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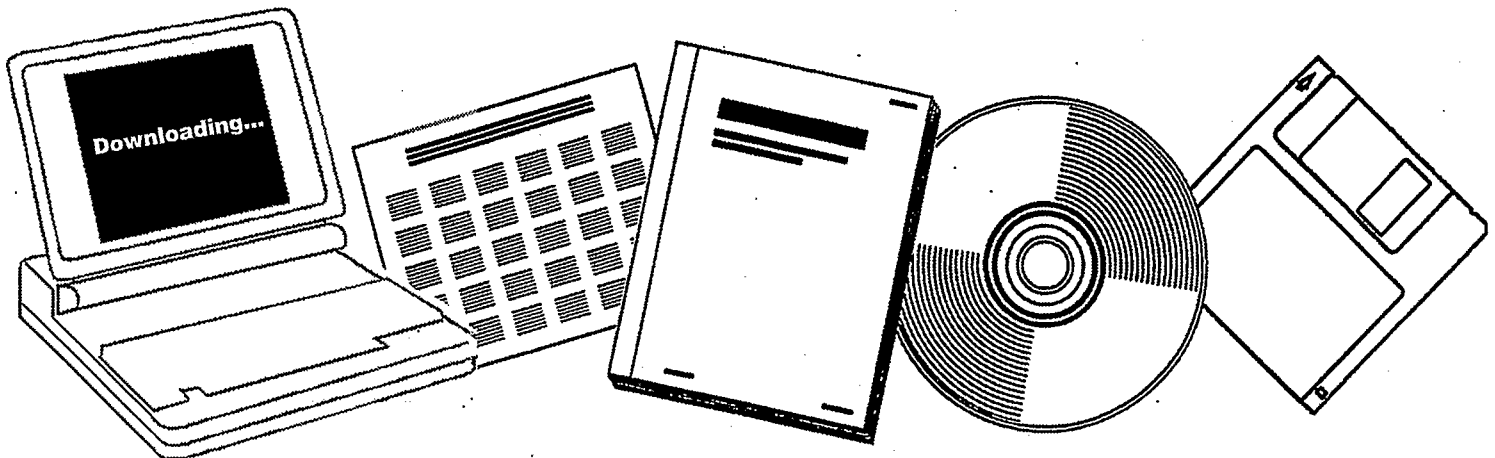
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**PRELIMINARY DESIGN SERVICES: RESEARCH AND  
DEVELOPMENT REPORT NO. 114. QUARTERLY  
REPORT, JANUARY--MARCH 1978**

PARSONS (RALPH M.) CO.  
PASADENA, CA

JUN 1978



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# PRELIMINARY DESIGN SERVICES

RESEARCH AND DEVELOPMENT REPORT NO. 114

QUARTERLY REPORT

FOR THE PERIOD: JANUARY-MARCH 1978

*Prepared by:*

THE RALPH M. PARSONS COMPANY

100 West Walnut Street

Pasadena, California 91124

Under Contract No. EX-76-C-01-1775

June 1978

*Prepared for*

DEPARTMENT OF ENERGY

OFFICE OF ASSISTANT SECRETARY FOR ENERGY TECHNOLOGY

DIVISION OF COAL CONVERSION

Washington, D.C. 20545

FIRST QUARTERLY REPORT  
PRELIMINARY DESIGN SERVICES  
THE RALPH M. PARSONS COMPANY

I. OBJECTIVE AND SCOPE OF WORK

The objective is to develop preliminary designs and economic evaluations for a number of types of coal conversion plants. The following designs are included in the scope of work:

- Conceptual commercial plant for a coal-oil-energy-development (COED) plant
- Oil/Gas plant to produce liquid fuels plus substitute natural gas (SNG)
- Commercial-scale Fischer-Tropsch plant with motor fuel and SNG as the main products
- Coal conversion plant to produce power, oil, gas, and other products (POGO)
- Facilities complex capable of demonstrating the commercial feasibility of a variety of coal conversion processes that show promise during pilot plant operations

The facilities will be considered for conversion of coal to:

1. Low-to-high Btu fuel gas
  2. Methanol/motor fuel by Fischer-Tropsch process
  3. Clean liquid fuels by alternate liquefaction processes
- Prepare conceptual designs, define construction procedure and develop economics for three types of prestressed concrete pressure vessels for use in coal conversion plants.

