

PRELIMINARY REPORT

RANCHO SECO

PIPING VIBRATION

TDI DIESELS A & B

BY

DUKE ENGINEERING AND SERVICES
CHARLOTTE, N.C.

PURPOSE

The purpose of this calculation is to document the verification process that has been used to determine the structural adequacy of certain piping systems for the vibration environment sustained. These systems, identified below, are support systems for the two TDI diesel generators installed at the Rancho Seco Nuclear Power Plant in the Sacramento Municipal Utilities District, Sacramento, California.

SCOPE

The scope of piping included in this document are listed in Tables 1A and 1B by system and isometric drawing number.

VIBRATION MEASUREMENT PROCESS

METHOD - Vibration was measured using handheld vibration meters by scanning the piping in all directions with a velocity transducer. Vibration levels were recorded at the locations noted on the isometrics included in this report. (Figures A1 thru A41 and B1 thru B41) In addition, vibration data to be used as input to computer analysis of running deflection shapes was collected with hand held or magnet held accelerometers at pre-determined points on the pipe and anchor points. All data was collected while the engine was running at rated power (3000 KW).

INSTRUMENTATION - The instruments used for measuring vibration are shown in Appendix I. Calibration certification is also given in the appendix.

PARAMETERS MEASURED - Measurements were made in velocity for all piping qualified by velocity criteria. For piping qualified by computer analysis using operating deflection data, measurements were made in acceleration and double integrated by hand to get spectral displacement. The frequency range of interest for all measurements was 10-1000 Hz.

VIBRATION ACCEPTANCE CRITERIA

The vibration acceptance criteria is in accordance with "Requirements for Preoperational and Initial Start-up Vibration Testing of Nuclear Power Plant Piping Systems, ANSI/ASME OM3-1982"

METHODS OF QUALIFICATION

The basic method of qualification was the velocity method as per paragraph 5.1.2 of OM-3. There was some, but very limited, use of the displacement method as per paragraph 5.1.1. In the most complicated system, jacket water return, qualification was done by detailed stress analysis using SUPERPIPE, Version 22C, 1/30/87 computer code. Measured operating spectral peak response of the system was used to obtain displacement input for the computer model. Stresses were calculated for the operating shape for each significant spectral response frequency. At the maximum stress points for each of these operating shapes, the stresses caused by all significant operating shapes were vectorally combined with respect to the local coordinate system of the pipe. With respect to phase, the components were assumed to be in-phase. Stress allowables were in accordance with OM-3 (82) and C2K2 values were taken from ASME III

RESULTS

The results of velocity measurements are shown in Table 2A for the "A" diesel and in Table 2B for the "B" diesel. These tables also show the C2K2 values used in the calculation of the allowable velocities in accordance with OM-3 criteria. The criteria and measurement results for the turbocharger are presented in Table 3. The piping locations where OM-3 vibration criteria are not met are identified in the tables.

STRUCTURAL MODIFICATIONS

Several structural modifications were made in order to reduce the vibration to acceptable levels. The need for these modifications was determined by measuring vibrations, by evaluating previous failures and/or by modal analysis. These modifications are described below.

TURBOCHARGER SUPPORT - An E-W/vertical support/restraint was added on the west side in the form of a strut pinned at both ends. The strut attaches to the turbocharger support frame at the upper end and to structural steel framing at the lower end. The framing was added by tying into existing structural support steel. The need for the strut was determined from running vibration measurements, modal analysis and operating deflection shape analysis. The natural frequency of the existing system was 32 hz. The primary forcing frequency from the engine is 30 hz. Present vibration level is shown in Table 3.

EXHAUST MANIFOLD SHROUD - An exoskeleton structure was added to the shroud to stiffen and strengthen the shroud structure. Modal and operating deflection shape analysis revealed that the 4" jacket water header which was supported by the shroud was moving excessively. The header supports consisted of pipe clamps bolted to thick plates welded to the 3/16" thick shroud skin. The flexibility of this arrangement combined with the high energy loading from the engine had resulted in fatigue failure of the shroud skin at the support plate interface. With the addition of the exoskeleton structure, the header supports were moved away from the skin and connected to the added structure. All bolted joints in the shroud supports were shimmed where necessary to obtain interface contact prior to torquing of bolting.

LUBE OIL RETURN TO PRESSURE CONTROL VALVE - This piping had experienced a history of very high vibration and at least one fatigue failure. In addition to external piping vibration measurements, pressure pulsations were measured with dynamic pressure transducers. This revealed pressure spikes on the order of 300 psi P-P on top of a static pressure of 92 psi. This ~~extreme~~ pressure pulsation condition, combined with the existence of seven elbows in the system, and further combined with structural resonance with the fundamental forcing frequency of the pump, created a vibration response unmanageable with restraints. The system design went through many iterations to de-tune the resonance condition and to reduce the pressure pulsations in the line. Eventually, the pressure pulsations were reduced drastically with the use of an in-line expansion tank at the exit of the pump. The vibration on the line was reduced to levels that are acceptable by the OM-3 velocity criteria. However, on subsequent runs of the "A" engine, the pressure pulses increased suddenly and drastically and could not be controlled through adjustment of the pressure control valve. Similar excursions of pressure have occurred also on "B" engine. However, adjustment of the pressure control valve on each occasion has reduced the vibration to acceptable levels. Based on the OM-3 velocity criteria, the vibration level on this system on both A and B units during these times of pressure pulse excursion was unacceptable. However, if the "B" engine excursions continue to be correctable by control valve adjustments, the resulting vibration levels are acceptable. The resolution of this problem has been reassigned to others.

JACKET WATER RETURN LINE

The modifications to the exhaust shroud also included modifications to the supports to the 4" header on this line. (See Exhaust Manifold Shroud) Additionally, a vertical support at the juncture of the 4" header with the 6" header was re-located and re-designed. A vertical support on the 1½" return line from the exhaust shroud was also added. This support is supplied by the 6" header at the 6" header support location. The entire piping configuration in this general area was changed by SMUD simultaneous with the addition of the shroud exoskeleton. Other support/restraints have been removed from the lines coming from the turbocharger and one support/restraint has been re-designed to provide only N-S restraint on these small lines. All of these modifications have been made to reduce the vibrations from resonance with engine produced excitation. This piping was analyzed using operating displacements. Based on this analysis, B engine met the requirements of OM-3 (82). Certain portions of the small piping on A engine do not meet the requirements of OM-3. SMUD has decided to replace this piping with stainless steel piping which has higher endurance limits. In addition, the connection of this piping to the shroud will be evaluated by strain gaging and/or detailed stress analysis by others.

TURBOCHARGER LUBE OIL SUPPLY LINE (½")

A restraint was added to this line to reduce vibration. The problem was discovered when the threaded (NPT) connection to the turbocharger housing started leaking during a run. The pipe was replaced. It was observed that the thread engagement on this connection was only 3/8". From the standpoint of "good design practice" in a high vibration environment, this appears to be inadequate. The vibration was acceptable after the restraint was installed.

CHEMICAL ADDITION TANK INLET PIPING

A restraint was added to this line on the B engine to de-tune the line away from a resonant condition. The initial velocity level was 7 IPS-PK. The vibration level is now 2 IPS-PK.

COMBUSTION AIR INTERCOOLER AND WALKWAY PLATFORM

The intercooler is mounted on the east side of the engine with five upper brackets and two lower brackets. The walkway platform was initially supported by the intercooler and, thus, the intercooler support brackets. Inspection of these joints revealed that the joints were not tight. After re-lubricating the bolts and re-torquing to TDI specifications, the joints still had gaps. On the "A" diesel, a shim 0.2" thick machined with compound angles was required to properly shim the lower bracket before torquing the bolts. On the "B" engine, three broken bolts were found during the re-torquing process. None of these bolts were broken by the retorquing process. All of these bolts on the "B" engine were replaced. Before the bolts were removed for re-torquing, they were torqued to the TDI specified torque in order to assure structural integrity before beginning work. One of the broken bolts was actually torqued to specification even though it was already completely severed. This was possible because it failed at an angle, leaving several partial threads intact inside the threaded hole in the engine. This shows that simply torquing bolts without removing them first is inconclusive with regard to structural integrity. By unmagnified visual examination, we conclude that these bolts failed in fatigue resulting from vibration loading on the non-preloaded joint. The combination of non-parallel bracket joint surfaces and insufficient bolt pre-load allows the vibration load on the joint to result in cyclic strain on the bolts sufficient to result in fatigue failure.

FUEL OIL LINE TO SUPPLY HEADER

Restraints were added to this line. In addition, rubber inserts were added in the restraints for energy absorption. Initial vibration was 16-18 IPS-PK. Present vibration level in active areas is 6-8 IPS-PK which is considered acceptable by OM-3 criteria.

STARTING AIR PIPING - GENERATOR END

An existing restraint was modified to increase stiffness and thereby detune resonance with engine excitation. Initial vibration level was 7 IPS-PK. Present vibration level is 4.2 to 4.5 IPS-PK which is acceptable by OM-3 criteria.

TURBOCHARGER LUBE OIL RETURN LINE

Because of a previous piping failure at the turbocharger connection, the piping was redesigned to obtain flexibility in the vertical direction. An expansion loop was added in the middle of the span and the loop was restrained laterally by connecting the loop to the combustion air line. The major vibration source became the combustion air line as a result of this tie-in. The pipe was analyzed (See Appendix II) according to the deflection criteria and was acceptable.

CONCLUSIONS

The following piping, as it is now constructed, does not meet the requirements of OM-3 (82).

1. Jacket Water Return Line - A Engine

REASON: Small piping from exhaust shroud and turbocharger does not meet stress criteria based on computer analysis. Stress at highest point is 20,680 PSI vs 10,000 PSI allowed by OM-3 (82). However, SMUD has issued design documents to replace this piping with stainless steel which will meet OM-3 (82) requirements.

2. Fuel Oil Tubing (1") from pump to filter

REASON: OM-3 (82) Velocity Criteria is exceeded.

Velocity is 9 IPS-PK vs 7.9 IPS-PK allowed by OM-3 (82) Criteria. SMUD has issued support designs to reduce these levels to acceptable limits.

The following piping is not included in this report because the evaluation of this piping was reassigned to Engineering Dynamics, Inc..

Lube Oil Discharge Piping to Pressure Control Valve and to Lube Oil Cooler - Unit A

All other piping included in the scope of this document has been evaluated for vibration response at 3000 MW load, and is considered to be operable in the vibration environment measured.

SUPPORTING CALCULATIONS

Calculations supporting vibration evaluation are included in Appendix II.

OVERALL ASSESSMENT OF VIBRATION PROBLEMS

The major sources of piping excitation are

1. Engine
2. Lube Oil Pump

The derivation of excitation frequencies is as follows:

1. Engine

Speed	450 RPM
	7.5 hz
Firing frequency (single)	3.75 hz
(composite)	30.0 hz
Harmonics - Multiples of	3.75 hz
Side bands - Multiples of	3.75 hz

OVERALL ASSESSMENT OF VIBRATION PROBLEMS (Continued)

2. Lube Oil Gear Pump

Speed	612 RPM
	10.2 hz
Lobe pass frequency	61.2 hz
Harmonics - Multiples of	61.2 hz

The lateral engine vibration is over 2 IPS-PK at the top of both engines and the major engine-generated frequency is 30 hz. In the jacket water return piping on "A" engine, 18.75 hz (5th order of firing frequency) has a major effect also. In addition, the engine spectra includes all harmonics of 3.75 hz to 100 hz. With this close spacing of excitation frequencies, it is quite evident that de-tuning of resonances would be almost impossible.

Performed by W. H. Scheffler 2-11-88
for V. G. Arzani

*Approved by W. H. Scheffler 2-11-88
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* The final report and approval is withheld pending receipt of final as-built drawings, and the verification of analysis validity in accordance with these drawings.

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TABLE 1A
PIPING ISOMETRICS

TDI DIESEL - A

Jacket Water System

<u>Drawing No.</u>	<u>Rev.</u>	<u>DCN</u>
10019-4-XX-1	0	OA
10019-6-HC-1	0	OA
10019-2½-HC-1	0	OC
10019-6-XX-1	0	OB
10019-2-HC-1	0	OC
10209-6-XX-1	0	OA
10209-5-XX-1	0	OA
10209-2-XX-1	0	0
10403-6-XX-1	0	0
10405-6-XX-1	0	0
10409-2½-XX-1	0	0
10411-2-XX-1	0	0
10413-8-XX-1	0	0
10503-2-XX-1	0	0
66003-2½-XX-1	0	OA

Lube Oil System

<u>Drawing No.</u>	<u>Rev.</u>	<u>DCN</u>
10013-3-XX-1	0	0
10023-1½-XX-1	-	OA
10205-2½-XX-1	0	0
10207-5-XX-1	0	0
10207-4-XX-1	0	OD
10207-4-XX-1A	0	0
10211-4-XX-1	0	0
10211-4-XX-2	0	0
10211-4-XX-3	0	0
10211-4-XX-4	0	0
10211-1½-XX-1	0	OA
10211-3/4-XX-1	0	OA
10219-8-XX-1	0	0
10301-2½-XX-1	0	0
10303-2-XX-1	0	0
10303-2-XX-2	0	0
10303-2-XX-3	0	0
10303-½-XX-1	0	0

TABLE 1A (Continued)

PIPING ISOMETRICS

TDI DIESEL - A

Fuel Oil System

10011-1-XX-1	0	OA
10011-2-XX-1	0	OA
10011-1 $\frac{1}{2}$ -XX-1	0	0
10017-1 $\frac{1}{2}$ -XX-1	0	0
10027-1-XX-1	0	OA

Combustion Air System

10019-14-XX-1	0	0
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Starting Air System

10111-3-XX-1	0	OA
10111-3-XX-2	0	OA
10117-3-XX-1	0	OA

TABLE 1B
PIPING ISOMETRICS

TDI DIESEL - B

Jacket Water System

<u>Drawing No.</u>	<u>Rev.</u>	<u>DCN</u>
10018-4-XX-1	0	0A
10018-6-HC-1	0	0A
10018-6-XX-1	0	0C
10018-2½-HC-1	0	0C
10018-2-HC-1	0	0D
10208-6-XX-1	0	0A
10208-5-XX-1	0	0A
10208-2-XX-1	0	0
10402-6-XX-1	0	0
10404-6-XX-1	0	0
10408-2½-XX-1	0	0
10410-2-XX-1	0	0
10412-8-XX-1	0	0
10502-2-XX-1	0	0
66002-2½-XX-1	0	0

Lube Oil System

<u>Drawing No.</u>	<u>Rev.</u>	<u>DCN</u>
10012-3-XX-1	0	0B
10022-1½-XX-1	-	0A
10204-2½-XX-1	0	0
10206-5-XX-1	0	0
10206-4-XX-1	0	0D
10206-4-XX-1A	0	0
10210-4-XX-1	0	0
10210-4-XX-2	0	0
10210-4-XX-3	0	0
10210-4-XX-4	0	0
10210-1½-XX-1	0	0A
10210-3/4-XX-1	0	0
10218-8-XX-1	0	0
10300-2½-XX-1	0	0
10302-2-XX-1	0	0
10302-2-XX-2	0	0
10302-2-XX-3	0	0
10302-½-XX-1	0	0

TABLE 1B (Continued)

PIPING ISOMETRICS

TDI DIESEL- 8

Fuel Oil System

<u>Drawing No.</u>	<u>Rev.</u>	<u>DCN</u>
10010-1-XX-1	0	OA
10010-2-XX-1	0	OA
10010-1 $\frac{1}{2}$ -XX-1	0	0
10016-1 $\frac{1}{2}$ -XX-1	0	0
10026-1-XX-1	0	OA

Combustion and Starting Air System

<u>Drawing No.</u>	<u>Rev.</u>	<u>DCN</u>
10018-14-XX-1	0	0
10110-3-XX-1	0	OA
10110-3-XX-2	0	OA
10116-3-XX-1	0	OA

TABLE - 2A

Dev./Station _____ Unit _____ File No. _____
 Subject DIESEL - A PIPING VIBRATION - VELOCITY
ACCEPTANCE CRITERIA / MEASUREMENTS By _____ Date _____
 Sheet No. 1 of 16 Problem No. _____ Checked By _____ Date _____
JACKET WATER SYSTEM

SYSTEM / PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
JACKET WATER SUPPLY					N/A	
10413-8"-XX-SH.1	8"	1	5.0	3.8		0.35
		2				0.8
		3				0.8
10403-6"-XX-SH.1		PUMP				1.1
	6"	5	5.0	4.0		1.1
		6				1.1
		7				2.1
		8				1.9
		9				0.5
10405-6"-XX-SH.1	6"	10	5.0	4.0		0.85
		11				1.2
		12				0.4
		13				0.4
		14				0.24

Dev./Station

Unit File No.

Subject

DIESEL A
JACKET WATER SYSTEM

By

Date

Sheet No. 2 of 16 Problem No.

Checked By

Date

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
10209-6"-XX-SH.1	6"	15	5.0	4.0	N/A	0.7
		16				0.8
		17				1.4
	4"	18		4.1		2.0
	6"	19		4.0		1.2
	4"	20		4.1		2.2
	5"	21		4.0		2.1
10209-5"-XX-SH.1	5"	22	5.0	4.0		1.1
		23				2.2
		24				2.0
	1½"	25	4.6	4.8		3.8
		26		4.8		4.5
	5"	27	5.0	4.0		2.2
		28				1.9
		29				1.5

Dev./Station

Unit

File No.

Subject

DIESEL A
JACKET WATER SYSTEM

By

Date

Sheet No. 3 of

Problem No.

Checked By

Date

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C_2K_2	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
10209-2"-XX-SH.1	2"	30	5.0	4.3	N/A	2.8
	1 1/2"	31	|	|		3.5
	|	32	|	|		1.8
JACKET WATER ST. PIPE OVERFLOW						
10409-2 1/2"-XX-SH.1	2 1/2"	1	5	4.4		0.21
	|	2	|	|		0.3
	|	3	|	|		0.3
	|	4	|	|		0.45
	|	5	|	|		0.7
JACKET WATER KEEP WARM						
10411-2"-XX-SH.1	2"	6	5	4.3		0.4
	|	7	|	|		0.42
	3/4"	8	|	4.6		0.45
	2"	9	|	4.3		0.35
	PUMP	10	|	|		0.2

Dev./Station

Unit

File No.

Subject

DIESEL A

JACKET WATER SYSTEM

By

Date

Sheet No.

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of

16

Problem No.

Checked By

Date

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
10503-2"-XX-SH.1	3/4"	11	5	4.6	N/A	1.0
	1 1/2"	12		4.4		0.5
	1	13		4.4		0.45
	2"	14		4.3		0.35
JACKET WATER DEMINERALIZED WATER						
66003-2 1/2"-XX-SH.1	2 1/2"	15	5	4.4		0.4
	1	16				0.4
	1	17				0.4
JACKET WATER RETURN						
	THIS PIPING WAS EVALUATED USING					
10019-6-HC-SH.1	COMPUTERIZED DISPLACEMENT ANALYSIS.					
10019-6-XX-SH.1	THIS ANALYSIS IS SHOWN IN DUKE					
10019-2 1/2"-HC-SH.1	CALCULATIONS 4086-1607.04-0004 AND					
10019-2-HC-SH.1	4086-1607.04-0017					
10019-4-XX-SH.1						

DIESEL A LUBE OIL SYSTEM

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SYSTEM/ PIPING DRAWING	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
LUBE OIL CRANK CASE VENT					N/A	
10013-3"-XX-SH.1	4"	1	5	4.1		0.5
	|	2	|	|		2.0
	|	3	|	|		2.4
	3"	4	|	4.3		2.6
		4A				3.0
		5				2.0
		6				2.4
	4"	7		4.1		1.8
	3"	8		4.3		2.2
		8A				3.5
		9				2.5
		10				1.0

DIESEL A LUBE OIL SYSTEM

[illegible]

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DIESEL A
LUBE OIL SYSTEM

SYSTEM/ PIPING DRAWING	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
10303-2"-XX-SH.1	1½"	9	5	4.4	N/A	0.4
	1"	10				1.0
	2"	11		4.3		0.3
	1"	12				0.35
	1"	13				0.8
10303-2"-XX-SH.2	2"	14	5	4.3		0.6
	1"	15				1.8
	1"	16				1.8
	1"	17				1.4
	1"	18				1.2
10303-2"-XX-SH.3	2½"	19	5	4.4		1.5
	2"	20		4.3		2.4
	1"	21				4.0
	1"	22				3.5

DIESEL. A
LUBE OIL SYSTEM

[illegible]

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DIESEL A
LUBE OIL SYSTEM

SYSTEM/ PIPING DRAWING	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
LUBE OIL SUPPLY (CONTINUED)					N/A	
10211-4"XX-SH.1	6"	25	5	4.0		0.4
	|	26	|	|		0.5
	4"	27		4.2		0.6
		28				0.5
		29				0.25
		30				0.14
10211-4"XX-SH.2	4"	31	5	4.2		0.12
		32				0.3
		33				0.7
		34				0.5
		35				0.55
		36				0.7

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DIESEL A

LUBE OIL SYSTEM

SYSTEM/ PIPING DRAWING	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
10211-4"-XX-SH.3	4"	37	5	4.2	N/A	0.7
		38				1.2
		39				1.2
		40				1.0
10211-4"-XX-SH.4	4"	41	5	4.2		1.6
		42				2.2
		43				2.5
		44				2.5
		45				2.0
LUBE OIL TURBO SUPPLY						
10211-1 1/4"-XX-SH.1	1 1/4"	46	5	4.5		3.5 R
		47				3.5
		48				2.2
R - RELATIVE VELOCITY W.R.T. "ANCHOR PT." (43). MODE SHAPE CONFIRMED BY PROFILE INVESTIGATION.						

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DIESEL A LUBE OIL SYSTEM

SYSTEM/ PIPING DRAWING	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
LUBE OIL ROCKER ARM SUPPLY					N/A	
10211- $\frac{3}{4}$ "-XX-SH. 1	$\frac{3}{4}$ " TUBE	49	3.0	6.9 ⁽¹⁾		4.0
		50				5.0
		51				4.5
	1"	52	5.0	4.6		2.4
		53				2.4
		54				2.6
		55		8.7 ⁽²⁾		4.0
LUBE OIL TO TURBO ($\frac{1}{2}$ ")						
10303- $\frac{1}{2}$ "-XX-SH. 1	$\frac{1}{2}$ "	56	4.6	5.2		4.5
(1) WET/DRY WEIGHT RATIO = 1.5 USED FOR TUBING						
(2) C ₄ = 1.33 INSTEAD OF 0.7						

DIESEL A

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FUEL OIL SYSTEM

SYSTEM/ PIPING DRAWING	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
FUEL OIL 10011-1 1/2"-XX-SH. 1	1 1/2"	1	5	4.4	N/A	0.6
		2				1.5
		3				2.0
		4		8.4 ⁽¹⁾		4.0
	1" TUBE	5	2.6	7.9		6.5
		6				4.5
		7				3.0
10027-1"-XX-SH. 1	1" TUBE	9	2.6	7.9		3.5
		10				7.0
		11				9.0 *
		12				6.0
		12A				7.0
		13				6.0
		14				1.2

(1) C₄ = 1.33 for CANTILEVER

(*) Tubing is to be supported to reduce vibration.

DIESEL A FUEL OIL SYSTEM

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SYSTEM/ PIPING DRAWING	PIPE SIZE	POINT NO.	C_2K_2	Vel. Allowed		MEASURED $\frac{IN}{SEC} - PK$
				OM-3	DUKE	
10011-1"-XX-SH.1	1" TUBE	15	2.6	7.9		1.2
		16	2.0 ⁽¹⁾	10.3		8.0
		16A	2.0 ⁽¹⁾	10.3		8.0
		16B	2.6	7.9		6.0
		16C		|		4.5
		17				4.0
		18				6.0
		18A				7.0
		19				4.0
		20				4.5

(1) $C_2K_2 = 2.0$ is used for out-of-plane bending of 3-D bend.

NOTED: a) MAX. NOMINAL STRESS IS AT COMPRESSION FITTING
w/ $C_2K_2 = 1.0$

b) Magnet did not hold \Rightarrow stainless steel tubing
(carbon steel allowable conservatively used)

Sh. 14 of 16

(1) $C_4 = 1.33$	FOR CANTILEVERED END OF 2" HEADER
(2) $C_4 = 1.0$	FOR Z-LEV / OUT-OF-PLANE

DIESEL A

Sh. 15 of 16 COMBUSTION AND STARTING AIR

SYSTEM/ PIPING DRAWING	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
COMBUSTION AIR					N/A	
10019-14"-XX-SH.1	12"	1	5	5.0		2.6
	14"	2	|	|		2.4
	|	3	|	|		2.5
	|	4	|	|		2.0
	|	5	|	|		1.8
	|	6	|	|		2.0
	|	7	|	|		1.6
STARTING AIR						
10117-3"-XX-SH.1	3"	1	5	5.0		1.2
	|	2	|	|		4.5
	|	3	|	|		3.5
	|	4	|	|		3.2
	|	5	|	|		3.0

DIESEL A

STARTING AIR SYSTEM

Sh. 16 of 16

SYSTEM/ PIPING DRAWING	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
10111-3"-XX-SH.2	3"	6	5	5.0	N/A	1.5
		7				3.0
		8				3.0
		9				3.0
10111-3"-XX-SH.1	3"	10	5	5.0		2.6
		11				3.0
		12				2.5
		13				2.2
	1 1/2"	14				1.2
	3"	15				2.4
	1 1/2"	16				1.0
	3"	17				2.2
	1 1/2"	18				1.0
	3"	19				2.8
	1 1/2"	20				1.2
	3"	21				3.0

TABLE -2B

DIESEL-B PIPING VIBRATION - VELOCITY
ACCEPTANCE CRITERIA/MEASUREMENTS

L 17

JACKET WATER SYSTEM

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C_2K_2	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
JACKET WATER - SUPPLY					N/A	
10412-8"-XX-SH.1	8"	1	5	3.8		0.4
	|	2	|	|		1.2
	|	3	|	|		0.9
10402-6"-XX-SH1	6"	4	5	4.0		0.8
	|	5	|	|		0.8
	|	6	|	|		0.9
	|	7	|	|		1.2
	|	8	|	|		1.2
	|	9	|	|		0.6
10404-6"-XX-SH 1	6"	10	5	4.0		0.6
	|	11	|	|		0.7
	|	12	|	|		0.5
	|	12A	|	|		0.6
	|	13	|	|		0.35
	|	14	|	|		0.2

DIESEL B JACKET WATER SYSTEM

2 17

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
10208-6"-XX-SH.1	6"	15	5	4.0	N/A	0.6
(JACKET WATER SUPPLY (cont.))	|	16	|	|		0.8
	|	17	|	|		0.8
	4"	18	|	4.1		1.5
	6"	19	|	4.0		0.8
	4"	20	|	4.1		1.5
	5"	21	|	4.0		0.8
10208-5"-XX-SH.1	5"	22	5	4.0		0.8
	|	23	|	|		2.0
	|	24	|	|		1.4
	1½"	25	|	4.4		4.0
	|	26	|	|		2.4
	5"	27	|	4.0		1.2
	|	28	|	|		1.4
	|	29	|	|		1.2

DIESEL B JACKET WATER SYSTEM

3 17

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
10208-2"-XX-SH1	2"	30	5	4.3	N/A	3.5
(J.W. SUPPLY CONT.)	1 1/2"	31	|	|		3.5
	|	32	|	|		1.8
JACKET WATER ST. PIPE OVERFLOW						
10408-2 1/2"-XX-SH1	2 1/2"	1	5	4.4		0.2
	|	2	|	|		0.25
	|	3	|	|		0.22
	|	4	|	|		0.35
	|	5	|	|		0.4
JACKET WATER KEEPWARM						
10410-2"-XX-SH1	2"	6	5	4.3		0.3
	|	7	|	|		0.3
	3/4"	8	|	4.6		0.35
	2"	9	|	4.3		0.28
	|	10	|	|		0.35

DIESEL B JACKET WATER SYSTEM

4 17

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
10502-2"-XX-SH.1	3/4"	11	5	4.6	NA	0.9
(JACKET WATER KEEPWARM (CONT.))	1 1/2"	12	|	4.4		0.4
	1	13	|	4.4		0.5
	2"	14	|	4.3		0.3
JACKET WATER DEMINERALIZED WATER						
66002-2 1/2"-XX-SH1	2 1/2"	15	5	4.4		0.4
		16	|	|		0.35
		17	|	|		0.3
JACKET WATER RETURN		THIS PIPING WAS EVALUATED USING				
10018-6-HC-SH1		COMPUTERIZED DISPLACEMENT				
10018-8-XX-SH1		ANALYSIS, THIS ANALYSIS IS SHOWN				
10018-2 1/2-HC-SH1		IN DUKE CALCULATIONS 4086-1607.04-0004				
10018-2-HC-SH1		AND 4086-1607.04-0017				
10018-4-XX-SH1						

DIESEL B
LUBE OIL SYSTEM

5 17

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
LUBE OIL CRANK CASE VENT					N/A	
10012-3"-XX-SH.1	4"	1	5	4.1		0.8
	|	2	|	|		1.8
	|	3	|	|		2.2
	3"	4		4.3		2.6
	|	4A		|		3.0
	|	5		|		2.4
	|	6		|		2.4
	4"	7		4.1		2.2
	3"	8		4.3		2.6
	|	8A		|		3.2
	|	9		|		2.0
	|	10		|		0.9

DIESEL B
LUBE OIL SYSTEM
6 17

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
LUBE OIL; TURBO DRAIN					N/A	
10022-1 1/2"-XX-SW.1	1 1/2"	0	5	4.4		1.8
	|	1	|	|		4.0
	|	2	|	|		3.6
	|	2A	|	|		3.2
	|	3	4.6	4.8		4.5
	1 1/2"					
	|	4	5	4.4		3.5
	|	4A	|	|		3.0
	|	5	|	|		3.4
	|	6	|	|		4.0
	|	7	4.6	4.8		4.5
	1 1/2"					
	|	8	5	4.4		2.6
	|	9	|	|		0.45

7 17

[illegible]

DIESEL B
LUBE OIL SYSTEM
8 17

[illegible]

DIESEL B LUBE OIL SYSTEM

9 17

[illegible]

Sh. 9A of 17

DIESEL - B LUBE OIL SYSTEM

SYSTEM/ PIPING DRAWING	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allow ON	$\frac{1}{KE}$ /A	MEASURED IN/sec-PK
10206-4"-XX-SH. 1	PUMP	0	5.0	4		0.8
	3"	1	5.0	4.4		1.5
		2				2.0
		3				1.8
		4				1.5
		5				2.7
		6				1.8
		7				1.2
		8				1.5
		9				1.6
		10				1.8
		11				1.8
		12				1.6

LUBE OIL SYSTEM

Sh. 9B of 17

[illegible]

DIESEL B LUBE OIL SYSTEM

10 17

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
LUBE OIL SUPPLY (CONT.)					N/A	
10210-4"-XX-SH.1	4"	ALL	5	4.2		less than 0.9
10210-4"-XX-SH.2	4"	ALL				less than 0.9
10210-4"-XX-SH.3	4"	37				less than 0.9
		38				less than 0.9
		39				1.0
		40				1.6
10210-4"-XX-SH.4	4"	41	5	4.2		1.8
		42				2.2
		43				2.5
		44				2.0
10210-1 1/4"-XX-SH.1	1 1/4"	46	5	4.5		4.0 ₂
		47				3.0
		48				3.0

Unit _____ File No. _____

Subject

DIESEL B

LUBE OIL SYSTEM

By

Date _____

Sheet No. 11 of 17 Problem No. _____

Checked By

Date _____

SYSTEM / PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
LUBE OIL SUPPLY TO ROCKER ARMS					N/A	
10210-3/4"-XX-SH.1	3/4" TUBE	49	3.0	6.9 ⁽¹⁾		6.0
		50				5.5
		51				5.5
	1"	51A	5.0	4.6		3.5
		52A				3.0
		53				3.0
		54				3.5
		55		8.7 ⁽²⁾		4.5
LUBE OIL TO TURBO (1/2")						
10302-1/2"-XX-SH.1	1/2"	56	4.6	5.2		4.2
(2) C ₄ = 1.33	instead of	0.7				
(1) ASSUMES WET/DRY	WEIGHT	RATIO	= 1.5	FOR TUBING		

DIESEL B FUEL OIL SYSTEM

12 17

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
FUEL OIL SYSTEM					N/A	
10010-1 1/2"-XX-SH.1	1 1/2"	1	5	4.4		less than 0.9
		2				1.2
		3				2.0
		4				2.4
	1" TUBING	5	2.6	7.9		6.0
		7				3.0
10026-1"-XX-SH.1	1" TUBING	9	2.6	7.9		3.5
		10				8.0
		11A				9.0
		12				8.0
		13				6.5
		14				2.0
		* - TUBING IS TO BE SUPPORTED TO REDUCE VIBRATION				

DIESEL B FUEL OIL SYSTEM

[illegible]

Unit _____ File No _____

DIESEL B

FUEL OIL SYSTEM

BV

Date _____

Sheet No _____

14 of 17

Problem No.

