

~~SECRET~~

64-12-202(7)

Revised through the
MOUND LSDR PROJECT
 (funded through DOE's OPENNESS INITIATIVE)
 Record Copy held at Mound Facility

December 11, 1964

Mr. W. B. Greener, Area Manager
 U. S. Atomic Energy Commission
 P. O. Box 66
 Mansfield, Ohio

Dear Mr. Greener:

Preliminary Proposal - Materials Processing Facilities
Mound Laboratory, Mansfield, Ohio

We are submitting for your consideration eight copies of the Preliminary Proposal for the Materials Processing Facilities, prepared in accordance with Chapter 6106 of the AEC Manual.

Should you require any additional information in connection with this project, please advise.

Very truly yours,

Original signed by D.L. Scott

David L. Scott
 Vice President,
 Plant Manager

DLB:mc

Encs.

cc: Mr. W. B. Greener (2)
 cc: Mr. J. E. Bradley
 Mr. C. A. Kaeig
 Dr. C. R. Grove
 Mr. F. L. Halbach
 Mr. L. V. Jones

Mr. C. J. Larson
 Dr. E. A. Reinhold
 Mr. D. L. Scott
 Mr. S. F. Thomas
 Central Files (2)

Document transmitted
 herewith contains
 RESTRICTED DATA

~~SECRET~~

When Separated From Enclosures, Handle
 This Document As **UNCLASSIFIED**

~~SECRET~~

Date 12/11/64 Initials DAH

This document consists of 16 pages. This is copy 18 of 19 series A.

PRELIMINARY PROPOSAL
FOR
MATERIALS PROCESSING FACILITIES

14-12-202

Directive: DAY-38
Date: December 10, 1964

a. General Description of Work: This project is to provide a continuing capability for the formulation of plastics and to provide appropriate space and capacity for the molding of plastic parts used in the production of detonators and explosive weapons components. The facility will also provide areas for cable inspection, injection molding and bonded storage. Plastic formulation is now located in a portion of the main warehouse. Relocation of this work from the central warehouse is necessary for safety reasons.

The Materials Processing Facilities provides for the design and construction of the Plastic Formulation Building, a "B" Building addition; also included are modifications to a portion of the existing "B" Building.

Formulation Building: This building will provide an area for the manufacture of plastics and is to be located approximately 40 feet to the north of Warehouse No. 15 (Reference Drawing No. 1). The building, 50'W x 100'L, will contain a main floor area of 5000 square feet and a penthouse area of 1300 square feet. The building is to be of steel and concrete block construction with concrete floors and built-up roofing. The interior walls are to be concrete block with a paint finish. A mezzanine area in the wet plastic process area is to be provided to permit gravity flow of process material. An elevator is to be provided to safely transfer materials. The entire building is to be air conditioned except for the mechanical equipment room. An electric substation will be located on the north side of the building.

The building layout is shown on Drawings No. 4 and No. 6. The first floor provides areas for raw plastic storage, office, plastic testing, walk-in cooler, rest room, dry plastic process

~~GROUP 1~~

~~Excluded from automatic
downgrading and
declassification~~

-1-

~~RESTRICTED DATA~~

~~SECRET~~

~~This document contains restricted
data as defined in the Atomic
Energy Act of 1954. Its trans-
mittal or the disclosure of its
contents in any manner to an un-
authorized person is prohibited.~~

MOUND DECLASSIFICATION REVIEW	
REVIEW DATE: <u>2/26/89</u> <input type="checkbox"/> ACC <input checked="" type="checkbox"/> DC <input type="checkbox"/> ADD <u>Dunston</u>	DETERMINATION (CIRCLE NUMBER) 1. CLASSIFICATION RETAINED 2. CLASSIFICATION CHANGED TO _____ 3. CONTAINS NO DCB CLASSIFIED INFO 4. COORDINATE WITH _____ 5. CLASSIFICATION CHANGED TO _____ 6. CLASSIFIED INFO BRANCH _____ 7. OTHER (SPECIFY) _____
AUTHORITY: ADD _____ NAME: _____	

SECRET

and part of the wet plastic process. The penthouse provides areas for part of the wet plastic process and part of the ventilation equipment.

