

HAZARD AND OPERABILITY STUDY

**HERMOSA BEACH PROJECT
TEST PHASE**

**FOR
MACPHERSON OIL COMPANY
2716 OCEAN PARK BLVD. NO. 3080
SANTA MONICA, CA 90405**

**PREPARED BY
ROBERT BROWN ENGINEERS
CARSON, CA 90746**

MAY 15, 1998

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1.0 INTRODUCTION

Macpherson Oil Company plans to construct a facility in Hermosa Beach to produce oil and natural gas. As a precursor to constructing a full fledged facility, Macpherson Oil Company is building a temporary test facility to produce up to 600 Barrels per day of Oil, 1200 Barrels per day of produced water and 150,000 SCFD of gas. This temporary test facility will confirm the feasibility and potential of the eventual oil and gas production for the facility.

Based upon the requirements of California Coastal Commission as well as to fulfill the requirements of CFR 29 Part 1910.119 (OSHA), a Process Hazard Analysis (PHA) has been conducted. Hazard and Operability Study (HAZOPS) is selected for the Process Hazard Analysis using American Institute of Chemical Engineers (AIChE) Guidelines for Hazard Evaluation Procedures, 2nd Edition.

2.0 PROJECT DESCRIPTION

Windward Associates (Macpherson Oil Company, general partner) proposes to develop an oil production facility comprised of 30 oil production wells, three water disposal wells, conversion of one existing well to a water disposal well and an oil processing facility on City owned property in the beach community of Hermosa Beach, California. The project will be developed in two basic phases:

- Phase 1: Development, Exploration and Testing
- Phase 2: Development, Drilling Remaining Wells and Production

Phase 1 is the focus of the HAZOP study. This phase will commence after Windward Associates obtains all required permits and approvals. The development portion of this phase will consist of the demolition and removal of all existing City Maintenance Yard facilities except the metal building on the northeast corner of the property and the existing crude oil production well.

The site will be re-graded. New masonry retaining walls and a concrete wall will be constructed. New electrical service and electrical equipment will be installed. Temporary production facilities and surrounding landscaping will be installed. After the site improvements have been completed, the drilling rig will be moved on the site. The site will be enclosed with a sound attenuation wall to contain sound generated by the drilling operations as required by the City of Hermosa Beach code.

During the Development, Exploratory and Testing Phase of the project, the site will be jointly used by the City of Hermosa Beach. The existing metal building on the northeast corner of the property will be used for City Maintenance purposes.

The exploratory portion of this phase will consist of drilling up to three crude oil production test wells to determine whether commercial quantities of crude oil production can be obtained. Prior to drilling operations, the existing crude oil production well, Stinnett Well No. 1, located on the property will be converted to a water disposal well. The temporary facility will consist of

- Exploratory Oil Wells (up to 3)
- Free Water Knock Out Vessel
- Well Tester
- Wash Tanks (2)
- Oil Stock Tanks (4)
- Crude Oil Loading Facility
- Produced Water System
- Vapor Recovery System for Tanks and Vessels
- Casing Gas Disposal using Thermal Oxidizer and
Emergency Vent System for the Relief System.

The maximum operating pressure for the facility is 50 psig at the ambient temperature with the exception of water injection. The produced water is injected at about 1,200 psig. The details for the equipment required is shown on the Process Flow Diagram, Process and Instrumentation Diagrams (P&IDs) and the plot plan used to conduct the HAZOP Study (section 4.0).

The testing portion of this phase will consist of monitoring the production from the exploratory well(s) for up to a maximum of twelve months from the date drilling begins on the first well. If the well(s) are deemed to be commercial value during the testing, the project will advance to the final phase. The City of Hermosa Beach has issued a Conditional Use Permit for the project that limits production during the

Test phase to maximum of 600 barrels of crude oil per day. The anticipated produced water rate is 1,200 barrels per day and the gas production rate of 150,000 SCFD. Crude oil will be trucked from the site to local refineries, produced water will be reinjected into the production reservoir formations and produced gas will be burned in a thermal oxidizer that is permitted by the South Coast Air Quality Management District.

If commercial quantities of crude oil are not found, the project will be terminated at the end of the Test Phase. All Equipment will be removed for the site and the property will be returned to the City of Hermosa Beach.

3.0 HAZARD AND OPERABILITY STUDY

3.1 Procedure

The Hazard and Operability (HAZOP) Study technique was developed to identify and evaluate safety hazards in a process plant and to identify operating problems which, although not hazardous, could compromise the plant's ability to achieve design productivity.

In HAZOP Study a multi disciplinary team members use a creative and systematic approach to identify hazards and operability problems resulting from deviations for the process's design intent that could lead to undesirable consequences. An experienced team leader systematically guides the team through the plant design using a fixed set of words (called "guide words"). These guide words are applied at specific points of "study nodes" in the plant design and are combined with specific process parameters to identify potential deviations from the plant's intended operation.

HAZOP Study carefully reviews a process or operation in a systematic fashion to determine whether process deviation can lead to undesirable consequences. The HAZOP team lists potential causes and consequences of the deviation as well as existing safeguards protecting against the deviation. When a team determines that inadequate protection exists for a credible deviation, it usually recommends that action be taken to reduce the risk.

The results of the study are team's findings, which include identification of hazards and operating problems; recommendations for changes in design, procedures, etc. to improve system; and recommendations to evaluate where no conclusion was possible due to a lack or inadequate information. The results of team discussions concerning the causes, effects and safeguards for deviations for each study node (which is a section of the process) are recorded in a column-format table.

3.2 HAZOP Study Deviation Matrix

DESIGN PARAMETER	GUIDE WORD						
	MORE	LESS	NONE	REVERSE	PART OF	AS WELL AS	OTHER THAN
FLOW	High Flow	Low Flow	No Flow	Back Flow			Loss of Containment
PRESSURE	High Press	Low Press	Vacuum		Partial Pressure		
TEMPERATURE	High Temp	Low Temp				Cryogenic	
COMPOSITION OR STATE	Additional Phase	Loss of Phase		Change of State	Wrong Concentration	Contaminants	Wrong Material
LEVEL	High Level	Low Level	No Level				Loss of Containment

Other Parameters: Corrosion, Utility Failure, Start up, Shutdown, Human Factors and Facility Siting.

3.3. Risk Ranking

During the initial stage of the HAZOP study, the team develops a Severity (Criticality) Rating and Likelihood (Probability) Rating for preparation of Risk (Hazard) Ranking Matrix. This allows screening of identified hazards by prioritization and sorting to focus subsequent corrective action on the significant identified hazards and eliminating the insignificant or trivial hazards from any further consideration. The following Risk Ranking Index was adopted in the HAZOP team review.

Severity (Criticality) Ranking

- | | | |
|----|--------------|--|
| 1. | Catastrophic | Life threatening to personnel; Public exposure to life threatening hazard; Large uncontained release to environment; or Monetary loss greater than \$ 1,000,000. |
| 2. | Severe | Disability/severe injury to personnel; Public exposure to hazards that could produce injuries; Moderate uncontained release to environment; or Monetary loss between \$ 100,000 and \$ 1,000,000 |
| 3. | Moderate | Loss time injury/no disability to personnel; Public nuisance but no harmful effects; A contained release to Environment; or Monetary loss between \$ 10,000 and \$ 100,000. |
| 4. | Negligible | First aid injury/no disability to personnel; No public impact; Small contained release to environment; or Monetary or production loss less than \$ 10,000. |

3.4 Likelihood (Probability) Ranking

- | | | |
|----|---------------|--|
| 1. | Frequent | Expected to occur frequently in the life of a single plant, i.e., may occur more frequently than once per year. |
| 2. | Probable | Expected to occur several times in the life of a single plant, i.e., may occur between 1 and 10 years |
| 3. | Occasional | Expected to occur once in the life of a single plant i.e., may occur between 10 and 100 years. |
| 4. | Rare | Could occur in the life of a single plant but expected to occur once in the life of multiple plants, i.e., may occur between 100 and 10,000 years. |
| 5. | Extraordinary | Unlikely to occur in the life of multiple plant, i.e., may occur less frequently than once per 10,000 years |

3.5 Risk Ranking Matrix

	Likelihood				
Severity	1	2	3	4	5
1	1	1	1	2	4
2	1	2	3	3	4
3	2	3	4	4	4
4	4	4	4	4	4

The risk ranking codes assigned to each grid of the risk ranking matrix are as follows:

Risk Ranking*

- | | |
|-----------------------------|--|
| 1. Unacceptable | Mitigation planning should be completed within six months using engineering and/or administrative controls to reduce the risk ranking to a 3 or less. |
| 2. Undesirable | Mitigation planning should be completed within twelve months using engineering and/or administrative controls to reduce the risk ranking to a 3 or less. |
| 3. Acceptable with controls | Should be verified that procedures or controls are in place. |
| 4. Acceptable as is | No mitigation action required. |

* For this test phase any hazard with risk ranking of either 1 or 2 have been mitigated to the maximum extent possible.

3.6 HAZOP Study Team

HAZOP Study team assembled to identify potential hazard or operability problems was composed of a multi disciplined personnel with the technical expertise to answer most guide world deviation questions without resorting to further expertise.

The HAZOP Study team meetings were held at Hermosa Beach near the site and at Robert Brown Engineers offices. A site visit was also conducted prior to commencing the HAZOP Study. The team members conducting the HAZOP Studies for the project were as follows:

Jay Sheth, P. E. Process Consultant/HAZOPS Team Leader

B.S. and M.S. in Chemical Engineering, Registered Professional Chemical Engineer in California and Arizona. Over 25 years of experience in petroleum hydrocarbon processing facilities. More than 13 years experience in conducting safety reviews of the Oil and Gas processing facilities. Included in the Safety reviews: Process Hazard Analysis Review; Operating procedures review; Design and construction review; and As built check of the facilities. Currently in charge of Robert Brown Engineers operations.

George D. Economus, P. E. Engineering Consultant/HAZOPS Scribe

B.S. in Chemical Engineering. Registered Professional Mechanical Engineer in California and Oregon. Over 20 years of experience in petroleum and petrochemical industries. Specialized expertise in project management, process and mechanical design including safety, regulatory and field construction. Currently an independent consultant.

David E. Gautschy Project Manager/HAZOPS Scribe

Project Manager for the Hermosa Beach Project. Over 25 years of extensive experience in oil production facilities and other disciplines including planning permitting, inspecting, designing and managing. A.A. in Architecture and Engineering, Urban planning. Building Inspector at ICBO. Qualified General Contractor and Deputy Concrete Inspector.

George J. Dana P. E. Design Engineer

B.S. in Civil Engineering. Registered Professional Civil/Structural Engineer in California. Over 36 years of extensive experience in major oil companies projects including project management, design and development of petrochemical facilities. Employed by major oil companies for mechanical, civil and structural design and construction. Currently an independent consultant.

Rick A. Smith Operations Superintendent

Over 31 years of extensive experience in production rig work, drilling and oil well production. The specific experience include oil well construction and production management, oil rig work, chemical treating and liaison with regulating agencies. Currently operations superintendent for the project to operate and manage the facility.

Frank Tso, P.E. Electrical Engineer

M.S. in electrical Engineering, Registered Professional Electrical engineer in California and six other

States. Over 30 years of extensive experience in designing and managing electrical systems for petroleum facilities, office buildings and other infrastructures. Currently owns consulting company specialized in electrical engineering services.

The HAZOP Study team conducted the HAZOP in five sessions . Details for each session is provided in the attached pages.

