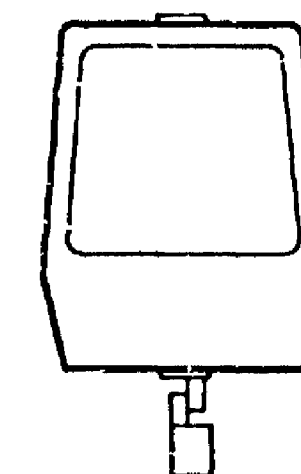


**LUMINAIRE REQUIREMENTS**

1. CAST ALUMINUM OR 3.2MM MIN. THICKNESS EXTRUDED ALUMINUM HOUSING FOR HIGH PRESSURE SODIUM (HPS) AND METAL HALIDE (M.H.) LUMINAIRES. 1-1/2" STRAIGHT STANCHION.
2. UL LISTED FOR WET LOCATION AND OUTDOOR SALT WATER MARINE.
3. GLASS GLOBE WITH GUARD LENS.
4. LAMP: 1-175W M.H., 277V
5. PROVIDE ALUMINUM DOME REFLECTOR, CORROSION RESISTANT HARDWARE, PAF, POWDER COAT.
6. BALLAST SHALL BE HIGH POWER FACTOR TYPE (.85) WITH CHARACTERISTICS AS INDICATED.
7. PROVIDE INTERNAL GROUNDING PROVISIONS.
8. PROVIDE CHANNEL AND HARDWARE FOR MOUNTING OF UPRIGHT TO PIPING SUPPORTS AS REQUIRED. PROVIDE TRANSITION TO 1-1/2" UPRIGHT.

**LIGHTING FIXTURE 'B'**

INDUSTRIAL STANCHION MOUNT - 175W M.H.

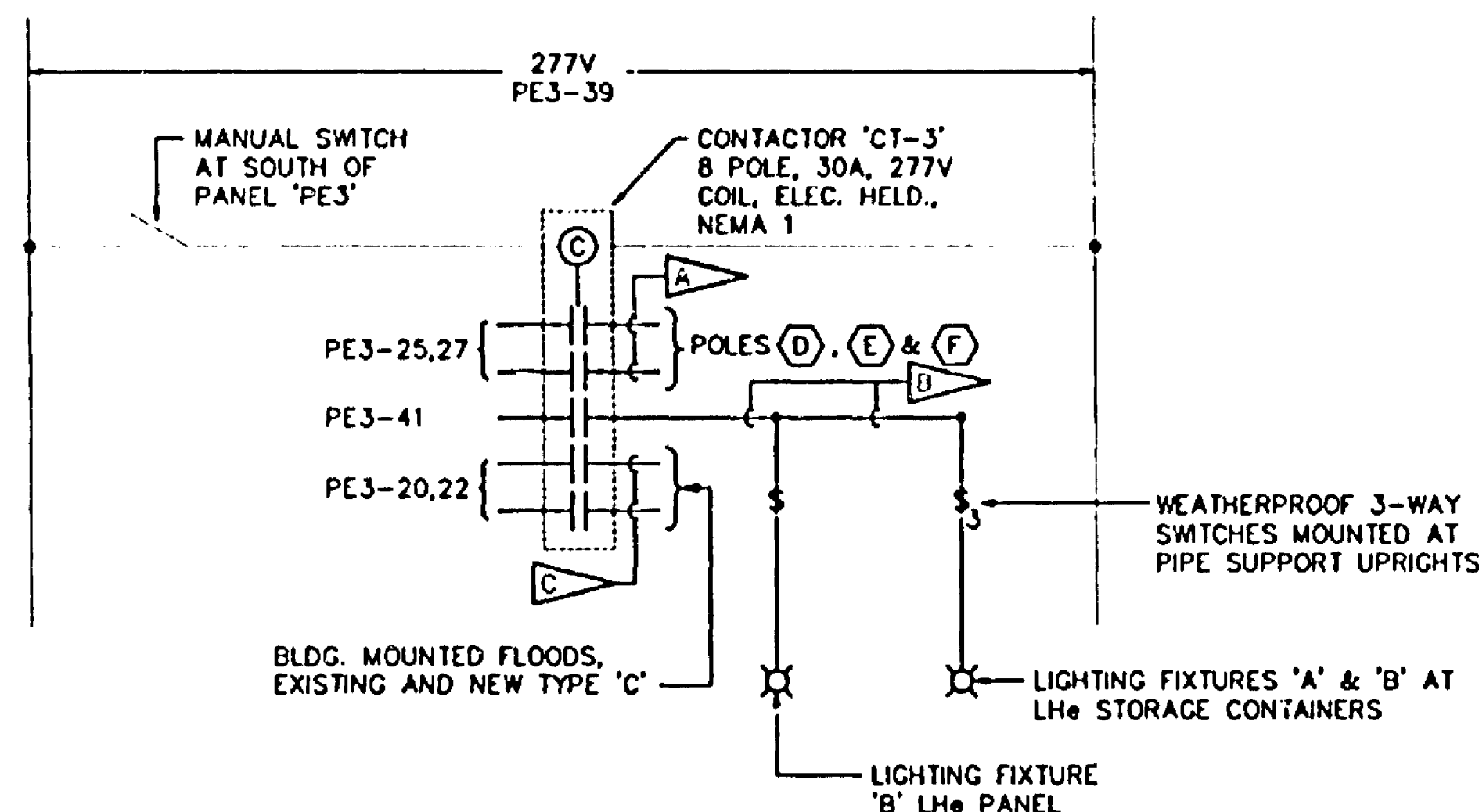


**LUMINAIRE REQUIREMENTS**

1. CAST ALUMINUM OR 3.2MM MIN. THICKNESS EXTRUDED ALUMINUM HOUSING FOR HIGH PRESSURE SODIUM (HPS) AND METAL HALIDE (M.H.) LUMINAIRES. CLIP-FITTER MOUNTING FOR WALL AND POLE APPLICATIONS.
2. UL LISTED FOR WET LOCATIONS.
3. HEAT AND SHOCK RESISTANT TEMPERED GLASS LENS.
4. LAMP: 1-400W M.H., 480V
5. PROVIDE ALUMINUM REFLECTOR, CORROSION RESISTANT HARDWARE, POLYESTER POWDER COAT DB
6. BALLAST SHALL BE HIGH POWER FACTOR TYPE (.85) WITH CHARACTERISTICS AS INDICATED.
7. PROVIDE INTERNAL GROUNDING PROVISIONS.
8. TYPE 'C' - WALL MOUNTING, PROVIDE BRACKET.
9. TYPE 'D' - TRI-BRACKET MOUNTED ATOP OF EXISTING ALUM. 30' POLE TENON, SEE EP-1, SUBMITTALS, FOR REQUIRED WIND LOAD CALCS.
10. TYPE 'E' - DUO-BRACKET MOUNTED ATOP OF ALUM. 30' POLE TENON, SEE EP-1, SUBMITTALS, FOR REQUIRED WIND LOAD CALCS.
11. TYPE 'F' - DUO-BRACKET MOUNTED ATOP OF ALUM. 20' POLE TENON, SEE EP-1, SUBMITTALS, FOR REQUIRED WIND LOAD CALCS.