The wet plastic process area which consists of Rooms No. 5, 6, 7, mezzanine floor and the penthouse area is a hazardous area and the electrical installation will meet Class I, Group D requirements. The dry plastic process area, Room No. 8, will contain equipment for grinding, screening, drying and pressing. Room No. 11 will be the storage area for incoming raw plastic materials and other materials used in processing. The walk-in cooler will provide storage for the finished plastic. Room No. 4 is the plastic testing laboratory.

The existing process equipment presently located in a part of the main warehouse will be relocated in the Formulation Building. The equipment will be installed as shown on Drawings No. 4 and 6.

"B" Building Addition: This building will provide an area for injection molding, bonded storage, cable inspection and supporting functions. The building is to be located to the west of and connect to the existing "B" Building (Reference Drawing No. 1 and Sketch No. 1). The building, 36'W x 100'L, will contain a floor area of 3600 square feet and a penthouse area of 630 square feet. The building is to be of steel and masonry construction with concrete floors and built-up roofing. The interior walls are to be concrete block with a paint finish. Nominal plastered ceiling height is to be 10 feet, providing a crawl space for duct work, electric and piped services. The building addition is to be air conditioned except for the penthouse area.

The existing "B" Building dock is to be modified to provide area for a storage room, an office, and a degreaser room.

The building layout is shown on Drawing No. 2. Room No. 5 will provide area for cable inspection. Bonded storage will utilize Room No. 2 and Room No. 1 will house the engravers, cut-off mills, gages and injection molding. The penthouse will provide area for the mechanical equipment.

The existing equipment presently located in Room B-105 will be relocated in the "B" Building Addition.

"B" Building Modifications: The "B" Building Modifications will provide for equipment installation for molding operations in Room B-105 (Reference Sketch No. 1).

SECRET

- b. Justification of Need: Mound Laboratory produces all detonators used in nuclear weapons, as well as various other explosive components. Every detonator, regardless of type, uses plastic as the inert component on which the explosive parts are assembled. In addition, Mound Laboratory provides development support to the Design Agencies on these types of weapon components. These activities have grown from the production of a single type in 1956 to over one million units of 22 basic types in FY-1963.

The proposed Formulation Building is to provide a continuing capability for the formulation of plastics to meet the quality requirements of weapons component production. At the present time the formulation of plastics is done in a portion of the main warehouse. Continued use of this space has disadvantages from an operational standpoint and also because the formulation process, involving working with highly volatile and flammable material such as acetone, should not be housed in this type of structure. The removal of the plastic formulation operations from the warehouse will eliminate this safety hazard from the "W" Building, thereby minimizing potential loss through fire and explosion and providing added insurance against jeopardizing weapons component schedules. Moreover, this space should be re-converted to its original use to accommodate the present higher level of warehousing activities. There has been a threefold increase in the number of receipts and shipments through the warehouse during the past six years.

The detonator requirements of dimensional tolerance and stability, homogeneity and purity are extremely critical in order that quality and reliability of the finished part can be assured. In spite of utmost care in manufacture and stringent in-process testing, failure of the plastic component is one of the more usual causes for rejection of finished detonators. Thus, there is a continuing and vital program aimed at improvement of plastics processing.

Commercial vendors have demonstrated that they are unable to consistently supply asbestos filled DAP which meets the present high requirements for reliability as outlined in LASL specifications. These are the specifications for Allowable Surface Defects and Radiographic Requirements. These are typical of the kinds of specifications that apply to the 1E26, 1E26S, 1E27, 1E29, MC1942, MC1943, MC1957, MC1690, ER-184, etc., detonators. Consequently, Mound will continue to produce both asbestos and dacron filled DAP.

