

Sauget, Illinois, 62201

REQUEST FOR QUOTATION

DATE 9/12/77	INQUIRY NO. K-412	SHIP VIA
DELIVERY REQUIRED	TERMS	F.O.B.

SUMMARY OF QUOTATIONS

ITEM	QUANTITY	VENDOR NO. 1	VENDOR NO. 2	VENDOR NO. 3	VENDOR NO. 4
	cc:	A. Lewis - WGK			
	N.	L. Davis - CS4F			
TERMS					
F.O.B.					
DELIVERY					

QUANTITY

MATERIAL

You are invited to submit your quotation to cover mechanical work as described, "Site Preparation for Dismantling Dept. 246."

Please arrange to meet with our Mr. Avon Lewis at 9:30 a.m., September 19, 1977, to visit the job site and have any questions answered.

To be considered, your quotation must be in my office on or before September 28, 1977.

PLEASE ADDRESS YOUR QUOTATION TO THE ATTN. OF
D. M. FRANCISCO.

REPLY DUE BY

September 28, 1977

PURCHASING
AGENT

D. M. Francisco/bp

PU 27 REV. 5-73

PURCHASING DEPARTMENT COPY

PCB-ARCH-EXT0374547

PROJECT TRANSMITTAL

I. TITLE: SITE PREPARATION FOR DISMANTLING DEPT. 246

PROJ. SPONSOR: <u>A. LEWIS</u>	STA. NO. <u>2180</u>	WORK ORDER NO'S. _____	APP'D AMOUNT _____ _____ _____ _____
PROJ. NO. <u>2535</u>	PKG. DATE _____	_____	
DEPT. NO. <u>246/702</u>	EDC _____	_____	
TSD JOB 91370: _____ TOTAL PROJECT COST _____			

JUSTIFICATION _____

- II. 1 COPY TO PROJ. SPONSOR _____
- 1 COPY TO PROJ. PLAN. SUPV. _____
- 1 COPY TO PRODUCTION SUPV. W. CRABTREE
- 1 COPY TO ZONE MAINT. SUPV. O. HOTTO
- (Min) 4 COPIES TO PROJ. PLANNER/FOREMAN (MECH) _____
- (4) COPIES TO PROJ. PLANNER/FOREMAN (E&I) _____
- 1 COPY TO ZONE MECH. ENGR. _____
- 1 COPY TO ZONE MAINT. ENGR. _____
- (1) COPY TO E & I SUPV. FOR LIAISON _____

CIRCULATE COPY TO:

		Date Reviewed	Initials
1) OPERATING SUPT.	<u>W. ENGMAN</u>	_____	_____
2) TSD SUPT. (PROC.)	<u>L. SPRANDEL</u>	_____	_____
3) SAFETY ENGINEER	<u>C. WENKING</u>	_____	_____
4) ENVIRONMENTAL ENGR.	<u>F. BASILE</u>	_____	_____
5) MECH. STD. ENGR.	<u>T. MORROW</u>	_____	_____
6) OTHERS	<u>J. SEGRAVE</u>	_____	_____

RETURN CIRCULATION PACKAGE TO PROJ. SPONSOR A. LEWIS

III. ATTACHED IS: _____ Partial Pkg. (Complete Pkg. by 1 / 1)

X Complete Pkg. (MECH. ONLY)

_____ Revised Pkg. (Revision _____ to Pkg. of 1 / 1)

X Safety and Environmental Review Held 9 / 7 / 77.

_____ Field Check (is) (is not) necessary.

COMMENTS: _____

PROJECT PKG. CONTENTS: _____ LIST OF DRAWINGS _____ COPY OF PURCH. ORDERS

_____ PROJECT DESCRIPTION _____ PROJECT ESTIMATE W/MANPOWER SHEET

_____ WORK DESCRIPTION _____

_____ MATERIAL LIST _____

1. FRENCH - ORAM - 200 # STEAM
2. NITROGEN LINES
3. MONSANTO WILL PURGE

SPECIFICATIONS AND WORK DESCRIPTION

SITE PREPARATION

FOR

DISMANTLING DEPARTMENT 246

DEPARTMENT	246/702
PROJECT ESTIMATE NO.	2535
WORK ORDER NO.	2-2535-001/702

MONSANTO INDUSTRIAL CHEMICALS COMPANY

TECHNICAL SERVICES DEPARTMENT

W. G. KRUMMRICH PLANT

SAUGET, ILLINOIS

Prepared By:
A. C. Lewis
Date:
9/1/77

1.0 - SCOPE

The work covered by this description includes the entire mechanical design for the site preparation for dismantling the Aroclor manufacturing facilities, Department 246, W. G. Krummrich Plant. Electrical work is not covered in this description.

The work covered by this description includes:

- 1.1 Excavation, form work, and concrete work to install reinforced concrete footings for hydrogen line pipe supports.
- 1.2 Erection of steel for hydrogen line pipe supports.
- 1.3 Install 1" and 6" steel hydrogen piping.
- 1.4 Excavation work for cut-off of underground utility piping.
- 1.5 Cut-off of under-ground utility piping.
- 1.6 Cut-off of above ground utility piping.
- 1.7 Backfill of excavation and patching of concrete paving and miscellaneous repairs to existing concrete, curb and gutter, or asphalt excavated or damaged during construction.

2.0 - DRAWING LIST

TS-D-91717, Rev. 2	Relocate Hydrogen Piping at Dept. 222
TS-D-13826, Rev. 0	Relocated L.P. & H.P. Hydrogen Lines From Dept. 246, Pipe Supports & Fdn. Details
SK-A-2535-1	200# Steam Service Cut Off to Dept. 246
SK-A-2535-2	80# Steam Service Cut Off to Dept. 246
SK-A-2535-4	City Water Service Cut Off to Dept. 246
SK-A-2535-5	Well Water Service Cut Off to Dept. 2-6
SK-A-2535-6	Plant Air Service Cut Off to Dept. 246
SK-A-2535-7	Instrument Air Service Cut Off to Dept. 246
SK-A-2535-8	Natural Gas Service Cut Off to Dept. 246

3.0 - LIST OF STANDARDS

- A2.1, STD 2300 Concrete Work - Construction Specifications
- A8.1, STD 2300 Construction Specifications - General Conditions
- P2.2, STD FIDI Piping System Specifications
- P3.1, STD F82 Piping Specifications
- P6.1, STD 2304 Recommended Practices - Underground Cast Iron Pipes

4.0 - MATERIALS

All materials for this project shall be supplied by the contractor.

5.0 - DETAILED DESCRIPTION OF WORK

5.1 Relocate L.P. and H.P. Hydrogen Lines

New reinforced concrete footings must be installed for relocated hydrogen piping supports. Refer to drawings TS-D-9717 and 13826 for details.

- 5.1.1 Excavate for concrete footings. Install rebars and prepare form work. All concrete construction Per Monsanto Company specifications A2.1, STD 2300. Contractor has the option of using Sonotubes for form work.
- 5.1.2 Fabricate and erect steel for pipe supports.
- 5.1.3 Fabricate and install one new 6" low pressure hydrogen pipeline per Monsanto Company specification P2.2, STD F1D1.
- 5.1.4 Fabricate and install one new 1" high pressure hydrogen pipeline per Monsanto Company specification P3.1, STD F82.
- 5.1.5 All steel and new piping to be painted per Monsanto Company specification K1.3, STD C3.

5.2 Cut-Off of Underground Piping

Break out asphalt paving, concrete paving and concrete curb/gutter as required for excavation.

5.2 Cut-Off of Underground Piping (cont'd)

5.2.1 Excavate as necessary to locate the 3" and 4" C.I. city water branch lines supplying Dept. 246. Cut branch lines north of 2nd Street and plug per SK-A-2535-4.

5.2.2 Excavate as necessary to locate the 6" C.I. well branch line supplying Dept. 246. Cut branch line north of 2nd Street and plug per drawing SK-A-2585-5. A shutdown of the well water supply header will be necessary for the branch line cut-off.

5.3 Cut-Off of 80# Steam Service

Traps
Close the 6" valve on the header to Dept. 246 and the 2" valve on the header to the loading dock. Disconnect both branches and install blind flange on the valves. See drawing SK-A-2535-2 for details.

5.4 Cut-Off of 200# Steam Service

Traps
Close the 6" valve on the header to Dept. 246. Disconnect the header from the east side of the valve and blank the valve. See drawing SK-A-2535-1 for details.

5.5 Cut-Off of Plant Air Service

Shut off
Cut the 4" plant air header at the northeast corner of building C-T and install a new valve and blind flange. A shutdown of the plant air header will be necessary for the branch line cut-off. Refer to drawing SK-A-2535-6 for details.

5.6 Cut-Off Instrument Air Service

Close the 3" valve on the header to Dept. 246. Disconnect the header from the east side of the valve and plug the valve. See drawing SK-A-2535-7.

5.7 Cut-Off of Natural Gas Service

Close the 1½" valve on the north wall of building C-T. Disconnect the 1½" header to Dept. 246 and plug the valve. See drawing SK-A-2535-8 for details.

5.8 Backfilling and Paving

5.8.1 Backfill material shall be clean sandy loam, free of large boulders, rubble, wood rubbish or other organic material. Excavated material may be used if clean and approved by the Monsanto Field Engineer.

5.8.2 Where asphalt and concrete paving is broken out for excavation, it shall be replaced in kind after backfilling is completed.

5.9 Clean Up

The contractor shall clean up any scrap material rubble, waste concrete, etc., which has been created or caused by his work on this project.

6.0 - GENERAL

6.1 Safety

While working on this project, the contractor is to abide by all Monsanto Company safety precautions and observe OSHA standards as outlined by the Safety Department. The contractor must also follow plant procedures in the obtaining of permits.

6.2 Miscellaneous

All work performed on this project shall be under the direction of the Monsanto Field Engineer. Any tie-in work, shutdowns, street closings, or work which will interfere with normal plant operations shall be done only after consultation with and approval of the Monsanto Field Engineer.

sms

REVISION 1

ADDENDUM

The following items have been changed or added on this project and are to be furnished and completed as described.

ITEM

1. Disconnect existing 6" chlorine line at flange on northeast corner of building C-T. Install blind flange on header as shown on drawing TS-D-9717, Rev. 2.
2. Do not use a torch in any form, to cut or weld on the existing chlorine line.
3. Before breaking into the chlorine line, the line is to be purged with an inert gas.

If there are any questions on the revision, contact Avon Lewis at station 2180.

sms

Architectural And Structural Manual
Civil Engineering
CONCRETE WORK - CONSTRUCTION SPECIFICATIONS
W. G. Krummrich Plant

MAN. SECT PART

A 2.1 STD 2300

ISSUE 1 DATE 9/70

PAGE 1 OF 2

1. SCOPE The work covered by this Section 3 of the Construction Specifications includes concrete mixing, forming, placement, reinforcing steel, finishing and curing for curbs, slabs, roadways, foundations and structures.

