HW-12598

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13. - 15. F. C. Schlemmer, Atomic Energy Commission
16. Pink Copy
17. Yellow Copy
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19. 300 File
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Richland, Washington
March 1, 1949

MANUFACTURING DIVISIONS ANNUAL REPORT, 1948

MANUFACTURING DIVISIONS

GENERAL ELECTRIC COMPANY

HANFORD WORKS

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MANUFACTURING DIVISIONS

ANNUAL REPORT - 1948

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HW-12598

March 1, 1949.

P DIVISION

ANNUAL REPORT - YEAR 1948

This report covers in summary form the major activities of the P Division during the year 1948.

I. PERSONNEL

As of January 1, 1948 the P Division force consisted of 257 employees; this number had increased to 374 by the end of the year. Personnel was distributed as indicated in the table below:

January 1, 1948	100 Areas	300 Area	700 Area	Total
Exempt	33	16	5	54
Non Exempt	82	118	3	203
Total	115	134	8	257

December 31, 1948	100 Areas	300 Area	700 Area	Total
Exempt	37	14	10*	61
Non Exempt	150**	160	3	313
Total	187	174	13	374

* Includes six men assigned to construction liaison group.
** Includes seven men assigned to acceptance tests on DR Pile.

The increase in the 700 Area was necessary to (a) meet increased production requirements of canned slugs (18 men); (b) to man the newly completed melting and casting facilities (12 men); and (c) provide personnel in training for purpose of releasing men to the 100 Areas for the 100-H crew (10 men). The increase in the 100 Areas represents manpower necessary for the activation of 100-B Area (42 men) and a compliment of men in training for the H Area pile to be completed in 1949, (30 men).

The personnel in the P Division worked on a planned overtime (48 hour week) schedule for a part of the year. The 100 Areas went on the 48 hour schedule in June and were working this schedule at year's end; the 300 Area was on the overtime schedule from May until December.

II. OPERATING EXPERIENCE

General

The D and F Piles were operated throughout the period at a nominal power level of 275 MW; the B pile was activated July 1, 1948 and operated at 275 MW for the balance of the year. The over-all "time operated" efficiency for the piles was 81.3%.

At the beginning of the year the 300 Area production rate was approximately 70 tons of acceptable canned slugs per month; this rate

was doubled by the end of the period. The increased production was necessary to meet the 100 Areas' requirements and to provide a stock pile of material for initial loading of two new piles.

100 Areas

The principle operating problems resulted from: (a) graphite expansion; (b) Van Stone flange corrosion; (c) ruptured process tubes; and (d) blistered and ruptured slugs.

The expansion of the graphite moderator continued to be a major operating problem. (See summary of this effect in Document No. HW-10152). Two major operating changed were made to lessen the adverse effects of the expansion:

(a) On January 17, 1948, addition of CO_2 to the pile atmosphere was experimentally begun at D pile. The anticipated results were realized in elevation of graphite temperatures, reactivity gains, and changes in gas processing building operation. The concentration of CO_2 was increased to 25% in March. By mid-year it appeared that the upward growth of the graphite in D pile had tapered off. However, it was difficult to determine whether this condition had resulted from the CO_2 additions or from a "saturation" effect of accumulated exposure. In an effort to clarify this situation and at the same time to determine whether actual shrinkage of the graphite was possible under the elevated temperatures, the concentration of CO_2 in the D pile atmosphere was raised to 40%, and the introduction of CO_2 into the B and F pile atmospheres was begun. At year end, B pile was operating with 10% CO_2, D with 40%, and F with 25%. The expansion has virtually ceased at D pile; results from B and F piles will not be available for some time.

(b) The continued expansion of the graphite increased the amount of bowing of the process tubes and there was some indication that 8" uranium slugs might eventually fail to pass the point of maximum bending at the inner entrance of the gun barrels. In order to avoid this possibility, the charging of 4" uranium slugs became standard in all piles on February 1, 1948.

One new effect of graphite growth was observed during the year. It was noted that a measurable opening was developing at the junction of the far side and top biological shields at D and F piles caused by the upward and outward expansion of the moderator. This movement permitted a radiation beam to emerge from the pile. The character and direction of the beam was such that no immediate remedial action was necessary.

The Van Stone flange corrosion problem was under study throughout the period. A program for repair of these flanges was completed in March, 1948, (See "Mechanical Experience" below). Most of the development work done during the period was aimed at providing a sacrificial agent

which would corrode preferentially in place of the aluminum flange. Among the materials tested were cast aluminum and galvanized stainless steel nozzles; magnesium zinc, and other gasket materials; and magnesium spacer pieces for insertion in the tube. At the end of the year it appeared that an aluminum nozzle for the rear face and a galvanized nozzle for the front face represented the best solution of the problem.

Late in the year, two ruptured process tubes were encountered, one at B Area and one at F Area. In both cases the rupture had resulted from chemical action coincident with the jacket failure of a SR-15 (lithium fluride) slug. The ruptures were located and tube replacements effected.

During the early part of the year, stuck tubes resulting from distortion of the slugs were a serious problem. In February, Tube No. 2464-D stuck so tightly that specialized equipment and techniques were necessary to free it. In May, Tubes No. 0865-F and 1165-F required the same action. A total of 21 other tubes of the same type material required specialized discharge techniques in varying degrees throughout the period. The problem of slug distortion was attacked primarily through fabrication developments in the 300 Area.

In June, high effluent water readings at 100-F were found to be the result of a ruptured slug. Details of the work done in removing this piece and returning the pile to normal operating condition may be found in Document No. HW-10284. In November, a slug rupture occurred in Tube No. 0569-B. In this case the rupture was detected in its early stages and normal operation was resumed without any significant loss of production.

In line with the work begun in 1947, the development and testing of equipment to permit segmented discharge was continued. Several methods and models were tested and a satisfactory design was established following which the necessary equipment was fabricated so that the program could be instituted, if desired, with a minimum of lost time.

Considerable work was done during the year in an effort to eliminate the discharge to the Columbia River of radioactive algae growing in the 107 retention basins. The basins in all three pile areas were drained and cleaned, and the standard operating procedure was revised to permit use of only one-half of the basin at a time. This procedure permits draining of half of the basin at regular periods to inhibit algae growth. Chlorination of the basins was adopted as a means of killing the algae.

300 Area

The Melt Plant was completed in February and operation of the facility was begun in that month. The plant operated on a three shift basis throughout most of the period to work off a backlog of solid scrap and to melt and cast the scrap resulting from machining of alpha rolled rods.

The canning operation underwent several changes during the year. Investigations made during 1947 had indicated that the distortion of irradiated slugs appeared to result from course grain formation developed in the metal during processing in the gamma phase. Consequently, an active program of alpha phase processing was initiated early in 1948 which involved alpha phase rolling and lead dip canning. In April the alpha-rolled, lead-dipped slugs were established as standard for all pile charging but in May it was found that such material underwent significant dimensional changes under irradiation. The canning process was immediately returned to the triple dip method while continuing the use of alpha rolled rods. A process change involving increased slug agitation in the bronze bath, together with higher bronze bath temperatures, was made to insure complete transformation of the metal to the beta phase, since this type material had proved to be the most satisfactory yet developed.

Continuing the work begun in 1947, repeated attempts were made to extrude uranium in the alpha phase. In only one instance was it possible to successfully extrude a billet; this result could not be duplicated in later runs. Consequently, the project was abandoned and at year's end study is in progress to determine the feasibility of subjecting gamma metal to induction heating to achieve the desired grain structure.

III. MECHANICAL EXPERIENCE

100 Areas

A general program of repairs to the Van Stone flanges was completed in March. The results are tabulated below:

	B Pile	D Pile	F Pile
Front Face -- Percent Repaired:	16	8	10
Rear Face -- Percent Repaired:	16	8	54

Considerable work was done during the year to combat the adverse effects of the graphite expansion. The major items were:

(a) Vertical Safety Rods. The program of realignment of rod guides and buffing of rods was continued. In some cases bowed and/or cracked rod tips were replaced. Late in the year it was necessary to shorten the rod guide on #27 rod at F Pile to eliminate wear on the aluminum thimble caused by distortion of the rod.

(b) The brick wall between the top of the pile and the discharge area was removed at all three pile areas to permit unrestricted upward movement of the pile shield. The wall was replaced with a canvas curtain to retain the proper ventilation balance. The cork filler which sealed the discharge area on the sides of the piles was removed to permit unrestricted outward motion of the side shields.

(c) Neoprene seals were replaced on all piles as necessary to prevent rupture of the seal due to shield movement.