In addition, supporting efforts will be provided for the above activities. These efforts include planning and progress monitoring, equipment development, construction materials development, and environmental factors.

## II. SUMMARY OF PROGRESS TO DATE

A brief review of the status of the major active design efforts is given below, followed by a more detailed reporting on the progress of individual tasks.

### A. POGO Plant Design

We completed publication work on the final R&D report. One hundred copies of the final report were transmitted to DOE.

We transmitted a reproducible and one copy of the final R&D report to the Technical Information Center (TIC) for printing and public distribution, thus completing this task assignment.

### B. Multi-Process Demonstration Facility

We completed the fuel gas plant design (Plant No. 1) and fixed capital investment based on use of a high reliability heat exchange system downstream of the gasifier. We completed the design of a fluid bed gasifier for Plant No. 2.

We completed the economics section and made refinements to the report draft. The report draft was transmitted to DOE on March 31, 1978 for review.

### C. Prestressed Concrete Pressure Vessels

The draft of the final report was completed and made ready for transmittal to DOE. We also shipped to DOE two (2) models of the conceptual integrated PCPV gasifier vessel.

Preparations are underway for an oral presentation of the results of the study to DOE and DOE-invited contractors in Washington, D.C. on April 11, 1978.

D. General

We transmitted reproducible copies of the R&D report titled "Coal Conversion Applications, Collected Works 1972 through 1977" to DOE's Technical Information Center (TIC) for printing and public distribution. This report contains copies of thirty-nine (39) of our publications in the field of coal conversion; it also lists fourteen (14) supplemental published references.

We transmitted to Chemical Engineering Progress (CEP) the corrected transcript of a session titled "Equipment Applications to Coal Conversion Operations" which was presented at the Annual American Institute of Chemical Engineers Meeting held in New York on November 13-17, 1977.

III. DETAILED DESCRIPTION OF TECHNICAL PROGRESS

A. POGO Plant Design

1. Objective

To develop preliminary designs of three coal processing plants which will produce power, oil, gas and other products. The plants are to be located in the Eastern Region of the Interior Coal Region, Southern Appalachia, and the Rocky Mountain Coal Province. The processes employed in this plant design shall be the result of an economic selection from the candidate coal conversion processes available.

2. Activity This Quarter

- a. We completed republication work on the final R&D report. This involved final typing, completion of artwork on the figures, and retinement and printing of the foldout flow diagrams.

- b. We received patent clearance on January 20, 1978 for the POGO R&D Report from the California Patent Group of the Department of Energy, San Francisco Operation Office.
- c. Twenty-two copies of the POGO final report were transmitted to the Department of Energy by our letter PN-436 dated January 27, 1978, followed later by eighty (80) additional copies.
- d. We transmitted, at the direction of DOE, two copies each of the POGO R&D report and the POGO fixed capital investment estimate to the U.S. Army Corps of Engineers, Huntsville, Alabama for their review of our estimate.
- e. We transmitted a reproducible and one copy of the final R&D report to the DOE-Technical Information Center (TIC) in Oak Ridge, TN for printing and public distribution, thus completing this task assignment.

B. Multi-Process Demonstration Plant

1. Objective

To develop preliminary designs for a facilities complex capable of demonstrating the commercial feasibility of a variety of coal conversion processes that show promise during the pilot plant scale operations. These designs shall be multi-process modules. The completed facility shall include modules of facilities which can be common to two or more other processes; also, it will provide allowances for future modification and/or replacement of various pieces of equipment to meet new requirements.

2. Activity This Quarter

- a. We completed the design of the Plant 1 low-pressure fuel gas gasification and heat recovery units using hot gas to steam superheating and hot gas to steam generation exchangers for the gasifier effluent heat exchange train.