2. MATERIALS

2.1 Ready-Mixed Concrete: All concrete shall be ready-mixed, consisting of cement, fine and coarse aggregates (sand and gravel, not crushed limestone) and water, conforming to the usual requirements of ASTM Specifications. It shall be proportioned in such a manner that a concrete will be obtained having a compressive strength of 3000 pounds per square inch in 28 days. It shall have a constant slump of not more than 4" for formed concrete and not more than 3" for slabs and consistent with workability required to place the concrete without excessive vibration to secure best possible density and appearance. It shall be free from sand streaks or honeycomb. Concrete materials and handling shall conform to applicable portions of the Standard Specifications, Section 504, Articles 504.01 through and including Article 504.15. The coarse aggregates shall qualify for Class X concrete. It shall also be mixed, transported and placed according to A.C.I. Standards.

2.2 Steel reinforcement shall be free from excessive loose and flaking rust and dirt. Intermediate grade billet steel deformed bars shall conform to ASTM designation A-15 and to the specification for minimum requirements of deformation, ASTM A305. Welded wire fabric shall conform to ASTM designation A-16 and to specifications for Welded Steel Wire Fabric for Concrete Reinforcement ASTM A185.

2.3 Concrete expansion joint material as shown on the plans shall be (minimum $\frac{1}{2}$ " thickness) Flexcell Expansion Joint Filler as manufactured by the Celotex Corporation or equal and to full thickness of floor, slab or curb, according to ASTM designation: D-544.

3. FORMING

3.1 All visible surfaces shall be formed with clean plywood or other material to insure smooth surface. Contact surfaces of forms shall be coated with non-staining paraffin oil prior to setting of steel. Forms may be removed at the engineers approval, but in no case less than three days after placements. Loading of concrete shall be avoided for at least seven days after placement.

3.1.1 Chamfering Exposed corners of concrete shall have $\frac{3}{4}$ inch chamfers unless shown otherwise.

SOURCE

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4. PLACING REINFORCING STEEL AND EXPANSION JOINT FILLER

4.1 Reinforcement shall be accurately placed according to the drawings. Reinforcement shall be continuous in curbs, encasements, etc. with splices to be a minimum of 24 diameters for deformed bars and one full mesh for welded wire fabric and securely wired together. Any coating or incrustation which will reduce bond of steel to concrete shall be removed. All reinforcing steel to be bent cold.

4.2 Expansion joint filler is to be placed at maximum intervals of 50 feet. All permanent structures projecting through or partially surrounded by concrete shall be separated with expansion joint filler; all shall be edged.

5. CONCRETE PLACEMENT

5.1 Concrete shall be carefully worked around steel, compacted or vibrated plus hand spading to remove air pockets, to produce a dense, homogeneous mass free of honeycomb or other defects. All honeycomb shall be chipped out and replaced with dry pack grout.

5.2 Concrete shall be kept moist for five days or treated with curing compound to prevent rapid curing. At atmospheric temperatures of 40°F or less, conditions of placing concrete are to proceed only with the approval by the engineer. Forms and grades shall be thoroughly "wet down" and excess water removed before placing concrete.

5.3 Strike off concrete to finished elevations using a wood float to finish concrete. Extreme care shall be exercised to produce finished curb grades true to specified elevations to prevent water pockets.

6. TESTS AND REPORTS

6.1 Four standard test samples of concrete will be taken in random fashion each day or for each separate concrete pour if required by the engineer.

6.2 Tests shall be made by a recognized testing laboratory, two samples at seven (7) days and two at twenty-eight (28) days. Reports shall be submitted to the Monsanto engineer in duplicate if tests are required by the engineer. All cost of sampling, testing, and reporting to be borne by the contractor.

7. REFERENCES Monsanto Standard

A2.1 Std. 1, Plain and Reinforced Concrete,
General Construction Specification

Architectural And Structural Manual
Civil Engineering
CONSTRUCTION SPECIFICATIONS-GENERAL CONDITIONS
W. G. Krummrich Plant

MAN. SECT PART	
A 8.1 STD 2300	
ISSUE 1	DATE 9/70
PAGE 1	OF 2

1. SCOPE This Section 1 of the Construction Specifications lists reference authorities governing specific portions of the work plus general conditions regarding quantities, plant procedures and housekeeping.

2. REFERENCE AUTHORITIES

2.1 The Standard Specifications for Road and Bridge Construction of the State of Illinois, adopted August 1, 1968, and all its revisions to date, shall be considered a part of these specifications and shall be called "Standard Specifications".

2.2 Other authorities quoted for specific matters are:

2.2.1 The Asphalt Institute and its publication "The Asphalt Handbook".

2.2.2 A.S.T.M., American Society for Testing Materials and their tests and procedures.

2.2.3 C.R.S.I., Concrete Reinforcement Steel Institute pertaining to quality and placement of reinforcing steel.

2.2.4 A.C.I., American Concrete Institute governing quality and placing of concrete.

2.2.5 American Concrete Pipe Association in reference to "The Concrete Pipe Handbook" governing specification and construction of concrete pipe.

3. GENERAL

3.1 Quantities provided are thought to be accurate, however, Monsanto will not be responsible for differences between actual quantities and quantities shown.

3.2 Monsanto will assist the contractor to keep road areas under construction free of traffic. When plant operations require access, roadways may be opened by the engineer.

The contractor will be responsible and provide at his expense:

- (1) Adequate barricades to close the roads.
- (2) Barricades at all potentially hazardous excavations on the work site.
- (3) Blinkers and warning lights.

SOURCE

LATEST ADDITIONS OR REVISIONS ARE SHOWN BY  OR OUTLINING. DELETIONS ARE SHOWN BY .

3.3 The following plant procedures shall be strictly followed as outlined in Section B, Supplementary Conditions, and as directed by the engineer:

- (1) L19 High Work Permit
- (2) L 2 Fire Permit
- (3) L10 Tank Entering Permit
- (4) L34 Excavation Permit

3.4 Good housekeeping shall be maintained at all times. Work areas shall be kept clean and orderly. Scrap and debris shall be removed daily from the work sites.

MAN. SECT PART		F1D1
P2.2 STD		F1D1E
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MODIFICATIONS		
C-All Iron Valves - See P2.2 STD F1D1C. E-Gal. See Par 4.1 F-A53 TPF pipe See P2.2 STD F1D1F		

CLASS 125 STEEL CLASS D GENERAL SERVICE
Threaded (1½") & Buttweld (48") - Threaded Brass & Flanged IBBM Valves - 200 F

1. APPLICATION This specification is intended for use in fluids permitting Class D piping. Fluids must be non-corrosive and not sensitive to brass.
- 1.1 Service Range System rating with valves without Buna seats is as follows: Sizes thru 12": 200 psig @ 0 to 150 F; 180 psig @ 200. Sizes 14" and 16": 150 psig @ 0 to 150 F; 135 psig @ 200 max. Sizes above 16": 120 psig @ 0 to 150 F max.

- 1.2 Temperature Limitations System is limited to 200 F by Code restriction on A120 pipe. Valves with Buna trim (BF5 and BH49P are limited to 180 F, max). See Figure 1.

2. PIPING COMPONENTS

CONSTRUCTION	Threaded malleable iron fittings, brass valves, and steel flanges.				Buttweld fittings, flanged IBBM valves, and slip-on flanges.																
NOMINAL PIPE SIZE	1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	26 - 48				
PIPE	Continuous welded carbon steel; A120.							Seamless steel; A53 Type S Gr B							Note a						
	Extra Strong Weight				Standard Weight				Sch 20			Schedule 10				Calculate Note b					
NIPPLES	FBW carbon steel; A120 XS WT																				
FITTINGS & LINE CPGS.	Malleable iron; A197 150 lb; threaded; B16.3				Carbon steel; A234 grade WPB, buttwelding; B16.9 standard weight							Sch 20			Schedule 10			Note c			
COUPLINGS FOR BRANCHES	Forged steel; A105 3000 lb; threaded; B16.11																				
UNIONS	Forged steel; A105 3000 lb; threaded																				
OUTLETS	Forged steel; A105 3000 lb; threaded				Forged steel; A105 buttwelding standard weight							Sch 20			Schedule 10						
BRANCH CONSTRUCTION (FOR RUN SIZES)	Use threaded components as per Table IB, p. 2.				See paragraph 3.3														Note c		
STUBENDS																					
FLANGES	Forged steel; A105 Class 150 ANSI; threaded; B16.5 1/16" raised face				Forged steel; A105 Class 150 ANSI; slip-on B16.5 1/6" raised face (use WN adj. to BW fittings thru 12" size only)							Carbon Steel 125 lb LW (Note d)									
BOLTING	Carbon steel; A307 Grade B heavy hexagonal bolts with heavy hex nuts																				
GASKETS	Compressed asbestos flat ring Class 150 1/8" thick, Garlock 7021, or equal.																Cloth/Rubber		Note e		
ELECTRODES	Bare: AWS A5.12 Class E60S-2. Coated: AWS A5.1 series E60																				
PRESSURE CONN *	Detail P9 Valve: 1/2" BF5				Detail P13 Valve: 1/2" BF5																
VENT *	Detail V1				Detail V21 Valve: 3/4" BF5																
DRAIN * (See par 3.4)	Detail D17 Valve: ½" BF5		Detail D17 Valve: 3/4" BF5		Detail D21 Valve: 1" BF5				Detail D21 Valve: 1½" BA5				Detail D24 Valve: 2" EA43		Detail D24 Valve: to suit						
TW CONNECTION *	Detail T1				Detail T11				Detail T11, T33 Detail T29, 4" NPS Only												
NOMINAL PIPE SIZE	1/2	3/4	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	26 - 48				
GATE VALVE	EA5 125 lb threaded				EA43 Class 125 flg. FF (400 F max, sizes thru 16")							EA41 Class 125 flanged, FF (400 F max, sizes thru 16")							(See ven. cat. for avail. sizes)		
GLOBE/ANGLE VALVE	BE1 150 lb threaded				EB41/EL41 Class 125 flanged FF																
SWING CHECK VALVE (VERT OR HOR USE)	BC5 125 lb threaded				EC41 Class 125 flanged, FF (400 F max, sizes thru 16")										30" max size						
LIFT CHECK VALVE (HOR USE)	BC2 150 lb threaded																				
BALL VALVE	BF5 150 lb thrd (180 F max.)																				
PLUG VALVE	CD3 200 lb threaded				CD41 Class 125 flanged, FF (36" max. size)																
BUTTERFLY VALVE					BH49P Class 125 flanged, wafer (30" max. size) (180 F max.)																

NOTES

- a. PIPING MATERIAL LARGER THAN 24" NPS: ASTM A134 FUSION BUTTWELDED (STRAIGHT OR SPIRAL SEAM WELD) PIPE FABRICATED FROM ASTM A283 GRADE C PLATE; ALTERNATE: ASTM A211 FUSION LAP-WELD (SPIRAL SEAM WELD) PIPE FABRICATED FROM ASTM A245 GRADE C SHEET.
- b. CALCULATE WALL THICKNESS USING FORMULA AND STRESSES FROM ANSI B31.3, WITH 1/16" ALLOWANCE FOR CORROSION. SELECT THICKNESS FROM TABLE III, P. 2, FOR A245 SHEETS.
- c. BUTTWELD FITTINGS, SIZES 26" - 36", CONFORM TO MSS SP48 WHEN REQUIRED. THE USE OF MITERS, STUB-INS, FABRICATED REDUCERS, ETC., SHOULD BE CONSIDERED WHEN ECONOMICALLY FEASIBLE.
- d. FLANGES FOR SIZES 26" - 48" ARE ASTM A105 (MATERIAL WITH DRILLING CONFORMING TO ANSI B16.1). FLANGES ARE SLIP-ON WITH FULL FACE.
- e. GASKETS FOR SIZES 26" - 48" ARE FULL FACE CLOTH INSERTED RUBBER, 1/8" THICK, GARLOCK 19 OR EQUAL (MAXIMUM-OD SINGLE PIECE GASKET 44" - USE DOVETAIL JOINT, SEGMENTAL GASKETS FOR LARGER SIZES).