~~SECRET~~

Currently, Mound's plant is producing material which is 90% acceptable as judged by radiography acceptance. Performance of outside suppliers has been in the range of only 30% to 65% acceptance. The poor performance of commercial material cannot be tolerated because of the greater number of parts which must be molded to get the number of good parts required to meet production schedules. Although the effort continues, it is doubtful that a reliable outside source will be established. The problem is a lack of real interest on the part of manufacturers in producing relatively small quantities of various types of extremely high quality material.

The Design Agency specifies that the plastic molded material is to be free of metallic inclusions in the critical area of the head to a degree which cannot be met by commercial sources. This dictates that a special process must be used to remove these particles. Their specifications are much more rigid than the industry standards for this type of plastic. Repeated efforts have been made to procure this material from commercial vendors but they have been unable to do the special processing on the limited quantities Mound has required.

The need for an addition to the "B" Building for plastic molding is related to the increased number of types and sizes of explosive devices being produced. An addition to the "I" Building was recently constructed to provide an essential capacity and capability in the high explosive assembly area. The "B" Building must be expanded as proposed in this project to maintain the necessary parallel support for the high explosive facility.

The "B" Building was originally built as a biological laboratory and later adapted to detonator inert component fabrication. The area allocated to production of molded plastic parts was not designed for the variety of size and type required for these explosive devices. The space presently utilized is crowded to a point where it could influence the capability of maintaining the high quality outlined in reference to the ER-206G program. Originally, four presses, two surface grinders, two polishing set-ups, electrode forming, head marking, and support equipment were set up in "B" Building for the production of one size and type of plastic part. Over the past five years, an increase in demand for parts of new design and size has forced the enlargement of this area and an increase in equipment. Three molding presses, a milling machine, a centerless grinder, and other support equipment have been added to this area to keep abreast the change in scope.

~~SECRET~~

Plastic parts will be required for the ER-206G and future models of such detonators as the MC1690, MC1693, MC1991, MC1943, and other Sandia devices. There is no space available in which to set up presses required to produce these new configurations. The adjacent areas in "B" Building are to be reconditioned to provide space for installation of two additional presses. The operations now in the areas to be reconditioned will be relocated into the "B" Building Addition.

The project will provide space for the following additional operations.

- (1) Capability for injection molding. The Sandia Corporation is developing the concept of series detonators and transducers to provide very small, lightweight, and efficient firing sets for programs related to the Weevil concept. These will also require injection molding of connectors onto detonators similar to the ER-184 and ER-185 development programs. Space must be provided for this function since capability for injection molding does not exist at Mound.

- (2) Consolidation of all cable inspection in a single area. Some of the cables measure 45 feet in length, which requires a room of even greater length to perform accurate length measurements. The following are some of the inspections performed on the cables: length, high potential and resistance.

These tests and others are specified by the Design Agencies to provide a minimal measure of quality assurance on the products related to it and their testing.

- (3) "Bonded Storage" in the "B" Building Addition in accordance with Design Agency specifications. Bonded storage is the protected storage of material that has been through inspection and accepted for use in production and fabrication operations. If the material is not properly protected it must be reinspected and reaccepted for use in production. Many components must be stored and controlled in an air conditioned atmosphere.

1. Initial and Ultimate Planned Capacity

The capacity of the Formulation Facility will not be changed in its relocation as provided for in this project. The existing equipment and process services will be re-used. It requires a one week period to complete the processing of a 300 pound batch of a plastic formulation. The facility is operated relative to demands and in full support of the production needs of the explosive component items.

The "B" Building Addition is to have capability as follows:

- (a) The existing "B" Building is equipped for molding three different types of plastic parts. The planned capability will be increased to mold eight different types of plastic parts.
- (b) Space is provided for process functions of injection molding, bonded storage and cable inspection.

2. Type of Feed, Process Flow Diagram, Material Balance, Flow Sheet and Product Specification.

The "B" Building Addition - This facility does not lend itself to flow sheet type information since the nature of the work is varied.