Checked By

Date _____

[illegible]

DIESEL B FUEL OIL SYSTEM

15 17

[illegible]

DIESEL B
COMBUSTION AND STARTING AIR
16 17

SYSTEM/ PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
COMBUSTION AIR					N/A	
10018-14"-XX-SH.1	12"	1	5	5.0		2.0
	14"	2				2.4
		3				2.2
		4				2.0
		5				1.3
		6				1.8
		7				1.2
STARTING AIR						
10116-3"-XX-SH.1	3"	1	5	5.0		2.0
		2				3.4
		3				3.8
		4				4.0
		5				4.2

DIESEL B
STARTING AIR SYSTEM
 17 17

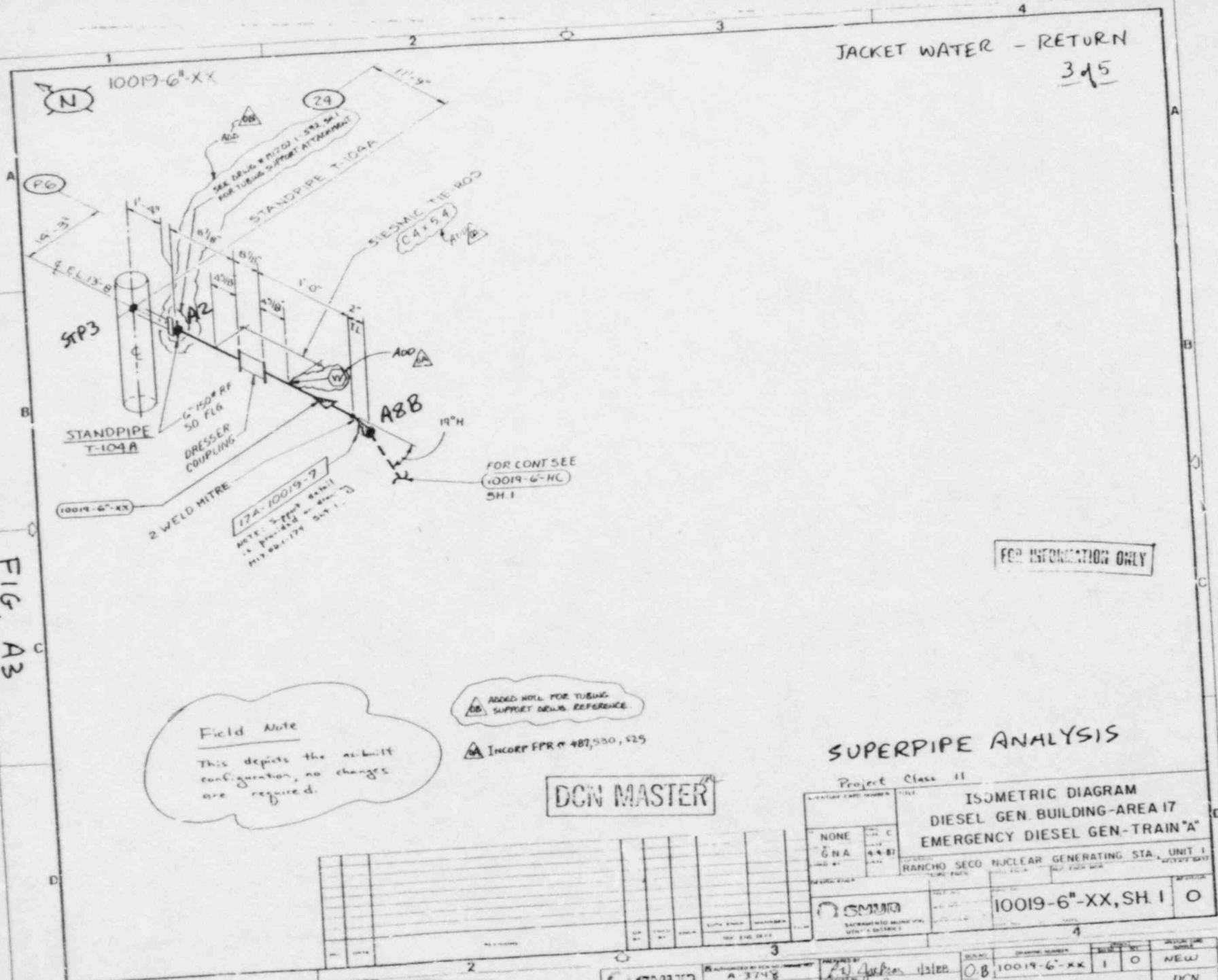
SYSTEM / PIPING DRWG	PIPE SIZE	POINT NO.	C ₂ K ₂	Vel. Allowed		MEASURED IN/sec-PK
				OM-3	DUKE	
STARTING AIR (CONTINUED)					N/A	
10110-3"-XX-SH.2	3"	6	5	5.0		2.5
	|	7	|	|		3.8
	|	8	|	|		4.0
	|	9	|	|		4.0
10110-3"-XX-SH.1	3"	10	5	5.0		4.0
	|	11	|	|		4.3
	|	12	|	|		3.4
	|	13	|	|		2.0
	1 1/2"	14	|	|		1.2
	3"	15	|	|		2.4
	1 1/2"	16	|	|		1.6
	3"	17	|	|		2.4
	1 1/2"	18	|	|		1.4
	1 1/2"	20	|	|		1.4
	21	21	|	|		3.2

TABLE 3
TURBOCHARGER VIBRATION

<u>ENGINE</u>	<u>VIBRATION-M'LS P-P</u>		
	<u>AXIAL</u>	<u>VERTICAL</u>	<u>HORIZONTAL</u>
	X	Y	Z
A	17	9	19
B	8.5	6.5	19

Measurements were made at center line elevation on turbocharger casing under full load conditions. TDI allowables were stated as 25 mils p-p at 30 hz. The above measured values include all frequencies between 10 hz and 1000 hz.

FIG. A3



JACKET WATER - RETURN
345

FOR INFORMATION ONLY

Field Note

This depicts the as-built configuration, no changes are required.

ADDED HOLE FOR TUBING SUPPORT DOWNS REFERENCE

INCORP FPR # 487,550, 525

DCN MASTER

SUPERPIPE ANALYSIS

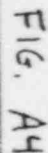
Project Class II

ISOMETRIC DIAGRAM DIESEL GEN. BUILDING-AREA 17 EMERGENCY DIESEL GEN-TRAIN "A"	
RANCHO SECO NUCLEAR GENERATING STA. UNIT 1	
10019-6-XX, SH. 1	

NEW DRAWING / ENTER INTO SYSTEM

SMUD DRAWING CHANGE NOTICE	APPROVED BY A 3/48	DATE 1/1/88	BY J. Hernandez	DATE 1/1/88											
	<table border="1"> <tr> <td>PROJECT NUMBER</td> <td>10019-6-XX</td> <td>SHEET</td> <td>1</td> <td>TOTAL SHEETS</td> <td>1</td> </tr> <tr> <td colspan="3">DRAWN BY</td> <td>DATE</td> <td colspan="2"></td> </tr> </table>				PROJECT NUMBER	10019-6-XX	SHEET	1	TOTAL SHEETS	1	DRAWN BY			DATE	
PROJECT NUMBER	10019-6-XX	SHEET	1	TOTAL SHEETS	1										
DRAWN BY			DATE												

1. FIELD TO USE EXISTING MATERIAL FOR FLANGE PLATE AS INDICATED
2. FIELD TO VERIFY ALL DIMENSIONS PRIOR TO FABRICATION AND INSTALLATION
3. INSULATE CROSSER COUPLING (ITEMS 3 & 19) WITH MIN. CALCEM SILICATE OR EQUIVALENT INSULATION WITH METAL JACKETING. JACKETING SHALL BE PREFABRICATED AND REMOVED. SEE SPEC. MAT. QT. TECHNICAL SPECIFICATION 3.18
4. PIPE ENDS WITHIN CROSSER COUPLING SHALL BE SEPARATED BY A GAP OF 1/8" TO 1/4"



W.P.	FILLER METAL
ALT.	FILLER METAL
N.D.T.	POST WELD HT.

ITEM NO	QTY	DESCRIPTION
BILL OF MATERIAL		
APERTURE CARD NUMBER	TITLE	
	ISOMETRIC DIAGRAM	
NO. NONE	DIESEL GENERATOR BLDG.- AREA 17	
OR BY GNA	JACKET WATER SYSTEM-TRAIN A	
DATE	DATE	
PROJECT NO.	PROJECT NAME	
	RANCHO SECO NUCLEAR GENERATING STA. UNIT 1	
DESIGNER	TEMP. ENGR.	PROJ. ENGR.
		REC. TECH. WRK.
DATE	DATE	DATE
BY	BY	BY
10019-2*HC,SHI 0		

NEW DRAWING ENTER INTO SYSTEM

FLUID DRAWING CHANGE NOTICE

☐ **Print** All Comments on

□

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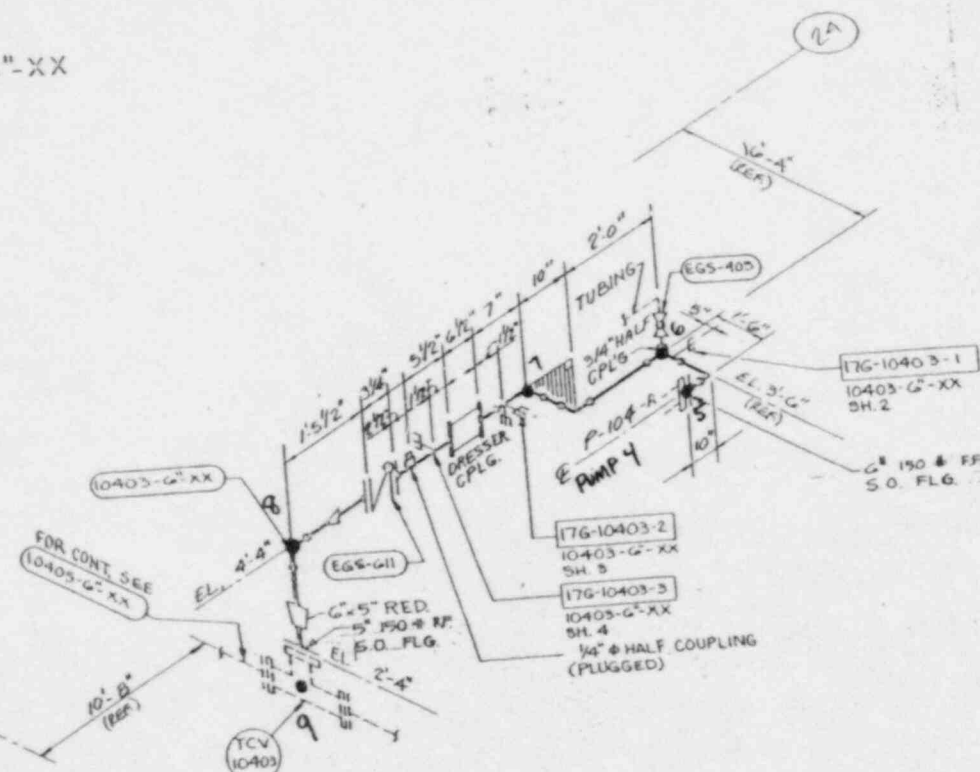
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SUPERPIPE ANALYSIS

JACKET WATER - SUPPLY 2 of 6

10403-6"-XX

FIG. A7



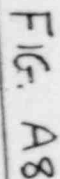
FOR INFORMATION ONLY

NEW Dwg.
ADD TO SYSTEM

DCN MASTER

Project Class 11		ISOMETRIC DIAGRAM DIESEL GEN. BUILDING-AREA 17 JACKET WATER SYS.-TRAIN "A"	
APP. TUBE CARD NUMBER	TITLE	UNIT 1	
NONE	C	RANCHO SECO NUCLEAR GENERATING STA.	
G.N.A.	9-12-87	THAT TUBE WER	
DESIGNER	DATE	DATE	DATE
10403-6"-XX	10	NEW	DCN
10403-6"-XX, SH.1	101		

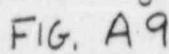
104,05-5¹-X3



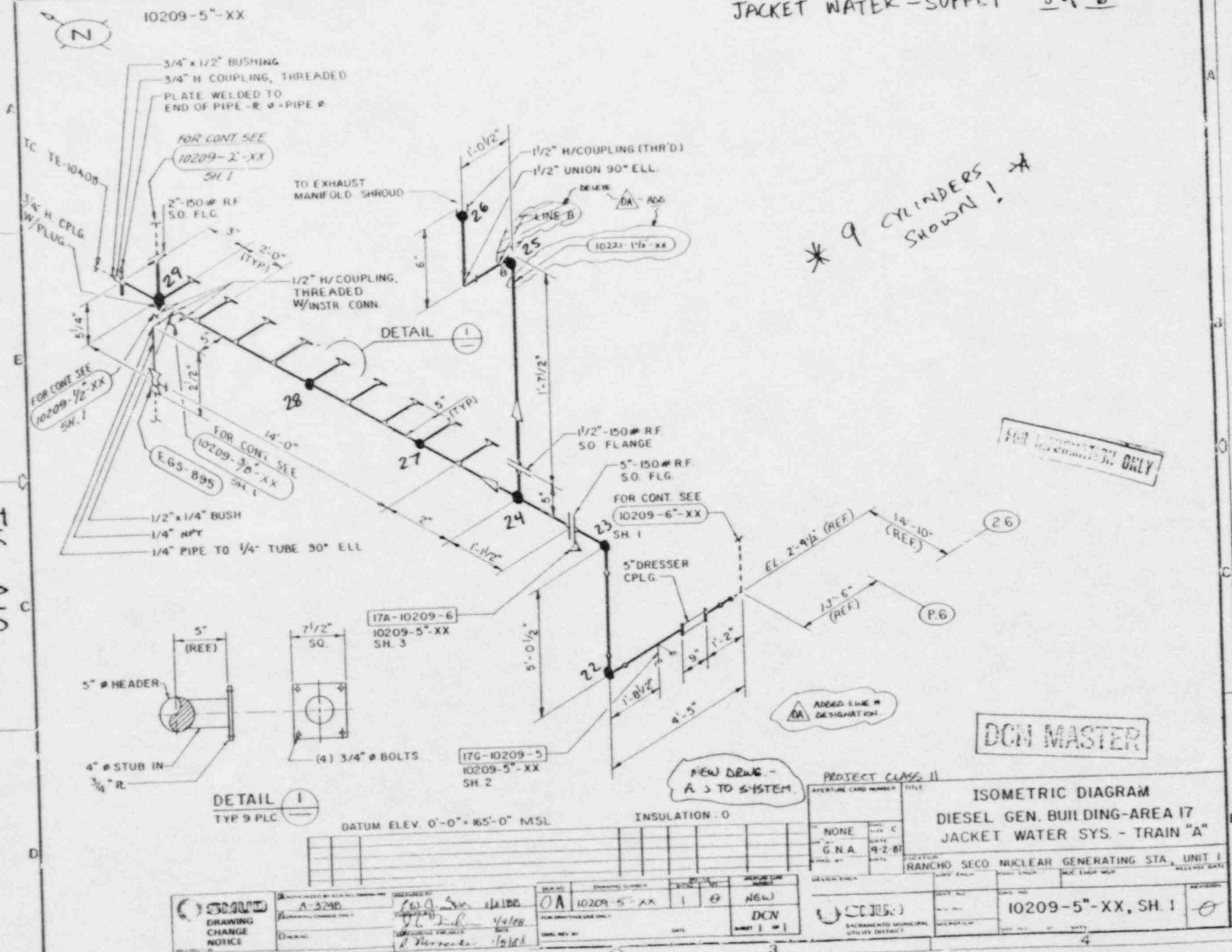
NEW DWG.
ADD TO SYSTEM

PROJECT CLASS 1 L		ISOMETRIC DIAGRAM	
APERTURE CARD NUMBER		TITLE	
DIESEL GEN. BLDG.-AREA 17		JACKET WATER SYS.-TRAIN "A"	
NTS	DATE	DATE	DATE
9/87	9/87		
RANCHO SECO NUCLEAR GENERATING STA., UNIT 1		RECALL DATA	
DESIGN TEAM	TEAM LEAD	TEAM LEAD	TEAM LEAD
10405-6-XX, SH. 1			
EXAMINED BY (ORIGINAL)		EXAMINED BY (ORIGINAL)	

4 of 6



FOR ADULTS ONLY



JACKET WATER - SUPPLY 616

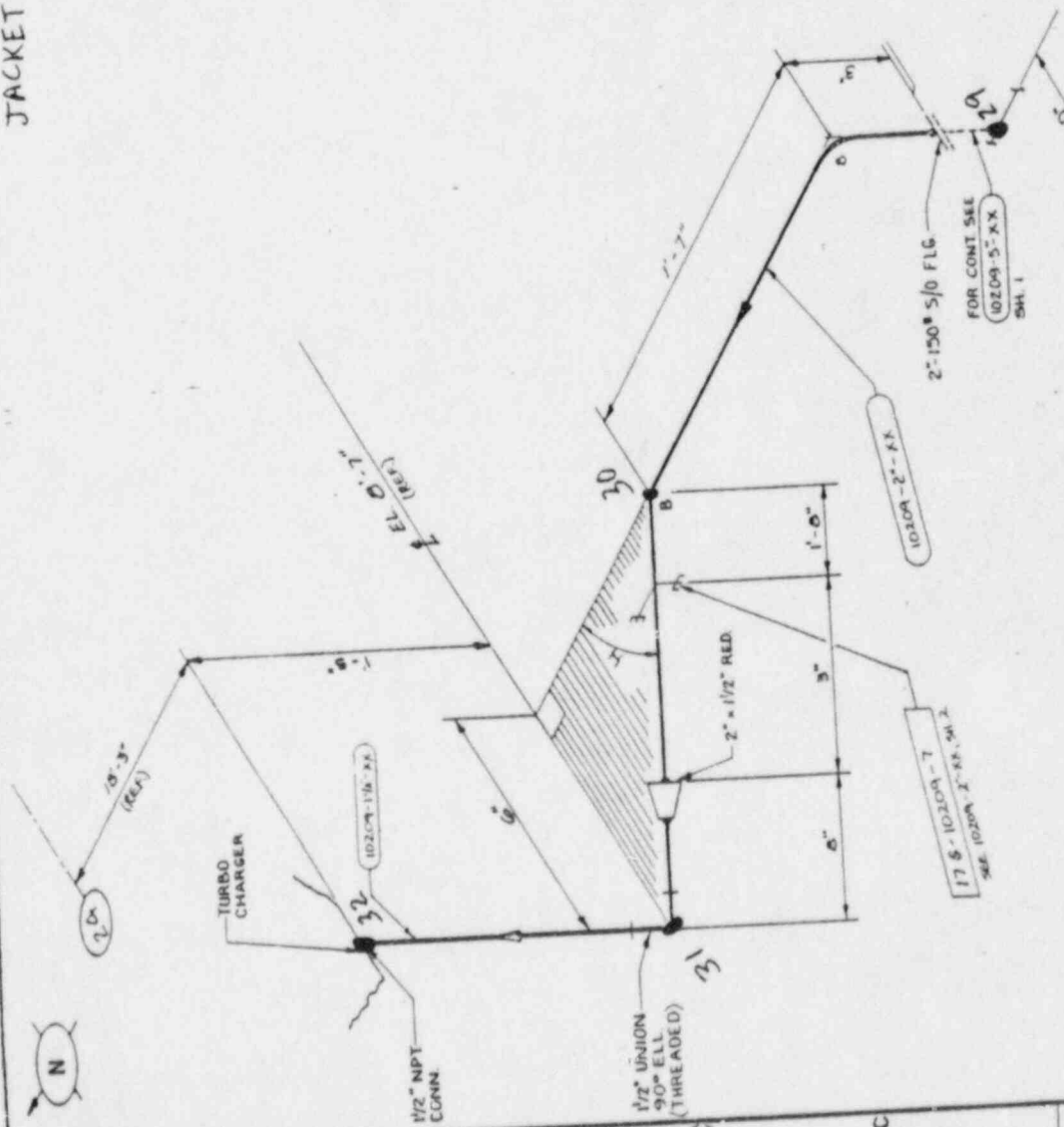


FIG. A11

FOR INFORMATION ONLY

NEW DRUG -
ADD TO SYSTEM

PROJECT CLASS II

ISOMETRIC DIAGRAM
DIESEL GEN. BUILDING-AREA 17
JACKET WATER SYS - TRAIN "A"

APERTURE CARD NUMBER	TITLE
NONE	ISOMETRIC
DATE	DATE
10209-5-XX	10209-2-XX, SH 1
10209-5-XX	10209-2-XX, SH 1
10209-5-XX	10209-2-XX, SH 1

LOCATION: RANCHO SECO NUCLEAR GENERATING STA. - REACTOR BENT

UTILITY DISTRICT: 10209-2-XX, SH 1

DATE: 10209-2-XX, SH 1

SCALE: 1" = 10'

10209-2-XX, SH 1



A 3748

1/15/80

1/15/80

1/15/80

1/15/80

1/15/80

1/15/80

1/15/80

1/15/80

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1/15/80

1/15/80

1/15/80

1/15/80

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1/15/80

1/15/80

JACKET WATER - OVERFLOW 141

0-100-2-2-1-1-1

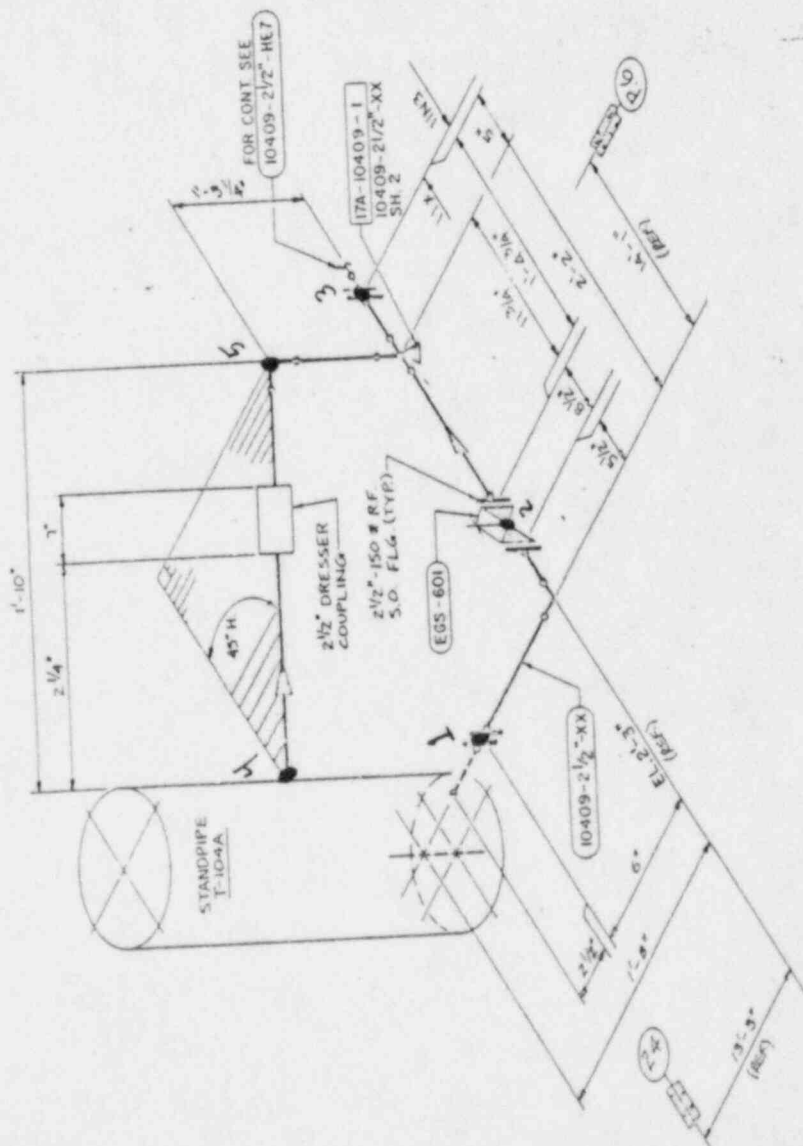


FIG. A12

NEW DUCTS
ADD TO SYSTEM

DCN MASTER

ISOMETRIC DIAGRAM
DIESEL GEN. BLDG. - AREA 17
JACKET WATER SYS. - TRAIN "A"

PROJECT CLASS 11

APPROVED	DATE	BY	CHK
DMW	5.7.87		

REVISIONS

NO.	DATE	DESCRIPTION
1		

10409-2 1/2" - XX SH 1 - 0

INSULATION: 0

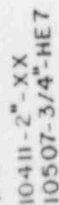
DATUM EL. 0'-0" ± 155'-0" MSL

REVISION	DATE	DESCRIPTION
1		

10409-2 1/2" - XX SH 1 - 0

NEW DCN

192



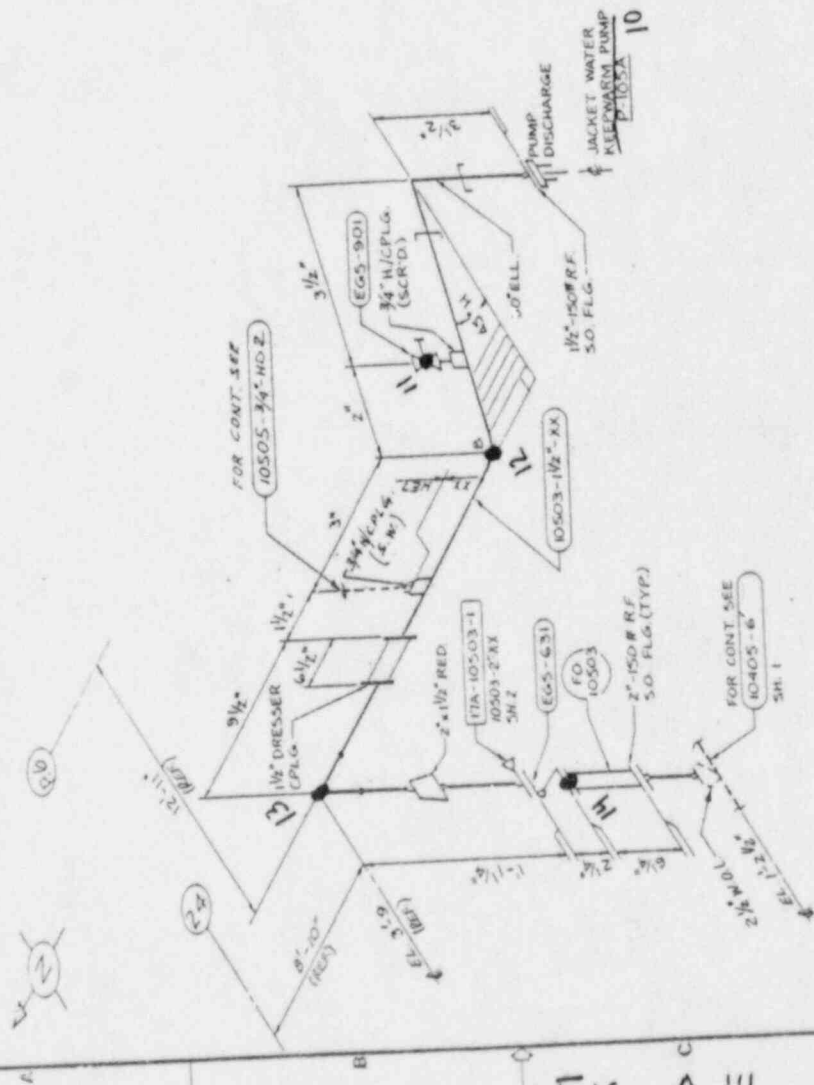
NEW ORIGINAL -
ADD TO SYSTEM

FIG. A13

[illegible]

JACKET WATER - KEEPWARM 2-42

10503-2"-XX
10505-3/4"-HD2



NEW PIPE
ADD TO SYSTEM

NEW PIPE
ADD TO SYSTEM

INSULATION: 0

DATUM ELEV. 0'-0" = 165'-0" M.S.L.

PROJECT CLASS 11

ISOMETRIC DIAGRAM
DIESEL GEN. BLDG. - AREA 17
JACKET WATER SYSTEM-TRAIN "A"

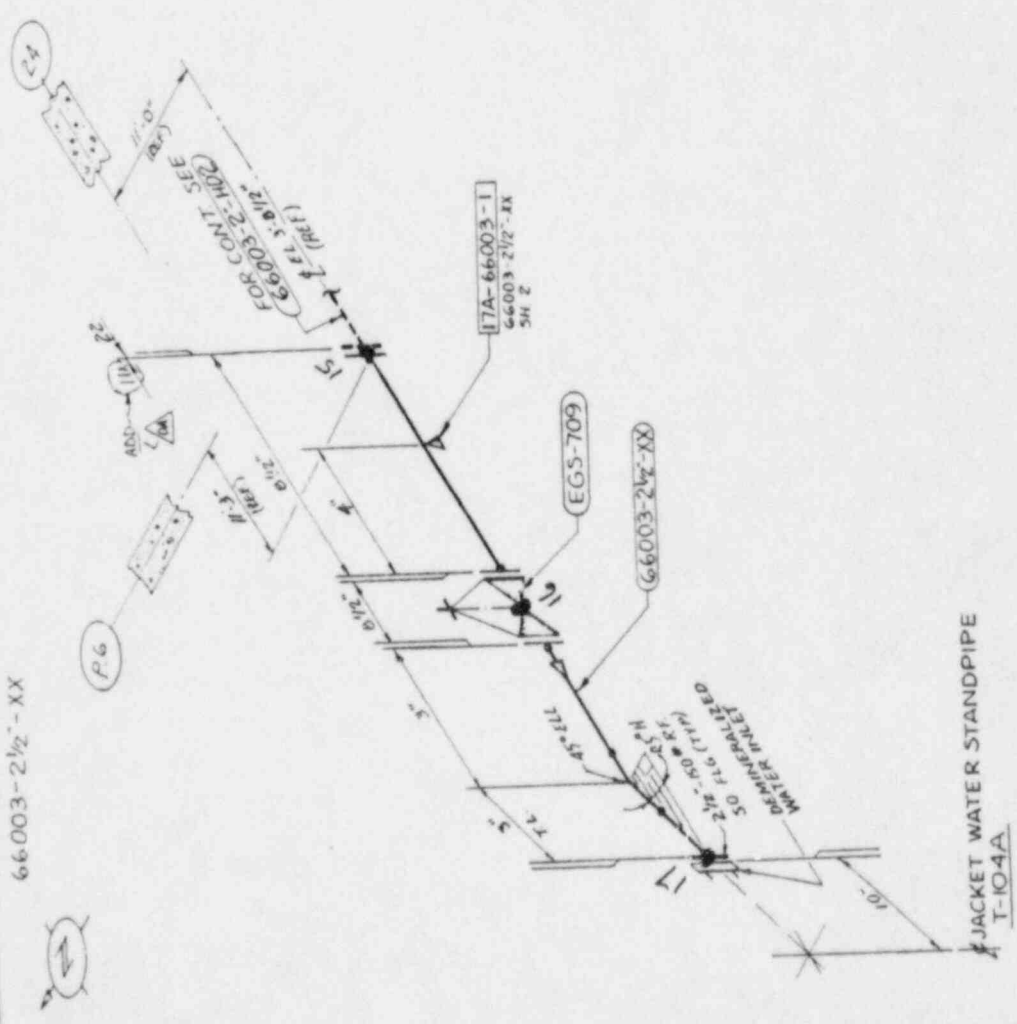
UNIT 1
RANCHO SECO NUCLEAR GENERATING STA. - BACKUP UNIT

10503-2"-XX, SH. 1

NO.	DATE	REVISION	BY	CHKD.	APP'D.
1	10/1/77	1	...	...	...
2	10/1/77	2	...	...	...
3	10/1/77	3	...	...	...
4	10/1/77	4	...	...	...
5	10/1/77	5	...	...	...
6	10/1/77	6	...	...	...
7	10/1/77	7	...	...	...
8	10/1/77	8	...	...	...
9	10/1/77	9	...	...	...
10	10/1/77	10	...	...	...

FIG. A 14

JACKET WATER - DEMIN INTL 141



NEW ORIGINAL-
ADD TO SYSTEM.

