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DuPont
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EXTRACT

SAVANNAH RIVER PLANT

FABRICATION AND TESTING HISTORY
PROTOTYPE AND PRODUCTION UNITS

NEW YORK SHIPBUILDING CORPORATION
Camden, New Jersey

Subcontractor
For

ENGINEERING DEPARTMENT
E. I. DU PONT DE NEMOURS & CO. (INC.)
Wilmington, Delaware

Prime Contractor
For

GROUP 1
EXCLUDED FROM AUTOMATIC DOWNGRADING
AND DECLASSIFICATION

UNITED STATES ATOMIC ENERGY COMMISSION

U. S. CONTRACT NO. AT(07-2)-1
DU PONT PROJECT NO. 8980
SUBCONTRACT NO. AXC-167-1/2

September, 1954

Classification Changed to
UNCLASSIFIED by Authority of
T. B. NILAND
By EVA Date 3-8-74

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FABRICATION AND TESTING HISTORY

PROTOTYPE AND PRODUCTION UNITS

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SAVANNAH RIVER PLANT

FABRICATION AND TESTING HISTORY

PROTOTYPE AND PRODUCTION UNITS

I - INTRODUCTION

From April, 1951 to August, 1954, New York Shipbuilding Corporation carried out a subcontract with E. I. du Pont de Nemours & Company that was without parallel in the shipyard's history.

The work, designated the "NYX Project" for reasons of security, was vital to the operations of the Savannah River Plant, Aiken, S.C., which was then being designed and constructed by du Pont for the Atomic Energy Commission. It consisted of three broad parts:

1. Developmental and Experimental Work.
2. Fabrication and Testing of a Prototype Unit.
3. Fabrication of Production Units.

Five production units were ultimately built, one of them converted from the prototype. All were fabricated from stainless steel, and involved welding techniques, control of thermal distortion and tolerances never previously attempted on assemblies of comparable size.

Du Pont's technical experience and the background of New York Ship in heavy construction, particularly in the fabrication of naval gun turrets, were combined from the outset to resolve the difficult fabrication problems that occurred almost daily. Representatives of both companies worked together as a team in the shops and at supervisory levels to an unprecedented extent.

The report that follows is intended primarily to summarize New York Ship's part in the project, but also includes some of du Pont's activities since the work of the two organizations was so interrelated. Because of the scope of the program, it will not always be possible to provide detailed information, but rather to record what happened in general terms. Where the reader desires more specific data, he should refer to original plans and records, including various reports compiled during the course of the project.

II - SUBCONTRACT WITH E.I. DU PONT DE NEMOURS & COMPANY (INC.)

INITIAL CONTACT BETWEEN DU PONT AND NEW YORK SHIP

The original contact between the two companies concerning the NYX Project took place during the first week of April, 1951. Du Pont was then making a survey of plant facilities on the East Coast, and in a telephone call to the Assistant to the President of New York Ship inquired about the shipyard's ability to handle the vertical boring of nests of tube sheets approximately five feet thick.

New York Ship expressed interest in further discussions of the proposed work and a meeting was held at the shipyard shortly afterward. The outstanding facilities at New York Ship and the availability of large machine tools and handling equipment caused du Pont to make an immediate and intensive study of the shipyard as the site for the project. A decision to award the work to New York Ship followed in a few days.

NEW YORK SHIP'S ORGANIZATION, ACTIVITIES AND FACILITIES

New York Shipbuilding Corporation with main office and works at Camden, New Jersey is incorporated under the laws of the State of New York. The company was founded in 1899, and the shipyard was constructed shortly thereafter on the Delaware River in the southern part of Camden. The yard was later enlarged to occupy nearly a mile of waterfront including the mouth of Newton Creek and river frontage in Gloucester City. The plant covers an area of about 250 acres on which are located the various shipways, docks and shops. Many machine tools of large size and capacity are available, along with handling equipment for assemblies up to 300 tons in weight.

At the beginning of 1951, New York Ship had built some 247 naval and 357 merchant vessels, including battleships and aircraft carriers, with a total tonnage of more than 2.1 million, as well as many items of heavy industrial equipment and machinery.

A particularly desirable feature of the shipyard from the standpoint of the NYX Project was the availability of the southern section of the plant known as the South Yard, which was separated from the main shipyard by Newton Creek. Substantial use of this area, with facilities having a replacement value in excess of \$12,500,000, had been discontinued due to the decline in shipbuilding following World War II.

Two adjoining structures, Buildings 3 and 10, located in the South Yard had been used for wartime naval gun turret fabrication and were almost ideally suited for the test and fabrication programs contemplated by du Pont. The buildings were large, had excellent facilities and were convenient to dock areas where units could be loaded on barges for transportation to the Savannah River Plant.

At the time of initial contract discussions, New York Ship had four shipbuilding contracts in progress and fewer than 6000 employees--both considerably below the yard's capacity. The company was therefore in a position to accept additional work, and to carry out the NYX Project without an extensive building program.

LETTER OF INTENT, FORMAL CONTRACT AND SCOPE OF WORK

LETTER OF INTENT AND SUPPLEMENTS

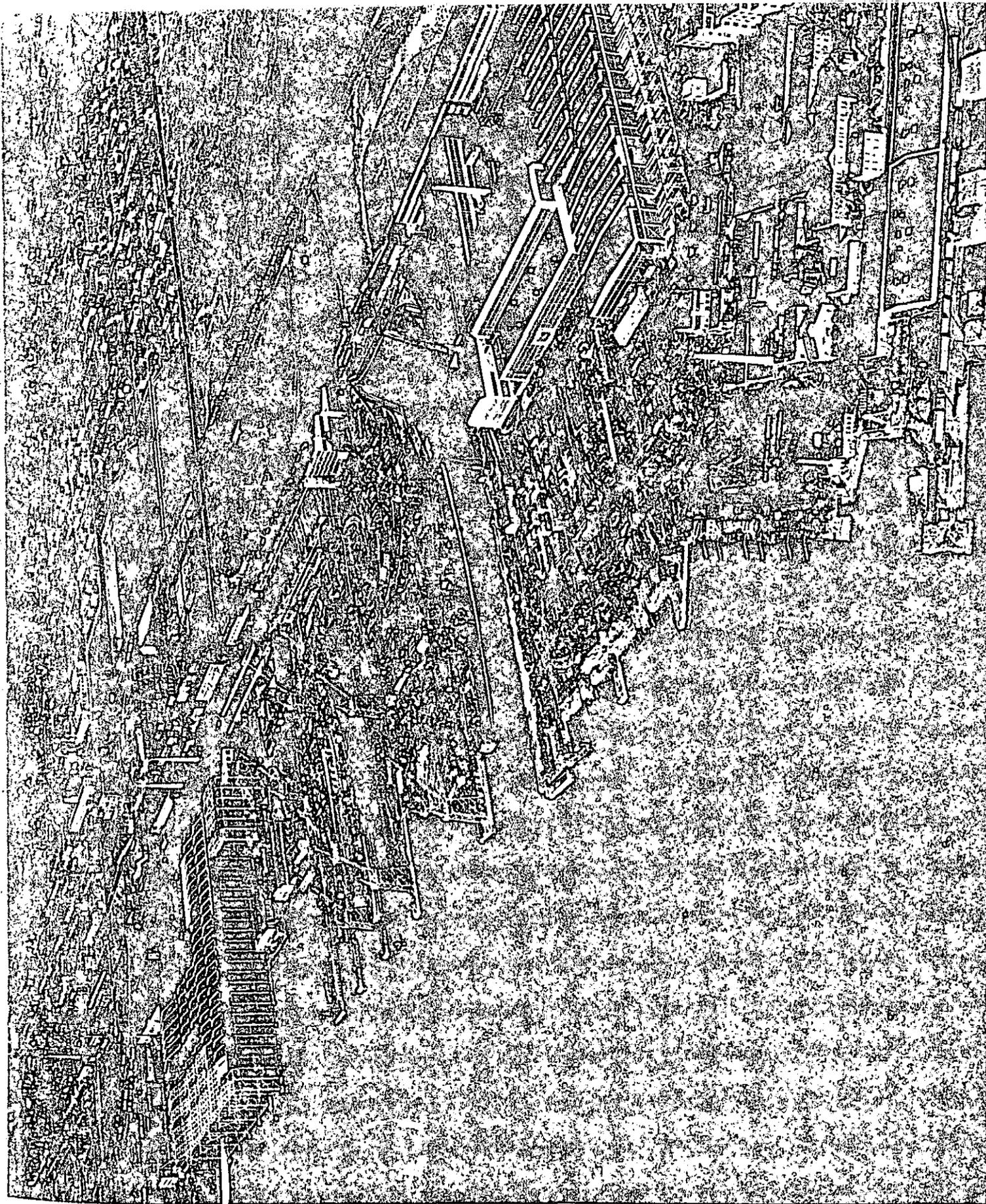
On April 25, 1951, du Pont authorized New York Shipbuilding Corporation by a letter of intent to proceed with the fabrication and assembling of certain equipment for the Savannah River Plant, du Pont Project No. 8980. The work was to be performed under du Pont's prime contract AT(07-2)-1 with the United States Atomic Energy Commission, effective August 1, 1950. The Letter of Intent provided for the execution of a subcontract identified as AXC-167-1/2 within 120 days, or any mutually agreed extension. It was also provided that the subcontract would be on a cost-plus-a-fixed-fee basis.