- b. We completed the design of an oxygen-blown intermediate pressure agglomerating ash fluid bed gasifier as a second type of demonstration gasifier for Plant 2. A significant feature of this unit includes the agglomerating ash section of the gasifier which incorporates features tested in a four-foot diameter test unit by the Institute of Gas Technology.
- c. The fixed capital investment for the fluidized bed gasifier was completed; the Plant 2 fixed capital investment was revised to include this addition.
- d. We completed the Plant 2 and Plant 3 utility summaries.
- e. We completed preparation of the plot plan. This is shown in Figure 1.
- f. We started work on the artist's conceptual drawing.
- g. We completed the draft of the final report and transmitted copies to DOE on March 31, 1978 for review.

### 3. Activity Forecast Next Quarter

We will complete the artist's conceptual drawing for inclusion in the final report.

We will begin production work on the final report following receipt of DOE's comments.

## C. Prestressed Concrete Pressure Vessels

### 1. Objective

To prepare preliminary designs, technical analyses of construction and operating performance, and economics for three types of prestressed concrete pressure vessels. These will be compared against conventional steel pressure vessels in the same duties. The three types are:



- a. A large, high pressure, 25-foot ID by 125-foot tangent-to-tangent gasifier reactor vessel.
- b. A combination of a large dissolver reactor vessel and a flash drum. These vessels would operate at about 2,025 psig and 805<sup>o</sup>F.
- c. A large diameter absorber column operating at about 1,075 psig and 150<sup>o</sup>F. This vessel will have internal components such as trays.

## 2. Activity This Quarter

- a. The studies of methods of construction for the vessels were completed. The selected methods utilize conventional established slip-form techniques. The steel vessel components are prefabricated and installed prior to beginning concrete pouring.
- b. We completed preparation of equipment lists and materials take-offs for use in preparation of the fixed capital investment estimate.
- c. Fixed capital investment estimates were essentially completed for four PCPV vessel cases. The results indicate that the largest percentage reduction in fixed capital investment was in the substitution of one large PCPV dissolver-separator for nine steel dissolvers and nine steel separators.
- d. Elevation outline drawings for the integrated gasifier, dissolver-separator, absorber, and the gasifier reactor PCPV's were completed. They are shown on Parsons drawings D-01-VS-1, D-01-VS-10, D-01-VS-20 and D-01-VS-30, respectively, at the end of this report.

- e. We completed construction of the two (2) models of the conceptual integrated PCPV gasifier vessel and shipped them to DOE. The first model showed the vessel under construction and the second model displayed a sectional view of the vessel.
- f. We prepared slides for the April 11 presentation to DOE in Washington, D.C.
- g. We completed the draft of the final report titled "Prestressed Concrete Pressure Vessels, Conceptual Design/Economic Analysis" and prepared to transmit it to DOE for review.

### 3. Activity Forecast Next Quarter

We will transmit the draft of the final task assignment report to DOE for review and prepare for the presentation of the project results to be given in Washington, D.C. on April 11, 1978.

We will begin production work on the final report after comments are reviewed from DOE.

## D. General

1. We transmitted three Patent Disclosures on the POGO design to the Department of Energy.
2. We will present an invited paper titled "Projected Economics for Project POGO - A Coal Refinery" and serve as session chairman for the Southern California Section, American Institute of Chemical Engineers (AIChE) 14th Annual Technical Meeting in Anaheim, California on April 18, 1978.
3. We will present an invited paper titled "Project POGO Coal Refinery, Air Emission Control Procedures" to the 85th National Meeting of the American Institute of Chemical Engineers (AIChE) in Philadelphia on June 6, 1978.