PROJECT CLASS II

ISOMETRIC DIAGRAM

DIESEL GEN. BUILDING-AREA 17

JACKET WATER SYSTEM-TRAIN "A"

UNIT 1	UNIT 2	UNIT 3	UNIT 4	UNIT 5	UNIT 6	UNIT 7	UNIT 8	UNIT 9	UNIT 10	UNIT 11	UNIT 12	UNIT 13	UNIT 14	UNIT 15	UNIT 16	UNIT 17	UNIT 18	UNIT 19	UNIT 20

UNIT 17

UNIT 18

UNIT 19

UNIT 20

UNIT 21

UNIT 22

UNIT 23

UNIT 24

UNIT 25

UNIT 26

UNIT 27

UNIT 28

UNIT 29

UNIT 30

UNIT 31

UNIT 32

UNIT 33

UNIT 34

UNIT 35

UNIT 36

UNIT 37

UNIT 38

UNIT 39

UNIT 40

UNIT 41

UNIT 42

UNIT 43

UNIT 44

UNIT 45

UNIT 46

UNIT 47

UNIT 48

UNIT 49

UNIT 50

UNIT 51

UNIT 52

UNIT 53

UNIT 54

UNIT 55

UNIT 56

UNIT 57

UNIT 58

UNIT 59

UNIT 60

UNIT 61

UNIT 62

UNIT 63

UNIT 64

UNIT 65

UNIT 66

UNIT 67

UNIT 68

UNIT 69

UNIT 70

UNIT 71

UNIT 72

UNIT 73

UNIT 74

UNIT 75

UNIT 76

UNIT 77

UNIT 78

UNIT 79

UNIT 80

UNIT 81

UNIT 82

UNIT 83

UNIT 84

UNIT 85

UNIT 86

UNIT 87

UNIT 88

UNIT 89

UNIT 90

UNIT 91

UNIT 92

UNIT 93

UNIT 94

UNIT 95

UNIT 96

UNIT 97

UNIT 98

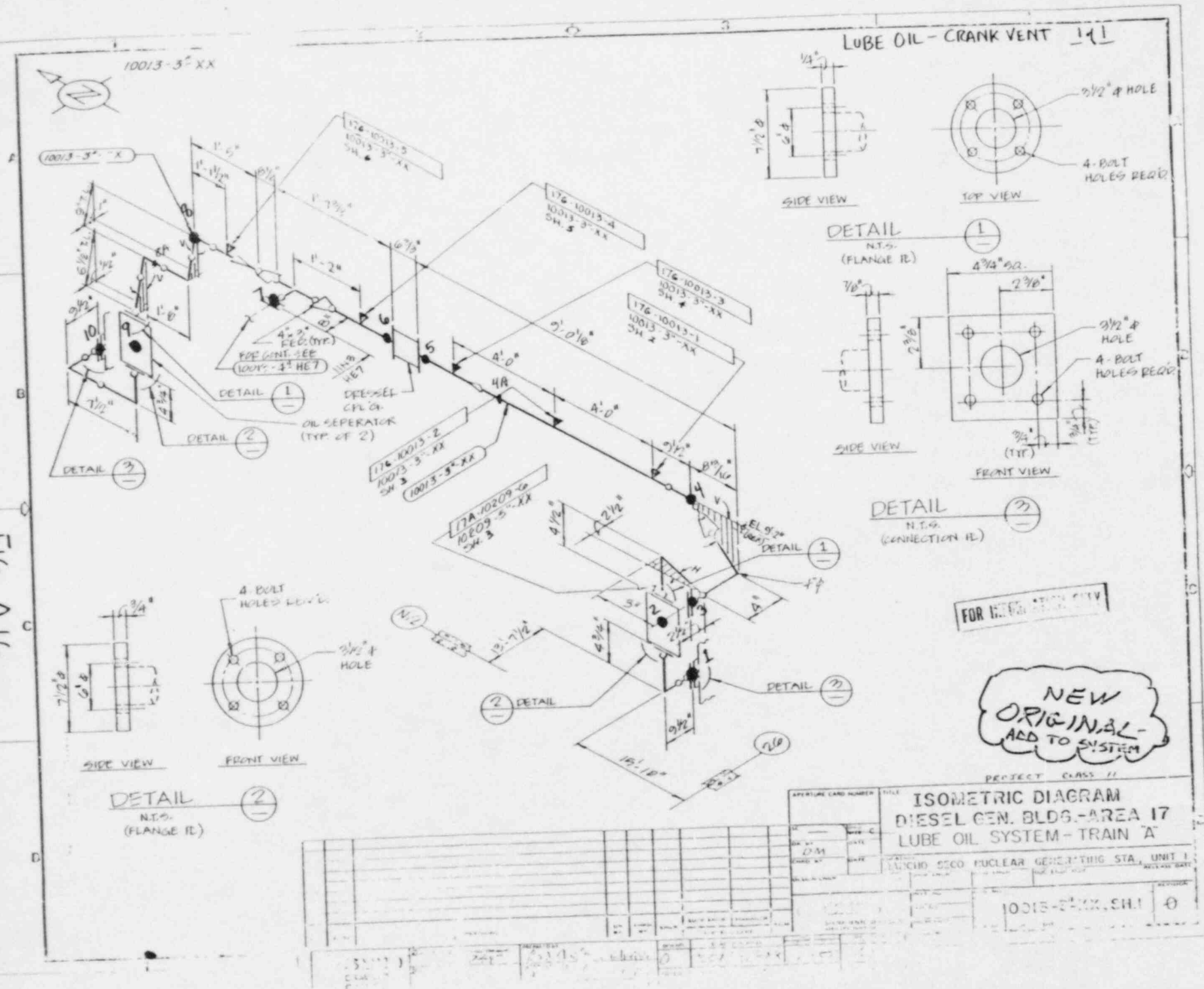
UNIT 99

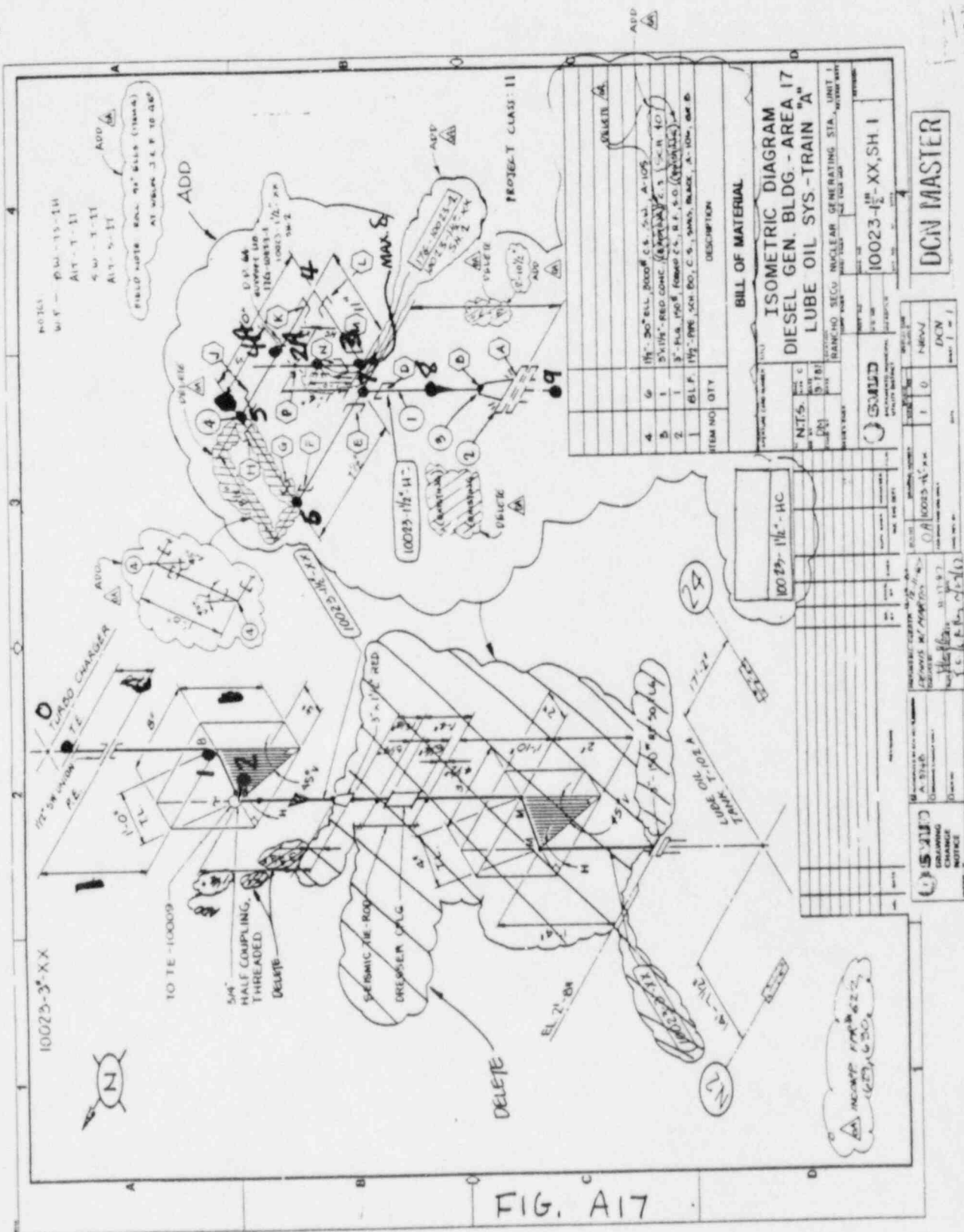
UNIT 100

ADD LINE CLASS
DESIGNATION

FIG. A15

Fig. A16





10207-5⁺-XX
10207-1^{1/2}-XX

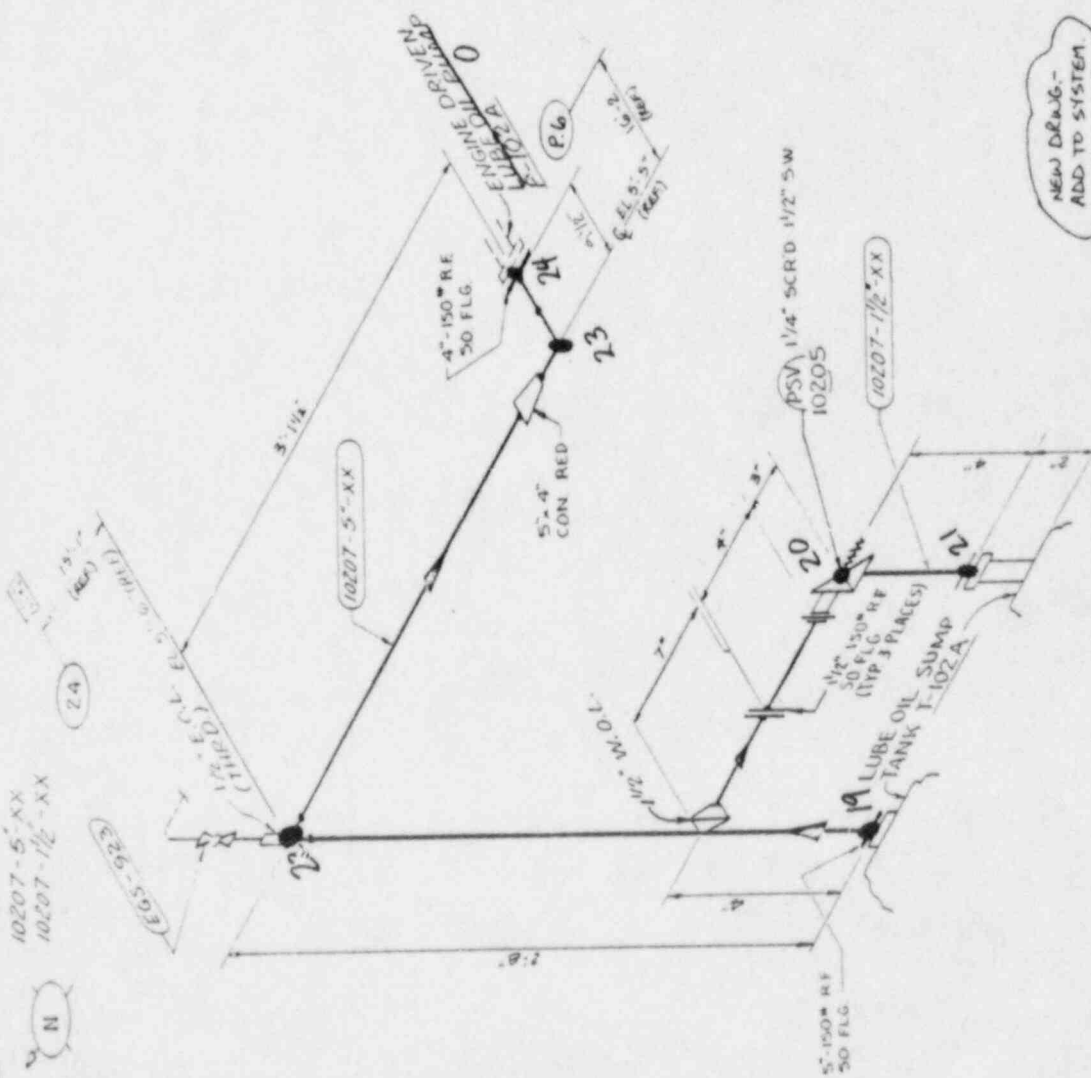


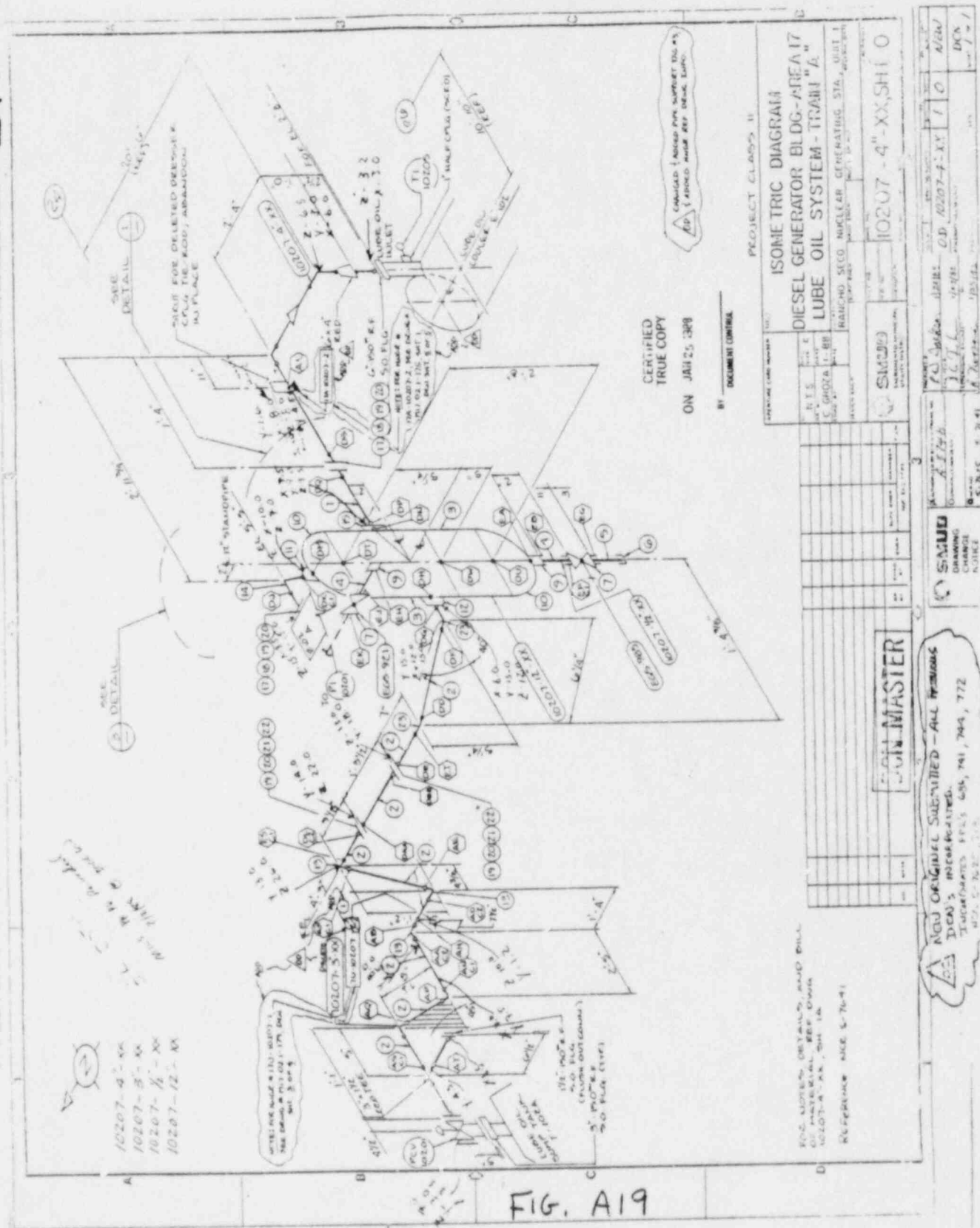
FIG. A18

NEW DRUGS -
ADD TO SYSTEM

10207-1 1/2" - XX

ITEM #	QTY	DESCRIPTION
NO.		
<p>UNITED STATES GOVERNMENT</p> <p>ISOMETRIC DIAGRAM</p> <p>DIESEL GEN. BUILDING-AREA 17</p> <p>LUBE OIL SYS. - TRAIL "A"</p> <p>UNIT 1</p> <p>RANCHO SECO NUCLEAR GENERATING STA.</p> <p>10207 - 5" X 1/2" SH. I</p>		

[illegible]



LUBE OIL-SUPPLY 498

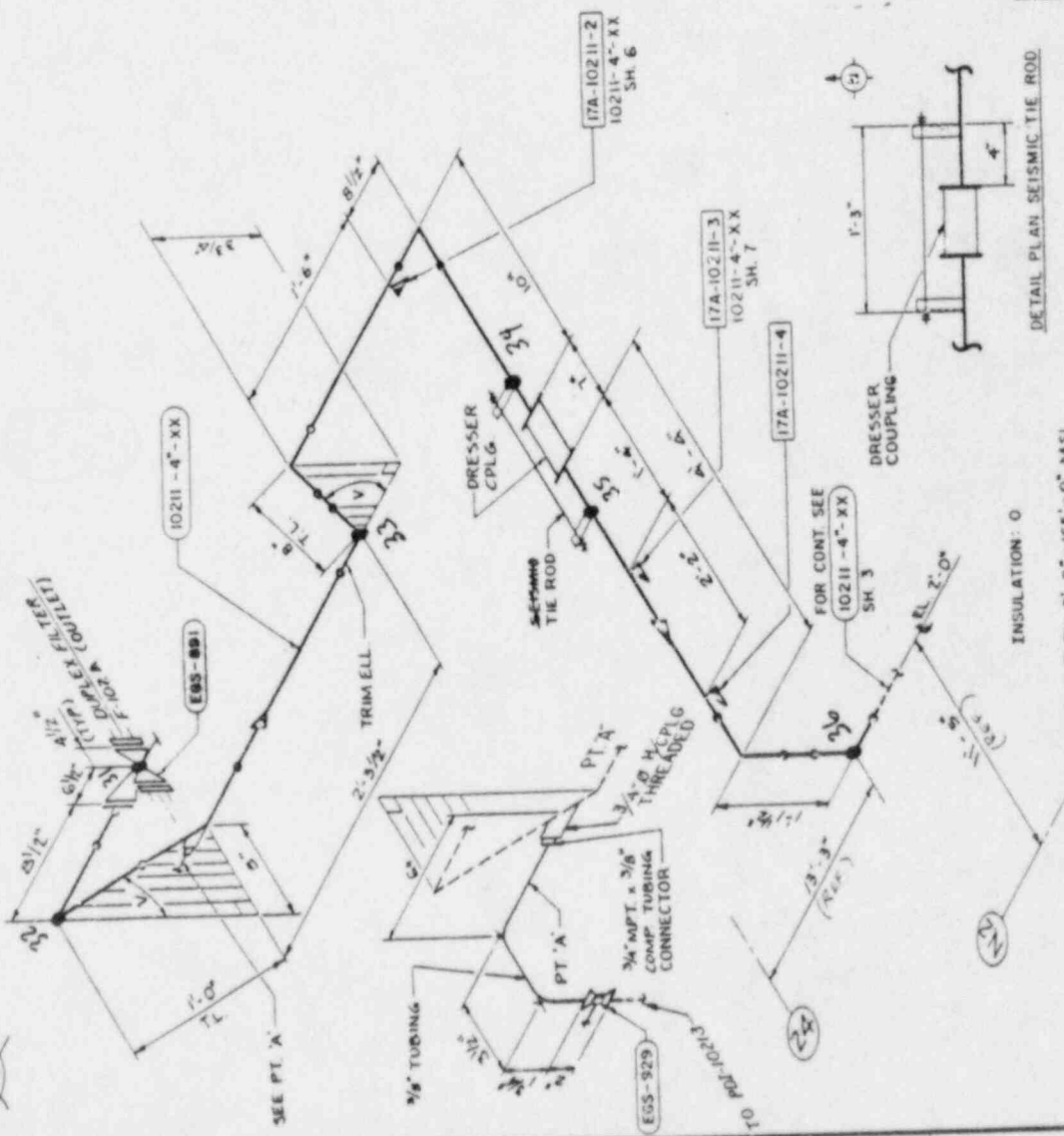


FIG. A21

DCN MASTER

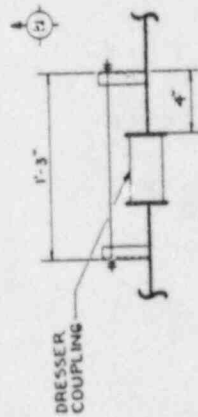
Project CLASS II

ISOMETRIC DIAGRAM	
DIESEL GEN BLDG - AREA 17	
LUBE OIL SYS - TRAIN "A"	
RANCHO SECO NUCLEAR GENERATING STA., UNIT 1	
SHEET NO. 0	
10211-4"-XX, SH. 2	

DETAIL PLAN SEISMIC TIE ROD

DATUM ELEV. 0'-0" - 165'-0" MSL

INSULATION: 0



DATE	10/21/81	BY	XX	2	C	XX
REVISION		DATE				

LUBE OIL - SUPPLY 548

(N) 10211-4"-XX

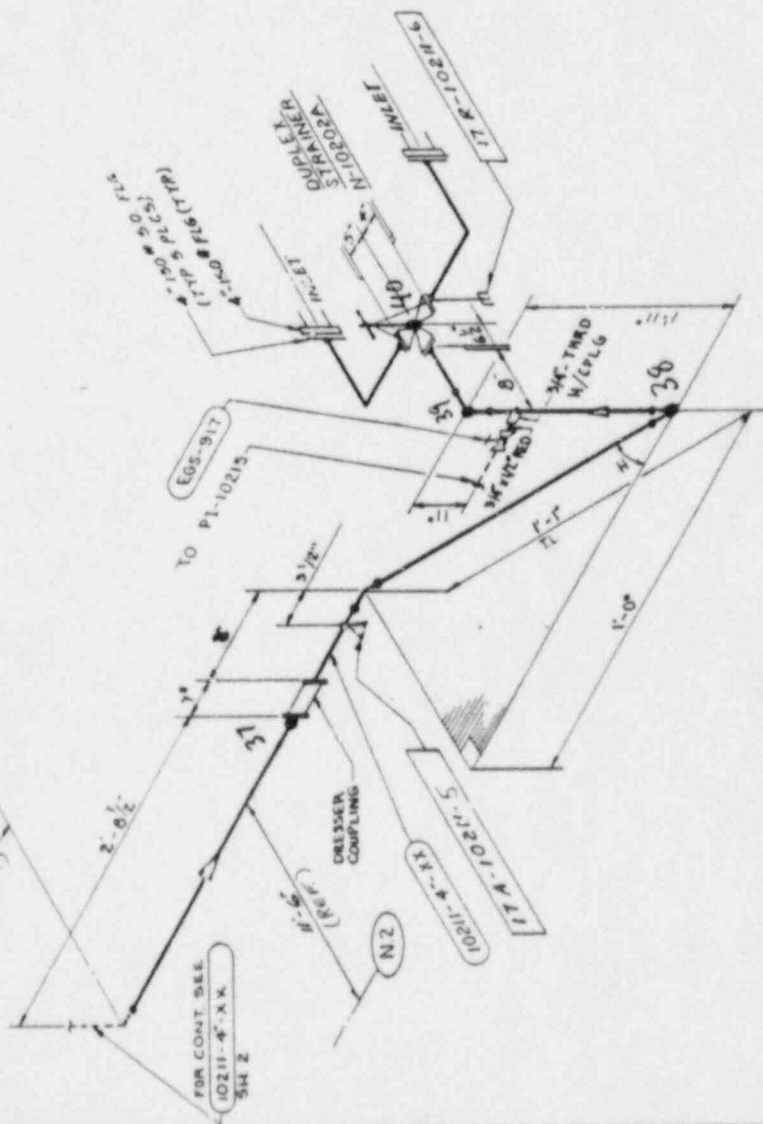


FIG. A22

DCN MASTER

PROJECT CLASS II

ISOMETRIC DIAGRAM	
DIESEL GEN. BUILDING-AREA 17	
LUBE OIL SYS. - TRAIN "A"	
RANCHO SECO NUCLEAR GENERATING STA., UNIT 1	
NUCLEAR BAY	
10211-4"-XX, SH 3	0

DATE	BY	CHECKED	DATE
10/1/71	DCN		

LUBE OIL-SUPPLY 618

10211-4"-XX

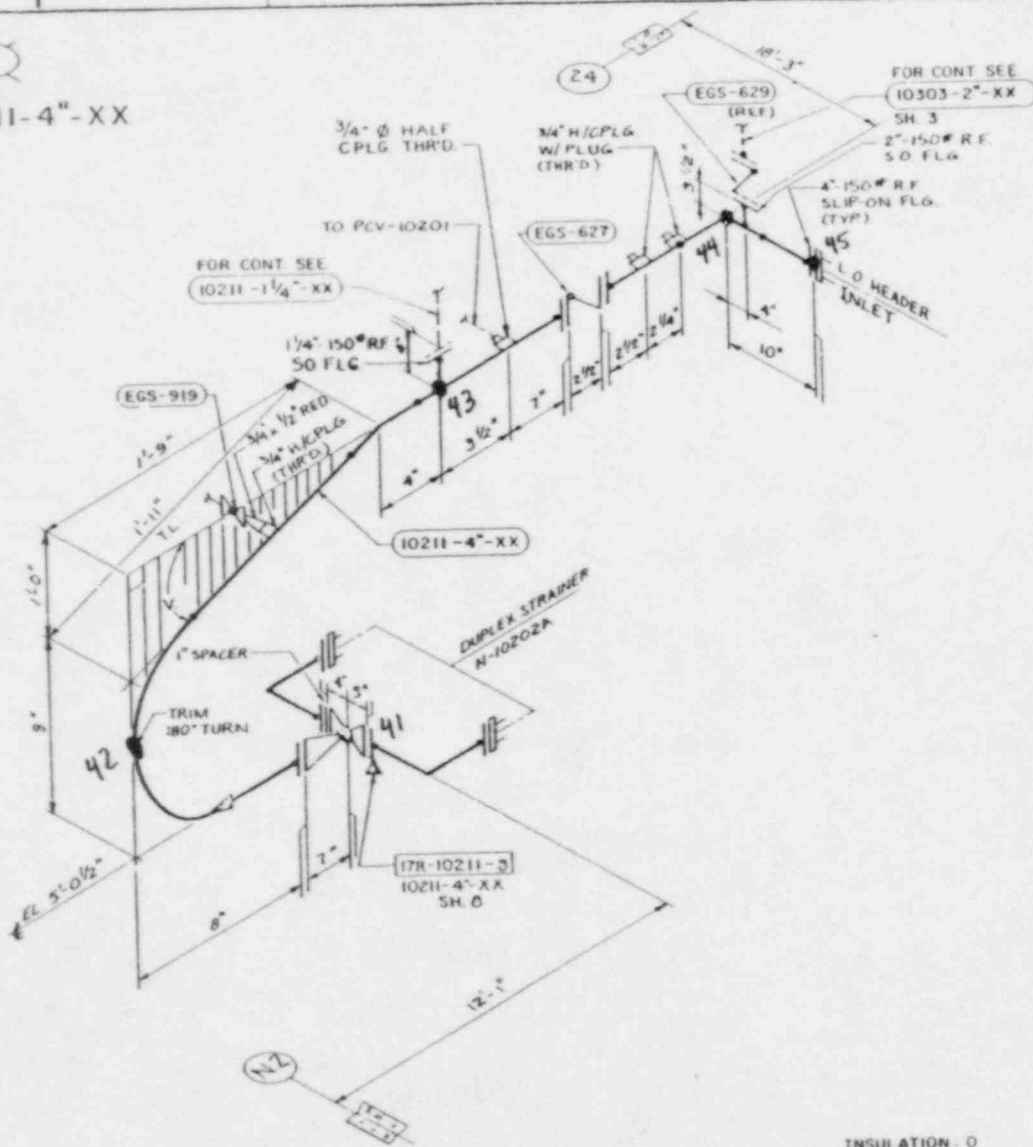


FIG. A23

NEW
ORIGINAL-
ADD TO SYSTEM.

INSULATION - 0
DATUM EL. 0'-0" = 165'-0" MSL

APERTURE CARD NUMBER		FILE	
NTS		ISOMETRIC DIAGRAM	
DATE 8/87		DIESEL GEN. BLDG - AREA 17	
DRAWN BY		LUBE OIL SYS. - TRAIN "A"	
CHECKED BY		RANCHO SECO NUCLEAR GENERATING STA., UNIT 1	
APPROVED BY		DATE	
10211-4"-XX, SH. 4		0	

10211-4"-XX	4-3745	10211-4"-XX	4	1	1
DRAWING	CHART 2	NO. 122			

LUBE OIL-SUPPLY 7 of 8

FOR INFORMATION ONLY

DCN MASTER

ISOMETRIC DIAGRAM
DIESEL GEN. BLDG.-AREA 17
LUBE OIL SYSTEM-TRAIN "A"

RANCHO SECO NUCLEAR GENERATING STA., 22.1407 NORTH
UNIT 1
SHEET NO. 10211-1 1/4" XX, SH. 1

CSMUD

10211-1 1/4" XX, SH. 1

NEW

FOR

10211-1 1/4" XX, SH. 1

NEW

FOR

10211-1 1/4" XX, SH. 1

NEW

FOR

10211-1 1/4" XX, SH. 1

NEW

FOR

10211-1 1/4" XX, SH. 1

NEW

FOR

10211-1 1/4" XX, SH. 1

NEW

FOR

10211-1 1/4" XX, SH. 1

NEW

FOR

10211-1 1/4" XX, SH. 1

NEW

FOR

FIG. A24

New Book
Add to 5550.00

RE-USED REFERENCE
DRAWING, SUPP.

FOR CONT SEE
10211-1 1/4" XX, SH. 4

FOR CONT SEE
10211-1 1/4" XX, SH. 1

FOR CONT SEE
10211-1 1/4" XX, SH. 1

FOR CONT SEE
10211-1 1/4" XX, SH. 1

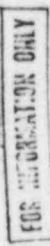
FOR CONT SEE
10211-1 1/4" XX, SH. 1

FOR CONT SEE
10211-1 1/4" XX, SH. 1

FOR CONT SEE
10211-1 1/4" XX, SH. 1

FOR CONT SEE
10211-1 1/4" XX, SH. 1

FOR CONT SEE
10211-1 1/4" XX, SH. 1



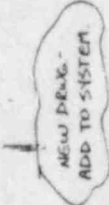
DETAIL
(TOP & R.C.S.)

NEW DRUGS -
ADD TO SYSTEM

CHILLED PIPE
SUPPORT TAG #7

**RECEIVED
DRAWING
CHANGE
NOTICE**

FIG. A25



DCN MASTER

ISOMETRIC DIAGRAM
DIESEL GEN. BUILDING-AREA 17
LUBE OIL SYSTEM - TRAIN "A"

RANCHO SECO NUCLEAR	GENERATING STA.	UNIT 1
power plants	power plants	44.7362 MW

10303-1/2"-XX, SH.

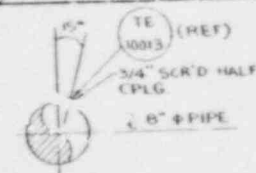
FOR INFORMATION ONLY

FIG. A26

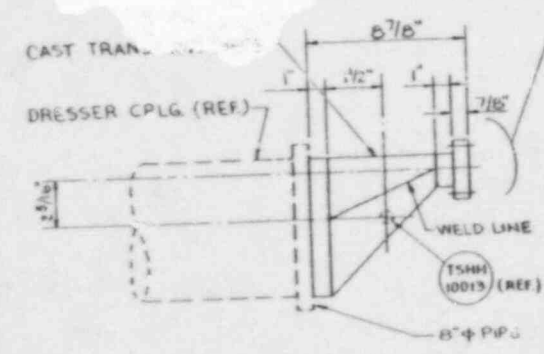
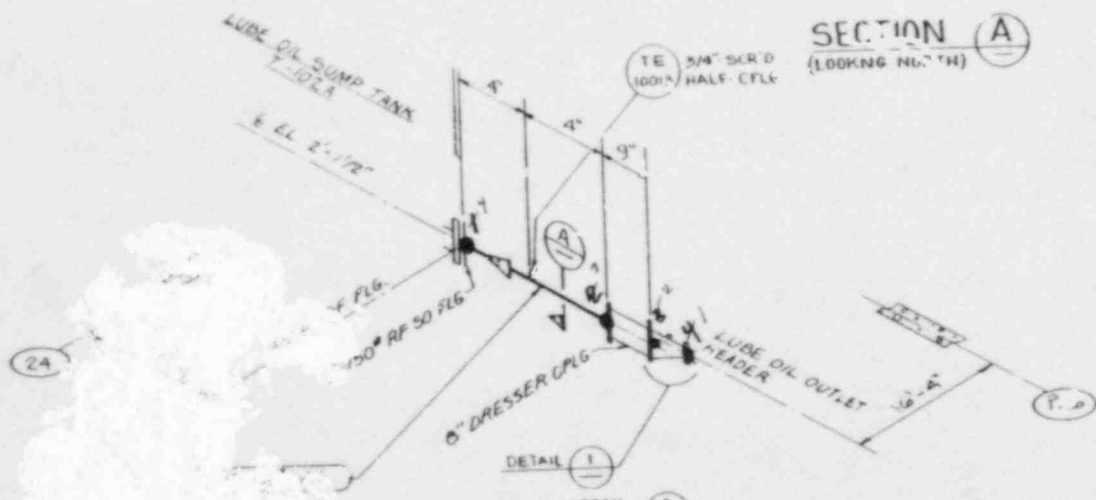
FIG. A27

LUBE OIL - ENG DRAIN 141

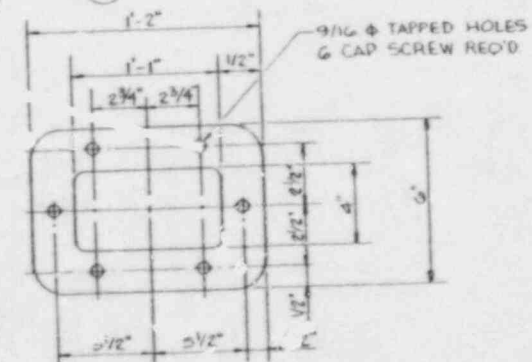
10219-B-KX



SECTION A
(LOOKING NORTHEAST)



DETAIL 1

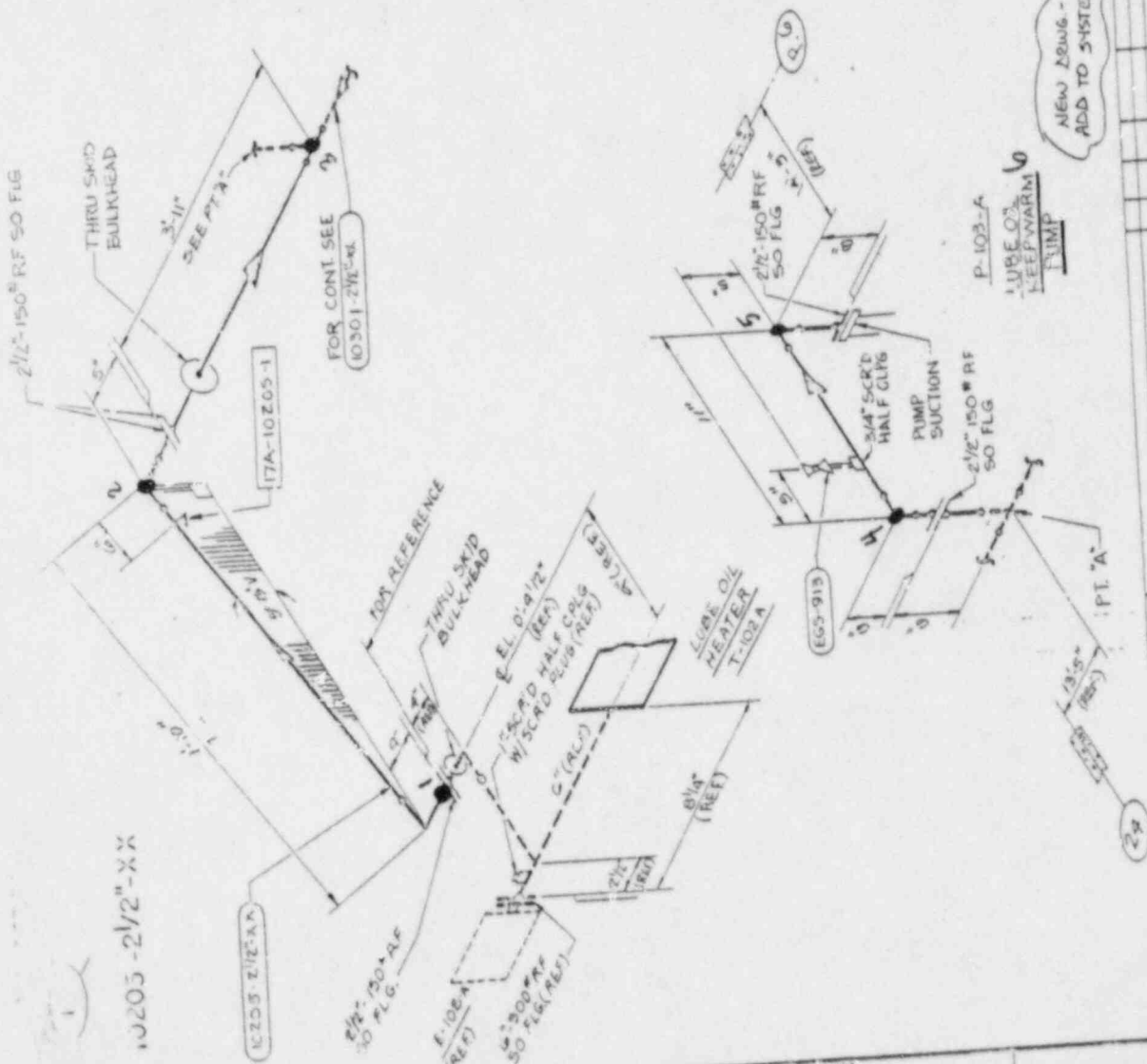


DETAIL 2

NEW
ORIGINAL
ADD TO SYSTEM

APERTURE CARD NUMBER		TITLE	
NONE		ISOMETRIC DIAGRAM	
GNA		DIESEL GEN. BUILDING-AREA 17	
		LUBE OIL SYS. - TRAIN "A"	
PROJECT		RANCHO SECO NUCLEAR GENERATING STA. UNIT 1	
DESIGN		10219-C-KX, SH.1	
CHECKED		0	

LUBE OIL - KEEP WARM 115



FOR INFORMATION ONLY

DCN MASTER

PROJECT CLASS 1

ISOMETRIC DIAGRAM
DIESEL GEN BUILDING-AREA 17
LUBE OIL SYS. - TRAIN "A"

UNIT 1
RANCHO SEC-1 NUCLEAR GENERATING STA.
UNIT 1
UNIT 1

10205-2 1/2" XX, SH. 1

DCN

NEW 2500G - ADD TO SYSTEM.