In April, during a routine inspection of the vertical safety rods, considerable quantities of iron dust were found in the bottom of the aluminum thimbles. In some of the most serious cases this deposit prevented the rod from fully entering the pile by as much as 2½ inches. By July, all of this dust had been satisfactorily removed.

In January, design work was begun on a replacement effluent sewer for the F Pile. This replacement was necessary because the thermal stresses induced in the original concrete line had broken it in several places and no satisfactory repairs could be made. Construction was begun in April and the completed steel replacement sewer was placed in service in September.

IV. NOTEWORTHY IMPROVEMENTS

During the year a program of increasing the concentration of product in pile charges to effect economics in virgin metal requirements was begun. By the end of the year test tonnages with concentrations approaching 250 MWD/Ton were being discharged; it is expected that the goal of 400 MWD/Ton will be reached by the summer of 1949. See document GEH-13.751, 12-10-48 Schlemmer to Muir for further details.

V. DEVELOPMENT PROGRAM

Current Plants

Several programs, aimed at prolonging the life of or increasing the operating efficiency of the present piles, were studied. Among the more important were:

(a) Vertical Safety Rods. Replacement of present equipment with stainless steel rods and guides is contemplated. This is expected to eliminate rusting of the rods and will guarantee satisfactory operation of the third safety device.

(b) CO_2 additions. Concentrations above the present 25% are contemplated to retard, or stop, graphite expansion at F Pile.

(c) Poison Splines. Cadmium coated tapes for emergency insertion in the process tubes to augment the present control system are being developed as a means of permitting pile operation at levels higher than the current 275 MW.

New Facilities

As of the end of the year, two new pile areas are under construction. The DR Pile, which is intended as a replacement for D Pile, is nearly complete. The 100-H Area, which is a completely new facility very similar to the present pile areas is scheduled for completion in the summer of 1949.

In the 300 Areas, studies are being made of the feasibility of providing rolling mill facilities at Hanford Works.

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VI. SPECIAL HAZARDS

The special hazards problems in the 100 Areas remain fundamentally the same as outlined in the previous report (Document No. HW-10151). In general, contamination problems continued to increase and an extension of the use of protective clothing became necessary.

In the 300 Area, several new special hazards problems arose in connection with the operation of the melting and casting plant. The airborne contamination resulting from this process necessitated the use of full protective equipment including respirators and assault masks. At the year's end, a complete study of the ventilation problem in this plant is in progress.

In October, the earth wall of the contaminated liquid waste retention pond in the 300 Area failed and approximately 16,000,000 gallons of radioactive waste water ran into the river. A new pond was constructed and placed in use.

VII. SAFETY

During the year, two major injuries occurred in the P Division. Both were in the 300 Area and resulted from burns suffered in handling process materials.

E. P. Lee

March 9, 1949

S DIVISION ANNUAL REPORT

1948

I PERSONNEL

The number of employees on the S Division payroll at the beginning and end of the year were as follows:

	December 31, 1947	December 31, 1948
Exempt Roll	59	59
Non-Exempt Roll (Operators	239	241
Non-Exempt Roll (Clerical	2	13

As indicated by the tabulation, there was essentially no increase in the number of persons employes by the S Division during the year with the exception of the absorption of fourteen clerical employees formerly reporting to the Accounting Division.

Four exempt roll employees were loaned to the Technical Divisions during the year for work on the 234-5 Project, bringing the total S Division exempt roll employees assigned to this work to five. At year end, two exempt roll employees were assigned to full time work as consultants on the Redox construction program.

II OPERATIONAL EXPERIENCE

Five hundred and thirty-five batches were started in the Canyon Buildings and five hundred and twenty-five batches were processed through the Concentration Buildings and the Isolation Building. The average purity for the completed batches was 98.8 percent and the average waste losses averaged 2.6 percent per batch. Production commitments were met on schedule, and no serious process difficulties were encountered.

Reduction in effective time cycles through improvement in operating efficiencies and through the use of spare process equipment permitted the reduction in the over-all time cycle per batch from twenty-four to sixteen hours. Through these improvements the S Division was able to handle the increased 100 Area production resulting from the activation of the 100-B reactor with no significant increase in total plutonium waste losses.

Through the medium of Production Test 221-T-13, Document HW-9297, a 30 percent volume reduction at the end of the extraction step was effected with

no adverse effect on process waste losses or on decontamination. The savings from this improvement in waste storage and essential material costs per year will approximate $750,000, assuming a three pile level of operation.

As a result of improved operating efficiencies, the operation of the Isolation Building was placed on a five-day or fifteen shifts per week basis in August. The manpower savings realized by the S Division and all servicing divisions assigned to this operation approximate $70,000 per year.

Approximately 3,000,000 gallons of second cycle waste supernate were jetted from the 241-B and 241-T waste storage tanks to the underground disposal cribs during the year. The underground sampling program being carried on by the H.I. Division indicates that the activity from this material is being retained by the soil near the cribs and that no activity has approached the water table under the cribs. This subject is covered in detail in Document HW-9671, R. E. Brown and H. G. Ruppert, issued 5-3-48, "Underground Waste Disposal at Hanford".

At T Plant, construction of the 241-TX waste tank farm (Project C-163) which consists of eighteen 758,000 gallon tanks was essentially complete as were the tie lines, making this facility available to receive wastes from the 221-T Canyon. Considerable work remains to be done, however, before the new tie line system can be tied into U Plant and the 241-T tank farm. At B Plant, the construction of the 241-BY waste tank farm (twelve 758,000 gallon tanks, Project C-271) was progressing satisfactorily; the bottoms of all twelve tanks being essentially complete. In connection with tank farm construction it is noteworthy that design improvements were incorporated in both the TX and BY Projects which made it possible to increase their storage volume by more than 42% and with only an 11% increase in cost.

The responsibility for the operation and maintenance of the Meteorological facilities was transferred from the S Division to the Health Instrument Division on May 1, 1948.

III MECHANICAL EXPERIENCE

Mechanical performance of S Division processing equipment was satisfactory. Major mechanical failures are itemized below. Replacement was effected in all cases by standard remote control methods with no above tolerance exposure to personnel. Repair of this equipment was not possible because of excessive radiation levels.

S Division

(a) Ten 15 H.P. and two 5 H.P. agitator assemblies failed in the 221-B and 221-T Canyon Buildings. In most cases the exact cause of the failure could not be determined. The average accumulated operating hours on these machines, however, exceeded the expectancy stipulated by the manufacturer (Philadelphia Gear Works) by a substantial amount. Possible methods of increasing the life of the machine are under study.

(b) The pot coil in the Section 4 dissolver at B Plant failed, necessitating its replacement.

(c) A leaking flange on a case spray line of the 8-2 extraction centrifuge at T Plant necessitated replacement of the machine.

(d) Development of a leak in the pipe trench on the 8-4 extraction cake solution tank to 12-7 oxidation tank line at the 90° bend in the section of pipe through concrete at Section 8, made it necessary to abandon the line and modify the piping in Section 12 to permit solution to be transferred from the 8-4 to 12-7 tank via the original 8-4 to 12-6 tank jet line.

(e) Ten jet assemblies were replaced in the two plants because of gasket failures. Development of methods for remote gasket replacements was initiated early in 1948 but no feasible solution was available at year end.

(f) The creeping of steam piping through concrete to the cells in the T and B Canyon Buildings was recognized as a serious problem. The flanges on these pipes, originally positioned six inches from the pipe gallery wall, have receded toward the wall in varying degrees. In a few cases, the concrete must now be chipped away in order to remove the flange studs. At the other end of the pipe the tendency to creep out of the wall into the cell is evident. There are two cases where the pipe has moved approximately two inches into the cell despite the anchorage provided at this end. A preliminary engineering study was initiated and completed during 1948; the findings are contained in Document E.R. 2368, Recommendation Report No. 116, issued 10-12-48. This report recommends the use of compression sleeves to resist further creeping or, if these devices should not prove feasible, the installation of flexible tubing through the present steam piping. At the close of the year plans were in effect to install a limited number of compression sleeves to determine their effectiveness.

(g) A large percentage of precipitator tank cooling jackets in the Canyon Buildings have developed leaks. While this has not resulted in serious loss of cooling or heating efficiency, the volume of water leaking into the cell drainage system presents a serious waste disposal problem and complicates both the detection and recovery of product in case of product solution leaks. Improved jacket designs have been developed and the replacement of several precipitator tanks is planned.