**FIXTURE TYPE 'C', 'D', 'E', 'F'**

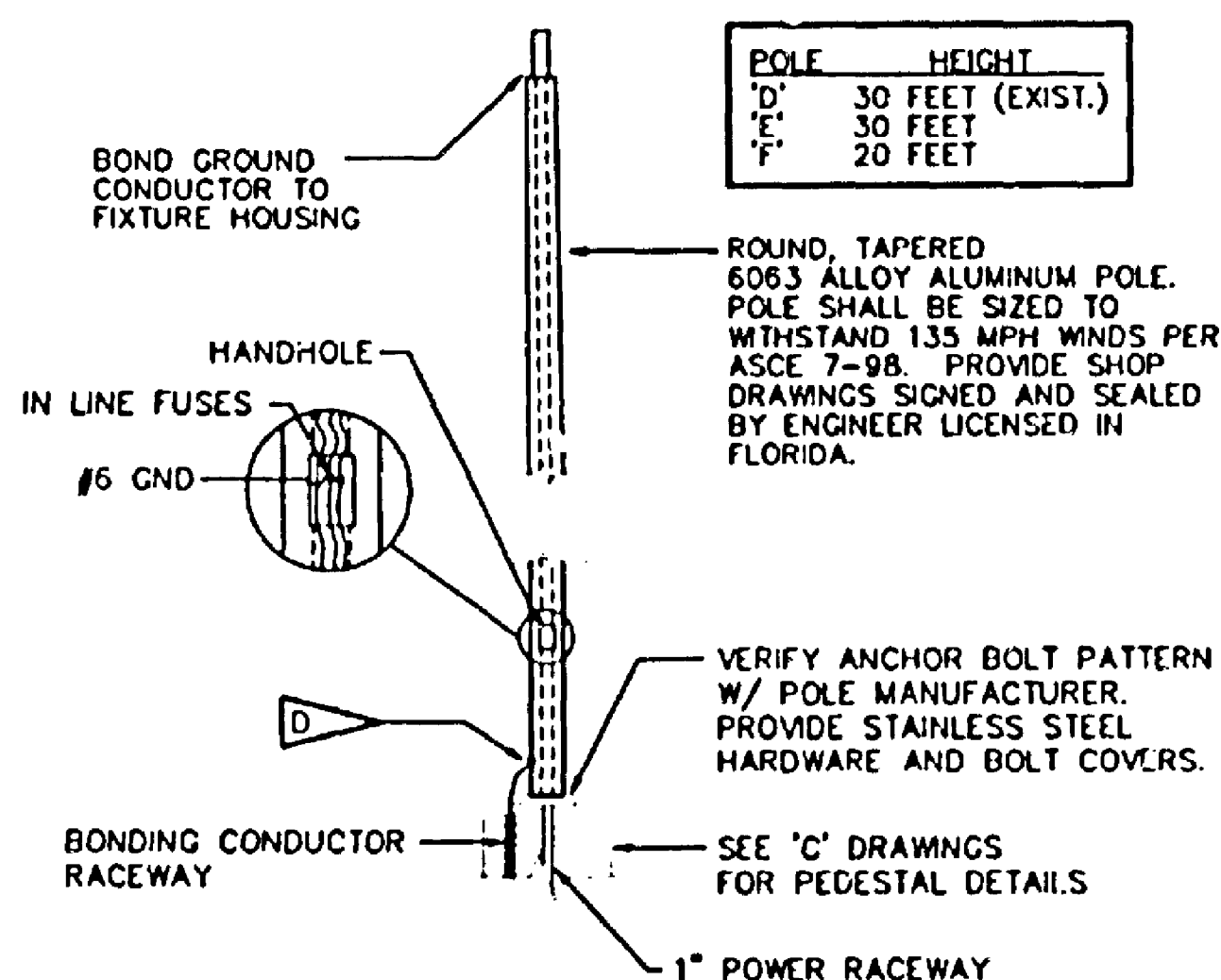
WALL MOUNTED AREA LIGHT - 1 LAMP



**LIGHTING SCHEMATIC**

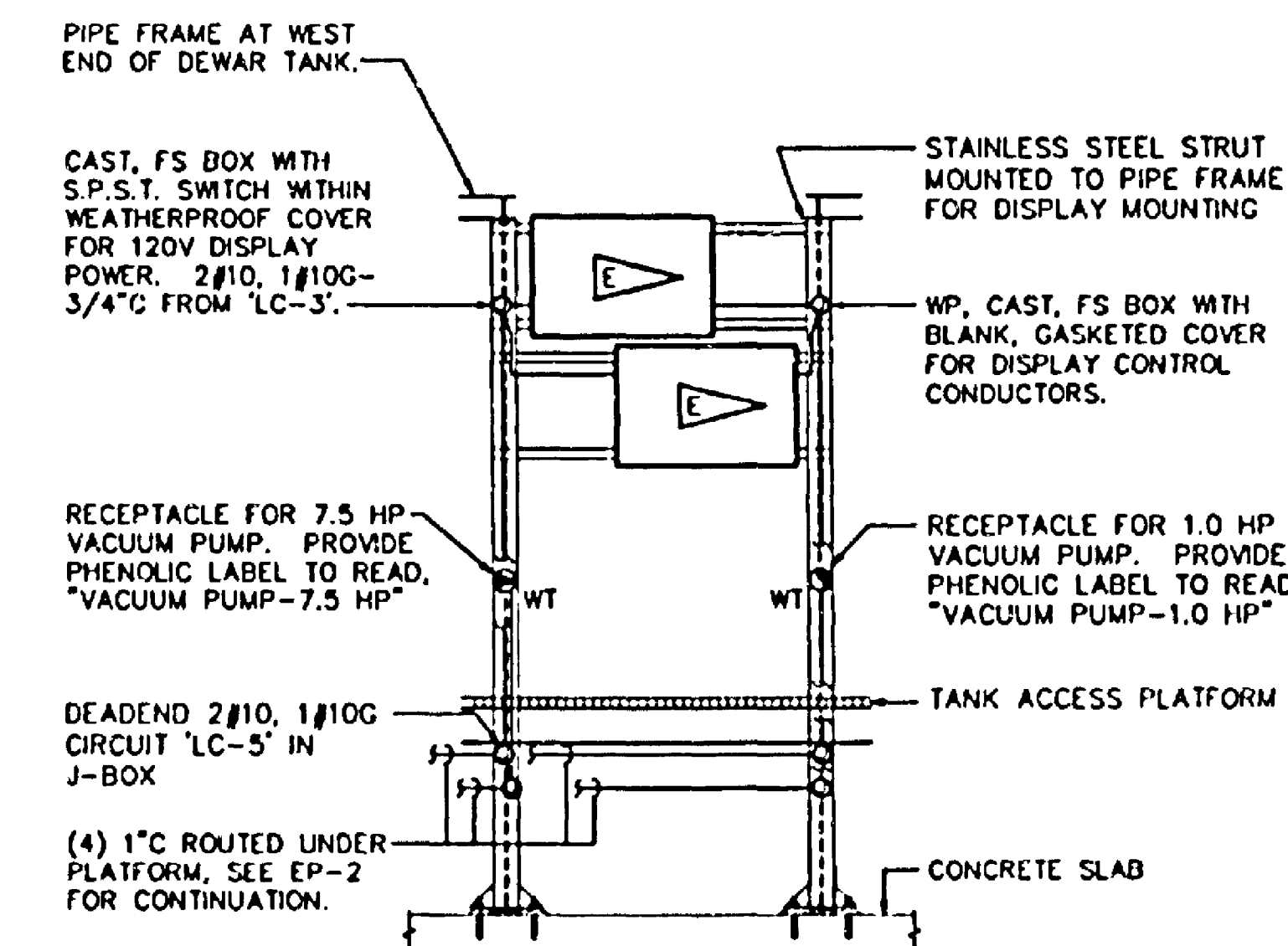
SCALE: NONE

KC  
EP-2, EP-4, EP-6



**POLE DETAIL**

TAPERED ALUMINUM POLE



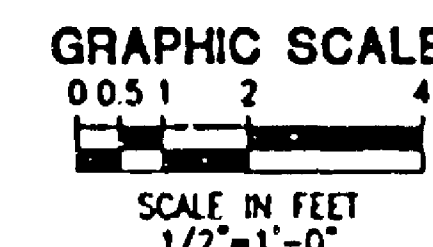
**DISPLAY MOUNTING BRACKET DETAIL**

SCALE: 1/2" = 1'-0"

KE  
EP-5, EP-6

**SPECIFIC NOTES:**

- EXISTING 1" HOMERUN RACEWAY TO REWORKED POLE FIXTURES MAY BE REUSED. OTHERWISE PROVIDE NEW. PROVIDE NEW WIRING (2#12, 1#12G) TO EACH POLE. SEE ONE-LINE DIAGRAM AND PARTIAL LIGHTING SITE PLAN FOR ADDITIONAL INFORMATION.
- 2#10, 1#10G-1" SHALL BE ROUTED IN EXISTING HOMERUN CONDUIT FOR POLES 'D' & 'E'. PROVIDE WEATHERPROOF JBOX AT LH STORAGE CONTAINER #1 FOR SEPARATION OF CIRCUITS.
- EXTEND EXISTING CIRCUIT TO NEW FIXTURES. PROVIDE NEW WIRING AND CONDUIT. SEE ONE-LINE DIAGRAM ON SHEET EP-4 FOR BRANCH CIRCUIT SIZES.
- BOND ALUMINUM POLE TO GROUNDING SYSTEM VIA DUAL-RATED LUG (RATED FOR USE WITH ALUMINUM AND COPPER CONDUCTORS). REMOVE PAINT FROM POLE UNDERNEATH GROUND LUG AND PROVIDE ANTI-OXIDANT MATERIAL TO PRESERVE ELECTRICAL CONTINUITY.
- PROVIDE AND INSTALL (2) DISPLAY ENCLOSURES FOR TANK DISPLAYS (SEE SHEET EC-1, ITEM 7). EACH DISPLAY SHALL CONSIST OF A 30"x24"x6", NEMA 4 ENCLOSURE (HOFFMAN A-30N20ALP, SEE SHEET EC-1, ITEM 22) AND A WINDOW KIT (HOFFMAN A-PWK231SNFSS, SEE SHEET EC-1, ITEM 23).
- PROVIDE ADDITIONAL SUPPORT ANGLES, STRUT, ETC. AS REQUIRED FOR FIXTURE MOUNTING AND SUPPORT.




