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REDOX COMMITTEE
CONFERENCE NOTES AND RECOMMENDATIONS

Meeting of April 11, 1949

1. At our meeting of April 5, 1949, a program was suggested reviewing the process constituting the Redox Production Plant, including the recommendations for a separations process program described in Document HW-12685 (INDC 2824) dated March 9, 1949, as well as other process steps.

To incorporate these changes, consisting of additions and omissions, the Committee will appoint engineers or representatives of the various Divisions in accordance with the requirements of the subjects under consideration.
2. As most of the development work for the Redox Processes was done at other places, such as Oak Ridge, Argonne, and Schenectady, it is recommended and approved that J. M. Frame, R. B. Richards, J. G. Bradley, O. C. Schroeder, and W. K. MacCreedy visit these places at an early date to familiarize themselves with and study the latest developments and to decide on their worthiness for incorporation into the Redox Process program.
3. The first function of the committee is to prepare a program setting forth the order in which the different changes are to be considered. This will be started immediately, even though the above named men will be absent on an inspection trip to the various laboratories, as outlined

above

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1

Interviewing
Official:

C. J. Banick

C. J. Banick, AED Class Officer

3/25/89

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4. This program of review and taking-stock practically suspends all work by The Kellex Corporation and it is our opinion that about 2 or 3 months will be required for firming up the whole Redox Program, including all the development work required for the preparation of new Engineering and Instrument Flow Diagrams.
5. The above program is the amplification of all recommendations and suggestions in our Conference Notes and Recommendations of April 5, 1949, paragraphs 5 and 6.
6. Relationship Procedure between the Architect Engineer and General Electric Design Division.

We have also given consideration to a relationship procedure between the Architect Engineer and the General Electric Design Division that will assure us a businesslike basis to accomplish the plant design to be constructed at a reasonable cost and one that can be successfully operated. This procedure is attached.

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O. H. Greager
O. H. Greager

W. K. MacCreedy
W. K. MacCreedy

E. W. Seckendorff
E. W. Seckendorff

OUTLINE FOR A RELATIONSHIP PROCEDURE BETWEEN THE
ARCHITECT ENGINEER AND GENERAL ELECTRIC DESIGN DIVISION

I. The fundamental basis of the subject, "A Relationship Procedure between the Architect Engineer and the General Electric Company Design Division", is that the General Electric Company is charged with the full responsibility for the design and construction of an operating plant that can be constructed at a reasonable cost and can be operated successfully.

To establish a workable relationship procedure between the Architect Engineer and General Electric Company representatives, the following basic information for the development of a program for the design and construction of a Production Plant has to be settled and agreed upon by the General Electric Company Divisions.

1. That the selected process is workable. A function of the Technical Division.
2. The preparation of engineering flow sketches which are to be prepared by the General Electric Design Division Engineers during the course of calculating and planning the job, to describe the principal flow, to help visualize the equipment required, and to summarize the results of calculations. These will form the basis for further development of the Process and Engineering Flow Diagrams and Equipment Arrangement Drawings.

The Engineer's Flow Sketch may be drawn freehand if the result is clear and intelligible. The use of a straight edge and compass is recommended. A neatly drawn flow sketch may often be used to transmit information.

Show all essential equipment and lines. When a detailed estimate is being made, show all possible equipment items listed individually in the estimate.

Show letter and item numbers of major equipment .

Show as a minimum those instruments required for control when a detailed estimate is made requiring a full list of instruments, show and number all instruments.

Show operating temperatures, pressures and quantities, writing these over the flow lines and referring to tables to one side for detailed stream analysis if it is necessary to present these data.

Use standard abbreviations and symbols to designate equipment and instruments in accordance with PS-100 to PS-111, using the equipment symbols specified for the Engineer's Flow Sketch. (See Attachment A).

Use the simplest presentation possible without losing clarity. It is not usually necessary to show by-passes, valves, spare equipment or a multiplicity of heat exchanger shells. Whether or not equipment internals are shown depends on whether or not these details have a significant effect on the basic design.

Once the Process Flow Diagram and the Engineering Flow Diagram have been prepared, they supersede the Engineer's Flow Sketches and the latter need not be revised.

3. The preparation of a Material Balance and Process Flow Diagram is to be outlined by the Technical Division and drawn in preliminary form by the General Electric Company Design Division and then submitted to the Architect Engineer for the preparation of final drawings.

These diagrams show the process flow in a simplified manner and provide a permanent record and reference for calculated design, conditions of pressure, temperature, flow, and other characteristics. They are used as a guide to equipment selection and major line sizing. These diagrams should be given to the Manufacturing Divisions for their approval and records, and are intended to keep all parties working on the job, including the Manufacturing Division, on a common basis of design.

Since the diagram is for general use outside of our organization, good appearance is essential. The following procedure should be used in making this diagram:

Show only major equipment and principal lines. Show names and item numbers of equipment.

Show only sufficient equipment internals and details to explain the essential operation features.

Show operating conditions at the equipment and main stream quantities and compositions in a table. Show characteristics of other streams in boxes adjacent to their location on the diagram.

If required, show utility requirements at equipment with totals in a table.

Do not show by-passes, valves, spare equipment, individual heat exchangers of multiple batteries, individual boiler or furnace tubes and auxiliary lines.

As a rule, show only major instruments which have the effect of modifying the operation.

Use standard abbreviations and symbols given in PS-100 to PS-111 as specified for Process Flow Diagrams.

4. The preparation of Engineering Flow Diagrams. The purpose of the Engineering Flow Diagrams is to provide a master basis and guide to the complete design and it is used for a basis for preparing detailed piping drawings. The Engineering, as well as the Construction Department use it to check equipment and piping, and in case of conflicting drawings, the Engineering Flow Diagram is considered to be correct.

It is used as a basis for preparing equipment, valve, and instrument lists, and controlling purchasing and expediting.

It is to provide all interested Divisions of the General Electric Company with a detailed record of the design.

The Engineering Flow Diagram is drawn in a preliminary manner by the Design Division, to be completed as a permanent drawing,

on tracing paper, by the Architect Engineer.

It is drawn to show in diagrammatic form every item of equipment, every pipe line, and every valve and instrument in the plant, with the exception of instrument piping details.

Every valve, however small, including valves on pressure gages and gage glasses, every instrument and all significant equipment details should be indicated. It is frequently advisable to show various systems on individual flow diagrams. All pipe branches from headers should be shown in the proper sequence.

Where a valve is other than line size it should be so marked on the flow diagram.

This type of flow diagram attempts to portray the functional segmentation of the plant and is drawn in the manner most suitable for this purpose. In general it is desirable to show equipment and groups of equipment in elevation view, particularly where head considerations are an important factor in the job. In the case of two separated groups of equipment at the same elevation, such as vessels and machinery, it is permissible to show the vessels on the base line in elevation view, and pumps and compressors or other equipment below the base line in plan view, but in the case of a building of several stories having equipment on each floor, it is necessary to show the equipment at the correct elevation.

In laying out an Engineering Flow Diagram, use plenty of room and extend over several full size drawings if necessary.

Since the Engineering Flow Diagram is primarily the basis and guide for piping and mechanical design and not for material

balance or process information, no data of this character should be given on the drawing.

The following information should be given on the diagram:

The size of all tanks, towers (ID and straight lengths, including skirt, if any) process vessels.

Size of drums (ID and straight lengths).

Set pressure of safety valves.

All lines should be sized and each line and branch line given its own line number.

Where a line reduces in size, and it is not apparent from the diagram, a reducer shall be shown.

Mark number of all valves.

Use the standard symbols for the Engineering Flow Diagram as shown on PS-100 to PS-111 (See Attachment A). These symbols should be followed in all cases.

Shading of lines and use of dotted or dot and dash lines are highly desirable to set off the main lines from the auxiliary lines.

5. The General Electric Design Division Engineers, with the cooperation of the Technical and Manufacturing Divisions will prepare, as a guide for the Architect Engineer, a comprehensive functional description of:

- a. Process equipment, piping, pumps, and necessary auxiliary equipment such as instruments, ventilation, waste disposal, including the safety requirements and special instructions that are to be reflected in the design of the plant.
- b. The general facilities and utilities, such as offices, locker rooms, sanitary features, ventilation, electric power, steam and water, shops, for non-process areas.

This detailed description is to be the guide for the detailed designs to be made by the Architect Engineer.

6. General Arrangement Drawings. These drawings shall locate the principal equipment in space and shall result in the most economical design of the piping between the principal equipment, including features necessary for easy maintenance. These drawings also determine overall dimensions of the structures housing the equipment. These shall be prepared simultaneously with the preparation of the Engineering Flow Diagrams by the General Electric Design Division, in a preliminary manner, to be finally drawn and completed by the Architect Engineer.
7. During the preparation of the preliminary drawings of Process Flow Sketches, Process Flow Diagrams, and the Engineering Flow Diagrams, and Arrangement Drawings, special detailed study sketches will have to be prepared to prove the feasibility of an economical and operable piping arrangement and equipment location, as well as to avoid later complications due to possible interferences and awkward replacement of equipment and piping for maintenance purposes.

All these sketches showing a feasible and acceptable arrangement shall be preserved and blueprints of them shall be transmitted to the Architect Engineer for his guidance so that no unnecessary time and effort is spent by him for development on these particular installations.