At B Plant, Project C-262, calling for the installation of the necessary facilities for the preparation of bismuth subnitrate from bismuth metal, was completed at a total cost of $11,700, or $11,300 less than originally estimated. All bismuth subnitrate used in the T and B Plants is now being prepared from the metal. Estimated savings approximate $30,000 per year for both plants operating at a three pile level of production.

IV FUTURE PROGRAM

A. Current Plants

Attention during the coming year will be focused upon the increase in capacity of the T and B Plants through the operation of existing spare equipment with possible minor equipment additions. Study will also be given to possible further waste volume reduction in conjunction with the metal enrichment program. This work will be conducted in accordance with production test control methods. Consideration will be given to the replacement of certain of the present process vessels with smaller vessels should volume reduction prove this to be attractive. Volume reduction of wastes through the use of more concentrated sodium hydroxide used in neutralization will also be studied. Continued emphasis will be placed upon reduction of product waste losses.

B. Future Facilities

Document HW-12097, "Technical Divisions Annual Report - 1948", covers the 234-5, Redox, Metal Recovery and Rala programs in sufficient detail to indicate the progress made on each of these items during the past year. The following comments highlight the effect of these facilities upon the S Division.

234-5 Project

By the close of the year, four S Division supervisors were on loan

to the Technical Divisions to assist in the forwarding of this program. Based on a construction completion status of not over 60 percent at year-end, the S Division does not forecast operation of this facility before June 1, 1949 and then at a considerably curtailed rate in view of the normal start up problems which are expected to be encountered. The operating staff, both monthly and weekly roll, have been assembled and the S Division will be prepared to accept full responsibility for operation of Phase I of this facility as soon as the Technical Divisions have discharged their responsibility relative to process start up and training of S Division personnel.

Redox

In view of the effect that the Redox program may have upon future separations area operations, the S Division has closely followed all phases of Project C-187 since its inception. Throughout 1948, the S Division staffed the important pos. of Contact Engineer for both the Test Plant and Main Plant portions of this project. The Contact Engineer, working in close cooperation with the Design and Construction Divisions, represented all of the Technical and Manufacturing Divisions and he was given both the responsibility and authority for final design approval, thereby providing additional assurance that the Redox facilities would be constructed in accordance with operating and technical requirements and standards.

Rala

In anticipation of receiving Atomic Energy Commission approval to proceed with the design and construction of a Rala plant, the S Division made tentative plans at year-end to assign several members of its key personnel to a Rala Contact Engineering Group. Agreement has been reached between the Technical and Manufacturing Divisions that in the event such approval is received, the Manufacturing Divisions will assume primary responsibility for guidance of this program.

V SPECIAL HAZARDS

Contamination and radiation control was maintained at a high standard throughout the year with the exception of the stack gas problem. At the start of the year all information indicated that the source of the discrete active particles being discharged from the process stacks was associated with corrosion of the black iron ducts at the stack

fans. Replacement of the black iron duct work (which necessitated the replacement of the electrically driven fans) was completed during March with a marked decrease in the incidence of the larger particles. Prior to the completion of this work, however, the presence of minute active particles in the gas stream originating beyond the fans was discovered. This resulted in intensification of engineering and experimental studies resulting in the installation of CWS Type 6 filter units on all cell ventilation ducts, the installation of scrubbers in the dissolver off-gas lines and the construction of sand filters for purification of the cell ventilation air. By year-end the CWS cell filter units were found to be ineffective and had to be removed. All dissolver off-gas is being water scrubbed but with less than desired efficiency. Operation of the sand filters which were completed during October is very satisfactory; an approximate 99.8 percent efficiency in removal of activity being effected across the filters. Serious recontamination of the air following the filters, the bulk of which apparently originates in the dissolver off-gas, is under intensive study. Additional purification facilities will be installed as soon as engineering and experimental studies indicate the type of purification equipment needed.

Documents HW-11082 and HW-11529 contain a comprehensive review of the stack gas problem through October, 1948. The design details for the sand filter installations are covered in Document HW-11706, Project C-313.

VI SAFETY

The S Division completed the year with no major or sub-major injuries. As of December 31, 1948, the Division completed five successive years without a major injury, having suffered no lost time injury since start up. This major accomplishment involved the accumulation of 2,652,779 injury free exposure hours. The minor injury frequency rate for the year was 3.02 as compared to 3.19 for the year 1947.

S Division

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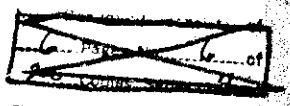
April 11, 1949

POWER DIVISION

ANNUAL REPORT - YEAR 1948



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I. PERSONNEL

On February 9, H. H. Miller, Power Superintendent, was promoted and H. F. Measley, Assistant Superintendent, was made Superintendent; J. A. Todd was appointed Assistant Superintendent.

On October 20, F. P. Britson, Chief Supervisor of the 100 Areas, was relieved of his operational duties and placed in charge of a Power Facilities Inspection Group, organized for the inspection and acceptance of the expansion program power facilities, relative to the 100 DR and H Areas.

A summary of personnel at the beginning and end of the year is as follows:

	Power Gen'l.	100	200	300	White Bluffs	100 DR & H	700 1100	Pasco Col. Camp	3000	Total
Jan. 1, 1948										
Exempt	3	53	16	0	1	-	7	1	4	85
Non-Exempt	2	231	66	12	8	-	44	23	28	414
Total	5	284	82	12	9	-	51	24	32	499
Dec. 31, 1948										
Exempt	7	55	13	1	1	4	-	-	-	81
Non-Exempt	3	278	63	16	7	0	-	-	-	367
Total	10	333	76	17	8	4	-	-	-	448

Total personnel in the Division was reduced from 499 to 448 employees during the year. This net reduction of 51 employees was the result of the transfer of divisional operating responsibility of several areas to other Divisions, streamlining of the supervisory organization, and the elimination of operating jobs where possible.

The transfer of divisional operating responsibility for the several miscellaneous Power Areas included: the transfer of the No. 1 Heating Plant in North Richland to the sub-contractor, and the assumption of operation of the North Richland water system by the Power Division, both on May 20, as a result of which, one exempt and five non-exempt employees were made available for transfer to the 100 Areas; the consolidation of the Richland and North Richland water supply systems in July, wherein three exempt employees were made available for assignment in the 100 Areas;

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and the transfer of all Power Division services for Richland, North Richland and the Pasco Depot to the Community Division on August 23, with the consequent inter-departmental transfer of 9 exempt and 59 non-exempt employees.

Concurrent with the 100 B Area re-activation on July 1, the positions of Shift Supervisor in the process water pump houses, and the 100 Areas power house day Senior Supervisors were eliminated. These changes, made possible by technological improvements in operations provided the additional supervision necessary for staffing 100 B Area on a six day work week. On August 1, two operators were promoted to Foreman in preparation for return to a five day week.

During the months of September and October, three graduate engineers were transferred from the Design and Construction Division as Supervisors in Training for Power Division future expansion.

Further reductions in supervisory jobs were made on December 27 when the position of Shift Foreman for all 100 Area Water Plants was eliminated, making these men available for training to staff 100 H Area.

At the year's end, the indicated total of 448 employees was composed of 81 exempt and 367 non-exempt. The established 40-hour week standard operating crew for all operating areas was 70 exempt and 363 non-exempt; thus the Division had on the roll a standard operating crew overage of 11 exempt and 4 non-exempt personnel available, or in training, for areas being constructed.

II. OPERATING EXPERIENCE

At the request of the "P" Division, normal process water flows and pressures to the Pile Building were changed for test purposes on several occasions during the year in 100 D and F Areas. The operation of all power equipment was satisfactory during these tests.

It was agreed by all Divisions concerned that the operation of the Refrigeration Plants in 100-D and F Areas would no longer be necessary for cooling process water. This equipment was declared available for excess on August 13, and the lay-up of the York refrigeration units was completed in both areas by September 21.

All shipment of coal to the plant was virtually stopped during the period March 16 to April 13 due to a strike within the coal industry. Throughout this interval it was necessary to move approximately seventeen percent of 100 F Areas six month reserve coal supply to the other areas.

Power Division

Flood stage Columbia River water reached a high level elevation of 391 feet on June 13 at 100 F Area, as compared to the March-April average of 366 feet. This high turbidity river water and the subsequent difficulty in maintaining the standard process water quality made it necessary to resume operation of all filters in 100 D and F Areas where previously ten filter operation was in effect for test purposes. A gradual increase of coagulant feed rate was made until June 1 when a maximum feed of 56 ppm was reached.