The basic Letter of Intent was amended by fourteen separate supplements, numbered 1 to 14, which successively extended its termination date to December 31, 1952. The formal subcontract was approved by the Atomic Energy Commission on December 2, 1952, making any further extension of the Letter of Intent unnecessary.

FORMAL SUBCONTRACT AND MODIFICATIONS

The formal subcontract AXC-167-1/2 between New York Ship and du Pont, although effective as of April 25, 1951, was the subject of extended negotiations concerned largely with: (1) percentage of plant burden or overhead applicable to the work, (2) amount of the fixed fee, and (3) compensation for the use of the South Yard during the test phase of the project.

In the subcontract, du Pont and New York Ship agreed that overhead was to be reimbursed on the basis of 59 per cent of the salaries and wages paid between April 1 and September 30, 1951.



NEW YORK SHIPBUILDING CORPORATION. The South Yard lies below Newton Creek (center of photograph). Buildings 3 and 10 are the large white-sided structures which form an "U" adjacent to the creek. Building 3 is parallel to the creek and Building 10 parallels the Delaware River. Building ways are at upper left.

For the period October 1, 1951, to March 31, 1952, an overhead rate of 58-1/2 per cent was agreed upon. Succeeding overhead rates were to be established by negotiation. The subcontract further established New York Ship's fixed fee at \$975,000, and the payment for the use of South Yard facilities at \$10,700 per month during the test phase of the project.

The formal subcontract was signed by New York Ship on January 3, 1952, and transmitted to the Atomic Energy Commission for approval. It was approved by the Atomic Energy Commission on December 2, 1952, and returned to New York Ship December 15, 1952.

The subcontract listed the estimated cost of the NYX Project as \$15,200,000, exclusive of fee, based on the scope of work set forth in du Pont's letter of December 13, 1951.

Seven modifications were made to the basic subcontract. Three of these extended the scope of work and resulted in an increase in the estimated cost of the project and in the fixed fee.

Modification Number 1 of February 1, 1952, deleted the requirement for the contracting officer to approve payment of installments of the fixed fee.

Modification Number 2 of June 3, 1952, was a major revision of the subcontract. It provided a new basis for the reimbursement for overhead expenses, tentatively setting the rate at 53 per cent of salaries and wages, but providing for an annual audit as of April 30th each year to determine the actual overhead costs. The audit, to be performed by independent public accountants, would be used to adjust tentative payments made during the year to agree with the actual overhead expenses. The method to be followed in determining overhead costs was made a part of the subcontract and designated Appendix B.

The modification also provided for a reduction in the amount of payment by du Pont for the use of the South Yard in the event that New York Ship made use of parts of it.

Modification Number 3, dated January 11, 1952, covered the fabrication of a stainless steel tank known as the "Physics Laboratory Tank and Grid Beam Assembly" at a fixed fee of \$7500 and an estimated cost of \$75,000. The total fee and estimated cost figures for the project then became \$982,500 and \$15,275,000 respectively.

Modification Number 4, dated December 19, 1952, provided that applicable overtime, premium and shift differential pay would be included as salaries and wages in computing the 53 per cent overhead reimbursement to New York Ship.

Modification Number 5, dated March 24, 1953, covered the fabrication of three "deck plates" for the 105-R actuator guide system and five sets of "forest structures and deck framing." The fee for this work was set at \$33,400 and the cost was estimated as \$417,500. The total fee and cost figures for the project then became \$1,015,900 and \$15,692,500 respectively. The same modification also provided for a reduction in the monthly compensation for the use of the South Yard to \$7,300 per month for period April 1 to June 30, 1952; to \$6,700 per month from July 1 to July 31, 1952; and thereafter to \$4,800 per month during the period that the South Yard facilities were used in connection with the test work. (Use of the South Yard for test work ended on August 31, 1953.)

Modification Number 6, dated August 6, 1953, covered three principal items. First, it provided for the conversion of the "NYX" Unit to the "K" Production Unit at a fee of \$72,000 and an estimated cost of \$812,000. Secondly, it provided for the fabrication of two "holding racks" and purchase of materials to fabricate a total of five racks. The fee for this work was \$8,300 and the estimated cost \$104,000. The third provision covered the fabrication of three holding racks at a fee of \$6000 and cost of \$75,000. The modification resulted in bringing the total fee to \$1,102,200 and estimated cost to \$16,683,500.

Modification Number 7 revised Sections IIA, IIB and III of Appendix B to the subcontract for the purpose of establishing negotiated fixed percentage allowances to be paid for indirect costs and overhead expenses subsequent to the date April 30, 1954. The contractual provisions prior to Modification No. 7 would have required paying a temporary percentage allowance for such costs which would later be adjusted to conform to actual costs, as determined by audit. In consideration of the fact that the expenses of making such an audit would be borne by the Government, and the nominal amount of such costs involved, it was determined to be advantageous to all parties concerned to modify the subcontract as in Modification No. 7.

SCOPE OF WORK AND ADDITIONS

The basic letter dated December 13, 1951, defining the scope of work to be performed under New York Ship's subcontract AXC-167-1/2 was written by the du Pont Engineering Department. It listed the work under six headings, the first five of which were used as the basis for cost estimating by New York Ship. The scope of work at that time was as follows:

1. Developmental Work
 - a. Prepare and test reduced size section.
 - b. Perform developmental work in connection with fabrication, including machining and specialized welding experiments.
 - c. Train and qualify welders in specialized techniques required for "NYX" development and production work.
2. Fabrication and Erection of Prototype (First) Unit
 - a. Provide necessary materials, jigs and fixtures (except such as are provided by du Pont or the Atomic Energy Commission) and fabricate the following parts: Plenum Chamber, Top Tube Sheet Assembly, Main Tank, Bottom Tube Sheet Assembly, and Process Piping.
 - b. Erect Prototype Unit.
3. Test Facilities and Services
 - a. Provide materials, facilities, and services (except such as are provided by du Pont or the Atomic Energy Commission) as required for testing the Prototype Unit and its auxiliaries.
 - b. Construct and erect all required alterations and additions to New York Ship's facilities including barricades, foundations, platforms, crane runways, pumping station, pipe lines, and sub-station to handle 18,000 kv.-a. for testing purposes.
 - c. Obtain revisions to the Public Service Electric and Gas Company distribution system to provide 18,000 kv.-a. for testing purposes.
 - d. Provide all labor, supplies and equipment to comply with Atomic Energy Commission security requirements.
 - e. Subsequent to completion of testing, dismantle, remove and prepare for shipment as directed, all testing facilities, including Prototype Unit. Restore New York Ship's facilities to original condition.

4. Test Operations

- a. Handle, store, and service all Atomic Energy Commission and du Pont furnished equipment, and prepare and install it for test purposes.
- b. Perform required services during testing.

5. Fabricate Four Production Units

- a. Provide necessary materials (except as are provided by du Pont or the Atomic Energy Commission) and fabricate four Production Units generally similar to the final design of the Prototype Unit; said Production Units to be prepared for shipment to the Savannah River Plant without erection or testing.

6. Machine Tools

- a. Provide necessary machine tools and gages (except as are provided by du Pont or the Atomic Energy Commission) for the work outlined above.

The estimated cost of the project, based on information available on August 27, 1951, was listed in the December 13, 1951, scope-of-work letter as \$8,487,595 for labor and \$6,696,615 for materials, or a total of \$15,184,210, not including New York Ship's fixed fee. For contract purposes, this figure was rounded to \$15,200,000.