8. Scope Drawings. The Scope Drawings consist of a Process Flow Diagram with material balance; Engineering Flow Diagram; General Arrangement Drawing; Plans and Elevations of all buildings showing location of principal equipment; Plot Plan, showing location of all buildings with area key plan; General Building Specifications; Utility Layout Drawings, with pertinent data. All these drawings are to be prepared by the Architect Engineer with the cooperation of General Electric Company Design Division, except for the Process Flow Diagram, the Engineering Flow Diagram, and General Arrangement Drawings, the method of preparation of which has been described in the above paragraphs 2, 3, 4, 5, and 6.
9. No detail construction drawings shall be started until the Scope Drawings described above are "approved for construction."
10. All drawings, either scope or detail, require General Electric Company approval.
11. The drawings and specifications resulting from the work described in paragraphs 1 to 7 above, and subsequent revisions, if any, are to be approved by an authorized representative of the United States Atomic Energy Commission, and form the basis for all detailed designs, specifications, and requisitions to be prepared by the Architect

Engineer, who will be responsible to the General Electric Company Design Division for all dimensions and sizes of the final design. He has to verify all information submitted by General Electric Company Design Division and has to bring to their attention any matter he may disagree with.

12. The Architect Engineer, as soon as he has received the complete information and data to be furnished by the General Electric Design Division as described above, shall prepare without delay, the following:

- a. Drawing Schedule
- b. Specification Schedule
- c. Material and Equipment List,

and submit these at the earliest possible date to the Design Division for publication to all interested parties.

13. The Architect Engineer shall prepare a monthly progress report which shall show, in addition to the narrative portion, the following tables:

RELATIONSHIP PROCEDURE

TABLE I

PERSONNEL REQUIREMENTS FOR THE MONTH

	<u>Number</u>	<u>Man Hours Required for Entire Project</u>	<u>Man Hours Spent</u>
MANAGEMENT	_____	_____	_____
ENGINEERS	_____	_____	_____
Architectural	_____	_____	_____
Structural	_____	_____	_____
Process	_____	_____	_____
Instrumentation	_____	_____	_____
Mechanical	_____	_____	_____
Electrical	_____	_____	_____
Building Service (H & V)	_____	_____	_____
OFFICE	_____	_____	_____
Administrative	_____	_____	_____
Accounting	_____	_____	_____
Clerical	_____	_____	_____
Procurement	_____	_____	_____
Security	_____	_____	_____
TOTAL	_____	_____	_____
Authorized Overtime	_____	_____	_____

TABLE II

	<u>Number to be Issued</u>	<u>Number Issued</u>	<u>Manhours Required</u>	<u>Manhours Spent</u>	<u>Percent of Project</u>	<u>Percent Complete</u>	<u>Weighted Percent</u>
<u>DRAWINGS</u>							
Architectural	_____	_____	_____	_____	_____	_____	_____
Concrete	_____	_____	_____	_____	_____	_____	_____
Steel	_____	_____	_____	_____	_____	_____	_____
Process	_____	_____	_____	_____	_____	_____	_____
Instrumentation	_____	_____	_____	_____	_____	_____	_____
Mechanical	_____	_____	_____	_____	_____	_____	_____
(Water, Steam, etc.)	_____	_____	_____	_____	_____	_____	_____
Electrical	_____	_____	_____	_____	_____	_____	_____
Building Service	_____	_____	_____	_____	_____	_____	_____
<u>SPECIFICATIONS</u>							
Architectural	_____	_____	_____	_____	_____	_____	_____
Concrete	_____	_____	_____	_____	_____	_____	_____
Steel	_____	_____	_____	_____	_____	_____	_____
Process	_____	_____	_____	_____	_____	_____	_____
Instrumentation	_____	_____	_____	_____	_____	_____	_____
Mechanical	_____	_____	_____	_____	_____	_____	_____
(Water, Steam, etc.)	_____	_____	_____	_____	_____	_____	_____
Electrical	_____	_____	_____	_____	_____	_____	_____
Building Service	_____	_____	_____	_____	_____	_____	_____
<u>REQUISITIONS</u>							
Architectural	_____	_____	_____	_____	_____	_____	_____
Concrete	_____	_____	_____	_____	_____	_____	_____
Steel	_____	_____	_____	_____	_____	_____	_____
Process	_____	_____	_____	_____	_____	_____	_____
Instrumentation	_____	_____	_____	_____	_____	_____	_____
Mechanical	_____	_____	_____	_____	_____	_____	_____
(Water, Steam, etc.)	_____	_____	_____	_____	_____	_____	_____
Electrical	_____	_____	_____	_____	_____	_____	_____
Building Service	_____	_____	_____	_____	_____	_____	_____
Totals	_____	_____	_____	_____	100%	_____	_____

In Table II please note that the drawings issued are to be considered drawings approved by all parties for construction.

14. To accomplish the work outlined above, the Architect Engineer shall furnish at Richland a small staff of competent, responsible engineers necessary to reach agreements in design matters, on details, interpretation of safety requirements, Health Instrument Division requirements, materials of construction, type of equipment, etc. These agreements are to be the basis of detail design to be carried out by the Architect Engineer.
15. The approval of all drawings will be at Richland.
16. The overall project shall be grouped at an early date in logical sections which shall be adhered to for the preparation of all reports or schedules, such as: drawing schedules, construction schedules, material and equipment lists, etc. A list applicable to the Redox Production Plant is herewith suggested:

I. 202-S BUILDING

A. Architectural

To include such group headings as:

1. Concrete (total quantity only)
2. Structural Steel (Listing of tonnage by main groups such as roof trusses, etc.)
3. Reinforcing Steel
4. Building fittings such as doors, frames, etc., which constitute parts of the building.

B. Building Service Equipment

1. Cold Blower Rooms
2. Hot Blower Rooms
3. Switchgear Rooms and associated transformers.
4. Mechanical Equipment Room

C. Building Service Facilities

1. Remote Maintenance Shop (incl. electric power but not lighting)
2. Unregulated Shop ditto
3. Regulated Shop ditto
4. Instrument Shop ditto
5. Decontamination Room
6. Change Rooms (SWP and General)
7. Offices (special equipment and telephone, not including furniture and fixtures)

D. Process Equipment

1. Dissolver Section I (complete

Include all equipment in the section such as tanks, agitators, ejectors, pumps, piping⁽¹⁾, and pipe jumpers, valves, spray nozzles, equipment supports, connectors. Each piece of equipment, such as a tank, and all of its accessories - agitator(s), pump(s), etc. - should appear as a collective group. Do not group together all motors, ejectors, etc. Each section to have its own M & E. List grouping as illustrated here.

2. M. S. Preparation Section
3. Re-work Section
4. Organic Section
5. Waste Section
6. First Cycle
7. U Cycle
8. Pu Cycle
9. Vessel Vent Section

- (1) Piping, particularly process piping, due to its overlapping or extension from one area or section to others, must be handled on an M & E List in a special manner.

It is suggested that each pipe or run of pipe from its inlet to its outlet connection be assigned to a particular section, room, or portion of the building. Where the pipe or run of pipe extends into or thru another section, room, or portion of the building a notation should be made keying the pipe to its original assigned location. Pipe "bundles" can be similarly handled up to a point of divergence.

D. Process Equipment (Continued)

10 Canyon (above cells)
(a) Crane and accessories

11 Sample Gallery

12 Operating Gallery

Include pumps, samplers, etc., in galleries by sections where this subdivision is applicable.

13 Aqueous Make-Up Section

14 Organic Make-Up Section

15 Feed Gallery

- II. 242-S Organic Waste
- III. 211-S Chemical Tank Farm
- IV. 203-S Metal Storage
- V. 276-S Solvent Storage
- VI. 291-S Stack, Fans, and Filters
- VII. 277-S Mock-Up
- VIII. 252-S Substation
- IX. 219-S Laboratory Waste Retention
- X. 232-S Dry Waste Disposal
- XI. 2605-S Fences and Guard Towers
- XII. 2701-S Exclusion Area Gate House
- XIII. 2601-W Railroads
- XIV. 2503-W Electrical Distribution
- XV. 2802-W Steam Distribution
- XVI. 2901-W Water System Distribution

This list was primarily prepared for the grouping to be used in the preparation of the material and equipment list, but shall also apply to the drawing schedule and the design and construction schedule.

17. Drawing Schedule. Drawing Schedules shall be prepared as per attached form. (Attachment B).
18. Specification Schedule. Use the same form as for the drawing schedule. The number of specifications shall be kept at a minimum. Duplication shall be avoided. To accomplish this, the specification scopes have to be well analyzed and planned.
19. Design and Construction Schedules shall be prepared in accordance with the attached form. (Attachment C). The Design and Construction Schedule shall be prepared by the Architect Engineer as soon as the Engineering Flow Diagrams and Arrangement Drawings have been agreed upon, but prior to the final approval of these drawings. This schedule is to be submitted by the Division Engineer in responsible charge of the project to all interested parties and the Management of General Electric Company for their respective approval.
20. The preparation of a Material and Equipment List shall conform with our Procedure Memorandum No. 39, dated 2/22/49, PM-1324, and be prepared in accordance with the form attached thereto. (Attachment D).
21. Preparation of Estimates. Estimates are primarily prepared for authorization of funds which are requested by the General Electric Company in the form of a Project Proposal submitted to the United States Atomic Energy Commission. Since in practically all cases the work to be performed by the Design Division will be divided in a greater or less degree between the General Electric Company Design Division and the Architect Engineer, it is apparent that the preparation of estimates and the resulting Project Proposal or modifications thereof, will be a joint undertaking of the General Electric Design Division, assisted by the Construction

RELATIONSHIP PROCEDURE

Division for certain proper information, and the Architect Engineer. These estimates, prepared by both parties, shall be in detail and shall, in general, follow the Form HW-7.30, entitled "Estimate Work Sheet." A sample of this form is attached. (Attachment E).

Both the General Electric Design Division and the Architect Engineer are requested to maintain a perpetual, up to date estimate.