----- Session 1 for MOC -----

Company: Macpherson Oil Company
Location: Hermosa Beach, CA
Facility: Hermosa Beach Oil Development Project

Session Date: 04-14-98

Drawing No.: M-1.01,2,3,4

Name	Phone number	Location
Leader: Jay Sheth, P.E.	213-770-3630	Carson, CA
Scribe: George Economus, P.E.	805-962-2198	Goleta, CA

Team:

David Gautschy, Proj Manager	562-427-0419	Signal Hill, CA
Frank Tso, P.E. (Half Day)	714-379-5959	Huntington Beach CA
Rick Smith, Superintendent	310-543-4229	Torrance, CA
George Dana, P.E.	760-753-3625	Encitnitas, CA

Comments:

----- Session 2 for MOC -----

Company: Macpherson Oil Company
Location: Hermosa Beach, CA
Facility: Hermosa Beach Oil Development Project

Session Date: 04-15-98

Drawing No.: M-1.01,2,3,4

Name	Phone number	Location
Leader: Jay Sheth, P.E.	213-770-3630	Carson, CA
Scribe: George Economus, P.E.	805-962-2198	Goleta, CA
Team: David Gautschy, Proj.Manager	562-427-0419	Signal Hill, CA
George Dana, P.E.	760-753-3625	Encitnitas, CA
Rick Smith, Superintendent	310-543-4229	Torrance, CA

Comments:

----- Session 3 for MOC -----

Company: Macpherson Oil Company
Location: Hermosa Beach, CA
Facility: Hermosa Beach Oil Development Project

Session Date: 04-16-98

Drawing No.: M-1.01,2,3,4

Name	Phone number	Location
Leader: Jay Sheth, P.E.	213-770-3630	Carson, CA
Scribe: David Gautschy, Proj.Manager	805-962-2198	Goleta, CA
Team: David Gautschy, Proj.Manager	562-427-0419	Signal Hill, CA
George Dana, P.E.	760-753-3625	Encitnitas, CA
Rick Smith, Superintendent	310-543-4229	Torrance, CA

Comments:

----- Session 4 for MOC -----

Company: Macpherson Oil Company
Location: Hermosa Beach, CA
Facility: Hermosa Beach Oil Development Project

Session Date: 04-20-98

Drawing No.: M-1.01,2,3,4

Name	Phone number	Location
Leader: Jay Sheth, P.E.	213-770-3630	Carson, CA
Scribe: David Gautschy, Proj. Manager	562-427-0419	Signal Hill, CA
Team: David Gautschy, Proj. Manager	562-427-0419	Signal Hill, CA
George Dana, P.E.	760-753-3625	Encinitas, CA
Rick Smith, Superintendent	310-543-4229	Torrance, CA

Comments:

----- Session 5 for MOC -----

Company: Macpherson Oil Company

Location: Hermosa Beach, CA

Facility: Hermosa Beach Oil Development Project

Session Date: 04-24-98

Drawing No.: M-1.01,2,3,4

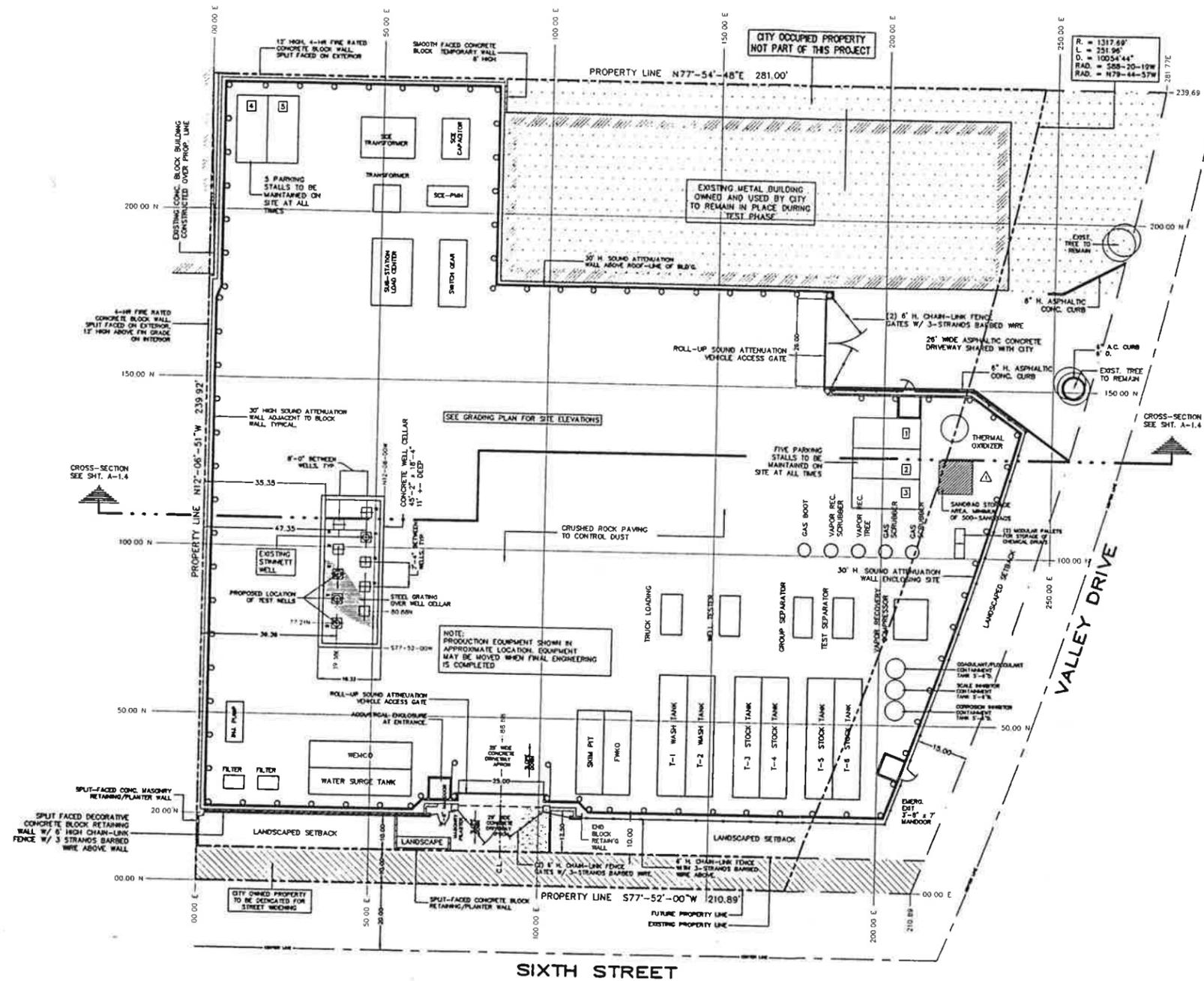
Name	Phone number	Location
Leader: Jay Sheth, P.E.	213-770-3630	Carson, CA
Scribe: David Gautschy, Proj. Manager	562-427-0419	Signal Hill, CA
Team: David Gautschy, Proj. Manager	562-427-0419	Signal Hill, CA
George Dana, P.E.	760-753-3625	Encinitas, CA
Rick Smith, Superintendent	310-543-4229	Torrance, CA
Frank Tso, P.E.	714-379-5959	Huntington Bch, CA

Comments:

4.0 Design Drawings

The following design drawings were used for the HAZOP Study:

1. Test Phase Process Flow Diagram
2. Drawing # M-1.01 Test Phase Piping and Instrumentation, Rev.1, dated 4-10-98
3. Drawing # M-1.02 Test Phase Piping and Instrumentation, Rev.1, dated 4-10-98
4. Drawing # M-1.03 Test Phase Piping and Instrumentation, Rev.1, dated 4-10-98
5. Drawing # M-1.04 Test Phase Piping and Instrumentation Rev.1 dated 4-10-98
6. Drawing # A-1.02 Test Phase Production Facility Site Plan, no Rev.#, dated 3-25-98



CITY OF HERMOSA BEACH
OIL DEVELOPMENT PROJECT
MACPHERSON OIL COMPANY

LEGAL DESCRIPTION:
LOTS 11 - 18 IN BLOCK R AND LOTS 11 - 18 IN BLOCK U OF TRACT NO. 2002 AS RECORDED IN BOOK NO. 22, PAGE NO. 154 OF MAPS IN THE OFFICE OF THE COUNTY RECORDER OF LOS ANGELES COUNTY TOGETHER WITH THAT PORTION OF BARD STREET VACATED BY ORDINANCE NO. 300, 8-24-22 AS INSTRUMENT NO. 854 AND RECORDED IN BOOK NO. 1407, PAGE NO. 87 OF OFFICIAL RECORDS.

BASES OF BEARINGS:
THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE OF SIXTH STREET BEING S77-52-00W AS SHOWN ON TRACT NO. 2002, BOOK NO. 22, PAGE NO. 154.

GRID ROTATED 12-08-00° CLOCKWISE
CENTERED AT THE INTERSECTION OF THE
NORTHERLY PROP. LINE OF SIXTH STREET
AND THE WESTERLY PROP. LINE OF THE
SITE BEING 00.00 E AND 00.00 M FOR
CONVENIENCE IN USE.

TEST PHASE, CONCEPTUAL SITE PLAN, TESTING

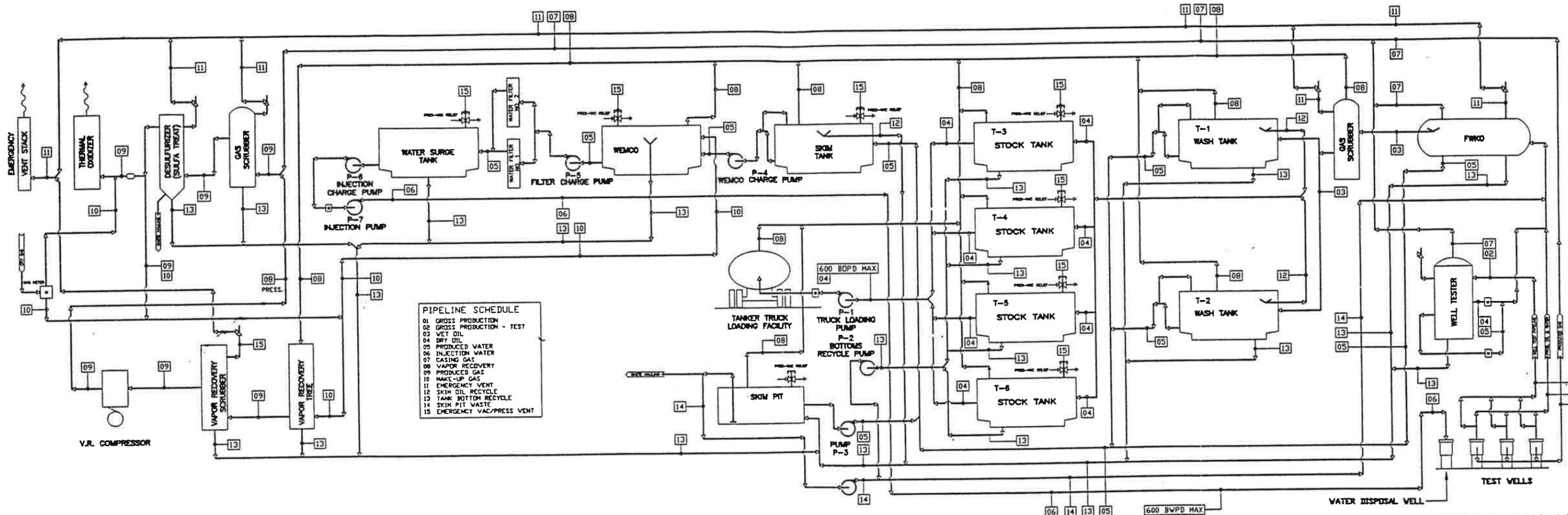
SCALE: 1" = 20'-0"

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REVISIONS TO APPROVED PLANS					ORIGINAL DRAWING		PLANS PREPARED BY:		PLANS PREPARED FOR:		HERMOSA BEACH PROJECT	
NO	DATE	DESCRIPTION	APPROVAL BY	DATE	CAD File No.	Date Drawn:	Drawn By:	Revised:	Revised:	Approved:	Dwg. Scale:	Plot Date:
1	3/25/98	SANDBAG STORAGE AREA	MOC		HBA102.DWG	DEC 12, 1996	DEG	MAR 71997	JULY 6, 1997		1" = 20'-0"	MAR 25, 1998
							DAVID E. GAUTSCHY, INC. 2698 JUNIPERO AVE. # 201B SIGNAL HILL, CALIFORNIA 90806 (562) 427-0419		MACPHERSON OIL COMPANY 2716 OCEAN PARK BLVD., NO. 3080 SANTA MONICA, CALIFORNIA 90405		TEST PHASE PRODUCTION FACILITY SITE PLAN 555 SIXTH STREET, HERMOSA BEACH, CA.	

A-1.02

Sheet of



PIPELINE SCHEDULE

01	GROSS PRODUCTION
02	GROSS PRODUCTION - TEST
03	NET OIL
04	DRY OIL
05	PRODUCED WATER
06	INJECTION WATER
07	CASING GAS
08	VAPOR RECOVERY
09	PRODUCED GAS
10	MAKE-UP GAS
11	EMERGENCY VENT
12	SKIM OIL RECYCLE
13	TANK BOTTOM RECYCLE
14	SKIM PIT WASTE
15	EMERGENCY VAC/PRESS VENT

**PROCESS FLOW DIAGRAM
PHASE ONE PRODUCTION
TEST FACILITIES**

HBPFD.dwg DEG 10/27/97

- PROCESS FLOW EACH WELL:**
- A. FLUID - CRUDE OIL & WATER
600 B/D W/ 67% WATER
 - B. GAS - 50 MSCFD
 - C. CRUDE - 19° GRAVITY
 - D. TEMPERATURE - 100° F.
 - E. PRESSURE TO FWKO - 50 PSIG

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Drawn By:	DEG
Revised:	NOV 3, 1997
Revised:	APR 10, 1998