Various modifications and additions were made to the scope of work from time to time, and were reflected later in the subcontract either by reference or modification of the contract. The principal additions to the scope of work authorized by letter prior to modification of the basic subcontract are listed below:

On May 20, 1952, a supplementary letter was written by du Pont explaining that in Item 2(a) above, Process Piping was to provide only for the Prototype Unit. In Item 5(a), New York Ship was to be responsible for loading the units on a carrier to be provided by du Pont for shipment to the Savannah River Plant. These items were considered to have been covered by the original scope of work and the letter was treated as a clarification of existing scope.

A subsequent letter from du Pont, dated June 6, 1952, authorized New York Ship to proceed with the fabrication of a stainless steel "Physics Laboratory" tank as a change in the scope of work of the subcontract.

The scope of work was again increased on August 5, 1952, when du Pont authorized New York Ship to proceed with the fabrication of three "deck plates" and four "forest structures and deck framing." A fifth "forest structure," converted from an existing obsolete structure was added to the scope of work by a du Pont letter dated January 21, 1953.

On March 23, 1953, New York Ship was authorized to add to the scope of work the fabrication of two "holding racks" and the procurement of material for the fabrication of five "holding racks." On July 16, 1953, du Pont authorized New York Ship to proceed with the fabrication of three additional "holding racks."

Other additions to the scope of work were made by direct modification of the subcontract.

FINAL COMPLETION OF CONTRACT

All equipment fabrication was completed in May, 1954, but additional time was required to dismantle temporary facilities, restore buildings to their original condition, dispose of equipment and records, and complete other miscellaneous work. Some of the du Pont Engineering Department representatives, stationed at New York Ship, remained until August 13, 1954, to assist in the closeout work. The subcontract was not formally closed until a later date.

The final cost of the subcontract was approximately \$16,940,000, including New York Ship's fee.

III - ORGANIZATIONS - FUNCTIONS AND RESPONSIBILITIES

DU PONT ORGANIZATION FOR THE NYX PROJECT

As the prime contractor with the Atomic Energy Commission, E. I. du Pont de Nemours & Company had basic responsibility for the entire Savannah River Plant program of which the NYX Project was a relatively small, though critical part. Within the du Pont organization, the Engineering and Explosives Departments were most closely associated with the project.

Du Pont provided New York Ship with essentially all design requirements during the course of the project. Much of the procurement of materials was handled by du Pont also, particularly in the areas where serious shortages existed or where government directives were needed to obtain controlled items. The various pumps, motors and other auxiliaries used in the test operations of the prototype unit were also supplied by du Pont.

ENGINEERING DEPARTMENT

Over-all execution and control of the NYX Project during the first two months of New York Ship participation was the responsibility of the 100 Area Design Project Manager. The Design Project Manager continued to have design responsibility for the duration of the project.

Beginning in July, 1951, responsibility for the construction progress of the NYX subcontract was assumed by the Construction Division of the Engineering Department, which was represented by a Field Project Manager assigned to New York Ship.

The Material and Equipment Section of the Construction Division was active at New York Ship from the beginning of the project. This section provided expediting and priority services for both du Pont and New York Ship purchase orders. In addition, in its supervision of quality control, the Material and Equipment Section provided a complete inspection service throughout the project. A great number of special gages and instruments were designed specifically for application to the NYX Project, and inspections were carried out around-the-clock by the Material and Equipment Section.

The Control Division of the Engineering Department provided services in establishing and maintaining accounting and payroll procedures at New York Ship which were acceptable to the Atomic Energy Commission. A Control Division representative was resident at the site for performing the

control function at New York Ship until the completion of the subcontract.

The local du Pont construction organization is indicated by the organization chart, included as Exhibit "A-1" in the appendix.

EXPLOSIVES DEPARTMENT

The test operations of the "NYX" Unit in the South Yard were carried out under the direction of the "NYX Organization" of the Atomic Energy Division of du Pont's Explosives Department.

NEW YORK SHIPBUILDING CORPORATION

In its role of subcontractor to du Pont, New York Ship was responsible for accomplishing the scope of work described in Part II of this report. Relatively little design work was needed since nearly all drawings were furnished by du Pont, although some of the temporary facilities used in the test of the prototype "NYX" Unit in Building 10 in the South Yard were provided by the New York Ship plant engineer.

New York Ship's principal responsibility was in the fabrication of the various units. The development of welding and line boring techniques, the furnishing of security protection, and the procurement of a large proportion of the materials and services for the project were additional responsibilities of considerable magnitude. In performing the fabrication work the various departments of New York Ship made a number of shop drawings. These covered various jigs and fixtures, and details of parts of du Pont drawings. Some four hundred such shop drawings produced during the NYX Project were listed in catalog form and copies of the list were transmitted to du Pont for the Project files.

Nearly all of New York Ship's twenty yard departments contributed to the NYX Project in some degree. The three departments principally engaged in the work were the Welding Engineer Department, the Boiler Shop and the Machine Shop. Organization charts, Exhibits "A-2 to 4," in the appendix to this report show the shipyard organization at the beginning and at the end of the NYX Project.

Within the New York Ship organization, a special "NYX Project Manager" office was established on June 1, 1951. The NYX Project Manager reported to the shipyard's Works Manager, and had a staff which, at its peak, consisted of eleven persons. The organization of this office is described in detail in Part VII.

OTHER ORGANIZATIONS

Aside from regular services such as utilities, cleaning, sandblasting, etc., which New York Ship regularly obtained from outside organizations in its normal course of business, three firms were awarded special sub-subcontracts in connection with the test facilities provided in Building 10.

Public Service Electric and Gas Company of New Jersey received a sub-subcontract for the installation of temporary power facilities to Building 10 at a cost of \$204,907.86. Of this amount, \$200,249.50 was subsequently refunded because most of the installed facilities could be utilized by the company.

Ralph Cornell, contractor, Woodbury, New Jersey, received contracts totaling \$583,000 for furnishing labor and materials to construct nearly all of the test facilities in Building 10.

Upon the completion of test operations in Building 10, the Pantano House Wrecking Company, Philadelphia, was awarded a contract totaling \$39,060 to demolish and remove the major part of the facilities erected by Cornell.

FORCE CHARTS

The number of persons assigned to the work at New York Ship is indicated by force charts in the appendix. Exhibit "B-1" shows the number of New York Ship personnel, and Exhibit "B-2" indicates the total force, including all groups.

IV - ORGANIZING OF JOB

INITIAL ORGANIZATIONS FOR THE PROJECT

The formal Letter of Intent from du Pont of April 25, 1951, covered in very broad terms the work to be done at New York Ship, i.e., "Fabricating and assembling certain equipment, as requested in writing by du Pont, for the 100 Area at Savannah River Plant, Aiken, S.C."

Details of the job, as permitted by the clearance status of New York Ship personnel, were covered by du Pont in an initial design and fabrication conference at New York Ship on April 24 and in a series of subsequent meetings attended by New York Ship's Welding Engineer and the superintendents of a few departments such as the Machine Shop and Boiler Shop. A study of the procurement and fabrication problems involved in the project was thus begun simultaneously with the Letter of Intent. On May 16, all superintendents and department heads were notified that the shipyard had undertaken work, (New York Ship Contract 8000) for the Atomic Energy Commission, as a subcontractor to du Pont. A broad series of New York Ship charge numbers was assigned as follows: 8001, covering work relating to the reduced scale section; 8002, covering special security work (later to include general office work); 8100 to 8590 were reserved for actual production work; and 8600 and above were to cover all material and labor charges involved in the provision of facilities for production or test.

The shipyard was able to proceed with the work through its normal departmental organization, but a growing need to coordinate the over-all project, and almost continuous developments in design, made desirable the assignment of a project manager. On June 1, 1951, an NYX Project Manager was appointed. Although not a full-time position at first, it quickly became so and supervision by an NYX Project Manager continued until the end of the subcontract.

On May 1, New York Ship instituted a limited security program for the NYX Project through its Office Services Department. Questionnaires for initial clearances were processed through this office, but in view of the extent of security work and the proposed test operations of the "NYX" Unit a separate security office was necessary. On July 18, 1951, an NYX Security Officer was appointed as discussed in Part V of this report.

The first du Pont representative assigned to the project was from the Control Division. He arrived in mid-May, 1951, and was joined within a few days by an expeditor and an

inspector from the Material and Equipment Section of the Construction Division. The du Pont representatives were given office space in the upper floors of the employment office building and the adjacent yard office building.

On July 9, a du Pont Field Project Manager was assigned, and engineers for the Building 10 test area arrived in late July and August.

Du Pont's peak construction force consisted of eleven engineers, while the Material and Equipment Section grew to twenty-three inspectors and two expeditors.

Early in 1952, the du Pont representatives moved to offices in Building 3, in the South Yard to be nearer to the construction and fabrication work.

