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FILM PROCESSING INVESTIGATION

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FILM PROCESSING INVESTIGATION

This Report has been reviewed and is approved.

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FILM PROCESSING INVESTIGATION

This report has been reviewed and is approved.

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- ABSTRACT -

A properly designed chemical mixing system and facility to provide efficient mixing from dry chemicals and clean storage of mixed solutions required for operation is of utmost importance. Consideration must be given to the requirements of present and planned programs and also to projected future work loads. The present chemical mixing system has been evaluated in terms of personnel utilization, work projects, supplies, equipment, space, and overall system design. This evaluation has shown that the present system is totally inadequate.

A major redesign of the entire chemical mixing, storage, analysis and supply system is necessary to ensure that PTD can meet its present and future commitments.

Therefore, as a result of this study, a chemical mix system is proposed which will effectively utilize available manpower and space while employing all presently available delivery/ storage tanks. The proposal attempts to minimize additional expenditure of funds and recommends additional equipment, space, and manpower to satisfy processing chemical solution volume demands.

INTRODUCTION

A significant increase in the film processing load for the Photographic Technology Division is programmed for the near future. This study evaluates the present operational chemical mixing system and defines its limitations in terms of the ability to meet present and programmed chemical supply and delivery requirements.

These requirements include the ability to provide an adequate supply of certified chemistry for production requirements as well as the ability to provide special chemical mixes for testing and evaluation. The system must also be capable of short-term response to unexpected processing requirements.

Initial evaluation of the present chemical mixing system indicated that the delivery/storage tank system is inadequate to support full production loads for the existing processors. Several proposed additional systems have been considered to add increased capability in PTD. These proposals have been evaluated in terms of overall systems requirements and have been rejected in favor of the more complete system proposed in this report.

This report includes as an integral part of the system, an expanded chemical analysis system. Chemical analysis of the various photographic solutions is absolutely necessary if the high standards of quality are to be maintained in PTD. This analysis area must be located adjacent to the chemical mixing area for efficient operation.

DISCUSSION

According to the assigned task, the following elements were incorporated into this study

A. Future processing loads were estimated

   1. Precision Laboratory

   2. Motion Picture Laboratory

   3. Still Laboratory

B. In terms of the quantities of chemical solutions required for the estimated production loads, the existing chemical mixing system was evaluated. This evaluation considered the various machines, replenishment rates, and processes, and also the proposed additions to the chemical mixing system.

C. The efficiency of the Chemical Mixing Facility was studied to determine the optimum operation of available equipment. This included a study of the frequency and volumes of required mixes and considered possible changes in equipment and personnel to improve operation.

D. The feasibility of Formulation changes to reduce tank volume requirements was investigated.

E. The impact of estimated requirements on the supply and chemical analysis functions was also considered.

The study has considered present and future requirements in terms of the following:

A. Space available

1. Supplies

2. Mixing and storage of solutions

3. Chemical Analysis

B. Equipment

1. Chemical Mixers

2. Delivery/storage tanks

3. Transfer system

C. Manpower

1. Supply

2. Mixing

3 Analysis

D. Building construction

1. Chemical mixing present stress area

2. Main beam location

For future requirements, it was assumed that there would be a 50% increase in Earth Resources support in the wide film field with a continuing yearly increase(25%)in general Earth Resources support for several years. Also considered was the additional supply requirements to support the cartographic function in the Metric Laboratory (Bldg. 17). Other factors taken into account include support for Skylab S190A and S190B photographic experiments.

This study also considered the planned removal of the 4C Paper processor and the possible discontinued usage of ME-2A after

Apollo 17. The conversion of the Kodak Ektachrome RT processer, Model 1411 to the type C-22 Ektacolor negative process was included, and the addition of three model 1811 processors. Specific information about the present system, projected requirements, storage capabilities and the proposed system is contained in the attachments at the end of this report.

CONCLUSIONS

The photographic material processing requirements in PTD have exceeded the capability of the chemical mixing and supply system to deliver high use chemical solutions to the processors. A chemical mixing facility must have the capability to support the photographic processing equipment under all reasonable operating conditions. The nature of this support requires that, once a processor is put into use, the supporting chemical delivery/storage unit must be of sufficient capacity to continuously deliver chemistry to the processor. A chemical mixing analysis system must be available to insure that sufficient reserve volumes of certified chemical solutions are maintained.