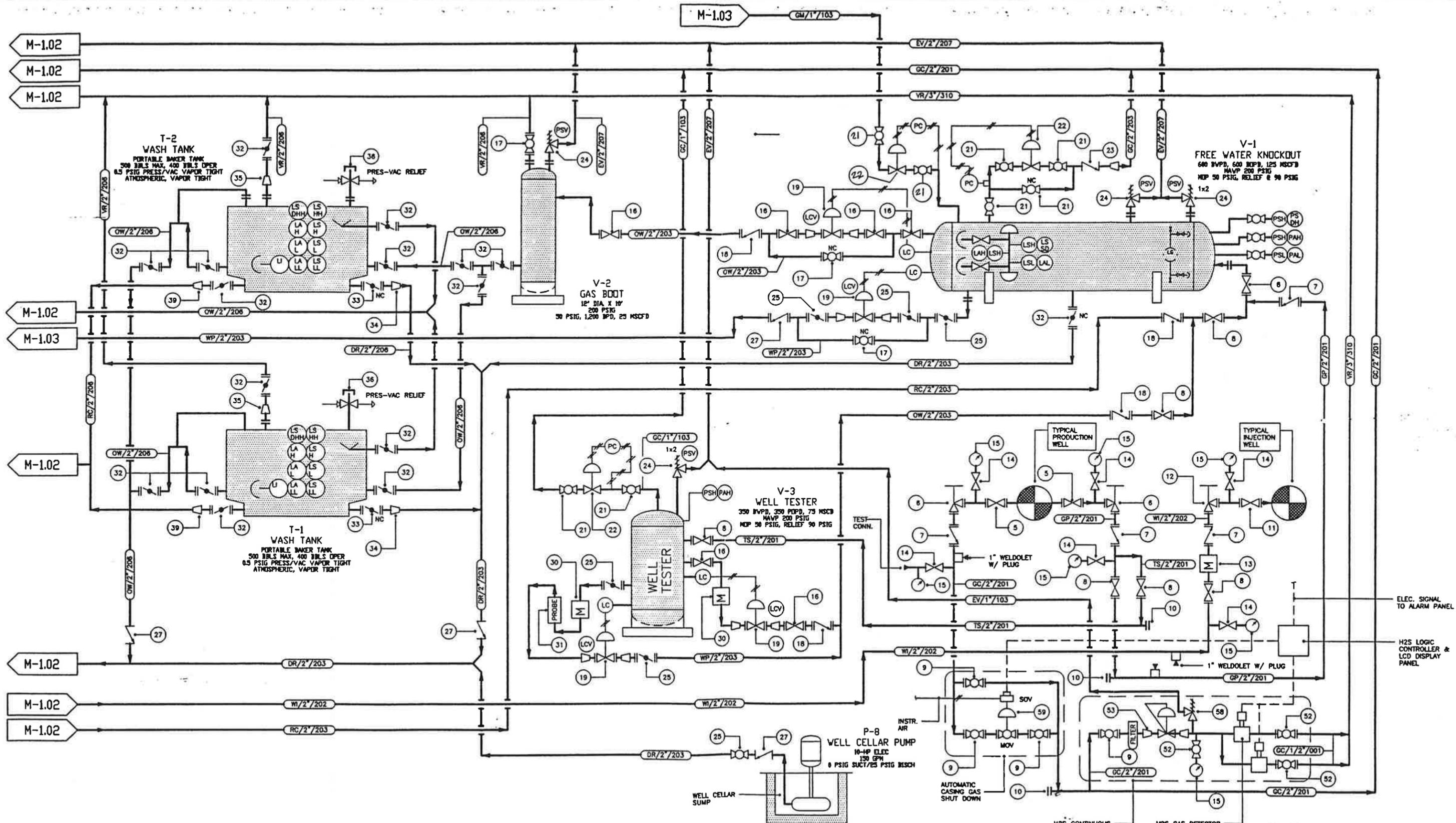
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HERMOSA BEACH PROJECT
TEST PHASE
PROCESS FLOW DIAGRAM
555 SIXTH STREET, HERMOSA BEACH, CA.

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 Date Drawn: 2/24/98
 Drawn By: DEG
 Revised:
 Revised:
 Approved:

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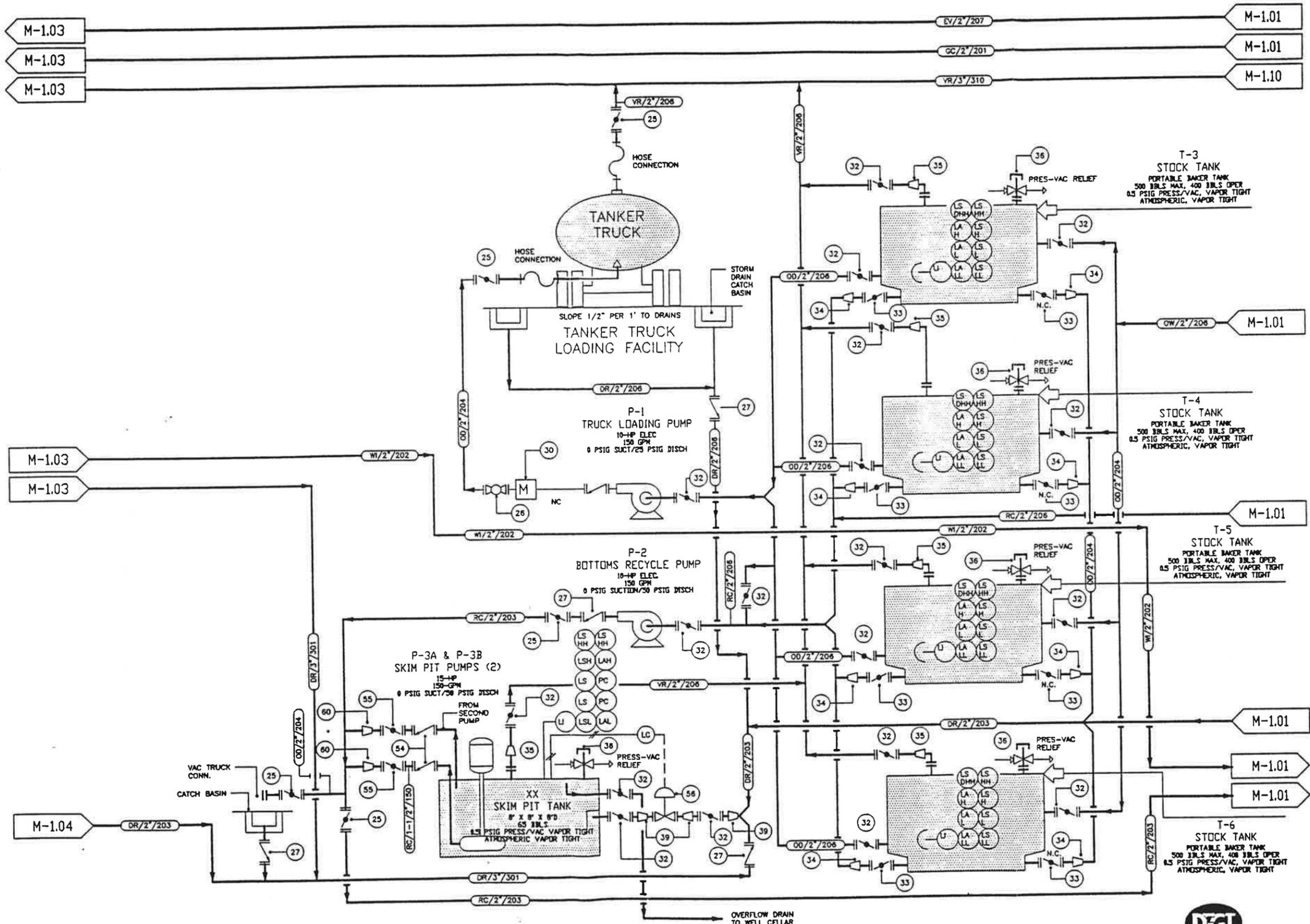
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HERMOSA BEACH PROJECT
TEST PHASE
PIPING AND INSTRUMENTATION
 555 SIXTH STREET, HERMOSA BEACH, CA.

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M-1.01
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INSTRUMENT CODING

BC	BURNER CONTROLLER
BSL	BURNER SAFETY LOW
HLSO	HIGH LEVEL SWITCH SHUT DOWN
HPSH	HIGH PRESSURE SWITCH SHUT DOWN
HTSD	HIGH TEMPERATURE SWITCH SHUT DOWN
IC	INTERFACE CONTROLLER
IT	IGNITION TRANSFORMER
LAH	LEVEL ALARM HIGH
LAHM	LEVEL ALARM HIGH HIGH
LAL	LEVEL ALARM LOW
LALL	LEVEL ALARM LOW LOW
LC	LEVEL CONTROLLER
LC-1	LEVEL CONTROLLER #1
LCV	LEVEL CONTROL VALVE
LG	LEVEL GLASS
LI	LEVEL INDICATOR
LPSD	LEVEL PRESSURE SWITCH SHUT DOWN
LSC-1	LEVEL SWITCH PUMP CONTROL #1
LSDH	LEVEL SWITCH SHUT DOWN HIGH
LSH	LEVEL SWITCH HIGH
LSHM	LEVEL SWITCH HIGH HIGH
LSL	LEVEL SWITCH LOW
LSLL	LEVEL SWITCH LOW LOW
LSDHM	LEVEL SWITCH SHUT DOWN HIGH HIGH
M	METER
NC	NORMALLY CLOSED
PAH	PRESSURE ALARM HIGH
PAL	PRESSURE ALARM LOW
PC	PRESSURE CONTROLLER
PCV	PRESSURE CONTROLLER VALVE
PI	PRESSURE INDICATOR
PRV	PRESSURE RELIEF VALVE
PSDH	PRESSURE SWITCH SHUT DOWN HIGH
PSE	PRESSURE SAFETY ELEMENT
PSH	PRESSURE SWITCH HIGH
PSHL	PRESSURE SWITCH HIGH LOW
PSL	PRESSURE SWITCH LOW
PSV	PRESSURE SWITCH VALVE
SC	FLAME - SAFETY GUARD SCANNER
SCH	PIPE SCHEDULE
SDV	SHUT DOWN VALVE
SV	SOLENOID VALVE
TC	TEMPERATURE CONTROLLER
TE	THERMAL COUPLES
TI	TEMPERATURE INDICATOR
TSE	TEMPERATURE SAFETY ELEMENT
TSH	TEMPERATURE SWITCH HIGH



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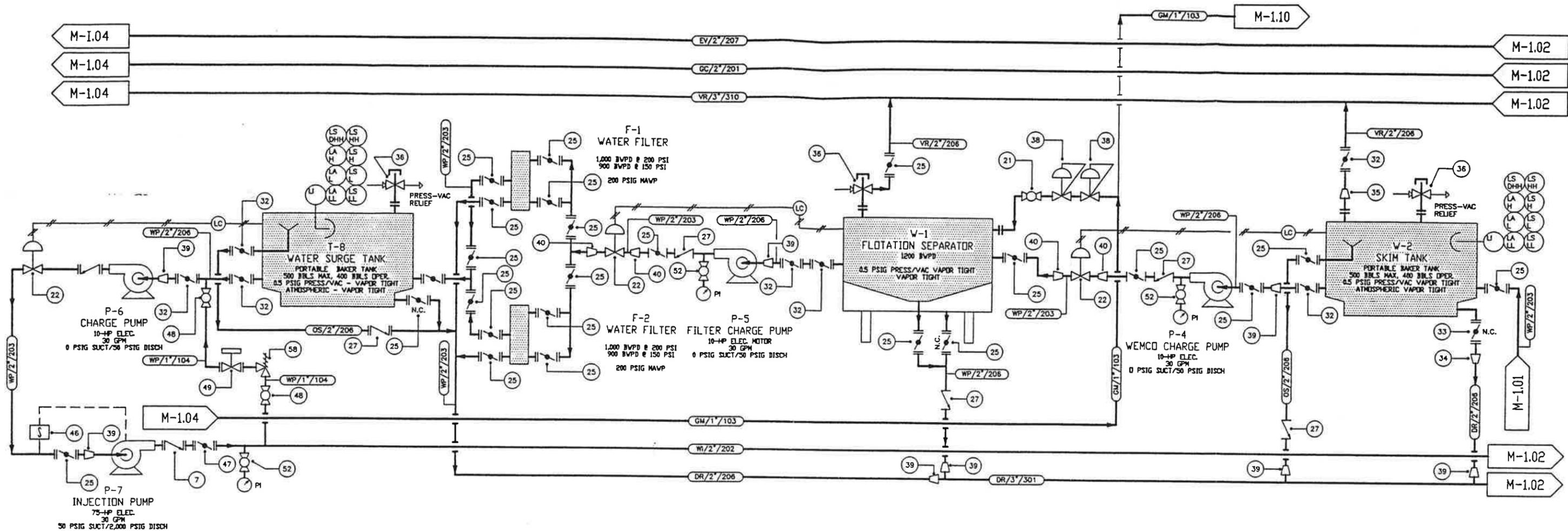
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REVISION	
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HERMOSA BEACH PROJECT
 TEST PHASE
PIPING & INSTRUMENTATION
 555 SIXTH STREET, HERMOSA BEACH, CA.