P-103-A
LUBE OIL
KEEP WARM
PUMP

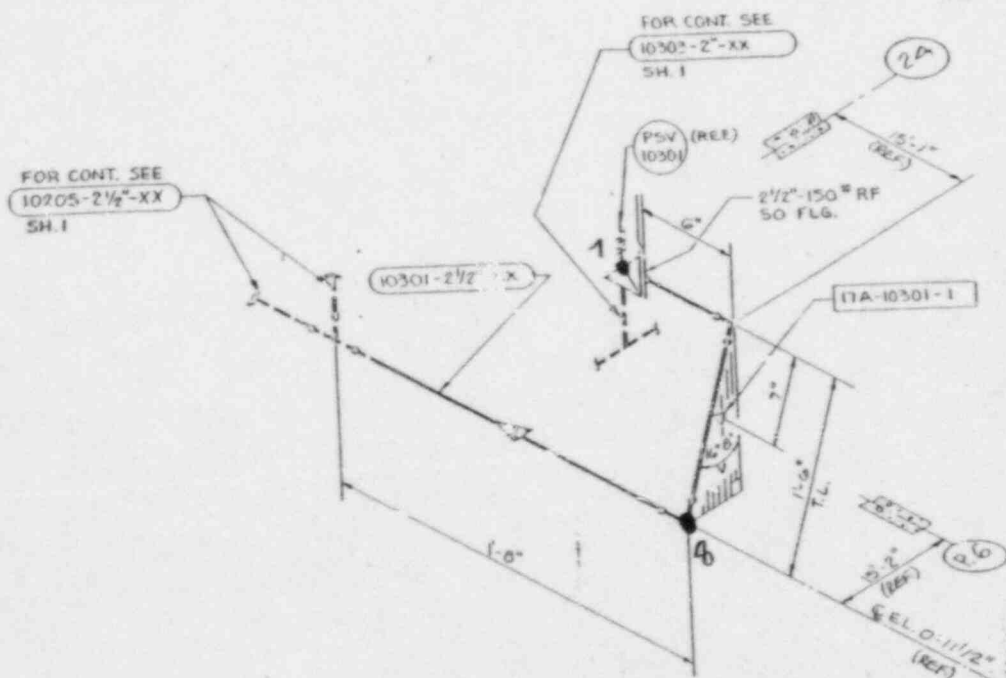
10205-2 1/2" XX

DCN

FIG. A28

10301-2 1/2"-XX

Fig. A29



DCN MASTER

NEW DRUG. -
ADD TO SYSTEM

NEW DRUG.
ADD TO SYSTEM.

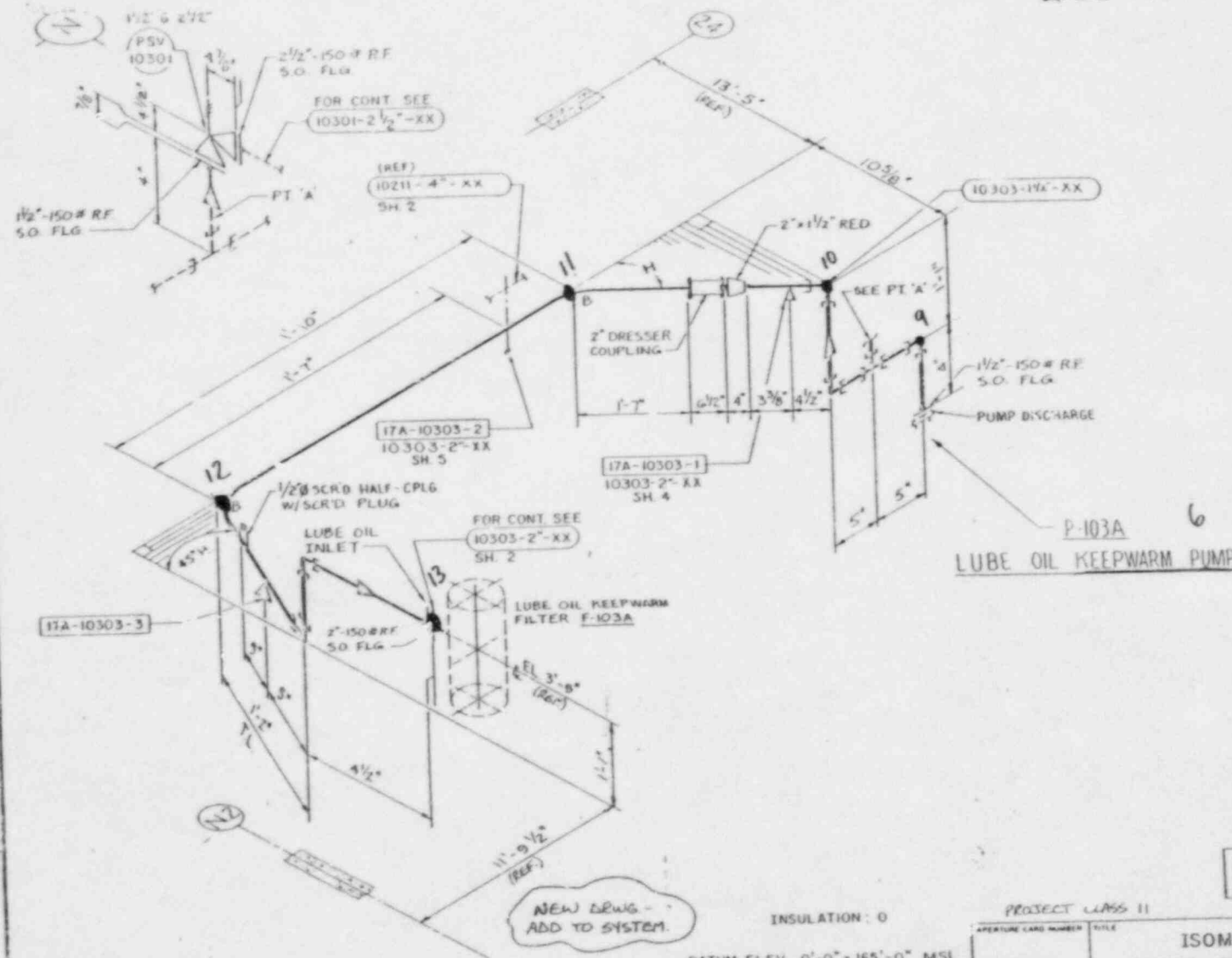
PROJECT CLASS II									
APERTURE CARD NUMBER					TITLE				
					ISOMETRIC DIAGRAM				
					DIESEL GEN. BUILDING-AREA 17				
					LUBE OIL SYS.-TRAIN "A"				
					RANCHO SECO NUCLEAR GENERATING STA., UNIT 1				
					RELEASER DATE				

APERTURE CARD NUMBER	TITLE	DATE	BY	REVISION
0	10301-2 1/2-XX	1	NEW	DCN

APERTURE CARD NUMBER	TITLE	DATE	BY	REVISION
0	10301-2 1/2-XX	1	NEW	DCN

LUBE OIL - KEEP WARM 3 of 5

FIG. A30



FOR INFORMATION ONLY

DCN MASTER

NEW DRWG -
ADD TO SYSTEM.

INSULATION: 0

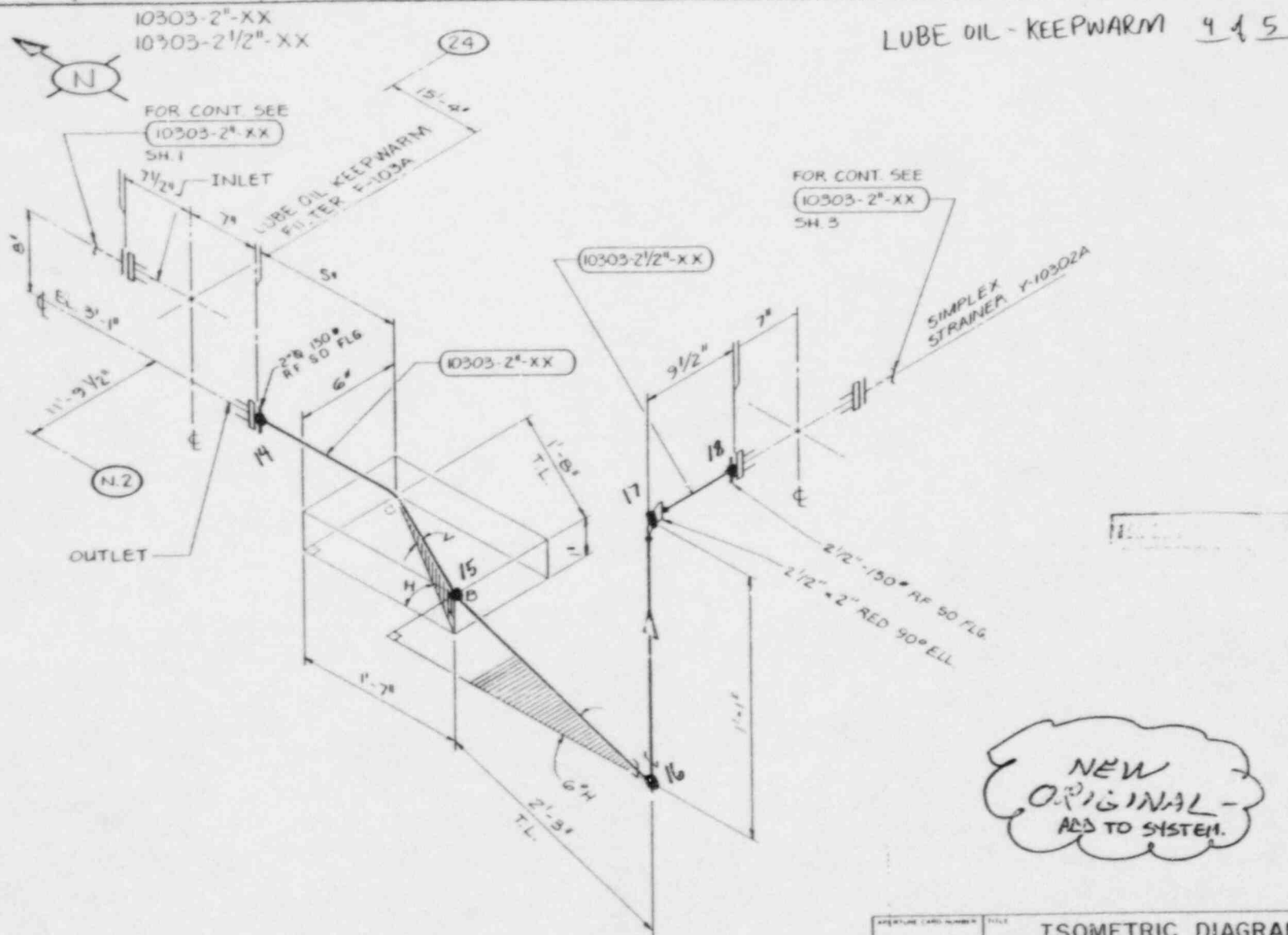
DATUM ELEV. 0'-0" = 165'-0" MSL

NO.	DATE	REVISION	BY	CHKD	ENGR	DATE	REMARKS

PROJECT CLASS 11		TITLE	
APERTURE CARD NUMBER		ISOMETRIC DIAGRAM	
NONE		DIESEL GEN. BUILDING-AREA 17	
G.N.A.		LUBE OIL SYS. - TRAIN "A"	
DATE BY		LOCATION	
RANCHO SECO NUCLEAR GENERATING STA. UNIT 1		REVISION	
DESIGN-TEAM		10303-2"-XX, SH. 1	
DATE		BY	
DATE		BY	
DATE		BY	

APPROVED	DATE	BY	DATE	BY

FIG. A31



ISOMETRIC DIAGRAM	
DIESEL GEN. BLDG. - AREA 17	
LUBE OIL SYS-TRAIN "A"	
RANCHO SECO NUCLEAR GENERATING STA., UNIT 1	
10303-2"-XX, SH. 2	0

3/11	10303-2"-XX	2	10303-2"-XX	2	10303-2"-XX	2
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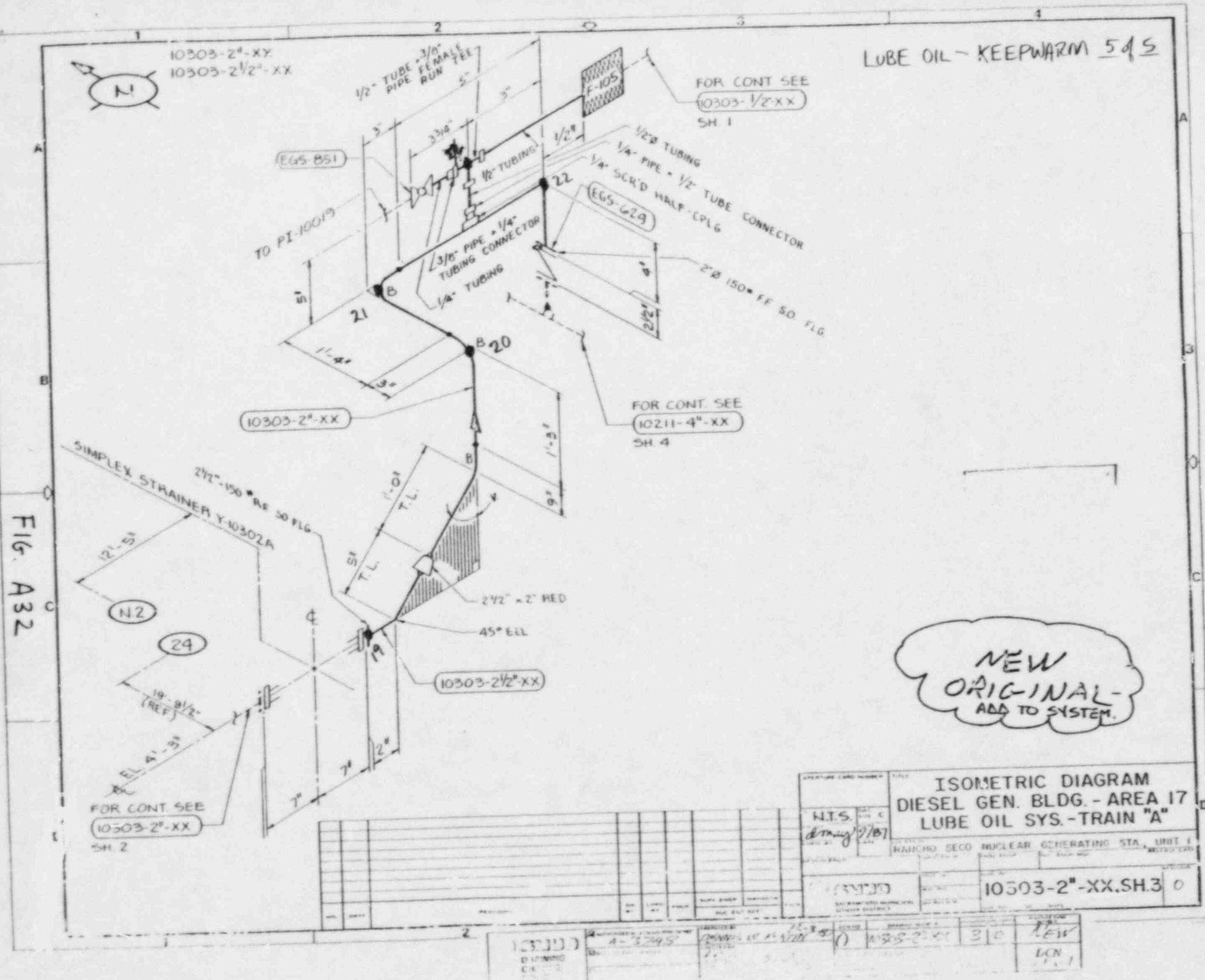
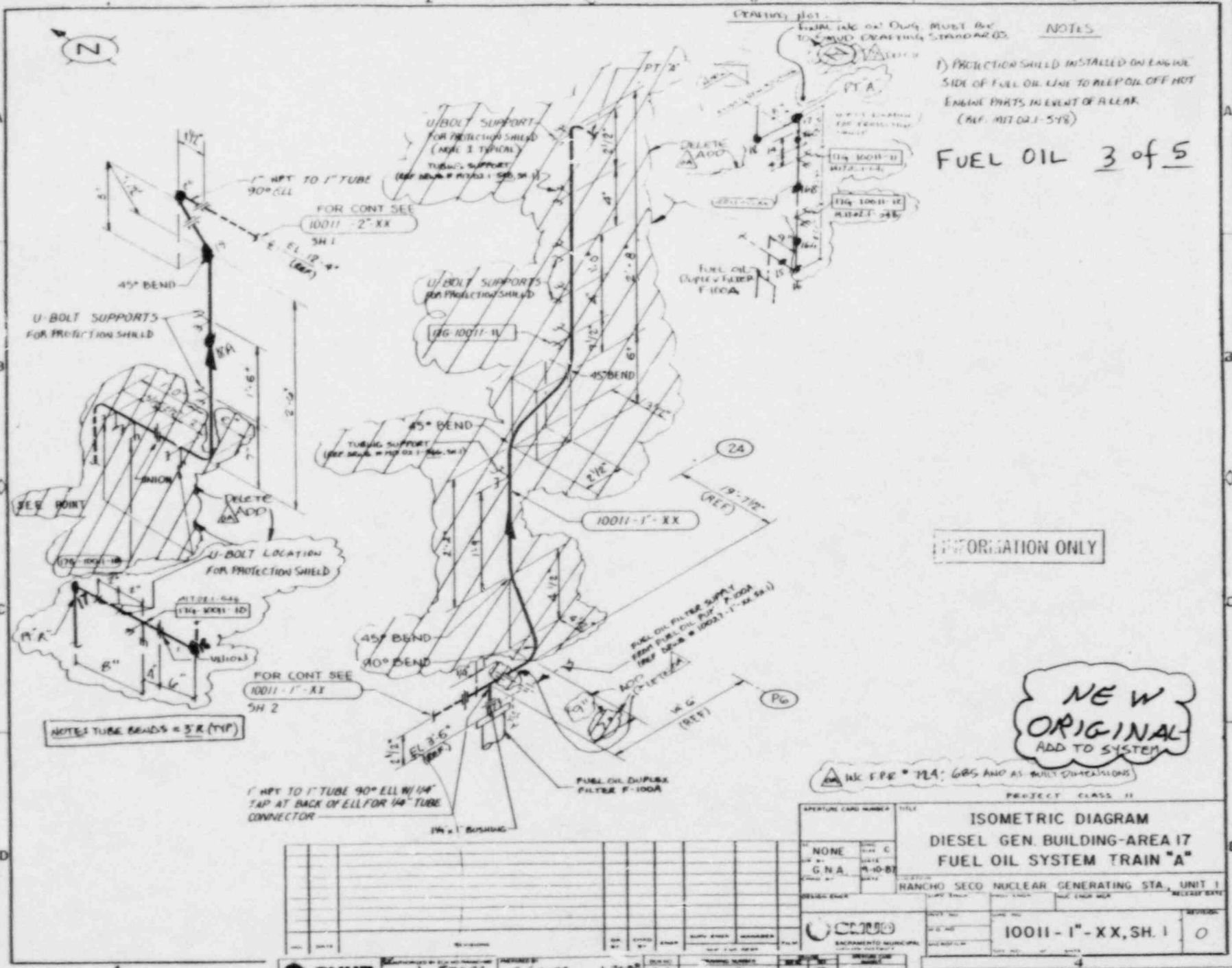


FIG. A35



NOTES
1) PROTECTION SHIELD INSTALLED ON ENGINE SIDE OF FUEL OIL LINE TO PREVENT OFF HOT ENGINE PARTS IN EVENT OF A LEAK.
(REF. MIT 02.1-518)

FUEL OIL 3 of 5

FOR INFORMATION ONLY

NEW ORIGINAL
ADD TO SYSTEM

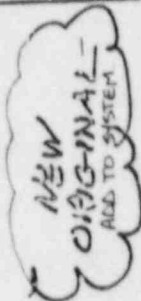
1/4" W.P. 1/4" GAS AND AS BUILT DIMENSIONS
PROJECT CLASS II

APERTURE CARD NUMBER		TITLE	
NONE		ISOMETRIC DIAGRAM	
G.N.A. 10-0-01		DIESEL GEN. BUILDING-AREA 17	
		FUEL OIL SYSTEM TRAIN "A"	
DESIGN ENGINE		RANCHO SECO NUCLEAR GENERATING STA., UNIT 1	
		RELIEF VALVE	
		10011-1'-XX, SH. 1	
		0	

SMUD	DESIGNED BY	CHECKED BY	DATE
	A. S. 10011-1'-XX		10/1/77

DCN MASTER

140-2'XX, 54.1



PROYECTO CUBANA

ISOMETRIC DIAGRAM
DIESEL GEN. BUILDING AREA 17
FUEL OIL SYSTEM-TRAIN "A"

	UNIT 1	UNIT 2	UNIT 3	UNIT 4	UNIT 5	UNIT 6	UNIT 7	UNIT 8	UNIT 9	UNIT 10	UNIT 11	UNIT 12	UNIT 13	UNIT 14	UNIT 15	UNIT 16	UNIT 17	UNIT 18	UNIT 19	UNIT 20	UNIT 21	UNIT 22	UNIT 23	UNIT 24	UNIT 25	UNIT 26	UNIT 27	UNIT 28	UNIT 29	UNIT 30	UNIT 31	UNIT 32	UNIT 33	UNIT 34	UNIT 35	UNIT 36	UNIT 37	UNIT 38	UNIT 39	UNIT 40	UNIT 41	UNIT 42	UNIT 43	UNIT 44	UNIT 45	UNIT 46	UNIT 47	UNIT 48	UNIT 49	UNIT 50	UNIT 51	UNIT 52	UNIT 53	UNIT 54	UNIT 55	UNIT 56	UNIT 57	UNIT 58	UNIT 59	UNIT 60	UNIT 61	UNIT 62	UNIT 63	UNIT 64	UNIT 65	UNIT 66	UNIT 67	UNIT 68	UNIT 69	UNIT 70	UNIT 71	UNIT 72	UNIT 73	UNIT 74	UNIT 75	UNIT 76	UNIT 77	UNIT 78	UNIT 79	UNIT 80	UNIT 81	UNIT 82	UNIT 83	UNIT 84	UNIT 85	UNIT 86	UNIT 87	UNIT 88	UNIT 89	UNIT 90	UNIT 91	UNIT 92	UNIT 93	UNIT 94	UNIT 95	UNIT 96	UNIT 97	UNIT 98	UNIT 99	UNIT 100	UNIT 101	UNIT 102	UNIT 103	UNIT 104	UNIT 105	UNIT 106	UNIT 107	UNIT 108	UNIT 109	UNIT 110	UNIT 111	UNIT 112	UNIT 113	UNIT 114	UNIT 115	UNIT 116	UNIT 117	UNIT 118	UNIT 119	UNIT 120	UNIT 121	UNIT 122	UNIT 123	UNIT 124	UNIT 125	UNIT 126	UNIT 127	UNIT 128	UNIT 129	UNIT 130	UNIT 131	UNIT 132	UNIT 133	UNIT 134	UNIT 135	UNIT 136	UNIT 137	UNIT 138	UNIT 139	UNIT 140	UNIT 141	UNIT 142	UNIT 143	UNIT 144	UNIT 145	UNIT 146	UNIT 147	UNIT 148	UNIT 149	UNIT 150	UNIT 151	UNIT 152	UNIT 153	UNIT 154	UNIT 155	UNIT 156	UNIT 157	UNIT 158	UNIT 159	UNIT 160	UNIT 161	UNIT 162	UNIT 163	UNIT 164	UNIT 165	UNIT 166	UNIT 167	UNIT 168	UNIT 169	UNIT 170	UNIT 171	UNIT 172	UNIT 173	UNIT 174	UNIT 175	UNIT 176	UNIT 177	UNIT 178	UNIT 179	UNIT 180	UNIT 181	UNIT 182	UNIT 183	UNIT 184	UNIT 185	UNIT 186	UNIT 187	UNIT 188	UNIT 189	UNIT 190	UNIT 191	UNIT 192	UNIT 193	UNIT 194	UNIT 195	UNIT 196	UNIT 197	UNIT 198	UNIT 199	UNIT 200	UNIT 201	UNIT 202	UNIT 203	UNIT 204	UNIT 205	UNIT 206	UNIT 207	UNIT 208	UNIT 209	UNIT 210	UNIT 211	UNIT 212	UNIT 213	UNIT 214	UNIT 215	UNIT 216	UNIT 217	UNIT 218	UNIT 219	UNIT 220	UNIT 221	UNIT 222	UNIT 223	UNIT 224	UNIT 225	UNIT 226	UNIT 227	UNIT 228	UNIT 229	UNIT 230	UNIT 231	UNIT 232	UNIT 233	UNIT 234	UNIT 235	UNIT 236	UNIT 237	UNIT 238	UNIT 239	UNIT 240	UNIT 241	UNIT 242	UNIT 243	UNIT 244	UNIT 245	UNIT 246	UNIT 247	UNIT 248	UNIT 249	UNIT 250	UNIT 251	UNIT 252	UNIT 253	UNIT 254	UNIT 255	UNIT 256	UNIT 257	UNIT 258	UNIT 259	UNIT 260	UNIT 261	UNIT 262	UNIT 263	UNIT 264	UNIT 265	UNIT 266	UNIT 267	UNIT 268	UNIT 269	UNIT 270	UNIT 271	UNIT 272	UNIT 273	UNIT 274	UNIT 275	UNIT 276	UNIT 277	UNIT 278	UNIT 279	UNIT 280	UNIT 281	UNIT 282	UNIT 283	UNIT 284	UNIT 285	UNIT 286	UNIT 287	UNIT 288	UNIT 289	UNIT 290	UNIT 291	UNIT 292	UNIT 293	UNIT 294	UNIT 295	UNIT 296	UNIT 297	UNIT 298	UNIT 299	UNIT 300	UNIT 301	UNIT 302	UNIT 303	UNIT 304	UNIT 305	UNIT 306	UNIT 307	UNIT 308	UNIT 309	UNIT 310	UNIT 311	UNIT 312	UNIT 313	UNIT 314	UNIT 315	UNIT 316	UNIT 317	UNIT 318	UNIT 319	UNIT 320	UNIT 321	UNIT 322	UNIT 323	UNIT 324	UNIT 325	UNIT 326	UNIT 327	UNIT 328	UNIT 329	UNIT 330	UNIT 331	UNIT 332	UNIT 333	UNIT 334	UNIT 335	UNIT 336	UNIT 337	UNIT 338	UNIT 339	UNIT 340	UNIT 341	UNIT 342	UNIT 343	UNIT 344	UNIT 345	UNIT 346	UNIT 347	UNIT 348	UNIT 349	UNIT 350	UNIT 351	UNIT 352	UNIT 353	UNIT 354	UNIT 355	UNIT 356	UNIT 357	UNIT 358	UNIT 359	UNIT 360	UNIT 361	UNIT 362	UNIT 363	UNIT 364	UNIT 365	UNIT 366	UNIT 367	UNIT 368	UNIT 369	UNIT 370	UNIT 371	UNIT 372	UNIT 373	UNIT 374	UNIT 375	UNIT 376	UNIT 377	UNIT 378	UNIT 379	UNIT 380	UNIT 381	UNIT 382	UNIT 383	UNIT 384	UNIT 385	UNIT 386	UNIT 387	UNIT 388	UNIT 389	UNIT 390	UNIT 391	UNIT 392	UNIT 393	UNIT 394	UNIT 395	UNIT 396	UNIT 397	UNIT 398	UNIT 399	UNIT 400	UNIT 401	UNIT 402	UNIT 403	UNIT 404	UNIT 405	UNIT 406	UNIT 407	UNIT 408	UNIT 409	UNIT 410	UNIT 411	UNIT 412	UNIT 413	UNIT 414	UNIT 415	UNIT 416	UNIT 417	UNIT 418	UNIT 419</
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10011-2nd-XX, SH.1

④

52110
CLAWING
CLAWING
CLAWING

18. $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$

64	1/2	1/2	1/2	1/2
65	1/2	1/2	1/2	1/2
66	1/2	1/2	1/2	1/2
67	1/2	1/2	1/2	1/2
68	1/2	1/2	1/2	1/2
69	1/2	1/2	1/2	1/2
70	1/2	1/2	1/2	1/2
71	1/2	1/2	1/2	1/2
72	1/2	1/2	1/2	1/2
73	1/2	1/2	1/2	1/2
74	1/2	1/2	1/2	1/2
75	1/2	1/2	1/2	1/2
76	1/2	1/2	1/2	1/2
77	1/2	1/2	1/2	1/2
78	1/2	1/2	1/2	1/2
79	1/2	1/2	1/2	1/2
80	1/2	1/2	1/2	1/2
81	1/2	1/2	1/2	1/2
82	1/2	1/2	1/2	1/2
83	1/2	1/2	1/2	1/2
84	1/2	1/2	1/2	1/2
85	1/2	1/2	1/2	1/2
86	1/2	1/2	1/2	1/2
87	1/2	1/2	1/2	1/2
88	1/2	1/2	1/2	1/2
89	1/2	1/2	1/2	1/2
90	1/2	1/2	1/2	1/2
91	1/2	1/2	1/2	1/2
92	1/2	1/2	1/2	1/2
93	1/2	1/2	1/2	1/2
94	1/2	1/2	1/2	1/2
95	1/2	1/2	1/2	1/2
96	1/2	1/2	1/2	1/2
97	1/2	1/2	1/2	1/2
98	1/2	1/2	1/2	1/2
99	1/2	1/2	1/2	1/2
100	1/2	1/2	1/2	1/2

1001-22-xx

1	0	500
		DCN
		1000

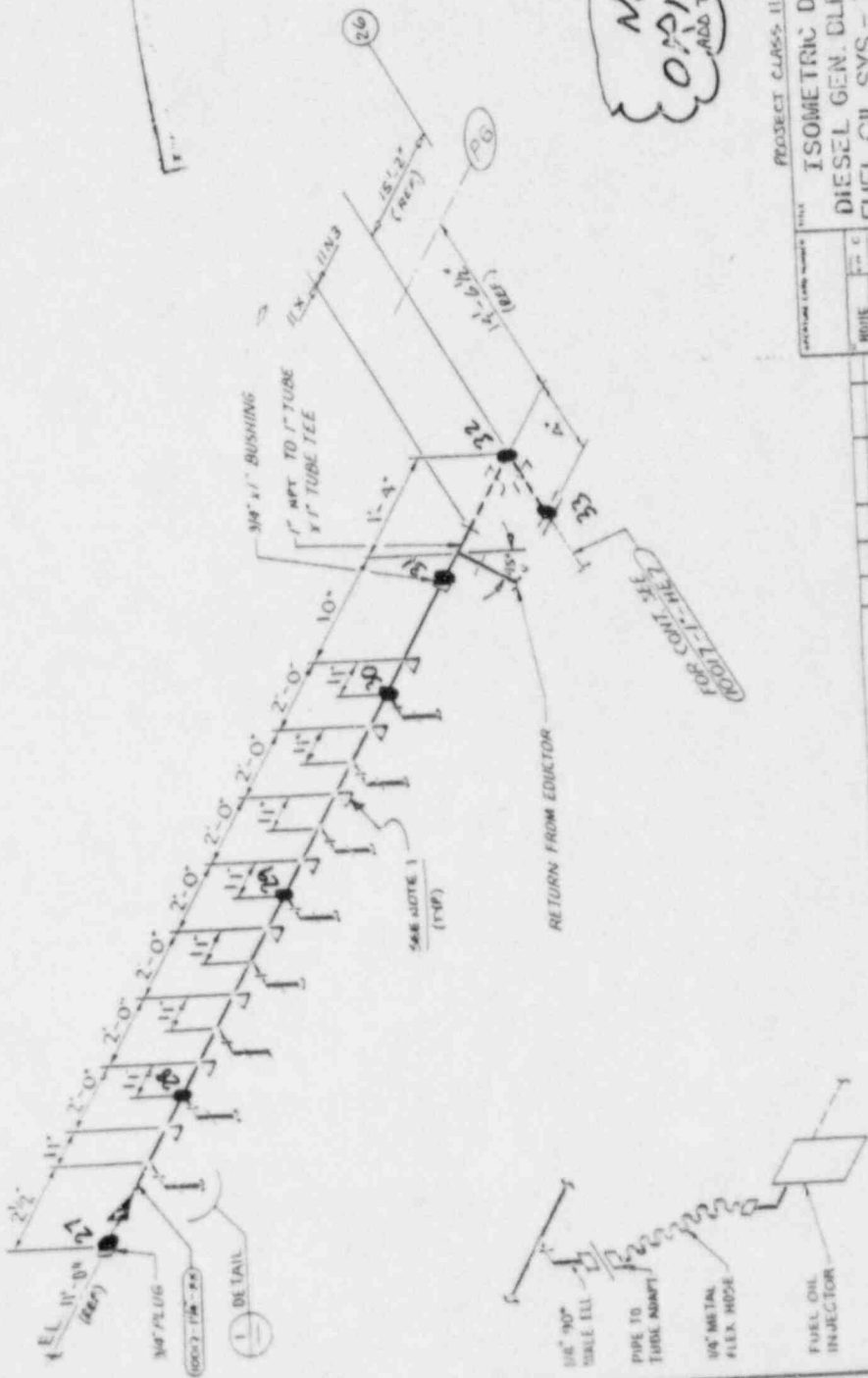
FIG. A36

NOTE

1) FOR PIPE SUPPORTS SEE
DWG 10011-2"-XX, SH 2

FUEL OIL 545

NEW
ORIGINAL
ADD TO SYSTEM



PROJECT CLASS II

ISOMETRIC DIAGRAM
DIESEL GEN. BLDG. AREA 17
FUEL OIL SYS. - TRAIN 'A'