The General Electric Design Division which is responsible for the project, will be charged with the responsibility of maintaining a list of increases and decreases in cost as additions, revisions, or omissions are made in the scope of the project. The revised project proposals have to be submitted to the Management for transmittal to the United States Atomic Energy Commission as soon as it is indicated that the cost of the project will increase 10% or more of the funds authorized by the United States Atomic Energy Commission for the project.

The detailed cost estimates are to be summarized in accordance with the General Electric Company Nucleonics Department Form HW-7.29.1, Engineering Cost Estimate, HW-7.29.2, Construction Cost Estimate and HW-7.29.3, Cost of Contractor's Work Arranged in Accordance with Complexity of Work.

The cost items to be furnished by the Architect Engineer are indicated on the attached project cost estimate forms mentioned above. (Attachment F).

All detailed estimates, including the summary to be incorporated with the project proposal which also has to be amplified with

the important details to justify the figures contained in the project proposal estimate, have to be submitted by the Division Engineer of the General Electric Design Division to their Estimating Department for checking and criticism. This applies also to the Architect Engineer.

The purpose of this step is to assure ourselves that all costs will represent local conditions which, in many respects, are at variance with general conditions due to security and other complications.

22. Development Work. In many instances, development work on special equipment for the design and construction of process plants will be required. This work may be undertaken through special contractual arrangements either with other branches of the General Electric Company, or with other especially qualified organizations, research laboratories, or companies. If such development work is to be administered by either the Architect Engineer or the General Electric Design Division, it will be necessary for either party to submit a complete description of the purpose of the development work to be undertaken which should fully justify the qualifications of a given agency, reflecting why this particular work should be done by them. It shall state an estimate of the time required to do the work, as well as the cost of the work.

All such work must be authorized and entered into either by General Electric Company Purchase Order, or by a contract which is to be negotiated and agreed upon and signed by the required parties before any work shall be done by the proposed agency.

23. Eight copies of a monthly progress report prepared by every agency doing development work for the project administered either by the General Electric Company Design Division or the Architect Engineer should be submitted to the General Electric Division Engineer in charge of the project.
24. For general information and guidance, there is attached a copy of Project Memorandum No. 1, dated January 1, 1948, and supplement No. 1 to PM-1, dated January 31, 1949. (Attachment G).

STANDARD SYMBOLS FOR FLOW DIAGRAMS

TYPE	DESIGNATION	SYMBOL FOR ENGINEER'S FLOW SKETCH, HEAT BALANCE DIAGRAM OR PROCESS FLOW DIAGRAM	SYMBOL FOR ENGINEERING FLOW DIAGRAM																	
GENERAL																				
FOR STARTING POINT OF DIAGRAM USE THIS SYMBOL
STEAM GENERATORS (BOILERS)																				
STEAM GENERATOR	B
STEAM GENERATOR WITH SUPERHEATER AND/OR ECONOMIZER AND/OR REHEATER	B
FURNACES																				
FURNACE OR HEATER	F		<small>SHOW TUBE ARRANGEMENT IN SUFFICIENT DETAIL TO LOCATE INSTRUMENTS</small>																	
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">MADE</td> <td style="width: 15%;">RAG CON J M</td> <td rowspan="4" style="text-align: center; vertical-align: middle;"> STANDARD SYMBOLS FOR FLOW DIAGRAMS </td> <td style="width: 15%;"></td> </tr> <tr> <td>CHECKED</td> <td>TEC</td> <td></td> </tr> <tr> <td>APPROVED</td> <td>rek</td> <td></td> </tr> <tr> <td>DATE</td> <td>6.6.47</td> <td></td> </tr> <tr> <td colspan="3">REVISIONS</td> <td style="text-align: center; vertical-align: middle;">PS-100</td> </tr> </table>				MADE	RAG CON J M	STANDARD SYMBOLS FOR FLOW DIAGRAMS		CHECKED	TEC		APPROVED	rek		DATE	6.6.47		REVISIONS			PS-100
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REVISIONS			PS-100																	

STANDARD SYMBOLS FOR FLOW DIAGRAMS

TYPE	DESIGNATION	SYMBOL FOR ENGINEER'S FLOW SKETCH, HEAT BALANCE DIAGRAM OR PROCESS FLOW DIAGRAM	SYMBOL FOR ENGINEERING FLOW DIAGRAM
TURBINE GENERATORS			
TURBINE GENERATOR, CONDENSING, WITH OR WITHOUT EXTRACTION	TG		
TURBINES			
STEAM TURBINE, BACK PRESSURE WITH OR WITHOUT EXTRACTION	TU		
STEAM TURBINE, ATMOSPHERIC EXHAUST	TU		
STANDARD SYMBOLS FOR FLOW DIAGRAMS			
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STANDARD SYMBOLS FOR FLOW DIAGRAMS

TYPE	DESIGNATION	SYMBOL FOR ENGINEER'S FLOW SKETCH, HEAT BALANCE DIAGRAM OR PROCESS FLOW DIAGRAM	SYMBOL FOR ENGINEERING FLOW DIAGRAM
TOWERS			
BUBBLE CAP	T	<p>USUALLY SHOW ONLY INTERNALS WHICH LOCATE FEED AND REFLUX POINTS AND EXPLAIN REBOILER CONNECTIONS, ETC</p>	<p>SHOW EACH BUBBLE TRAY DOTTED. SHOW ONLY SIGNIFICANT DETAILS OF DOWNCOMERS. SHOW INTERNAL PANS, BAFFLES, ETC. DOTTED</p>
PACKED	T		<p>REPRESENT EACH TYPE OF PACKING BY DIFFERENT CROSSHATCHING</p>
DRUMS AND TANKS			
VERTICAL DRUM	D	-OR-	-OR-
HORIZONTAL DRUM	D
SPHERE	TK
STORAGE TANK	TK
CLOSED TANK	TK		-OR-
OPEN TANK	TK
MADE		PAG CON JIM	
CHECKED		TEC	
APPROVED		12/1	
DATE		12/1	
REVISIONS			
STANDARD SYMBOLS FOR FLOW DIAGRAMS			
PS-102			

STANDARD SYMBOLS FOR FLOW DIAGRAMS

TYPE	DESIGNATION	SYMBOL FOR ENGINEER'S FLOW SKETCH, HEAT BALANCE DIAGRAM OR PROCESS FLOW DIAGRAM	SYMBOL FOR ENGINEERING FLOW DIAGRAM
HEATERS, DEAERATORS, HEAT EXCHANGERS, CONDENSERS, COOLERS, ETC.			
EVAPORATOR	E		
DIRECT CONTACT HEATER	H		
DEAERATOR	DE		
DEAERATOR WITH SURGE TANK	DST		
HORIZONTAL EXCHANGER	E	- OR -	- OR - SHOW ACTUAL NUMBER OF SHELLS
VERTICAL EXCHANGER	E	USE HORIZONTAL SYMBOL ABOVE FOR MOST CASES	
KETTLE	E		SHOW INTERNAL DAM WHEN USED
DOUBLE PIPE, G FIN, ETC.	E	USE SYMBOL FOR HORIZONTAL EXCHANGER	SHOW ACTUAL NUMBER OF BANKS
JACKETED PIPE	E		
COOLER BOX	E		
COOLER AND CONDENSER	E		SAME AS EXCHANGER
STEAM HEATER	E	STEAM	SAME AS EXCHANGER - SHOW TRAPS
CONDENSER WITH WATER TRAP OR HOTWELL	E		

MADE	RAG CON J M
CHECKED	TEC
APPROVED	2 7 6
DATE	6 4 4
REVISIONS	

STANDARD SYMBOLS
FOR
FLOW DIAGRAMS

PS-103

STANDARD SYMBOLS FOR FLOW DIAGRAMS 1162

TYPE	DESIGNATION	SYMBOL FOR ENGINEER'S FLOW SKETCH, HEAT BALANCE DIAGRAM OR PROCESS FLOW DIAGRAM	SYMBOL FOR ENGINEERING FLOW DIAGRAM
COMPRESSORS			
MOTOR DRIVEN SINGLE STAGE	C
MOTOR DRIVEN TWO STAGE	C	<small>SHOW TWO STAGES ONLY WHEN INTERCOOLERS MUST BE USED</small>
STEAM DRIVEN SINGLE STAGE	C
STEAM DRIVEN TWO STAGE	C	<small>SHOW TWO STAGES ONLY WHEN INTERCOOLERS MUST BE SHOWN ALSO MAY BE USED FOR ENGINEERING FLOW DIAGRAM IF TANDEM TYPE IS PURCHASED</small>
GAS ENGINE		<small>SHOW ONE CYLINDER PER STAGE</small>	<small>SHOW ACTUAL NUMBER OF COMPRESSOR AND ENGINE CYLINDERS</small>
FANS OR BLOWERS			
FAN OR BLOWER	FN	<small>TURBINE DRIVE</small> <small>MOTOR DRIVE</small>
STANDARD SYMBOLS FOR FLOW DIAGRAMS			
MADE	BY	STANDARD SYMBOLS FOR FLOW DIAGRAMS	
CHECKED	BY		
APPROVED	BY		
DATE			
REVISIONS			
			PS-104