3. DESIGN CONSIDERATIONS

- 3.1 Bends Field cold bending is not permitted.
- 3.2 Thread Lubricant Pipe joints use TFE sealing and threading compound (Bakerseal #899-21 or equal).
- 3.3 Branches Use unreinforced stub-ins in accordance with Table IA, if:
- (1) Design pressure (corrected to 100 F) does not exceed value in Table IA for any planned branches.
- (2) Piping flexibility and stresses are within acceptable limits.
- Otherwise, use branch construction in Table IB.

* THE DETAILS FOR THESE CONNECTIONS ARE FOUND IN PG.5.

4. MODIFICATIONS

- 4.1 When suffix letter E is used (F1D1E), pipe in sizes 3"-24" NPS, shall be hot-dip galvanized after fabrication. Bolts for modification E shall be galvanized. Verify galvanizing facilities for each project so that piping can be fabricated in flanged spools no longer than double dip lengths.

REFERENCES ARE TO ASTM OR ANSI STANDARDS UNLESS NOTED.

SOURCE CEA 0519

LATEST ADDITIONS OR REVISIONS ARE SHOWN BY [] OR OUTLINING. DELETIONS ARE SHOWN BY []



TABLE I. BRANCH CONSTRUCTION (SEE PAR. 3.3, P. 1)

WELD, PAD TO RUN, in.
REINF PAD THK, in.

* BASED ON STRESS OF 7200 PSI AT 100F, SIZES THRU 4"; 20000 PSI AT 100F SIZES 6" AND LARGER.

† USE TABLE 1B ONLY IF TABLE 1A IS NOT SUITABLE PER PAR. 3.3, P. 1. A FULL STRENGTH BRANCH IS AT LEAST AS STRONG AS THE WEAKER OF PIPE RUN OR THE FLANGED JOINT.

‡ SEE P6.1 STD 21 FOR DETAILS OF ALTERNATE PAD-REINFORCED STUB-IN FOR BRANCH SIZES 8" NPS AND LARGER.

TC = THREADED COUPLING; TSW = SWEEPOLET; TT = THREADED TEE; TTW = BUTTWELD TEE; TW = BUTTWELD OUTLET; TWT = THREADED OUTLET.

TABLE II. PIPE TEMPERATURE CORRECTION FACTORS

TEMPERATURE, F	MIN TO 100	200
FACTOR	1.0	.95

TABLE III. PREFERRED THICKNESSES FOR ASTM A245 SHEETS
(PARTIAL LIST)

	0.1800
	0.1600
	0.1400
	0.1250
0.2240	0.1120
0.2000	0.1000

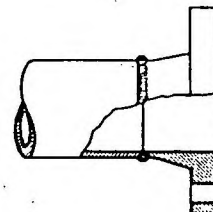


PIPING MANUAL
PIPE AND FITTINGS SPECIFICATIONS
F82 CONSTRUCTION - FULL SERVICE
Welded - Carbon Steel - 1500 lb Flanges

1. APPLICATION This Specification is intended for general use. Cold bending of pipe is not recommended.

1.1 Service Range Maximum allowable pressures for flanges are 3600 psig at -20 F, 2125 psig at 750 F. Note that ratings of pipe larger than 3" falls below ratings for flanged joint at some temperatures. See Figure 1 for complete pressure-temperature ratings.

1.2 Use Limitations Upper temperature limit of 750 F recognizes the possibility of carbon steel graphitization at higher temperatures. Maximum pipe size is largest not requiring post heat treatment.



2. MATERIAL

ITEM	SIZE RANGE	DESCRIPTION	SPECIFICATION
PIPE	1" thru 6"	Schedule 160 Seamless Carbon Steel	ASTM A 106 Grade B
FITTINGS	1" thru 6"	Schedule 160 Carbon Steel Buttwelding	ASTM A 234 Grade WPB Material USAS B16.9 Dimensions
	Thru 4" (Branch) ⁽¹⁾	160 Weight Forged Carbon Steel Welding Outlet, Buttweld Connections	ASTM A 105 Material
WELDING ELECTRODES	All	Coated Electrodes	ASTM A 233 E60 Series
		Bare Electrodes for GMAW Process	ASTM A 559 Class E60S-2
FLANGES	1" thru 6"	USAS 1500 lb Forged Carbon Steel Welding Neck, 1/4" Raised Face with Smooth Finish, Schedule 160 Bore	ASTM A 105 Grade II Material USAS B16.5 Dimensions
GASKETS ⁽²⁾	1" thru 6"	.175" Thick 1500 lb Spiral Wound, Type 304 Stainless Steel and Asbestos	API STD 601
BOLTING	All	Alloy Steel Continuous Threaded Studs	ASTM A 193 Grade B7
		Heavy Hex Nuts	ASTM A 194 Grade 2H

⁽¹⁾Use welding outlet fittings in accordance with P6.1 STD 2.

⁽²⁾Gaskets specified are standard. Where service conditions require special gaskets they must be fully described on Drawings and in the Pipeline Schedule.

3. PROCUREMENT

3.1 Pipe Seamless pipe is furnished in random mill lengths. Single random length range is 16 to 22 feet, inclusive, with short lengths 12 to 16 feet permissible up to 5% of the order. Order plain ends.

3.2 Fittings Order welding outlet fittings with buttwelding connections for branch attachment. Typical products are "Weldolets" (Bonney Forge and Tool Works, Allentown, Pa.); and "Couplets" (Henry Vogt Machine Co., Louisville, Ky.).

3.3 Thread Lubricant Acceptable products for lubricating bolt threads in flanged joints are Crane "Formula 425" or Alpha Molykote Corp. "Type U".

4. REFERENCE STANDARDS

- P3.2 STD 2 Pressure Piping Systems Construction Specification
P6.1 STD 2 Branch Connections Reinforcement

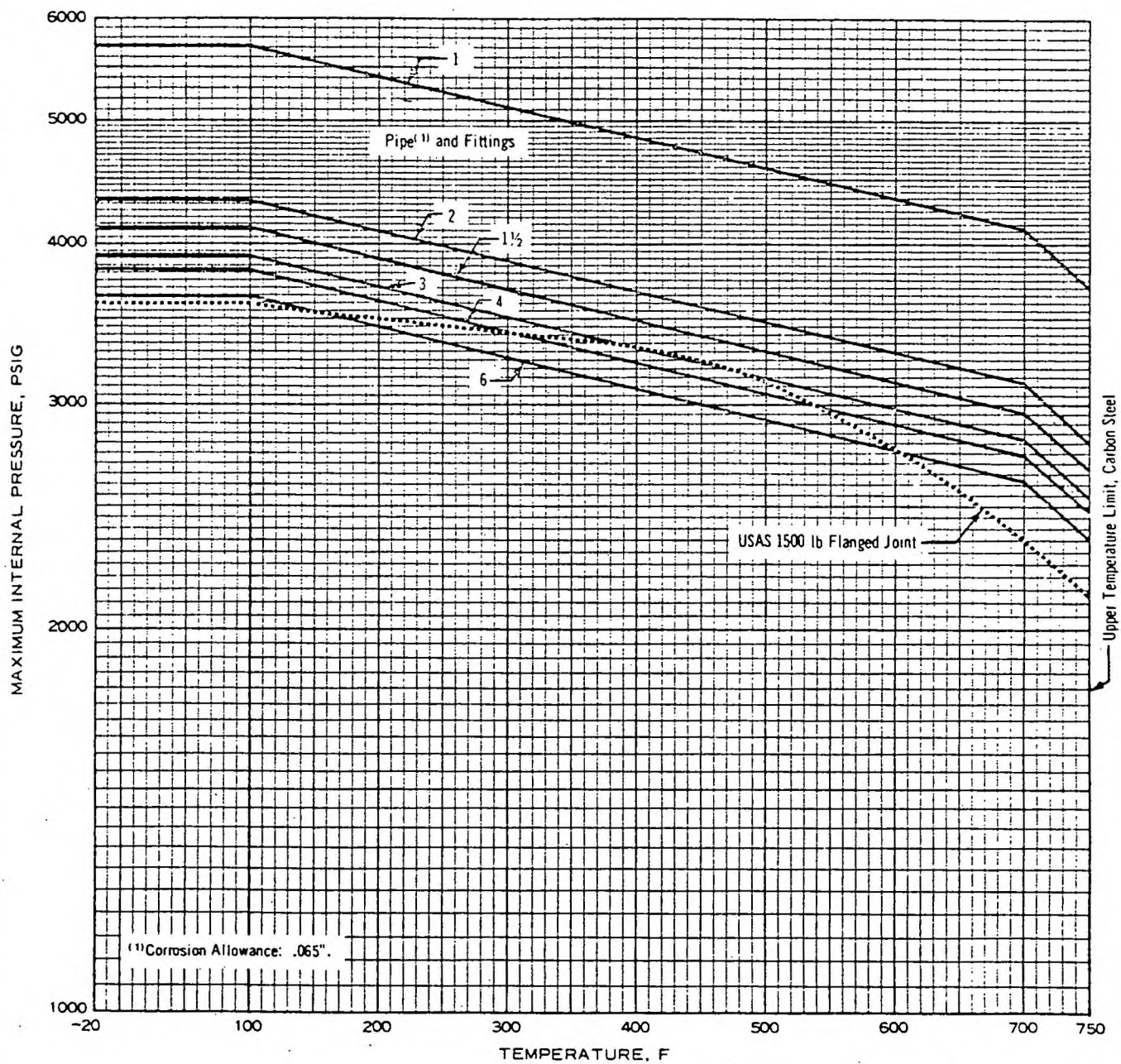


FIGURE 1. PRESSURE-TEMPERATURE LIMITS FOR MATERIALS

PIPING MANUAL
RECOMMENDED PRACTICES
UNDERGROUND CAST IRON PIPE - MECH. JOINTS
W. G. Krummrich Plant

1. SCOPE This recommended practices standard covers excavation and laying specifications and anchoring details used in the installation of mechanical jointed cast iron water mains.

2. GOVERNING STANDARD Unless specified otherwise in this standard, installation of cast iron underground water mains shall conform to AWWA Std. C600-54T.

3. EXCAVATION

3.1 Preferred Procedure Excavate to grade or the depth required to provide uniform and continuous bearing and support for the pipe on solid and undisturbed ground along its entire length. Where the pipe does not lay on undisturbed ground, voids must be filled and compacted to provide continuous support and bearing. Bell holes shall be provided at each joint for sufficient working clearance.

3.2 Excavate and Block Method for Special Circumstances With the approval of the engineer, pipe may be supported at grade on wood or concrete blocks to provide bell clearance. However, backfill must be manually placed up to 6 inches above the line and compacted to provide uniform support along the entire length of the pipe.