During the operations of the "NYX" Unit in Building 10, approximately seventy-five persons from the du Pont Explosives Department were assigned to New York Ship. The operations organization was provided with office space in Building 10, and later with additional offices in Building 3.

DEVELOPMENT OF CONSTRUCTION SCHEDULES

During the first weeks of the NYX Project at New York Ship both du Pont and New York Ship directed their efforts primarily toward obtaining materials and organizing the work. While fabrication and the development of welding and machining procedures were being pushed on a priority basis, operations were performed without formal scheduling.

The need for scheduling was recognized, and as soon as preliminary fabrication steps had been developed a series of meetings was held between du Pont and New York Ship representatives in which time estimates for each fabrication step were made. Limiting items were then selected from the various estimates and the remaining work scheduled in proper sequence in the program. The first master construction schedule was issued in September, 1951, by the du Pont Field Project Manager. Subsequent construction schedules were issued from time to time as required by design changes, difficulties in procurement of materials, and fabrication difficulties that had not been anticipated in previous scheduling.

As of the end of 1951, the du Pont construction schedule was based on the following optimum dates:

<u>Unit</u>	<u>Start of Fabrication</u>	<u>Completion of Fabrication</u>
NYX	September 1, 1951	March, 1952
R	November 1, 1951	May 1, 1952
P	February 15, 1952	July 15, 1952
L	May 1, 1952	January 1, 1953
K	November 1, 1952	July 1, 1953
C	May 1, 1953	January 1, 1954

Soon after the issuance of the original schedule, regular weekly meetings began between representatives of the New York Ship departments directly concerned with fabrication, du Pont Design Division, Construction Division and occasionally representatives of the Atomic Energy Division (Explosives Department), the Engineering Research Laboratory, Engineering Service Division and the Mechanical Development Laboratory. The New York Ship NYX Project Manager began the preparation of detailed weekly fabrication schedules in December, 1951, which continued for the duration of the project. The meetings continued until April 15, 1952, when they were discontinued and replaced by a weekly scheduling meeting attended by the New York Ship fabricating departments, the du Pont Field Project Manager's staff and Material and Equipment Section representatives. The scheduling meetings continued throughout the project.

DEVELOPMENT OF CONSTRUCTION REPORTS

The du Pont Field Project Manager at New York Ship initiated a Weekly Force Report in August, 1951, which was continued until the end of the project. The report showed the number of du Pont personnel of the Construction Division, along with New York Ship and lump-sum sub-subcontractors' employees, who were engaged in the project.

Du Pont also submitted: A Weekly Activities Report, summarizing important activities and problems encountered in the preceding week; a Bi-Weekly Progress Report showing percentage of completion of the various items of the subcontract, and listing the number of visitors and the number of persons working on the project; Organization Charts showing New York Ship and du Pont staffs; Monthly Atomic Energy Commission Furniture and Fixture Tag Report; a monthly Government Vehicle Report; Monthly Safety Report; a monthly Payroll, Overtime and

Premium Time Report; and a monthly Material Premium Report, showing premium payments necessary to obtain materials that were urgently needed to complete the project.

Monthly Cost Report, showing all reimbursable costs incurred were prepared by New York Ship, and submitted by du Pont to the Atomic Energy Commission. Quarterly Wage and Salary Reports, prepared by New York Ship, were also submitted by du Pont to the Atomic Energy Commission.

DESIGN STATUS WHEN WORK WAS STARTED AT NEW YORK SHIP

The design of the prototype "NYX" Unit and the subsequent production units was still fluid at the time New York Ship undertook the project. The concept at that time called for a unit similar to the final production units except that it had no Bottom Tube Sheet Assembly and the rod tubes were positioned horizontally rather than vertically.

However, by the time actual work was begun at New York Ship, the design of the "NYX" Unit had been frozen (as of May 30, 1951). Fabrication of the tube sheets from sections of plate commenced early in July, and the center-to-center spacing of the tubes was determined later in the month from shrinkage experiments on a reduced scale mock-up (Eight-Foot Mock-Up). Design and drafting work was expedited through June, and on July 12, 1951, drawings relating to the "NYX" Unit Plenum Chamber and Top Tube Sheet Assembly were issued so that New York Ship could proceed.

PROCUREMENT STATUS WHEN WORK WAS STARTED AT NEW YORK SHIP

The major procurement requirements for the NYX Project were stainless steel plate, stainless tubing, and special fabrication tools.

Prior to selecting New York Ship as a subcontractor, du Pont had anticipated the need for stainless steel plates and obtained allotments under the Controlled Materials Program. These were applied to general mill orders placed through G. O. Carlson.

Shortly after New York Ship started work on the project, a bill of materials was provided for the "NYX" Unit so that orders could be placed at once.

Du Pont had also initiated procurement efforts for welding wire and the stainless tubing required for the Plenum and tube sheet assemblies, but the delivery situation was not satisfactory at the time work was started at New York Ship. This situation was improved in time for fabrication by directive assistance.

The procurement of fabrication tools had been initiated by du Pont prior to the start of work at New York Ship in anticipation of critical requirements for such equipment. Du Pont was engaged in development work with the Air Reduction Company to perfect the special tube welding equipment later used on all units, and with Consolidated Machine Tool Corporation in connection with special boring equipment of a capacity to handle large tube sheets; but the rest of the welding machine and machine tool procurement program was carried out jointly by du Pont and New York Ship after the beginning of the NYX Project.

V - SECURITY

POLICIES AND PROCEDURES

Security was a vital consideration during the entire NYX Project. From the very beginning of the program, the safeguarding of information and materiel was a primary objective comparable to construction of the equipment.

The security measures taken by New York Ship in connection with the NYX Project were under the general supervision of the Atomic Energy Commission. Representatives of the Commission made frequent inspections of the shipyard and the procedures of the NYX Security Office.

Access to plans and restricted data was limited to those with an actual "need to know" who had been cleared for security by the Atomic Energy Commission. The shipyard was protected by a watch force and fences, while areas in which classified NYX work was done were further screened by barriers and patrolled night and day by special armed guards. All who entered classified areas were required to present passes and be identified by guards.

During preliminary negotiations with du Pont, New York Ship could not be informed of the classified details of the NYX Project. The equipment to be built was designated simply as tube sheets and the test operation outlined only briefly. When a Letter of Intent was issued by du Pont on April 25, 1951, it became necessary to advise New York Ship personnel of classified details of the job. Personnel Security Questionnaires were made out by key personnel of New York Ship who would be the first to have access to restricted data. On May 21, 1951, the first eight individuals to be cleared met in Wilmington, Delaware, for the purpose of orientation concerning the NYX Project.

In the meantime, on May 8, 1951, representatives of the Security Division of the Atomic Energy Commission visited New York Ship and surveyed the plant. They recommended that the company establish a separate security office for the NYX Project. On June 18, 1951, New York Ship engaged Henry W. Rodney, a former U. S. Secret Service Special Agent-in-Charge, as security officer of the NYX Project.

PERSONNEL SECURITY

The first work of the NYX Security Office was the processing of Personnel Security Questionnaires for the large number of New York Ship employees who would soon require

knowledge of restricted data in order to carry out their duties. The Security Officer interviewed each one, briefed him as to security requirements, and determined whether the employee desired to be assigned to the NYX Project. Those who volunteered were then photographed, fingerprinted and processed in accordance with directives of the Atomic Energy Commission. Normally "Q" Clearances were requested. These clearances required about two and one half months for completion. When it was not possible to anticipate the need for cleared personnel and the delay would slow the NYX Project, requests were made for "QE" (Emergency) Clearance.

Clearance of du Pont representatives was administered through the du Pont organization. The Atomic Energy Commission notified the Security Office of du Pont employees cleared to work on the project, and passes were issued to them by the NYX Security Office.

An "exchange" system of passes was used for identification of cleared personnel. Such personnel were issued identification cards by the NYX Security Office. Each card contained a description of the individual, his NYX number, photograph and signature. Matching badges were kept by guards at the entrance to the restricted area and classified either as "active" or "inactive". Upon presentation of his identification card, a person whose badge was in the "active" group would be issued his badge which he was required to wear at all times in the restricted area. On his departure he would return the badge and receive his card. Special permission was required from the Security Office to admit persons who, though cleared, were not actively engaged on work in the restricted area, and whose badges were, therefore, filed in the "inactive" category.

A number of visitors representing various agencies and vendors found it necessary to visit the project. They were required to obtain advance permission from the Area Security Officer of the Atomic Energy Commission.