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Drawn By:	DEG
Revised:	4/10/98
Revised:	
Approved:	

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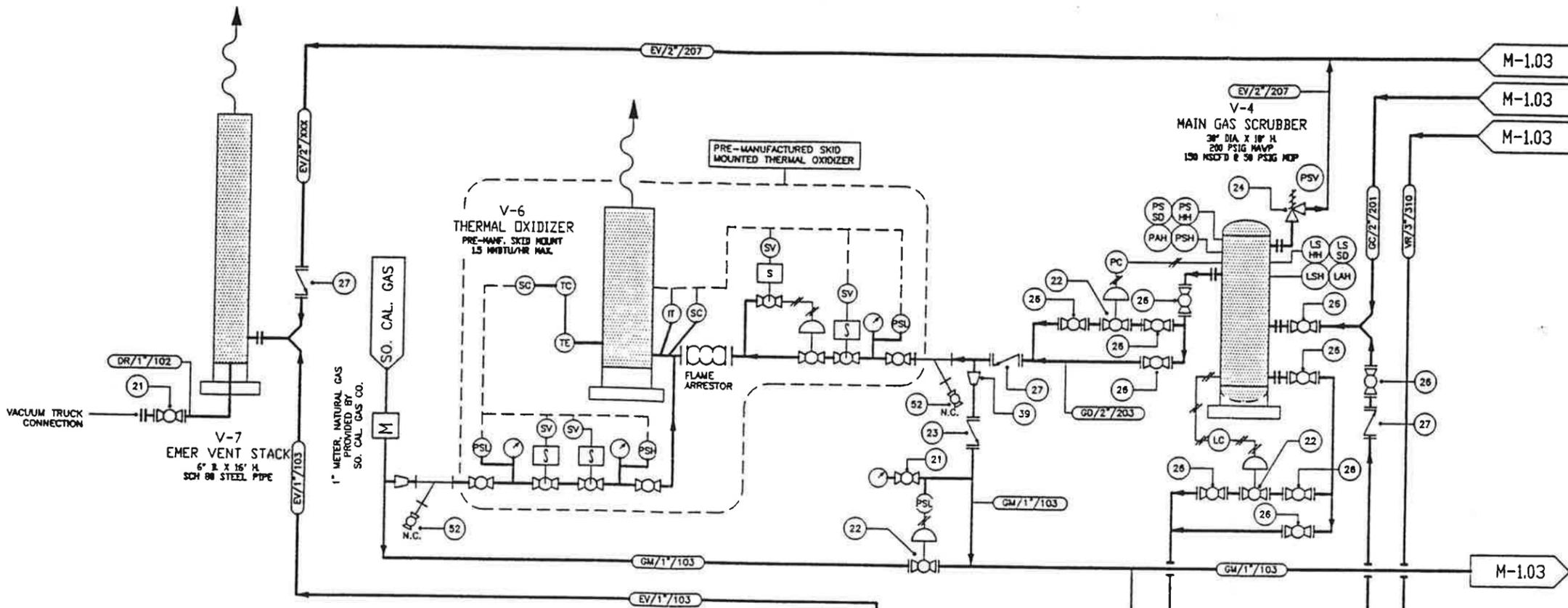
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 555 SIXTH STREET, HERMOSA BEACH, CA.

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Plot Date: 4/10/98
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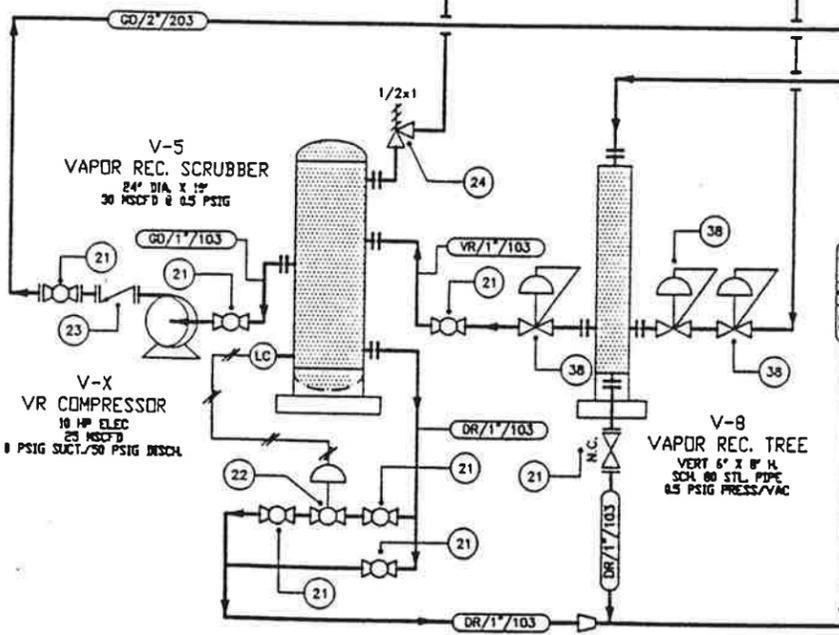
EQUIPMENT AND FITTING LEGEND

- 1 2" SCH 80 CASING GAS
- 2 2" SCH 80 PRODUCED FLUIDS
- 3 2" SCH 80 OIL TEST
- 4 2" SCH 80 WATER INJECTION
- 5 2" - 2,000 LB W.P., GATE VALVE, FLANGED
- 6 2" - 2,000 LB W.P., ADJUSTABLE CHOKE, FLANGED
- 7 2" - 600 LB ANSI CHECK VALVE, FLANGED
- 8 2" - 600 LB ANSI GATE VALVE, FLANGED
- 9 2" - 600 LB ANSI BALL VALVE, FLANGED
- 10 2" - 600 LB ANSI BLIND FLANGE
- 11 2" - 600 LB ANSI GATE VALVE, FLANGED
- 12 2" - 2,000 LB W.P. ADJUSTABLE CHOKE, FLANGED
- 13 2" - 2,000 LB W.P. HALLIBURTON METER
- 14 3/4" - 2,000 LB. W.P. GATE VALVE, SCREWED
- 15 PRESSURE GAGE
- 16 2" - 150 LB ANSI GATE VALVE, FLANGED
- 17 2" - 150 LB ANSI BALL VALVE, FLANGED
- 18 2" - 150 LB ANSI CHECK VALVE, FLANGED
- 19 1" - 150 LB ANSI CONTROL VALVE, FLANGED
- 20 2" - SCH 40 GAS RELIEF
- 21 1" - 150 LB ANSI BALL VALVE, SCREWED
- 22 1" - 150 LB ANSI CONTROL VALVE, SCREWED
- 23 1" - 150 LB ANSI CHECK VALVE, SCREWED
- 24 1" - 150 LB ANSI SAFETY RELIEF VALVE, SCREWED
- 25 2" - 150 LB ANSI BUTTERFLY VALVE, FLANGED
- 26 2" - 150 LB ANSI BALL VALVE, FLANGED
- 27 2" - 150 LB ANSI CHECK VALVE, FLANGED
- 28 2" SCH 40 PIPE
- 29 3" SCH 40 PIPE
- 30 2" - 150 LB ANSI METER, FLANGED
- 31 2" - 150 LB ANSI PROBE
- 32 3" - 150 LB ANSI BUTTERFLY VALVE, FLANGED
- 33 4" - 150 LB ANSI BUTTERFLY VALVE, FLANGED
- 34 4" X 3" WELD REDUCER, SCH 40
- 35 6" X 3" WELD REDUCER, SCH 40
- 36 2" - 150 LB VAREC P.V. VALVE, FLANGED
- 37 1" GAS METER
- 38 1" - 150 LB VAREC P.R. VALVE, SCREWED
- 39 3" X 2" WELD REDUCER, MATCH PIPE SCH.
- 40 2" X 1" WELD REDUCER, MATCH PIPE SCH.
- 41 WATER, WEMCO CHARGE PUMP
- 42 WATER FILTER CHARGE PUMP
- 43 WATER CARTRIDGE FILTER
- 44 WATER INJECTION CHARGE PUMP
- 45 WATER INJECTION PUMP
- 46 LOW FLOW SHUT-DOWN SWITCH
- 47 HIGH PRESSURE BALL VALVE, FLANGED
- 48 1" 600 LB ANSI BALL VALVE
- 49 1" 600 LB ANSI ADJUSTABLE CHOKE
- 50 1/2" - 600 LB ANSI CHOKE VALVE, SCREWED
- 51 1/2" - 600 LB ANSI FISHER PRESSURE REGULATOR
- 52 1/2" - 600 LB ANSI BALL VALVE, SCREWED
- 53 2" X 1/2" WELD REDUCER, MATCH PIPE SCH.
- 54 1-1/2" 150 LB ANSI CHECK VALVE
- 55 1-1/2" 150 LB ANSI BUTTERFLY VALVE
- 56 2" 150 LB ANSI CONTROL VALVE
- 57 1/2" 600 LB ANSI PRESSURE CONTROL VALVE
- 58 1/2" 600 LB ANSI PRESSURE RELIEF VALVE
- 59 2" 600 LB ANSI MOTOR OPERATED VALVE
- 60 2" X 1-1/2" WELD REDUCER, MATCH PIPE SCH.



COMMODITY ABBREVIATIONS	PIPING SPECIFICATION TEST PHASE							
	SPECIFICATION	MATERIAL	PIPE DIA. INCHES	SCHEDULE	WALL THK. INCHES	MAWP PSIG	MOP PSIG	MTP PSIG
AB BREATHING AIR	001	STEEL	1/2	80	0.147	566	<10	850
AI INSTRUMENT AIR	102	STEEL	1	40	0.133	466	<10	700
AJ UTILITY AIR	103	STEEL	1	40	0.133	466	100	700
DR DRAIN	104	STEEL	1	80	0.179	1666	1200	2500
DS STORM DRAIN	150	STEEL	1-1/2"	40	0.145	733	25	1100
EY EMERGENCY VENT								
GC CASING GAS								
GD DRY GAS								
GM MAKE-UP GAS	201	STEEL	2	80	0.218	1440	1100	2500
GP GROSS PRODUCTION	202	STEEL	2	80	0.218	1440	1200	2500
GU UTILITY GAS (SCGC)	203	STEEL	2	40	0.154	255	75	2300
GW GAS WET	204	STEEL	2	40	0.154	255	25	2300
OD DRY OIL	205	STEEL	2	40	0.154	255	20	2300
OS SKIM OIL	206	STEEL	2	40	0.154	255	<10	2300
OW WET OIL	207	STEEL	2	40	0.154	255	100	2300
RC RECYCLE								
TS TEST								
VR VAPOR RECOVERY	301	STEEL	3	40	0.216	255	80	2220
WF WATER FIRE SERVICE	302	STEEL	3	40	0.216	255	50	2220
WI WATER INJECTION	303	STEEL	3	40	0.216	255	12	2220
WP PRODUCED WATER	304	X	3	X	X	X	X	X
XX BREATHING AIR								
XXX								
	310	FIBERGLASS	3		0.3	50	10	
	401	X	4	X	X	X	X	X

MAWP = MAXIMUM ALLOWABLE WORKING PRESSURE
MOP = MAXIMUM OPERATING PRESSURE
MTP = MANUFACTURER TEST PRESSURE



PRESSURE VESSEL SETTINGS (PSIG), TEST PHASE							
VESSEL	MAWP	MOP	HIGH PRESS ALARM	LOW PRESS ALARM	HIGH PRESS SHUT-IN	LOW PRESS SHUT-IN	RELIEF VALVE
3 - PHASE SEPARATOR (FWKO)	200 MIN.	50	60	40	80	20	90
GAS BOOT	200 MIN.	50	-	-	-	-	90
WELL TESTER	200 MIN.	50	60	40	80	20	90
GAS SCRUBBER	200 MIN.	50	60	40	80	20	90
VAPOR RECOVERY COMPRESSOR SCRUBBER	100 MIN.	5	-	-	-	-	10

MAWP = MAXIMUM ALLOWABLE WORKING PRESSURE (DESIGN PRESS. PER ASME CODE)
MOP = MAXIMUM OPERATING PRESSURE (PER ASME CODE)

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REVISIONS TO APPROVED PLANS			
NO	DATE	DESCRIPTION	APPROVAL BY
1	4/10/98	REV. PER JAY SMETH 4/8/98	MOG DEG

ORIGINAL DRAWING	
CAD File No.	DATE
M1.04	2/19/98
Drawn By:	DEG
Revised:	4/10/98
Approved:	

PLANS PREPARED BY:
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PLANS PREPARED FOR:
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HERMOSA BEACH PROJECT
TEST PHASE
PIPING & INSTRUMENTATION
555 SIXTH STREET, HERMOSA BEACH, CA.

Dwg. Scale: NOT TO SCALE
Plot Date: 4/10/98
M-1.04
Sheet of

5.0 RECOMMENDATIONS AND ACTION ITEMS

HAZOP Study team has identified 39 recommendations for the testing facility. Macpherson Oil Company has agreed to implement all 39 recommendations. The following pages provide list of these recommendations. Also at the end of the report, updated P&IDs are provided which reflect the design changes. Operational and other mitigations will need to be taken care of prior to start up of the testing facility. Macpherson Oil Company will maintain detail log of these mitigations to ensure all they are implemented prior to start up.