3.3 Underground Obstruction Clearance Sufficient sub-grade and side excavation must be provided so that all parts of the piping and metal tie rods have 6 inches minimum clearance between large rocks, abandoned foundations or other obstructions.

3.4 Minimum Depth of Bury Depth of bury or covering shall not be less than the following or local frost line whichever is the greater as shown on Fig. 14:

- (1) Areas not traversed by vehicles--30 inches.
- (2) Roadways or areas traversed by heavily loaded vehicles--48 inches (See Par. 4.5)
- (3) Railroads--top of encasement--48 inches (See Par. 4.5)

See Fig. 14 for map showing recommended depths of cover for freeze protection.

4. LAYING OF PIPE

4.1 General Requirements

- (1) Inspect all pipe and fittings for cracks before installation by "ringing" with a light hammer.
- (2) During laying, care shall be taken to prevent all debris, tools, clothing or other materials from entering the pipe.
- (3) When pipe laying is not in progress, the open ends of the pipe shall be closed with a watertight plug. Incompleted joints shall be sufficiently tightened to be as watertight as possible.

4.2 Allowable Deflection at Joints Whenever it is desirable to deflect mechanical-joint pipe to form a long-radius curve, the amount of deflection shall not exceed the maximum limits shown in Table 1. Use of fittings is preferred because they provide a more positive means of locating buried water mains.

TABLE 1 MAXIMUM PERMISSABLE DEFLECTIONS IN LAYING MECHANICAL-JOINT PIPE BASED ON EIGHTEEN FOOT LENGTHS (James E. Clow and Sons)

Pipe Size Inches	Angle °-Min.	Deflection Inches	Approx. No. of 18 Ft. Lengths for 90° Bend	Approx. Radius of Curve - Ft.
3	8°-18'	31	11	125
4	8°-18'	31	11	125
6	7°-07'	27	13	145
8	5°-21'	20	17	195
10	5°-21'	20	17	195
12	5°-21'	20	17	195
14	3°-35'	13-1/2	25	285
16	3°-35'	13-1/2	25	285

4.3 Assembly of Joints Clean the bell and spigot end of the pipe to remove dirt, grit, tar, etc., before assembling the parts. Brushing the gasket and the spigot end with soapy water will aid in putting the gasket in place.

4.3.1 Bolting When tightening bolts, it is essential that the gland be brought up toward the pipe flange evenly. Bolts must be tightened evenly. This may be done by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, and last, the remaining bolts. This cycle should be repeated until all bolts are within the range of torques shown in Table 2. If effective sealing is not attained at the maximum torque shown in Table 2, the joint should be disassembled, thoroughly cleaned, and reassembled.

TABLE 2 RECOMMENDED TORQUE VALUES FOR BOLTING MECHANICAL JOINT PIPE (USAS A21.11)

Bolt Size Diam.-In.	Range of Torque Ft.-Lb.	Length of Wrench Inches	Pipe Diameters Covered-In.
5/8	40-60	8	2 thru 3
3/4	60-90	10	4 thru 16

4.4 Anchorage and Reaction Backing

4.4.1 Hydrants and Post Indicator Valves The bowl of each hydrant and valve shall be tied to the pipe with metal tie rods as shown in Appendix A or thrust blocks shall be provided in accordance with Table 3. Tie rods are preferred.

4.4.2 Fittings All plugs, caps, tees, and bends deflecting 22-1/2 degrees or more on mains 6 inches in diameter and larger shall be provided with metal rods or clamps as shown in Appendix A, or thrust blocks shall be provided in accordance with Table 3.

4.4.3 Thrust-Block Anchorages Cast thrust blocks in place so that they will bear against an area of undisturbed soil in the trench wall having a soil resistance of two tons per square foot or more. Place thrust blocks so that the joints will be accessible for inspection and repair. See Figs. 1 and 2.

Make thrust blocks of concrete of a mix not leaner than 1 part cement, 2-1/2 parts sand, and 5 parts gravel or stone.

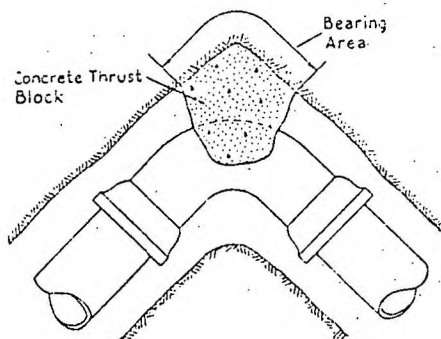


Fig. 1 One-quarter bend thrust block

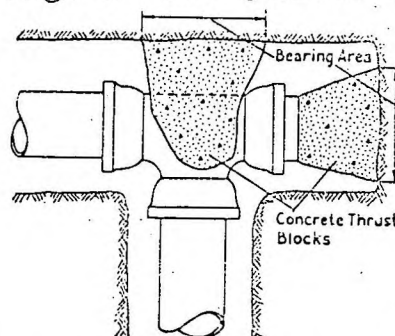


Fig. 2 Tee and plug thrust block

TABLE 3 AREA OF BEARING FACE OF CONCRETE THRUST BLOCKS FOR MECHANICAL-JOINT PIPE

(Handbook of Industrial Loss Prevention - McGraw-Hill)

Pipe Size Inches	Area of Bearing Face, Square Feet			
	1/4 bend	1/8 bend	Plugs and Tees	Hydrant Bowl
6, 8	3	3	3	3
10	4	3	3	
12	6	3	4	
14, 16	11	4	7	

4.5 Encasement of Water Mains Where cast iron water mains pass below railroads or heavily traveled highways or streets they shall be encased in steel pipe, 1/4 inch minimum wall, or poured concrete with a minimum thickness of 6 inches on all sides. Installations below streets and railroads may be expedited by driving casings or boring methods which minimize excavating.

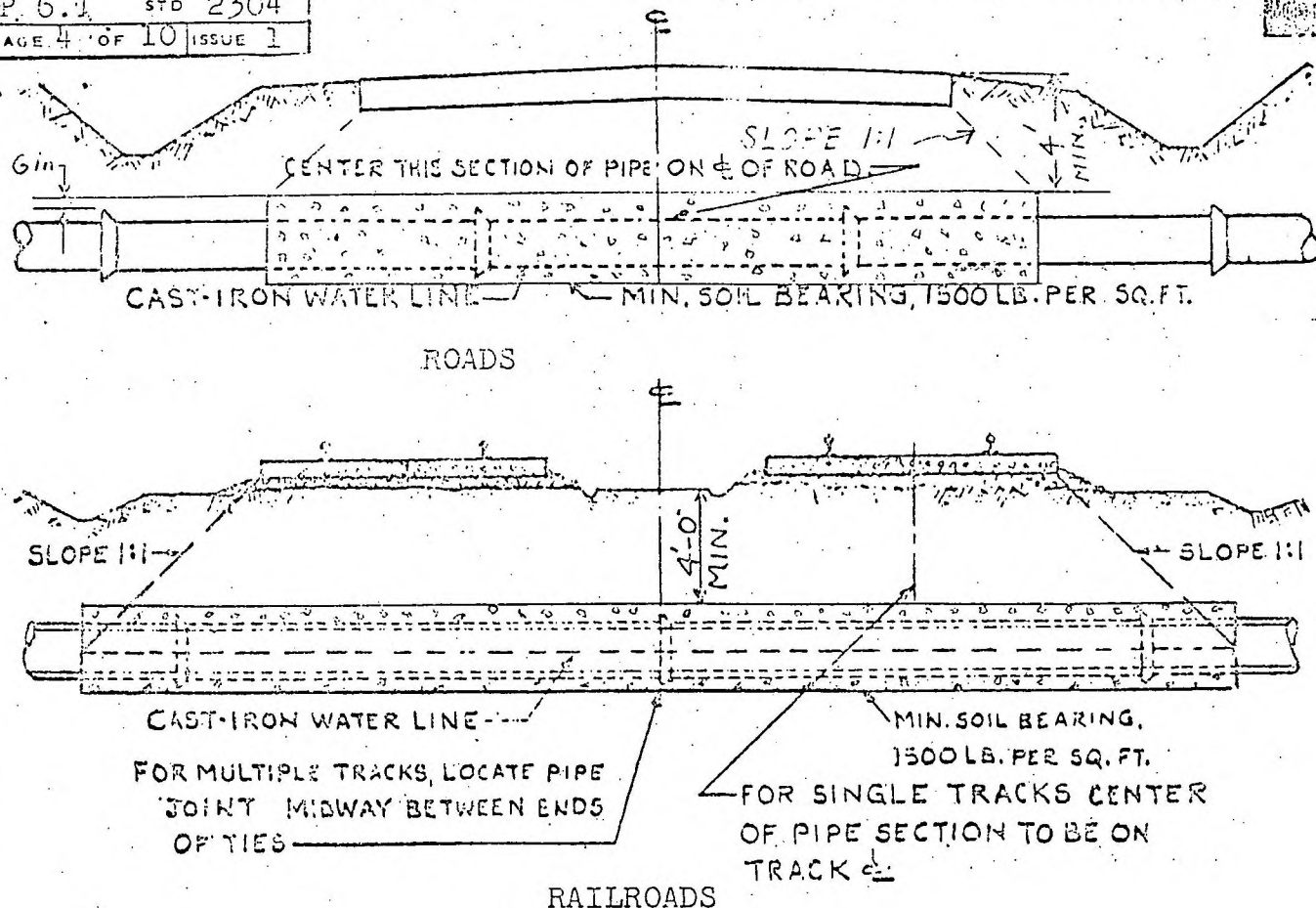


Fig. 3 Details of Encasements

5. SETTING VALVES AND HYDRANTS

5.1 Valve Pits Valve pits shall be provided for check valves or other valves requiring protection for working parts as shown on the drawings. Note Construct pits to permit minor valve repairs and protect the pipe from impact where it passes through the pit wall. This is best done by leaving a 1/2 inch asphalt or tar filled space between the pit wall and the pipe. Valve pit manhole covers should be so arranged to permit valves to be key operated through a sleeved opening with cover.

5.2 Valves Care must be used to insure that gate valves are set plumb so that the indicator posts attached to them will be vertical.

5.3 Hydrants Remove dirt or foreign material from hydrants before setting. All hydrants must be plumb with the center line of the nozzles at least 18 inches above the finished grade. Connection to the main shall be with a 6 inch line and a 6 inch gate valve for hydrant isolation.

5.3.1 Drainage If a hydrant is set in pervious soil, provide drainage at the base by placing coarse gravel or coarse stone mixed with coarse sand from the bottom of the trench to at least 6 inches above the waste opening and to a distance of 1 foot around the base of the hydrant.

If a hydrant is set in clay or other impervious soil, excavate a drainage pit two feet in diameter and three feet deep below it. Fill the pit compactly with coarse gravel or crushed stone mixed with coarse sand under and around the elbow of the hydrant and to a level of six inches above the waste opening. No drainage system should be connected to a sewer.

5.3.2 Anchorage Anchor hydrants to the underground main as shown in Fig. 12. The foot piece (bowl) of each hydrant should in addition be well braced with a thrust block against unexcavated earth at the end of the trench. See Table 3 and Fig. 1.