UNIT 1	10017-1/4"-XX, SH 1
REVISION	
DATE	
BY	
CHECKED	
APPROVED	

NO. 1	10017-1/4"-XX, SH 1
NO. 2	
NO. 3	
NO. 4	
NO. 5	
NO. 6	
NO. 7	
NO. 8	
NO. 9	
NO. 10	
NO. 11	
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NO. 19	
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NO. 33	
NO. 34	
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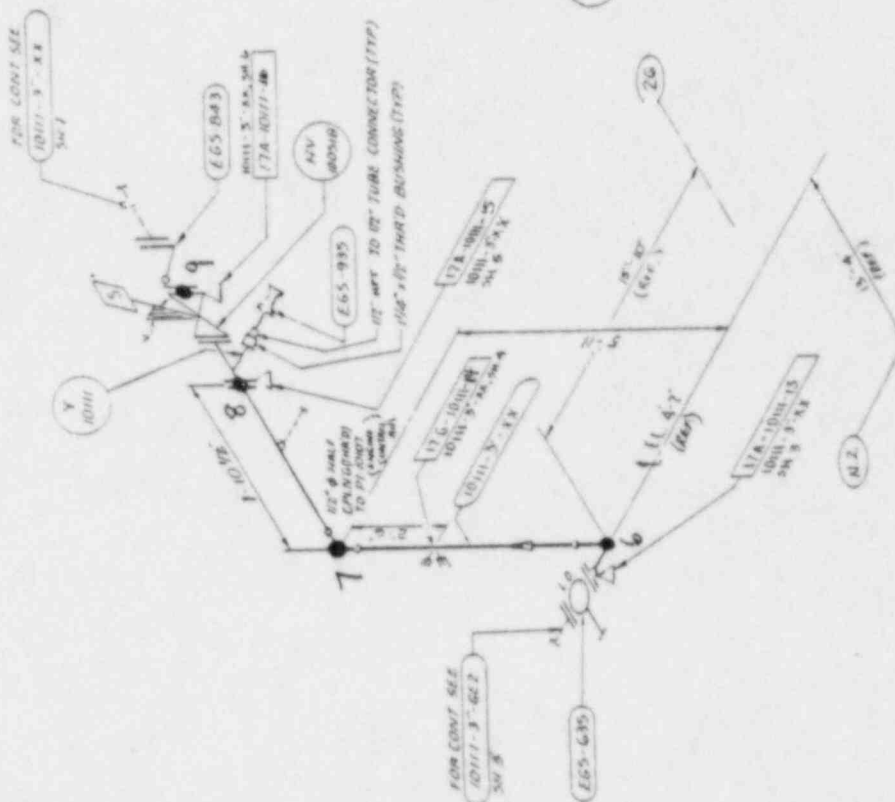
FIG. A37



FIG. A38

STARTING AIR 2 1/2 3

10111-3-X-X



NEW ORIGINAL DESIGN -
INCORPORATES PREVIOUS
FOR 1 ADDS SUPPORT
DURING 2000

FOR INFORMATION

PROJECT CADD 11

ISOMETRIC DIAGRAM
DIESEL GENERATOR BLDG AREA 17
STARTING AIR SYSTEM - TRAIN "A"

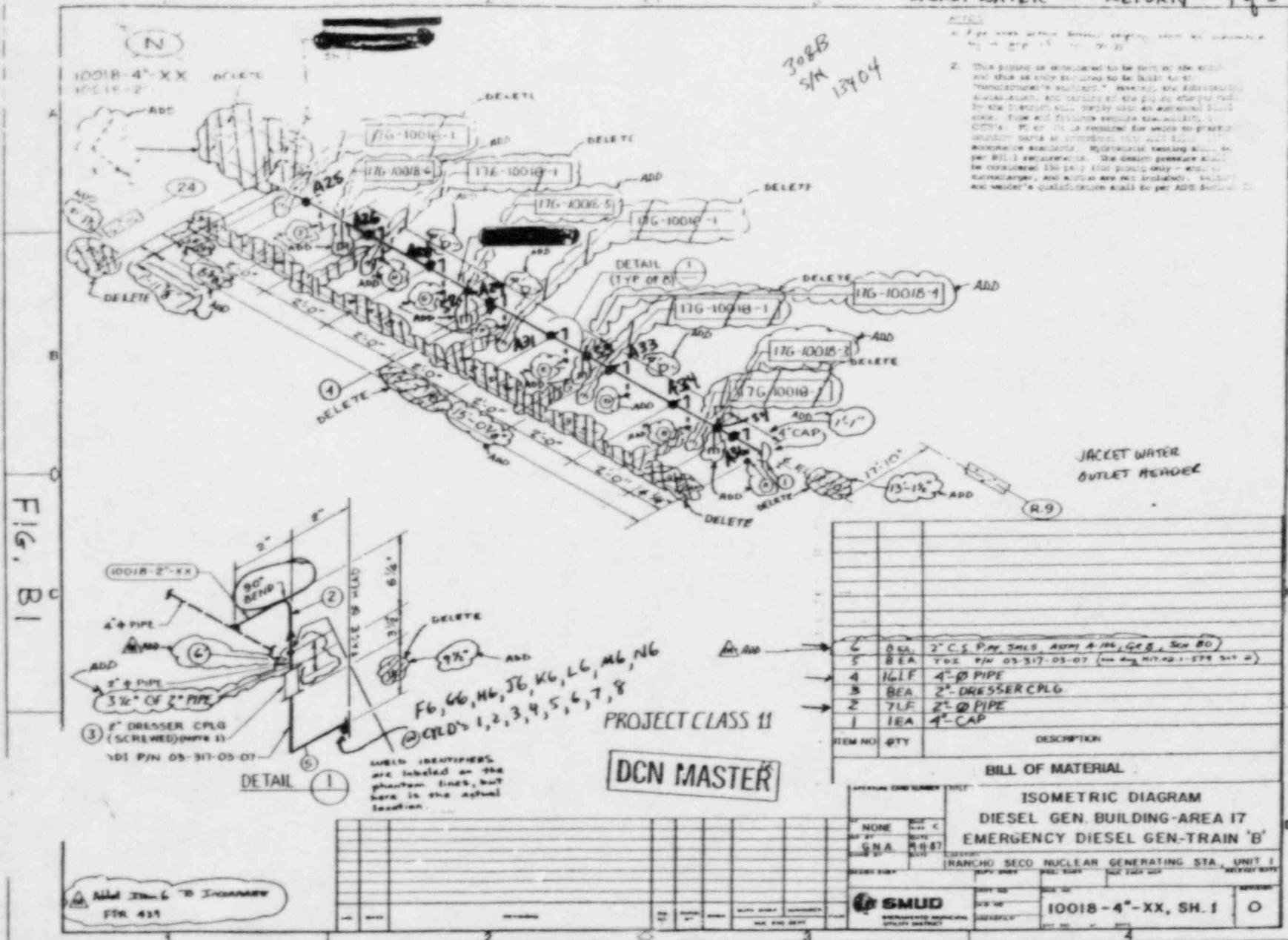
DATE: 10/11/11
BY: [Signature]
CHECKED: [Signature]
APPROVED: [Signature]

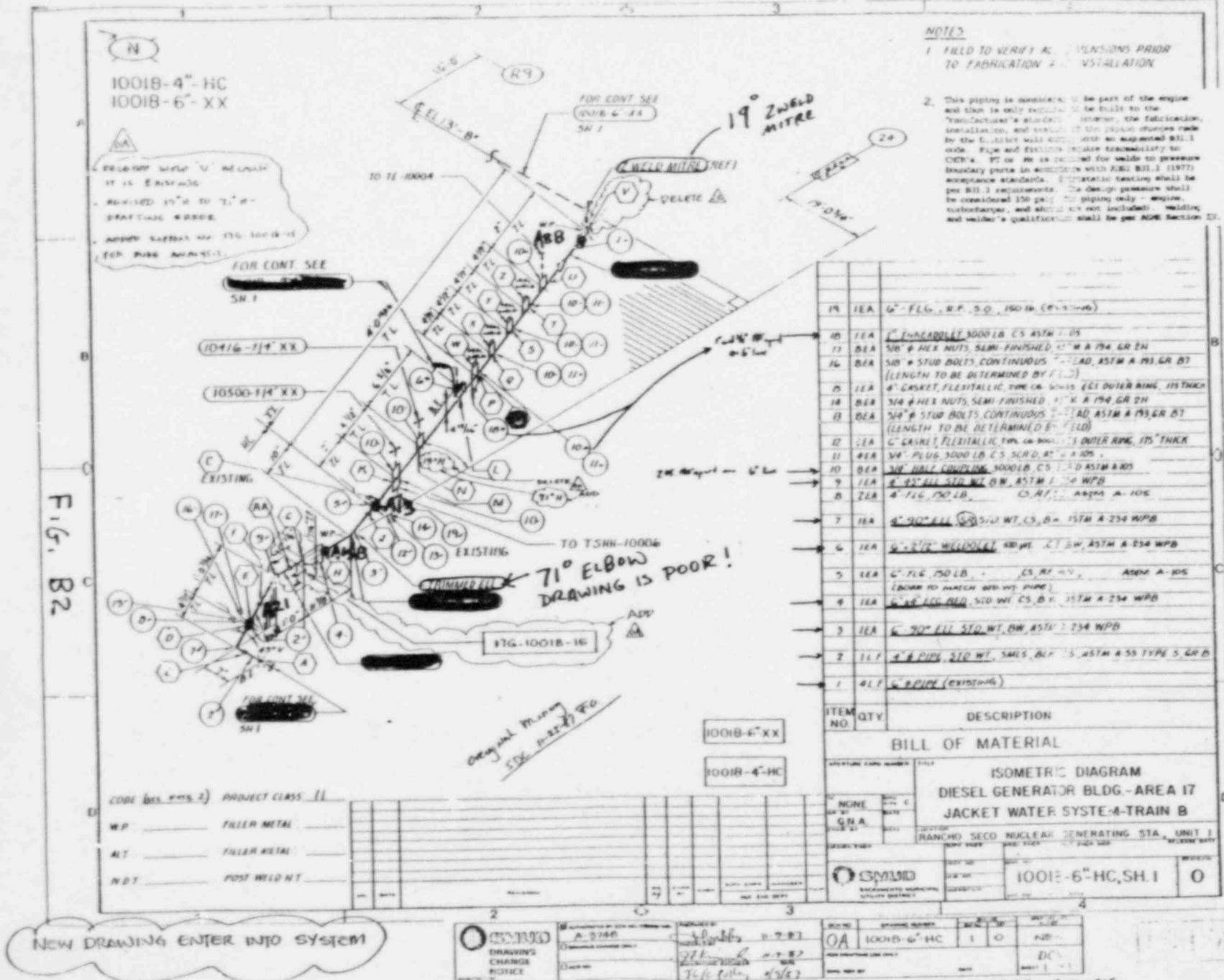
10111-3-X-X, SPL2 0

10111-3-X-X

NO.	DESCRIPTION	DATE	BY	CHECKED	APPROVED
1	10111-3-X-X	10/11/11	[Signature]	[Signature]	[Signature]
2	10111-3-X-X	10/11/11	[Signature]	[Signature]	[Signature]
3	10111-3-X-X	10/11/11	[Signature]	[Signature]	[Signature]

FIG. A40





JACKET WATER - RETURN 3 of 5

FOR INFORMATION ONLY

Project Class II

ISOMETRIC DIAGRAM
DIESEL GEN. BUILDING AREA 17
JACKET WATER SYS. - TRAIN "B"

UNIT 1	GENERATING STA.	10018-6-XX, SH.1
RANCHO SECO NUCLEAR	UNIT 1	10018-6-XX, SH.1

CS&MD

DATE	1/15/68	BY	A. J. HARRIS
REVISION	1	DATE	1/15/68
BY	A. J. HARRIS	DATE	1/15/68

NEW DRAWING / ENTER INTO SYSTEM

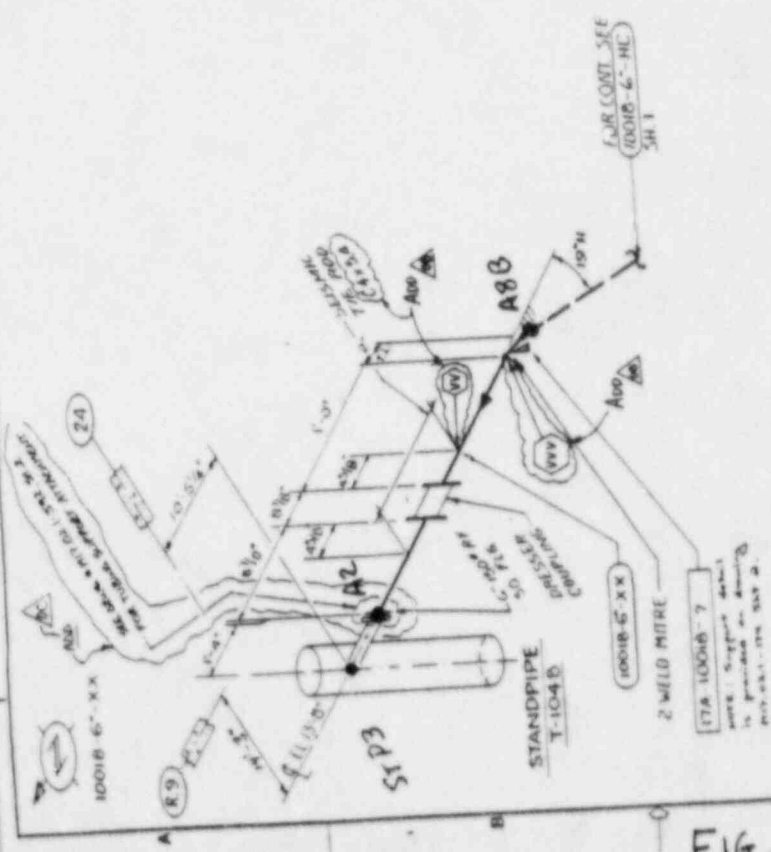
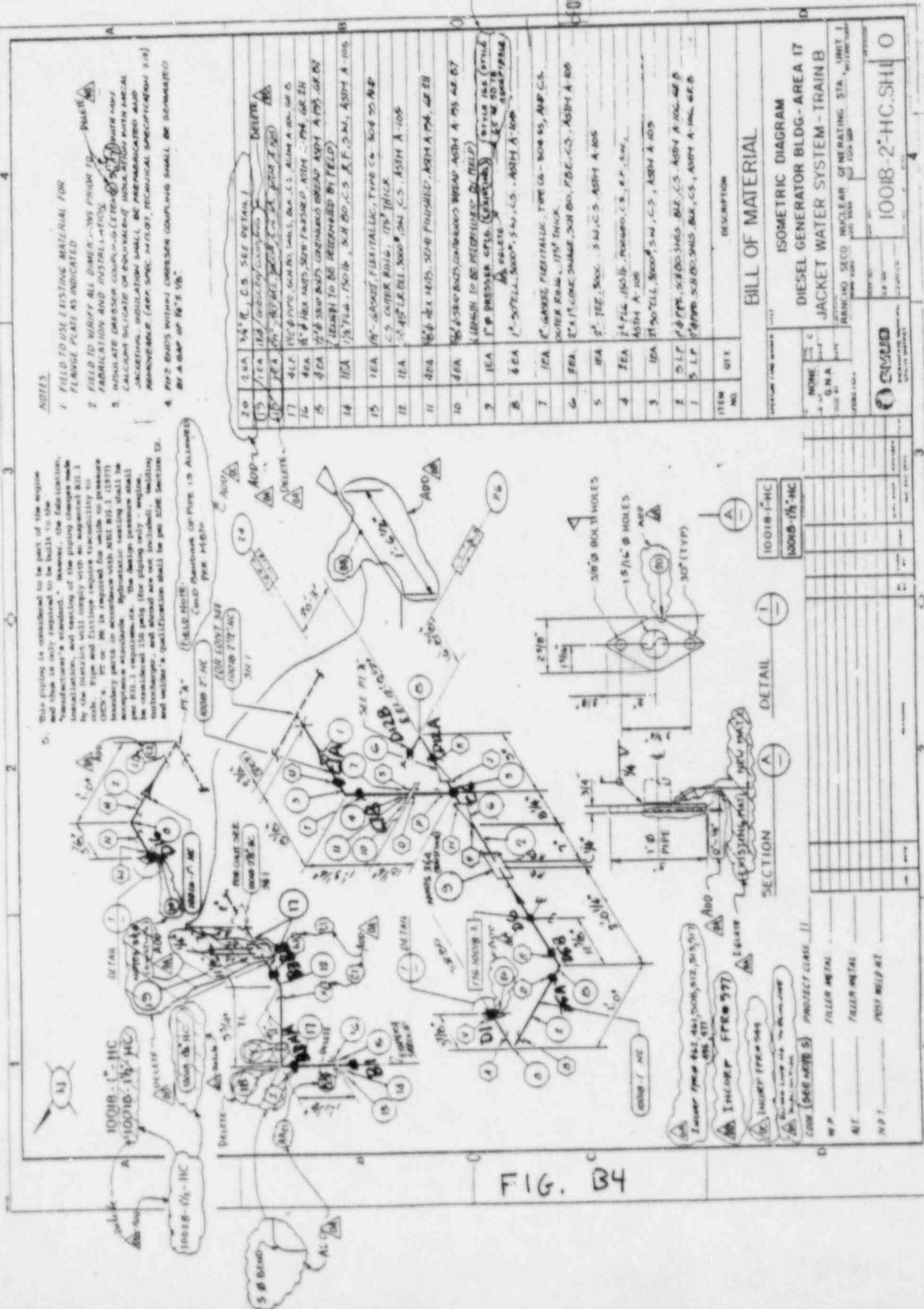


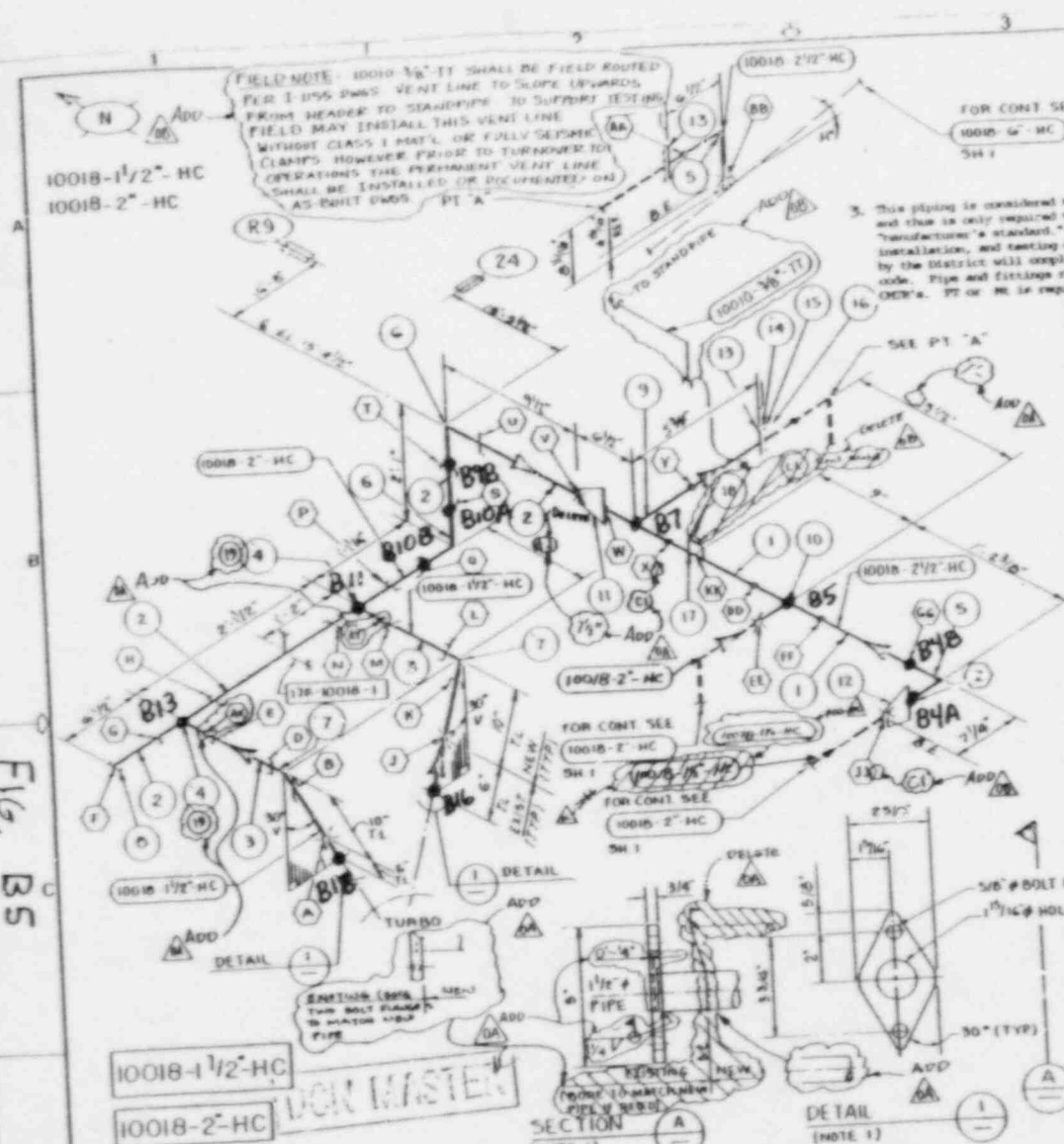
FIG. B3

JACKET WATER - RETURN 4 of 5



OR INFORMATION ONLY

SUPERPIPE ANALYSIS



ADD
NOTE

1. FIELD TO USE EXISTING MATERIAL FOR PIPE AND FLANGE PLATE AS INDICATED
2. FIELD TO VERIFY ALL DIMENSIONS PRIOR TO FABRICATION AND INSTALLATION

3. This piping is considered to be part of the engine and thus is only required to be built to the "Manufacturer's standard." However, the fabrication, installation, and testing of the piping changes made by the District will comply with an augmented ASME code. Pipe and fittings require traceability to ASME code. Welding is required for welds to pressure

boundary parts in accordance with ASME B31.1 (1977) acceptance standards. Hydrostatic testing shall be per B31.1 requirements. The design pressure shall be considered 150 psig (for piping only - engine, turbocharger, and -weld are not included). Welding and welder's qualification shall be per ASME Section IX.

IN	EA	DESCRIPTION
		NO. PLUG 3000° CS END ASTM A 105
		3/4" HALF-COUPLING 3000° CS SCHWED
17	1EA	ASTM A 105
16	4EA	5/16" 6 HEX NUTS 5END FINISHED, ASTM A-190 GR 2H
15	4EA	5/16" * STUD BOLTS CONTINUOUS THREAD ASTM-A-193, 6H BT(LENGTH TO BE DETERMINED BY FIELD)
14	1EA	2 1/2" GASKET, FLEXITALLIC, C6 30455 EC'S DUTER RING, 175 THICK
13	2EA	2 1/2" - FLG. 150° CS RTW N ASTM A-105
		(BORE TO PIPE SCHEDULE)
12	1EA	2 1/2" x 1 1/4" CONC P-F 150 WT CS BW ASTM A 234 WPB
		(BORE 1 1/2" END IL PIPE SCHEDULE)
11	1EA	2 1/2" 1" CONC RED SCH 40 CS BW ASTM A 234 WPB (BORE 2 1/2" END TO PIPE SCHEDULE)
10	1EA	2 1/2" x 2 1/2" x 2" RED TEE SCH 40 CS BW ASTM-A-234 WPB (BORE 2 1/2" END TO PIPE SCHEDULE)
9	1EA	2 1/2" TEE STD WT CS BW ASTM A 234 NPD
8	1EA	1" CAP 3000° CS SW ASTM A 105
7	2EA	1 1/2" - 90° ELL 3000° CS SW ASTM A 105
6	2EA	2" 90° ELL 3000° CS SW ASTM A 105
5	2EA	2" x 1 1/2" RED, 3000° C 6, 3W, ASTM-A-193 A 234 WPB
4	2EA	2 1/2" 90° ELL STD WT CS BW ASTM A 234 WPB
3	2EA	2 1/2" x 1 1/2" TEE 3000° CS SW ASTM A 105
2	3LF	1 1/2" x PIPE, SCH 40 SMLS BLK. CS. ASTM A 106 GR B
2	6LF	2" x PIPE, SCH 40 SMLS BLK. CS ASTM A 106 GR B
1	5LF	2 1/2" x PIPE, STD WT SMLS BLK. CS, ASTM-A 53 TYPE 2, GR B

BILL OF MATERIAL

ISOMETRIC DIAGRAM
DIESEL GENERATOR BLDG-AREA 17
JACKET WATER SYSTEM-TRAIN "B"

ANCHO SECO NUCLEAR GENERATING STA. UNIT 1

10018-2 1/2"-HC,SH.1 0

SUPER PIPE ANALYSIS

NEW
DCN

CODE: (see spec) PROJECT CLASS: 11
W.P. _____ FILLER METAL: _____
ALT. _____ FILLER METAL: _____
P.D.T. _____ POST WELD HT. _____

NEW DRAWING/ENTER INTO SYSTEM

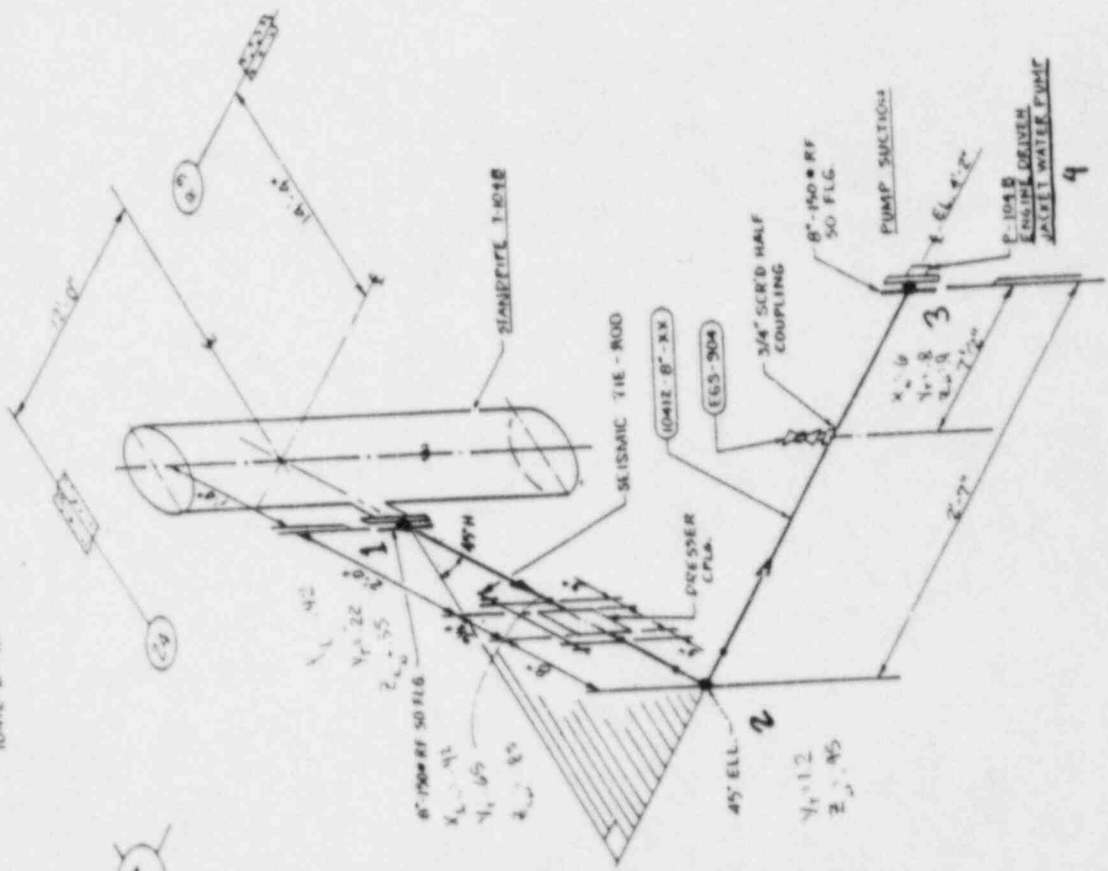


$\Delta x_{\text{max}} = 200 \times 10^{-3} \times 4.4, 4.73, 4.77, 5.03$

INVESTIGATION FILE 977 (which was closed FILE 974), 500, 502. WRITTEN AGAINST 1000 T.
SA T. IN 1968.

JACKET WATER - SUPPLY 146

4/22/68
J.B. JMA



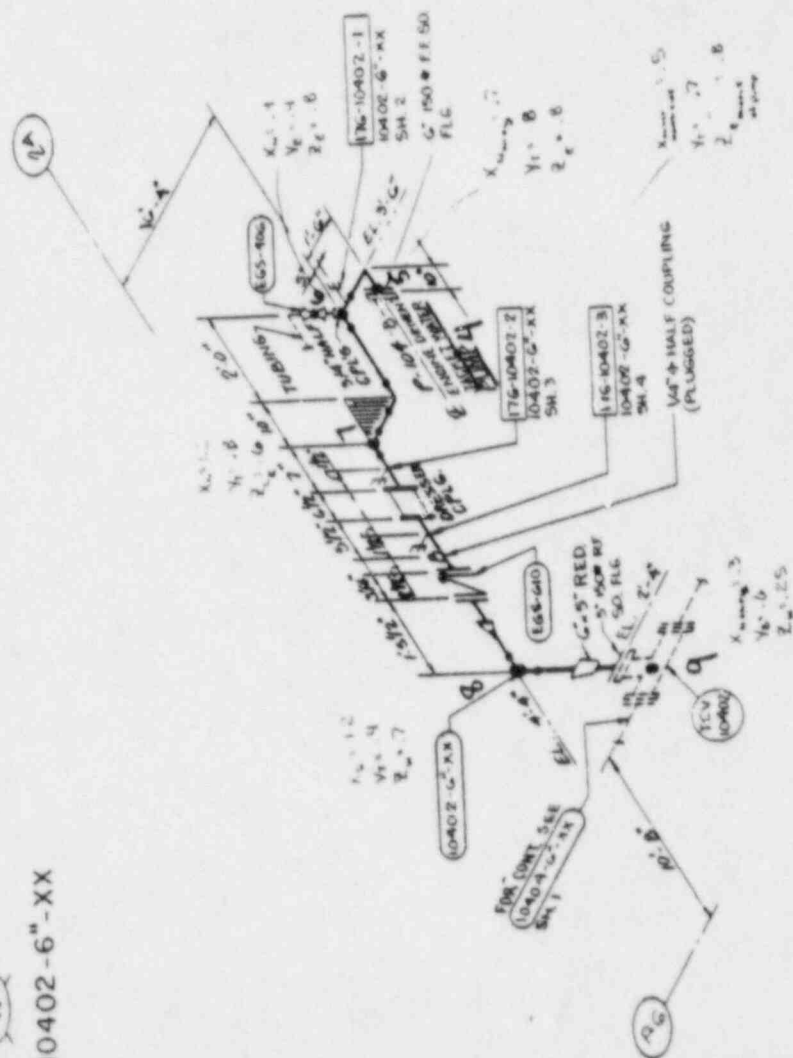
NEW
ORIGINAL-
ADD TO SYSTEM.

ISOMETRIC DIAGRAM	
DIESEL GEN. BUILDING - AREA 17	
JACKET WATER SYS. - TRAIN "B"	
PROJECT NO.	10412-9" XX, SH. 1
DATE	4/22/68
BY	J.B. JMA
CHECKED	
APPROVED	

ALLOWED

FIG. B6

10402-6"-XX



NEW
ORIGINAL
ADD TO SYSTEM.