Flood conditions prevalent during the months of May, June, and July caused abnormal operation of the Village water and sewerage systems, as described in more detail in Part III. On June 1, the sanitary water chlorine residual was increased from a normal 0.2 ppm to 1.0 ppm, then was returned to 0.2 ppm on July 3 as the hazard from flood water diminished. Water purity was maintained throughout the critical period.

III. MECHANICAL EXPERIENCE

On April 16, the twenty-four inch rubber expansion joint in the south process water line in the 100 D Area Demineralization Plant ruptured causing the tank room to be flooded. This line was temporarily blanked and a permanent line by-passing this building was installed.

Flood stage Columbia River water in June resulted in considerable ground settlement as well as sagging stairways and roadbeds around the River Pump Houses. Rip-rap on the downstream bank of the river pump house intake washed out in the 100 F Area and will be replaced before the 1949 seasonal high water. Mud accumulation on the intake travelling screens as a result of silt carried by the swollen river caused shear pins to break at 100 F Area, and a bull gear failure at 100 D Area.

Tests were run during the year on various boilers in all 100 Areas, while employing several variations of steam-air jets in attempts to improve combustion and reduce smoke, particularly when burning Washington coal. The results indicate little effect on efficiency, but an appreciable reduction of smoke when high volatile Washington or Utah coals are burned. The jets provided no improvement while burning Wyoming coals.

On October 4, steam service to the Canyon Building in the 200 West Area was disrupted when several twelve foot steam line supporting poles were broken by high winds. No interruption to normal processing was effected. All poles have been surveyed and replaced where necessary.

Excessive maintenance on the 200 West Area reservoir twelve-inch level control valve was corrected by the installation of a six-inch by-pass which would carry normal flow, with peak flow through the cone valve.

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Power Division

In the 1100 Area, the June - July Columbia River flood made it necessary to construct dikes and place sandbags to protect the Sewerage Lift Station, the Sewerage Disposal Plant and all sanitary supply wells. All village irrigation systems were out of service on a number of occasions due to flood damage to the main irrigation ditch. One side of the Sewerage Plant chlorine retention basin raised several inches, due to the buoyant effect of ground water. Some damage was done due to cracking of the concrete between the basin and Parshall metering flume. On the East side of the Village, numerous sewer and sanitary water mains and service lines were damaged requiring extensive repair, replacement, or relocation.

IV. NOTEWORTHY IMPROVEMENTS

Major improvements resulting in appreciable savings in present and future operations were made during the year in the reduction of supervisory jobs, in water treatment, essential material handling, and in the reduction of steam costs. The total resulting savings will amount to over $470,000 yearly.

The reduction of supervisory jobs as a result of intensive training and job analysis, as previously described in Part I, Personnel, will result in a saving of approximately $60,000 a year.

A change in the method of handling ferric sulphate, by bulk rather than bag shipments, effective in October, should result in an estimated saving of approximately $10,000 a year.

Further, a fundamental study of coagulation and filtration and the statistical analysis of the effects of operational variables led to important reductions in water treatment chemicals. The institution of this research and development program has resulted in essential material cost reductions valued at approximately $52,000 a year. Preliminary adjustment, starting in August, of sodium silicate feed limits in a production area, resulted in savings of $3000 for the fourth quarter. Eventual savings will depend on final test results.

The reduction of steam costs in all Areas by improving boiler efficiency and by revising coal standard specifications to encourage competitive bidding among vendors, resulted in savings of approximately $175,000 for the fiscal year 1948, and expected savings of approximately $500,000 for the fiscal year 1949.

V. PRESENT DEVELOPMENT PROGRAM

A. Current Plants

As a result of contamination in the 300 Area deep wells, an alternate water supply from North Richland to the 300 Area was completed and placed in service on December 7; also, an extension to the 300 Area Heating Plant, consisting of the installation of a third boiler and auxiliaries, of adequate capacity to supply the area's

[redacted]

additional requirements was put into service in November.

In order to meet the increased demand on Power Division services as a result of the Building 234-5 and Redox Test Plant Construction, the expansion of Power House and Filter Plant facilities in the 200 West Area was necessary. By year's end, construction on the Power House and the Filter Plant extension was to a large extent completed.

Additional water facilities for the Richland-North Richland domestic water supply system were made available in June with the addition of four new wells and a North Richland booster pump house. Sanitary sewerage services to handle the additional load imposed by North Richland and the new Richland housing area were increased with the completion of construction in April of a new thirty-inch force main from the Sewerage Lift Station to the Disposal Plant.

Expansion within 100 D Area to handle services that will be required upon the completion of 100 DR were underway in April, and briefly, consisted of three additional filters and basins at the Filter Plant with additional pumps at the River, Reservoir, and Process Pump Houses. Construction on all projects was virtually complete at year's end.

A reduction of silicate feed to process water at 100 B was effected in August, by reducing the feed rate from approximately 5.2 to 2.5 ppm. Preliminary information indicates that favorable results and a reduction of costs may be anticipated.

In August, one filter in the 100 F Area was converted to an all sand filter for the purpose of determining possible economy and improvement in the quality of water. In order to obtain additional filter data, two 100 DR filters were equipped with higher ratios of sand to anthrafilt than had been used in existing filters.

Filter Plant tests which started in August in the 200 West Area, wherein activated silica was fed as a coagulant aid, were still in progress at year's end. Preliminary data indicates favorable results.

From February through May, ten-filter operation was established in the 100 D and F Areas to determine the number of additional filters required at 100 D for the addition of 100 DR. These tests indicated that operation at higher flow rates was satisfactory only for normal water conditions.

B. New Facilities

Approval for 100 DR construction was given in January with preliminary work under way early in the year on additions to the Filter Plant and to the River, Reservoir, and Process Pump Houses, as noted in Section "A" above. Facilities under the jurisdiction of the Power Division were well toward completion at year's end.

Power Division

Approval for 100 H Area construction was given in January with work starting very soon thereafter. The 100 H Area is similar to the three existing 100 Areas with the major exceptions of the elimination of the Chemical Mixing and Deaeration Buildings, and the Demineralization and Refrigeration Plants.

Power facilities related to the 200 West Area expansion were under construction throughout the year, and at year's end significant progress had been made.

VI. SAFETY

The Power Division's perfect safety record of 1607 days without a major injury was broken on May 26, 1948, when a power operator in 100 B Area suffered partial amputation of his left little and ring finger as his fingers were caught between the center and end links of a large metal pontoon hangar. It was necessary to adopt a special procedure for handling this linkage which should preclude a future recurrence.

A review of minor and near-serious injuries revealed that an undue number were occurring in coal handling operations, whereupon a committee with representation from all areas was formed for the express purpose of revising coal handler's safety rules. A further notable contribution to coal handling safety resulted when successful attempts were made in obtaining a high percentage of coal shipments in hopper bottom cars instead of the flat bottom cars formerly received. These safety measures resulted in a substantial reduction in the number of minor injuries charged to coal handling.

H. J. Wheeley

March 1, 1949

ELECTRICAL DIVISION

ANNUAL REPORT - YEAR 1948

GENERAL

The backlog of work on hand increased 33 percent during the year (12,439 versus 9,379 mandays), mainly in the Telephone and Distribution Sections due to the general expansion program. Year end total personnel remained at 285, unchanged from January 1. An increase of personnel, mainly in the Telephone and Distribution Sections, was balanced by the transfer of 20 men and associate Village work to the Community Division.

Power consumption and power peaks rose to new high levels toward the end of the year. The December 27 peak of 68,200 KW is an all-time high. The increase is due to re-opening of 100-B Area in July, and the gradual addition of approximately 1300 houses to the Richland Village load.

Six major power system disturbances occurred to the 220 KV system, five originating from the Bonneville Power Administration 230 KV system. The sixth disturbance was occasioned by a pole top fire discovered in time to permit critical power conditions to be established (see comments later). None of the above involved interruption to process load, although production was curtailed. Low voltage and low frequency was experienced during these periods. Three general outages of the 66 KV system (feeding Richland, North Richland, and 300 Area) were experienced. Two were caused by breaking of poles due to high winds, and the third because of Columbia River flood at the Pasco Station of Bonneville in early June. The 40 year old 66 KV system is approaching the end of its useful life; meanwhile, construction of a new 115 KV system (Project C-177) has progressed sufficiently to enable relieving the 66 KV system of some load in the immediate future.

May and June flood conditions on the Columbia River required building a dike to protect Hanford Substation. At crest conditions, it was necessary to remove all switchgear from the building to a temporary building where it remains pending abandonment of the 66 KV system (to be replaced by 115 KV). Power to the 66 KV system was not interrupted during this change.