6. CATHODIC PROTECTION AND COATING All cast iron pipe shall be coated in accordance with K 1.3 Std 604 before installation. All joints, tie rods, and clamps shall be coated after installation and the damaged areas of the pipe coating repaired. In addition, cathodic protection shall be provided in accordance with details shown in Appendixes B and C, pages 9 and 10.

7. HYDROSTATIC TESTING All newly laid pipe shall be subjected to a hydrostatic test before back filling is complete. Back fill to the center of the pipe, except at the joints with well tamped or settled back fill material before starting the test.

7.1 Air Venting Expell air from the pipe before applying the specified test pressure, see Par. 7.2. If hydrants or blow offs are not available at high places, the contractor shall make the necessary valved taps at points of highest elevation before testing and insert plugs after tests are complete.

7.2 Test Pressure The hydrostatic test pressure shall be at least 1-1/2 times the normal static pressure but not less than 200 psi. Measure the test pressure at the lowest point and maintain it for at least one hour. Carefully examine all exposed pipe, fittings, valves, hydrants, and joints for leaks and adjust or replace as required.

7.3 Leakage Test Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section, necessary to maintain the specified leakage test pressure, P, psig, which is equal to the normal operating pressure of the section being tested. The quantity is usually measured by pumping from a calibrated suction tank or container.

Acceptable leakage, L, in gallons per hour, must be less than

$$L = \frac{ND \sqrt{P}}{1850} \text{ where}$$

L=Allowable leakage, gallons per hour

N=Number of joints in the length of pipeline tested

D=Nominal diameter of the pipe, inches

P=Average leakage test pressure (normal operating pressure), psig

7.3.1 Allowable leakage per 100 joints - gph (U.S.)

Avg. Test Pressure PSIG	Pipe Diameter - Inches								
	2	3	4	6	8	10	12	14	16
90	1.02	1.54	2.05	3.08	4.10	5.13	6.15	7.18	8.21
80	.96	1.45	1.93	2.90	3.87	4.84	5.80	6.77	7.74
70	.90	1.36	1.81	2.71	3.62	4.52	5.43	6.33	7.24

Taken from Table 1, AWWA C600-54T

7.4 Testing after Backfilling Hydrostatic pressure and leakage tests shall be conducted again after backfilling. Correction of faults caused by the backfilling shall be corrected by the contractor.

8. BACKFILLING Backfilling more than 1/2 the pipe diameter, see Par. 7, shall not be started until the engineer is notified and the results of the hydrostatic and leakage tests are acceptable.

8.1 Materials and Methods Backfill material shall be sand or clean sand loam up to a minimum one foot above the pipe. It shall be placed in three inch lifts and each lift shall be hand compacted.

The remainder of the backfill may be sand, 3/4 inch crushed rock, or clean earth free of cinders, ashes, refuse, boulders, rocks, or organic materials. It shall be placed in one foot lifts compacted by hand or mechanical means. The above is used where future settling cannot be tolerated and under roads, walks, new slabs, etc.

8.2 Alternate Methods Where settlement of backfill is not critical, puddling with a water lance may be used. Also backfill above one foot above the pipe need not be compacted if additional material above grade is provided for settlement to grade.

9. REFERENCE STANDARDS

- (a) American Water Works Association AWWA C600-54T
- (b) W. G. Krummrich Plant Special Practices SP-C-2546 and SP-C-2547
- (c) Handbook of Industrial Loss Prevention, Factory Mutual Engineering Division. McGraw-Hill Book Company

APPENDIX A

PIPE ANCHORAGE FOR STANDARDIZED MECHANICAL
JOINT CAST IRON PIPE

If the distance between joints is less than 12 feet, extend the anchorage to the second bell as shown in Figure 5.

Bolt diameter = $\frac{3}{4}$ inch

Rod diameter = $\frac{3}{4}$ inch

Maximum thrust resistance per rod or bolt = 6,000 pounds

NUMBER OF RODS-BOLTS-STRAPS REQUIRED FOR
ANCHORAGE OF FITTINGS

(Handbook of Industrial Loss Prevention-McGraw-Hill)

Pipe Size Inches	Tee and 1/4 Bend	1/8 Bend	Plugs	Hydrant
2 thru 12	2 rods	2 rods	1 strap-2 bolts	2 rods
14 thru 16	4 rods	4 rods	3 straps-6 bolts	



Fig. 4 plug
in pipe bell

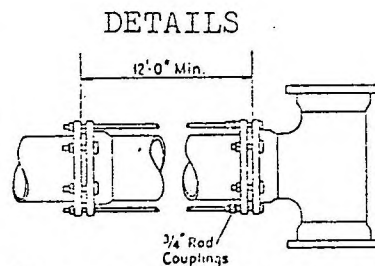


Fig. 5 Tee; bell to
pipe bell

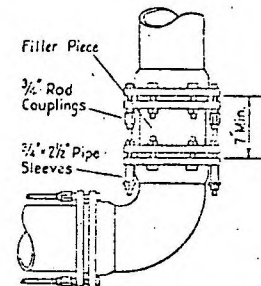


Fig. 6 One-quarter
bend; bell to pipe
bell and spigot

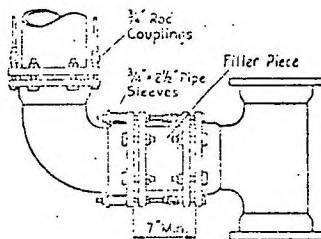


Fig. 7 One-quarter
bend; bell to bell
of tee

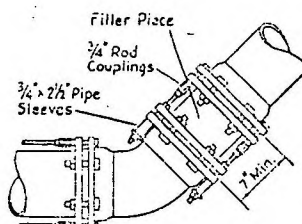


Fig. 8 One-eighth
bend; bell to pipe
bell and spigot

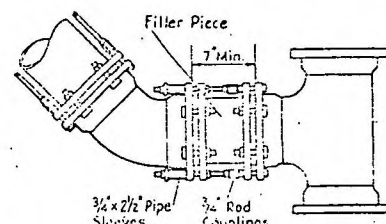


Fig. 9 One-eighth
bend; bell to bell
of tee

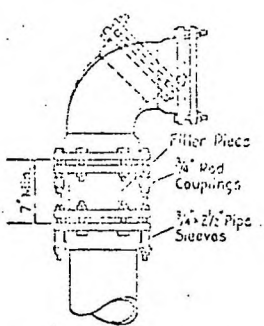


Fig. 10 Plug; one-quarter and one-eighth bends

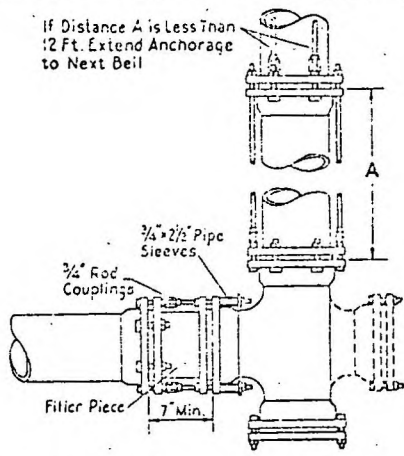


Fig. 11 Plug; side or run outlet of tee or cross

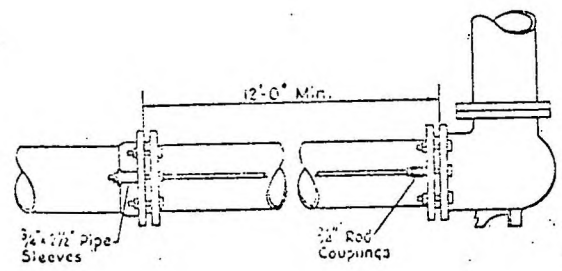


Fig. 12 Hydrant; bell to pipe spigot

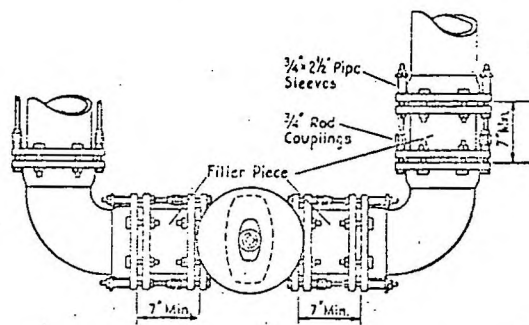


Fig. 13 Indicator post valve; bell to one-quarter bend bell

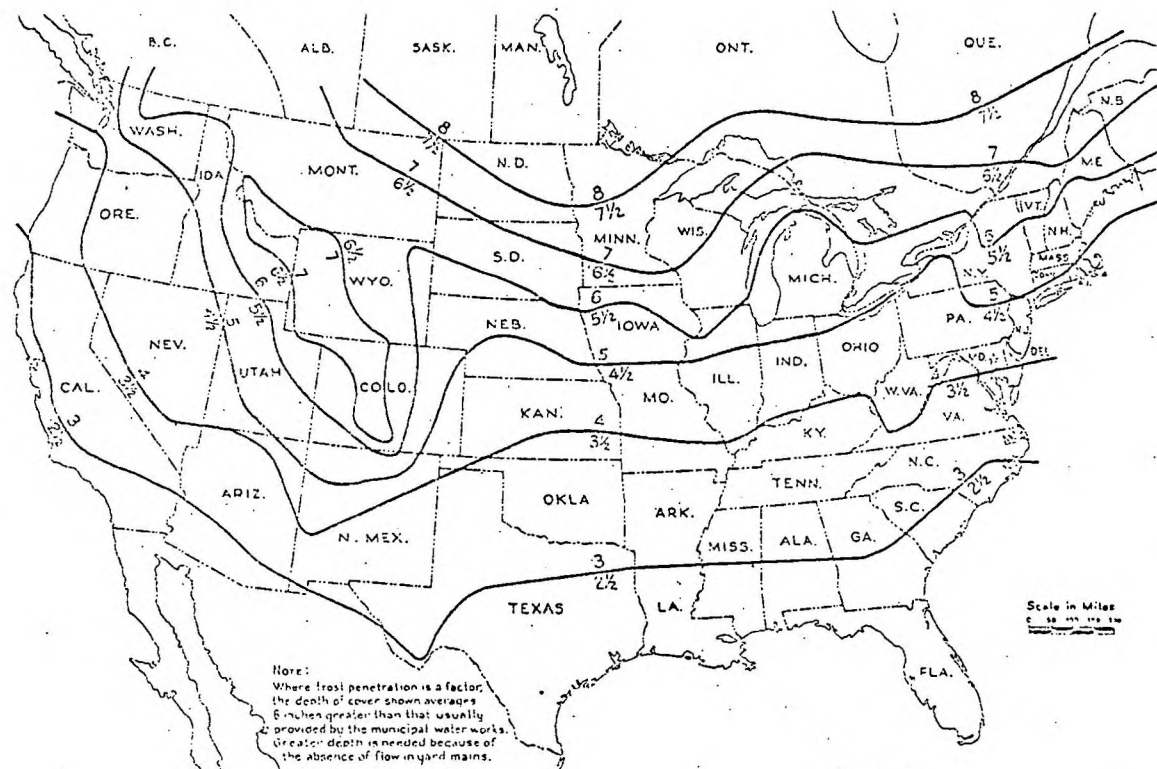
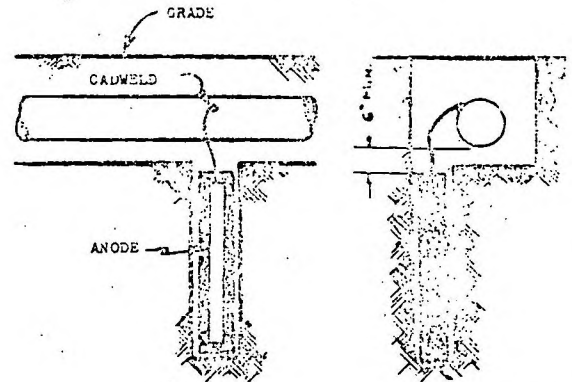
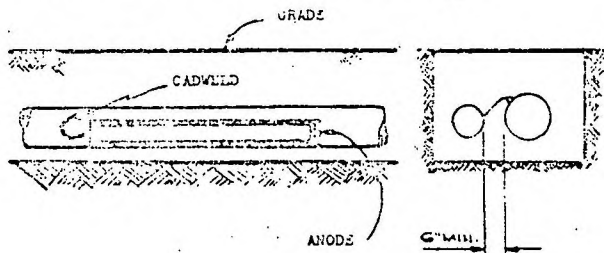