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








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Tel: 817-335-1111 Fax: 817-335-1112  
Engineering Business Number: 6000

SYM	ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS				
SIGNATURES DATE				
DRAWN	P. PALOMO		7/18/02	
CHECKED	C. GARTMAN		7/18/02	
ENGINEER	M. RACAN		7/18/02	
SUBMITTED CROSSING 8/1/02				
APPROVED	J. PORTA		8/1/02	
TITLE BRANCH CHIEF		SIZE DWG. NO.	REV	
		F 79K35402		
		PROJ. NO. 980361	SHEET 43	

**LIGHTING DETAILS**








GENERAL ELECTRICAL CONTROL SYSTEM NOTES




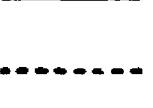


1. UNLESS NOTED OTHERWISE, ALL NEW ELECTRICAL ITEMS ARE IDENTIFIED BY HEAVIER LINE WEIGHT AND ALL EXISTING ELECTRICAL ITEMS IDENTIFIED BY LIGHTER LINE WEIGHT.
2. GOVERNMENT FURNISHED EQUIPMENT (GFE) SHALL BE INSTALLED BY CONTRACTOR UNLESS OTHERWISE SPECIFIED.
3. PARTS WILL BE DENOTED AS  ON EC SHEETS.
4. PARTLIST ITEMS ARE FOR PHASE II AND ARE IN CONTRACT. PARTLIST ITEMS SHALL BE PROVIDED (EXCEPT FOR THOSE IDENTIFIED AS GFE) BY THE CONTRACTOR. THE GOVERNMENT RESERVES THE RIGHT TO REPLACE ANY PART NOT IDENTIFIED AS GFE WITH ITS OWN APPROVED EQUAL, AND FURNISH IT TO THE CONTRACTOR AS GFE AT NO ADDITIONAL COST. CONDUIT AND SMALL SUPPLIES SHALL BE SELECTED AND PROCURED BY THE CONTRACTOR IN ACCORDANCE WITH GENERAL NOTES ON THIS DRAWING.
5. CONTRACTOR SHALL VISIT AND CAREFULLY EXAMINE THESE PORTIONS OF THE SITE EFFECTED BY THIS WORK BEFORE SUBMITTING PROPOSALS, SO AS TO BECOME FAMILIAR WITH EXISTING CONDITIONS EFFECTED BY EXECUTION OF THIS WORK.
6. ALL WORK SHALL BE IN ACCORDANCE WITH LATEST EDITION OF THE NATIONAL ELECTRICAL CODE, NFPA 70.
  - 6.1 CLASS 1 CONTROL CIRCUITS SHALL BE TREATED AS COMMUNICATIONS CIRCUITS SINCE SOME CARRY FSX SIGNALS AND SHALL COMPLY WITH NFPA 701 ARTICLES 720, 725 AND CHAPTER 8, WITH SPECIAL ATTENTION TO ARTICLES 720-10, 725-54 AND 810-13.
  - 6.2 THE INSTALLATION CONTRACTOR SHALL CONDUCT OR WITNESS A TEST OF THE COMPLETE SYSTEM (CONTINUITY & VOLTAGE) UPON COMPLETION OF INSTALLATION. A WRITTEN RECORD SHALL BE KEPT OF SUCH TESTS AND PROVIDED TO THE CONTRACTING OFFICER FOR DETERMINATION OF COMPLIANCE.
7. MATERIALS SHALL BE LISTED BY THE UNDERWRITER'S LABORATORIES, INC. SHOULD PLANS AND CODES CONFLICT. THE CODE TAKES PRECEDENCE. MAKE NO CHANGES, EVEN IN CASE OF CONFLICT, WITHOUT FIRST OBTAINING APPROVAL OF THE CONTRACTING OFFICER.
8. A GREEN, COPPER GROUND WIRE SHALL BE INSTALLED IN ALL CONDUIT SYSTEMS AND SHALL BE BONDED TO ALL ENCLOSURES, BOXES AND EQUIPMENT.
9. BONDING JUMPERS SHALL BE USED TO BOND CONDUIT TO ENCLOSURES, BOXES AND EQUIPMENT WHERE CONCENTRIC OR ECCENTRIC KNOCKOUTS ARE USED.
10. THE CONTRACTOR IS REQUIRED TO FURNISH, INSTALL, WIRE AND CONNECT ALL SPECIFIED EQUIPMENT AS WELL AS COMPONENTS, ACCESSORIES, WIRING AND MOUNTING HARDWARE TO INSURE THAT SPECIFIED EQUIPMENT FUNCTIONS MEET SYSTEM(S) VOLTAGE AND CONTINUITY REQUIREMENTS.
11. EXISTING CONDITIONS AND UTILITIES INDICATED ARE TAKEN FROM EXISTING CONSTRUCTION DOCUMENTS, VARIOUS SURVEYS AND FIELD INVESTIGATIONS. IT IS TO BE UNDERSTOOD THAT UNFORESEEN CONDITIONS COULD EXIST AND NEW WORK MAY NOT BE FIELD LOCATED EXACTLY AS SHOWN ON THE DRAWINGS. CONTRACTOR TO VERIFY ALL FIELD CONDITIONS.
12. WHERE NEW-TO-EXISTING CONNECTIONS ARE INDICATED, THE CONTRACTORS SHALL PROVIDE ALL MATERIALS (JUNCTION BOXES, CONDUIT, WIRE AND WIRE CONNECTIONS) AND LABOR REQUIRED TO MAKE THE CONNECTIONS.
13. INSTALL SPECIFIED EQUIPMENT, AS NOTED ON DRAWINGS OR APPROVED EQUAL. ADDITIONAL EQUIPMENT AND MATERIAL MAY BE REQUIRED OTHER THAN THAT SHOWN ON DRAWINGS. ALL MATERIAL, LABOR AND EQUIPMENT REQUIRED SHALL BE PROVIDED BY THE INSTALLER.
14. UNLESS OTHERWISE NOTED, ALL POWER CIRCUIT CONDUCTORS SHALL BE COPPER AND MINIMUM #12 AWG. CONDUITS SHALL BE 3/4" MINIMUM.
15. IT SHALL BE THE RESPONSIBILITY OF CONTRACTOR TO PROTECT EXISTING UTILITIES FROM DAMAGE. THE CONTRACTOR IS RESPONSIBLE FOR THE REPAIR AND/OR REPLACEMENT (AS DETERMINED BY THE C.O.) OF UTILITIES AND PROPERTY DAMAGED BY THE CONTRACTOR (OR HIS/HER SUB-CONTRACTORS)
16. ITEM TO BE SUBMITTED BY THE CONTRACTOR INCLUDE:
  - 16.1 MATERIAL/PARTS CERTIFICATIONS.
  - 16.2 ELECTRICAL VENDOR DATA I. E. ELECTRICAL DRAWINGS/SKETCHES/SCHEMATICS/MANUALS THAT ARE NORMALLY PROVIDED BY AND INCLUDED WITH VENDOR PARTS/ASSEMBLIES.
  - 16.3 TEST REPORTS OF CONTINUITY, GROUNDING AND END-TO-END TERMINATION OF PROPER VOLTAGES/CURRENTS TO SENSORS/CONTROLS (POST INSTALLATION) AND MANUFACTURERS BENCH TESTS (PRE-INSTALLATION).
  - 16.4 AS-BUILTS OF CONDUIT ROUTING SATISFYING GENERAL NOTE 6 ON SHEET EC-2.

ITEM NO.	ELECTEICAL PART DESCRIPTION	QUANTITY	PART/STOCK NO., MANUFACTURE
1	WEIGH-TRONIX INDICATOR-DISPLAY, LOAD CELL	2	W1-127 
2	WEIGHTBAR LOAD CELL	8	WEIGH-TRONIX MODEL BMB 19175-0108  
3	NEMA 4 JUNCTION BOX	2	WEIGH-TRONIX MODEL 20960 
4	CABLE (6 STRANDED 22 GAGE TELEPHONE WIRE)	6 	6/C 22AWG PVC/PVC (QUABBIN 7E35-0Z5 OR EQUAL)
5	SLC CARD MODULE, ANALOG INPUT	1	1746-N14, ALLEN BRADLEY
6	SLC CARD MODULE, ANALOG OUTPUT	1	1746-N041, ALLEN BRADLEY
7	6-DIGIT DISPLAY MODULE	2	87/232-45-6, VORNE INDUSTRIES
8	ANALOG INPUT BOARD FOR DISPLAY MODULE	2	87/719, VORNE INDUSTRIES
9	MONITOR, TOUCHSCREEN (14" CRT)	1	2711E-T14C6, ALLEN-BRADLEY
10	RTD	1 	PT100, various
11	SURGE SUPPRESSOR	2	P.N. 24539, ATLANTIC SCIENTIFIC
12	CABLE (4 STRANDED 22 GAGE TELEPHONE WIRE)	8	A/C 22 AWG, SEMI-RIGID PVC INSULATION (QUABBIN #7525 OR EQUAL)
13	DIN RAIL, ONE METER	1	A/B #199-DR1
14	TB MOUNTING PLATE (18" X 18" X 1/16")	1	FAB PER FLAG NOTE E SH EC-5
15	N/A	N/A	N/A
16	TERMINAL BOARDS	100	1492-W4, ALLEN BRADLEY
17	CABLE (2 CONDUCTOR, OVERALL SHIELD)	82 	BELDEN # 8761 CABLE
18	N/A	N/A	N/A
19	N/A	N/A	N/A
20	N/A	N/A	N/A
21	SURGE SUPPRESSOR	2	P.N. 24542, ATLANTIC SCIENTIFIC (6 WIRE)
22	NEMA 4 ENCLOSURE, 30"X20"X6"	2 	A-30H20ALP, HOFFMAN
23	WINDOW KIT	2 	A-PWK2315NFSS, HOFFMAN