Company: Macpherson Oil Company

Facility: Hermosa Beach Oil Development Project

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Session: 1 04-14-98

Revision: 0 04-14-98 Dwg#: M-1.01,2,3,4

Node: 1 Gross Production from Well Through Free Water K.O.Drum, V-1

Parameter: Flow

Intention: Produce 1200 BWPD, 600 BOPD at Normal Operating Pressure 50 of psig and Ambient Temperature.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
1	High Flow	Add LLSD to V-1	04-14-98	
2		Add LSDLL on V-1.	04-14-98	

Session: 1 04-14-98

Revision: 0 04-14-98 Dwg#: M-1.01,2,3,4

Node: 2 Casing Gas through Main Scrubber, V-4

Parameter: Level

Intention: Send up to 150 MSCFD of Casing Gas to the Thermal Oxidizer at 50 psig and Ambient Temperature.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
3	No Level	Add Low Level Alarm on V-4	04-14-98	

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Facility: Hermosa Beach Oil Development Project

Page: 2

Session: 2 04-15-98

Revision: 0 04-15-98

Dwg#: M-1.01,2,3,4

Node: 3 Well Tester System

Parameter: Flow

Intention: To Test the Well at up to 350 BWPD, 350 BOPD and 75 MSCFD of Gas at a Normal Operating Pressure of 50 psig and Ambient Temperature.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
4	No/Low Flow	Ensure that proper operating procedures are incorporated into the Operation and Training Manuals.	04-14-98	
5		Ensure that proper operating procedures are incorporated into the Operation and Training Manuals.	04-14-98	
6	Reverse Flow	Add second check valve on inlet piping.	04-15-98	
7		Add check valve on the discharge line to the casing gas header.	04-15-98	

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Session: 2 04-15-98

Revision: 0 04-15-98

Dwg#: M-1.01,2,3,4

Node: 4 Vapor Recovery System

Parameter: Flow

Intention: Recovery of Low Pressure Gas from Vessels and Tanks at Ambient Temperature to Minimize Releases to Atmosphere.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
8	No/Low Flow	Add PI on V-8 and a PAH at the end of the vapor recovery header.	04-15-98	
9		Ensure compressor rental package has vacuum protection	04-15-98	
10		Add PAL at end of the vapor recovery header	04-15-98	
11	High Flow	-Add PAH on V. R. header. -Add PI on V-8. -Add PAH on V-5. -Add Car Seal Open (CSO) globe valve upstream of PV-7. -Add ball valves on each side of PV-8 with a bypass valve.	04-15-98	
12	Reverse	Add PAH on V-5.	04-15-98	

Company: Macpherson Oil Company

Facility: Hermosa Beach Oil Development Project

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Session: 2 04-15-98

Revision: 0 04-15-98

Dwg#: M-1.01,2,3,4

Node: 4 Vapor Recovery System

Parameter: Flow

Intention: Recovery of Low Pressure Gas from Vessels and Tanks at Ambient Temperature to Minimize Releases to Atmosphere.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
	Flow			

Session: 2 04-15-98

Revision: 0 04-15-98

Dwg#: M-1.01,2,3,4

Node: 4 Vapor Recovery System

Parameter: Level

Intention: Recovery of Low Pressure Gas from Vessels and Tanks at Ambient Temperature.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
13	No/Low Level	Ensure Operating Procedures provide adequate monitoring during draining operations.	04-15-98	
14		Ensure Operating Procedures provide adequate monitoring during draining operations.	04-15-98	
15	High Level	Ensure Operating Procedures provide adequate	04-15-98	

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

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Session: 2 04-15-98 Revision: 0 04-15-98 Dwg#: M-1.01,2,3,4
 Node: 4 Vapor Recovery System
 Parameter: Level
 Intention: Recovery of Low Pressure Gas from Vessels and Tanks at Ambient Temperature.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
16		monitoring during draining operations. Ensure Rental Compressor Package Suction Scrubber has LAH, LSDHH and Level Gage for Operator Monitoring	04-15-98	

Session: 2 04-15-98 Revision: 0 04-15-98 Dwg#: M-1.01,2,3,4
 Node: 5 Wet Oil System
 Parameter: Pressure
 Intention: 600 BOPD, 100 BWPD and 25 MSCFD of Gas at 50 psig Operating Pressure and Ambient Temperature.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
17	High Pressure	- Add PI to V-2 - Add PAH to V-2 set at 55 psig - CSO block valve at V-2 outlet	04-15-98	

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

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Session: 3 04-16-98 Revision: 0 04-16-98 Dwg#: M-1.01,2,3,4
 Node: 6 Produced Water System
 Parameter: Flow
 Intention: Produce up to 1200 BPD of Water for Water Injection at Ambient Temperature.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
18	No/Low Flow	Install Pressure Gage(s) on Filters	04-16-98	
19	More Flow	- Add PAH on Vapor Recovery Header - Add Manometer on W-1 - Install PI on the Make-up Gas line to W-1.	04-16-98	

Session: 3 04-16-98 Revision: 0 04-16-98 Dwg#: M-1.01,2,3,4
 Node: 6 Produced Water System
 Parameter: Level
 Intention: Produce up to 1200 BPD of Water for Water Injection at Ambient Temperature.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
20	No/Low Level	Install Low Level Switch for Pump P-5 Shut-down on Low Level.	04-16-98	

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

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Session: 3 04-16-98 Revision: 0 04-16-98 Dwg#: M-1.01,2,3,4

Node: 7 Dry Oil and Tanker Truck Loading

Parameter: Flow

Intention: Load 600 BPD of Dry Crude Oil at Ambient Temperature

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
21	No/Low Flow	Operator training for Hose maintenance and inspection.	04-16-98	
22		Ensure the tank truck has high pressure shutdown.	04-16-98	

Session: 3 04-16-98 Revision: 0 04-16-98 Dwg#: M-1.01,2,3,4

Node: 7 Dry Oil and Tanker Truck Loading

Parameter: Pressure

Intention: Load 600 BPD of Dry Crude at Ambient Temperature

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
23	High Pressure	Ensure tank truck has meter to monitor loading and level gage on truck.	04-16-98	

Company: Macpherson Oil Company

Facility: Hermosa Beach Oil Development Project

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Session: 3 04-16-98

Revision: 0 04-16-98

Dwg#: M-1.01,2,3,4

Node: 8 Thermal Oxidizer and Make-up Gas System

Parameter: Pressure

Intention: Safe Burning of Produced Gas and Maintain Positive Pressure in the System and Pilot.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
24	High Pressure	Install pressure regulator to reduce line pressure to pilot	04-16-98	

Session: 4 04-20-98

Revision: 0 04-20-98

Dwg#: M-1.01,2,3,4

Node: 9 Emergency Vent System

Parameter: Flow

Intention: Safe Venting of Process Systems During Upset Conditions

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
25	No/Low Flow	Remove Check Valve at inlet to Emergency Vent Stack. Install liquid knock out vessel upstream of Emergency Vent Stack with Pressure Alarm High and High High Pressure Shut-down.	04-20-98	
26	More Flow	PSVs to be maintained for	04-20-98	

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

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Session: 4 04-20-98 Revision: 0 04-20-98 Dwg#: M-1.01,2,3,4
 Node: 9 Emergency Vent System

Parameter: Flow

Intention: Safe Venting of Process Systems During Upset Conditions

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
27	Reverse Flow	proper operation Ensure that the line is purged after the release event.	04-20-98	

Session: 4 04-20-98 Revision: 0 04-20-98 Dwg#: M-1.01,2,3,4
 Node: 9 Emergency Vent System

Parameter: Pressure

Intention: Safe Venting of Process Systems During Upset Conditions

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
28	High Pressure	Remove check valve from the system.	04-20-98	

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

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Session: 4 04-20-98 Revision: 0 04-20-98 Dwg#: M-1.01,2,3,4
 Node: 9 Emergency Vent System

Parameter: Level

Intention: Safe Venting of Process Systems During Upset Conditions

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
29	High Level	Install Liquid Knock Out Drum up-stream of Vent Scrubber Stack with High Level Alarm and High Level Shut-down of production.	04-20-98	

Session: 4 04-20-98 Revision: 0 04-20-98 Dwg#: M-1.01,2,3,4
 Node: 10 Drain System

Parameter: Flow

Intention: Draining of Systems During Normal Operation at Ambient Temperature.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
30	No/Low Flow	Relocate LV-10 closer to WEMCO for better control	04-20-98	
31	Reverse Flow	Add LSDLL on V-1	04-20-98	
32		Install LAL on W-1	04-20-98	

Company: Macpherson Oil Company

Facility: Hermosa Beach Oil Development Project

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Session: 4 04-20-98

Revision: 0 04-20-98

Dwg#: M-1.01,2,3,4

Node: 11 Recycle System

Parameter: Flow

Intention: Recycle Offspec Products at Ambient Temperature

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
33	More Flow	Verify type of pump that will be installed. Centrifugal pump may allow flow even if the pump is shut in.	04-20-98	

Session: 4 04-20-98

Revision: 0 04-20-98

Dwg#: M-1.01,2,3,4

Node: 11 Recycle System

Parameter: Pressure

Intention: Recycle Offspec Products at Ambient Temperature.

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
34	High Pressure	Operating Procedures to include monitoring pump operation	04-20-98	

Company: Macpherson Oil Company

Facility: Hermosa Beach Oil Development Project

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Session: 5 04-24-98

Revision: 0 04-20-98 Dwg#: M-1.01,2,3,4

Node: 12 External Events, Human Error, Faci. Siting & Envir. Concerns

Parameter: Other

Intention: Safe Operations

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS
35	Other	- Hydrotest equipment and piping to 1-1/2 times the Maximum Allowable Working Pressure (MAWP). - Implement corrosion inhibitor Program	04-24-98	
36		External wrapping of underground piping.	04-24-98	
37		Design facility to handle 100 year storm event	04-24-98	
38		Verify that the system is sized adequately to handle all upset scenarios	04-24-98	
39		Interlock MOV on the Casing Gas line to Close when the Production Wells are shut in.	04-24-98	

Company: Macpherson Oil Company
Facility: Hermosa Beach Oil Development Project

Session: 5 04-24-98 Revision: 0 04-20-98 Dwg#: M-1.01,2,3,4
Node: 12 External Events, Human Error, Faci. Siting & Envir. Concerns
Parameter: Other Intention: Safe Operations

Ref #	DEVIATION	RECOMMENDATIONS	DATE	COMMENTS

6.0 STUDY NODES

The facility design was divided in to twelve Study Nodes by the HAZOP study team as described below.

- Node 1. Gross Production from Well Through Free Water K.O. Drum, V-1
- Node 2. Casing Gas through Main Scrubber, V-4
- Node 3. Well Tester System
- Node 4. Vapor Recovery System
- Node 5. Wet Oil System
- Node 6. Produced Water System
- Node 7. Dry Oil and Tanker Truck Loading
- Node 8. Thermal Oxidizer and Make-up Gas System
- Node 9. Emergency Vent System
- Node 10. Drain System
- Node 11. Recycle System
- Node 12. External Events, Human Error, Facility, Siting & Environmental Concerns.

APPENDIX

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 3
 Page: 3

Session: 2 04-15-98 Revision: 0 04-15-98 Dwg#: M-1.01,2,3,4
 Node: 3 Well Tester System

Parameter: Pressure

Intention: To Test the Well at up to 350 BWP, 350 BOPD and 75 MSCFD of Gas at a Normal Operating Pressure of 50 psig and Ambient Temperature.

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
No/Low	No/Low Pressure	Normal when not testing. Inlet block valve closed	Inability to test						No hazard identified			
High	High Pressure	LV-4 and/or LV-5 fail closed PV-4 fails closed	Increase in level causes pressure increase and liquid carryover through PV-4 to V-4 Invalid test	PAH-3, PSV-3 on V-3 and LAH-4, LSDHH-4 on V-4					No hazard identified No hazard identified			
Vacuum	Vacuum Pressure	Not applicable							No hazard identified			

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 3
 Page: 4

Session: 2 04-15-98 Revision: 0 04-15-98 Dwg#: M-1.01,2,3,4
 Node: 3 Well Tester System

Parameter: Level

Intention: To Test the Well at up to 350 BWPD, 350 BOPD and 75 MSCFD of Gas at a Normal Operating Pressure of 50 psig and Ambient Temperature.

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
No/Low	No/Low Level	LV-4 and/or LV-5 fail open	Invalid test						No hazard identified			
High	High Level	LV-4 and/or LV-5 fail closed	Increased level for liquid carryover to V-4	LAH-4 and LSDHH-4 on V-4					No hazard identified			

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 4
 Page: 1

Session: 2 04-15-98 Revision: 0 04-15-98 Dwg#: M-1.01,2,3,4
 Node: 4 Vapor Recovery System

Parameter: Flow Intention: Recovery of Low Pressure Gas from Vessels and Tanks at Ambient Temperature to Minimize Releases to Atmosphere.