During the period of operations of the NYX Security Office, approximately 2850 separate visits were approved by the Atomic Energy Commission. Since numerous visits were made by the same persons, the number of individuals visiting the project was considerably smaller. Each visitor was processed by the NYX Security Office and escorted while in the restricted area. (The above does not apply to individuals who, because of frequent visits, were issued regular photographic identification passes under the "exchange" system.) Both chronological and alphabetical records were maintained of all visitors and were held by the New York Ship Security Office until disposal was authorized by the Atomic Energy Commission.

Upon the closing of the NYX Security Office with Building 10 no longer a restricted area, the exchange system was abolished and visits were handled in accordance with regular shipyard routine. Admission was controlled by the watch force at plant gates, and granted when authorized by du Pont or the NYX Project Manager.

When employment of a cleared individual was terminated or he no longer required access to classified material, his clearance was also terminated. He was interviewed by the NYX Security Officer to make certain that he turned in all papers and other classified material and was warned not to discuss any classified information he might possess. He was also required to sign a Security Termination Statement which was forwarded to the Atomic Energy Commission.

As work of a classified nature drew to a close in the spring of 1953, the number of clearances to be terminated increased sharply. With the closing of the security phase of the project in Building 10 on May 13, 1953, the NYX Security Office made personal contact with all cleared personnel, except a few whose duties would require continued access to either classified material or restricted data. NYX identification cards were recovered from employees and destroyed, as were all exchange badges used in the restricted area of Building 10. Each employee whose "Q" clearance was terminated was briefed and required to sign a Security Termination Statement.

When the NYX Security Office was closed on June 19, 1953, clearances were outstanding for 50 employees of New York Shipbuilding Corporation. During the two-year period of operations of the NYX Security Office, a total of 487 "Q" clearances were processed to completion and approval by the Atomic Energy Commission. When the NYX Security Office was closed, cognizance of outstanding clearances was transferred to the New York Ship Security Office for termination at appropriate times.

MATERIEL SECURITY

During the early stages of the NYX Project, materiel security measures were concerned chiefly with blueprints and documents. Safes and combination lock cabinets were provided for storage of such materiels. Outside of regular working hours, guards made hourly checks of all such safes and cabinets.

As fabrication of the process units proceeded, it became necessary to store uranium at the shipyard for use in tests of the "NYX" Unit which was to be assembled in Building

10 in the South Yard. Accordingly, a wire cage approximately 48 ft. long was built in the southwest corner of the building and, after inspection and approval by Atomic Energy Commission representatives, was established as a restricted area on October 10, 1951. When the first shipment of uranium arrived shortly thereafter from Oak Ridge, Tennessee, it was stored in the cage and a continuous armed watch was posted.

The restricted area was enlarged on December 15, 1951, to include the uranium cage and an additional 8200 sq. ft. to be used in uranium loading operations. This area was surrounded by a cinder block wall, topped with composition panels. The restricted area was further enlarged on June 6, 1952, to include all of Building 10. Since one end of the original building opened directly into Building 3 and one side was open to Building 5, extensive barricades were required. A personnel entrance was provided in the north barricade and designated Main Personnel Door No. 2. All other entrances to Building 10 were secured with padlocks. The restricted area, in which the "NYX" Unit was assembled and tested, was covered at all times by five guards so stationed that the entire area of the building was under constant surveillance.

Much of the work on the process units was carried out in the different shops of the shipyard simultaneously with the company's other activities. The normal yard security restrictions were considered adequate at this stage of the work, except that additional anti-sabotage precautions were taken.

Accountability for the uranium used in test operations at New York Ship was, in the case of the NYX Project, assigned to the Security Officer. He was designated Accountability Representative of the Atomic Energy Commission and in that capacity received, stored, issued and kept records of all uranium used in the NYX Project. He was assisted by an employee stationed at the cage in which uranium was stored.

The accountability representative issued uranium to certain other organizations such as Arma Corporation and American Machine and Foundry Company which required the material in constructing components for the process units. Such transfers were made only at the direction of the Atomic Energy Commission.

At the end of each month, the accountability officer took an inventory and submitted a report to the Atomic Energy Commission showing all transactions in uranium.

Uranium for the NYX Project was received in twelve separate shipments by truck from Oak Ridge, Tennessee, with the first shipment arriving on October 10, 1951.

Return of the uranium to Atomic Energy Commission custody began on February 24, 1953, and continued until April 29, 1953. A total of eleven shipments was made to the Savannah River Plant by truck.

By letter dated June 3, 1953, the New York Ship Accountability Representative was notified by J. H. Rubin, Accountability Representative, Atomic Energy Commission, Savannah River Operations Office, that all uranium materials received by New York Ship had been accounted for by other authorized accountability stations. The accountability station at New York Ship was thereupon placed on the inactive list as of May 13, 1953.

NYX SECURITY OFFICE AND STAFF

The NYX security office consisted of two rooms on the second floor of the Employment Building. Personnel were as follows:

Security Officer	Henry W. Rodney	6/18/51 to 6/19/53
Senior Clerk and Assistant to	Security Officer Warren S. Jones	6/25/51 to 6/19/53
Secretary	Mrs. Dorothy M. Marshall*	4/25/51 to 5/15/53

Note: *Employed in processing security questionnaires prior to formal establishment of NYX Security Office.

During the summer and fall of 1951, additional typists were used to prepare Personnel Security Questionnaires. A maximum of four was required and all were released by November, 1951.

During the period of activity of the NYX Security Office at New York Ship from June 18, 1951, to June 19, 1953, no known incidents involving compromise of classified material took place. There were no known cases of sabotage or loss of classified material.

VI - FABRICATION AND TESTING FACILITIES

FACILITIES CONSTRUCTED OR PROVIDED

Existing Buildings 3, 5 and 10 in the South Yard were well equipped for fabrication of the NYX Project. Known as the Machine Shop and Blacksmith Shop, Buildings 3 and 5 had been modernized and Building 10 constructed in 1940-1942 under Navy contract to fabricate and assemble large gun turrets for cruisers and battleships.

Equipment consisted of horizontal and vertical boring and facing mills, planers, lathes, turning and general purpose machine, welding positioner, radial drills, layout platens and two turret erecting pits. Excellent integrated overhead traveling crane facilities existed with capacities ranging from 5 tons to 250 tons lift. Also there were railroad trackage and equipment for transporting materials between the shops and the North Yard, including a specially designed barge and landing platform adjacent to Building 3 at the south side of Newton Creek, for transporting turret assemblies by water.

At the time surveys were begun in April, 1951, to determine the changes necessary to undertake the highly classified and specialized experimental NYX Project, these buildings were in occasional use for heavy machine work and generally for storage of large items of marine equipment. Following discussions with shipyard officials regarding the necessity for continued access to, and occasional use of, heavy machine tool facilities for the normal shipyard program, du Pont engineers continued their surveys to determine acceptable architectural changes that would assure adequate security control, and additional temporary electric power and water facilities required in connection with the proposed test and partial operation of the prototype unit.

Upon completion and approval of the preliminary studies in June, du Pont issued drawings for bidding purposes. The required work included a concrete foundation mat and twelve-sided foundation tower, temporary motor and pump foundations, inner and outer security barricades, control room and construction offices, instrument shop and dark room, precision crane runway and supports, stairways and platforms, and relocation of a 20-ft. boring mill. Temporary electric power and water facilities were also required.

Completion of inner barricades and assembly components was originally called for by September 1, with balance of work to be finished by October 1, 1951.

The shipyard maintenance departments were staffed for normal repair work only, and were not in a position to undertake this additional work; nor was there reasonable assurance that temporary help could be obtained quickly in the necessary trades of carpenters, plumbers, welders, steel erectors, electricians, laborers, etc. from the commercial labor market at a time of high industrial activity in the area. This situation was reviewed with du Pont and Atomic Energy Commission representatives, and the proposal to subcontract the work was approved. Competitive bids were solicited from Ralph Cornell, Inc., Goldner Construction Company and Kauffman Construction Company.

Cornell's low bid of \$511,979 was selected and approved by du Pont and Atomic Energy Commission and confirmed by New York Shipbuilding Corporation Purchase Order 8643-1 dated August 24, 1951. Cornell, a contractor primarily for structural steel erection, with offices in Woodbury, New Jersey, undertook the structural steel work himself and subcontracted the balance of the work as follows:

All pipe work for Cornell was done by Benjamin Lessner Company, Inc. of Philadelphia; all electrical work by Electro Construction Company of Philadelphia; all carpentry and general work, including forming and pouring of concrete, by Consolidated Construction Company, Inc. of Woodbury, New Jersey.