The Formulation Building - The process equipment and process flow diagram is shown on drawings No. 4 and M-4 and is outlined as follows:

Approximately 150 pounds (22.7 gal.) of acetone and 150 pounds of Dapon (diallyl phyhallate prepolymer) are mixed in a 50 gallon tank (varnish kettle No. 1) located in the penthouse.

After the Dapon is dissolved and the solution completely mixed, five gallons of the concentrated varnish is vacuum transferred to varnish kettle No. 2.

Approximately 135 pounds (20.4 gal.) of acetone is added to the concentrated varnish in varnish kettle No. 2. After mixing, the resultant "dilute" varnish is transferred by nitrogen pressure through micron filters to the mix muller.

In the mix muller the dilute varnish is first mixed with 146 pounds of asbestos and then the balance of the concentrated varnish in kettle No. 1 is transferred by nitrogen pressure through the micron filters to the mix muller to complete the mixing. 4.5 pounds of zinc stearate and 3/4 pound of titanium dioxide are added near the end of the mix muller cycle.

When the mixing of the asbestos-varnish in the mix muller is complete, the material is transferred by gravity to the slurry kettle located on the mezzanine. In the slurry kettle the complete mixing of the fibrous and non-fibrous slurries is accomplished. Removal of magnetite takes place during this mixing operation. Catalysts are added just prior to transfer. After completion of the mixing, the mass is transferred by gravity to a 50 gallon sigma blade mixer located on the first floor.

The plastic mass is mixed in the sigma-blade mixer under a vacuum of 24-26" Hg. The acetone is distilled during this operation. The acetone remains in a condensed state by using refrigerant at 0°C in the cooling coil. The mixing continues until approximately 12-15% residual acetone remains in the plastic. The mixing end point is determined using a recording wattmeter.

The plastic mass is removed from the sigma-blade mixer and is divided into 20 lots of 15 pounds each. Each lot is flattened, placed in a plastic bag and allowed to cool to room temperature in an aging cabinet.

Each lot is then roll milled to advance its state of cure and remove additional volatiles. The end point is determined by material temperature and power input to the roll mill as recorded by a wattmeter.

The rolled plastic is cut into strips and allowed to cool to room temperature.

The strips are ground in the press granulator with a 3/8" screen and the powder is transferred to the rotary dryer to reduce the residual volatiles to a maximum of 1.5 per cent.

The molding powder is classified using a gyrocentric screen.

Each lot is sampled and tested and then pressed into preforms by a Stokes press. The preforms are stored in the walk-in cooler for production molding.

3. Number of Operating Personnel, Occupants, Persons Served and/or Extent of Service Provided.

The Materials Processing Facilities will require the addition of nine personnel for a total of twenty-nine operating personnel on a one-shift basis.

4. Principal Injury, Fire, Explosion and Radiation Risks

The principle risks are outlined as follows:

Formulation Building

(a) Principal Injury Risk

1. Work required at elevated levels around various plastic processing equipment.

All work at elevated levels will be accomplished from elevated floor sections and catwalks equipped with standard handrail, midrail and toeboard. Access to upper areas are by steel stairs equipped with handrails and safety treads.

2. Potential atmospheric dust from the plastics processing.

Atmospheric dusting of plastic will be limited by system design and removed through ventilation. The dusting will be minimized through the utilization of tube transfer system for finely divided materials.

(b) Fire and Explosion Risk

1. Use of substantial quantities of flammable solvents such as acetone in processing.

Solvent vapors will be removed through a complete single pass ventilation system. Extra hazard vapor areas will have special ventilation. The blower handling vapors is spark proof.

A flammable - vapor detection system is incorporated in the facility to provide automatic warning of hazardous mixture in the atmosphere.

The entire area of the building is covered by automatic sprinklers, fire hose and proper type hand extinguishers.

Class I Group D electrical service and equipment is provided in solvent vapor hazardous areas.

(c) Radiation Risks - None

"B" Building Addition

For the "B" Building Addition there is no specific injury, fire or explosive hazards involved.

The entire area of the building addition is covered by automatic sprinklers, fire hose and proper type hand extinguishers.