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
No/Low	No/Low Flow	Compressor C-1 fails or PV-5 on outlet of V-8 fails closed or manual block valve closed or check valve fails closed.	Build up higher backup pressure on vapor recovery lines or tanks and vessels. Potential to overpressure tanks and cause gas release to atmosphere from tank Pressure-Vacuum Relief Valves. Potential for odor nuisance.	Pressure-Vacuum Relief Valve for overpressure protection. Gas detectors provide safeguard by shutting down the facility.	3	2	3	Add PI on V-8 and a PAH at the end of the vapor recovery header.		GDE	04-15-98	
		PV-5 fails closed or compressor suction block valves closed.	Compressor suction vessel V-5 sees vacuum condition		3	2	3	Ensure compressor rental package has vacuum protection		GDE	04-15-98	
		PV-6 or PV-7 fails closed (no makeup gas to vapor recovery system).	Pull vacuum on vapor recovery headers system and potential to pull air into tanks. Potential for explosive mixture in tanks.	Pressure-Vacuum Relief Valves on Tanks.	3	2	3	Add PAL at end of the vapor recovery header		GDE	04-15-98	
High	High Flow	PV-6 or PV-7 fail open	Higher pressure in V-5 and the V. R. header. Potential to lift the Pressure-Vacuum relief valves on tanks and release gas to atmosphere. Potential odor nuisance.	PSV-5	3	2	3	-Add PAH on V. R. header. -Add PI on V-8. -Add PAH on V-5. -Add Car Seal Open (CSO) globe valve upstream of PV-7. -Add ball valves on each side of PV-8 with a bypass valve.		GDE	04-15-98	
Reverse	Reverse Flow	Compressor shutdown (with no built-in	Higher pressure in V-5 and the V. R. header. Potential	Two check valves in series in compressor discharge line.	3	3	4	Add PAH on V-5.		GDE	04-15-98	

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 4
 Page: 5

Session: 2 04-15-98 Revision: 0 04-15-98 Dwg#: M-1.01,2,3,4

Node: 4 Vapor Recovery System

Parameter: Level

Intention: Recovery of Low Pressure Gas from Vessels and Tanks at Ambient Temperature.

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
No/Low	No/Low Level	Drain Valve on V-8 Open.	Gas Blowby to Drain System	PVSV-1 and operating procedures. Also, Vapor Recovery Compressor should recycle from skim pit.	3	3	4	Ensure Operating Procedures provide adequate monitoring during draining operations.		GDE	04-15-98	
		LV-6 Fail Open or Bypass Open.	Same as Above	Same as Above	3	2	3	Ensure Operating Procedures provide adequate monitoring during draining operations.		GDE	04-15-98	
High	High Level	Operator Fails to manually drain V-8	Liquid carryover to V-5	LV-6 on V-5	4	3	4	Ensure Operating Procedures provide adequate monitoring during draining operations.		GDE	04-15-98	
		LV-6 Fails Closed	Liquid carryover into compressor		3	2	3	Ensure Rental Compressor Package Suction Scrubber has LAH, LSDHH and Level Gage for Operator Monitoring		GDE	04-15-98	

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 5
 Page: 1

Session: 2 04-15-98 Revision: 0 04-15-98 Dwg#: M-1.01,2,3,4
 Node: 5 Wet Oil System

Parameter: Flow Intention: 600 BOPD, 100 BWPD and 25 MSCFD of Gas at 50 psig Operating Pressure and Ambient Temperature.

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
No/Low	No/Low Flow	Inlet and outlet block valves closed on V-2 or inlet check valve fails closed	Liquid and pressure build up in V-1 leading to automatic production shutdown.	Proper operating and maintenance procedures					No hazard identified			
		Suction block valve at P-1 closed.	Normal condition						No hazard identified			Valve open only during the truck loading operation.
High	High Flow	Not applicable							No hazard identified			
Reverse	Reverse Flow	Not applicable due to gravity flow system							No hazard identified			

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 5
 Page: 3

Session: 2 04-15-98 Revision: 0 04-15-98 Dwg#: M-1.01,2,3,4
 Node: 5 Wet Oil System

Parameter: Pressure Intention: 600 BOPD, 100 BWP and 25 MSCFD of Gas at 50 psig Operating Pressusre and Ambient Temperature.

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
No/Low	No/Low Pressure	See No Flow										
High	High Pressure	Block valves at outlet of V-2 closed Wash Tank and Stock Tanks oil outlet block valves closed	Increasing pressure in the gas boot leading to automatic production shutdown. Possible liquid release to atmosphere through PSV-2. Possible liquid carry over to vapor recovery system and/or liquid release to atmosphere through the Pressure-Vacuum relief valve on the tank.	PSV-2 set at 90 psig PAH-1 set at 60 psig PSDHH-1 set at 80 psig LAH and LSDHH on T-1, T-2, T-3, T-4, T-5, T-6	3	2	3	- Add PI to V-2 - Add PAH to V-2 set at 55 psig - CSO block valve at V-2 outlet		GDE	04-15-98	
Vacuum	Vacuum Pressure	Not applicable							No hazard identified			

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 5
 Page: 4

Session: 2 04-15-98 Revision: 0 04-15-98 Dwg#: M-1.01,2,3,4
 Node: 5 Wet Oil System

Parameter: Level Intention: 600 BOPD, 100 BWPD and 25 MSCFD of Gas at 50 psig Operating Pressure and Ambient Temperature.

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
No/Low	No/Low Level	Drain valve open on T-1 through T-6	Will drain to Skim Pit tank. Skim Pit pump will pump out to V-1	LAL and LALL in all tanks					No hazard identified			
High	High Level	Product oil discharge valve closed on Stock Tanks	Possible liquid carry over to vapor recovery system and/or liquid release to atmosphere through the Pressure-Vacuum relief valve on the tank.	LAH and LSDHH on all Stock Tanks					No hazard identified			

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 6
 Page: 1

Session: 3 04-16-98 Revision: 0 04-16-98 Dwg#: M-1.01,2,3,4
 Node: 6 Produced Water System

Parameter: Flow Intention: Produce up to 1200 BPD of Water for Water Injection at Ambient Temperature.

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
No/Low	No/Low Flow	Check Valve on discharge line from V-1 Fails Closed or Inlet Valve Closed at W-2.	See Node 1, LV-2 Fails Closed	LSSL Pump P-4 Shut-down								
		Outlet Valve at W-2 Closed or Suction to Pump Valve Closed at P-4 or P-4 Shut-down. Pump Discharge Valve at P-4 Closed	Produced Water Flows to T-7, Skim Pit.	LAH and LSDHH at W-2 LAH and LSDHH at T-7. PVSV at W-2								
		Valve Closed on Skim Line from W-2	Offspec Produced Water.	W-1 will process this offspec oily water.					No Hazard Identified			
		Make Gas Block Valve or Control Valve at W-1 Fails Closed	Possible Offspec Produced Water to W-1.	W-1 will process this offspec oily water.					No Hazard Identified			
		Outlet Line Valve Closed at W-1 or Pump P-5 Shut-down.	Overflow of Produced Water to the Vapor Recovery System from which it is Diverted to Drain System	PVSV on W-1 and Operator Monitoring.					No Hazard Identified			
		Block Valve Closed on Skim Oil line from W-1	Offspec Produced Water Requiring Reprocessing.						No Hazard Identified			
		Pump Discharge P-5 or Water Filters inlet Blocked	Pump Shut-down and Produced Water to Skim Pit through Vapor Recovery.	Operator Surveillance					No Hazard Identified			
		Filter(s) Outlet	Same as Above	Filters designed for 200				Install Pressure	No Hazard	DG	04-16-98	

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 9
 Page: 1

Session: 4 04-20-98 Revision: 0 04-20-98 Dwg#: M-1.01,2,3,4
 Node: 9 Emergency Vent System

Parameter: Flow Intention: Safe Venting of Process Systems During Upset Conditions

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
No/Low	No/Low Flow	Normal Operation Relief Valve not Functioning during upset condition. Check Valve in system fails closed.	Over pressure of pressure vessel with possible rupture. Same as above.	Second PSV or High Pressure Alarm or High High Pressure Shut-down in the system. PAH and PSDHH to prevent relief to Emergency Vent System.	2	2	2	Remove Check Valve at inlet to Emergency Vent Stack. Install liquid knock out vessel upstream of Emergency Vent Stack with Pressure Alarm High and High High Pressure Shut-down.		DG	04-20-98	
More	More Flow	PSV leaking Drain Block Valve on Emergency Vent Scrubber left open or fails open.	System is designed to handle the worst case pressure relief scenario Liquid spill to ground.	Operator training and blind flange is installed at the end of line				PSVs to be maintained for proper operation		DG	04-20-98	
Reverse	Reverse Flow	Air ingress	Normal Operation not a concern					Ensure that the line is purged after the release event.	No hydrocarbons present during normal operation	DG	04-20-98	

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 9
 Page: 4

Session: 4 04-20-98 Revision: 0 04-20-98 Dwg#: M-1.01,2,3,4
 Node: 9 Emergency Vent System

Parameter: Level Intention: Safe Venting of Process Systems During Upset Conditions

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
No/Low	No/Low Level	Normal Condition										
High	High Level	Pressure Relief	Liquid carryover to atmosphere		2	2	2	Install Liquid Knock Out Drum up-stream of Vent Scrubber Stack with High Level Alarm and High High Level Shut-down of production.		DG	04-20-98	

Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 10
 Page: 1

Session: 4 04-20-98 Revision: 0 04-20-98 Dwg#: M-1.01,2,3,4
 Node: 10 Drain System

Parameter: Flow Intention: Draining of Systems During Normal Operation at Ambient Temperature.

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
No/Low	No/Low Flow	Normal Condition										
		Block Valve Closed or Check Valve fails closed	Unable to drain vessel or tank	Facility is designed with appropriate safeguards. Operator training and monitoring.								
		Check Valve fails closed or Block Valve closed at truck loading catch basin	Spill from truck is not contained at truck loading area	Truck loading area graded towards cellar allowing spill to flow to the cellar								
		Control Valve LV-10 fails closed or impedes drain line flow	Same as above	Same as above				Relocate LV-10 closer to WEMCO for better control		DG	04-20-98	
More	More Flow	Cellar Pump P-8 fails or Block Valve closed or Check Valve fails closed	Under severe rain storm overflow of well cellar may occur	Facility designed to handle worst case impounding. Possible use of vacuum truck for hauling excess fluids.								
		Severe rain storm or liquid spill	Skim pit unable to handle fluid volume and possible facility shut-down	LSDHH Facility shuts in production due to high level in Skim Pit T-7 and fluid flows to well cellar								
Reverse	Reverse Flow	Check Valve fails open at P-8 and Pump P-8 is not running	Reverse flow from T-7 to T-9.	Normal overflow from T-7 to T-9, no concern.								
		V-1 drain Block Valve Open/Fail Open and Check Valve Fail Open at T-9	Cellar fills with fluid	LAL-1 on V-1				Add LSDLL on V-1		DG	04-20-98	
		T-1, T-2, T-3, T-4, T-5, T-6, T-8,	Same as above	LAL and LALL on each tank except W-1				Install LAL on W-1		DG	04-20-98	

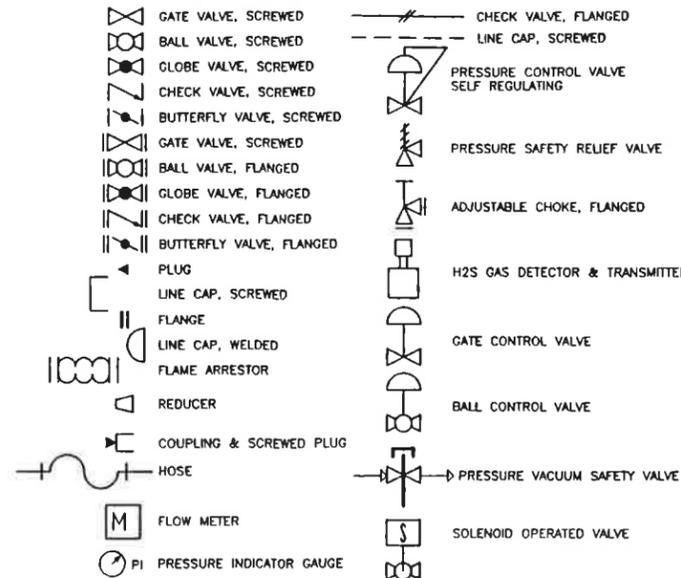
Company: Macpherson Oil Company
 Facility: Hermosa Beach Oil Development Project

Node: 12
 Page: 1

Session: 5 04-24-98 Revision: 0 04-20-98 Dwg#: M-1.01,2,3,4
 Node: 12 External Events, Human Error, Faci. Siting & Envir. Concerns
 Parameter: Other Intention: Safe Operations

GW	DEVIATION	CAUSES	CONSEQUENCES	SAFEGUARDS	S L R	RECOMMENDATIONS	REMARKS	BY	DATE	COMMENTS
	Other	Corrosion of used rental equipment including vessels and tanks	Possible leak or rupture of oil, produced water and gas handling equipment.	All new valves and piping will be utilized in the facility.		- Hydrotest equipment and piping to 1-1/2 times the Maximum Allowable Working Pressure (MAWP). - Implement corrosion Inhibitor Program		DG	04-24-98	
		External corrosion of underground piping system	Same as above			External wrapping of underground piping.		DG	04-24-98	
		Heavy rain storm	Possible water ponding of facility and overflow of sumps and the celler	Shutdown of production wells and continued water injection of storm water. Facility is designed for heavy rain storm to contain storm water.		Design facility to handle 100 year storm event		DG	04-24-98	
		Inadequate sizing of the relief system	Potential rupture of vessel or process systems			Verify that the system is sized adequately to handle all upset scenarios		DG	04-24-98	
		Piping leak or flange leak in the facility	Product spill or gas release	Facility is designed per ASME/ANSI codes, other applicable codes and general industry standards			Hydrocarbon and H2S detectors are in place to provide automatic shut down			
		Line rupture due to third party damage	Same as above	Third party safety training and orientation. Operator monitoring.						
		Lightning protection	Possible damage to equipment	Grounding of equipment to provide protection. None of the equipment is above 30 feet in height.						