Under the present processing requirements, the chemical mixing and supply capability in PTD is inadequate. Estimated increases in the processing requirements in PTD can not be met without modifications to the present system.

All formulation changes recommended by Eastman Kodak have been implemented. Further chemical formulation changes designed to reduce tank volume requirements do not appear feasible due to the wide varieties of photographic materials used in PTD. Since sensitized materials are designed for use with tailored chemical process parameters, it is not possible to predict chemical com-

patibility in future photographic processes. As the state of the photographic art advances, process parameters are changed, and PTD must maintain sufficient versatility to adapt to these changes.

An efficient chemical mixing support system consists of a supply function to maintain an adequate reserve of bulk chemicals and other consumables; a chemical mixing function with an efficient solution delivery/storage tank system; and a chemical analysis function to perform quality control and certification of every chemical solution mixed. These functions are interdependent, and a failure of any of these functions results in a breakdown in the entire chemical mixing system. Deficiencies in the present system will result in the total inability of the support functions to provide chemistries to the processing units.

This study of the chemical mixing, analysis, and supply system requirements has shown that an expanded system and facility is required. It has also evaluated several proposed extensions of the present system.

The proposal to add 11 new tanks to the area adjoining the Fultron mix room would provide additional EA-5 and C-22 color chemistries. This system has several shortcomings when viewed in terms of the overall chemical mixing facility. It requires identical chemical solutions to be stored in two areas and its

location will jeopardize the integrity of the Fultron system. In addition, there is no mixing capability programmed for this area.

The 11 tank expansion of chemical mixing into hallway 204 will create maintenance access problems. The tanks proposed are too small and their location will not properly complement the present or programmed chemical solution requirements. Chemical mixing units to support this additional capability were not proposed and are not presently available.

is totally inadequate and will be corrected. The following recommendations are suggested to insure that future photographic solution delivery/storage and mixing needs are satisfied.

Recommendations for immediate implementation

1. Cancel the proposed construction of 22 chemical storage tanks and the associated work requirements.
2. Cancel plans to install 11 new tanks in the area adjoining the Fultron Mix Room.
3. Cancel plans to remove wall between Rooms 290, 296, and hallway 204.
4. Cancel installation of 11 new tanks in the proposed expanded Chemical Mix area in Hallway 204.
5. Reallocate present available space according to detailed functions in attachment 6-3
6. Reserve areas for silver recovery and Blix Chemical system as shown on attachment 6-7
7. Purchase and install equipment as specified in attachments 6-9
8. Relocate equipment as specified in attachment 6-10
9. Modify building as specified in attachment 6-12

10. Install quick-fill valves in all processors lacking such valves.
11. Purchase and install 4 mixers as specified in attachment 6-13

Recommendations for near future implementation

1. Modify building as specified in attachment 6-15
2. Relocate mixers and pumps from temporary to permanent locations.
3. Install glass sight gauges on all delivery/storage tanks.
4. Purchase and install remainder of equipment as specified in attachment 6-13
5. Purchase and install three transfer panels including 3 Hasteloy bleach pumps and 19 chemical solution pumps. Specific mixing and delivery system recommendations are in attachment 6-12
6. Relocate chemistries and delivery lines as specified in attachment 6-8

Once the above recommendations have been implemented, the tanks, should be renumbered in accordance with attachment 5-1 and 5-2 and the proper chemistries assigned in accordance with 5-2. Each solution's chemical mixer, transfer line and pump, delivery/storage tank and delivery lines should be numbered identically.

It is recommended that a copy of this proposal be made available to MSC engineering to insure that adequate electrical energy, building floor stress load reserve and solution disposal capability be included in the final plans.

APPENDIX

4--Determine if the frequency and volume of required mixes are comensurate with the operator man hours available now.

5--Recommend such changes in equipment and personnel as appear necessary for the efficient operation of PTD laboratories.

6--Analyze the usage of chemical mixing and storage facilities in order to learn more efficient application of available equipment. This study would include the feasibility of formulation changes to reduce tank volume requirements.

PROJECTED EQUIPMENT

3 ea. Kodak Ektachrome RT Processors (EA-5 Color film process)

1 ea. Kodak Versamat Film Processor (black and white file/paper process)

1 ea. Simplex Color Paper Processor (Ektaprint R Process)

1 ea. Kodak Ektachrome RT Processor, model 1411
This processor is presently in place and has been converted from EA-5 color film processing configuration to type C-22 color negative film processing system.