Subsequent design changes and additions to scope of Cornell's sub-subcontract amounted to \$72,325 increased cost. These included forty-five items such as increased size and thickness of foundation mat, 340 ft. of steel fencing for security purposes, additional pump and motor foundations, six heat exchanger supports, 145 tons of trap rock to fill in substation area, six permanent pump and motor foundations, cooling water supply and drains from six substation transformers, additional stiffening and concrete fill for twelve temporary pump and motor foundations, realignment of temporary pumps and motors, additional foundation and timber structures for heat exchanger, additional concrete work, floor topping, hand rail, etc.

The additional items resulted from design changes, unforeseen construction difficulties and work that was not anticipated when bids were requested on a lump sum basis. The urgent need for the facilities had made it necessary to extend invitations to bid prior to the completion of firm design drawings so that certain changes were to be expected. The additional work was covered by Purchase Order 8643-1A dated November 18, 1952.

Building 5 Barricade

The barricade in Building 5 was smaller and of simpler construction than the north barricade. It covered approximately 3400 sq. ft. of opening. Framing for this barricade consisted of wood posts set 12 ft. on centers with wood girts on 4 ft. centers. Aside from the framing, this barricade was similar to the north barricade described immediately above. However, there was no opening with drop curtains and no curtain above since the barricade extended from the floor to the roof. Width of barricade was 120 ft. and average height 26 ft. except for two dormer window sections each 21 ft. wide and approximately 7 ft. high. Work was started on August 17 with laying cinder blocks. The barricade was completed September 5.

Assembly Room, Platforms, Storage Racks, Inner Barricade and "Slug" Locker

The assembly room, referred to generally as the "loading area" was in the southwest corner of Building 10 and was approximately 90 ft. square. It was closed off from the rest of the building by a fixed barricade and curtain on the north side approximately 47 ft. high, and on the east side by a barricade extending from the floor some 60 ft. to the roof. The canvas curtain at the top of the north barricade provided access for two 30-ton cranes by means of a hand-operated canvas drop curtain. This was the first area to go under security and provided facilities for storing inactive slugs, storing "Q" foils and "C" rods, loading and unloading "Q" foils, boiling slugs to test for leakage of containers and for pressing and shearing of "Q" foils to be scrapped.

The first work done in the loading area was construction of the barricade, the east wall of which was started August 9. The original plans for the north wall of the barricade called for five timber bents 31 ft. high averaging 17 ft. 6 in. apart between which were supported 5-in. channels supported by sag rods. Nailers were to be bolted to the channel girts and wallboard nailed to them except for bottom 8 ft. which was to have been sheet metal, either plain or corrugated. Late delivery of channel steel forced substitution of wood girts and studs. As a field change, asbestos board facing was used except for bottom 8 ft. where cinder blocks were used in place of sheet metal. The east wall of the barricade was built of wood framing with asbestos board facing and cinder blocks for lower 8 ft. Fastening this wall to the building steel eliminated the need for timber bents. The last work done on the barricade walls of the loading area was the covering of the roof truss directly over the north barricade with asbestos board. This was completed August 29.

Two flights of wood stairs in the southeast corner of the loading area led to a 20-ft. high wood platform some 30 ft. by 40 ft. in size. This main platform was supported on wood posts from the floor as was a 2-ft. wide wood walkway running north from the main platform. A 3-ft. wide wood walkway ran west from the southwest corner of the main platform and was supported on brackets fastened to the south wall columns. This walkway gave access to wood walkways 2 ft. wide at elevation 22 ft. along the top of two storage racks, each of which extended west some 56 ft.

The storage racks were constructed of structural steel and were 56 ft. long, 2 ft. wide and 22 ft. high with pairs of 4-in. channels at the top. "Q" foils and "C" rods were stored vertically in these racks, being supported at the top by wood blocks clamped around them.

A separate wood platform for the tipping table, approximately 7 ft. by 27 ft. at elevation 9 ft., with a stairway, was located under the northwest corner of the main platform. Another wood platform 4 ft. 4 in. by 14 ft. at elevation 4 ft. with stairs at center of east side, was located under west end of two openings in the main platform.

Two structural steel transfer fixtures bolted to the side of the main platform were used to transfer "Q" foils from the monorail hoist to a specially equipped hoist truck. This truck was used to move "Q" foils from the loading platform to the storage racks and later from the storage racks to a transfer fixture near the "NYX" Unit.

Also in the loading area was an overhead monorail system supported by approximately 380 ft. of 12-in. wide flange structural steel beam. This supporting steel was hung from the roof trusses with bottom of monorail steel being 2 ft. above the bottom of the roof trusses. All steel work was prefabricated and, in the loading area, either bolted or welded in place. In the southwest corner of the loading area, a woven wire locker 10 ft. by 45 ft. and 11 ft. high was provided for storage of slugs.

Cornell's sub-subcontract provided for erection of all the platforms and walkways described above and for the erection of the two storage racks, the monorail supporting steel (but not the monorail itself), fabrication and erection of the slug locker and placing of 2500 sq. ft., more or less, of "Crete-fix" (a special concrete grout) to provide a smooth floor surface in the operating area of the hoist truck.

Construction of the walkways and platforms was started August 16 and completed August 24 except for walkways on top of the storage racks, and sliding doors in east and north walls.

Later minor revisions to the platforms, started October 1 and completed October 6, were covered by an addition to the scope of work.

"Slug" locker erection was started August 18 and completed August 21. Wire panels were prefabricated for this locker but some obstructions not noted in original plan required reworking of some of the panels. On September 7 metal screen was placed over windows in "slug" locker. Though not in the sub-subcontract no addition to scope of work was made for this extra.

Erection of sliding doors in east and north walls was started August 28 and completed October 2.

Late delivery of the structural steel for the storage racks delayed their erection which was started December 5 and completed December 7.

The supporting steel for the monorail was erected September 29 and while erection of the monorail itself was not a part of Cornell's sub-subcontract because it was originally intended that New York Ship personnel would erect it, labor policy dictated that Cornell's men should do this work and also that they should install the electric power to it. Both of these items were covered by additions to the scope of the contract.

The amount of "Crete-fix" floor topping in the loading area was increased because of revised design. This was covered by an addition to the scope of the contract.

Subsequent to the completion of Cornell's sub-subcontract, New York Ship personnel added to and revised some of the structures in the loading area and also installed various equipment and facilities.

Control Room, Dark Room, Instrument Storage and Repair Rooms and Operating Department Office

Other than the "slug" locker previously described, the rooms and office listed above were the only separate enclosures constructed by Cornell.

The control room, 20 ft. by 27 ft. by 12 ft. high was of wood frame construction with exposed studs on the outside, plywood-lined walls inside, and "Celotex" lined ceiling. Roof was covered with tongue and groove boards.

The dark room, built against the east wall of the control room, was 8 ft. by 15 ft. 6 in. in size, including a labyrinth

entrance and was lined completely with "Celotex". It was painted black with all openings sealed to make the room light proof. Cornell furnished a 50-gal. capacity electric water heater, a sink, piped hot and cold water, and drain to a sewer. He, also, provided an exhaust fan for the dark room.

The instrument storage and repair rooms, each 20 ft. by 23 ft. in size, were located in the south end of Building 5 where it adjoined Building 10. During the early months of the job, the Control Room was used as an office by the Instrument Engineering personnel. Both the storage and repair rooms were constructed of woven wire panels. The storage room had a woven wire ceiling but there was no ceiling over the repair room. Woven wire design was used to make use of a roof-mounted unit heater in this part of Building 5. Since these rooms were located against the south wall of Building 5 and against the Building 5 barricade, woven wire panels were required only for the north wall of both rooms, the partition between them, and the ceiling of the storage room.

Framing of the control room, dark room and office was started September 5. Erection of woven wire panels for instrument storage and repair rooms was started September 25. Work on all these items was completed October 17. Field changes called for:

1. Partitioning the north end of the Operating Department office to make three small offices out of a single room.
2. Revising the lighting system accordingly.
3. Providing the additional doors required.
4. Providing five metal louvered ventilators.
5. Providing work benches for the dark room and the instrument repair room.
6. Applying "Crete-fix" to office floor.

FOUNDATIONS

NYX Unit Foundation

The "NYX" Unit foundation was a twelve-sided hollow tower approximately 33 ft. 6 in. high with sides 6 ft. 10 in. long and walls about 5 ft. 3 in. thick. The tower sat on a concrete mat 46 ft. by 76 ft. in size and 3 ft. 1-1/2 in. in height. The mat in turn rested on a 12-in. structural concrete slab to which were anchored 6-in. I-beams 4 ft. on centers.