SYMBOLS AND ABBREVIATIONS:

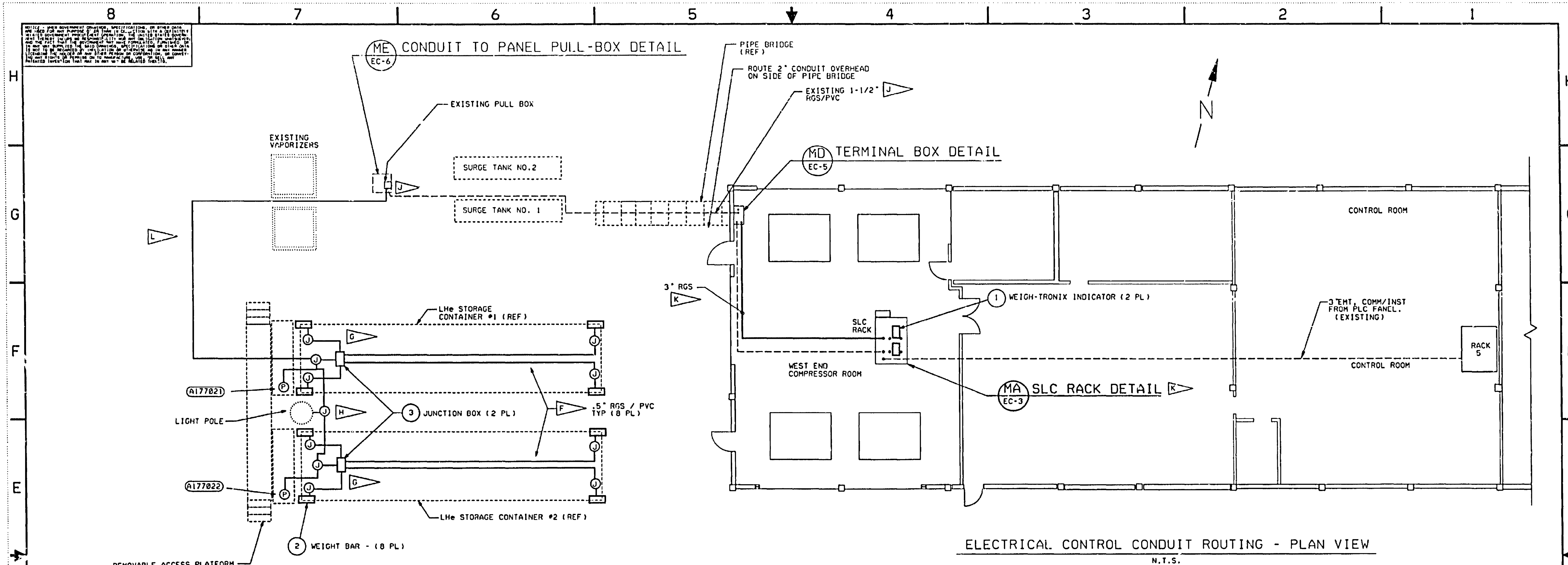
SPECIFIC NOTES:

-  GFE
-  SEE FLAGNOTE  FOR ROUTING AND WIRING ON EC-1, 6, & 8
-  SEE SCHEMATIC SHEETS EC-7 THRU EC-11
-  INSTALLATION OF RTD NOT-IN-CONTRACT
-  ALREADY INSTALLED
-  THESE COMPONENTS SHOWN ON SHEET EP-6

- EMT - ELECTRICAL METALLIC TUBING
- GND - GROUND
- ITPS - CABLE TWISTED PAIR, SHIELDED
- 1PA - ONE PAIR
- A/B - ALLEN BRADLEY
- EMT - ELECTRICAL METALLIC TUBING
- GFE - GOVERNMENT FURNISHED EQUIPMENT
- SLC - SMALL LOGIC CONTROLLER
- RGS - RIGID GALVANIZED STEEL
- SS - SURGE SUPPRESSION
- TB - TERMINAL BLOCK
- RTB - REMOVABLE TERMINAL BLOCK
- LHe SC - LHe STORAGE CONTAINER
- J-BOX - JUNCTION BOX
- C.O. - CONTRACTING OFFICER
- NEUT - NEUTRAL
- GND - GROUND
- MCR - MASTER CONTROL RELAY
- RTD - RESISTANCE TEMPERATURE DEVICE
-  OVERHEAD FAN
-  TRANSDUCER
-  J - JUNCTION BOX
-  NEW WORK IN CONTRACT
-  EXISTING
-  REFERENCE

SY. ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS			
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION			
JOHN F. KENNEDY SPACE CENTER, NASA			
KENNEDY SPACE CENTER, FLORIDA			
CONVERTER COMPRESSOR FACILITY MODIFICATIONS			
FOR LIQUID HELIUM STORAGE SYSTEM			
GENERAL ELECTRICAL CONTROL NOTES AND PARTS LIST			
SUBMITTED	DATE	BY	REV
APPROVED	DATE	BY	REV
TITLE		PROJECT NO.	SHEET NO.
EC-1		79K35402	43

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ELECTRICAL CONTROL CONDUIT ROUTING - PLAN VIEW  
N.T.S.

**GENERAL NOTES:**

1. PROVIDE NEW RGS CONDUIT SIZED PER CONDUIT LAYOUT ABOVE AND FIELD ROUTE CONDUIT ALONG PIPING/TUBING LAYOUT. CONDUIT SHALL BE INSTALLED WITH A MINIMUM OF 3 INCHES OF FREE AIR SPACE SEPARATION FROM MECHANICAL PIPING/TUBING. AVOID INTERFERENCE WITH OTHER COMPONENTS. CONDUIT SHALL BE SECURELY CLAMPED AND SUPPORTED AT LEAST EVERY 10 FEET VERTICALLY AND 8 FEET HORIZONTALLY. USE EXISTING UNISTRUTS TO SUPPORT NEW CONDUITS.
2. NO CONDUIT SHALL BE INSTALLED IN SUCH A MANNER AS TO BLOCK ACCESS, NOR CREATE A TRIPPING, OR A HEAD-BUMPING HAZARD. DETAILED ROUTING OF ALL CONDUIT SHALL BE APPROVED BY C.O., PRIOR TO INSTALLATION.
3. ALL OUTSIDE CONDUIT SHALL BE RGS/PVC. ALL INSIDE CONDUIT SHALL BE HOT DIPPED GALVANIZED. ADDITIONAL PULL ELBOWS SHALL BE INSTALLED AT THE CONTRACTORS DISCRETION, TO PREVENT CABLE DAMAGE, WHILE PULLING DURING INSTALLATION.
4. UNLESS OTHERWISE SPECIFIED, ROUTE CONDUIT ON CMU (NOT DRY-WALL) AND ON PIPING SUPPORTS, AS APPLICABLE. ROUTE CONDUIT ABOVE LIGHTS IN COMPRESSOR ROOM-NOT OVERHEAD OF THE COMPRESSORS. CONDUIT SHALL BE ROUTED AND SUPPORTED ON TOP OR SIDE (NOT BENEATH) OF THE PIPE BRIDGE STRUCTURE. CONDUIT SHALL NEVER BE SUPPORTED FROM EQUIPMENT NOR COMPONENTS. CONDUIT SHALL NOT BE SUPPORTED BY PIPING. CONDUIT SHALL BE SUPPORTED BY STRUCTURES ANCHORED TO THE CONCRETE. ROUTE CONDUIT SO AS TO NOT INTERFERE WITH OR RESTRICT ACCESS OR VISIBILITY TO (FOR MAINTENANCE AND/OR OPERATIONS OF) GAUGES/DISPLAYS (ETC.) ON EQUIPMENT/COMPONENTS. DO NOT ROUTE CONDUIT BENEATH UNJACKETED (NON-VJ) PIPING TO THE WEST (I.E., UPSTREAM) OF THERMOWELL A175398.
5. RUN OUTSIDE CONDUIT ALONG GROUND-UNDER EQUIPMENT STRUCTURE (APPROXIMATELY AS SHOWN) USING UNISTRUT CHANNEL, CLAMPS, FASTENERS AND ANCHOR BOLTS (ALL 304 STAINLESS STEEL).
6. THE CONTRACTOR SHALL SUBMIT A DETAILED LAYOUT DRAWING OF THE CONDUIT INSTALLATION TO THE C.O. FOR APPROVAL PRIOR TO FABRICATION AND INSTALLATION. LAYOUT DRAWING SHALL BE TO SCALE, CLEARLY DEPICT ROUTING DETAILS NEAR EQUIPMENT, SHOW FIELD VERIFIED DIMENSIONS OF ADJACENT PIPING/COMPONENT/EQUIPMENT. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE SUFFICIENT DETAIL AND CLARITY AS DETERMINED NECESSARY BY THE C.O.
7. UNLESS SPECIFICALLY WAIVED BY THE C.O., IT IS THE CONTRACTORS RESPONSIBILITY TO CORRECT ANY CONDUIT INSTALLED IN THIS CONTRACT THAT DOES NOT CONFORM TO THE CONTRACT DRAWINGS AND SPECIFICATIONS (EVEN IF APPROVED), AT NO EXPENSE TO THE GOVERNMENT.