FIG. B7

ISOMETRIC DIAGRAM

DIESEL GEN. BUILDING-AREA 17

STATION
REACTOR SEC0 NUCLEAS GENERATING STA., UNIT 1

10402-6"-XX-SH1

ALLOWED:

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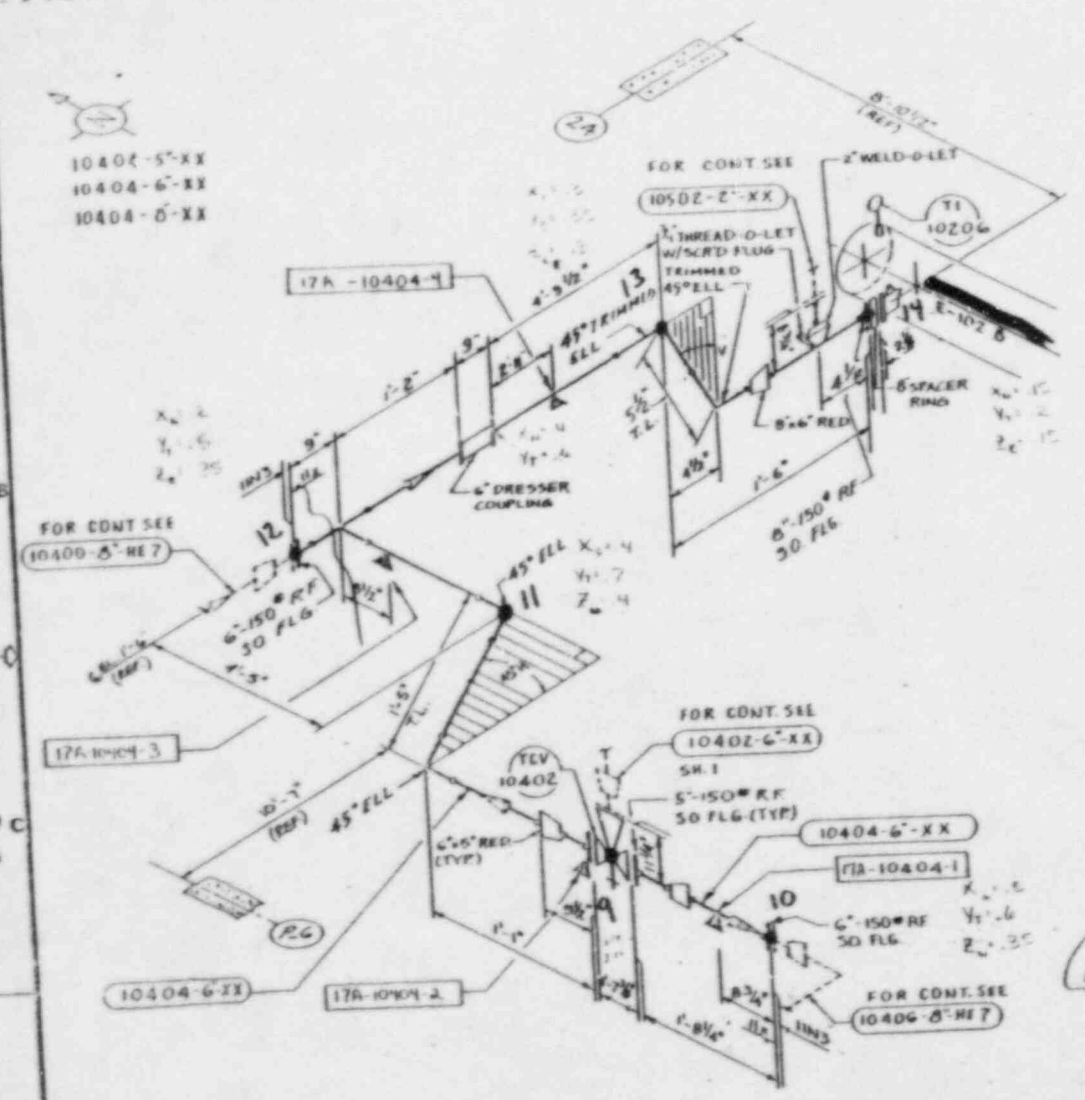
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JACKET WATER - SUPPLY 3461

1/2" / 100
1/8"
1/4" VLA

FIG. B8



FOR INFORMATION ONLY

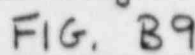
DCN MASTER

NEW Dwg. -
ADD TO SYSTEM.

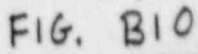
DESIGNED DESIGNED CHANGED NOTICE		A 3712 10404-6" XX 10404-6" XX		10404-6" XX 10404-6" XX 10404-6" XX		10404-6" XX 10404-6" XX 10404-6" XX		10404-6" XX 10404-6" XX 10404-6" XX		10404-6" XX 10404-6" XX 10404-6" XX	
PROJECT CLASS II		ISOMETRIC DIAGRAM DIESEL GEN BLDG.-AREA 17 JACKET WATER SYSTEM-TRAIN B		RANCHO SECO NUCLEAR GENERATING STA., UNIT 1		10404-6" XX, SH. 1		10404-6" XX, SH. 1		10404-6" XX, SH. 1	

ALLOWED

496



1/22/88
J. A. 46A



ALLOWED: 5th SAG 3rd 4th 6th 7th

JACKET WATER - SUPPLY 696

1/22/68
J.A. VOA

FOR INFORMATION ONLY

NEW DRUG -
ADD TO SYSTEM

NOTED: 6-22-68

DCI MASTER

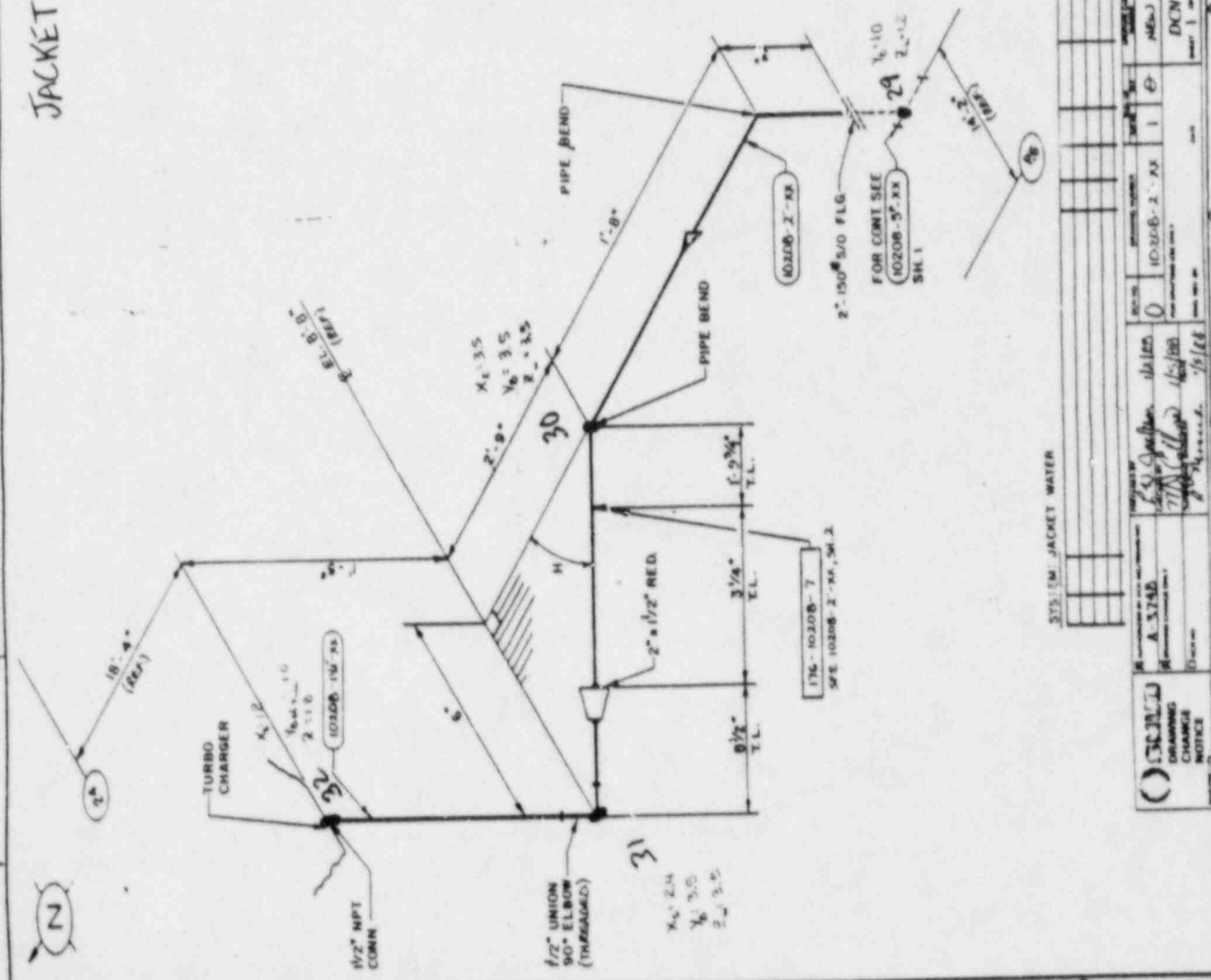


FIG. B11

PROJECT CLASS: 11

ISOMETRIC DIAGRAM
DIESEL GEN. BUILDING-AREA 17
JACKET WATER SYSTEM-TRAIN "B"

NO. 1	DATE 10/20/68	BY J.A. VOA
NO. 2	DATE 10/20/68	BY J.A. VOA
NO. 3	DATE 10/20/68	BY J.A. VOA
NO. 4	DATE 10/20/68	BY J.A. VOA
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NO. 45	DATE 10/20/68	BY J.A. VOA
NO. 46	DATE 10/20/68	BY J.A. VOA
NO. 47	DATE 10/20/68	BY J.A. VOA
NO. 48	DATE 10/20/68	BY J.A. VOA
NO. 49	DATE 10/20/68	BY J.A. VOA
NO. 50	DATE 10/20/68	BY J.A. VOA
NO. 51	DATE 10/20/68	BY J.A. VOA
NO. 52	DATE 10/20/68	BY J.A. VOA
NO. 53	DATE 10/20/68	BY J.A. VOA
NO. 54	DATE 10/20/68	BY J.A. VOA
NO. 55	DATE 10/20/68	BY J.A. VOA
NO. 56	DATE 10/20/68	BY J.A. VOA
NO. 57	DATE 10/20/68	BY J.A. VOA
NO. 58	DATE 10/20/68	BY J.A. VOA
NO. 59	DATE 10/20/68	BY J.A. VOA
NO. 60	DATE 10/20/68	BY J.A. VOA
NO. 61	DATE 10/20/68	BY J.A. VOA
NO. 62	DATE 10/20/68	BY J.A. VOA
NO. 63	DATE 10/20/68	BY J.A. VOA
NO. 64	DATE 10/20/68	BY J.A. VOA
NO. 65	DATE 10/20/68	BY J.A. VOA
NO. 66	DATE 10/20/68	BY J.A. VOA
NO. 67	DATE 10/20/68	BY J.A. VOA
NO. 68	DATE 10/20/68	BY J.A. VOA
NO. 69	DATE 10/20/68	BY J.A. VOA
NO. 70	DATE 10/20/68	BY J.A. VOA
NO. 71	DATE 10/20/68	BY J.A. VOA
NO. 72	DATE 10/20/68	BY J.A. VOA
NO. 73	DATE 10/20/68	BY J.A. VOA
NO. 74	DATE 10/20/68	BY J.A. VOA
NO. 75	DATE 10/20/68	BY J.A. VOA
NO. 76	DATE 10/20/68	BY J.A. VOA
NO. 77	DATE 10/20/68	BY J.A. VOA
NO. 78	DATE 10/20/68	BY J.A. VOA
NO. 79	DATE 10/20/68	BY J.A. VOA
NO. 80	DATE 10/20/68	BY J.A. VOA
NO. 81	DATE 10/20/68	BY J.A. VOA
NO. 82	DATE 10/20/68	BY J.A. VOA
NO. 83	DATE 10/20/68	BY J.A. VOA
NO. 84	DATE 10/20/68	BY J.A. VOA
NO. 85	DATE 10/20/68	BY J.A. VOA
NO. 86	DATE 10/20/68	BY J.A. VOA
NO. 87	DATE 10/20/68	BY J.A. VOA
NO. 88	DATE 10/20/68	BY J.A. VOA
NO. 89	DATE 10/20/68	BY J.A. VOA
NO. 90	DATE 10/20/68	BY J.A. VOA
NO. 91	DATE 10/20/68	BY J.A. VOA
NO. 92	DATE 10/20/68	BY J.A. VOA
NO. 93	DATE 10/20/68	BY J.A. VOA
NO. 94	DATE 10/20/68	BY J.A. VOA
NO. 95	DATE 10/20/68	BY J.A. VOA
NO. 96	DATE 10/20/68	BY J.A. VOA
NO. 97	DATE 10/20/68	BY J.A. VOA
NO. 98	DATE 10/20/68	BY J.A. VOA
NO. 99	DATE 10/20/68	BY J.A. VOA
NO. 100	DATE 10/20/68	BY J.A. VOA

SYSTEM: JACKET WATER

DATE: 10/20/68

BY: J.A. VOA

FOR: DCI MASTER

NOTICE: 10/20/68

JACKET WATER - OVERFLOW 14-1

12/2/88
J. L. J.

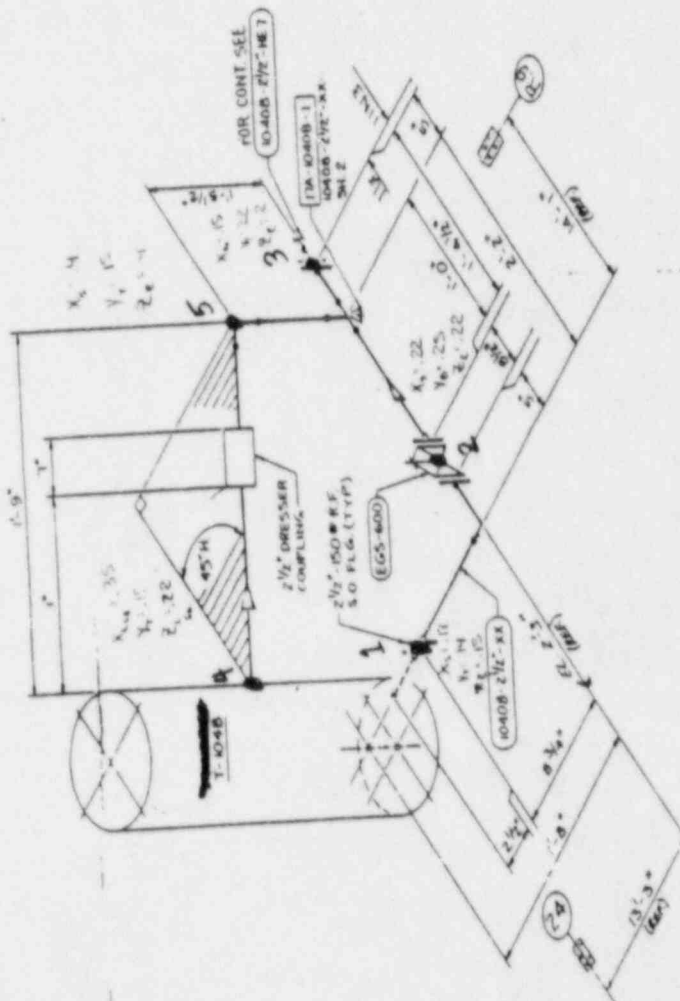


FIG. B12

DCN MASTER

© 1995
 CHANG
 CHANG
 CHANG

2014

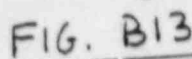
776 1862. 12/1/1862
C. J. Parker 12/1/1862
12/1/1862

AC-108 26 KK 1

1/20/21

Answer D

1/22/88
J. H. H.



NEW
ORIGINAL
AND TO SYSTEM.

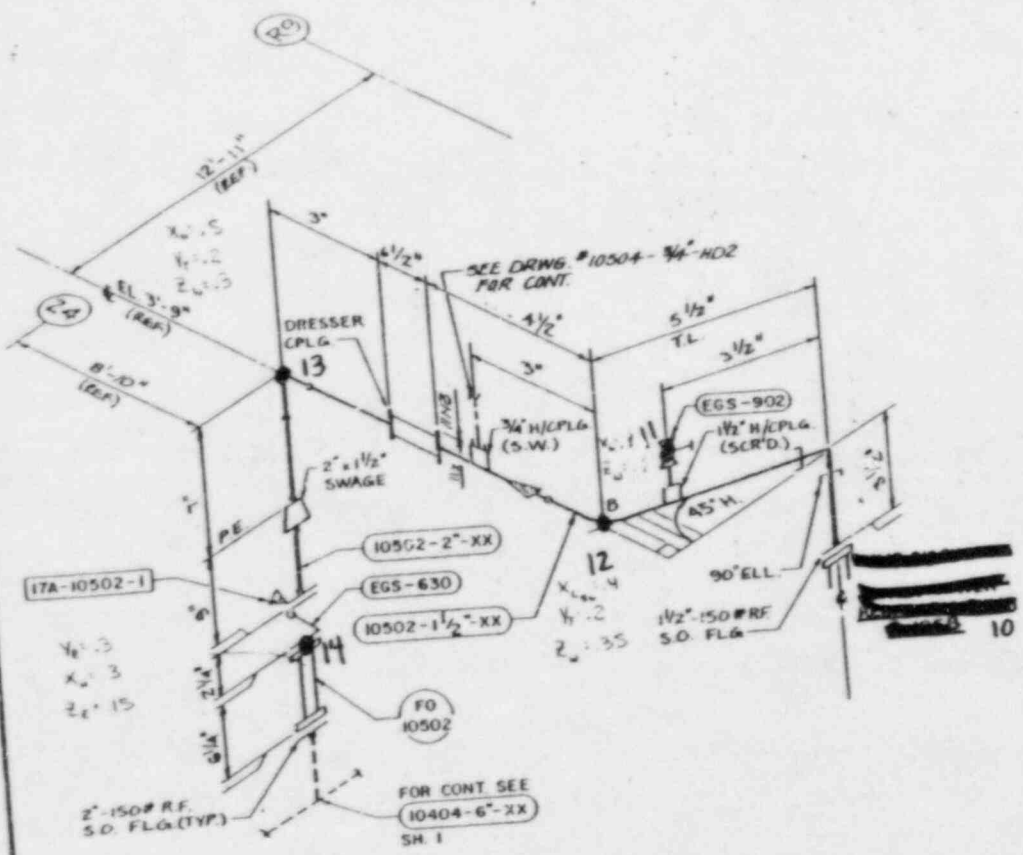
[illegible]

10502-2"-XX

JACKET WATER-KEEPWARM 2 of 2

1/2" RE
1" B
1.5" VWA

FIG. B14



FOR LATER SECTION ONLY

NEW Dwg
ADD TO SYSTEM

DCN MASTER

INSULATION: 0

PROJECT CLASS 11

DATUM ELEV. 0'-0"-165'-0" MSL

ISOMETRIC DIAGRAM	
DIESEL GEN. BLDG.-AREA 17	
JACKET WATER SYS.-TRAIN "B"	
RANCHO SECO NUCLEAR GENERATING STA., UNIT 1	
10502-2"-XX, SH. 1	

10502-2"-XX
DRAWING
CH 1000
10502

A 3118

7/18/67
J. J. Collins
J. J. Collins
J. J. Collins

10502-2"-XX
1
NEW
DCN
10502-2"-XX, SH. 1

ALLOWED 6/8/67
J. J. Collins

JACKET WATER - DEMON W-1

1/22/84
J.P.
J.A. VLB

FOR

DCN MASTER

PROJECT CLASS II

ISOMETRIC DIAGRAM
DIESEL GEN. BUILDING-AREA 17
JACKET WATER SYSTEM-TRAIN "B"

UNIT 1
RANCHO SECO NUCLEAR GENERATING STA.

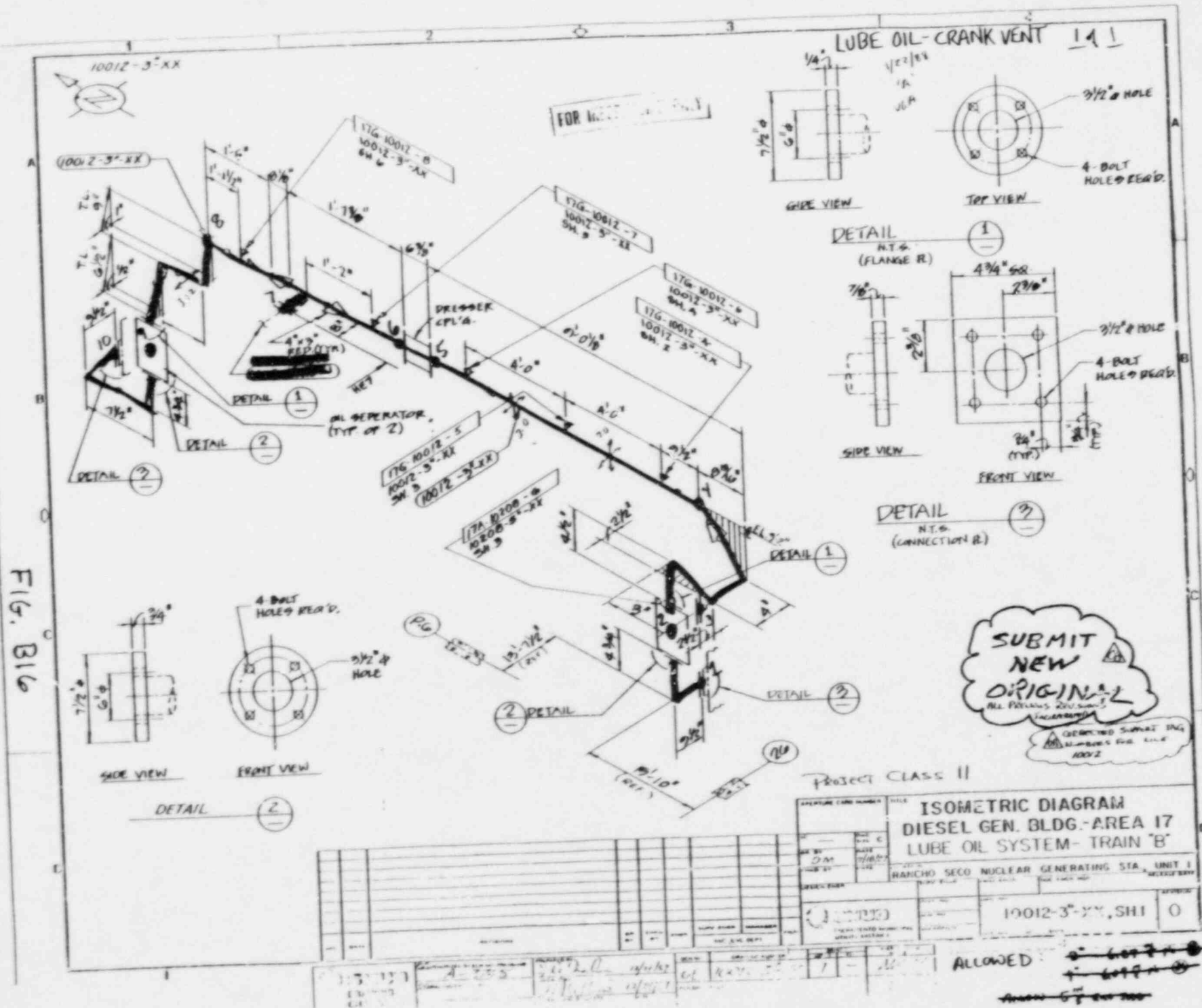
65002-2 1/2" XX, SH. 1-0

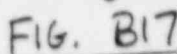
ALLOWED 6 7/8" end view

NEW DESIGN -
ADD TO SYSTEM

NO.	DESCRIPTION	DATE	BY	CHKD
1	65002-2 1/2" XX, SH. 1-0	1/22/84	J.P.	J.A. VLB
2	17A-66-002-1			
3	EGS-70B			
4	66002-2 1/2" XX			
5	17A-66-002-1			
6	EGS-70B			
7	66002-2 1/2" XX			
8	17A-66-002-1			
9	EGS-70B			
10	66002-2 1/2" XX			
11	17A-66-002-1			
12	EGS-70B			
13	66002-2 1/2" XX			
14	17A-66-002-1			
15	EGS-70B			
16	66002-2 1/2" XX			
17	17A-66-002-1			
18	EGS-70B			
19	66002-2 1/2" XX			
20	17A-66-002-1			
21	EGS-70B			
22	66002-2 1/2" XX			
23	17A-66-002-1			
24	EGS-70B			
25	66002-2 1/2" XX			
26	17A-66-002-1			
27	EGS-70B			
28	66002-2 1/2" XX			
29	17A-66-002-1			
30	EGS-70B			
31	66002-2 1/2" XX			
32	17A-66-002-1			
33	EGS-70B			
34	66002-2 1/2" XX			
35	17A-66-002-1			
36	EGS-70B			
37	66002-2 1/2" XX			
38	17A-66-002-1			
39	EGS-70B			
40	66002-2 1/2" XX			
41	17A-66-002-1			
42	EGS-70B			
43	66002-2 1/2" XX			
44	17A-66-002-1			
45	EGS-70B			
46	66002-2 1/2" XX			
47	17A-66-002-1			
48	EGS-70B			
49	66002-2 1/2" XX			
50	17A-66-002-1			
51	EGS-70B			
52	66002-2 1/2" XX			
53	17A-66-002-1			
54	EGS-70B			
55	66002-2 1/2" XX			
56	17A-66-002-1			
57	EGS-70B			
58	66002-2 1/2" XX			
59	17A-66-002-1			
60	EGS-70B			
61	66002-2 1/2" XX			
62	17A-66-002-1			
63	EGS-70B			
64	66002-2 1/2" XX			
65	17A-66-002-1			
66	EGS-70B			
67	66002-2 1/2" XX			
68	17A-66-002-1			
69	EGS-70B			
70	66002-2 1/2" XX			
71	17A-66-002-1			
72	EGS-70B			
73	66002-2 1/2" XX			
74	17A-66-002-1			
75	EGS-70B			
76	66002-2 1/2" XX			
77	17A-66-002-1			
78	EGS-70B			
79	66002-2 1/2" XX			
80	17A-66-002-1			
81	EGS-70B			
82	66002-2 1/2" XX			
83	17A-66-002-1			
84	EGS-70B			
85	66002-2 1/2" XX			
86	17A-66-002-1			
87	EGS-70B			
88	66002-2 1/2" XX			
89	17A-66-002-1			
90	EGS-70B			
91	66002-2 1/2" XX			
92	17A-66-002-1			
93	EGS-70B			
94	66002-2 1/2" XX			
95	17A-66-002-1			
96	EGS-70B			
97	66002-2 1/2" XX			
98	17A-66-002-1			
99	EGS-70B			
100	66002-2 1/2" XX			

FIG. B15



$$\frac{1}{11}$$


ATMO MOLL. 2003/1 20

PROJECT CLASS: 11

ITEM NO.	QTY	DESCRIPTION	UNIT	PRICE	TOTAL
1	1	1" P.V.C. PIPE 10' LONG	10'	1.00	10.00
2	1	1" P.V.C. FITTING	1	1.00	1.00
3	1	1" P.V.C. FITTING	1	1.00	1.00
4	1	1" P.V.C. FITTING	1	1.00	1.00
5	1	1" P.V.C. FITTING	1	1.00	1.00
6	1	1" P.V.C. FITTING	1	1.00	1.00
7	1	1" P.V.C. FITTING	1	1.00	1.00
8	1	1" P.V.C. FITTING	1	1.00	1.00
9	1	1" P.V.C. FITTING	1	1.00	1.00
10	1	1" P.V.C. FITTING	1	1.00	1.00
11	1	1" P.V.C. FITTING	1	1.00	1.00
12	1	1" P.V.C. FITTING	1	1.00	1.00
13	1	1" P.V.C. FITTING	1	1.00	1.00
14	1	1" P.V.C. FITTING	1	1.00	1.00
15	1	1" P.V.C. FITTING	1	1.00	1.00
16	1	1" P.V.C. FITTING	1	1.00	1.00
17	1	1" P.V.C. FITTING	1	1.00	1.00
18	1	1" P.V.C. FITTING	1	1.00	1.00
19	1	1" P.V.C. FITTING	1	1.00	1.00
20	1	1" P.V.C. FITTING	1	1.00	1.00
21	1	1" P.V.C. FITTING	1	1.00	1.00
22	1	1" P.V.C. FITTING	1	1.00	1.00
23	1	1" P.V.C. FITTING	1	1.00	1.00
24	1	1" P.V.C. FITTING	1	1.00	1.00
25	1	1" P.V.C. FITTING	1	1.00	1.00
26	1	1" P.V.C. FITTING	1	1.00	1.00
27	1	1" P.V.C. FITTING	1	1.00	1.00
28	1	1" P.V.C. FITTING	1	1.00	1.00
29	1	1" P.V.C. FITTING	1	1.00	1.00
30	1	1" P.V.C. FITTING	1	1.00	1.00
31	1	1" P.V.C. FITTING	1	1.00	1.00
32	1	1" P.V.C. FITTING	1	1.00	1.00
33	1	1" P.V.C. FITTING	1	1.00	1.00
34	1	1" P.V.C. FITTING	1	1.00	1.00
35	1	1" P.V.C. FITTING	1	1.00	1.00
36	1	1" P.V.C. FITTING	1	1.00	1.00
37	1	1" P.V.C. FITTING	1	1.00	1.00
38	1	1" P.V.C. FITTING	1	1.00	1.00
39	1	1" P.V.C. FITTING	1	1.00	1.00
40	1	1" P.V.C. FITTING	1	1.00	1.00
41	1	1" P.V.C. FITTING	1	1.00	1.00
42	1	1" P.V.C. FITTING	1	1.00	1.00
43	1	1" P.V.C. FITTING	1	1.00	1.00
44	1	1" P.V.C. FITTING	1	1.00	1.00
45	1	1" P.V.C. FITTING	1	1.00	1.00
46	1	1" P.V.C. FITTING	1	1.00	1.00
47	1	1" P.V.C. FITTING	1	1.00	1.00
48	1	1" P.V.C. FITTING	1	1.00	1.00
49	1	1" P.V.C. FITTING	1	1.00	1.00
50	1	1" P.V.C. FITTING	1	1.00	1.00
51	1	1" P.V.C. FITTING	1	1.00	1.00
52	1	1" P.V.C. FITTING	1	1.00	1.00
53	1	1" P.V.C. FITTING	1	1.00	1.00
54	1	1" P.V.C. FITTING	1	1.00	1.00
55	1	1" P.V.C. FITTING	1	1.00	1.00
56	1	1" P.V.C. FITTING	1	1.00	1.00
57	1	1" P.V.C. FITTING	1	1.00	1.00
58	1	1" P.V.C. FITTING	1	1.00	1.00
59	1	1" P.V.C. FITTING	1	1.00	1.00
60	1	1" P.V.C. FITTING	1	1.00	1.00
61	1	1" P.V.C. FITTING	1	1.00	1.00
62	1	1" P.V.C. FITTING	1	1.00	1.00
63	1	1" P.V.C. FITTING	1	1.00	1.00
64	1	1" P.V.C. FITTING	1	1.00	1.00

QUANTITY OF MATERIAL

ISOMETRIC DIAGRAM
DIESEL GEN. BLDG. - AREA 17
LUBE OIL SYS. - TRAIN "B"

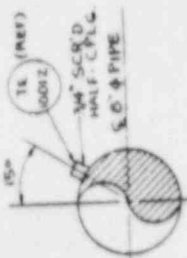
10022-14"-XX.SH.1

DCN MASTER

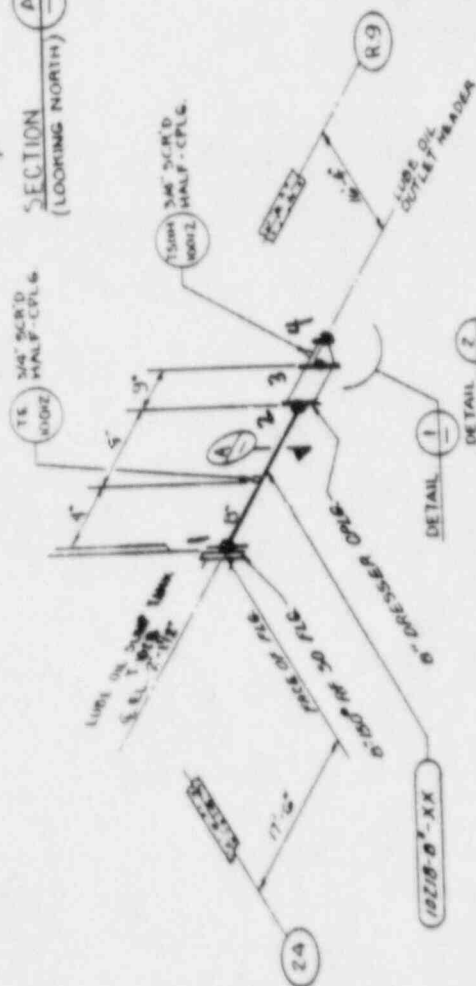
~~ALLOWED = 60 X 10³ X 1.18~~

LUBE OIL-ENG DRAIN 141

1/22/88
IN
VIA

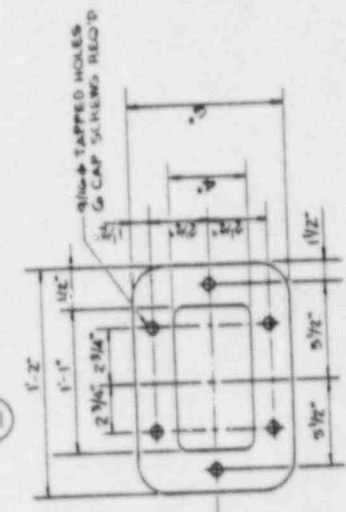


SECTION A
(LOOKING NORTH)

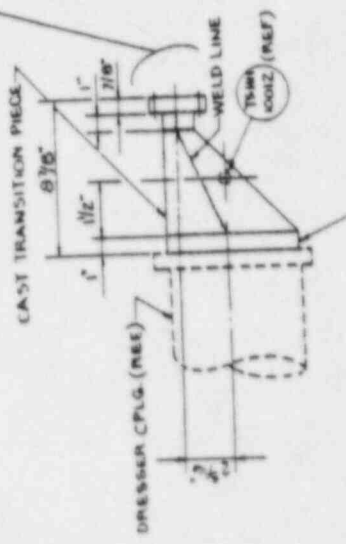


10218-8-XX

NEW
ORIGINAL-
ADD TO SYSTEM.