1 ea. Pako Color Paper Processor converted to process Ektaprint C Paper. The processor is presently in place and is being utilized to process Ektaprint R paper. It will be converted to process Ektaprint C paper when the Simplex Color paper Processor is installed.

1 ea. Hi-Speed Processor
This processor will be installed next to the RAM Processor.

1 ea. Ektaprint C Processor utilizing the Eastman Kodak three solution process (BLIX System). This unit replaces the 4C processor.

1 ea. Silver Recovery unit

1 ea. Ektaprint C BLIX System Delivery Tanks and Recovery Units

1 ea. Dishwasher to clean chemical analysis glassware.

PROGRAMMED EQUIPMENT MODIFICATIONS

1. Hi-Speed Processors
   a. Install quick fill valves on both Hi-Speed Processors.
   b. Back end of 16-35-70mm processor to be modified to facilitate water presoak of Skylab S190 film.
   c. Backing removal scrubber installation (contracted) on 16-35-70mm processor.
2. Fultron Processor
   a. Backing removal scrubber installation.
3. Chemical Mix Delivery/Storage Tanks
   a. Install sight gauges on all tanks.

CONSOLIDATED LIST OF EXCESS EQUIPMENT
AND DISCONTINUED CHEMICAL REQUIREMENTS

1. Chemical Mix delivery/storage tanks #43, 44, 45, 46, 47, and 48 (15 gallon capacity) -- remove and relocate to Building 17, Room 2030B.

2. 4C Processor -- section removal after Apollo 17

3. ME2A Color chemistry -- possible discontinued use after Apollo 17 and/or removal of 4C processor

4. Duomat Developer -- possible discontinued use after 4C processor removal

5. C-22 Color Chemistry formulation -- change to replace all components with EA-5 Color chemistries except C-22 Color Developer. Formulation change effective only when utilizing Versamat Model 1411 Processor.

DETAILED TASK REQU

1. SKYLAB

   a. Photographic Experiment [illegible] a projected low volume processing

   b. The Hi-Speed 16-35-70mm p[illegible]imated to have a 50% increase in produc[illegible]its.

2. Earth Resources

   a. Increased 9.5 inch color [illegible]rocessing

   b. Increased 9.5 inch color ne[illegible]cessing

PRESENT CHEMICAL DELIVERY/STORAGE TANK NUMBERS,
TYPE SOLUTIONS AND CAPACITIES, RECEIVING UNIT,
AND RECEIVING UNITS LOCATION BY ROOM NUMBER

Tank Number	Gallons Tank Capacity	Type Solution	Receiving Unit	Room No.
1	110	Ektaprint R Color Stabilizer	Pako Processor	108
2	110	Ektaprint R Color Bleach	Pako Processor	108
3	110	Ektaprint R Color Stop/ Hardener	Pako Processor	108
4	110	Ektaprint R Color Developer	Pako Processor	108
5	110	Ektaprint R Color Stop	Pako Processor	108
6	110	Ektaprint R Color 1st Developer	Pako Processor	108
7	110	Ektaprint R Color Form Fixer	Pako Processor	108
8	110	EA-5 Color Bleach Additive	Versamat 1811	172G 168
9	110	EA-5 Color Stabilizer	Versamat 1811	172G 168
10	110	EA-5 Color Fixer	Versamat 1811	172G 168
11	110	EA-5 Color 2nd Stop	Versamat 1811	172G 168
12	120	EA-5 Color Bleach	Versamat 1811	172G 168

Tank Number	Gallons Tank Capacity	Type Solution	Receiving Unit	Room No.
13	110	EA-5 Color Developer	Versamat 1811	172G
				168
14	110	EA-5 Color 1st Stop	Versamat 1811	172G
				168
15	110	EA-5 Color 1st Developer	Versamat 1811	172G
				168
16	110	EA-5 Color Neutralizer	Versamat 1811	172G
				168
17	110	EA-5 Color Prehardener	Versamat 1811	172G
				168
18	150	ME-4 Color Developer	Houston 70mm	187
			Processor	
			RAM Processor	187
19	110	empty	RAM Processor	187
20	150	ME-4 Color Stop	Houston B/W 16mm	187
			neg-pos	
			Houston 70mm	187
			Hi-Speed 35mm Proc.	187
			RAM Processor	187
21	100	Backing Removal	RAM Processor	187
22	100	ECO-3 1st Developer	RAM Processor	187
23	79.5	ME-4 Neutralizer	Houston 70mm	187
			RAM Processor	187
24	150	ME-4 Color Pre-	Houston 70mm	187
		hardener	RAM Processor	187