**SPECIFIC NOTES:**

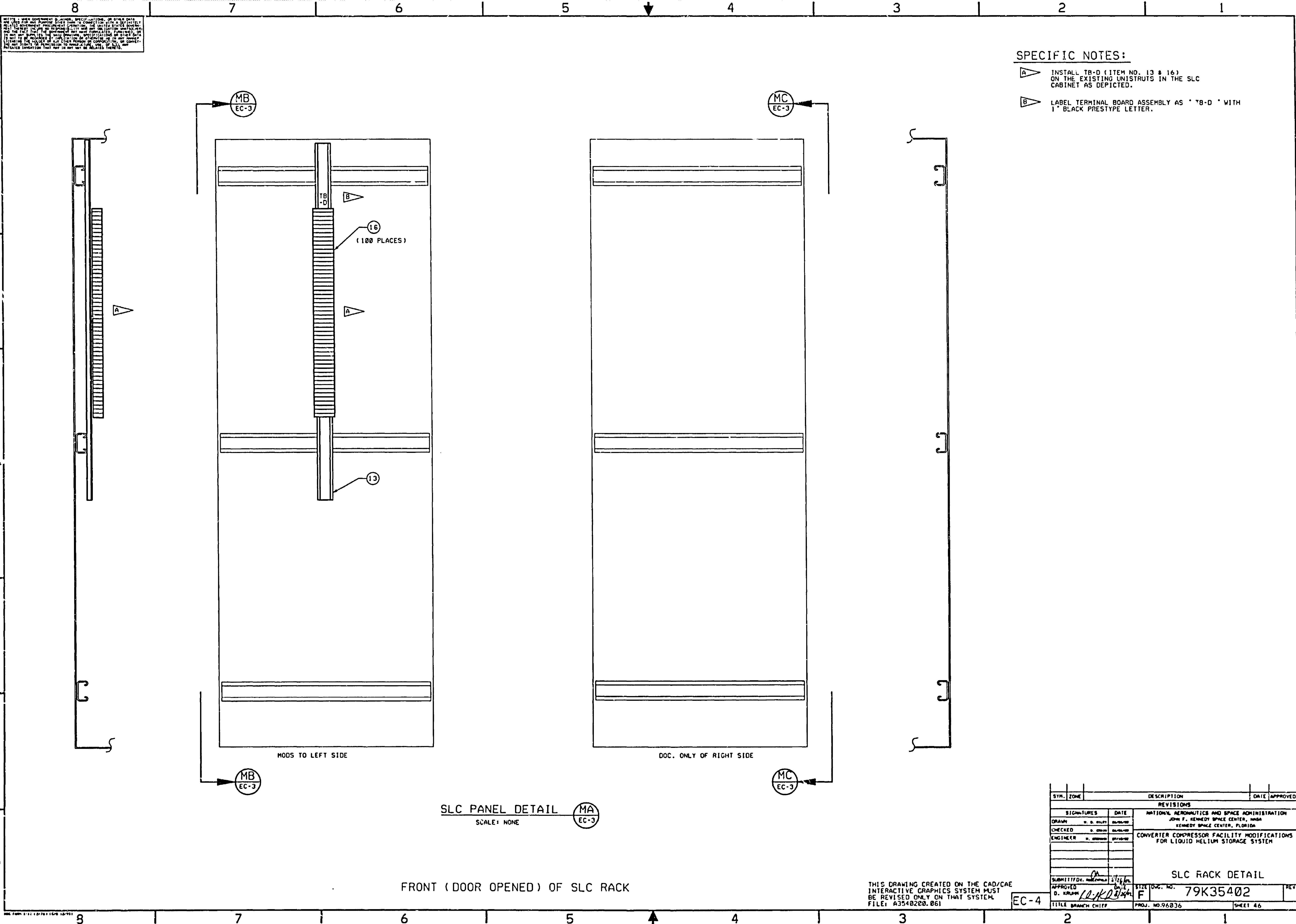
- F RUN CONDUIT ON GROUND FROM JUNCTION BOXES AT EACH LOAD CELL (8 PLACES) TO LOAD CELL JUNCTION BOXES (ITEM 3). MOUNT LOAD CELL JUNCTION BOXES ON CONCRETE USING 304 STAINLESS STEEL UNISTRUT CHANNEL (2 PLACES), FASTENERS AND ANCHOR BOLTS, APPROXIMATELY AS SHOWN, DIRECTLY BENEATH LHE STORAGE CONTAINER CENTERLINE AT WEST END. LOAD CELL JB'S SHOULD BE MOUNTED ON THE EAST SIDE OF THE WEST-END CONCRETE FOOTING OF EACH LHE STORAGE CONTAINER. RUN CONDUIT FROM THE PRESSURE TRANSDUCER ON EACH LHE STORAGE CONTAINER TO CONNECT TO THE CONDUIT USED FOR THE LOAD CELL JB'S (ITEM 3).
- G REPLACE THE INPUT CABLE "STRAIN RELIEF CONNECTORS" ON THE JUNCTION BOXES (JB) (ITEM NO. 3) WITH A .50 INCH "SEALTIGHT TO RIGID COUPLING". FIELD ROUTE .50 INCH CONDUIT FROM JB'S (ITEM 3) TO LOAD CELLS. REPLACE MANUFACTURER CABLING ON LOAD CELLS WITH ITEM 12. MOUNT SMALL JUNCTION BOX AT EACH LOAD CELL, USING A TERMINAL BLOCK FOR WIRING TO THE PIGTAIL LOAD CELL CABLING (SOLDERING OR WIRE NUTS ARE NOT ACCEPTABLE). INSTALL "LIQUID TIGHT STRAIN RELIEF" WHERE THE PIGTAIL LOAD CELL WIRING ENTERS SMALL JUNCTION BOXES. PULL NEW WIRING THROUGH FROM LOAD CELL TO JB (ITEM 3). TERMINATE CABLES IN JB (ITEM 3) PER MANUFACTURER'S RECOMMENDATIONS.
- H REPLACE THE OUTPUT CABLE "STRAIN RELIEF" ON EACH JB (ITEM NO. 3) WITH A .75 INCH "SEALTIGHT TO RIGID COUPLING". ROUTE A .75 INCH DIA. RGS/PVC CONDUIT PER THIS DRAWING. USE JUNCTION BOXES WHERE SHOWN TO COMBINE WIRING FROM LOAD CELL JB'S (ITEM 3) WITH LHE STORAGE CONTAINER ULLAGE PRESSURE TRANSDUCERS IN A SINGLE CONDUIT TO PULL BOX. FIELD ROUTE .75 INCH RGS/PVC CONDUIT PER GENERAL NOTE 1-5.
- I N/A
- J PUNCH HOLE FOR 1.0 INCH HUB SIZE IN EXISTING PULL BOX. INSTALL A CONDUIT CONNECTOR AND CONNECT CONDUIT ROUTED FROM JB'S (ITEM NO. 3). CONTINUE PULLING CABLE (ITEMS NO. 4 AND 12) THROUGH 1.5 INCH EXISTING CONDUIT TO PULL ELBOW AND DOWN TO SURGE SUPPRESSOR TERMINAL BOX INSIDE FACILITY WALL.
- K PULL CABLES (ITEM NO. 4 AND 12) FROM TERMINAL BOX TO SLC RACK THROUGH 3 INCH EXISTING CONDUIT. CONNECT CABLES (ITEM NO. 4 AND 12) PER FLAG NOTES ON SHEET EC-3 AND SCHEMATICS ON EC-9 AND EC-10.
- L COORDINATE ROUTING OF CONTROL CONDUITS ALONG SIDE ELECTRICAL POWER AND LIGHTING LINES. SEE FLAG NOTE "AA" ON SHEET EP-2.

REV. NO.	DATE	DESCRIPTION	APPROVED
REVISIONS			
1	08/14/02	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA	
2	08/14/02	CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM	
OVERALL CONDUIT ROUTING PLAN			
SUBMITTED BY: <i>[Signature]</i> DATE: 08/14/02		SIZE: 11x17	DC. NO.: 79K35402
APPROVED BY: <i>[Signature]</i> DATE: 08/14/02		FILE: A3540200.059	PROJ. NO. 96036
TITLE: BRANCH CHIEF		SHEET 44	

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EC-2





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**SPECIFIC NOTES:**

- A INSTALL TB-D (ITEM NO. 13 & 16) ON THE EXISTING UNISTRUTS IN THE SLC CABINET AS DEPICTED.
- B LABEL TERMINAL BOARD ASSEMBLY AS 'TB-D' WITH 1" BLACK PRESTYPE LETTER.