5. Radius or Physical Extent of Service for Communications System

The existing telephone, paging and ADT systems of Mound Laboratory will be extended to provide service to these facilities.

6. Material Accountability

The item components are of security classification requiring serial number accountability. The accountability system now serving the existing similar facilities at Mound Laboratory will be extended to cover these facilities.

7. Security

The Formulation Building is to be located within the main plant security fence. There will be no classified documents or items stored in this building.

The "B" Building Addition is to be located within the main plant security fence and the building itself set up as a restricted limited access area. Storage of classified components and items will be in bonded storage.

- c. Use of Existing Structures: There is no suitable space available in other structures at Mound Laboratory for the establishing of these facilities.
- d. Preliminary Plans: Preliminary plans consisting of a title sheet and location plan drawings 0 and 00 and drawings Nos. 1, 2, 3, 4, 5 and 6 for the "B" Building Addition and drawings Nos. 1, 2, 3, 4, 6, 7, 8, 9 and M-4 for the Formulation Building and Monsanto Sketch No. 1 are enclosed with this proposal.
- e. Outline Specifications: Outline specifications are enclosed with this proposal.
- f. Preliminary Estimate of Cost:

1. Engineering, Design and Inspection	\$ 35,000
@ 8% of construction costs	
2. Construction	440,000
a. Improvements to land	
Formulation Building	\$ 4,270
Site clearing, excavation and grading 20,000 s.f. @ \$0.15	\$ 3,000
Concrete sidewalks 360 s.f. @ \$0.60	220
Bituminous Paving 350 s.y. @ \$3.00	1,050
"B" Building Addition	3,550
Site clearing 7000 s.f. @ \$0.15	1,050
Concrete sidewalk 1275 s.f. @ \$0.60	770
Concrete curb 115 l.f. @ \$3.30	380
Bituminous Paving 225 s.y. @ \$3.00	675
Temporary Fence 150 l.f. @ \$4.50	675

b. Building

Formulation Building	\$234,750
Architectural & Structural \$ 75,000 6325 s.f. @ \$11.85 98000 cu.ft. @ \$0.76	
Mechanical Cost	
Heating, ventilating & Air Conditioning 6325 s.f. @ \$11.85	75,000
Plumbing 6325 s.f. @ \$0.63	4,000
Sprinkler System 6325 s.f. @ \$0.39	2,500
Electrical Cost	
Lighting and power 6325 s.f. @ \$4.42	28,000
Lightning and grounding 6325 s.f. @ \$0.19	1,250
Communications Paging, ADT 6325 s.f. @ \$0.87	5,500
Laboratory Furniture	1,500
Benches 40 l.f. @ \$28.00	
Cabinets 14 l.f. @ \$28.00	
Process Piping - Disconnect and move	15,000
Disconnect Move & Reconnect equipment	25,000