A general power shortage, due to rapid load growth in the Pacific Northwest, required curtailment of all unnecessary use during the last months of 1948. Public response to a conservation program was good, and no plant power interruptions were experienced because of this condition.

DEVELOPMENT PROGRAMS AND IMPROVEMENTS

An Electrical Standards Committee was developed with representation from Design and Construction, Project Engineering, Safety, Atomic Energy Commission and Community. Many electrical standards have been developed and published, chiefly concerned with outside lines and structures. Substantial economy and avoidance of duplication in design results.

A study of pole top fires has resulted in a program to bond all Type D (dead end) 220 KV structure hardware. This work was 50 percent complete at end of year.

The Richland line crews were consolidated in a single headquarters during the year. The 300 Area and the Minor Construction crews have been consolidated in a new headquarters in the 300 Area (combined Electrical and Instruments shops).

Shift coverage was reduced to one shift in the 200 Areas, starting in August.

For reasons of safety, and to minimize outages, a study has been completed and project requested to unground the 440 volt delta systems in all areas, substituting a delta-Y grounding bank with ground indication in each system.

All work area blackout procedures have been revised and tested.

In order to extend the useful life of 8,000 odd power and distribution poles, approximately 10 years, in Village of Richland and in plant areas (these were set in place with untreated butts under war emergency conditions), an Osmose butt treatment program has been developed, and including replacing poles where butt decay is beyond salvage. Work is approximately 50 percent complete.

Because of destructive pitting of underground stainless steel pipe in the 200 Areas, mainly to waste lines to Tank Farms, a complete study of stainless steel corrosion was made, and cathodic protection data were developed to assure complete protection against corrosion. Such protective equipment has been installed for all buried stainless steel. No further failures have been experienced.

An educational program for Electricians has been developed with the assistance of the School of Nuclear Engineering. Ninety non-exempt employees are participating in the work which it is expected will result in improved personnel as well as in a more efficient and better trained Electrical Maintenance group.

Construction power supply was arranged for 100-H Area. Similar arrangements were made for 100-DR Area, where electrical tests, tie-in, and final inspection prior to acceptance were in progress at the end of the year.

Progress during the year on the expanded plant telephone system and new exchanges in Richland and plant areas was not up to expectations. The physical cable plant is substantially complete but with some delays due to late delivery on some cable sizes. The central exchange equipment is behind schedule and cut-overs planned for February will probably be in mid-year 1949. However, other phases of the overall program are sufficiently delayed also so that no serious communication difficulties are anticipated. The 300 Area exchange was doubled in capacity to 200 lines with new trunking equipment. The North Richland exchange was increased to 600 lines and the trunking bottleneck eliminated by increasing trunk circuits to 39 trunks. The White Bluffs area remains critical until the new automatic exchange is installed in mid-year 1949.

SAFETY

A general revision of departmental Safety Handbook has been completed and is being printed.

The Electrical Division reports no lost time injuries in 1948, and ended the year with 890 consecutive days of no lost time due to injuries.

S [redacted]

April 1, 1949

ANNUAL REPORT OF INSTRUMENT DIVISION

PERIOD JANUARY 1, 1948 to DECEMBER 31, 1948

General

During the calendar year of 1948 there was an increase of 32 people in Instrument Division personnel. Of this number eight were transferred from the Accounting Division in April. It was necessary to increase the crew for activation of 100-B Area by the addition of twelve men. The remaining increase of twelve people was necessary to have available sufficient trained personnel for the activation of 234-5, 100-H, and the increasing work load, especially in the 300 Area shops.

A re-organization of the supervisory personnel in the 100 Areas resulted in the elimination of need for additional supervisors for the activation of 100-B. This change reduced operating costs by approximately $10,000 per year.

The addition to the 3717 Building which was completed this year provided additional space for machine tools. This facilitated the completion of larger quantities of work which had been impossible prior to that time. (Project C-141)

A building was constructed in the 300 Area for the development and maintenance of optical instruments. (Project C-220)

Operating experiences

Instrumentation was completed and instrument maintenance was provided for the start-up of 100-B.

During unusually cold weather, some instruments in the 100 Areas were rendered inactive due to freezing. This was caused by lack of proper heating in the rooms in which the instruments were located.

The Instrument Division assumed responsibility for the control maintenance of the air conditioning system in the 200 Areas at the request of the Power Division. Maintenance of these controls had been previously unassigned.

Responsibility for the IBM time clock maintenance in 700 Area was assumed by the Instrument Division when the Electrical Division transferred maintenance electricians to the Community Division.

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Instrument Division

Operating experiences (Cont.)

Complete instrumentation was provided for the addition and control of CO_2 at 105-D and 105-B. In conjunction with this, five Brown motion transmitters were installed and placed in operation for the study of graphite growth.

Complete instrumentation necessary to indicate flow and pressure differentials was provided for the 200 Area exhaust ventilation air sand filters.

In general, frequencies of preventative maintenance inspections and overhauls in all areas were reduced where experience indicated this to be practical. No trouble has resulted from this change and further reductions are being studied.

Improvements

It was necessary to install micro-switches on 75 recently purchased Brown recording instruments to eliminate chart tearing during printing. This correction was performed entirely by Instrument Division personnel after the Brown Instrument Company failed to make or suggest a correction.

An automatic plateau runner was developed and placed in operation for checking Geiger-Muller tubes. This resulted in a saving of about $1500 annually and made one additional person available for other work.

Plug-in thermocouples were installed on the 200 Areas ventilation exhaust fans. This eliminated considerable time in high radiation levels during fan overhauls.

A circuit was developed for the Cutie-Pie radiation detection instrument, which eliminated the necessity for vacuum chamber in this instrument. This circuit allows an easier and more rapid servicing procedure.

Facilities were provided at White Bluffs for the cooperation of the Instrument Division and contractor personnel in assembling and storing instruments for 100 and 200 Area construction. This has permitted plant fabrication of complete instrument panels by Construction personnel. These panels can then be tested and moved into place without labor disputes.

Development Program

Complete instrument coverage has been provided for all phases of the Redox Scale-Up and Demonstration Units, and for design of the Test Plant.

Instrument Division

Development Program (Cont.)

The Instrument Division Design and Construction Group provided instrumentation design data and covered instrument installation during construction of 234-5, 100-DR, and 100-H Areas.

At the request of other Divisions, the Instrument Development Group successfully completed the following items which were not commercially available:

1. Graphite grain detector for use in 101 Building.
2. Line operated alpha amplifier.
3. Electro-pneumatic motion indicator for pile motion studies.
4. Special ionization chambers for radiation energy studies.
5. Improved portable radiation detection instrument.

In addition, other minor studies and developments were completed.

Safety

The Instrument Division experienced no major or sub-major injuries during the year with an exposure of 41[illegible], [illegible]1 hours. The minor injury frequency experience was 5.13 minor injuries per 10,000 man hours worked.

One sub-major injury occurring in 1947 was reclassified this year as a major injury.

TRANSPORTATION DIVISION
1948 ANNUAL REPORT

General

The following functions within the Village heretofore performed by the Transportation Division were transferred to the Village Public Works Division during the year: February - Garbage and Trash Disposal, Coal and Fuel Oil Delivery, Care of Orchards, and Furniture Handling; March - Lawn Mower Repair, Grass Seed Distribution, and Janitor-Fireman-Watchman Services at the Labor Yard; August - Irrigation Canal and 700-1100 Area Cleanup. Transfer of 12 exempt and 127 non-exempt personnel was effected to continue these services.

A special group of the Labor Section was organized in July to handle the Transportation Division's construction activities. This organization made it possible to separate the construction activities from the routine area work thereby eliminating the dual responsibility formerly assigned to Area Foremen. Through the selection of men within the Division whose basic experience was in the Construction field the efficiency of the work forces was materially improved.

Because of flood conditions, it was necessary to evacuate the Transportation Division Labor Section from the Labor Yard to the 1131 Garage area where they have continued to perform their normal functions since it was not considered practical to rehabilitate the Labor Yard Area.

Safety

Safety Bulletin No. 19, Revised August 3, 1948, Standard Safe Practices Controlling the Operation, Movement and Inspection of Locomotive Cranes, Hydro Cranes and Other Portable Hoisting Apparatus. All operations and signalmen must have passed a satisfactory examination and have in their possession an Operator's or Signalman's Permit signed by an authorized person in the Transportation Division. It is the responsibility of all Hanford Works Divisions requiring the use of the above mentioned hoisting equipment to comply with these standards.