DETAIL 1



DETAIL 2

ISOMETRIC DIAGRAM	
DIESEL GEN BUILDING-AREA 17	
LUBE OIL SYSTEM-TRAIN "B"	
UNIT 1	
HATCHING SECOND NUCLEAR GENERATING STA. (SEE DRAWING)	
10213-8-XX, SH 1	

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	REMARKS
1	TS 3/4\"	1	EA	
2	TS 3/4\"	1	EA	
3	TS 3/4\"	1	EA	
4	TS 3/4\"	1	EA	
5	TS 3/4\"	1	EA	
6	TS 3/4\"	1	EA	
7	TS 3/4\"	1	EA	
8	TS 3/4\"	1	EA	
9	TS 3/4\"	1	EA	
10	TS 3/4\"	1	EA	
11	TS 3/4\"	1	EA	
12	TS 3/4\"	1	EA	
13	TS 3/4\"	1	EA	
14	TS 3/4\"	1	EA	
15	TS 3/4\"	1	EA	
16	TS 3/4\"	1	EA	
17	TS 3/4\"	1	EA	
18	TS 3/4\"	1	EA	
19	TS 3/4\"	1	EA	
20	TS 3/4\"	1	EA	
21	TS 3/4\"	1	EA	
22	TS 3/4\"	1	EA	
23	TS 3/4\"	1	EA	
24	TS 3/4\"	1	EA	
25	TS 3/4\"	1	EA	
26	TS 3/4\"	1	EA	
27	TS 3/4\"	1	EA	
28	TS 3/4\"	1	EA	
29	TS 3/4\"	1	EA	
30	TS 3/4\"	1	EA	
31	TS 3/4\"	1	EA	
32	TS 3/4\"	1	EA	
33	TS 3/4\"	1	EA	
34	TS 3/4\"	1	EA	
35	TS 3/4\"	1	EA	
36	TS 3/4\"	1	EA	
37	TS 3/4\"	1	EA	
38	TS 3/4\"	1	EA	
39	TS 3/4\"	1	EA	
40	TS 3/4\"	1	EA	
41	TS 3/4\"	1	EA	
42	TS 3/4\"	1	EA	
43	TS 3/4\"	1	EA	
44	TS 3/4\"	1	EA	
45	TS 3/4\"	1	EA	
46	TS 3/4\"	1	EA	
47	TS 3/4\"	1	EA	
48	TS 3/4\"	1	EA	
49	TS 3/4\"	1	EA	
50	TS 3/4\"	1	EA	
51	TS 3/4\"	1	EA	
52	TS 3/4\"	1	EA	
53	TS 3/4\"	1	EA	
54	TS 3/4\"	1	EA	
55	TS 3/4\"	1	EA	
56	TS 3/4\"	1	EA	
57	TS 3/4\"	1	EA	
58	TS 3/4\"	1	EA	
59	TS 3/4\"	1	EA	
60	TS 3/4\"	1	EA	
61	TS 3/4\"	1	EA	
62	TS 3/4\"	1	EA	
63	TS 3/4\"	1	EA	
64	TS 3/4\"	1	EA	
65	TS 3/4\"	1	EA	
66	TS 3/4\"	1	EA	
67	TS 3/4\"	1	EA	
68	TS 3/4\"	1	EA	
69	TS 3/4\"	1	EA	
70	TS 3/4\"	1	EA	
71	TS 3/4\"	1	EA	
72	TS 3/4\"	1	EA	
73	TS 3/4\"	1	EA	
74	TS 3/4\"	1	EA	
75	TS 3/4\"	1	EA	
76	TS 3/4\"	1	EA	
77	TS 3/4\"	1	EA	
78	TS 3/4\"	1	EA	
79	TS 3/4\"	1	EA	
80	TS 3/4\"	1	EA	
81	TS 3/4\"	1	EA	
82	TS 3/4\"	1	EA	
83	TS 3/4\"	1	EA	
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85	TS 3/4\"	1	EA	
86	TS 3/4\"	1	EA	
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89	TS 3/4\"	1	EA	
90	TS 3/4\"	1	EA	
91	TS 3/4\"	1	EA	
92	TS 3/4\"	1	EA	
93	TS 3/4\"	1	EA	
94	TS 3/4\"	1	EA	
95	TS 3/4\"	1	EA	
96	TS 3/4\"	1	EA	
97	TS 3/4\"	1	EA	
98	TS 3/4\"	1	EA	
99	TS 3/4\"	1	EA	
100	TS 3/4\"	1	EA	

ALLOWED

FIG. B18

LUBE OIL - KEEP WARM 145

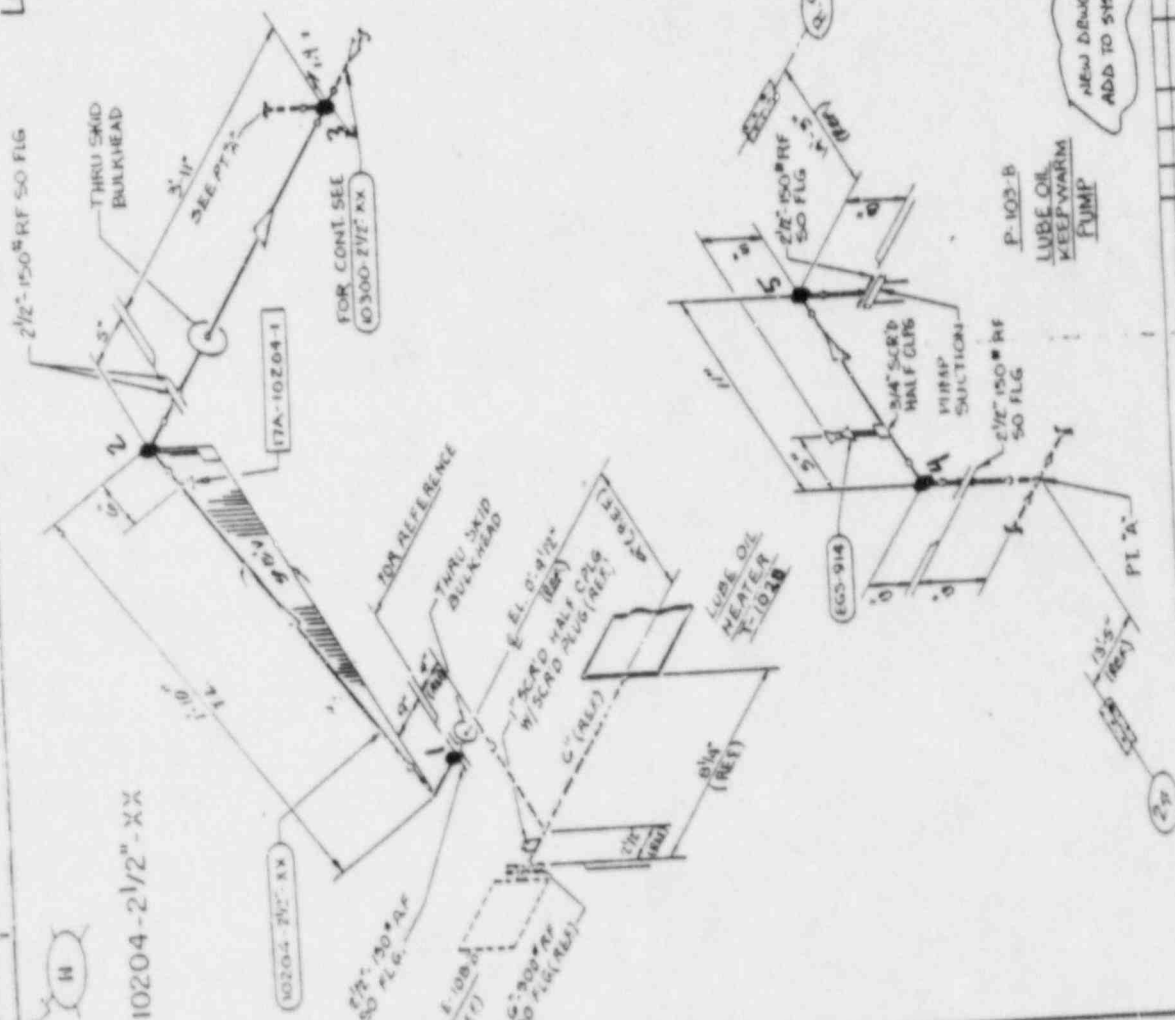
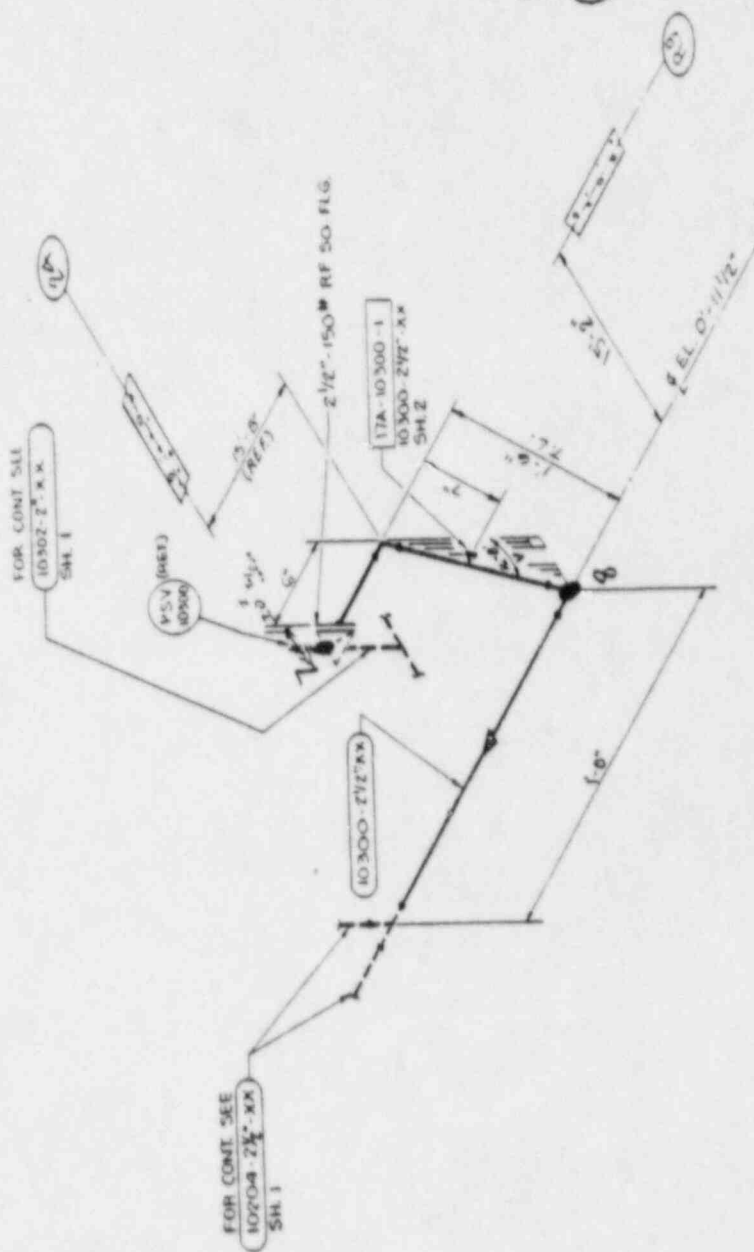


FIG. B19

1875

10300-2¹/₂"-XX

NEW
ORIGINAL-
ADD TO SYSTEM

FIG. B20

[illegible]

APPROVED

$\frac{d}{dt} \left(\frac{1}{\rho} \right) = - \frac{1}{\rho^2} \frac{d\rho}{dt}$ 

Kristen Love

DCM MASTER

PROJECT CLASS: 11

TABLE I. ATOM-TO-ATOM

NEW DRAFTS -
ADD TO SYSTEM!

ISOMETRIC DIAGRAM
DIESEL GEN. BUILDING-AREA 17
LUBE OIL SYS.-TRAIN "B"

SECO NUCLEAR GENERATING STA., UNIT 1

10202-2 nd -XX SH 1	10202-2 nd -XX SH 1
--------------------------------	--------------------------------

ALLOWED

FIG. B21

1000

FIG. B22

LUBE OIL - KEEP WARM 4-5

1/2" x 1/2"
"A"
"B"

10302-2"-XX
10302-2 1/2"-XX

FOR CONT. SEE
10302-2"-XX

SH. 1

INLET

7/8"

EL. 5'-8"
(REF.)

11'-9 1/2"
(REF.)

P. 6

OUTLET

2-150" RF 50 FLG.

(24)

11'-11 1/2"
(REF.)

10302-2"-XX

10302 2 1/2"-XX

FOR CONT. SEE

10302-2"-XX

SH. 5

10302B

2 1/2" x 2" RED 90° ELL

1 in. for Orientation ONLY

KEEP WARM LINE

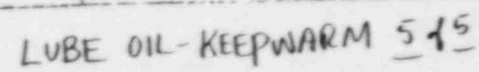
DCN MASTER

NEW DRUG -
ADD TO SYSTEM.

PROJECT CLASS II

ISOMETRIC DIAGRAM	
DIESEL GEN. BLDG. - AREA 17	
LUBE OIL SYS. - TRAIN "B"	
RANCH SEC. NUCLEAR GENERATING STA. UNIT 1	
DATE	10302-2"-XX, SH. 2

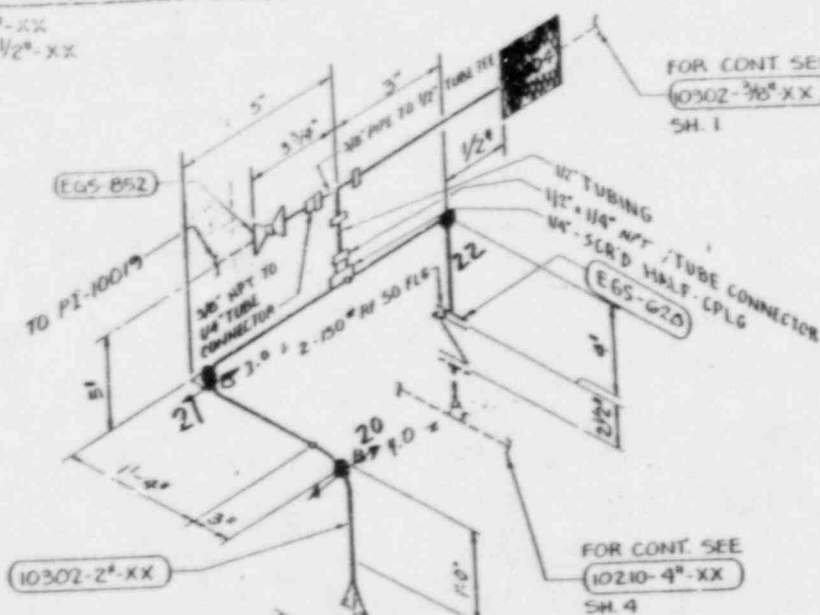
ALLOWED 6-23-68



10302-2ⁿ-XX
10302-2^{1/2}ⁿ-XX

FOR CONT SEE
10302-378-XX
SH. I

1/22/89
"A"
JLG



FOR CONT. SEE
10210-4ⁿ-XX
SM. 4

FOR INFORMATION ONLY

KEEPWARD LINE

DCN MASTER

NEW DRUG -
ADD TO SYSTEM

PROJECT CLASS (i)

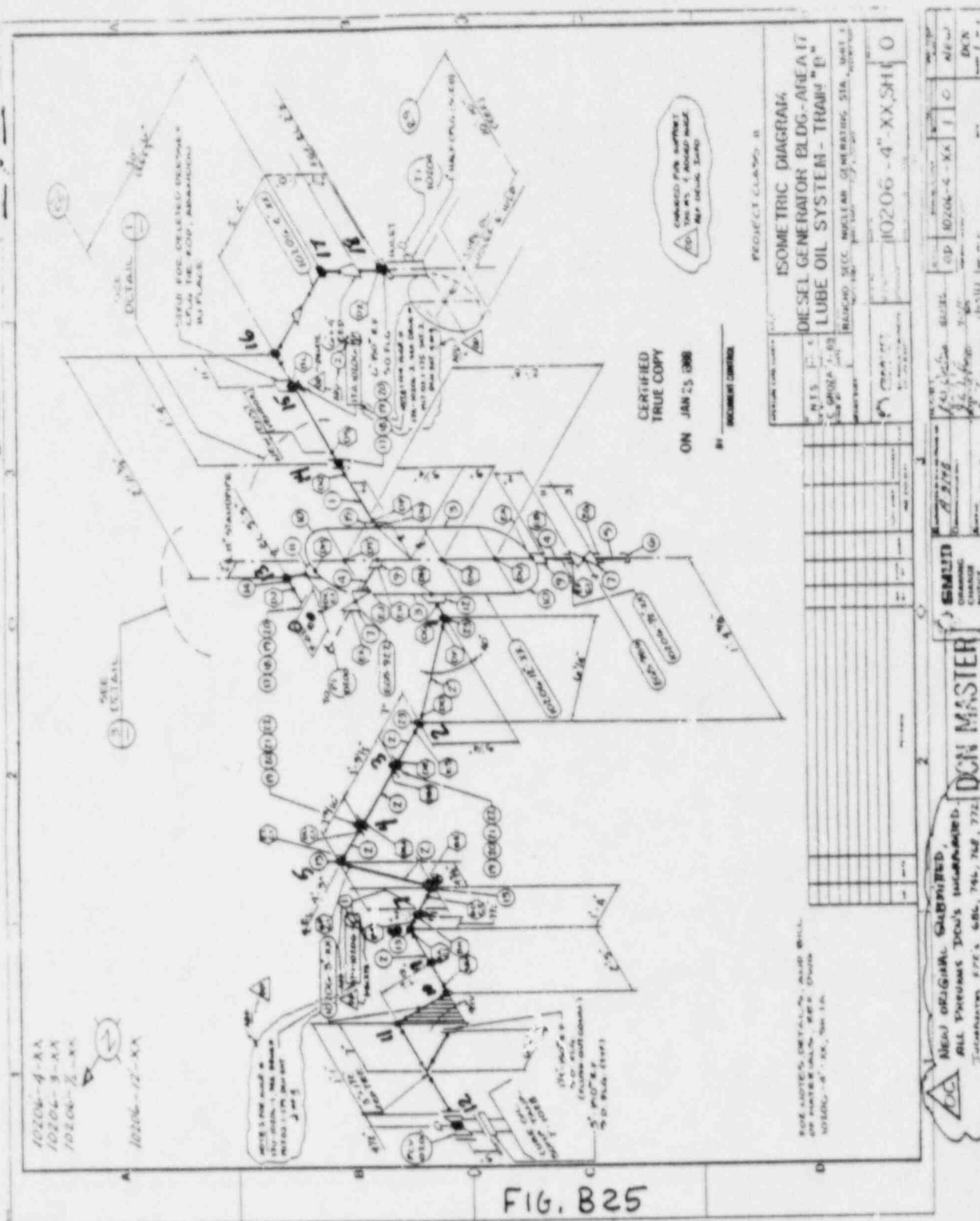
ISOMETRIC DIAGRAM
DIESEL GEN. BLDG. - AREA 17
LUBE OIL SYS. - TRAIN "B"

RANCHO SECO NUCLEAR GENERATING STA. UNIT 1

10202-2³-XX,SH3

ALLOWED ~~6.23~~ ~~11.11~~ (11)

LUBE OIL SUPPLY 2 of 8



FOR INFORMATION ONLY

LUBE OIL - SUPPLY 318

1/21/88
A
d/A

FOR INFORMATION ONLY

DCN MASTER

PROJECT CLASS II

ISOMETRIC DIAGRAM
DHS SEL GEN. BUILDING-AREA 17
LUBE OIL SYS.-TRAIN "B"

REVIEWED
PROJECT NO. 10210-4-X, SH. 1

DATE 10/21/88

BY 10210-4-X, SH. 1

10210-4-X, SH. 1

REVISIONS

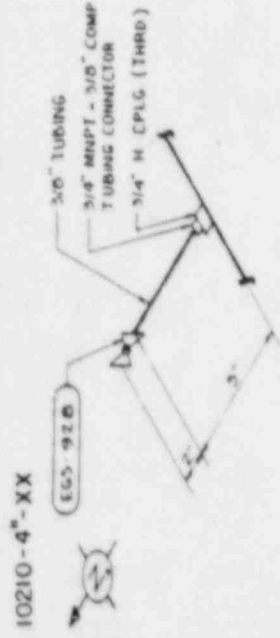
NO.	DESCRIPTION	DATE
1	AS SHOWN	10/21/88

APPROVED

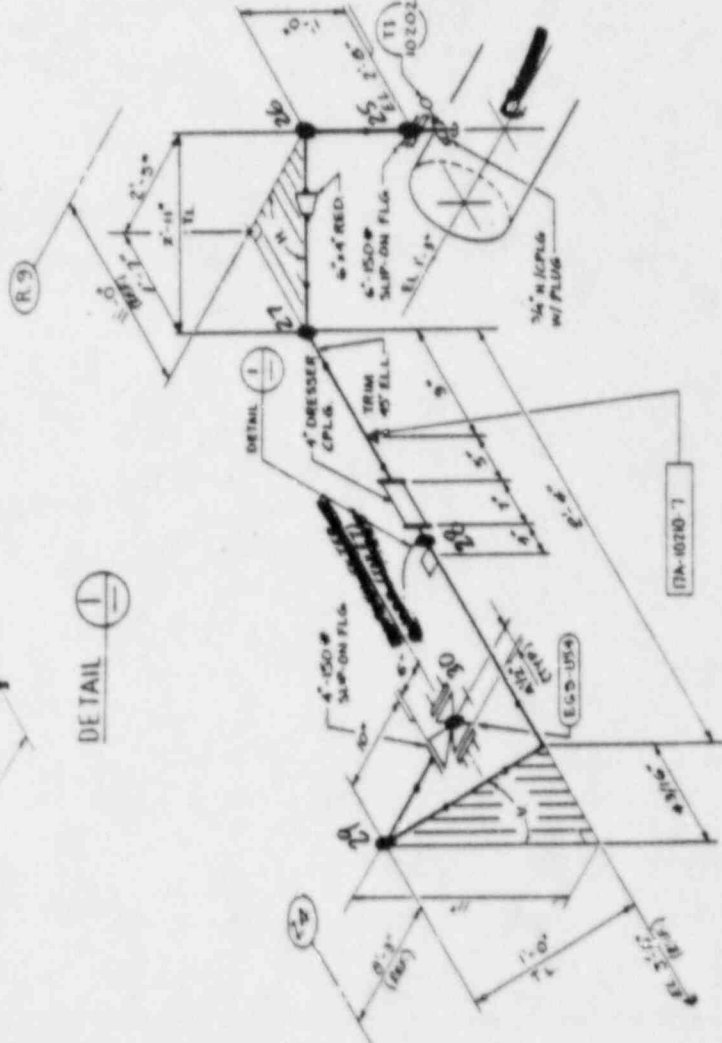
DATE 10/21/88

BY 10210-4-X, SH. 1

ALLOWED



DETAIL 1



NEW DRAIN -
ADD TO SYSTEM

FIG. B26

2007 2 2 1A



PROPERTY CLASS II

PERSONALIZATION ©

ISOMETRIC DIAGRAM
DIESEL GEN. BLDG - AREA 17
EMERGENCY DIESEL GEN. - TRAIN "B"

10210-4"-XX, SH 2

015900

100

10

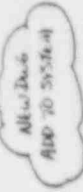
[illegible]

[illegible]

ALLOWED ~~6097~~ ~~6097~~

FIG. B27

1998



DEN MASTER

Project Cases 11

ISOMETRIC DIAGRAM
DIESEL GEN. BUILDING-AREA 17
PURE OIL SYSTEM-TRAIN "8"

[illegible][illegible]

ALLOWED

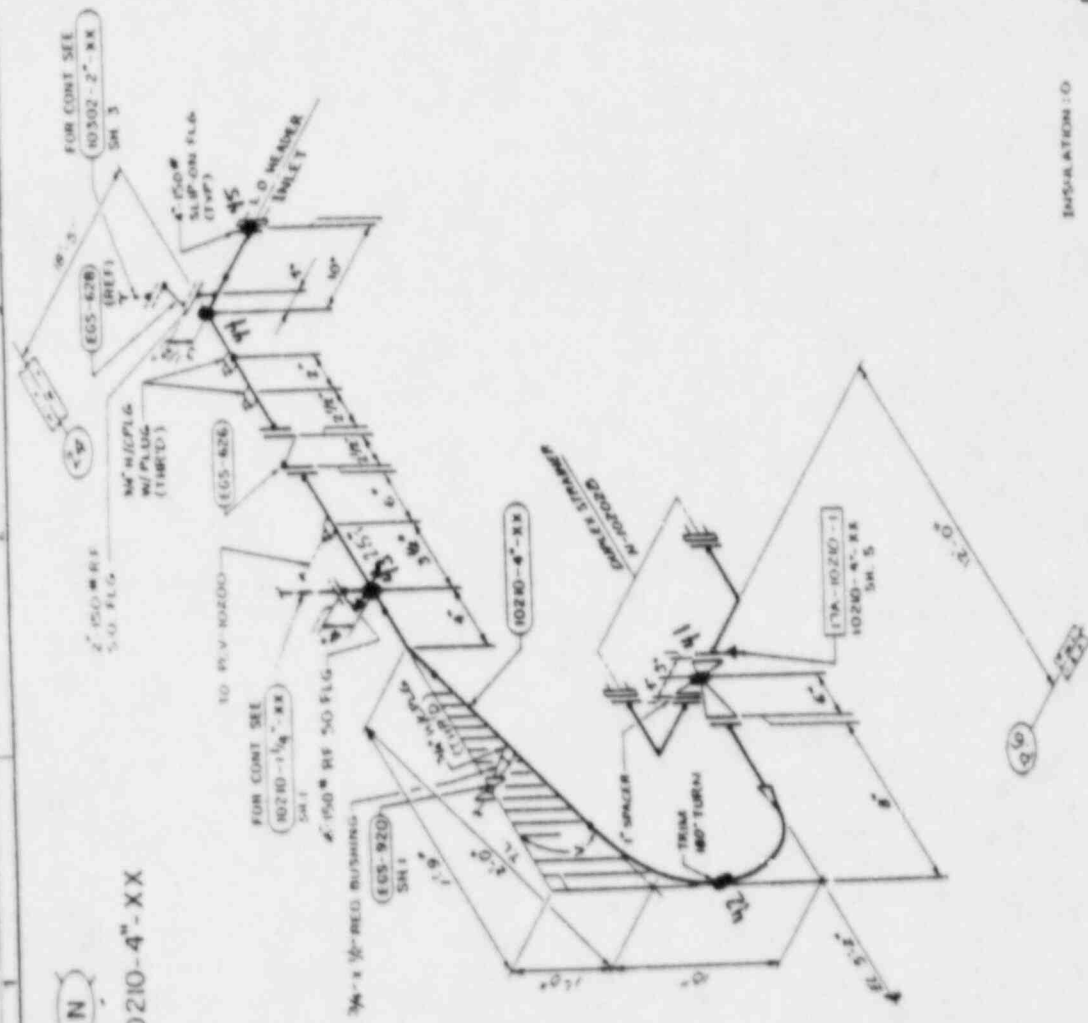
FIG. B28

LUBE OIL - SUPPLY 648

1/2" x 1/2" x 1/2"



10210-4"-XX



FOR INFORMATION ONLY

NEW ORIGINAL -
ADD TO SYSTEM

INSULATION: 10

DATUM EL. 0'-0" - 165'-0" MSL

ISOMETRIC DIAGRAM		DIESEL GEN BLDG - AREA A 17		LUBE OIL SYS - TRAIN "B"		UNIT 1	
DATE	10/15/50	BY	J. J. J.	CHKD	J. J. J.	NO.	1
REV.	1	DATE	10/15/50	BY	J. J. J.	NO.	1
REV.	2	DATE	10/15/50	BY	J. J. J.	NO.	1
REV.	3	DATE	10/15/50	BY	J. J. J.	NO.	1
REV.	4	DATE	10/15/50	BY	J. J. J.	NO.	1
REV.	5	DATE	10/15/50	BY	J. J. J.	NO.	1
REV.	6	DATE	10/15/50	BY	J. J. J.	NO.	1
REV.	7	DATE	10/15/50	BY	J. J. J.	NO.	1
REV.	8	DATE	10/15/50	BY	J. J. J.	NO.	1
REV.	9	DATE	10/15/50	BY	J. J. J.	NO.	1
REV.	10	DATE	10/15/50	BY	J. J. J.	NO.	1

10210-4"-XX, SH 4

Approved: *[Signature]*

FIG. B29

LUBE OIL SUPPLY 7d8

INFORMATION ONLY

SUBMIT
NEW
ORIGINAL

REMOVED REPAIRS
REPAIRS

PROJECT: CUBES II

INSULATION: 0

ISOMETRIC DIAGRAM
DIESEL GEN. BLDG - AREA 17
LUBE OIL SYSTEM - TRAIN "B"

UNIT 1
REACTOR SECO. NUCLEAR GENERATING STA.
10210-1 1/2" - XX, SH 1

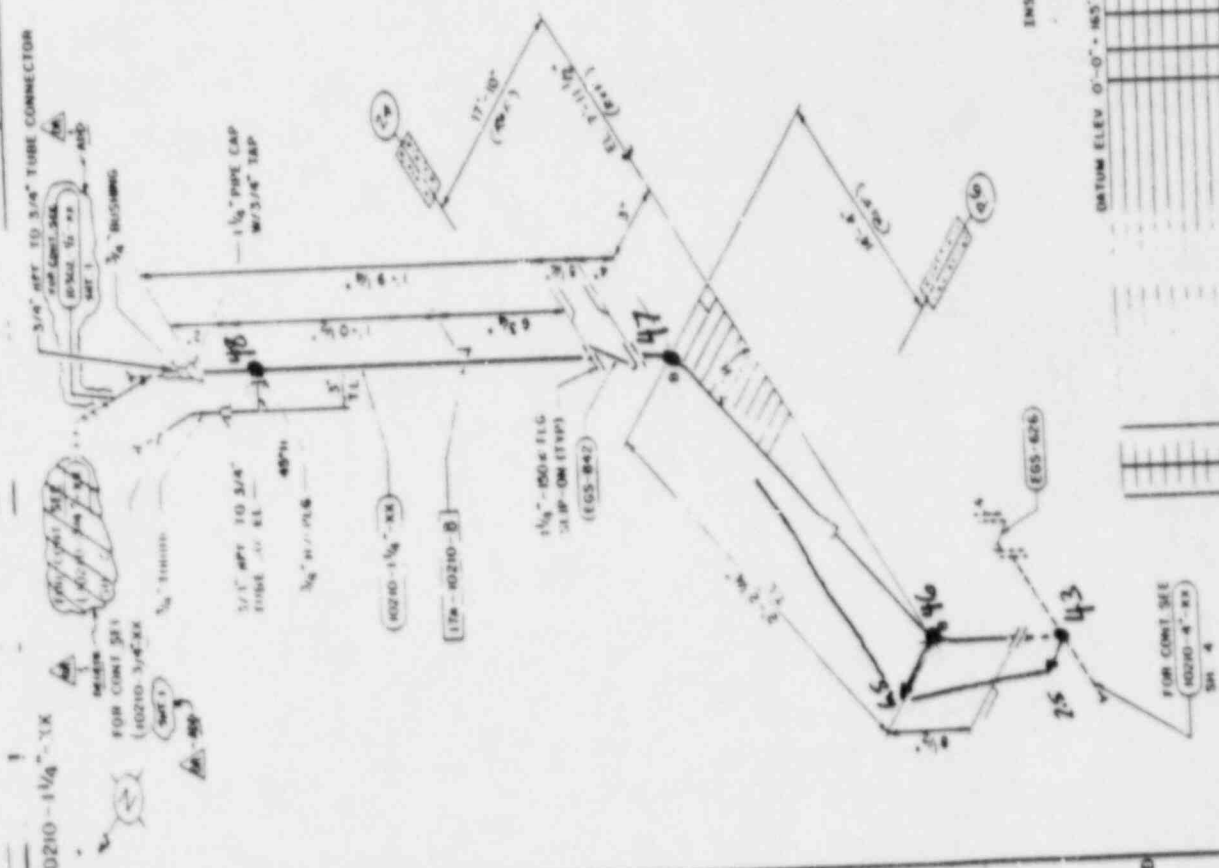
U-2000
NEW
DCN MASTER

DATE: 10/21/88
BY: [Signature]
CHECKED: [Signature]
APPROVED: [Signature]

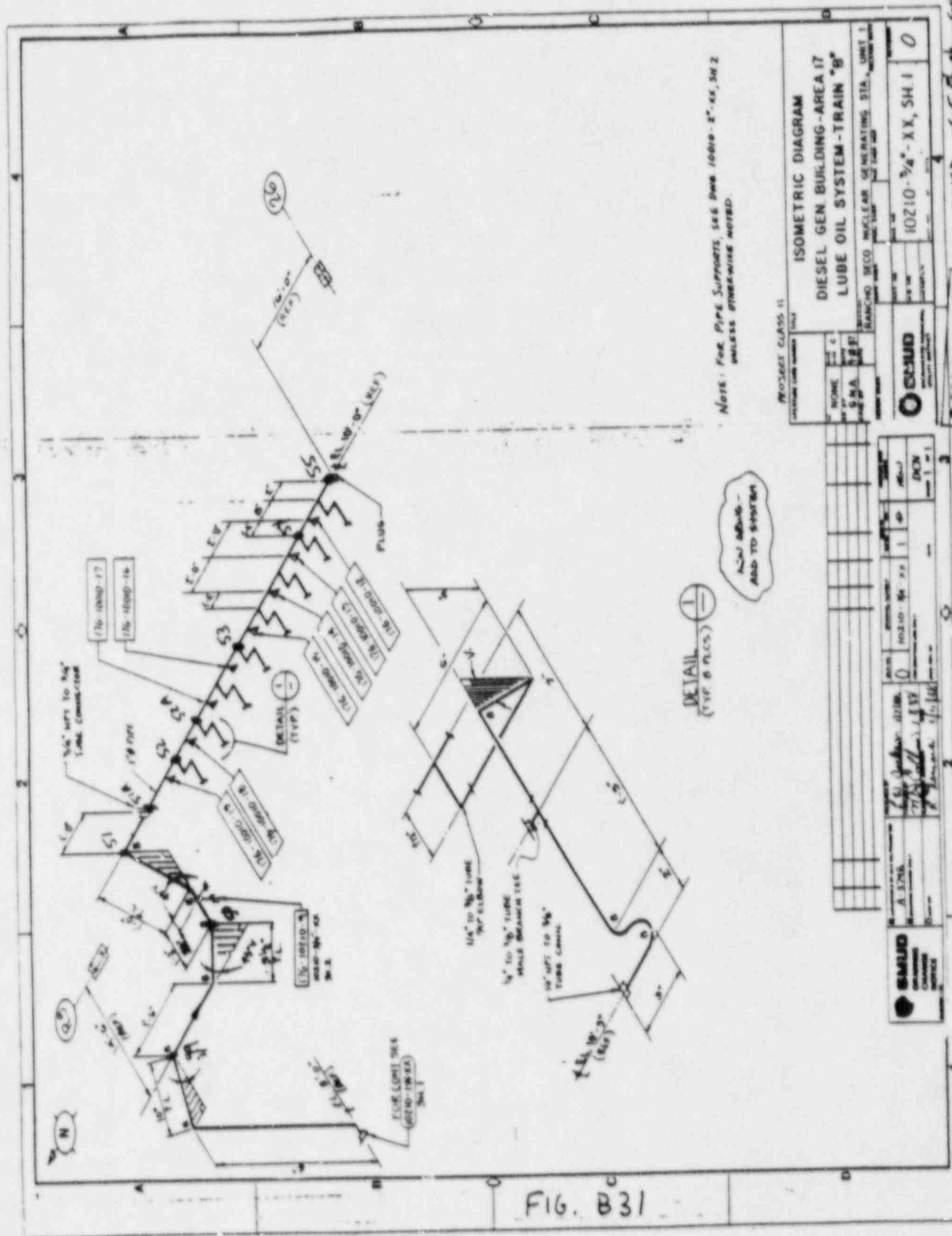
SMUD
SOUTHERN METROPOLITAN
UTILITY DISTRICT
CHARTERED
1909

FOR INFORMATION ONLY

FIG. B30



LUBE OIL-SUPPLY 898



NOTE: FOR PIPE SUPPORTS, SEE DWG 10010-X'-K8, SHEET
UNLESS OTHERWISE NOTED.