SLC PANEL DETAIL (MA/EC-3)  
SCALE: NONE

FRONT (DOOR OPENED) OF SLC RACK

SYN. ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS			
SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	
DRAWN		JOHN F. KENNEDY SPACE CENTER, NASA	
CHECKED		KENNEDY SPACE CENTER, FLORIDA	
ENGINEER		CONVERTER COMPRESSOR FACILITY MODIFICATIONS	
		FOR LIQUID HELIUM STORAGE SYSTEM	
SLC RACK DETAIL			
APPROVED	DATE	SIZE (Dwg. No.)	REV
D. KRAMER	12/14/84	F 79K35402	
TITLE BRANCH CHIEF	PROJ. NO. 96036	SHEET 46	

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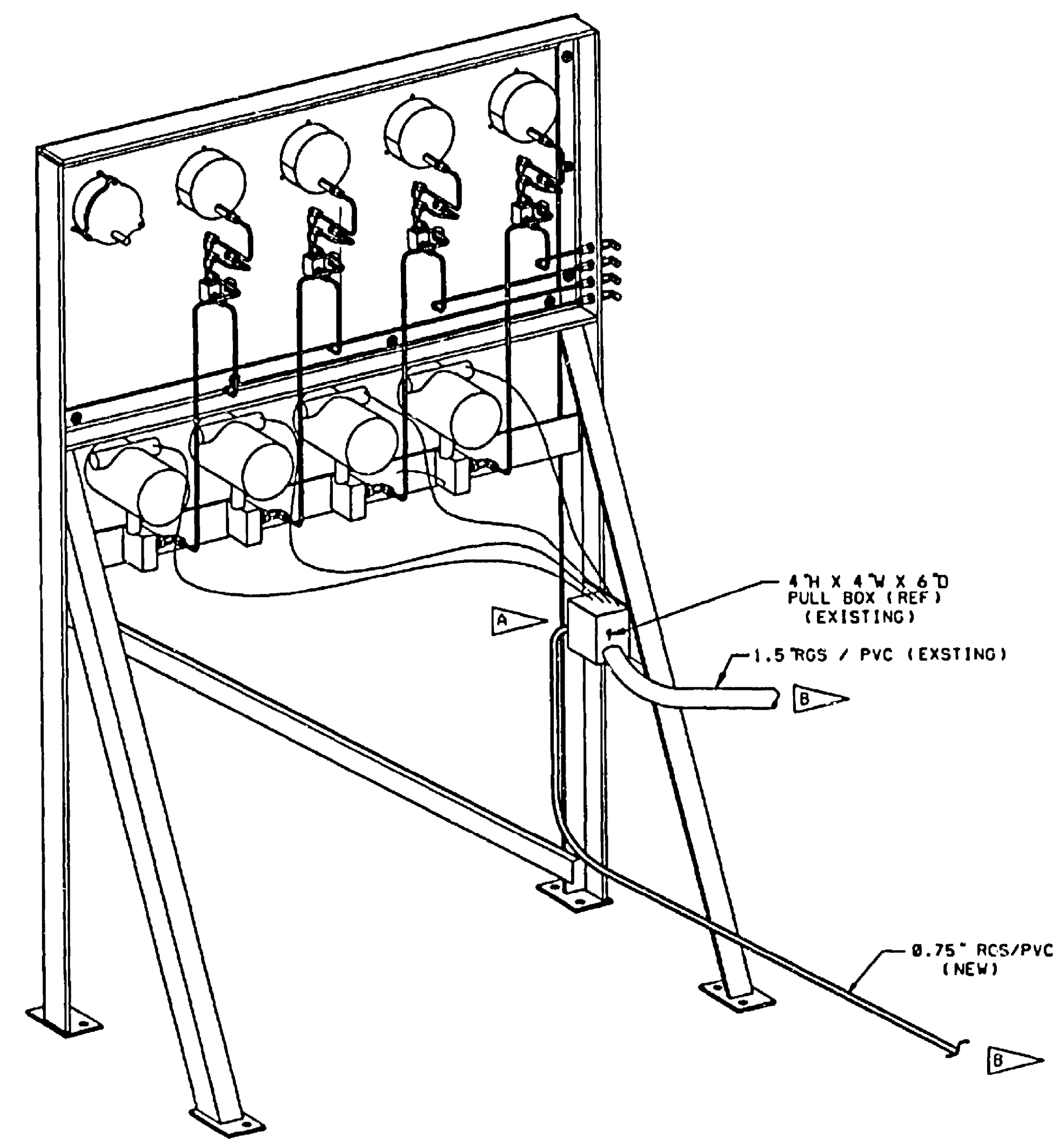
EC-4



NOTE: THE INSTRUMENTATION PANEL, WIRING AND CONDUIT SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE INSTRUMENTATION PANEL, WIRING AND CONDUIT INSTALLATION MANUAL, WHICH IS AVAILABLE FROM THE INSTRUMENTATION PANEL, WIRING AND CONDUIT INSTALLATION MANUAL, WHICH IS AVAILABLE FROM THE INSTRUMENTATION PANEL, WIRING AND CONDUIT INSTALLATION MANUAL.

**SPECIFIC NOTES:**

- A PUNCH HOLE FOR 1.0 INCH HUB SIZE IN PULL BOX. INSTALL A CONDUIT CONNECTOR AND CONNECT CONDUIT ROUTED FROM DEWAR JB.
- B RUN CABLES (FOR ULLAGE PRESSURE TRANSDUCERS, DEWAR GALLON INDICATORS, AND WEIGHT BAR JUNCTION BOX WIRES) THRU CONDUIT TO PULL BOX BELOW THE INSTRUMENTATION PANEL, PULLING ON TO PULL ELBOWS (PE) ABOVE SURGE SUPPRESSOR TERMINAL BOX (SS TB) AND DOWN TO SS TB. REFERENCE EC-8 AND EC-9 FOR PROPER CABLE ROUTING THROUGH TB-1 AND SLR RACK.



CONDUIT TO PANEL PULL-BOX DETAIL (ME)  
 SCALE: NONE  
 BACKVIEW  
 OF THE INSTRUMENTATION PANEL  
 EC-2

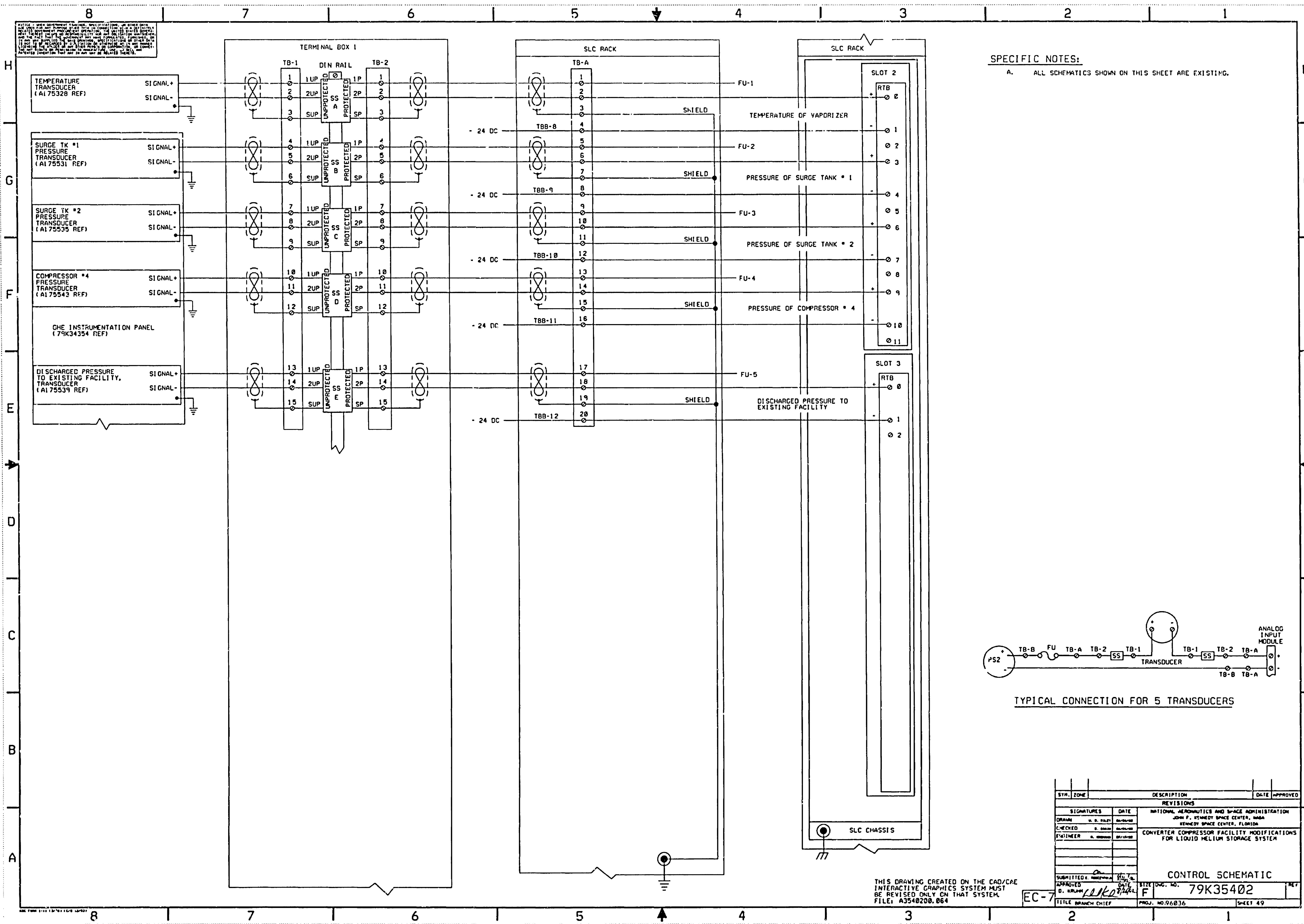
SYN. ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS			
SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, FLORIDA	
DRAWN	D. D. PALEY	8/2/80	
CHECKED	D. D. PALEY	8/2/80	
ENGINEER	D. D. PALEY	8/2/80	
CONVERTER COMPRESSOR FACILITY MODIFICATION* FOR LIQUID HELIUM STORAGE SYSTEM			
WIRING/CONDUIT DETAIL			
SUBMITTED:	D. KRUMHOLTZ	8/2/80	
APPROVED:	D. KRUMHOLTZ	8/2/80	
TITLE	BRANCH CHIEF	PROJ. NO. 94836	SHEET 48