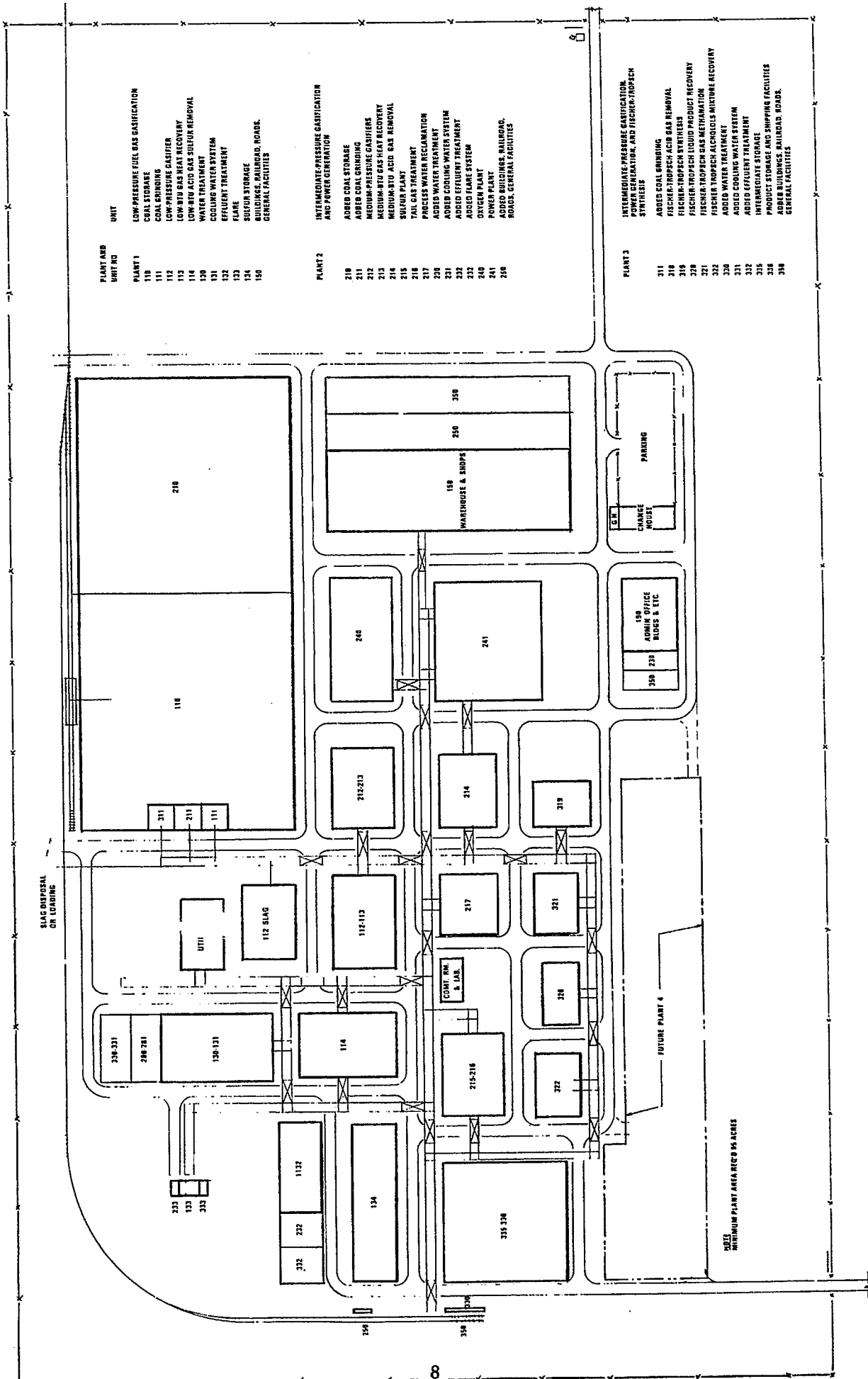


Figure 1 - Plot Plan  
Multi-Process Demonstration Plant



**NOTES**

1. ALL DIMENSIONS ARE FROM THE CENTERLINE UNLESS SPECIFICALLY NOTED OTHERWISE.
2. MATERIALS SHALL BE AS SPECIFIED IN THE MATERIALS SECTION UNLESS OTHERWISE NOTED.
3. WELDS SHALL BE AS SPECIFIED IN THE WELDS SECTION UNLESS OTHERWISE NOTED.
4. SURFACES SHALL BE AS SPECIFIED IN THE SURFACES SECTION UNLESS OTHERWISE NOTED.
5. FINISHES SHALL BE AS SPECIFIED IN THE FINISHES SECTION UNLESS OTHERWISE NOTED.
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8. ALL DIMENSIONS ARE FROM THE BOTTOM HEAD TANGENT LINE EXCEPT AS NOTED.
9. ALL DIMENSIONS SHALL BE THROUGHLY CLEANED INSIDE AND OUTSIDE UNLESS OTHERWISE NOTED.
10. VESSEL SHALL BE THOROUGHLY CLEANED INSIDE AND OUTSIDE UNLESS OTHERWISE NOTED.
11. VESSEL SHALL BE WELD SPATTER AND DIRT CLEAN UNLESS OTHERWISE NOTED.