STANDARD SYMBOLS FOR FLOW DIAGRAMS

SERVICE	INDICATORS	RECORDERS	INDICATING CONTROLLER	RECORDING CONTROLLER	NON INDICATING CONTROLLER	SYMBOL FOR ENGINEER'S FLOW SKETCH, HEAT BALANCE DIAGRAM OR PROCESS FLOW DIAGRAM	SYMBOL FOR ENGINEERING FLOW DIAGRAM
FLOW INSTRUMENTS							
ORIFICE	FI	FR	FIC	FRC			
DISPLACEMENT METER	DM	DM					
ROTOMETERS	RM						
TEST ORIFICE	OF						
ORIFICE FITTING	FF						
TEMPERATURE INSTRUMENTS							
UNCONNECTED THERMOCOUPLE OR RESISTANCE ELEMENT	TX						
ELECTRICAL POTENTIOMETER	TI	TR					
MILLIVOLTMETER OR RESISTANCE			TIC	TRC			
BULB	TI	TR					
TEMPERATURE ALARM	TA						
INDUSTRIAL THERMOMETER	IT						
THERMOMETER OR THERMOCOUPLE WELL	TW						
NOTE ON EACH JOB NUMBER INSTRUMENTS OF EACH TYPE CONSECUTIVELY, SUCH AS PC 123 ETC PRCH 123 ETC DPC 12 ETC						• FOR MULTI-POINT POTENTIOMETER INDICATORS AND RECORDERS NUMBER INDIVIDUAL INDICATORS AND RECORDERS IN THE EVEN NUMBERS (2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96, 98, 100) NUMBER INDIVIDUAL THERMOCOUPLE POINTS CONSECUTIVELY FOR EACH INSTRUMENT SUCH AS T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22, T23, T24, T25, T26, T27, T28, T29, T30, T31, T32, T33, T34, T35, T36, T37, T38, T39, T40, T41, T42, T43, T44, T45, T46, T47, T48, T49, T50, T51, T52, T53, T54, T55, T56, T57, T58, T59, T60, T61, T62, T63, T64, T65, T66, T67, T68, T69, T70, T71, T72, T73, T74, T75, T76, T77, T78, T79, T80, T81, T82, T83, T84, T85, T86, T87, T88, T89, T90, T91, T92, T93, T94, T95, T96, T97, T98, T99, T100	
MADE	946 CON JUM	STANDARD SYMBOLS FOR FLOW DIAGRAMS					PS-106
CHECKED	TEC						
APPROVED							
DATE	6-1-77						
REVISIONS							

STANDARD SYMBOLS FOR FLOW DIAGRAMS

SERVICE	INDICATORS	RECORDERS	INDICATING CONTROLLER	RECORDING CONTROLLER	NON INDICATING CONTROLLER	SYMBOL FOR ENGINEER'S FLOW SKETCH HEAT BALANCE DIAGRAM OR PROCESS FLOW DIAGRAM	SYMBOL FOR ENGINEERING FLOW DIAGRAM
PRESSURE INSTRUMENTS							
PRESSURE GAGE BOURDON SPIRAL OR BELLOW OR MANOMETER IN CASE	PI	PR					
			PIC	PRC			
					PC		
OPEN MANOMETER	PI						
DIFFERENTIAL PRESSURE GAGE	DPI	DPR					
			DPIC	DPRC			
					DPC	SEE ABOVE	
PRESSURE ALARM	PA						
PRESSURE SWITCH					PS		
DRAFT GAGE	DG						
VACUUM GAGE MERCURY TYPE	VG						

MADE	RAG CON JM
CHECKED	TEC
APPROVED	<i>[Signature]</i>
DATE	10-1-7
REVISIONS	

STANDARD SYMBOLS FOR FLOW DIAGRAMS

PS-107

STANDARD SYMBOLS FOR FLOW DIAGRAMS

SERVICE	INDICATORS	RECORDERS	INDICATING CONTROLLER	RECORDING CONTROLLER	NON-INDICATING CONTROLLER	SYMBOL FOR ENGINEER'S FLOW SKETCH HEAT BALANCE DIAGRAM OR PROCESS FLOW DIAGRAM	SYMBOL FOR ENGINEERING FLOW DIAGRAM
LEVEL INSTRUMENTS							
INTERNAL FLOAT	LI	LR				LI, LR
			LIC	LRC	LC	LIC, LRC LC SEE ABOVE
KIDNEY FLOAT OR DISPLACEMENT TYPE	LI	LR	LIC	LRC	LC	LI LR LIC LRC LC
DIFFERENTIAL	LDI	LDR	LDIC	LDRC	LDC	LDRC ETC
LIQUIDMETER	LI	LR	LIC	LRC	LC	LI, ETC
GAS BLOW BACK	LI	LR	LIC	LRC	LC	LI, ETC
FLOAT AND CHAIN	LI					LI
FLOAT SWITCH					LS	LS
GAGE GLASS TUBULAR OR REFLUX	GG					GG
FROST PLUG	FP					FP

WHEN AN ALARM IS USED WITH ANY LEVEL INSTRUMENT
ADD 'A' TO ITS DESIGNATION (E. LEVEL FLOAT CONTROL - LICA

MADE	RAG CON JM
CHECKED	TEC
APPROVED	<i>[Signature]</i>
DATE	6-1-1
REVISIONS	

STANDARD SYMBOLS FOR FLOW DIAGRAMS

PS-108

STANDARD SYMBOLS FOR FLOW DIAGRAMS

SERVICE	INDICATORS	RECORDERS	INDICATING CONTROLLER	RECORDING CONTROLLER	NON INDICATING CONTROLLER	SYMBOL FOR ENGINEER'S FLOW SKETCH, HEAT BALANCE DIAGRAM OR PROCESS FLOW DIAGRAM	SYMBOL FOR ENGINEERING FLOW DIAGRAM
MISCELLANEOUS INSTRUMENTS AND CONTROL VALVES							
SPECIFIC GRAVITY	SGI	SGR					
			SGIC	SGRC			
ACIDITY	pHI	pHR					
			pHIC	pHRC			
CONDUCTIVITY	CI	CR	CRIC	CRRC		SAME AS FOR pH	SAME AS FOR pH
INSTRUMENT ACTUATED DIAPHRAGM MOTOR VALVE			SAME AS INSTRUMENT EXCEPT ADD LETTER V SUCH AS TRCV-1				
DIAPHRAGM MOTOR VALVE WITH POSITIONER			SAME AS INSTRUMENT EXCEPT ADD LETTER V SUCH AS TRCV-1				
PNEUMATIC TRANSMITTER						NO SYMBOL	
CO ₂				CO ₂ RC			
O ₂		O ₂					
SMOKE DENSITY RECORDER		SDR					

MADE	RAG CON JM
CHECKED	T.E.C
APPROVED	J.C.K
DATE	6-4-47
REVISIONS	

STANDARD SYMBOLS
FOR
FLOW DIAGRAMS

PS-109

STANDARD SYMBOLS FOR FLOW DIAGRAMS

1162

TYPE	DESIGNATION	SYMBOL FOR ENGINEER'S FLOW SKETCH HEAT BALANCE DIAGRAM OR PROCESS FLOW DIAGRAM		SYMBOL FOR ENGINEERING FLOW DIAGRAM
PIPING, SPECIAL VALVES AND SPECIALTIES				
GATE VALVE	VG	USUALLY NOT SHOWN		
GLOBE VALVE	VO	. . .		IN ORDER TO AVOID ERRORS LETTERS VO SHOULD BE SHOWN
ANGLE VALVE	VA	. . .		
CHECK VALVE	VC	. . .		
STOP CHECK	VS	. . .		
PLUG COCK	VP	. . .		
THREE WAY PLUG COCK	3VP	. . .		
RELIEF OR SAFETY VALVE	RV,SV	. . .		
PRESSURE REDUCING	PRV	. . .		SHOW SOURCE OF CONTROL
HAND CONTROL VALVE	HCV	. . .		
ELECTRIC MOTOR OPERATED VALVE	EMV	. . .		
HYDRAULIC OR AIR MOTOR OPERATED VALVE	HOV	. . .		
DIAPHRAGM OPERATED VALVE USED AS REMOTE HAND CONTROL	DV	. . .		
LOADED NON REVERSE FLOW VALVE	NRV	. . .		
SOLENOID VALVE	EV	. . .		
SPECIAL VALVES	SEE JOB PIPING SPECIFICATIONS OR SPECIAL INSTRUCTIONS ISSUED WITH EACH JOB			

STANDARD SYMBOLS FOR FLOW DIAGRAMS 116

TYPE	DESIGNATION	SYMBOL FOR ENGINEER'S FLOW SKETCH, HEAT BALANCE DIAGRAM OR PROCESS FLOW DIAGRAM	SYMBOL FOR ENGINEERING FLOW DIAGRAM
PIPING, SPECIAL VALVES AND SPECIALTIES			
STRAINER	S	USUALLY NOT SHOWN	SINGLE DOUBLE
Y STRAINER	S
STEAM TRAP WATER TRAP	ST WT
DESUPERHEATER	DS
EJECTOR	J
SEPARATOR	SP
VACUUM BREAKER	VB
EXPANSION JOINT	ExJ
FUNNEL	F
STEAMOUT	StO
HOSE CONNECTION	HC
DRAIN	D
VENT	V
SAMPLE	S
SAMPLE COOLER	SC

MADE	RAG CON JM	STANDARD SYMBOLS FOR FLOW DIAGRAMS	
CHECKED	TEC		
APPROVED	<i>den</i>		
DATE	6-4-47		
REVISIONS			PS-III

NERAL ELECTRIC CO.
UCLEONICS DEPT.
CHLAND, WASHINGTON

SHEET _____ OF _____
DATE _____
PROJECT _____

[illegible]

11162

GENERAL ELECTRIC CO.
DESIGN & CONSTRUCTION DIVISION

ESTIMATED TIME SCHEDULE SHOWN BY HEAVY BLACK LINE

INSTRUCTIONS

SHOW DATE OF REPORT BY HEAVY VERTICAL RED LINE

SHOW IN RED, PERCENTAGE OF WORK COMPLETED

SHOW ACTUAL TIME SPENT AND ESTIMATED TIME TO COMPLETE

SHOW LOWER LINE OF TIME SCHEDULE

SHOW PERCENTAGES AND COMPLETION DATES OF PRECEDING

REPORT BY SMALL CROSSES.