Equipment

Miscellaneous laboratory \$ 2,000*
Equipment

"B" Building Addition \$ 151,650

Architectural and Structural 64,880
4230 s.f. @ \$15.33
66000 cu.ft. @ \$0.98

Mechanical Cost

Heating, Ventilating, & 22,315
Air Conditioning
4230 s.f. @ \$5.27

Plumbing 2,839
4230 s.f. @ \$0.67

Sprinkler System 1,014
4230 s.f. @ \$0.24

Electrical Cost

Lighting and power 16,087
4230 s.f. @ \$3.80

Communications, paging, 1,015
ADT 4230 s.f. @\$0.24

Laboratory Furniture 6,000

Benches
142 l.f. @ \$28.00

Cabinets
32 l.f. @ \$28.00

Shelving
100 l.f. @ \$11.00

Disconnect, Move & Reconnect 7,000*
equipment

Equipment

Misc. laboratory equipment 500*
2 Molding presses w/controls 30,000*

c. Utilities

Formulation Building		\$ 29,420
Steam and Condensate lines	\$11,550	
350 l.f. @ \$33.00		
Storm Sewer	340	
50 l.f. @ \$6.80		
Sanitary Sewer	170	
20 l.f. @ \$8.20		
Septic Tank & leaching field	1,300	
Water Line	200	
40 l.f. @ \$5.00		
Fire line	1,320	
165 l.f. @ \$8.00		
Electric - Substation	12,500	
500 KVA		
Power Transmission Line	2,040	
510 l.f. @ \$4.00		
"B" Building Addition		\$5,360
Steam and condensate and brine lines	1,050	
75 l.f. @ \$14.00		
Storm Sewer	720	
100 l.f. @ \$7.20		
Sanitary Line	880	
110 l.f. @ \$8.00		
Compressed air	760	
225 l.f. @ \$3.38		
Electrical		
Concrete envelope	1,050	
75 l.f. @ \$14.00		
Fire Line	900	
90 l.f. @ \$10.00		

d. Recondition Existing "B" and "W" Building \$ 11,000

Formulation Building

Work performed by Monsanto \$ 6,000*
Re-convert part of "W"
Bldg. to Receiving Area

"B" Building Addition

Work performed by Monsanto 5,000*
Alter Room B-105 for
installation of presses

- | | |
|--|-----------|
| 3. Contingency @ 19% of other cost | \$ 90,000 |
| 4. Indirect Costs (Indirect cost of approximately \$82,000 are pro-rated in construction cost. This covers the contractors overhead profit, taxes, insurance, bonds, etc.) | _____ |
| 5. Total Project Estimate | \$565,000 |

* Monsanto procurement and labor costs

Building costs are as follows:

Formulation Building

	<u>W/O Equip.</u>	<u>W/Equip.</u>
Gross Area 6,325 sq. ft. Unit Cost	\$ 30.23	\$37.11
Gross Volume 98,000 cu. ft. Unit Cost	\$ 1.95	\$ 2.39

"B" Building Addition

Gross Area 4,230 sq. ft. Unit Cost	\$ 25.56	\$35.85
Gross Volume 66,000 cu. ft. Unit Cost	\$ 1.63	\$ 2.29

g. Proposed Starting and Completion Dates:

	<u>Start</u>	<u>Complete</u>	<u>Amount</u>
Title I Engineering	9/17/64	11/23/64	\$ 7,200
Title II Engineering	12/28/64	3/15/65	12,400
Title III Engineering	5/3/65	2/1/66	15,400
Construction	5/3/65	2/1/66	389,500
Monsanto procurement and installation	5/3/65	4/1/66	50,500
Contingency			<u>90,000</u>
Total project estimate			\$565,000