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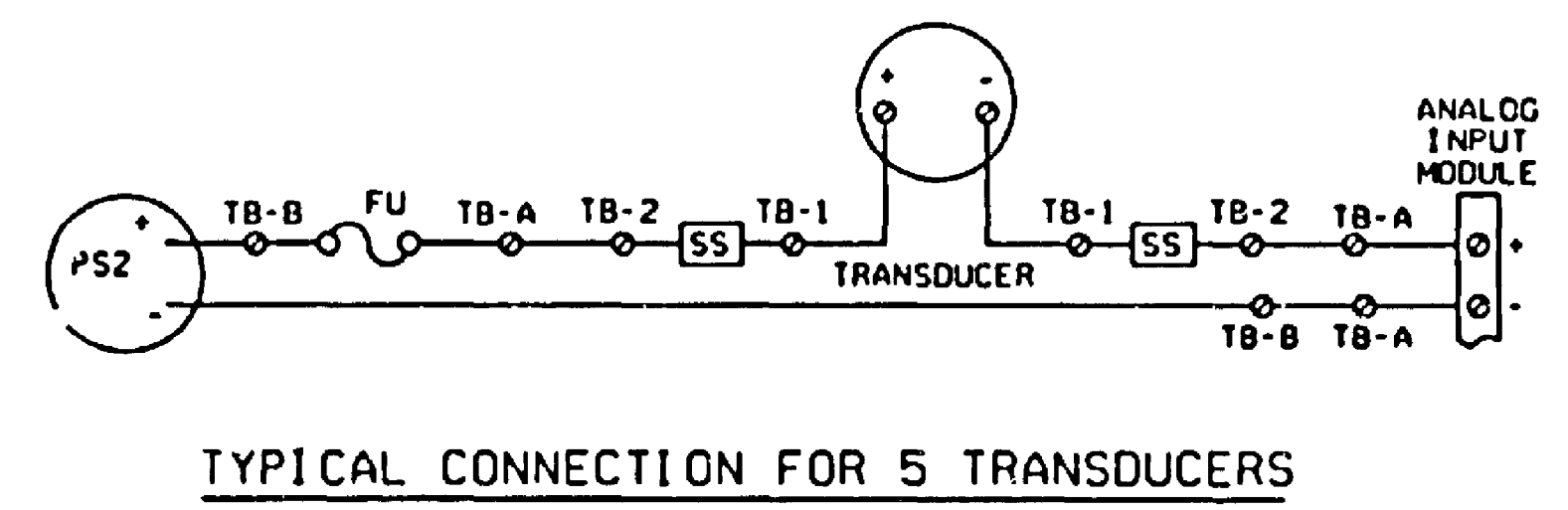
EC-6

SIZE Dwg. No. 79K35402





**SPECIFIC NOTES:**  
 A. ALL SCHEMATICS SHOWN ON THIS SHEET ARE EXISTING.



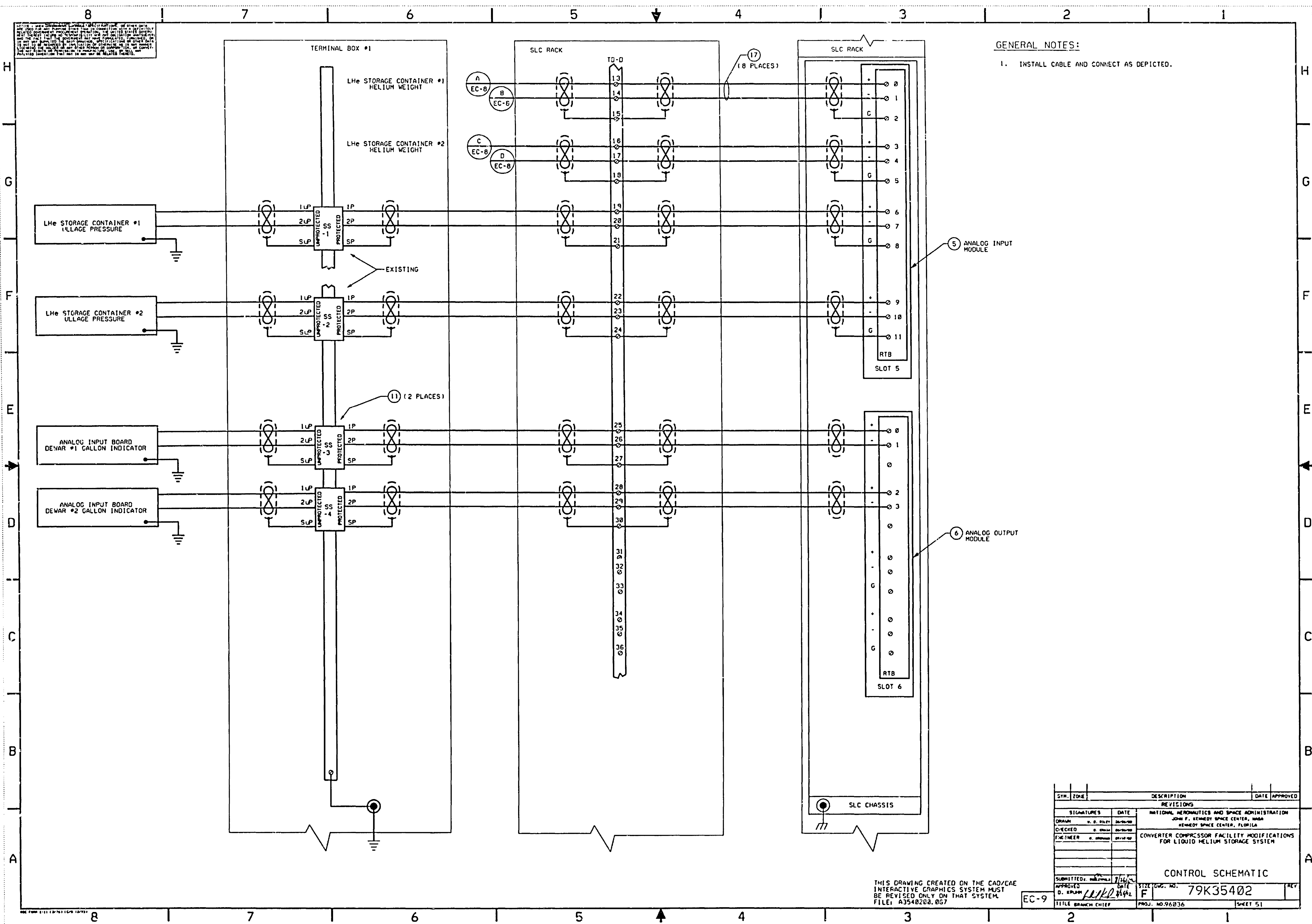
SY. ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS			
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION			
JOHN F. KENNEDY SPACE CENTER, NASA			
KENNEDY SPACE CENTER, FLORIDA			
CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM			
SIGNATURES	DATE		
DRAWN: H. S. RILEY	08/19/88		
CHECKED: S. GIBSON	08/19/88		
ENGINEER: H. GIBSON	08/19/88		
CONTROL SCHEMATIC			
SUBMITTED: 08/19/88		DATE: 08/19/88	SIZE: 11x17
APPROVED: [Signature]		DATE: 08/19/88	SIZE: 11x17
D. H. RILEY		DATE: 08/19/88	SIZE: 11x17
TITLE: BRANCH CHIEF		PROJ. NO. 96036	SHEET 49