DATE

SHEET NO.

PROJECT NO.

WORK

FOR

TIME SCHEDULE

DESCRIPTION OF WORK

PERCENTAGE
OF PROGRESS

20 40 60 80

MATERIAL AND EQUIPMENT LIST

For the purpose of expediting and controlling detail design, either by the General Electric Company or by the Architect Engineer, or, at a later date, by a vendor, the preparation of requisitions, the placing of purchase orders, and the delivery of material, it is requested that the General Electric Division Engineer or the Architect-Engineer in responsible charge of a project shall begin to prepare, at the earliest possible time, a Material and Equipment List.

This Material and Equipment List shall be started as soon as the engineering flow sheet, or a preliminary layout of a plant or building, has been reasonably firmed-up. Therefore, in the early issues of the list, only the equipment piece number, and possible quantity, and the description can be given.

The listing of the equipment shall be arranged in logical groupings for easy location of specific equipment items. It shall include every item required for the operation of every process included in the project. It shall be supplemented and issued every week thereafter as the engineering flow sheets or arrangement drawings are further firmed-up. It is understood that the Material and Equipment List shall reflect the size, capacity, and material specification of every process vessel, every pump and its motor, every valve, every pipeline including its instruments, and all ventilating equipment directly connected with or required by the process as shown on the engineering flow sheets or arrangement drawings. In other words, every item that is required to make a complete process plant or building shall be listed on the Material and Equipment List.

We should like to remark that a Material and Equipment List of similar arrangement is not a new invention, but has been successfully employed by many prominent engineering and construction firms.

The Material and Equipment List shall also cover all equipment and instruments to be requisitioned by the Technical, Manufacturing, or Health Instrument or other Divisions which were included in the estimate for the given project. It will, therefore, be necessary to distinguish by special markings, items requisitioned by the General Electric Company Design Division or its Architect Engineer from those items purchased by the Technical, Manufacturing or Health Instrument or other Divisions. Items to be purchased by General Electric Design Division shall be unmarked in the Vendor's column. Items to be purchased by the General Contractor shall be marked in the Vendor's column with an asterisk (*), if purchased by other Divisions than General Electric Design Division or the General Contractor, the Vendor's column shall be marked with two asterisks (**).

When this list approaches completeness, only individual sheets on which information has been added or changed shall be issued. This is to avoid unnecessary load on the reproduction section.

Design Division Engineers or the Architect Engineer will furnish the following information: equipment piece number; quantity; description; drawing number; requisition number, date and item; requested delivery date. The Procurement Division will furnish the purchase order number, date, and item; and the name of the vendor. Promised delivery dates and remarks shall be furnished by the Expediting Department of the Procurement Division.

The General Contractor Procurement Division shall be responsible for supplying all necessary information on field procured items to the General Electric Construction Procurement Division as required. General Electric Procurement Division will issue combined status reports as required. (Bimonthly at beginning, weekly later. Critical lists and charts will be prepared by General Electric Procurement Division.)

The first issue of the Material and Equipment List shall have a properly marked Acko, or equal, press board binder, and an index listing the logically arranged groups of equipment items. This index is to be revised and reissued whenever necessary.

Precise quantities are to be taken from detail drawings (such as length of pipe, fittings, etc.). Such items should indicate extra quantities to be ordered; i.e., quantities in addition to those arrived at from the take-off.

Distribution of the Material and Equipment List shall be made by the Procurement Division to all interested parties, such as the General Contractor, the Manager, Design and Construction Divisions, the Architect Engineer, the Division Engineer, Contact Engineer, Procurement Division of General Electric, the Expediting Department, and the Inspection Department.

The procedure for the preparation of a Material and Equipment List for a project or building shall be as follows:

The Division Engineer or the Architect Engineer will prepare a master sheet of the Material and Equipment List which will be expanded and revised as definite information becomes available. This information will cover the following columns:

<u>Number</u>	<u>Heading</u>
2	Equipment Piece Number
3	Quantity
4	Description
5	Drawing Number
6	Requisition Number
7	Requisition Date
8	Requisition Item Number
9	Required Delivery Date.

Procedure Memorandum #39 (cont'd)

The Design Division Engineer will transmit a reproducible of the master of the Material and Equipment List prepared by his organization or by the Architect Engineer, to the Procurement Division, which will add the information for the following columns:

<u>Number</u>	<u>Heading</u>
10	Purchase Order Number
11	Purchase Order Date
12	Purchase Order Item Number
13	Vendor's Name
14	Promised Delivery Dates
15	Remarks

The Procurement Division will issue prints from brought-up-to-date sheets of the Material and Equipment List to all interested parties.

Frank E. Creedon, Manager
Design & Construction Divisions

GENERAL ELECTRIC CO.
NUCLEONICS DEPT.
RICHLAND, WASHINGTON

MATERIAL & EQUIPMENT L

LINE NO.	EQ. PG. NO.	QUANT.	DESCRIPTION	DWS. NO.	REQUISITION			REQD. DEL. DATE	PURCHASE ORDER			VENDOR
					NO.	DATE	ITEM		NO.	DATE	ITEM	
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												

ISSUE NO. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
DATE

* BY FIELD
** BY OTHERS

3911504

BLDG. NO. 109X (100-68-48)

~~TI - E. J. T. Project NO. 00000~~

007XXX 3003

ESTIMATED BY

CHECKED BY

Description	Quantity	Unit	Unit Cost	Total Cost	Labor	Material	Total
(Including Dimensions & Eq. No.s.)							

Buildings - Industrial types

appx. 250 x 400, 3 floors, steel

Frame concrete floor slabs, D59

glazing, steeled sash, curved steel

Siding, poured concrete foundation

no l's and coloring fading.

Constricts blood inferior portion

placed on both sides of the

Steel and blast furnace

Structural Steel Joists

Boston Boston

Robertson, Alex. FXG 79795

17

Central Project

5144.0

10-20-50

100

Revised Draft 2/7/11

350/1000

Asst. Dir. 1/16

Have Trade that Abolition

4. "Concrete Block"

6" Concrete Block

Plaster

ESTIMATE WORK SHEET

BLDG. NO. 109 X (100' AREA)

DATE: SHEET NO. 2

TITLE: NRG, For the 'D' Project PROJECT NO. 00000

ESTIMATED BY

DWGS:

CODE XXX 400

CHECKED BY

Description (Including Dimensions & Eq. Pc. Nos.)	Quantity	Unit	Unit Cost	Total Cost		
				Labor	Material	Total
BUILDING:- CONTINUED						
Floor Slabs:-						
Ground Floor, 5" thick, on fill				—	—	—
Concrete	1850	CY	15.25	11100	27750	38850
Reinforcing Steel	37000	Lbs	1.07	2960	2590	5550
Reinforcing Mesh, 6" x 4" x 4"	5000	SF	1.06	5600	4800	10400
2 nd and 3 rd Floors				—	—	—
Form, wood	40000	SF	1.25	20000	16000	36000
Concrete, 5" thick	6670	CY	12.50	53360	120060	153420
Reinforcing Steel	66700	Lbs	1.07	53360	46690	100050
Drainage						
4" - Bonnet & Hat Roof Drains	8	ea	12.50	48	96	144
4" - Slopway 5" x 5" Floor Drains	60	ea	10.00	300	600	900
4" Soil line, including fittings						
hangers and painting	2500	LF	3.00	8000	7500	15500
6" dia Soil line, fittings, hangers						
and painting	800	LF	4.50	3600	3200	6800
4" dia Vents and rain water						
caddocks, fitting, hangers, paint	900	LF	3.00	2700	2610	5310
Foundations; building wall						
and column footings						
Excavation, 12" line	450	cy	1.20	540	180	720
Back Fill, " "	300	cy	1.20	120	60	180
Form	13000	SF	1.20	7800	2600	10400
Concrete	500	cy	12.50	3500	7500	11000
Reinforcing Steel	40000	Lbs	1.07	2800	2400	5200

ESTIMATE WORK SHEET

BLDG. NO. 109 (100 BREN)DATE _____ SHEET NO. 3TITLE: Mfg. Fac for D Prod PROJECT NO. 00000

ESTIMATED BY _____

DWGS: _____

CODE XXX400

CHECKED BY _____

Description (Including Dimensions & Eq. Pc. Nos.)	Quantity	Unit	Unit Cost	Total Cost		
				Labor	Material	Total
<u>BUILDING 1 - CONTINUED</u>						
CONTINUE THIS HANDING WITH ADDITIONAL ITEMS TO INCLUDE CEILINGS, DOORS, HARDWARE, LIGHTING, RADIATION AND HEATING LINES, PLUMBING FACILITIES WITH HOT AND COLD WATER LINES, SANITARY DRAIN, HOT WATER HEATER AND CIRCULATING SYSTEM INCLUDING FOUNDATIONS AND POWER SUPPLY TO ELECTRICALLY OPERATED UNITS ELEVATOR AND AIR CONDITIONING ARE TO BE INCLUDED IN EQUIPMENT						
<u>EQUIPMENT 1 -</u>						
<u>EP 100% SUPPLY PUMP</u>						
<u>2500 G.P.M., 300 FT. H.D., 3 stage</u>						
<u>centrifugal pump with C.I.</u>						
<u>base to receive drive</u>						
<u>1-P. 3xR273.00 per</u>						
<u>Order No. *RXP2699</u>				—	*4500	4500
<u>Feeder</u>				—	500	500
<u>Install and erect</u>				600	200	800
<u>100 HP 1780 R.P.M. 2300V</u>				—	—	—
<u>TEFC motor with magnetic</u>				—	—	—
<u>coupling, delivered, as per</u>				—	—	—
<u>Order No. *RXP 7422</u>				—	*2300	2300
<u>Install on base</u>				420	130	550
<u>Starter, Rock, Switch Gear</u>				700	1800	2500

ESTIMATE WORK SHEET

BLDG. NO. 109 X (13.3 AREA)

DATE _____ SHEET NO. 4

FILE: Mfg. Fac. for 'D' Prod.