A non-reinforced concrete filler had been poured between the I-beams. The structural slab in turn was supported by pile clusters under each building column. Only the mat and tower were new construction.

Platforms surrounded the tower at elevation of 18 ft. and 34 ft. above the original floor. Four flights of stairs, at the east side of the mat, gave access to the two tower platforms mentioned above.

Work on the mat began August 7, and it was poured August 13, requiring approximately 400 cu. yd. of concrete.

A misunderstanding regarding the size of the foundation mat, 46 ft. square versus 46 ft. by 76 ft. required an addition to the scope of the contract. A revision increasing thickness of the mat from 2 ft. 6 in. to 3 ft. 1-1/2 in. required another addition to the scope of the contract.

Erection of forms for the foundation tower and tying of reinforcing steel began August 16. Cornell rented reusable steel panel forms for this construction. The first lift, up to elevation 17 ft. 10-3/4 in. was poured August 24, the second lift to elevation 27 ft. September 7, and the third and final lift September 14. The four small piers at top of the foundation which supported the "C" rod actuator frame were poured September 20.

Structural steel at the top of the foundation was set in place November 2 and bolted loosely, since it would have to be removed temporarily when the "NYX" Unit was placed.

The two platforms around the unit foundation were supported by wood brackets fastened to the concrete with steel clips and bolts with lead cinch anchors. Drilling for these anchors started October 1 and was completed October 2. Erection of the two walkways was completed October 9. They were later strengthened considerably by the addition of supporting brackets with knee braces to corner posts in the handrails. This was done because of a change in the estimate of the number of people likely to be on the platforms at one time.

Because the stairs, to give access to the two platforms around the unit foundation, were supported from the precision craneway structural steel, construction was delayed pending erection of this steel. Work was started on the stairway December 8 and was completed December 14.

Pump and Motor Foundations

Temporary Pump and Motor Foundations

Twelve temporary pump and motor foundations were originally designed as grillage beams welded to the 6-in. I-beams anchored in the structural floor slab of Building 10. There was no structural floor slab under the six temporary pumps on the Building 5 side of the unit, and design called for the grillage beams to be anchored to an 18-in. thick reinforced concrete pad approximately 11 ft. 6 in. wide by 16 ft. 9 in. long. The pump base was bolted to 8-in. beams and the motors were bolted to 12-in. beams which were welded to the 8-in. beams. During operation of aligning pumps and motors, it developed that flexibility of grillage beam foundation prevented alignments to tolerance desired. As a first corrective measure, stiffeners were welded to both 8-in. and 14-in. beams. This was covered by an addition to the scope of the contract. While this reinforcement of the grillage beams permitted satisfactory alignment, it was found upon start-up of motors that excessive vibration occurred. To further reinforce the grillage beams and provide additional mass, they were encased in concrete grout. Addition of this grout very appreciably dampened motor vibration. Placing of this grout was covered by an addition to the scope of the contract.

The 18-in. thick concrete pads for the six temporary pumps and motors east of the unit were constructed first. It developed there was a misunderstanding regarding design for these six foundations. The additional work over and above that contemplated by Cornell, at the time he made his bid, was covered by an addition to the scope of the contract. Construction of the concrete pads was started August 21 and finished September 17. Placing of grillage beams, including grouting, for these six pumps was completed October 1. Work of aligning the east pumps and motors was started October 4 and was nearly completed October 10 when it was decided reinforcement of all grillage beams was required. In the meantime, grillage beams for the pumps west of the unit had been installed. These were welded to the 6-in. I-beams in the floor. Reinforcement of the grillage beams was completed October 19. Realignment of the six motors east of the unit was completed October 16 and was covered by an addition to the scope of the contract. Alignment of the six pumps west of the unit was started October 17 and completed October 24. Grouting of the temporary pumps and motors was started October 22 and was completed October 29. Another addition to the scope of contract was required to reimburse Cornell for work done in removing burned-off studs in pump bases. This was done by redrilling and retapping the stud bolt holes.

SUMMARY OF MAJOR A-E OR CONSTRUCTION SUB-CONTRACT

UNCLASSIFIED

1. Date of Compilation: February 1, 1953
2. Operations Office: SROO
3. Name and Address of Contractor and Contract Number: New York Shipbuilding Corp.
Camden, New Jersey
AXC 167 $\frac{1}{2}$
4. Name of Parent Corporation: Same as above
5. Principal Type of Work Covered by the Contract: Engineering Development and Manufacturing Services
6. Brief description of work covered by the contract: Develop, construct and test a full scale mock-up reactor at Camden, New Jersey. Fabricate and assemble reactors for Savannah River Plant.
7. Extent of Services of this AE Sub-contract: The sub-contractor will develop, construct and test a full scale mock-up of a production reactor and will fabricate and assemble four additional reactors for Savannah River Plant. The design and development in cooperation with du Pont design. The extent is as follows:

	<u>Process Development</u>	<u>Construction</u>	<u>Total</u>
New York Shipbuilding (less fee)	\$3,000,000	\$12,200,000	\$15,200,000
(Maximum fee)	380,000	800,000	1,180,000
Du Pont	2,500,000	2,400,000	4,900,000
TOTAL	<u>\$5,880,000</u>	<u>\$15,400,000</u>	<u>\$21,780,000</u>
8. Where will Work be Carried On: Development and design work to be performed at home of New York Shipbuilding Corp., Camden, N. J. Fabrication and assembly of reactors at Savannah River Plant.
9. Term of Sub-Contract: Effective Date: April 25, 1951
Estimated Completion Date: Late 1954
10. Type of Sub-Contract: Cost plus a fixed fee.

Classification Changed To
UNCLASSIFIED
By Authority of
J.M. BAUER *J.M. Bauer*
SR Classification Officer 7/11/86

SECRET

Box: 430
FOLDER: N810
HARD BACK (BROWN)
FOLDER

N.J. 34

[REDACTED]

UNCLASSIFIED

[REDACTED]

SUMMARY OF MAJOR A-E OR CONSTRUCTION SUB-CONTRACT

11. Reasons requiring the use of a CFFF Sub-Contract rather than Lump-Sum or Unit Price:

The scope and nature of the work was not sufficiently definable to estimate the cost in advance with a sufficient degree of accuracy to make it possible to use a fixed price type of contract. In addition, the nature of the project and the ~~time~~ completion schedule are such that it was necessary to start active design on parts of the project while design criteria for other parts of the project were under development.

12. Reasons for Selection of this Sub-Contractor for the Particular Work:

Criteria used in selection:
a. Established, integrated organization capable of working together as a team.
b. Demonstrated ability to execute unusual and complex engineering work.
c. Available force of trained engineers and draftsmen.
d. Adequate operational facilities.

13. Relation of the Work to be Performed under this Sub-Contract With Work Being Performed Under Other Contract:

The Sub-Contractor becomes a member of a contract team for this project with very close work relationship with du Pont together with the principal line of work performed by other Sub-Contractor.

14. Total Amount of Sub-Contract:

(a) Total cost exclusive of Fee is as follows:

Original estimate	\$15,200,000
Modification 3 Revised estimate	15,275,000

(b) Amount of Fees:

Original Estimate as Basis of Fee	Computed Fee	Negotiated Fee
\$15,200,000	\$1,180,000	\$ 982,500

(c) Total Obligations:

\$16,182,500

[REDACTED]

[REDACTED]

SECRET

UNCLASSIFIED

SUMMARY OF MAJOR A-E OR CONSTRUCTION SUB-CONTRACT

15. Brief Statement Describing Basis for Overhead Allowances:

The basis for overhead allowed is the ratio of direct labor on our work to the total direct labor multiplied by the total indirect expenses (excluding certain items expressly disallowed by the contract.) The overhead is paid at an interim rate subject to annual post audit by a CPA firm with adjustment based on actual labor and indirect expenses.

The overhead is intended to cover reimbursements for allowable costs which cannot be conveniently measured and charged as direct costs and, therefore, are distributed as overhead on the basis of direct labor costs.

The home office overhead includes general and administrative expenses and other indirect expenses pertaining architect engineering services. The contract does not distinguish between these overhead costs except that the items of allowable indirect expenses, to be used in the calculation of overhead, are defined in the sub-contract.

16. Statement of the Specific Basis and Computation Used in Negotiating and Establishing the Fee or Fees (including Fee adjustment.)

\$975,000 plus adjustment of \$7,500 Negotiated. Base construction figure used for calculation of fee - \$15,184,210. Total maximum fee authorized for negotiation \$1,181,000.