PICTORIAL LEGEND



ABBREVIATIONS

- AB BREATHING AIR
- AI INSTRUMENT AIR
- AU UTILITY AIR
- CSO VALVE SEALED OPEN
- DR DRAIN
- DS STORM DRAIN
- EV EMERGENCY VENT
- F.C. FAIL CLOSED
- F.O. FAIL OPEN
- GC GAS CLOSING
- GD DRY GAS
- GM MAKE-UP GAS
- GP GROSS PRODUCTION
- GU UTILITY GAS (SCGC)
- GW GAS WET
- N.C. NORMALLY CLOSED
- OD DRY OIL
- OS SKIM OIL
- OW WET OIL
- RC RECYCLE
- TS TEST
- VR VAPOR RECOVERY
- WF WATER FIRE SERVICE
- WI WATER INJECTION
- WP PRODUCED WATER

EQUIPMENT & FITTING LEGEND

- 1 2" SCH 80 CASING GAS
- 2 2" SCH 80 PRODUCED FLUIDS
- 3 2" SCH 80 OIL TEST
- 4 2" SCH 80 WATER INJECTION
- 5 2" - 2,000 LB W.P., GATE VALVE, FLANGED
- 6 2" - 2,000 LB W.P., ADJUSTABLE CHOKE, FLANGED
- 7 2" - 600 LB ANSI CHECK VALVE, FLANGED
- 8 2" - 600 LB ANSI GATE VALVE, FLANGED
- 9 2" - 600 LB ANSI BALL VALVE, FLANGED
- 10 2" - 600 LB ANSI BLIND FLANGE
- 11 2" - 600 LB ANSI GATE VALVE, FLANGED
- 12 2" - 2,000 LB W.P. ADJUSTABLE CHOKE, FLANGED
- 13 2" - 2,000 LB W.P. HALLIBURTON METER
- 14 3/4" - 2,000 LB. W.P. GATE VALVE, SCREWED
- 15 PRESSURE GAGE
- 16 2" - 150 LB ANSI GATE VALVE, FLANGED
- 17 2" - 150 LB ANSI BALL VALVE, FLANGED
- 18 2" - 150 LB ANSI CHECK VALVE, FLANGED
- 19 1" - 150 LB ANSI CONTROL VALVE, FLANGED
- 20 2" - SCH 40 RELIEF
- 21 1" - 150 LB ANSI BALL VALVE, SCREWED
- 22 1" - 150 LB ANSI CONTROL VALVE, SCREWED
- 23 1" - 150 LB ANSI CHECK VALVE, SCREWED
- 24 1" - 150 LB ANSI SAFETY RELIEF VALVE, SCREWED
- 25 2" - 150 LB ANSI BUTTERFLY VALVE, FLANGED
- 26 2" - 150 LB ANSI BALL VALVE, FLANGED
- 27 2" - 150 LB ANSI CHECK VALVE, FLANGED
- 28 2" SCH 40 PIPE
- 29 3" SCH 40 PIPE
- 30 3" - 150 LB ANSI METER, FLANGED
- 31 2" - 150 LB ANSI PROBE
- 32 3" - 150 LB ANSI BUTTERFLY VALVE, FLANGED
- 33 4" - 150 LB ANSI BUTTERFLY VALVE, FLANGED
- 34 4" X 3" WELD REDUCER, SCH 40
- 35 6" X 3" WELD REDUCER, SCH 40
- 36 2" - 150 LB VAREC P.V. VALVE, FLANGED
- 37 1" GAS METER
- 38 1" - 150 LB VAREC P.R. VALVE, SCREWED
- 39 3" X 2" WELD REDUCER, MATCH PIPE SCH.
- 40 2" X 1" WELD REDUCER, MATCH PIPE SCH.
- 41 WATER, WEMCO CHARGE PUMP
- 42 WATER FILTER CHARGE PUMP
- 43 WATER CARTRIDGE FILTER
- 44 WATER INJECTION CHARGE PUMP
- 45 WATER INJECTION PUMP
- 46 LOW FLOW SHUT-DOWN SWITCH
- 47 HIGH PRESSURE BALL VALVE, FLANGED
- 48 1" 600 LB ANSI BALL VALVE
- 49 1" 600 LB ANSI ADJUSTABLE CHOKE
- 50 1/2" - 600 LB ANSI CHOKE VALVE, SCREWED
- 51 1/2" - 600 LB ANSI FISHER PRESSURE REGULATOR
- 52 1/2" - 600 LB ANSI BALL VALVE, SCREWED
- 53 2" X 1/2" WELD REDUCER, MATCH PIPE SCH.
- 54 1-1/2" 150 LB ANSI CHECK VALVE
- 55 1-1/2" 150 LB ANSI BUTTERFLY VALVE
- 56 2" 150 LB ANSI CONTROL VALVE
- 57 1/2" 600 LB ANSI PRESSURE CONTROL VALVE
- 58 1/2" 600 LB ANSI PRESSURE RELIEF VALVE
- 59 2" 600 LB ANSI MOTOR OPERATED VALVE
- 60 2" X 1-1/2" WELD REDUCER, MATCH PIPE SCH.
- 61 3" 150 LB ANSI BALL VALVE, FLANGED
- 62 3" 150 LB ANSI CHECK VALVE, FLANGED
- 63 6 X 2 WELD RED., SCH. 40
- 64 1" 600 LB ANSI GLOBE VALVE
- 65 MANOMETER
- 66 1/2" 150 LB ANSI PRESSURE CONTROL VALVE
- 67 1/2" 150 LB ANSI BALL VALVE, SCREWED
- 68 1/2" 150 LB ANSI CHECK VALVE, SCREWED
- 69 1/2" AIR - WATER SEPARATOR, SCREWED

INSTRUMENT CODING

- BC BURNER CONTROLLER
- BSL BURNER SAFETY LOW
- HLSD HIGH LEVEL SWITCH SHUT DOWN
- HPSH HIGH PRESSURE SWITCH SHUT DOWN
- HTSD HIGH TEMPERATURE SWITCH SHUT DOWN
- IC INTERFACE CONTROLLER
- IT IGNITION TRANSFORMER
- LAH LEVEL ALARM HIGH
- LAHH LEVEL ALARM HIGH HIGH
- LAL LEVEL ALARM LOW
- LALL LEVEL ALARM LOW LOW
- LC LEVEL CONTROLLER
- LC-1 LEVEL CONTROLLER #1
- LCV LEVEL CONTROL VALVE
- LG LEVEL GLASS
- LI LEVEL INDICATOR
- LPSD LEVEL PRESSURE SWITCH SHUT DOWN
- LSC-1 LEVEL SWITCH PUMP CONTROL #1
- LSDH LEVEL SWITCH SHUT DOWN HIGH
- LSDHH LEVEL SWITCH SHUT DOWN HIGH HIGH
- LSOLL LEVEL SWITCH SHUT DOWN LOW LOW
- LSH LEVEL SWITCH HIGH
- LSHH LEVEL SWITCH HIGH HIGH
- LSL LEVEL SWITCH LOW
- LSLL LEVEL SWITCH LOW LOW
- M FLOW METER
- NC NORMALLY CLOSED
- PAH PRESSURE ALARM HIGH
- PAL PRESSURE ALARM LOW
- PC PRESSURE CONTROLLER
- PCV PRESSURE CONTROLLER VALVE
- PI PRESSURE INDICATOR
- PRV PRESSURE RELIEF VALVE
- PSDH PRESSURE SWITCH SHUT DOWN HIGH
- PSDHH PRESSURE SWITCH SHUT DOWN HIGH HIGH
- PSE PRESSURE SAFETY ELEMENT
- PSH PRESSURE SWITCH HIGH
- PSHL PRESSURE SWITCH HIGH LOW
- PSV PRESSURE SAFETY VALVE
- PSVS PRESS/VAC. SAFETY VALVE
- SG FLAME SAFETY GUARD SCANNER
- SCH PIPE SCHEDULE
- SDV SHUT DOWN VALVE
- SV SOLENOID VALVE
- TC TEMPERATURE CONTROLLER
- TE THERMAL COUPLES
- TI TEMPERATURE INDICATOR
- TSE TEMPERATURE SAFETY ELEMENT
- TSHSD TEMPERATURE SWITCH HIGH SHUT DOWN

PIPE SPECIFICATIONS TEST PHASE

SPECIFICATION	MATERIAL	PIPE DIA. INCHES	SCHEDULE	WALL THK. INCHES	MAMP PSIG	MOP PSIG	MTP PSIG
001	STEEL	1/2	80	0.147	566	200	850
102	STEEL	1	40	0.133	466	<10	700
103	STEEL	1	40	0.133	466	100	700
104	STEEL	1	80	0.179	1666	1200	2500
150	STEEL	1-1/2"	40	0.145	733	25	1100
201	STEEL	2	80	0.218	1440	1100	2500
202	STEEL	2	80	0.218	1440	1200	2500
203	STEEL	2	40	0.154	255	75	2300
204	STEEL	2	40	0.154	255	25	2300
205	STEEL	2	40	0.154	255	20	2300
206	STEEL	2	40	0.154	255	<10	2300
207	STEEL	2	40	0.154	255	100	2300
301	STEEL	3	40	0.216	255	80	2220
302	STEEL	3	40	0.216	255	50	2220
303	STEEL	3	40	0.216	255	12	2220
304	X	3	X	X	X	X	X
310	FIBERGLASS	3		0.3	50	10	

MAMP = MAXIMUM ALLOWABLE WORKING PRESSURE
MOP = MAXIMUM OPERATING PRESSURE
MTP = MANUFACTURER TEST PRESSURE

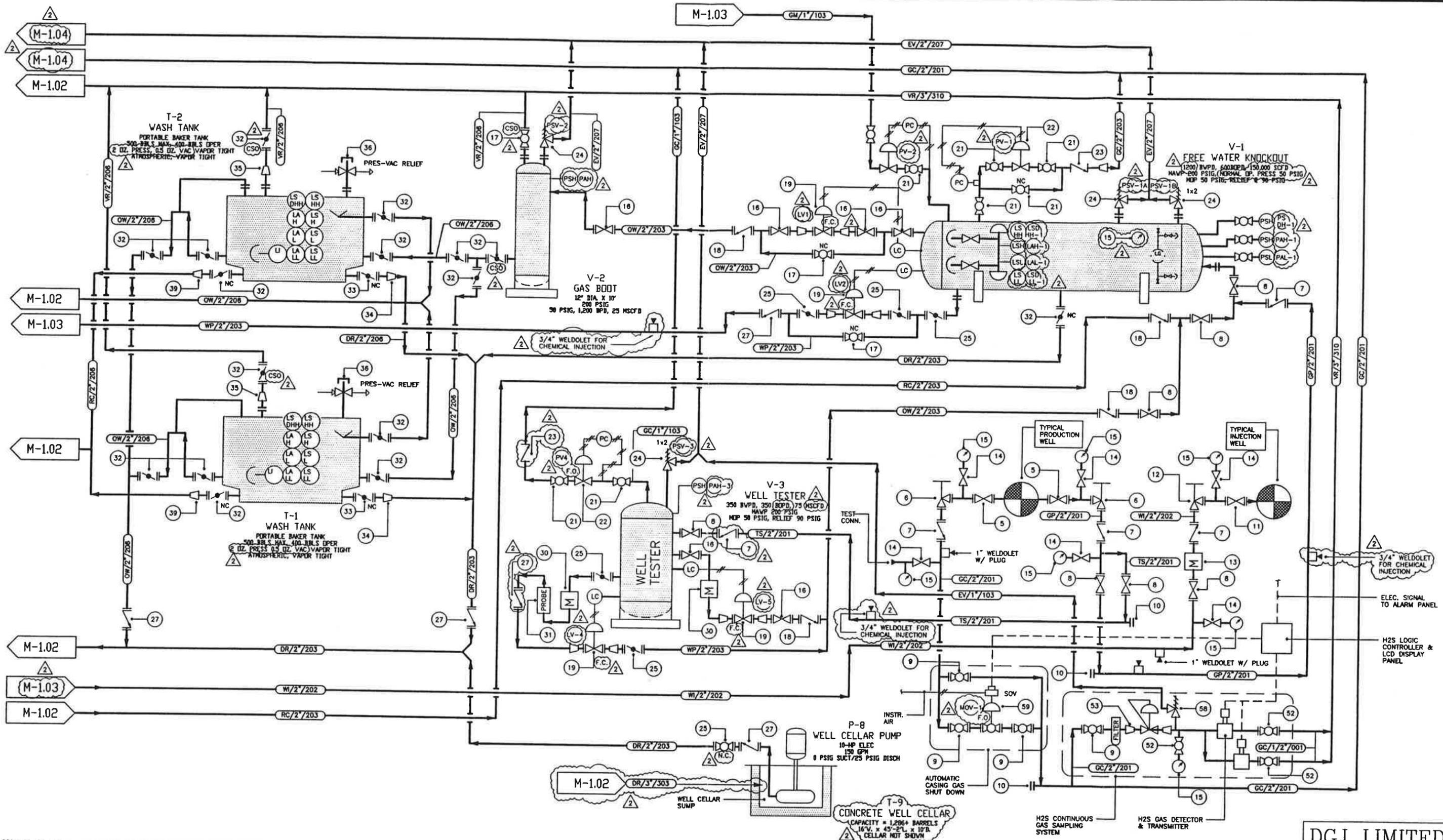
PRESSURE VESSEL SETTINGS TEST PHASE

VESSEL	MAMP	MOP	HIGH PRESS ALARM	LOW PRESS ALARM	HIGH PRESS SHUT-IN	LOW PRESS SHUT-IN	RELIEF VALVE
J - PHASE SEPARATOR (FWKO)	200 MIN.	50	60	40	80	20	90
GAS BOOT	200 MIN.	50	55	-	-	-	90
WELL TESTER	200 MIN.	50	60	40	80	20	90
GAS SCRUBBER	200 MIN.	50	60	40	80	20	90
VAPOR RECOVERY COMPRESSOR SCRUBBER	100 MIN.	5	-	-	-	-	10