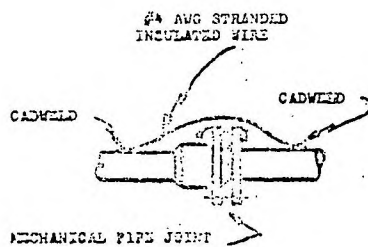
Fig. 14 Recommended Depth of Cover in Feet for Freeze Protection

INSTALLATION OF CATHODIC PROTECTION ANODES

B.1 Anode Placement The Plant Materials Engineering and Inspection Department shall determine the required number of anodes to be used and specify the locations for installation. After completion of work inform the department of any necessary deviations and furnish the department with a marked revised drawing or information for correction of plant records.

HORIZONTAL INSTALLATIONVERTICAL INSTALLATION

B.2 Electrical Bonding of Mechanical Pipe Joints All cathodically protected underground pipe joints shall be electrically bonded using the following method and materials.

CADWELD WIRE CONNECTIONS

TO CAST IRON (HORIZONTAL)

WIRE SIZE#12 SOLID
#4 SOLID
#4 STRANDEDMOLDHBA-1C
HBA-1K-4
HBA-1L-4CARTRIDGE(XP-19) #25*
(XP-19) #45
(XP-19) #25

TO STEEL (HORIZONTAL)

#12 SOLID
#4 SOLID
#4 STRANDEDM-108 PLAT
M-109 PLAT
M-109-S PLAT#15*
#15
#15

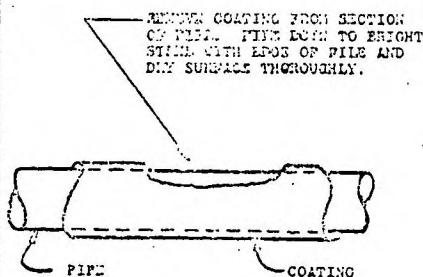
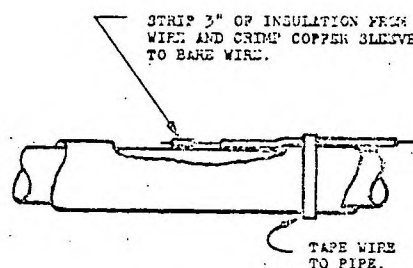
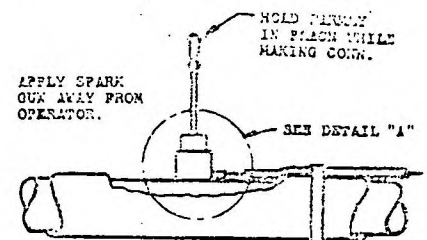
TO STEEL (VERTICAL)

#4 STRANDED

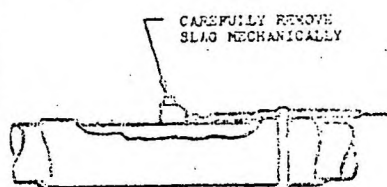
MB-117-S

#25

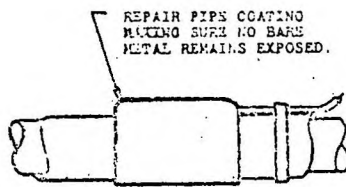
*USE ADAPTER SLEEVE #26180

B.3 Procedure for Making Typical Cadweld Connections (5 Steps)STEP 1STEP 2STEP 3

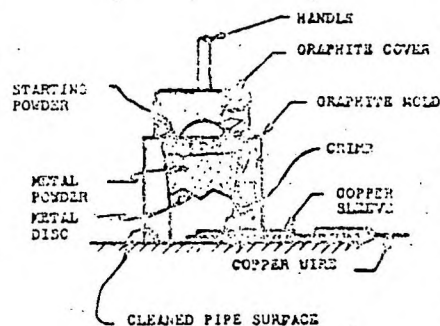
APPENDIX B (cont'd.)



STEP 4



STEP 5

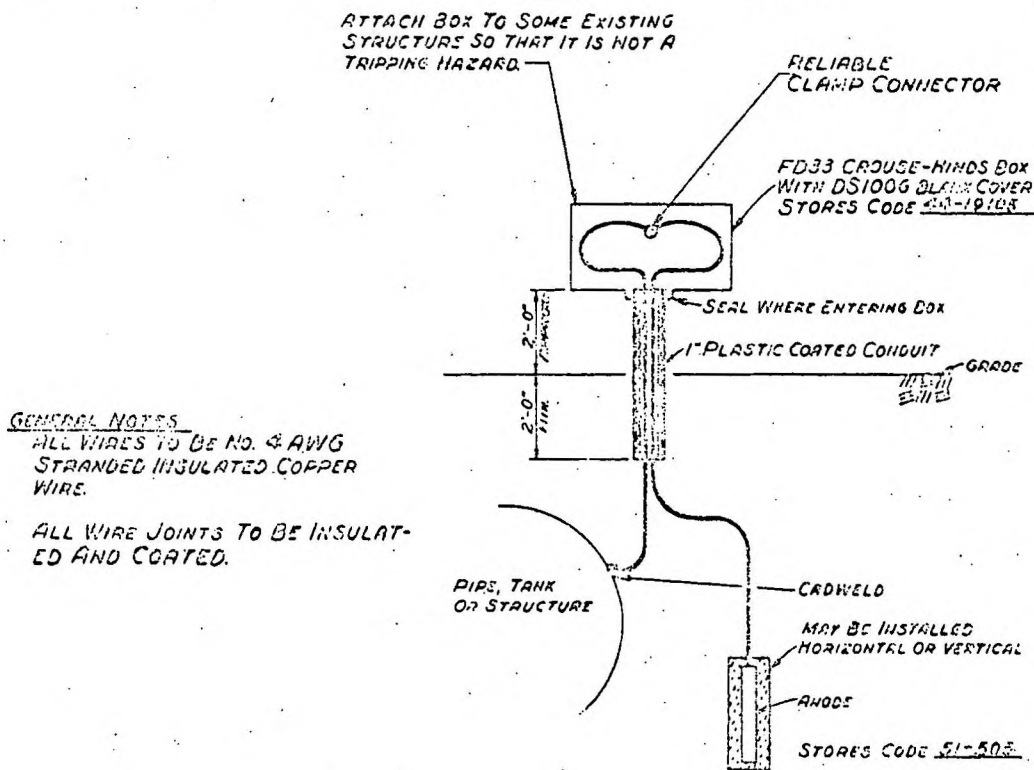


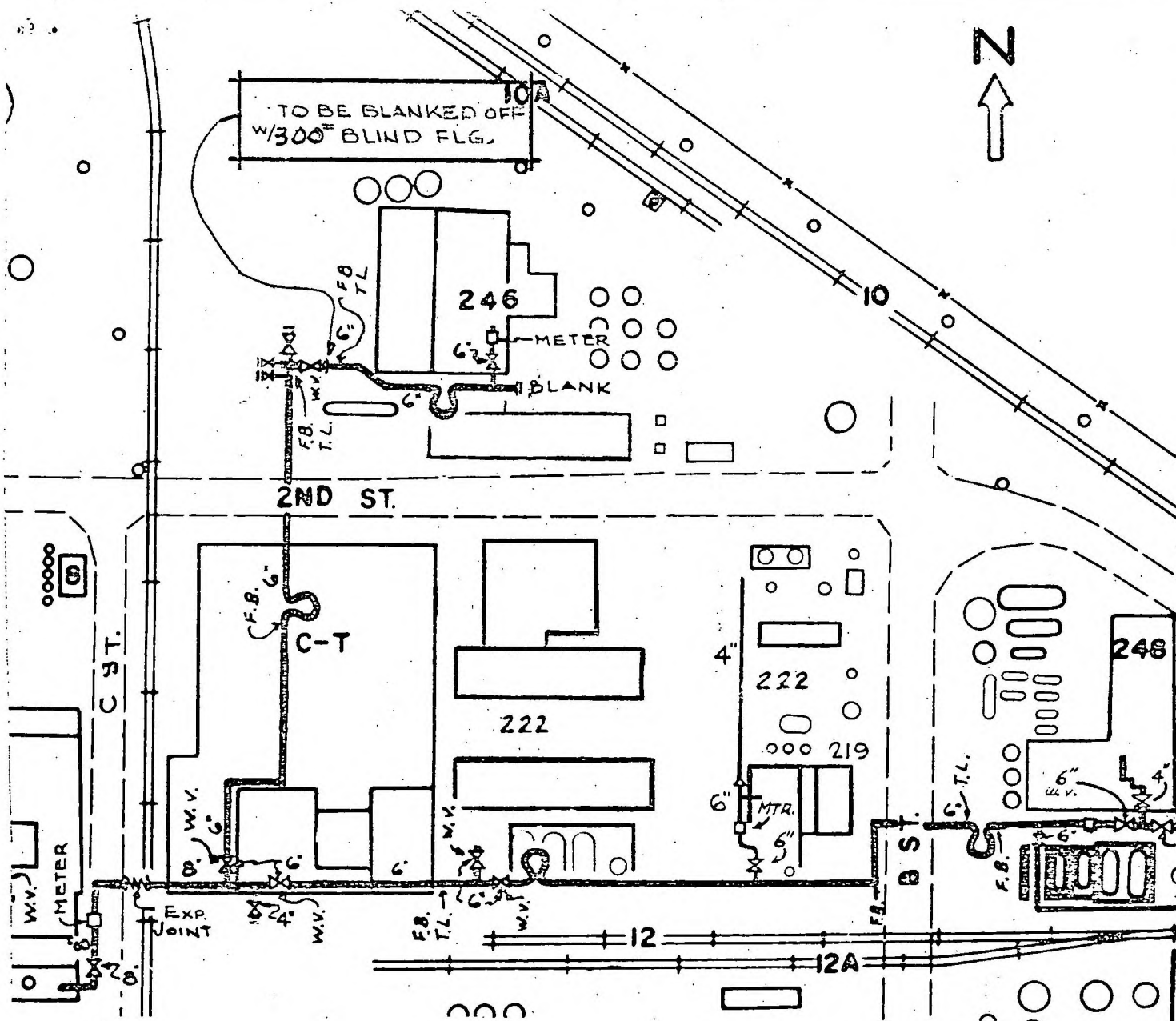
DETAIL "A"

APPENDIX C

INSTALLATION OF TEST STATION ON CATHODIC PROTECTION SYSTEMS

C.1 The Plant Materials Engineering and Inspection Department shall determine the required number of Test Stations to be installed and specify their locations. When specified they shall be installed as shown below.