PROJECT NO. 00000

ESTIMATED BY _____

DWGS: _____

CODE xxx400

CHECKED BY _____

Description (Including Dimensions & Eq. Pc. Nos.)	Quantity	Unit	Unit Cost	Total Cost		
				Labor	Material	Total
EQUIPMENT - CONTINUED						
EP100.0 SUPPLY PUMP (340T0)				—	—	—
Control Wiring and Control				—	—	—
for motor (including 220V. ckt.)				530	670	1200
Foundations for Pump				—	—	—
Excavation	6	CY	5.00	30	10	40
Backfill	2	CY	5.00	4	6	10
Formwork	200	SF	.60	120	50	170
Concrete	12	CY	6.50	84	216	300
Reinforcing Steel	1000	LB	.48	48	42	90
Vibration Pad - 3" cork				—	—	—
on 6" concrete slab base	100	SF	1.50	150	150	300
Piping Connections						
8" Sch. 140 Steel, welded						
fittings, Series 15 slip on flange						
as required for assembly						
hangers	450	LF	6.20 5.50	2925	2475	5400
Check Valve, 8" Sch. 40						
Valve (2), 300" G.C. Flange				150	700	850
Insulation 2" Fibre Glass	450	LT	1.80 1.40	810	630	1440
6" Sch. 40 Steel pipe, welded						
fittings, Series 15 slip on flange						
as required for assembly (8)	900	LF	.50 1.50	450	450	900
Insulation 2" Glass Wool	900	LF	1.50	1350	1170	2520

BLDG. NO. 109 X (100 PPH)
 TI E: Mfg. For "D" Product PROJECT NO. 00000
 DWGS: _____ CODE XXX 400

DATE _____ SHEET NO. 5
ESTIMATED BY _____
CHECKED BY _____

Description (Including Dimensions & Eq. Pc. Nos.)	Quantity	Unit	Unit Cost	Total		Cost
				Labor	Material	Total
EQUIPMENT- CONTINUED						
LIST ALL IDENTIFIABLE UNITS OF EQUIPMENT						
WITH THEIR ASSOCIATED AND AUXILIARY PARTS						
IN SIMILAR DETAIL						
ALSO LIST GROUPS OF EQUIPMENT SUCH						
AS PROCESS HEADERS, DIST. HEADS, ELECTRIC						
SERVING AND CONTROL CABLES						
IF PROJECT COVERS MORE THAN ONE BUILDING, SHOW						
DETAILS OF EACH BUILDING SEPARATELY. WHERE COST						
OF A PART HAS BEEN INCURRED FOR A BUILDING						
WILL NORMALLY BE IDENTIFIED BY A SERIAL						
NUMBER						

ESTIMATE WORK SHEET

BLDG. NO. 109X(100 AREA)

DATE _____ SHEET NO. 6

TI. E. Mfg. Fac. for "D" Proj PROJECT NO. 00000

ESTIMATED BY _____

DWGS: _____

CODE XXX300

CHECKED BY _____

Description (Including Dimensions & Eq. Pc. Nos.)	Quantity	Unit	Unit Cost	Total Cost		
				Labor	Material	Total
GRADING & ROAD ACCOUNT						
xxx301 SIDEWALK AND						
GENERAL ST. 20' WIDE						
Grabbing	3000	SF	.15	3000	1500	4500
Stripping, Avg. Dpt 18"	2000	CY	.55	800	300	1100
Grade embankment, 8' high	2000	LF	.60	2000	1200	3200
xxx302 SIDEWALK						
4" concrete on 6" gravel						
Let, 4' wide, hard finished	4000	SF	.30	1200	1200	2400
ROAD						
6" Asphalt concrete on						
6" crushed gravel bed and						
8" pit run gravel sub-base	3000	SY	2.25	3000	3750	6750
Excavation	1000	CY	.40	300	100	400
xxx303 LANDSCAPING						
3' Top Soil, Seed, & Fertilizer	4	Run	200	800	800	1600

ESTIMATE WORK SHEET

BLDG. NO. 109X(100 ARER)

DATE _____ SHEET NO. 7

TITLE: Mfg. Fac. Ac'D Room PROJECT NO. 00000

ESTIMATED BY _____

DWGS: _____

CODE XXX500

CHECKED BY _____

Description (Including Dimensions & Eq. Pc. Nos.)	Quantity	Unit	Unit Cost	Total Cost		
				Labor	Material	Total
PERMANENT UTILITIES						
XXX501 STEAM LINES						
OVERHEAD						
6" Sched 40 Steel, Weld Fittings						
hangers, Valves	900	LF	4.50	4050	4500	8550
Insulation 2" - 85% M.C.	900	LF	2.00	1800	1620	3420
4" dia. Sched 40 Steel, Weld Fittings						
hangers	1200	LF	3.50	4200	4800	9000
Insulation 2" - 85% M.C.	1200	LF	1.90	2280	2040	4320
Proc. Rod Sta. 250' - 150' - 15'	1	ea		900	1200	2100
P.V. 30"	100	ea	40.00	4000	3000	7000
UNDER GROUND						
4" Sched 40 R.W.I.	300	LF	2.00	600	1800	2400
6" Sched 40 R.W.I.	200	LF	3.50	300	1100	1400
Excavate, backfill	200	CY	1.00	200	120	320
XXX502 WATER LINE						
UNDER GROUND						
8" dia 150" C.I. - B+S						
pipe and fittings						
2 gate valves & stand pipe	800	LF	1.50	1200	2400	4000
6" dia 150" B+S pipe and						
fittings	400	LF	1.25	500	1600	2100
Excavation and Backfill	200	CY	1.00	200	120	320

GENERAL ELECTRIC COMPANY
Nucleonics Department

PROJECT COST ESTIMATE

Kenford Works
Richland, Washington

A. ENGINEERING COST ESTIMATE:

- (1) Transfer of Costs Incurred for Preparation of preliminary plans, reports, project proposals.
General Electric including _____ % Overhead
Architect Engineer including _____ % Overhead
\$ _____ \$ By G.E. _____
\$ By A.E. _____
- (2) Preparation of drawings, specifications, requisitions, comparison of bids, etc. by Architect Engineers, including fee.
\$ _____ \$ _____
2% overhead on above.
- (3) Preparation of preliminary, or final information, data, flow sheets, design specifications, etc., by G. E. Design Division including _____ % overhead and contingencies.
\$ By G.E. _____
- (4) Topographic data by G. E. Design & Construction Divisions, including _____ % overhead and contingencies.
\$ By G.E. _____
- (5) Cost of work done by Consultants either for Architect Engineers or for G. E. Design Division.
By A.E. \$ _____
ENGINEERING & DESIGN COST _____

PROJECT COST ESTIMATE

Hanford Works
Richland, Washington

B. CONSTRUCTION COST ESTIMATE:

Description	Material (a)	Labor	Total
(1) Temporary Construction Facilities and Buildings if provided solely for this project.	\$ _____	\$ _____	\$ By G.E.
(2) Preparation of site.	_____	_____	By G.E.
(b) (3) For structure or project structures (state No. & Name including book value of transferred capital items (c))	_____	_____	By A.E.
Structure	_____	_____	By A.E.
Equipment	_____	_____	By A.E.
(4) Total Cost of structure or project structures.	_____	_____	By A.E.
(5) Utilities such as light, power, steam, sanitary facilities, roads, walkways, etc., outside of buildings.	_____	_____	By G.E.
(6) Landscaping	_____	_____	By A.E.
(7) Heavy Construction Equipment charges for Items (1) to (6) inclusive.	_____	_____	A.E. & G.E.
(8) Total Items (1) to (7) Direct Labor & Material Cost	_____	_____	By A.E.
(9) Construction Overhead _____% of Item (8)	_____	_____	_____
(10) Subtotal	_____	_____	By A.E.
(11) Contingencies _____% of Item (8)	_____	_____	By A.E.
(12) Direct Construction Cost	_____	_____	By A.E.
(13) Estimated Contractor's Fee or profit _____% of Item (12)	_____	_____	By G.E.
(14) Total Estimated Contract Price	_____	_____	By G.E.
(15) Engineering Field Supervision including 10% contingencies	_____	_____	By G.E.
(16) Preliminary "start up" operation including 20% contingencies	_____	_____	By G.E.
(17) G. E. Co. Purchased & Installed Equipment (Such as Technical & Research Equipment (Excluding furniture))	_____	_____	By G.E.
(18) Subtotal	_____	_____	By G.E.
(19) General Overhead _____% of Item (18)	_____	_____	By G.E.
(20) Subtotal	_____	_____	By G.E.
(21) Distribution of Operating Cost of General Project Temporary Facilities _____% of Item (20)	_____	_____	By G.E.
(22) CONSTRUCTION COST	_____	_____	By G.E.

A. Engineering & Design Cost (Item A-6)

B. Construction Cost (Item B-22)

TOTAL PROJECT COST

By G.E.

- (a) Includes materials to be provided by General Electric in the amount of \$ _____
- (b) If more than one structure is involved in a project furnish a detail sheet listing all buildings or structures with costs.
- (c) Includes \$ _____, estimated book value of transferred capital items (Buildings, Materials, and or equipment.)