AEC	Cost	\$504,500 ^{1/}
Monsanto	Cost	\$ 60,500 ^{2/}

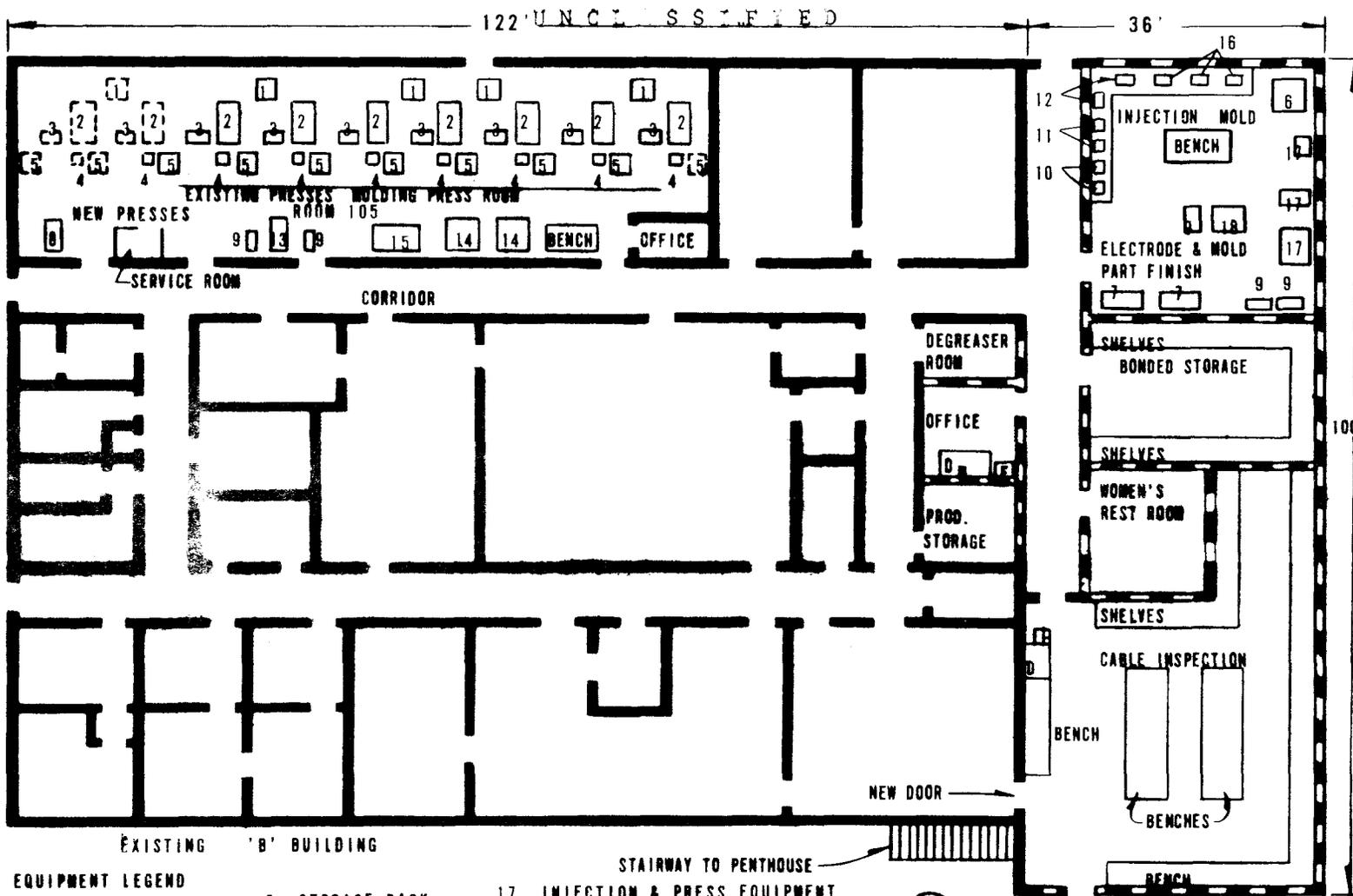
1/ Includes \$80,000 contingency

2/ Includes \$10,000 contingency

h. Proposed Method of Accomplishment:

Title I, II and III Engineering will be accomplished by Lennox, Matthews, Simmons and Ford, Inc., Indianapolis, Indiana, under a fixed fee contract. Construction will be performed by a contractor on a fixed price contract after competitive bidding.

Partial procurement and installation will be accomplished by Monsanto Research Corporation.



EQUIPMENT LEGEND

- | | |
|-----------------------|----------------------|
| 1. OIL HEATER | 9. STORAGE RACK |
| 2. PUMPS | 10. FLATNESS GAGE |
| 3. PRESS | 11. O. D. GAGE |
| 4. DI-ELECTRIC HEATER | 12. WIRE BENDER |
| 5. OPERATORS BENCH | 13. O. D. GRINDER |
| 6. DEGREASER | 14. SURFACE GRINDER |
| 7. WIRE CUT-OFF MILL | 15. THOMPSON GRINDER |
| 8. MILL | 16. ENGRAVER |

- | |
|---------------------------------|
| 17. INJECTION & PRESS EQUIPMENT |
| 18. STORAGE CABINET |

- | |
|--------|
| D DESK |
| F FILE |

MATERIALS PROCESSING FACILITIES

B BUILDING ADDITION

SKETCH NO. 1

JOB NO. 3902 12/2/64