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 EXCEPT FOR INTEGRAL, REMOVED NOZZLES, OR AS NOTED

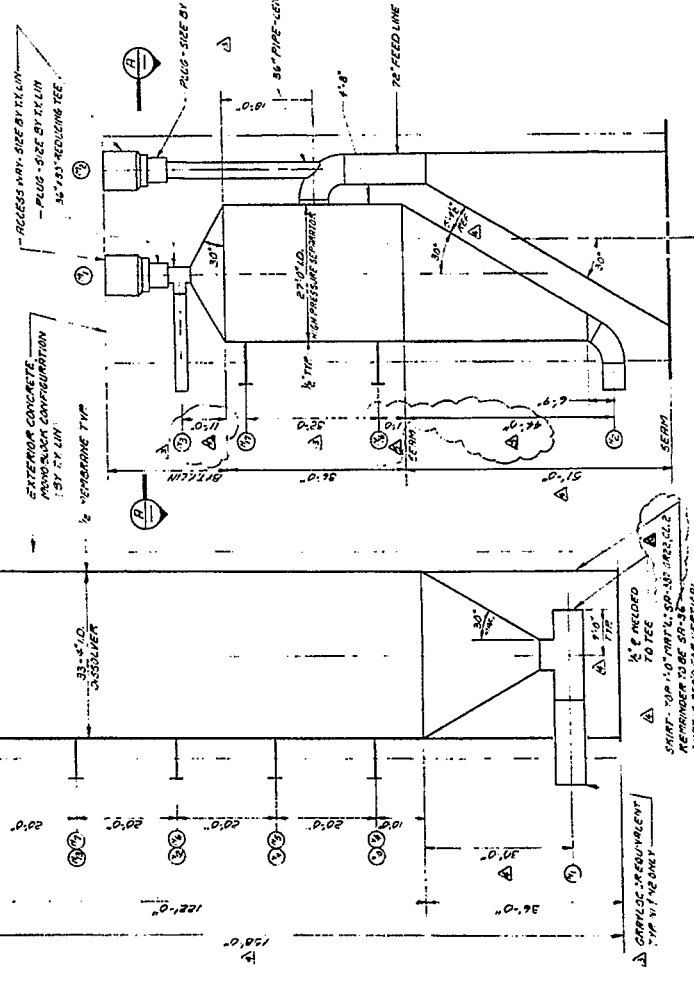
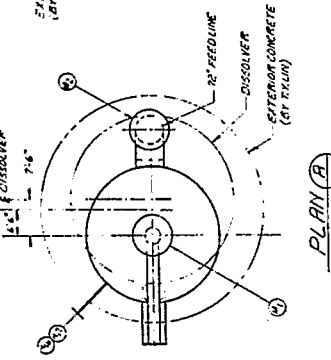
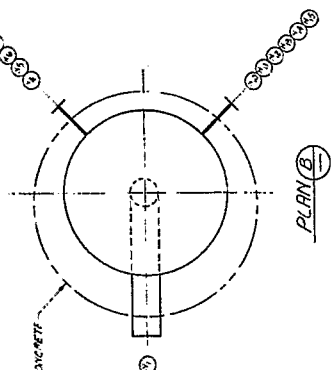
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11. FABRICATION WEIGHT (INCLUDING TRAYS)
12. TRAYS, CAPS AND RISERS, WEIGHT
13. OPERATING WEIGHT
14. INSULATION
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21. ALL DIMENSIONS ARE FROM BOTTOM HEAD TANGENT LINE EXCEPT AS NOTED.
22. ALL DIMENSIONS SHALL BE THROUGHLY CLEANED INSIDE AND OUTSIDE UNLESS OTHERWISE NOTED.
23. VESSEL SHALL BE WELD SPATTER AND DIRT CLEAN UNLESS OTHERWISE NOTED.