GENERAL ELECTRIC COMPANY
Nucleonics Department

PROJECT COST ESTIMATE

**Hanford Works
Richland, Washington**

**COST OF CONTRACTOR'S WORK ARRANGED IN ACCORDANCE WITH COMPLEXITY OF WORK
SPECIAL BREAKDOWN OF ITEM (10) EXCLUSIVE OF MATERIALS PURCHASED BY G. E. C.
(Footnotes (a) and (c) Form 7.29.2, Construction Cost Estimate)**

COMPLEXITY CLASSIFICATIONS:

- A. Manufacturing plants involving continuous closed processes or other complicated operations requiring a high degree of design layout or process control; laboratories or industrial units especially designed for handling radio-active conditions.**
- B. Normal manufacturing process and assembly operations such as ore dressing, metal working plants, and simple processing plants; also power plants, water treatment plants, sewage disposal plants and hospitals.**
- C. Permanent administrative and general service buildings, permanent housing, roads, railroads, gradings, sewers, storm drains, and water distribution systems.**
- D. Construction Camps and facilities and other construction of a temporary nature.**

GENERAL CONTRACTOR			ELECTRICAL CONTRACTOR			PIPING CONTRACTOR			VENTILATION CONTRACTOR			
	MATERIAL BY CONTRACTOR	LABOR	TOTAL	MATERIAL BY CONTRACTOR	LABOR	TOTAL	MATERIAL BY CONTRACTOR	LABOR	TOTAL	MATERIAL BY CONTRACTOR	LABOR	TOTAL
A.	A. E. is to fill in each column across for this Item "A"											
E.	A. E. is to fill in each column across this Item "E"											
C.	A. E. is to fill in each column across this Item "C"											
r	A. E. is to fill in each column across this Item "B"											

1162

WORK AUTHORITY
January 21, 1949

PROCEDURE COVERING INSTITUTION AND EXECUTION OF WORK INVOLVING
STUDIES AND INVESTIGATIONS, DESIGN AND CONSTRUCTION DIVISIONS

SUPPLEMENT NO. 1
TO PM-1

1. Please refer to Work Authority of same subject dated January 1, 1948, PM-1 and note the following information:
2. All types of projects are modified into two groups:
 - a. Major projects
 - b. Minor projects
3. MAJOR PROJECTS:

Major projects are those for which a Project Proposal has been prepared, has received approval by the Appropriations and Budget Committee, and a Directive from the Atomic Energy Commission. (These items are in excess of \$20,000.)
4. MINOR PROJECTS:

Minor projects are projects for which no Project Proposal is required. The expenditures for minor projects are limited to \$20,000. Expenditures are segregated as follows:

 - a. Less than \$5,000 - authority may be transferred for such expenditures to certain individuals.
 - b. \$5,000 - \$20,000 - requires Appropriations and Budget Committee and Atomic Energy Commission approval.
5. All requests for authorization to cover Minor projects are to be accompanied by a cost estimate, presented in the same manner as the cost estimate in Project Proposals for Major projects.
6. All Major and Minor projects will be initiated by either a Type A or Type B Work Authority signed by the Manager, Design & Construction Divisions.
7. A copy of this memorandum shall be construed as an authority to do the work as outlined above.

Frank R. Creedon, Manager
Design & Construction Divisions

**PROCEDURE COVERING INSTITUTION AND EXECUTION
OF WORK INVOLVING STUDIES AND INVESTIGATIONS,
DESIGN AND CONSTRUCTION**

**CONSTRUCTION PROJECT MANAGER
MEMORANDUM NO. 1**

JANUARY 1, 1948

**PROCEDURE COVERING INSTITUTION AND EXECUTION
OF WORK INVOLVING STUDIES AND INVESTIGATIONS,
DESIGN AND CONSTRUCTION**

**CONSTRUCTION PROJECT MANAGER
MEMORANDUM NO. 1**

1. Effective January 1, 1948, no new work will be started by the Design Engineering or Construction Departments until a Work Authority signed by the Construction Project Manager is received. In turn the Construction Project Manager will not issue a Work Authority until a Directive authorizing same signed by the Works Manager is received.

**NO WORK TO BE
STARTED WITH-
OUT WORK AUTH-
ORITY**

2. There will be two types of Work Authority:

**APPROVAL BY
WORKS MANAGER
REQUIRED**

Type A - Work Authority for studies, investigations and reports for improvements, relocations and additions originating from various sources within the Hanford Works.

**TWO TYPES OF
WORK AUTHORITY**

Type B - Work Authority for complete design or construction or both.

3. The following paragraphs, numbers 4 to 14, inclusive, deal exclusively with Type A Work Authority.

4. Requests for TYPE A WORK AUTHORITIES shall be addressed to the Works Manager. They will be identified according to source and numbered consecutively as follows:

**TYPE A WORK
AUTHORITIES**

Requested by the Manager Hanford Directed Operations
AEC, marked AEC-1, etc.

**ORIGINS OF WORK
AUTHORITIES**

Requested by General Electric Company Operation, marked GEO-1, etc.

Requested by General Electric Company Technical, marked GET-1, etc.

Requested by General Electric Company Service, marked GES-1, etc.

Requested by General Electric Company Design and Construction, marked GED-1, etc.

Requested by General Electric Company Works Engineer, marked GEW-1, etc.

Requested by General Electric Company Medical Department Superintendent, marked GEM-1, etc.

5. Requests must state clearly the purpose of the proposed study, investigation, etc. and be accompanied by a complete description, all available data and basic information together with estimated cost and time required.

PURPOSE OF STUDY

6. Following receipt of a request, the Works Manager shall, if he determines the study, investigation, etc. merits performance, issue a Directive to the Construction Project Manager authorizing its performance, together with a copy of all papers constituting the request. The Directive will designate the person selected by the Works Manager to be the Contact Engineer; i. e., a person who is fully familiar with the proposed study, investigation, etc. and who will furnish additional data or interpret the original Directive as required by the Design Engineering Department.

DIRECTIVE FROM
WORKS MANAGER
TO CONSTRUCTION
PROJECT MANAGER

CONTACT ENGINEER'S
ROOM & PHONE NO.

7. Upon receipt of a Directive from the Works Manager, the Construction Project Manager will issue an appropriate Work Authority, together with a copy of all papers which accompanied the Work Manager's Directive and name the Superintendent, Assistant Superintendent, Project Engineer or outside Engineering concern selected by Design Engineering Manager to be responsible for the performance of the study, investigation, etc.

TYPE A WORK
AUTHORITY TO
COVER ALL AVAIL-
ABLE INFORMATION

8. No change in scope of work as described in the Directive received from the Works Manager shall be made unless authorized by the Construction Project Manager, who will issue same only upon receipt of a corresponding supplemental Directive from the Works Manager, giving a description of the revised scope and the revised estimated time and cost.

RESPONSIBILITY
OF ENGINEER IN
CHARGE

9. The distribution of Work Authorities will be as follows:

NO CHANGE OF
SCOPE PERMITTED
WITHOUT APPROV-
AL BY WORKS MANA-
GER AND SUPPLE-
MENTARY WORK
AUTHORITY

Carleton Shugg, Manager Hanford Directed Operations (2)

DISTRIBUTION OF
TYPE A WORK
AUTHORITY

W. P. Cornelius, Chief Construction Division

R. S. Neblett, Administrator Nucleonics Projects,
General Electric Co., Schenectady, N.Y.

D. H. Lauder, Works Manager

G. G. Lall, Assistant Works Manager

*C. N. Gross, Production Superintendent

*A. B. Greninger, Technical Department Superintendent

*E. L. Richmond, Service Department Superintendent

*W. P. Overbeck, Works Engineer

*W. D. Norwood, M. D., Medical Department Superintendent

F.E. Baker, Works Accountant

F. W. Wilson, Design Engineering Manager

*C. O. Henning, Supt. Design Engineering Department

*R. E. Burroughs, Supt. Design Engineering Department

*O. H. Pilkey, Supt. Design Engineering Department

*A. J. Delong, Asst. Supt. Design Engineering Department

**DISTRIBUTION OF
TYPE A WORK
AUTHORITY (CONT.)**

10. Persons marked with asterisk receive copies of the Work Authorities when the scope of the investigation warrants.

11. If any of the issued Work Authorities do not meet with the approval of the Manager Hanford Directed Operations, it is expected that a Stop Order will be received promptly through the Works Manager.

**STOP ORDERS
BY MANAGER,
HANFORD DI-
RECTED OPERA-
TIONS**

12. Upon completion of the study, investigation, etc., the Design Engineering Manager will submit the results to the Construction Project Manager, who in turn will submit the complete report together with his recommendations to the Works Manager.

**TRANSMITTAL OF
REPORT ON
STUDY, INVESTI-
GATION BY
CONSTRUCTION
PROJECT MANAGER
TO WORKS MANA-
GER**

13. If the Works Manager approves the report and determines that design or construction or both shall be undertaken, he will so indicate in a letter returning the report with revisions, if any, to the Construction Project Manager for the preparation of an authorization request to be submitted by the Works Manager to the Manager, Hanford Directed Operations.

**WHEN APPROVED
BY WORKS MANA-
GER AUTHORIZA-
TION REQUEST**

**TRANSMITTAL OF
AUTHORIZATION
REQUEST BY CON-
STRUCTION PROJ-
ECT MANAGER TO
WORKS MANAGER**

14. This concludes the steps to be taken in connection with Type A Work Authority. Any further action comes under Type B Work Authority described in the pages following.

15. The remaining paragraphs, numbers 16 to 32, inclusive, deal exclusively with Type B Work Authority.

16. THE TYPE B WORK AUTHORITY will be for complete design or construction or both, approved by the Manager, Hanford Directed Operations for which a Directive has been received from the Works Manager.