DETAIL
(SEE 6 PAGES)

ADD TO SYSTEM

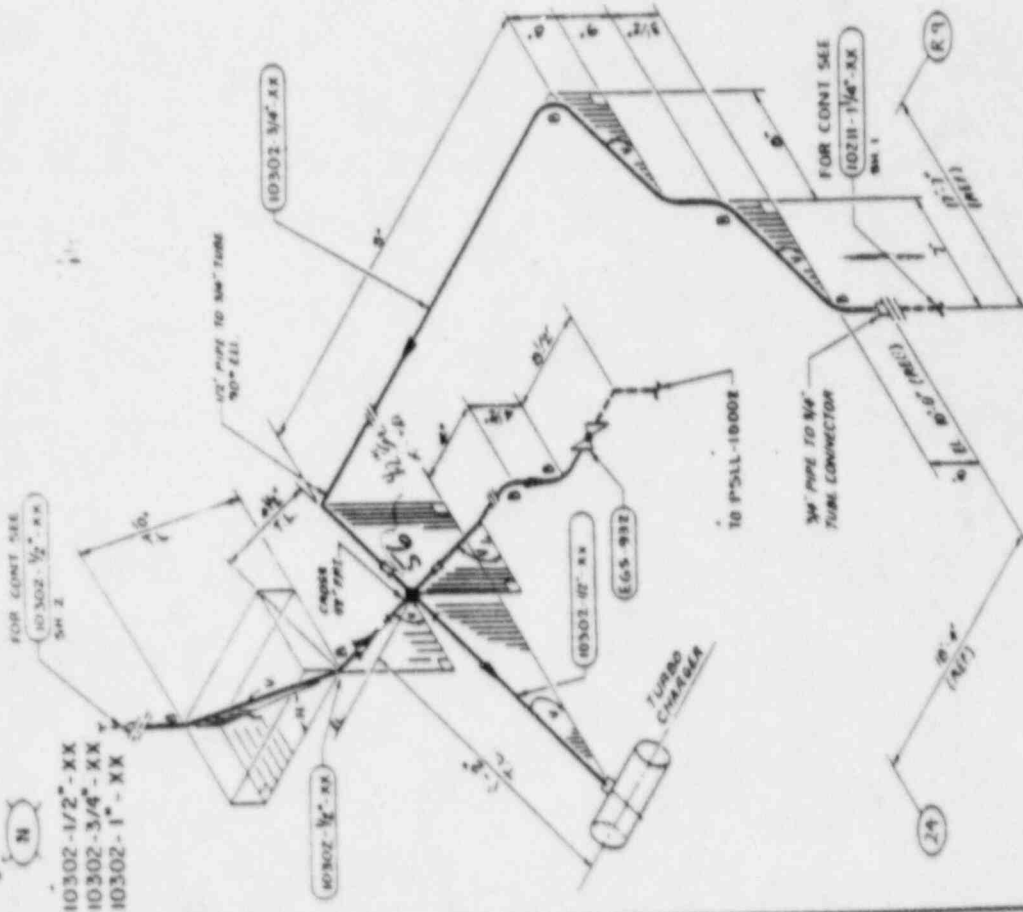
[illegible]

DCN MASTER

ALLOWED

FOR INFORMATION ONLY

*TUBING * LUBE OIL -
TURBO SUPPLY



NEW DRUG.
ADD TO SYSTEM

DCN MASTER

ISOMETRIC DIAGRAM	
DIESEL GEN. BUILDING-AREA 17	
LUBE OIL SYSTEM - TRAIN B	
BRANCH NO	SECO NUCLEAR GENERATING STA. UNIT 1
10302-1/2"-XX-5H1	
10302-1/2"-XX-5H1	

ITEM NO	DESCRIPTION	QTY	UNIT	DCN
1	10302-1/2"-XX-5H1	1	FT	1
2	10302-1/2"-XX-5H1	1	FT	1
3	10302-1/2"-XX-5H1	1	FT	1
4	10302-1/2"-XX-5H1	1	FT	1
5	10302-1/2"-XX-5H1	1	FT	1
6	10302-1/2"-XX-5H1	1	FT	1
7	10302-1/2"-XX-5H1	1	FT	1
8	10302-1/2"-XX-5H1	1	FT	1
9	10302-1/2"-XX-5H1	1	FT	1
10	10302-1/2"-XX-5H1	1	FT	1

FOR INFORMATION ONLY

FIG. B32

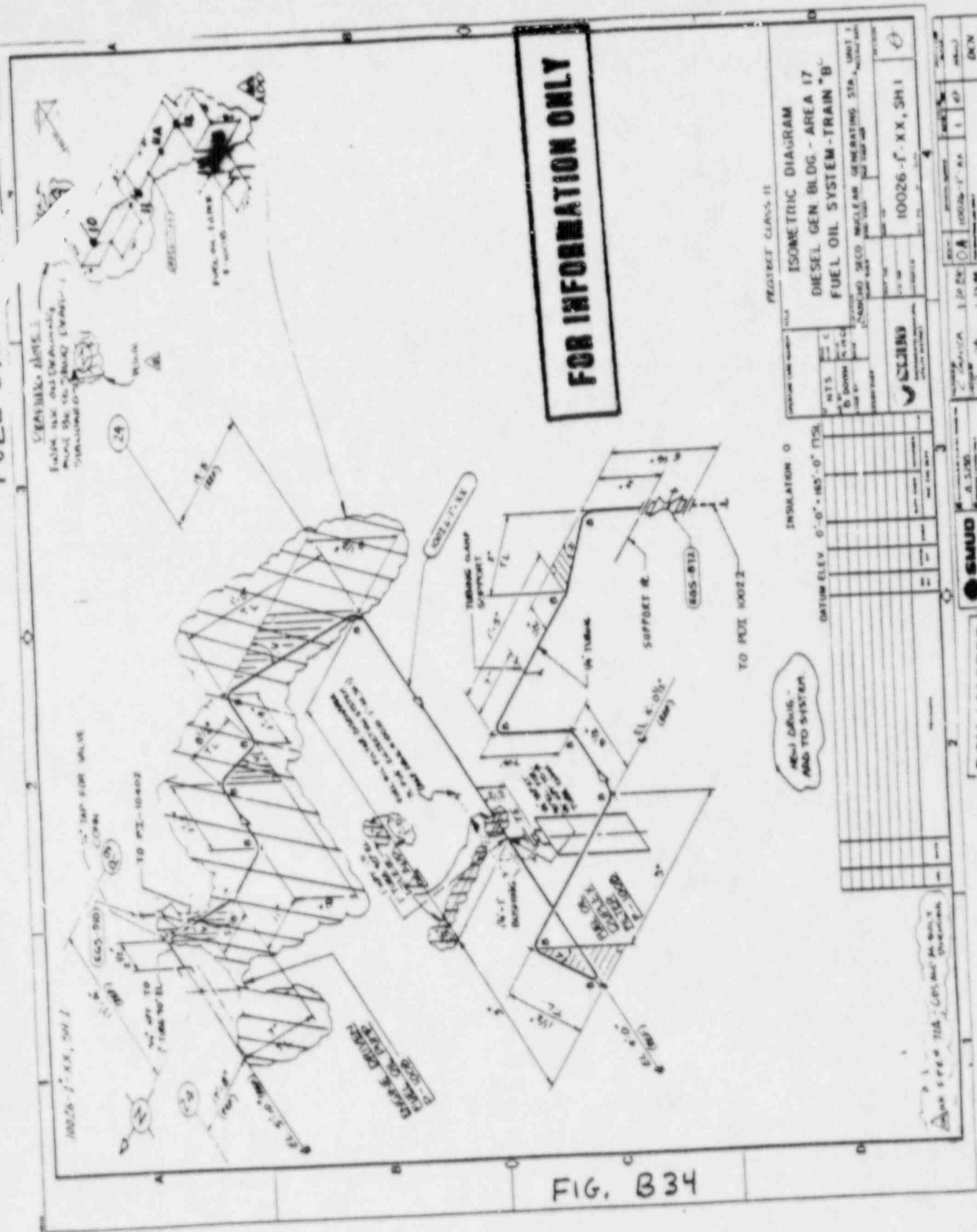
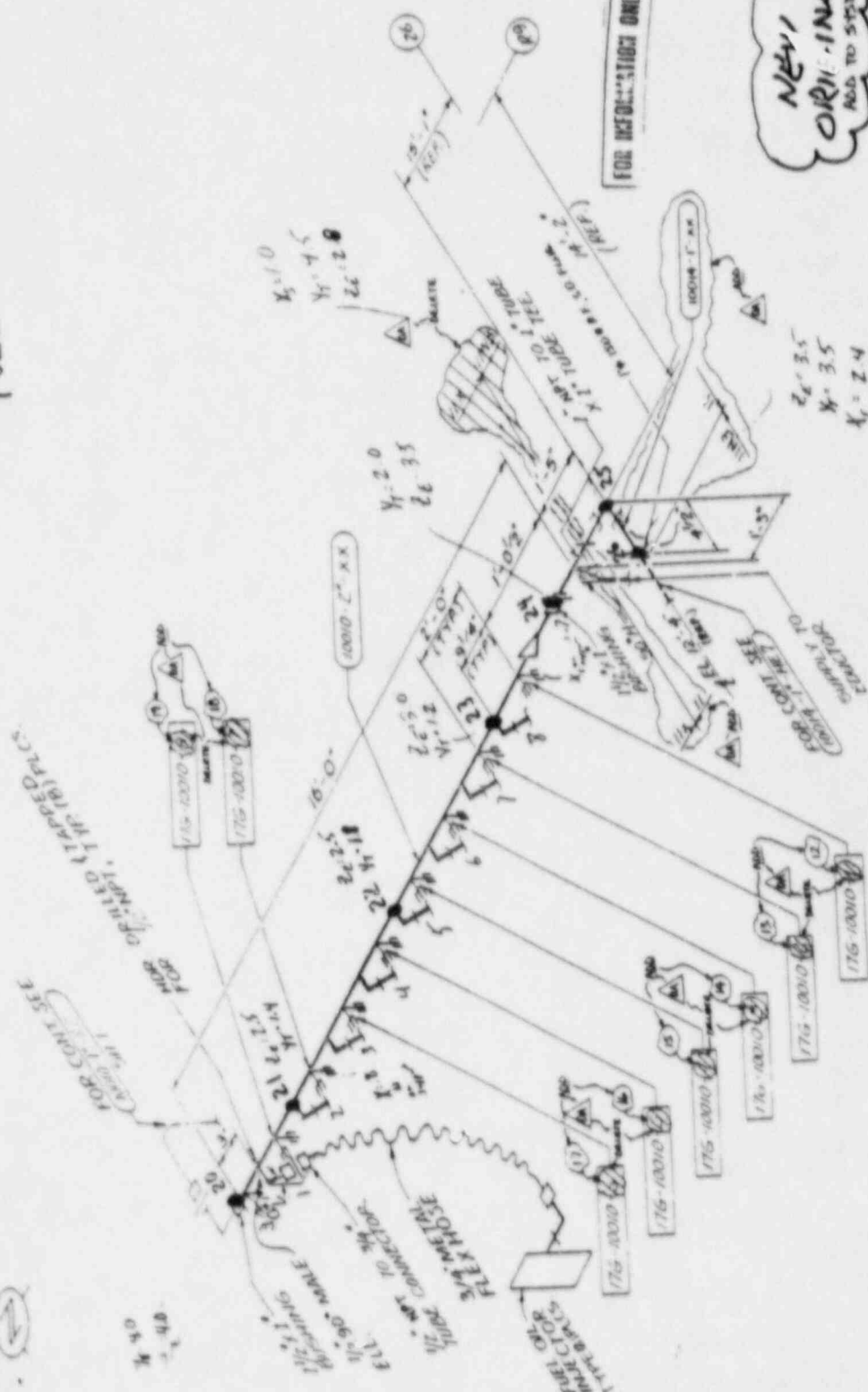


FIG. B34

FUEL OIL 445



FOR INFORMATION ONLY

NEW ORIGINAL-
ADD TO SYSTEM

Cum gratia

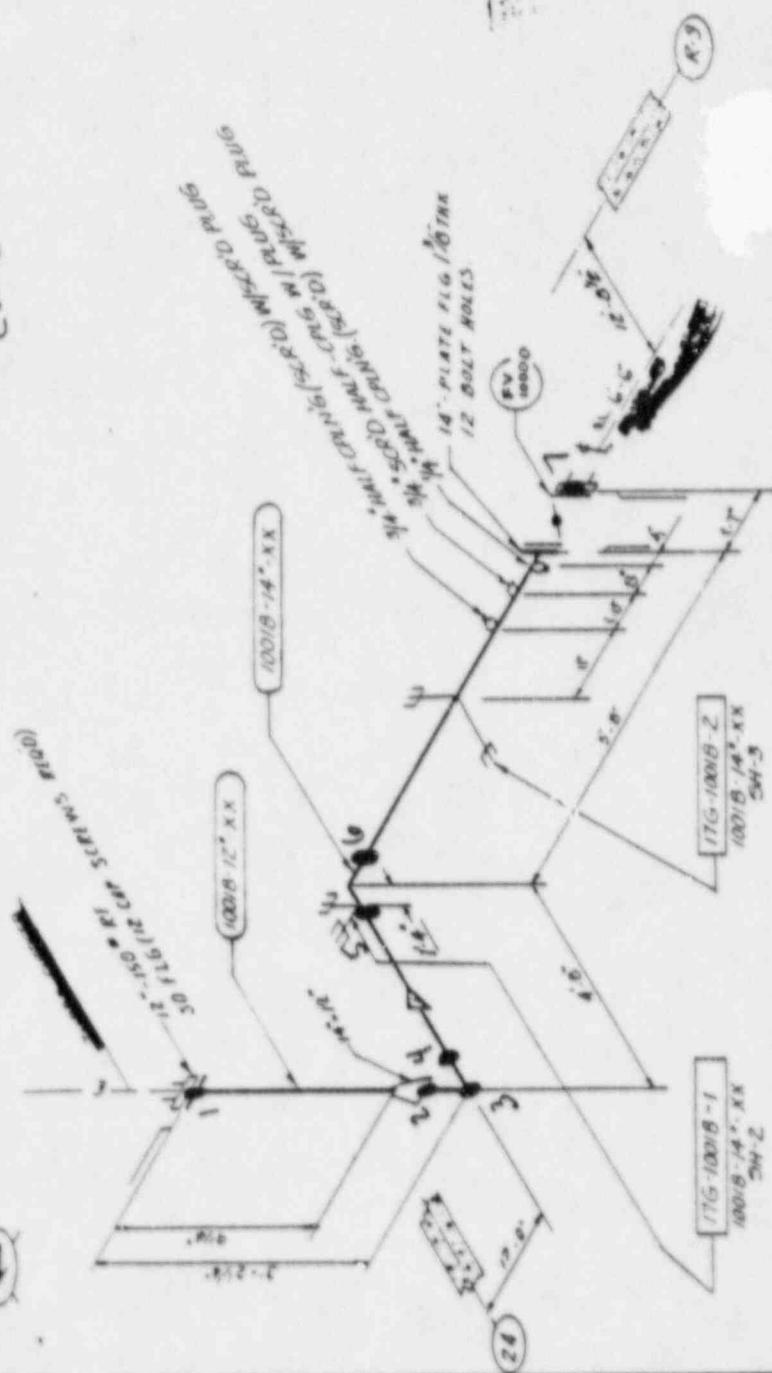
ISOMETRIC DIAGRAM
DIESEL GEN. BUILDING-AREA 17
FUEL INJECTION SYSTEM-TRAIN "B"

[illegible]

Answered 2

FIG. B36

COMBUSTION AIR 191-



NEW
ORIGINAL-
ADD TO SYSTEM

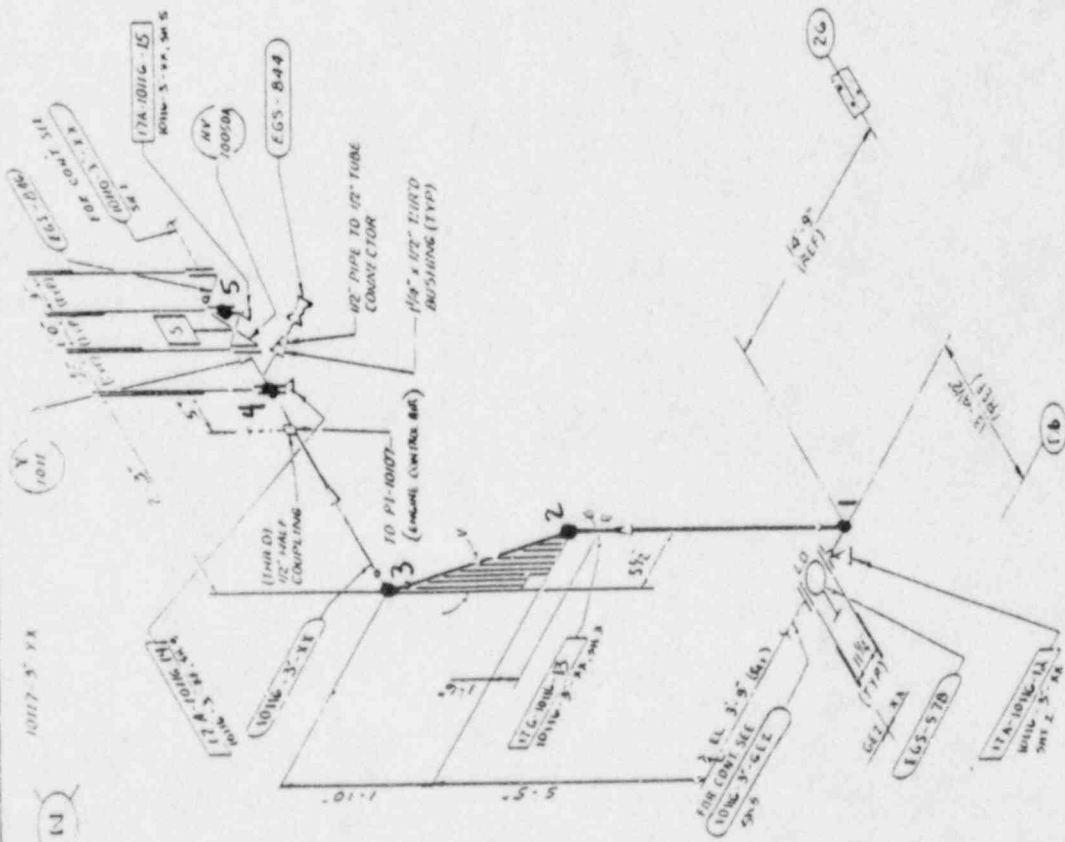
ISOMETRIC DIAGRAM	
DIESEL GEN BUILDING-AREA 17	
COMBUSTION AIR SYS - TRAIN "B"	
DATE	1001B-14-XX, SHI
BY	
CHECKED	
APPROVED	

NO.	DESCRIPTION	DATE	BY	CHECKED
1	1001B-14-XX			
2	1001B-14-XX			
3	1001B-14-XX			
4	1001B-14-XX			
5	1001B-14-XX			
6	1001B-14-XX			
7	1001B-14-XX			
8	1001B-14-XX			
9	1001B-14-XX			
10	1001B-14-XX			

FIG. B38

ALLOWED

STARTING AIR $14\frac{1}{2}$
3



ALL WORK TO BE DONE BY THE CONTRACTOR

NEW OFFICIALS: 1011G-15, 1011G-12, 1011G-14, 1011G-16, 1011G-18, 1011G-20, 1011G-22, 1011G-24, 1011G-26, 1011G-28, 1011G-30, 1011G-32, 1011G-34, 1011G-36, 1011G-38, 1011G-40, 1011G-42, 1011G-44, 1011G-46, 1011G-48, 1011G-50, 1011G-52, 1011G-54, 1011G-56, 1011G-58, 1011G-60, 1011G-62, 1011G-64, 1011G-66, 1011G-68, 1011G-70, 1011G-72, 1011G-74, 1011G-76, 1011G-78, 1011G-80, 1011G-82, 1011G-84, 1011G-86, 1011G-88, 1011G-90, 1011G-92, 1011G-94, 1011G-96, 1011G-98, 1011G-100.

PROJECT 1011G-11

ISOMETRIC DIAGRAM

DIESEL GENERATOR BLDG AREA 17

STARTING AIR SYSTEM - TRAIN "B"

1011G-15 - 1011G-12 - 1011G-14 - 1011G-16 - 1011G-18 - 1011G-20 - 1011G-22 - 1011G-24 - 1011G-26 - 1011G-28 - 1011G-30 - 1011G-32 - 1011G-34 - 1011G-36 - 1011G-38 - 1011G-40 - 1011G-42 - 1011G-44 - 1011G-46 - 1011G-48 - 1011G-50 - 1011G-52 - 1011G-54 - 1011G-56 - 1011G-58 - 1011G-60 - 1011G-62 - 1011G-64 - 1011G-66 - 1011G-68 - 1011G-70 - 1011G-72 - 1011G-74 - 1011G-76 - 1011G-78 - 1011G-80 - 1011G-82 - 1011G-84 - 1011G-86 - 1011G-88 - 1011G-90 - 1011G-92 - 1011G-94 - 1011G-96 - 1011G-98 - 1011G-100.

ALLOWED

FIG. B39

APPENDIX I

CALIBRATED VIBRATION MEASUREMENT INSTRUMENTATION WITH CALIBRATION CERTIFICATION

1. Bruel and Kjaer Hand Held Vibration Meter

Model 2516
S/N: 1372782
S/N: 1372783

2. Bruel and Kjaer Accelerometer Calibrator

Model 4294
S/N: 1248783

3. PCB Accelerometer

Model 308-B
S/N: 13404



Brüel & Kjær Instruments, Inc.

Certificate of Conformance

Model 2516 Serial No. 1372782
Customer Duke Power Company P.O. N48702-34

was tested and met factory specifications
according to the Referenced Test Procedure

on 12 November 1987 by Paul T. Melanson

Certified References^o

Calibration Due

B & K 111284	s/n 3	NBS-TN-234877(H)	26 June 1988
Fluke 8506A	s/n 3975029	NBS-TN-234877(F)	28 Nov. 1987
HP 5315A	s/n 2536A15460	WWVB(HP)	17 Feb. 1988

Reference Test Procedure:

Brüel & Kjær Factory Service Instructions 2516.1 Checking Procedure 9.82

Temperature

24°C

Relative Humidity

45%

Barometric Pressure

986mbar

Signed

Paul T. Melanson

Service Center

Brüel & Kjær Instruments, Inc.

185 Forest Street

Marlborough, Massachusetts 01752

^oReferences traceable to the National Bureau of Standards, Washington, D.C.

FREQ	STANDARD	UUT	FREQ	STANDARD	UUT
10 HZ	12 G	1.2	50 HZ	5 G	5.0
50 HZ	5 G	4.8	100 HZ	10 G	9.9
50 HZ	10 G	10.0	500 HZ	10 G	9.9
100 HZ	5 G	4.9	1000 HZ	10 G	9.7
100 HZ	10 G	9.9			
500 HZ	5 G	4.9			
500 HZ	10 G	10.0			
1000 HZ	5 G	4.8			
1000 HZ	10 G	9.8			

MAX ACCEPT ☒
 HOLD REJECT ☐

STANDARDS USED

DESCRIPTION	MANUFACTURER	MODEL	CTE#	CAL DUE DATE
			72602	12-4-88
			72601	5-20-88
			70101	7-2-88
			70327	7-21-88

I certify that the Test Equipment as calibrated meets its specifications.

R. J. Jindry 12-7-88
 Technician Date

CERTIFICATION OF COMPLIANCE WITH AP. 33 (IF FOUND OUT OF CALIBRATION)

I have reviewed the usage of this Test Equipment since its last calibration and have initiated retest of any invalidated usages.

 I&C ENGINEER Date

COMMENTS: TOLERANCE $\pm 5\%$



Brüel & Kjær Instruments, Inc.

Certificate of Conformance

Model 2516 Serial No. 1372783
Customer Duke Power Company P.O. N48702-34

was tested and met factory specifications
according to the Referenced Test Procedure

on 12 November 1987 by Paul T. Melanson

Certified References*

Calibration Due

B & K 111284	s/n 3	NBS-TN-234877(H)	26 June 1988
Fluke 8506A	s/n 3975029	NBS-TN-234877(F)	28 Nov. 1987
HP 5315A	s/n 2536A15460	WWVB(HP)	17 Feb. 1988

Reference Test Procedure:

Brüel & Kjær Factory Service Instructions 2516.1 Checking Procedure 9.82

Temperature

24°C

Relative Humidity

45%

Barometric Pressure

986mbar

Signed

Paul T. Melanson

Service Center

Brüel & Kjær Instruments, Inc.

185 Forest Street

Marlborough, Massachusetts 01752

*References traceable to the National Bureau of Standards, Washington, D.C.

170

DATE 2-7-88

FREQ	STANDARD	ULUT	EQUIV G
50 Hz	5g	504.3mV	5.043g
100 Hz	1g	100.2mV	1.002g
100 Hz	5g	505.6mV	5.056g
500 Hz	5g	508.1mV	5.081g
500 Hz	10g	1012.3mV	10.123g
1000 Hz	5g	509.2mV	5.092g
1000 Hz	10g	1025.2mV	10.252g

STANDARDS USED

STANDARDS USED				
DESCRIPTION	MANUFACTURER	MODEL	CTE#	CAL DUE DATE
			70602	12-4-88
			70601	5-20-88
			70327	7-22-88
			70101	4-12-88

I certify that the Test Equipment as calibrated meets its specifications.

D. Finney
Technician

12-7-88
Date

CERTIFICATION OF COMPLIANCE WITH AP. 33 (IF FOUND OUT OF CALIBRATION)

I have reviewed the usage of this Test Equipment since its last calibration and have initiated retest of any invalidated usages.

I&C ENGINEER

Date _____

COMMENTS: PER MFG. MNL $mV/g = 100$

TOL. $\pm 5\%$

DATE 2-7-88

DUKE POWER COMPANY
APPENDIX II

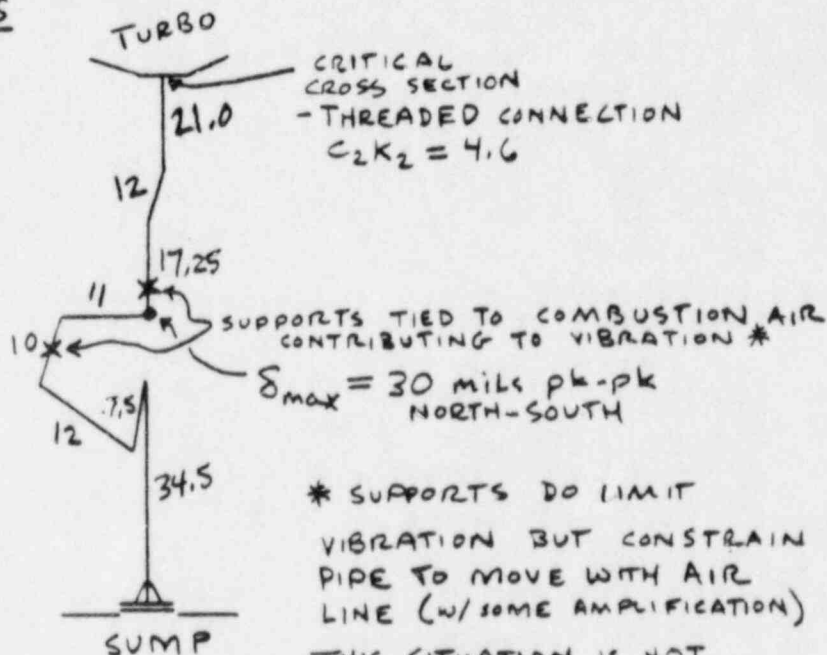
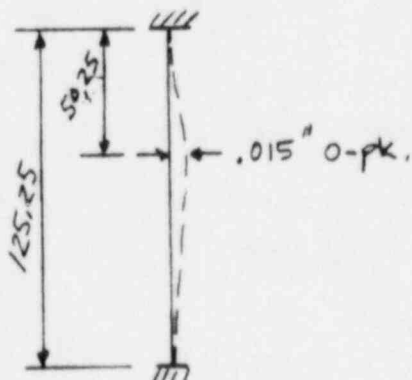
Dev./Station RANCHO SECO Unit 1 File No. _____
Subject DIESEL A — TURBOCHARGER LUBE OIL
DRAIN TO SUMP 1 1/2" LINE By VGA Date 2/6/88
Sheet No. II-6 of 2 Problem No. _____ Checked By WHS Date 2/7/88

DEFLECTION ANALYSIS

GEOMETRY:

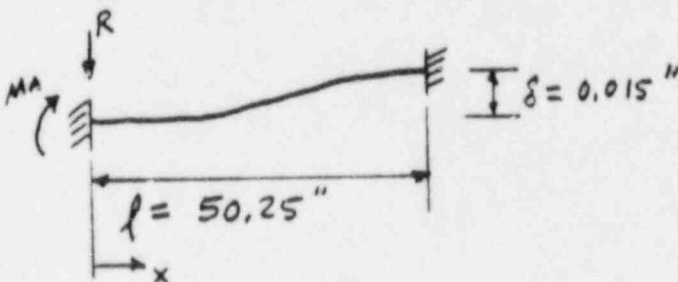
10023-1 1/2"-XX-SH. 1
DCN OA

MODEL:



* SUPPORTS DO LIMIT VIBRATION BUT CONSTRAIN PIPE TO MOVE WITH AIR LINE (w/ SOME AMPLIFICATION)
THIS SITUATION IS NOT SEVERE AS AIR LINE IS KNOWN TO BE IN PHASE WITH TURBOCHARGER.
ABSOLUTE DEFLECTION IS CONSERVATIVELY QUALIFIED;

FURTHER IDEALIZED:



Shear; $V = -R$

Moment; $M = M_A - Rx$

Slope; $\theta EI = \cancel{\theta_A}^0 + M_A x - \frac{1}{2} R x^2 \leftarrow \text{Boundary Condition } \theta = 0 \text{ at } x = l$

Deflection; $y EI = \cancel{\theta_A}^0 x + \cancel{\theta_A}^0 x^2 + \frac{1}{2} M_A x^2 - \frac{1}{6} R x^3$

Boundary Condition $y = \delta$ @ $x = l$

$\Rightarrow R = 2 \frac{M_A}{l}$

Dev./Station RANCHO SECOUnit 6 File No. _____Subject DIESEL ATURBO LUBE OIL DRAIN (cont.)By VGADate 2/6/88Sheet No. II-2 of 2 Problem No. _____Checked By WHSDate 2/7/88

Deflection Eq. :
$$y = \frac{1}{2} \frac{M_A x^2}{EI} - \frac{1}{6} \frac{R x^3}{EI}$$

at $x = l$:
$$\delta = \frac{1}{2} \frac{M_A l^2}{EI} - \frac{1}{6} \frac{(2 \frac{M_A}{l}) l^3}{EI}$$

$$2 E I \delta = M_A l^2 - \frac{2}{3} M_A l^2 = \frac{1}{3} M_A l^2$$

$$\Rightarrow M_A = \frac{6 E I \delta}{l^2}$$

and
$$S_{ALT} = C_2 K_2 \frac{6 E (\frac{D}{2}) \delta}{l^2}$$

Specifically :

$$S_{ALT} = (4.6) \frac{6 (30000000) (\frac{1.9}{2}) (.015")}{(50.25 \text{ in})^2} = 4670 \text{ psi}$$

$$\text{Ratio to Allowable} = 0.47$$

Noted :

1) Model is conservatively stiff, not including flexibility of bends between turbo and location of δ_{max} .

2) Actual deformation is less severe.

APPENDIX III

INSTRUCTIONS FOR INSTALLING STRUTS WITH PINNED-PINNED ENDS

Turbocharger Strut

1. With the jacket water temperatures at keep warm condition, install the strut with the pinned ends and lock nuts loose.
2. Turn the strut in the direction that will produce tension (shorten) the strut. Torque the strut in this direction to 100 ft.-lb.
3. Using a straight edge along the flat surface of the strut eye, make a scribe mark on the strut.
4. With a wrench on the eye, rotate the strut and eye back to center. Check with straight edge to insure that strut has not rotated relative to eye bolt.
5. With strut eye centered, tighten lock nut on one end by holding strut with wrench. Do not let strut rotate enough for eye to touch clevis. Torque to 500 ft.-lb.
6. Repeat step 5 on opposite end. Note that one end has left hand threads.

Jacket Water Strut

1. With jacket water temperature at keepwarm condition, install the strut with the pinned ends and lock nuts loose.
2. Turn the strut in the direction that will produce tension (shorten) the strut. Tighten with hands as tight as possible. Continue tightening 1/4 turn with wrench.
3. Holding strut in center position with wrench, tighten lock nuts on each end, one at a time. Torque to 100 ft.-lb.

Small Pinned Link Strut On 2" Line At NW Corner Of Turbocharger

1. Attach plate to turbocharger. Torque bolts to TDI specification.
2. Install assembled strut on pipe and tighten U-bolts until strut is snug.
3. Measure gap between pipe and plate.
4. Shim to eliminate all but .060-.080 in. of gap.
5. Tighten U-bolts using lock washers with moderate torque.

APPENDIX III (Continued)

INSTRUCTIONS FOR INSTALLING STRUTS WITH PINNED-PINNED ENDS

Sliding Restraint Between 2½" Line and 6" Elbow

1. Carefully mark locations of all parts relative to pipes and to each other before removing.
2. During reassembly, return all parts to original locations. Clearance between nut on 6" U-bolt and teflon clearance hole must be at least ¼ inch as assembled.
3. Shim to obtain interference fit of .060-.080 between teflon and lower plate while system is in keepwarm condition.
4. Torque 5/8 nuts to 75 ft-lb with TDI specified lubrication on all rubbing surfaces.