17. Total Payment Made or to be Made to the Sub-Contractor

	<u>CONSTRUCTION</u>			
	<u>FY 1952</u>	<u>FY 1953</u>	<u>FY 1954</u>	<u>FY 1955</u>
Fee	219,195	290,405	129,000	-----
Overhead Allowance	789,111	877,689	300,000	-----
Other	3,263,976	3,559,633	1,138,400	-----
	<u>OPERATION</u>			
Fee	118,028	135,972	89,900	-----
Overhead Allowance	424,905	420,095	220,200	-----
Other	1,670,944	1,744,056	866,000	-----

NOTE: Estimated Expenditures Reflect Funds Authorized To Date.

18. Summary of Previous Work Performed by Sub-Contractor and Fees Paid and Differences in Fee Paid Between Projects:

Not Applicable.

Box: 865

NJ:34

FOLDER: WILMINGTON
CARDIOLOGICAL
FILE
JANUARY 1952

This document consists of 3 pages
No. 2 of 1 Copies, Series A

o : Files

Date: January 17, 1952

from : Henry J. Stinger

subject: TRIP REPORT - NEW YORK SHIPBUILDING CORPORATION - JANUARY 11, 1952

SYMBOL : TR:HJS:s

Classification Changed To
UNCLASSIFIED

By Authority of
J.M. BAUER *J.M. Bauer*

SR Classification Officer *7/1/81*

Personnel present

AEC - Justin Karp and Henry Stinger, Reactors Branch

du Pont - Ken French, Process

Bob Kaiser,	"	(Assembly)
Leo Pope,	"	(Service Supervisor)
John Mann,	"	(Maintenance Supervisor)
Webb Willis,	Construction	(Instrumentation)
Jim Hacker,	"	"

General status of the work is as follows:

Tank fabrication--Assembly of sections for NYX unit in progress, plates fabricated for "R" unit not yet assembled.

Assembly of tank and heat exchangers--Concrete silo nearly complete, pads and fittings for tank being installed, process pumps and river water piping installed, heat exchangers on hand and platforms installed.

Instrumentation--Layout completed and preliminary installation started. Equipment not yet on hand for all measurements.

Process equipment--Approximately 150 "q" foils loaded with uranium, two slug loading and two magazine loading machines on hand and operating, wash and test station nearly complete, tipping table installed, layout and "q" tube inspection tables installed.

Detailed description of work status follows:

Tank Fabrication

NYX unit--Fabrication of the top and bottom tank sections is nearly complete. The top section consists of the plenum and the gas chamber; the bottom section consists of the shield and the gas plenum. The top half was in the horizontal boring mill having the tubes milled to a common plane when inspected. Manifolds for the inlet process water had not yet been welded in due to the restrictions on size imposed by the mill.

Gray

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Files

January 17, 1952

Top section of the tank proper with overflow nozzles was being welded together in sections.

(It is of interest to note here that the cast iron blocks which formerly were to have been used for the transfer of heat from the outside walls of the tank have been replaced with an open jacket filled with metal rings. This was done in order to provide greater cooling for higher power operation at 1000 MW and greater.)

Thermal shield plate and supporting gussets for the biological shield have been fabricated and are ready for assembly.

"R" unit--All of the horizontal plates were essentially complete. Further work on these, including insertion of the tubes, apparently is awaiting availability of equipment and experience on "NYX" unit.

Assembly of Tank and Heat Exchangers

The concrete shield and supporting structure for the tank is poured and in place. No process piping or instrumentation has yet been installed in the structure.

Twelve 6000 gpm pumps and their associated motors are installed and ready to be turned over. The river water piping has been installed and six heat exchangers are on hand but not yet installed. One platform is being prepared for the Savannah River type exchanger. Power tests on the pump motors are scheduled for the week of January 13.

Instrumentation

A 1/6 pie sector of the tank is to be completely instrumented for flow, temperature, and vibration.

Temperature--Four thermocouples are to be placed on each "q" tube in the instrument pin directly below the coolant channels; several others are located in the tank below the top shield and above the bottom shield. In addition, thermocouples are to be placed at each of the six inlets and outlets to the tank and to the heat exchangers. Recording will be made on a "segmental recorder" and instrument lights by a system previously described.¹

1. See memo, H. J. Stinger to files, 9/26/51, "Engineering Review Meeting on Instrumentation - All Areas - September 20, 1951."

January 17, 1952

Flow--Flow monitoring of all the "q" tubes in a 1/6 pie sector is to be accomplished by means of a scheme utilizing a series of rotary valves. One valve is connected to six "q" tubes and the flow through each tube passes to a Brown differential pressure transmitter in turn as the valve is automatically positioned. Electrical signals from the differential pressure transmitters will be recorded on a segmental type of recorder.

Flow through the heat exchangers, tank inlet and outlet connections, and the thermal shield will also be monitored.

Vibration and Stress

Strain gages are to be mounted in groups of four on the "q" foils - 8 to a foil. The gages are placed so as to measure longitudinal stresses at the top and center sections on each of the four tubes in a "q" foil.

In addition, several accelerometers (Calidyne) are scheduled to be placed at various points inside the tank.

Appropriate indications for the above will be made by means of galvanometers and recording oscilloscopes.

Other miscellaneous instruments are scheduled for test with the tank, including vibratometers, displacement type gages, etc.

Most of the instrumentation, especially the unusual elements, are being fabricated and tested at ERL before installation at NYX.

Process Equipment

Operation of the "q" foil loading equipment is in full swing. Several of the machines, including the magazine loader, appeared to require some additional development work. In spite of a rather clumsy approach to the handling problem (unique at NYX due to large amount of manual labor involved), a fair rate of assembly was approached. Twelve foils per day now constitutes a good loading, but with improvements in the magazine this can be increased to 30 to 40 using two magazines and two loaders.

All of the 150 foils loaded to date are the plain 1" type using boat tail spacers between slugs.

The wash and test station was incomplete and therefore not operable. This is an important element in the operation due to the time cycle involved and could be a restrictive item in manufacture.

It was noted that insufficient space had been provided on the loading platform for the vertical "q" foil disassembly machine and that no plans have been made for the horizontal plow machine.

NEW YORK SHIPBUILDING CORPORATION
CAMDEN, N. J.
INTER-OFFICE CORRESPONDENCE

Box #31 NJ-347
Folder #2: DuPont Order
DuPont

TO: See below
FROM: Mr. H. W. Pierce
DATE: August 1, 1951
SUBJECT: Du Pont Project 8920 - Savannah River Plant.
FILE:

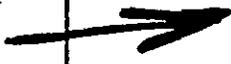
ENCLOSURE:
(A) Request for Purchase - covering Aluminum Cans and Caps.
Please note paragraph two of Request for Purchase alteration forwarded herewith as enclosure (A).

- HWP:isf
TO: Mr. D.A. Williams (Barto)
Mr. O.G. Perkins
Mr. J.A. Lynch
Mr. F. Jorgensen (Elmer)
Mr. C.B. Smith
Mr. E.J. McNally

H. W. Pierce

material furnished by others. Carbide & Carbon Chem. Corp. will combine the material received from Bendix and the containers on this Request for Purchase and ship in the boxes (AXC 843-1/2) to New York Shipbuilding Corp., Camden, N.J. Attn: of H. W. Pierce.

By copy of this Request for Purchase alteration to Mr. Pierce New York Shipbuilding Corp. they are advised that all of these containers and contents together with the shipping boxes are to be carefully preserved for disposition after the experimental program at their plant has been completed.



THIS CONFIRMS VERBAL ORDER PLACED

IN ACCORDANCE WITH QUOTATION No. _____ DATED _____ SIGNED BY _____ WITH _____

APPROVAL PRINTS	SETS	FINAL PRINTS	SETS	SPARE PARTS LIST	SETS	OPERATING INSTRUCTIONS	SETS
SHIPPING WEIGHT PER ITEM	<input type="checkbox"/>	FIELD LABOR REQUIRED	<input type="checkbox"/> YES <input type="checkbox"/> NO	ERECTION SUPERVISION	<input type="checkbox"/> YES <input type="checkbox"/> NO	INSPECTION BY DU PONT REQUIRED PRIOR TO SHIPMENT	<input type="checkbox"/> YES <input type="checkbox"/> NO
TO: E. L. DU PONT DE NEMOURS & CO.				VIA			
Carbide & Carbon Chem. Corp.				F.O.B.			
Attn: P. C. Haffelman				TERMS			
DESTINATION V 12 Plant, Cambridge, Tennessee				DESIGN A. D. Duff			
ITEM	ACCOUNT			PURCHASING			