MAMP = MAXIMUM ALLOWABLE WORKING PRESSURE (DESIGN PRESS. PER ASME CODE)
MOP = MAXIMUM OPERATING PRESSURE (PER ASME CODE)

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1		4/10/98	REV. PER JAY SHETH 4/8/98				Date Drawn: 4/29/98					M-1.00	
2		4/27/98	REV. PER HAZOP STUDY				Drawn By: DEG						
							Revised:						
							Approved:						



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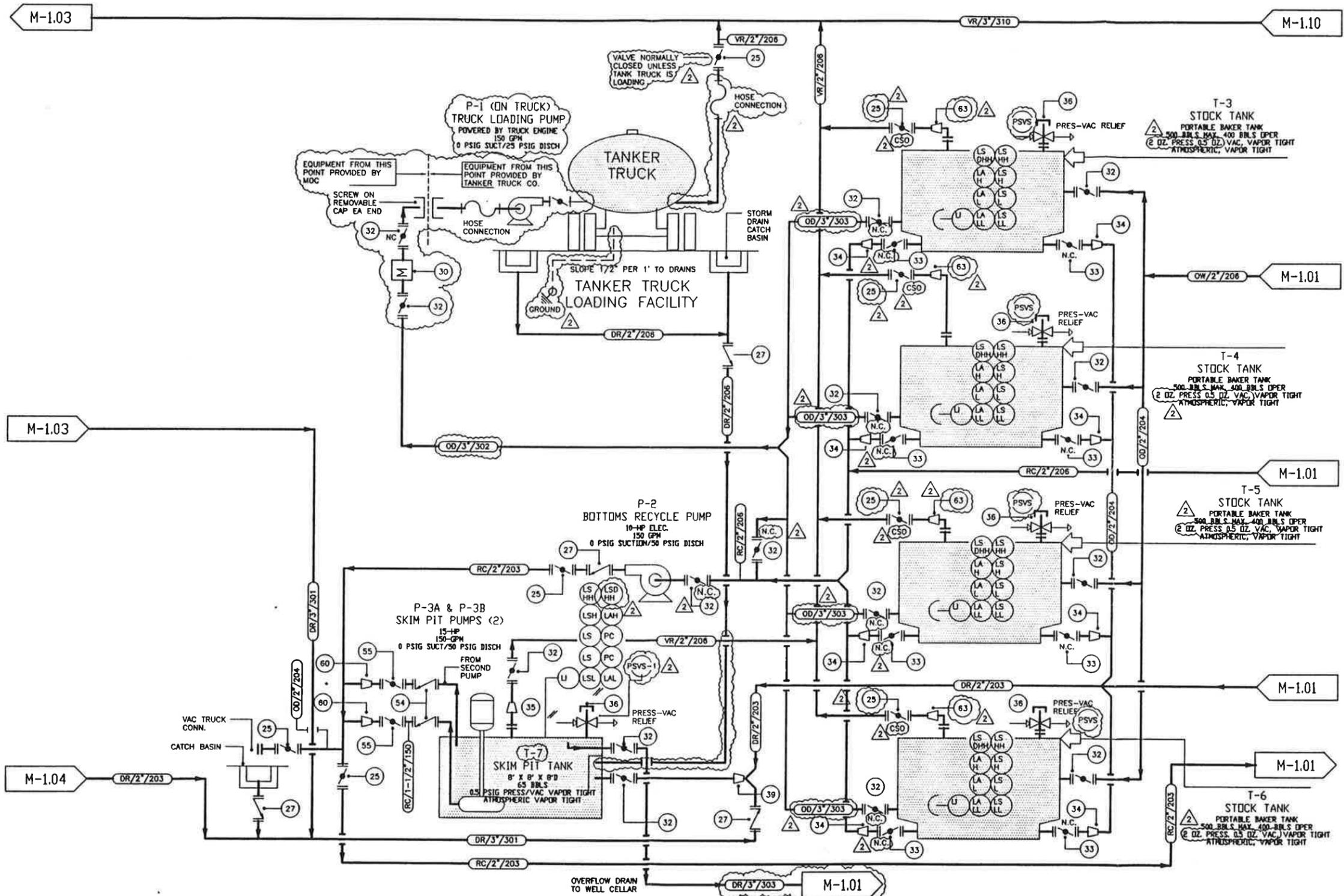
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2	4/22/98	REV. PER HAZOP	DEG		Drawn By: DEG
					Revised: 5/11/98
					Revised:
					Approved:

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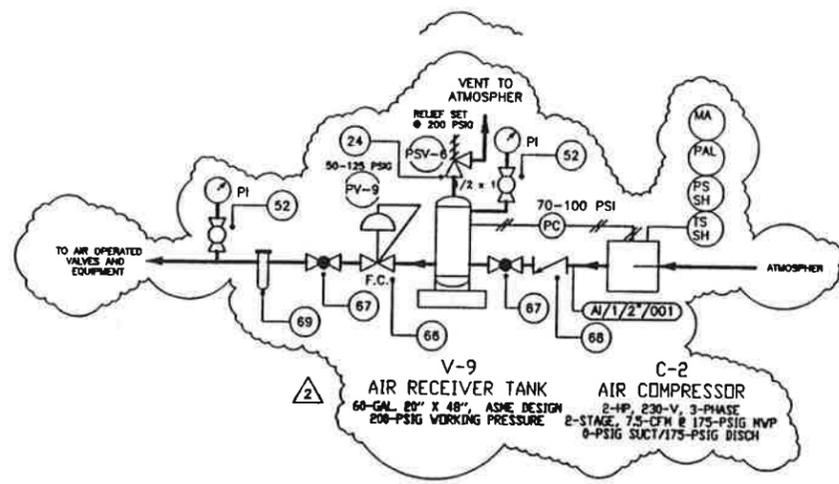
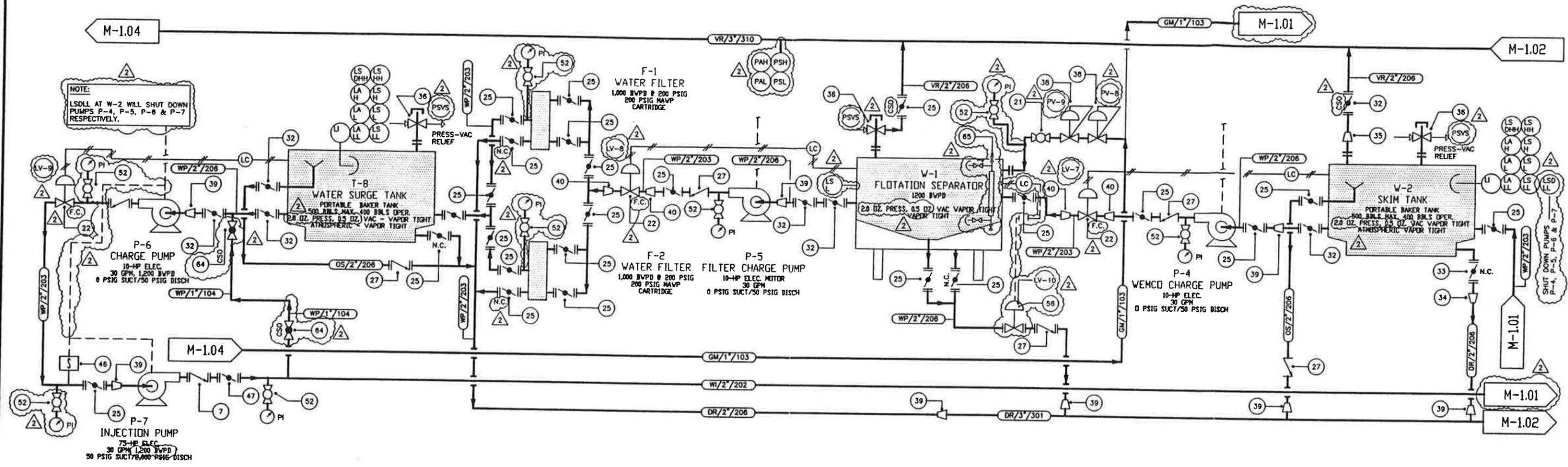
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Date Drawn:	2/24/98
Drawn By:	DEG
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Revised:	5/11/98
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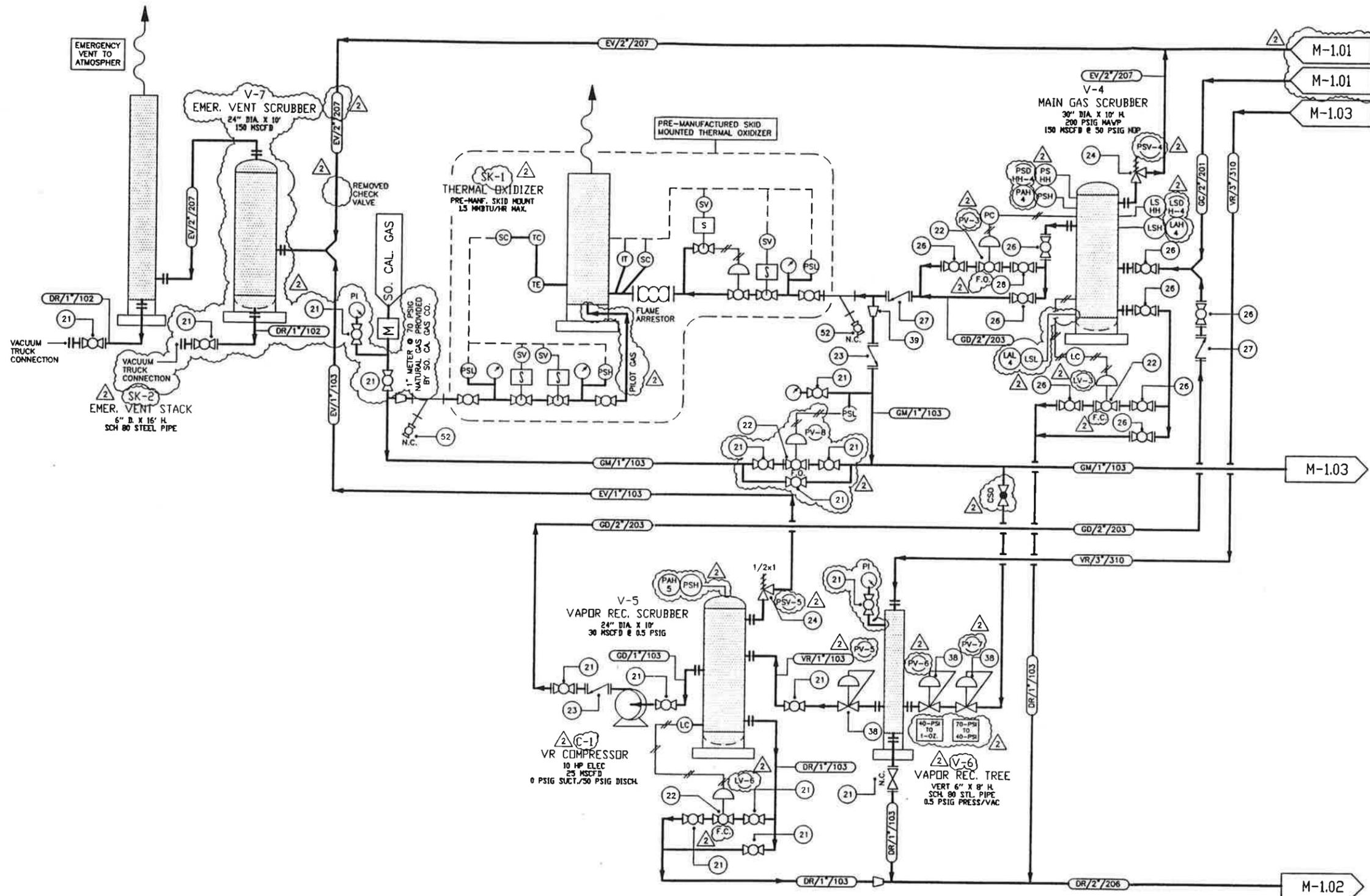
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HERMOSA BEACH PROJECT
 TEST PHASE
 PIPING & INSTRUMENTATION
 555 SIXTH STREET, HERMOSA BEACH, CA.

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