DEPARTMENT OF ENERGY  
 CONTRACT NO. EX-76-C-01-1775

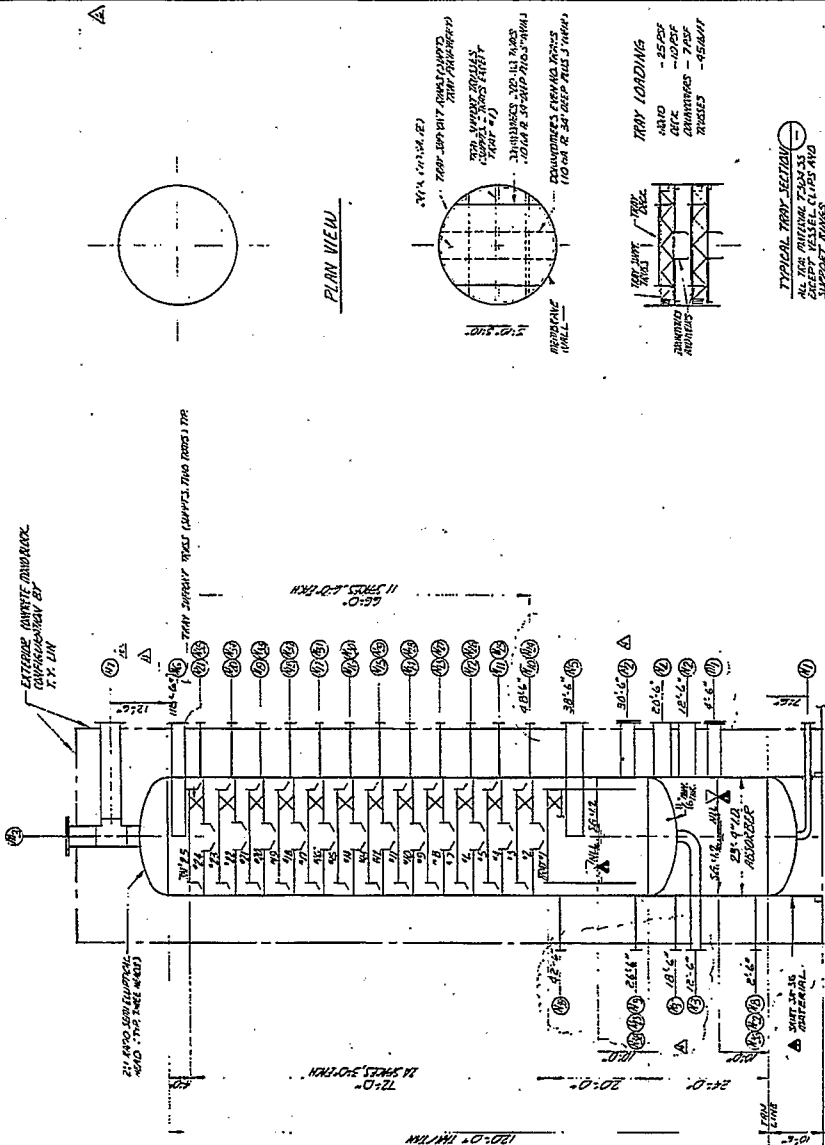
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CONCRETE FOR VESSEL	AS SHOWN	7



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6	7/1/77	ISSUED FOR CONSTRUCTION
7	7/1/77	ISSUED FOR CONSTRUCTION

**NOTES**

1. VESSEL SHALL BE DESIGNED FOR 150 PSIG AT 200°F.
2. ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED.
3. ALL MATERIALS SHALL BE AS SPECIFIED IN THE MATERIAL SPECIFICATIONS AND ALL FABRICATION SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS THEREOF.
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5. ALL WELDS SHALL BE MADE IN ACCORDANCE WITH THE REQUIREMENTS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) SECTION VIII, DIVISION 1.
6. ALL WELDS SHALL BE MADE BY THE SHOP AND SHALL BE FULL PENETRATION WELDS.
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NO.	DATE	BY	CHKD.	DESCRIPTION
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2	10/15/77	J. H. BROWN	J. H. BROWN	REVISIONS
3	10/15/77	J. H. BROWN	J. H. BROWN	REVISIONS
4	10/15/77	J. H. BROWN	J. H. BROWN	REVISIONS
5	10/15/77	J. H. BROWN	J. H. BROWN	REVISIONS