**TYPE B WORK
AUTHORITIES**

17. The basic (first issue) Work Authority issued by the Construction Project Manager will fully describe the scope of the project based on the information furnished from the various sources as follows:

**BASIC WORK
AUTHORITY**

(a) From the originator through the Works Manager:

Name of the Contact Engineer

All pertinent data

Process flow sheets

Operation requirements

Proposed Location

Layout and arrangement suggestion

(b) From the Construction Project Manager:

The manner in which the Design Engineering and Construction work is to be performed.

**MANNER IN WHICH
WORK WILL BE
DONE**

(c) From the Design Engineering Department:

Date of first issue Material and Equipment list, showing the principal equipment and also the equipment and material difficult to procure.

**MATERIAL AND
EQUIPMENT LIST**

Date of first issue of List of Drawings and date each drawing will be distributed.

**LIST OF DRAW-
INGS WITH
ISSUING DATES**

18. The Contact Engineer appointed by the Works ~~Manager~~ will represent both the Operating and Technical departments in the interpretation of the furnished data and elucidation of the operation requirements, and obtain approvals by the Technical and Operating Departments considered necessary in the course of the work. Location of his office and phone will be given.

**CONTACT
ENGINEER**

19. The Contact Engineer will be permitted to suggest alterations made necessary by Technical or Operating conditions. If the suggested changes alter the scope and the cost of the project, no further work so affected shall be performed until a written request approved by the Works Manager has been received by the Construction Project Manager and a supplementary Work Authority has been issued.

**MINOR
ALTERATION**

**MAJOR
ALTERATION**

**SUPPLEMENTARY
WORK AUTHORITY**

20. The Design Engineering Manager will designate a Superintendent to have full responsibility for the design, specifications, initiation of the preparations of contracts, drawings, sketches, requisitions and work performed by other Departments or outside Engineering concerns. Under his directions the material and equipment lists and drawing schedules shall be prepared. He will be charged with obtaining approval from the Chief of Construction, Hanford Directed Operations, of all basic drawings which shall consist of the following:

**SUPERINTENDENT
OF DESIGN ENGIN-
EERING DEPART-
MENT RESPONSIB-
ILITY**

**PREPARATION OF
MATERIAL AND
EQUIPMENT LISTS,
DRAWING SCHED-
ULES**

**APPROVAL OF
CHIEF OF CON-
STRUCTION ON
ALL BASIC
DRAWINGS**

- (1) Process Flow Sheet
- (2) Engineering Flow Sheet

- (3) Plot Plan Showing Location of all Buildings with Area Key Plan
- (4) General Arrangement Drawings, Plans and Elevations for all Buildings Showing Locations of Principal Equipment.
- (5) General Building Specifications
- (6) Utility Layout Drawings with pertinent data

21. These drawings are to amplify the description of the work stated in the Directive and the papers attached thereto as well as the basic Work Authority. They are to constitute the graphical presentation of the scope of the work.

22. The assigned Superintendent in charge of Design will advise the Construction Project Manager's Office by copy of letter transmitting the above described drawings to Chief of Construction, Hanford Directed Operations, for his approval. Upon receipt of approval, the Superintendent in charge of Design, will transmit one set of prints of the approved drawings to the office of the Construction Project Manager.

23. All other prints of drawings issued thereafter shall be distributed to the field forces and other interested parties, by the Superintendent of Design in accordance with the distribution schedule prepared by the Construction Project Manager's office. Whenever prints of new revised drawings are issued for the first time to the field, etc., a corresponding set of prints shall be sent to the Chief of Construction, Hanford Directed Operations, for record. The Construction Project

LETTER OF
TRANSMITTAL
FOR DRAWINGS
TO BE APPROVED
BY AEC

TRANSMITTAL OF
APPROVED DRAW-
INGS TO CONSTRUC-
TION PROJECT
MANAGER

ALL OTHER
PRINTS OF
DRAWINGS DIS-
TRIBUTED BY
SUPERINTENDENT
OF DESIGN

PRINTS FOR
THE CONSTRUC-
TION FORCES

PRINTS TO CHIEF
OF CONSTRUCTION

Manager's Office will be advised by copy of the letter of transmittal to the field forces and to the Chief of Construction, Hanford Directed Operation. All interested parties will be advised of such distributions by memo from the Construction Project Manager.

MEMO OF DISTRIBUTION TO ALL INTERESTED PARTIES

24. All drawings distributed in accordance with paragraph next above or distributed for field or procurement purposes will be stamped "APPROVED FOR CONSTRUCTION" by the Project Engineer in the space opposite the appropriate revision line in the revision block on the tracing.

25. All of the above procedure applies also to design work performed by outside Design Engineering firms.

26. The field forces which include construction contractors and their subs, will not be permitted to make changes which are not shown on issued drawings. Correction of interferences and minor shifting, or relocation of equipment may be approved by the Assistant Superintendent of Field Construction, General Electric Company, or his designate, involved. If such field changes are of considerable magnitude, the Assistant Superintendent of Field Construction, General Electric Company, must first obtain approval from the Superintendent of Design who will issue revised prints of the drawings involved after having made the required changes to them or he may issue a written authority to the Assistant Superintendent of Field Construction involved to make such changes. If the work required for such changes is of

PERMISSION TO MAKE CHANGES

INTERFERENCES OR RELOCATION OF EQUIPMENT

FIELD CHANGES OF CONSIDERABLE MAGNITUDE

major magnitude, the Superintendent of Design or Assistant Superintendent of Field Construction shall immediately advise the Office of the Construction Project Manager in writing of such changes and give the estimated approximate cost in both time and money.

27. All field changes must be transmitted by the Assistant Superintendent of Field Construction involved to the Superintendent of Design Engineering so that all affected tracings can be brought up to date. On completion of the project all tracings must show the entire plant, including details, "AS BUILT".

**"AS BUILT"
TRACINGS**

28. No changes in scope of the work required for technical reasons and operation will be permitted unless cleared through and submitted by the Contact Engineer and approved by the Works Manager. All other changes not affected by technical or operation reasons originated by the Design Engineering Department will be cleared through the Design Engineering Department through the Construction Project Manager with the Works Manager. If changes in scope are extremely urgent the Construction Project Manager will obtain approval by phone from the Works Manager and Design and Construction Departments will be advised by the Construction Project Manager to proceed with the changes. The appropriate engineer, either Contact or Design, will immediately confirm such requests in writing and the confirming supplementary Work Authority will be issued the Design and Construction Departments and all other interested parties.

**CLEARANCE OF
MECHANICS OF
SCOPE THROUGH
CONTACT ENGINEER
AND APPROVED
BY WORKS MANAGER**

**IN URGENT CASES
CLEARED BY
CONSTRUCTION
PROJECT MANAGER
BY PHONE**

**CONFIRMATORY
WORK AUTHORITY**

29. It may occur that after the project has been authorized and design or construction or both have progressed considerably, additional changes in the process or a new improved process is developed. If such developments are to be incorporated in the project underway, it is expected that the Construction Project Manager will be notified promptly. He will immediately issue a Stop Order on the work affected. After the nature and full extent of the changes have been determined, a supplemental Work Authority will be issued by the Construction Project Manager after receipt of a supplemental Directive signed by the Works Manager.

**SUPPLEMENTAL
WORK AUTHORITY
AFTER SUPPLE-
MENTAL DIRECT-
IVE FROM WORKS
MANAGER**

30. It is understood that at any time the Manager, Hanford Directed Operations, may request the Works Manager to alter, revise or cancel any issued Work Authority.

**MANAGER, HAN-
FORD DIRECTED
OPERATIONS MAY
REQUEST WORKS
MANAGER TO
ALTER OR CANCEL
ANY ISSUED WORK
AUTHORITY**

31. It is urgently requested that Operating, Technical, Design and Construction personnel refrain from discussing changes, alterations, etc., in the presence of erecting forces. Such discussions when overheard by the erecting forces have a demoralizing effect and lowers their production.

32. Depending on the subject matters or the scope of work described in the Work Authority the distribution will be abridged or extended.

The extended distribution will be as follows:

1. Carleton Shugg, Manager, Hanford Directed Operations (2)
2. W. P. Cornelius, Chief, Construction Division

3. R. S. Neblett, Administrator, Nucleonics Project, General Electric Co., Schenectady, N. Y.
4. D. H. Lauder, Works Manager
5. G. G. Lail, Assistant Works Manager
6. C. N. Gross, Production Superintendent
7. A. B. Greninger, Technical Department Superintendent
8. W. P. Overbeck, Works Engineer
9. W. D. Norwood, M. D., Medical Department Superintendent
10. F. E. Baker, Works Accountant
11. C. D. Barker, Asst. Construction Project Manager, Labor Relations.
12. F. W. Wilson, Design Engineering Manager
13. R. E. Burroughs, Superintendent Design Engineering
14. O. H. Pilkey, Superintendent Design Engineering
15. C. O. Henning, Superintendent Design Engineering
16. A. J. Delong, Asst. Superintendent Design Engineering
17. G. E. Hotaling, Purchasing Agent, Construction
18. R. H. Burrell, Material Expediting, Construction
19. T. G. LaFollette, Construction Department
20. H. E. Keel, Construction Department
21. W. L. Sapper, Construction Department
22. V. D. Nixon, Construction Department
23. B. Bowelle, Construction Department

- 24. A. G. Cervi, Construction Department
- 25. J. H. White, Construction Department
- 26. L. O. Hasselblad, Construction Department
- 27. Outside Engineering Firms Involved
- 28. Construction Contractors Involved
- 29. Construction Subcontractors Involved

Frank R. Creedon
CONSTRUCTION PROJECT MANAGER

January 1, 1948