Three Major Injuries, five Sub-Major Injuries, and 467 Minor Injuries were sustained within the Division during the year while experiencing 1,570,639 exposure hours. Minor Injuries in the Division averaged 39.4 per month with a cumulative Minor Injury frequency rate of 2.97 and a cumulative Major Injury frequency rate of 1.91.

Railroad Activities

Morrison-Knudsen, Track Maintenance Subcontractor, moved their forces from Benton City to Columbia Camp during the month of May.

Work on Project C-214 (Rehabilitation of Plant Railroads) approved in February is being performed by Morrison-Knudsen, Track Maintenance Subcontractor, and was approximately 60% complete at the end of December.

Railroad Activities - continued

Mechanization of railroad track maintenance equipment with spike driving, rail straightening and related power tools resulted in an estimated labor savings of $96,000 for the year.

Flood waters caused a washout on the Milwaukee Railroad's connecting line between Beverley, Washington and Riverland resulting in a suspension of service on June 9. A temporary track was constructed around the washout restoring service to Riverland on a limited basis June 12. Men, material, and equipment were furnished to the Milwaukee Railroad upon their request during the construction of this track.

Two new 120-ton Diesel-Electric Locomotives were placed in service in July and an additional two in December. These locomotives together with improved track conditions enabled the Railroad Operations Section to handle 57,285 cars in 1948 compared with 27,793 in 1947 with only a small increase in personnel. In addition they made it possible to excess two 65 ton Diesel-Electric Locomotives from service thereby resulting in reduced maintenance, handling of heavier tonnage at increased speed, and eliminated need for two additional train crews.

Radio equipment was installed in the Riverland Dispatcher's office and on the four 80-ton Diesel-Electric Locomotives during August. The remaining locomotives will be radio equipped and operative early in 1949.

Automotive Activities

Approximately 72% of our automotive equipment now in service is relatively new. The odd makes and models accumulated during the past four years were disposed of thereby standardizing our equipment and eliminating the necessity of stocking such a wide range of repair parts. The acquisition of this new equipment substantially reduced the volume of major repair work making it possible for the Mechanical Section to carry out a preventive maintenance program which has greatly enhanced the over-all operating efficiency of automotive equipment throughout the Works.

The procurement and use of specialized equipment, such as transit-mix trucks, 75-ton Kenworth tractor trailer unit, hydro-cranes, and the mechanization of coal handling equipment with self unloading trucks and conveyors for domestic delivery in the Village, has resulted in a labor savings of approximately $173,000 during the year while enabling the Division to perform a greatly increased work load with greater safety and expediency without increasing its manpower requirements.

Sixty-two new GMC suburban type 41-passenger coaches were assigned to Area service during September and October replacing 72 K-7 International 34-passenger busses making it possible to transport an increased number of passengers to the Areas with a marked reduction in manpower. Reduced maintenance and operating costs resulted in an estimated savings of $175,000 annually.

Automotive Activities - continued

In connection with the operation of these new coaches, a comprehensive Driver Training Program was established. Each driver received a sufficient amount of personal instructions to either qualify him or establish the fact that he was not qualified. Qualified drivers received a written certificate permitting them to operate this new equipment. The Mechanical personnel of the Motor Room and Bus Garage received instructions in the repair and service of GMC coaches from a factory representative during the period August 16 through August 18.

Village Bus Routes were changed, extended, and expanded as the need arose throughout the year in keeping pace with the completion of the new residential areas.

Effective October 25 special bus service was established to and from all Plant Areas for Patrol personnel. With the inception of this operation, it became necessary either to increase our driver forces or to permit selective overtime for a sufficient number of drivers to man these busses. The selective overtime method proved to be very economical as only 76 hours of overtime were required per week in comparison with 30 additional drivers which would have been required on a straight time basis thereby resulting in an estimated annual savings of $108,000.

Flood waters caused the closing of regular routes of travel to and from the Project making it necessary to provide other than normal modes of transportation for Project personnel on company business and official visitors for the period May 29 through June 21. This service was performed on a 24 hour per day basis by combined forces of the Transportation Division located at Pasco and Richland and the Richland Civil Air Patrol. The Civil Air Patrol performed an outstanding service for both the Project and general public in air transportation between locations isolated by flood conditions.

The Northern Pacific Railway established temporary passenger train shuttle service between Pasco, Kennewick, and Kiona, Washington for the period June 14 through June 24 as a flood emergency measure for the benefit of all Hanford Works employees isolated by flood conditions. Service was performed for the #2 Shift personnel to and from work. Arrangements were made with a subcontractor to establish connecting temporary bus service between the Northern Pacific Passenger Depot at Kiona, Washington, Hanford Works Areas, and Richland Bus Terminal for transfer to 700-1100 and 200 East and 200 West Areas. Connecting shuttle bus service was furnished throughout the Village from the Richland Bus Terminal by Transportation Division forces.

Ferry Service was established, as a flood emergency measure, across the Columbia River on June 22 at the Richland Landing which was constructed just east of the Commercial Bus Depot. Connecting bus service was established by Transportation Division between the Richland Ferry Landing, 700 Area, and the Richland Bus Terminal at shift change periods for Area workers. Service was discontinued on June 30.

Labor and Construction Activities

During the course of the year the Transportation Division Labor and Construction Section was required to congregate all their available forces and manpower on two occasions and direct them toward the completion of major projects, namely, the 200 East and 200 West Area Sand Filter Facilities and the construction of an Auxiliary Waste Disposal Basin in the 300 Area. Normal routine maintenance operations were necessarily postponed for the duration of these assignments.

Excavated 3,500 cubic yards of earth for the flood emergency dike in 100-F Area. Approximately 3,000 man-hours were expended on flood control and evacuation work for the period May 27 thru June 15.

Labor and transportation facilities were supplied as needed for the various projects and Well Drilling Program throughout the year.

Traffic Section

On September 13, 1948, check in the amount of $55,608.93 was received from the Milwaukee Road in payment of Reparation Claim O/C-57 on 1,088 cars of coal from Kleenburn, Wyoming to Hanford, Washington shipped during October and November 1946. Reparation was authorized by the Interstate Commerce Commission under Docket No. 209787 in the amount of $51,874.96 plus interest at 4% amounting to $3,733.97.

During the year common carrier, rail, and truck lines continued to seek increases in freight rates which were granted by the Interstate Commerce Commission and the various State regulatory bodies. On the average these increases amounted to approximately 15%.

During the year 25 proposals were presented to and approved by the carriers granting reductions in freight rates on various commodities moving to the Project. Through these reductions there was a direct savings in freight charges to the Project for the year amounting to $445,307.29.

R J Cooke

SUPERINTENDENT,
TRANSPORTATION DIVISION

RJ Cooke:LMW:aj

General:

The personnel within the division was reduced from 1074 to 595 during the year. The major reductions can be accounted for as follows: February 1 - 162 employees were transferred to the newly formed Project Engineering Division and on March 1 186 employees transferred to the Village Public Works Division. On August 15 the maintenance functions in the 700 Area, together with 97 employees were transferred to the Village Public Works Division. In October the Material Control Section of the Maintenance Division, which consisted of nine employees, was decentralized and the personnel redistributed to other groups within the division.

Due to the large amount of Project work approved, it was necessary to increase the personnel of the Minor Construction forces from 135 to 181 employees. This group has satisfactorily completed the following projects during the year: Building 722 Maintenance Shop, 700 Area; Addition to the 314 Building to provide billet casting facilities; Building 701-B Badge House, providing an entrance at the west side of the 700 Area; two additional wings for the 703 Building, which added 12,800 square feet of office space to the existing structure; Building 3745-A, additional X-Ray facilities for the Health Instrument Division; constructed a scale-up unit for the Redox development in the 321 Building. Morrison - Knudsen assisted our forces by constructing a tank farm for this installation; constructed 291-B and 291-T sand filters which removes the contamination from the stack gases; Building 305-A which provides a nine-tube mock-up of the pile unit for development studies of the Design and Technical Divisions; installed a 42" steel effluent line from 105-F to 107-F Buildings and constructed the 3707-C Building Change House for Technical Division in the 300 Area.

Investigation of the two 42" steel effluent lines in the Columbia River at 100-F Area revealed that air was being trapped in these lines because they are at a higher elevation for a distance of 250 feet where they cross an island and the $\frac{1}{4}$" holes originally drilled in the pipes at this point did not completely relieve the entrained air in the pipes. During January at low water of the Columbia river the maintenance forces installed eighteen additional 2" vent outlets on each pipe line which allowed the pocketed air to escape satisfactorily.