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**DEPARTMENT OF ENERGY**  
**CONTRACT NO. EX-78-CO-1775**

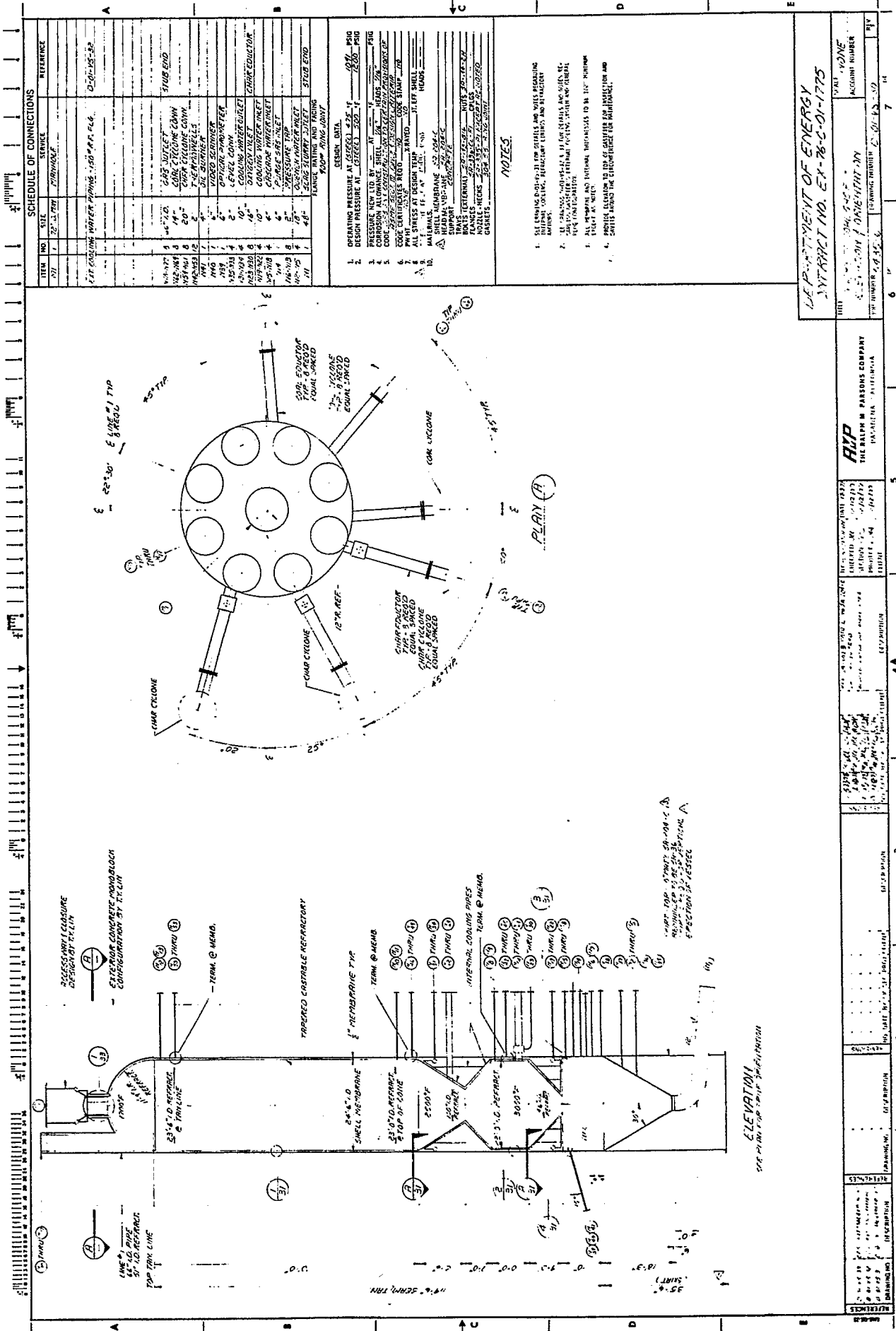
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 SHEET: 7 OF 7