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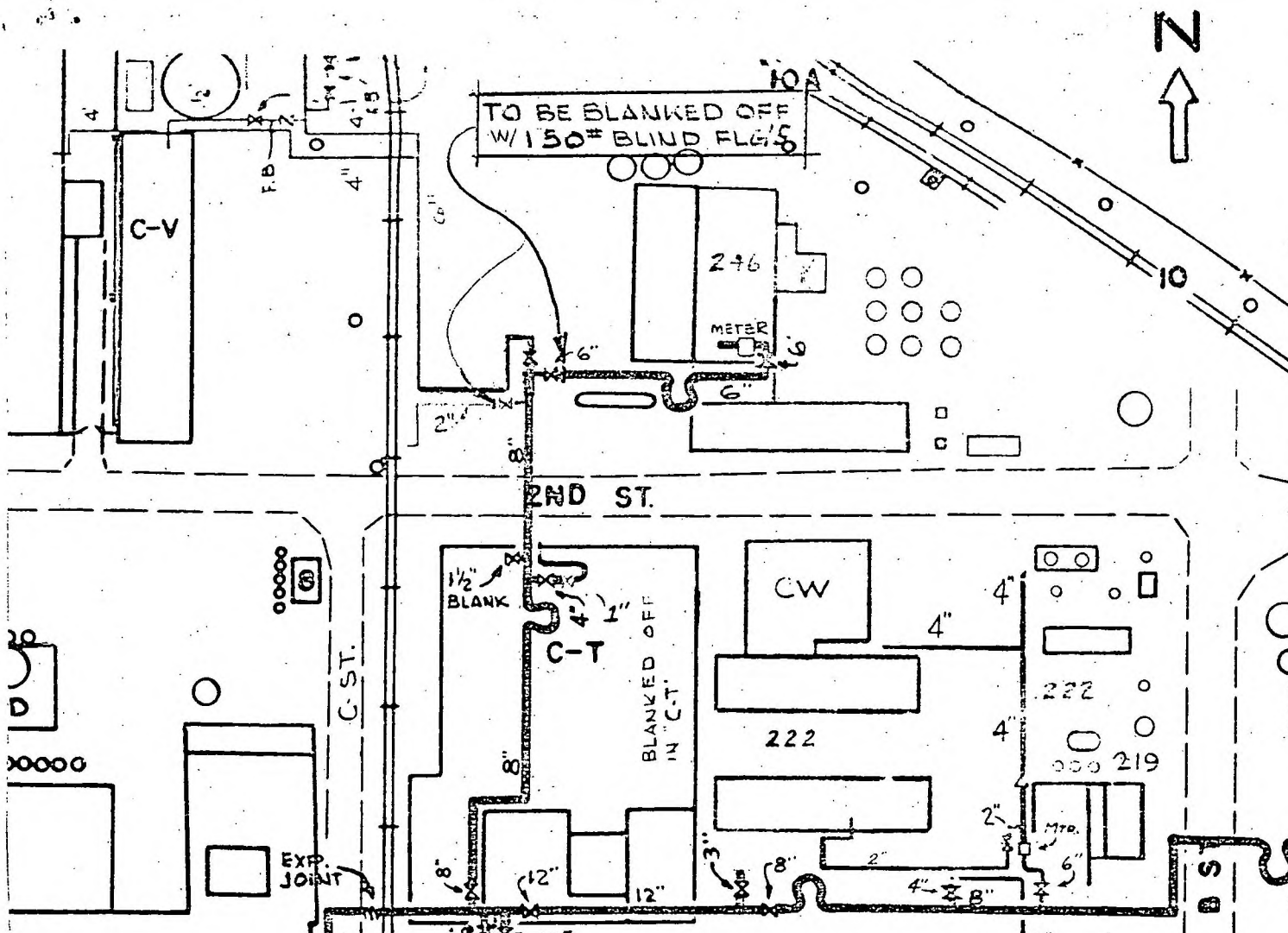
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TITLE

**200# STEAM
SERVICE CUT OFF TO
DEPT. 246**

	BY	DATE		BY	DATE
DRAWN	D. McCoy	8/19/77	APPD.		
CKD.			APPD.		
DSGN.			APPD.		
APPD.					

SCALE	JOB. NO.	EST. NO.
DEPT. No.	IDENTITY	DRAWING NUMBER
246		SK-2535-1
		REV.



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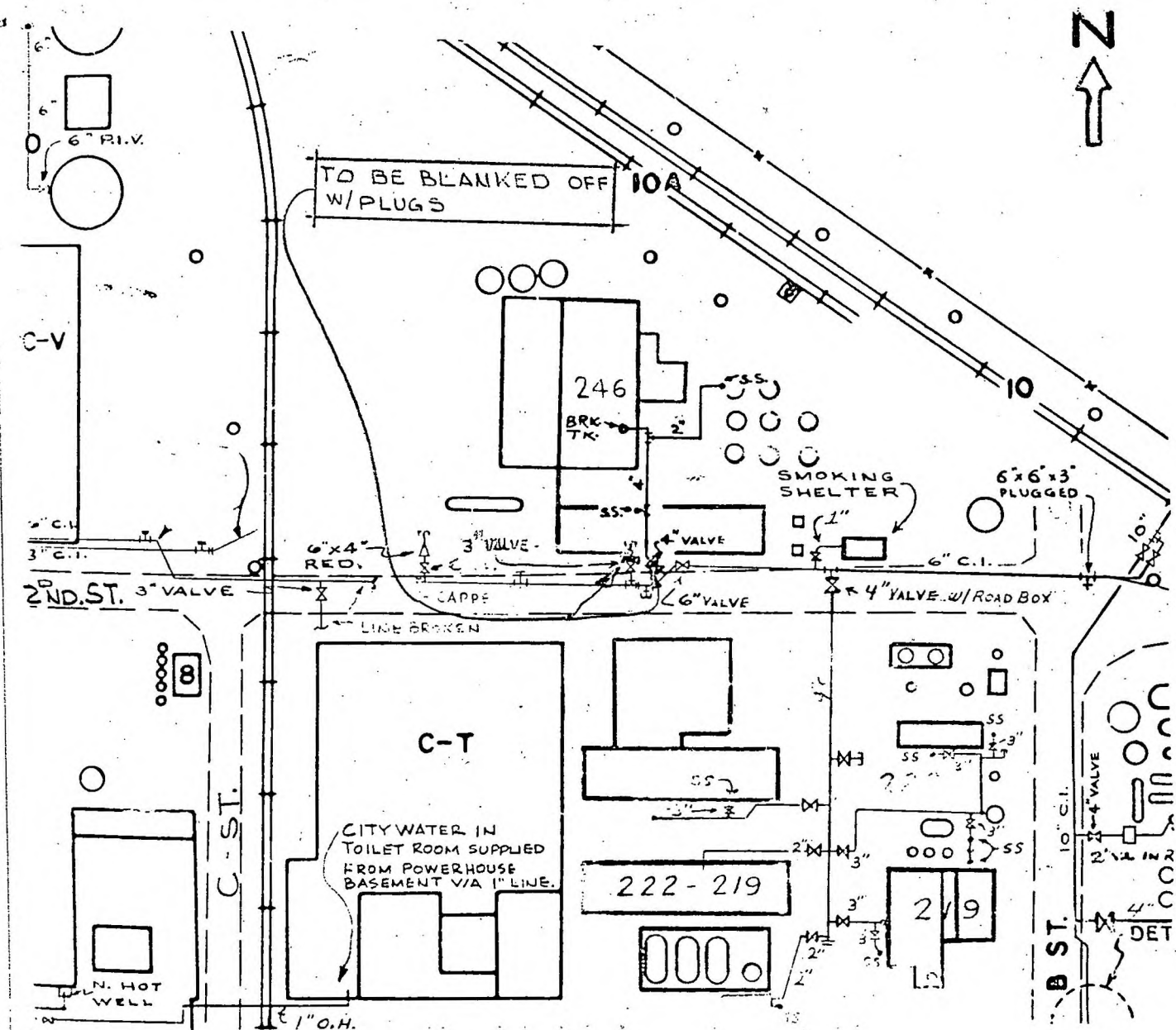
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TITLE

300° STEAM
SERVICE CUT OFF TO
DEPT. 246

	BY	DATE		BY	DATE
DRAWN	D. MCCOY	8/19/77	APPD.		
CKD.			APPD.		
DSGN.			APPD.		
APPD.					

SCALE	JOB. NO.	EST. NO.
DEPT. No. 246	IDENTITY	DRAWING NUMBER SK-2535-2
		REV.



NOTE:

WATER MAIN LOCATED MIN. 4' BELOW GRADE

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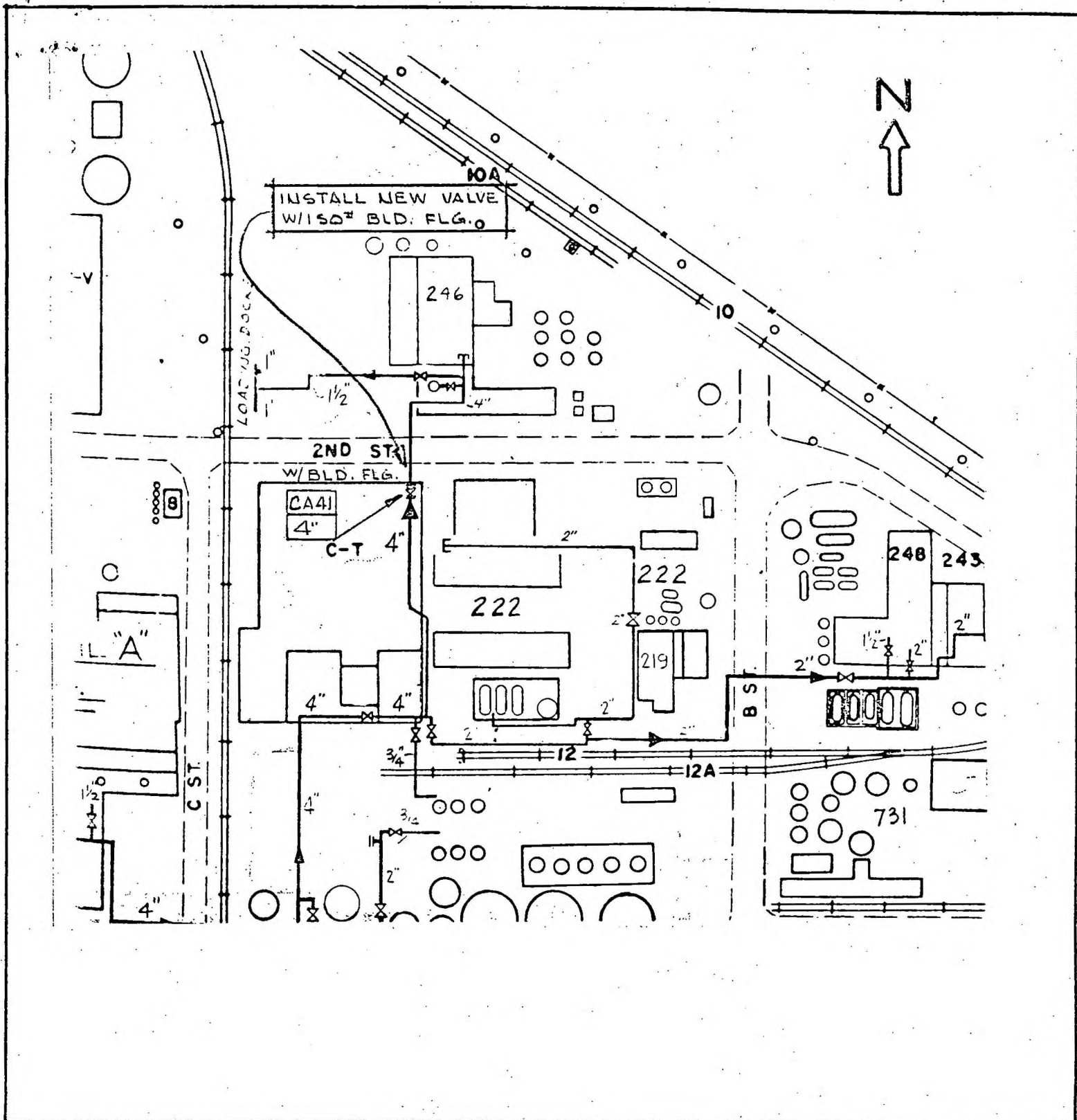
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TITLE
**CITY WATER
SERVICE CUT OFF TO
DEPT. 246**