The steel connecting ducts to the plenum chamber of the 291-T and B Plant exhaust fans were replaced with stainless steel. This was done to reduce the amount of particle contamination in the atmosphere caused by steel scale being knocked off the inside of the ducts and blown out through the stacks. Also, special type filter media filters were installed in all the active cell exhaust ducts and stainless steel scrubbers were fabricated and installed on the dissolvers in the 221 "T" and "B" Buildings.

Due to a failure of the mechanical brake screw shaft on the 75 ton crane in the WestCanyon Building a study was made by the Project Engineering Division of these brake assemblies. Recommendation Report 100 was issued which recommended a brake assembly of a heavier design and steel of high tensile strength. These new brake assemblies were installed on all building cranes in the areas.

The binding of #2 horizontal safety rod in the "B" File had developed to such proportions that it became impossible for the rod to enter the thimble. During March a portable milling machine was developed by the Maintenance shops to re-

move 3/16" of metal from the top of the rod without removing the rod from its working position in the unit. This was necessary as the rod was highly contaminated with radioactivity and had to be worked on remotely.

An underwater micrometer was fabricated for the Technical Division from their drawings to accurately measure process metal dimensions underwater. The entire assembly was made of stainless steel and brass to prevent corrosion.

A submerged reversing gear type oil pump was installed on #9 exhaust fan turbine in the 105-D Building in place of the one-way rotation priming type oil pump. This installation was made to eliminate bearing failures on these turbines as several turbine bearing failures have been experienced when the air duct dampers have been inadvertantly left open when the turbine had been shut down, causing the rotor to revolve backwards. This type of pump has proven successful and steps are being taken to install similar pumps on all such turbines in the areas.

The Maintenance forces completed the machining and assembly of nine horizontal safety rods for DR Pile and delivered them to Construction Division during November. This group immediately started the fabrication of seventeen rods for H Area.

During the flood stage of the Columbia River in June the Maintenance Division rendered substantial assistance to the operating divisions by the installations of emergency pumps, pipe lines, and other emergency facilities. In the Richland Combined Shop motors and other equipment were dismantled and moved to levels higher than the anticipated flood water.

Safety:

The Maintenance Division sustained four major and nine sub-major injuries during the year. Minor injuries in the division showed an increase of 14% over 1947. A concentrated effort of all supervision is being made to reduce the number of all types of injuries during the year of 1949.

PROJECT ENGINEERING DIVISION
ANNUAL REPORT - 1948

I. Organization and Personnel Summary

In February, 1948, the Engineering Section of the Maintenance Department was made a separate division, to be known as the Project Engineering Division of the Manufacturing Divisions with the responsibility of providing complete plant engineering services.

Its eventual organizational structure was as follows:

Superintendent - J. S. McMahon
Asst. Superintendent - S. F. Schure

Plant Process Section - V. W. Wood, Area Engineer

100 - 300 Group
200 - Group

Plant General Section - H. F. Peterson, Area Engineer

Electrical Group
Arch. - Civil - Mech. Group

Plant Industrial Section - C. A. Lyneis, Area Engineer

Studies Group
Cost Control Group

Several interesting personnel breakdowns are as follows:

Section	No. of Personnel Dec. 31, 1947	Dec. 31, 1948
Plant Process	48	51
Plant General	37	43
Plant Industrial	28	26
Administrative & Clerical	4	5
Total Division Personnel	117*	125

*The Reproduction Section was transferred to D & C in April, 1948, and is not included in this total. There were 47 in this section, making the actual division total 164.

[redacted]

Technical Personnel - Bachelor Degree

Type of Degree	No. of Personnel	
Mechanical Engineering	29	
Civil Engineering	11	
Architectural Engineering	4	
Chemical Engineering	5	
Electrical Engineering	7	
Other	5	
Total		61

(4 of these men also have a masters degree: one each in Mechanical, Electrical, Metallurgical, and Professional Engineering)

8 men over and above the 61, have formal engineering education, and background, although no professional degree 8

Non-Technical Personnel

Draftsmen	23	
Layout Men	15	
Clerical	18	
Total		56
Division Total		125

II. Plant Process Section
A. 100 Area Projects

Segmental Discharge

It was necessary to design certain mechanical equipment for use in charging process piles so that partial discharge of a tube of slugs could be accomplished and the column repositioned after discharge. When initiated, the savings claimed for the overall program including this technique, were approximately 30% of the metal fed to the pile. However, certain other improved methods have somewhat offset the saving and toward the end of the year it was becoming apparent that the limiting factor for the radiation of a slug in a process tube was no longer to be considered the maximum amount that any one slug could stand but rather again the average for the whole stringer. It is possible that future developments will change this picture considerably but such changes will be incidental to the program of high energy level pile operation. Other items auxiliary to the high level program are the Shielded Nozzle Caps (C-306) and Special Cadmium Plated Splines.

[redacted]

Effluent Process Sewer Line

The large concrete line carrying activated water from the 105 Bldg. to the 107-F retention basin had developed a considerable number of leaks. Since failure of this line would entail an interruption of production, the installation of a heavy coated steel pipe was rushed to completion in such a way that the old line was not disturbed to any great extent. The new line has been operating satisfactorily for some months and the old line may now be regarded as a stand-by facility.

Special Technical Laboratory (F-10) (C-315)

Building 108-B was chosen for the installation of a highly important laboratory which when completed will replace the facility for producing an important gaseous product originally prepared at Argonne National Laboratories, Chicago.

Completion of the slug processing was originally scheduled for January 1, 1949, but unavoidable delays have been encountered. It appears that Bldg. 108-B will also house the lithium-aluminum alloy preparation facilities which will be required in connection with the new process.

Effluent Diversionary Outlets for 107-B and F

Preliminary engineering work was completed in which it is proposed that cribs be provided for emergency diversion of contaminated water in case of a ruptured slug in a process pile.

Vertical Safety Rod No. 27 (E.R. 1068)

Progressive distortion of the vertical rod wells by graphite expansion has reached a point where additional means of relief are necessary to prevent binding and hang-up of the vertical safety rods. While several rods have given similar trouble, the No. 27 rod at F Area has received concentrated attention. A uniquely designed jointed-vertical-safety-rod was designed and has been fabricated for use in the pile.

Physical Testing Equipment

It was expected that in order to obtain sufficient physical data for the design of pile structures, etc., that the properties of irradiated metals should be investigated and in order to do this it was necessary to provide a remote control tension testing machine to operate under water, a hardness testing machine to operate under similar conditions, and a can opening device as an auxiliary.

[redacted]

Dismantling of Equipment in the Demineralizing & Deaerating Plants (C-172)

This project was initiated to make equipment in these buildings available for excess or transfer and some of it was removed for use by construction during the year. Equipment is now being removed only when need arises for a specific use.

Neutron Spectrometer (C-290)

At the request of the Technical Divisions the construction of a neutron spectrometer was undertaken to be installed in the 105-D Bldg. in order to study the behavior of metals under neutron bombardment and gain information on their crystalline structure.

Mock-Up Facilities for Special Metallurgical Studies (C-294)

It was necessary to provide certain facilities for sectioning "hot" materials for study by the Technical Divisions. The manipulatory technique was tested in this mock-up facility constructed in 111-B Bldg.

B. 200 Area Projects

Stack Gas Decontamination - 200 Areas (C-313)

The discharge of contaminated air and gases had been a critical and extremely disturbing one for many months. The program culminated in the start up of the sand filters in October. Air flow and efficiency tests continued for some time and the sand filters were found to be 99+% efficient though recontamination was apparently entering the air stream from the dissolvers. In view of this latter factor it was considered that additional installations including a stainless steel stack or other filtering media may eventually be necessary.

Disposal of Second Cycle Waste to Ground (C-120)

This project was completed in June and provided facilities through which second cycle waste could be diverted to underground cribs in tile fields. It covered test wells and an H. I. shaft was also constructed under Project C-160 to facilitate studies of the movement of the underground waste liquids.

Special Test Wells (C-133)

The H. I. program of underground exploration in connection with the waste disposal problem has required the drilling of 72 wells to water or bedrock in order to determine the extent which contamination from the waste areas was moving through the ground. This part of the program was largely completed at the end of the year and had yielded

[redacted]

a great deal of valuable information, because of which it has become possible to institute underground disposal of less radioactive wastes which showed an estimated saving of approximately $2,000,000 at the end of the year with a cost of less than $200,000 for test wells. The entire well program will of necessity be continued over a period of years under other projects.