THE RALPH H. PARSONS COMPANY  
 PASADENA, CALIFORNIA

SCALE: AS SHOWN

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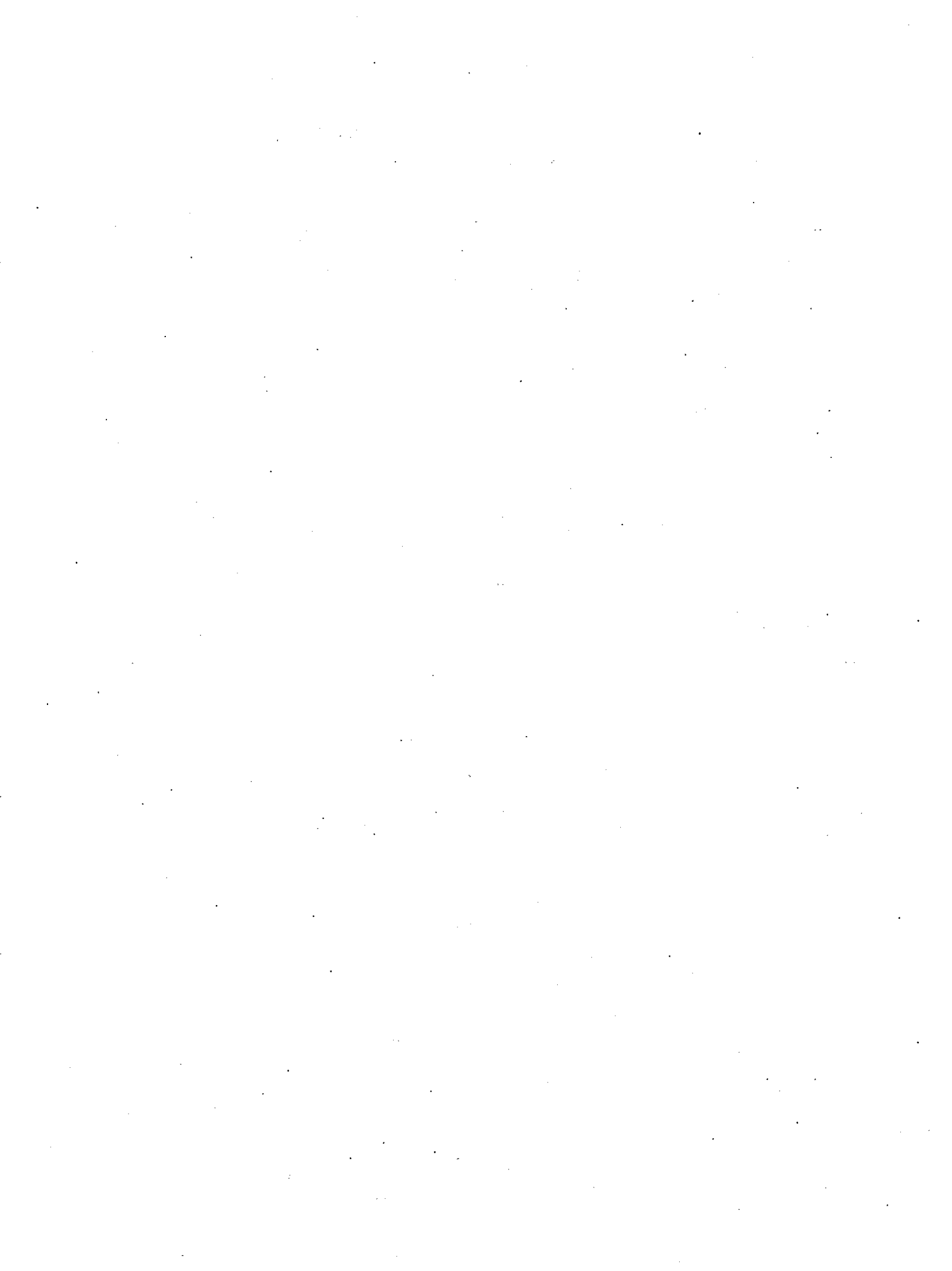
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100	24" DIA.	FRANCOISE	

DEPARTMENT OF ENERGY  
 CONTRACT NO. EX-78-C-01-1775

THE BATHURST PARSONS COMPANY  
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