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	BY	DATE		BY	DATE
DRAWN	D. M. CLOY	8/19/77	APPD.		
CKD.			APPD.		
DSGN.			APPD.		
APPD.					

SCALE	JOB. NO.	EST. NO. 2535
DEPT. NO. 246	IDENTITY	DRAWING NUMBER SK-2535-4
		REV.



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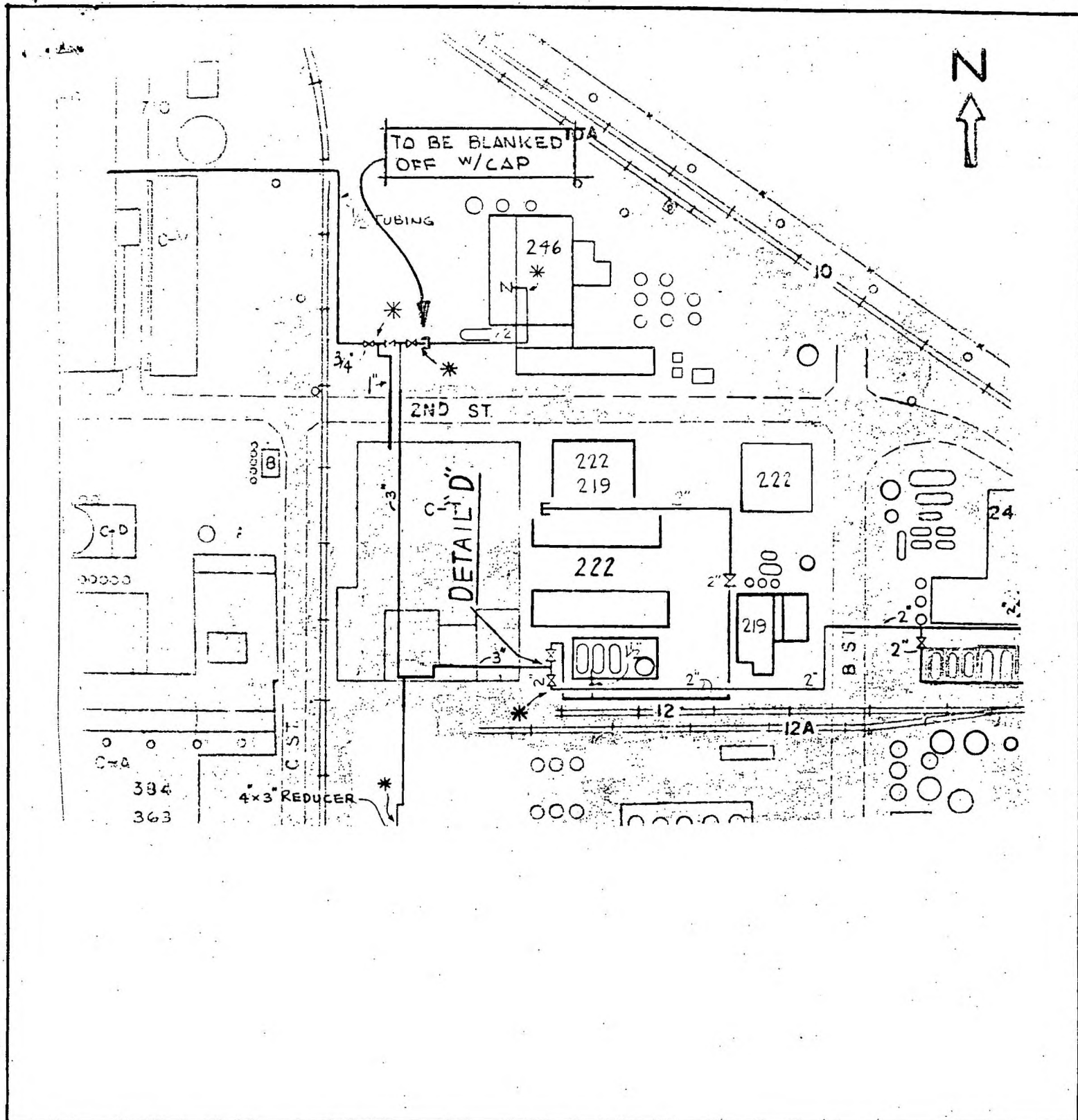
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TITLE

PLANT AIR
SERVICE CUT OFF TO
DEPT. 246

	BY	DATE		BY	DATE
DRAWN	D. McCLOY	8/19/77	APPD.		
CKD.			APPD.		
DSGN. APPD.			APPD.		

SCALE		JOB. NO.	EST. NO. 2535
DEPT. No. 246	IDENTITY	DRAWING NUMBER SK-2535-6	
		REV.	



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W. G. KRUMMRICH PLANT SAUGET, ILL.

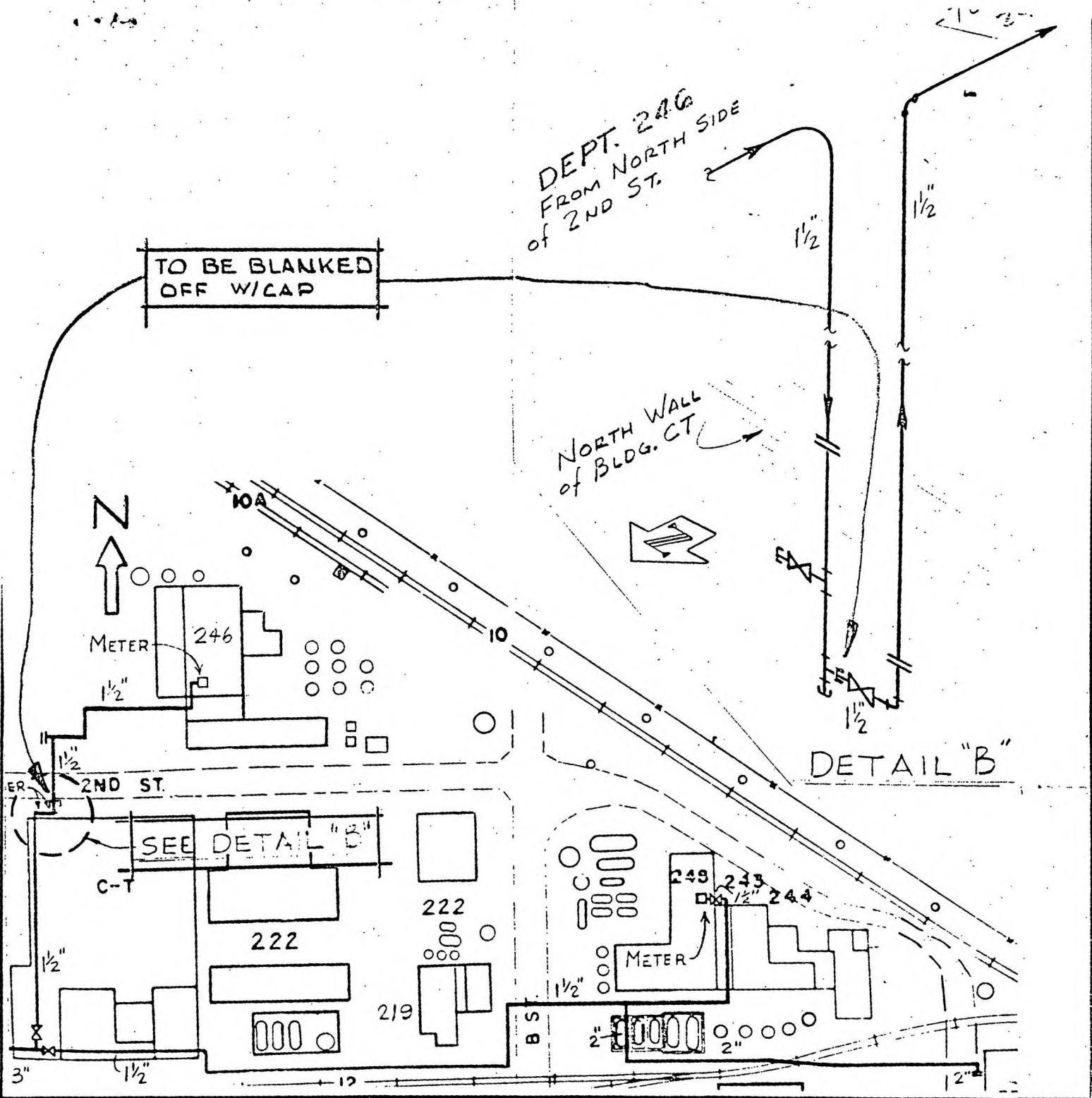
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TITLE
**INSTRUMENT AIR
SERVICE CUT OFF TO
DEPT. 246**

	BY	DATE		BY	DATE
DRAWN	D. McLOY	8/19/77	APPD.		
CKD.			APPD.		
DSGN.			APPD.		
APPD.					

SCALE	JOB. NO.	EST. NO.
246		2535
DEPT. No.	IDENTITY	DRAWING NUMBER
246		SK-2535-7
		REV.



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TITLE

**NATURAL GAS
SERVICE CUT OFF TO
DEPT. 246**

SCALE

DEPT. NO. 246

IDENTITY

JOB. NO.

EST. NO.

2535

DRAWING NUMBER

SK-2535-B

REV

	BY	DATE	APPD.	BY	DATE
DRAWN	D. McCLOY	8/17/77	APPD.		
CKD.			APPD.		
DSGN. APPD.			APPD.		