Alterations to 6 Periscope Assemblies (C-171)

This work included the installation of wide field periscope objectives which give more adequate view of the canyon work. The work was 90% complete at the end of the year.

Additional Process Waste Storage 200-W (C-163)

The Project Engineering portion of this work had been allocated $1,250,000 to cover diversion boxes and tie lines, which at the end of the year were 90% complete. The entire project covered the installation of 16 waste tanks complete with auxiliary facilities and connections to 221-T and 221-U.

Bismuth Subnitrate Facilities (C-262)

A project for preparation of this important chemical was necessary because it was not available in the market in the quantities needed, although metallic bismuth was plentiful. Facilities consisted of a dissolver in each building where metallic bismuth was heated in nitric acid to prepare a solution to be used in the Separations process.

Separation and Additional Control of 231 Process Wastes (C-305)

It was necessary to provide a means of segregating process wastes for sampling before mixing with laboratory wastes for disposal into ground cribs. This will allow the accountability requirements to be properly met in connection with the process materials handled in this building.

C. 300 Area Projects

Increased Ventilation 313 & 314 Bldgs.

Most of the work on this study was concentrated on the 314 Bldg. because of the greater seriousness of the uranium oxide problem in that location. It now appears that complete re-design of the exhaust system with a greater volume of air and improved filters will be necessary although the general clean up of the building will be facilitated through the installation of improved industrial type vacuum cleaner.

In the 313 Bldg. the worst conditions were at the first and second sorting tables and around the chip recovery press. The improved heating and ventilation are expected to take care of these problems without serious difficulty. It is recognized that the 314 Bldg. presents one of the most serious contamination and health hazard problems on the plant.

Rod and Bar Pickling and Oxide Recovery

Present oxide burning facilities generate considerable uranium dust and it is felt that if oxide can be removed by pickling it would be just as simple to recover uranium directly from a solution which would largely eliminate the dust problem. It also appears that scrap material can be pickled and then melted instead of being completely burned to oxide. On this basis considerable savings are expected in addition to relief from a serious health hazard.

Rolling Mill for Process Metal

Investigation was made of the relative merits of a rolling mill for uranium metal vs. an extrusion process. Information was gathered on both types of equipment, and the final decision reached was in favor of the rolling mill. Further studies are in progress regarding details of exact location and design

Mine-Tube Mock-Up (C-237)

This experimental installation in the 300 Area was for the purpose of studying pile distortion phenomena under controlled conditions. Graphite blocks similar to those in 105 DR and H piles were used and a second phase of the project will eventually cover blocks similar to 105-B, D, and F for additional tests. It is expected valuable information will be gained affecting the life of the Hanford piles.

Auxiliary Waste Disposal Pond - 300 Area

The original waste disposal pond had become sealed with aluminum compounds which had settled to the bottom in the form of gelatinous precipitate. Rather than attempt to drain it or allow it to run into the river, a new pond was constructed in an adjacent location and the original pond was arranged so that it would be kept moist and filled to a constant level. The aluminum compounds which caused the trouble are being diverted elsewhere.

III. Plant General Section

A. Arch., Civil & Mech. Projects

Experimental Animal Farm (C-184)

This unusual assignment involved the design of a set of modern farm buildings to be used exclusively for treating and recording effects of radioactivity and other contamination on domestic animals. New

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devices for stabling, feeding, and caring for animals as well as methods of testing, recording and disposing of wastes presented some interesting and perplexing problems. Proposed location is in 100-F Area.

Security Fences - All Areas (C-291)

Untreated wooden posts originally installed in the security fences have deteriorated badly, and under this project will be replaced with more durable materials. Treated wooden posts will be used on "limited" area perimeter fences and steel posts with chain link fencing on the inner "exclusion areas". This project should result in fence maintenance being reduced to a more normal amount.

Improvement of Area Administration Bldgs. (C-279)

At the end of the year work was about 45% complete on the rehabilitation of the administration buildings in the operating areas. Those structures although basically well built were originally intended to be of a temporary nature. This project covered the reconditioning of these structures to meet existing plant standards for office buildings.

Combined Shops in the Maintenance Hangar (C-143)

Under this project the various scattered maintenance Shop units were centralized in a large hangar building which was modified for the purpose. Improved facilities and centralized arrangement have made for better and more economical maintenance services.

700 Area Gate House and Parking Lot on Stevens Drive (C-202)

This project was necessary to improve the accessibility of the 700 Area and provide better parking facilities away from the front of the 703 Bldg. Work was completed in July.

Overhead Doors in 1131 Garage (C-186)

This project was completed in June and replaced the original swinging doors with a safer type of overhead doors. A number of injuries had occurred with the original doors during wind storms.

Rehabilitation of Plant Railroad (C-214)

The plant railroad system was all constructed within the period of about one year with untreated ties and relay rails throughout. Considerable deterioration of the ties has taken place, and it is now necessary to provide a roadbed which will be equal to the standard roadbed used by regular railroads servicing the areas in order that train crews from Union Pacific, etc., can operate their equipment on the plant lines. Some straightening and re-ballasting of the railroad routes has also been necessary. Work was about 60% completed at the end of the year.

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Transportation Consolidation (C-284)

The Transportation Division has suffered considerably from the decentralized condition of its facilities. Under this project it has been proposed to consolidate the Transportation Division activities and headquarters to effect economies and provide better service.

Automatic Sprinkler Riverland Locomotive Shops (C-213)

This building was without fire protection and was unattended during the night shifts. Due to this fact, it was felt necessary to provide some form of automatic fire protection. The project was closed in October.

Addition to 703 Administration Bldg. (C-209)

Under this project two concrete block wings were added to the 703 Bldg. Last items of work were completed and the project closed in October, although the building had been occupied sometime before. A freight elevator was also installed in the building under another project.

B. Electrical Projects

115 KV Transmission Line and Sub-Station (C-177)

This project covered conversion of the Richland and 300 Area power supply from 67,000 volts to 115,000 volts in order to supply adequate electrical power and provide increased reliability of service through dual connections at Benton City sub-station and a connection to the Grandview line. Additional sub-station capacity was also necessary in the Village and 300 Area.

At the end of December construction was well under way and about 50% of the work had been completed. The installation of certain transformers and switch gear will be delayed for several months because of slow deliveries on such items.

Overall Plant Telephone Project (C-276)

About 30% of this project had been completed by the end of December. The underground duct system in the Village of Richland had been pretty well completed and cable installed as rapidly as available. Much of the cable cannot be used until the dial system, under Project C-138, is installed and operating within the Village. To house the dial system an Exchange Building has been designed and is essentially completed.

The trunk cables to the areas were progressing satisfactorily, and it is felt that this project will provide adequate telephone communication facilities for the plant and the Village.

[redacted]

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Additional Trunk Richland to Kennewick (C-265)

The original telephone trunk connections to Kennewick and Pasco were poorly located and difficult to maintain. The Interstate Telephone Company has installed a new cable at a slightly different location, which avoids the main highway, and as soon as the tie-in from Richland to the Interstate Telephone Company cable has been made near the Richland Y, more satisfactory connection can be maintained between the reservation and the Bell system. The work has been delayed somewhat by procurement difficulties in connection with the cable crossing at the Yakima River.

IV. Plant Industrial Section

A. Studies Group

This is a relatively small group of engineers who carry out special and routine studies in almost every field of engineering. Included in their routine services are the preparation of job information sheets on operation, inspection and maintenance of plant equipment of various types; the assembly of data pertinent to equipment and material selection, specification and control; the inspection of concrete; and the analysis of lubricating oil received on the Works.

One of the special studies was:

Building 313 Mechanization Study
At the request of the "P" Division an industrial engineering study was made of the 313 Bldg. process, including possible applications of automatic machining equipment in order to increase production and provide operation more economical than under present conditions. Installation of an automatic screw machine is being considered as the first step in this program.

B. Control Group

This group has four primary functions which together provide the economic services required by an engineering division. These functions are: Material Take-Off, Cost Estimating, Material Expediting and Control, and Cost Control.

After plans for a certain job are prepared by the engineering staff they are referred to the Control Group for Material Take-Off and a concurrent cost estimate. When the project is approved, they work in conjunction with the Purchasing Division in the ordering of all material and the maintenance of an up-to-date check on all material due from outside sources and needed on important jobs.

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As the field work progresses, this group maintains records on all funds spent to date while the field engineer checks on the physical progress of every job. By this means it is possible to relate in most cases, expenditures vs percent physical completion.