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EC-7

79K35402



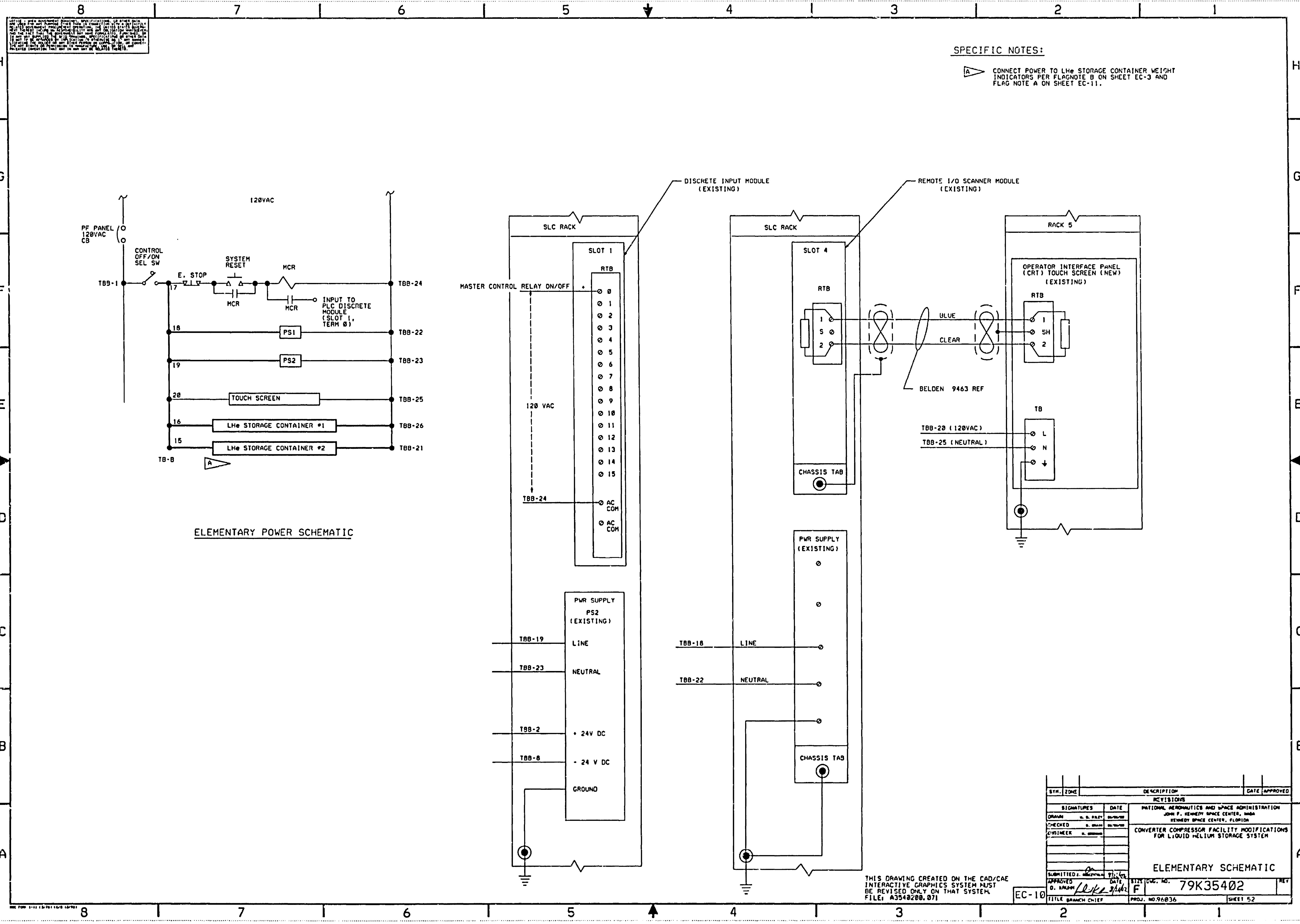


**GENERAL NOTES:**  
 1. INSTALL CABLE AND CONNECT AS DEPICTED.

SYN. ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS			
SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	
DRAWN	2/2/78	JOHN F. KENNEDY SPACE CENTER, NASA	
CHECKED	2/2/78	KENNEDY SPACE CENTER, FLORIDA	
ENGINEER	2/2/78	CONVERTER COMPRESSOR FACILITY MODIFICATIONS	
		FOR LIQUID HELIUM STORAGE SYSTEM	
CONTROL SCHEMATIC			
SUBMITTED	DATE	STATION NO.	REV
APPROVED	DATE	F 79K35402	
TITLE BRANCH CHIEF	PROJ. NO. 96036	SHEET 51	

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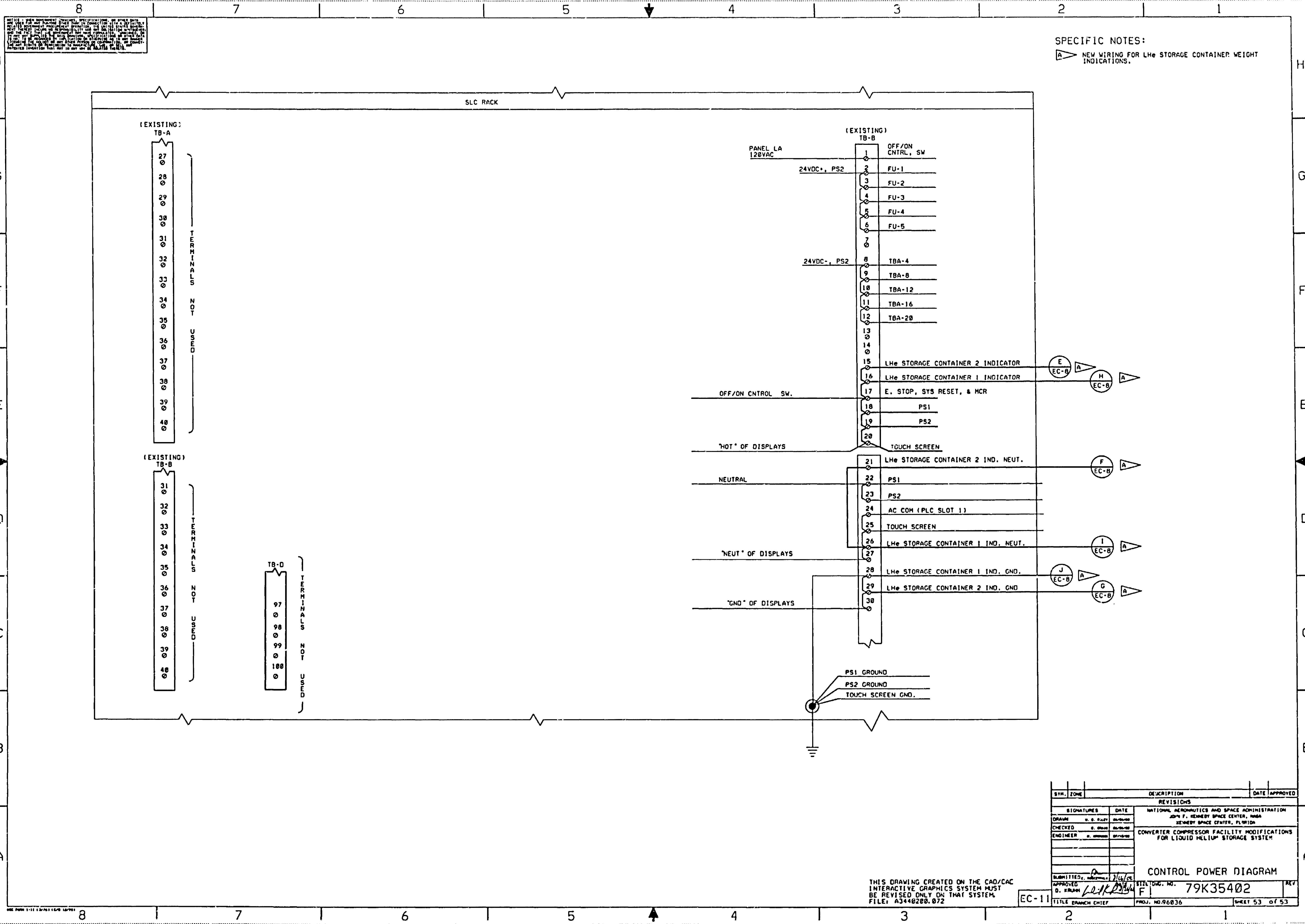
EC-9



**SPECIFIC NOTES:**

CONNECT POWER TO LHe STORAGE CONTAINER WEIGHT INDICATORS PER FLAGNOTE B ON SHEET EC-3 AND FLAG NOTE A ON SHEET EC-11.

SYN. ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS			
SIGNATURES			
DRAMAN	DATE	DATE	DATE
CHECKED	DATE	DATE	DATE
DESIGNED	DATE	DATE	DATE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA			
CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM			
<b>ELEMENTARY SCHEMATIC</b>			
EC-10	DATE	DATE	DATE
TITLE	BRANCH CHIEF	PROJ. NO. 96B36	SHEET 52



SPECIFIC NOTES:  
 [A] NEW WIRING FOR LHe STORAGE CONTAINER WEIGHT INDICATIONS.

SYN. ZONE	DESCRIPTION	DATE APPROVED
REVISIONS		
SIGNATURES	DATE	
DRAWN: v. o. ruz	01/01/01	
CHECKED: o. ruz	01/01/01	
ENGINEER: o. ruz	01/01/01	
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHNSON SPACE CENTER, FLORIDA JOHNSON SPACE CENTER, FLORIDA		
CONVERTER COMPRESSOR FACILITY MODIFICATIONS FOR LIQUID HELIUM STORAGE SYSTEM		
CONTROL POWER DIAGRAM		
APPROVED: [Signature]	TITLE: EC-11	PROJ. NO. 96B36
STATION: NO. 79K35402		SHEET 53 OF 53

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