Tank Number	Gallons Tank Capacity	Type Solution	Receiving Unit	Room No.
25	150	B/W Fixer	Houston B/W 16mm neg-pos	187
			Hi-Speed Processor	187
			Versamat 11C-M	172-L
				187
				108R
			Reversal Processor	187
			Tray/Sinks	177
			Log-E Processor	191
26	150	ME-4 Color 1st Developer	Houston 70mm Processor	187
			RAM Processor	187
27	150	Duomat B/W Developer	4A Processor	190
28	150	Himatic Stop	4A Processor	190
29	150	Himatic Fixer	4A Processor	190
30	250	ME-2A Color Developer Starter	Hi-Speed Processor	187
31	250	ME-2A Color 1st Developer Starter	Hi-Speed Processor	187
32	250	empty	Hi-Speed Processor	187
33	250	empty	Hi-Speed Processor	187
34	100	ME-2A and ME-4 Color Stabilizer	Houston 70mm Processor	187
			RAM Processor	187
			Hi-Speed Processor	187

Tank Number	Gallons Tank Capacity	Type Solution	Receiving Unit	Room No.
35	100	ME-2A Color 1st Developer	Hi-Speed Processor	187
36	100	empty	Hi-Speed Processor	187
37	100	ME-2A Color Developer	Hi-Speed Processor	187
38	120	empty	Hi-Speed Processor	187
39	110	ME-2A and ME-4 Color Fixer	Houston Processor	187
			RAM Processor	187
			Hi-Speed Processor	187
40	100	ME-2A and ME-4 Color Bleach	Houston 70mm	187
			RAM Processor	187
			Hi-Speed Processor	187
41	100	ME-2A Color 1st and 2nd Stop	Hi-Speed Processor	187
42	100	ME-2A Color Hardener	Hi-Speed Processor	187
43	15	Internegative	Sink/Tray Process	194
44	15	Litho A Developer	Log E Processor	191
45	15	Starfix B/W Fixer	Versamat 11C-M	187
46	15	ANSCO Color Stop/ Hardener	Tray/Sink Process	194
47	15	empty		
48	15	Litho B Developer	Log E Processor	191
49	50	D-19 B/W Developer	Hi-Speed B/W Processor	187

Tank Number	Gallons Tank Capacity	Type Solution	Receiving Unit	Room No.
50	50	Ektaprint C Color	ARKAY Processor	182-A
		Stabilizer	4C Processor	184
51	50	Ektaprint C Color Form	ARKAY Processor	182-A
		Fix	4C Processor	184
52	50	Ektaprint C Color Bleach	ARKAY Processor	182-A
			4C Processor	184
53	50	C-22 Color Stop	ARKAY Processor	182-A
			Pako Film Processor	184
54	50	Ektaprint C Color	ARKAY Processor	182-A
		Stop/Fix	4C Processor	184
55	50	empty	4C Processor	184
56	50	Ektaprint C Color	ARKAY Processor	182-A
		Developer (ECTA-C)	4C Processor	184
57	15	Versaflow B/W Developer	Versamat 11C-M	187
58	15	ANSCO Color Fixer	Tray/Sink Process	194
59	15	empty		
60	15	ANSCO Color Developer	Tray/Sink Process	194
61	15	ANSCO Color Bleach	Tray/Sink Process	194
62	15	ANSCO Color 1st Developer	Tray/Sink Process	194
63	15	empty		
64	15	empty		
65	50	C-22 Color Developer	Pako Processor	184
			Sink/Tray Process	
66	50	C-22 Color Fixer	Pako Film Processor	184

Tank Number	Gallons Tank Capacity	Type Solution	Receiving Unit	Room No.
67	50	C-22 Color Bleach	Pako Film Processor	184
68	50	C-22 Color Hardener	Pako Film Processor	184
69	50	Hunt CINI	Reversal Processor	187
70	50	Hunt CINI Bleach	Reversal Processor	187
71	50	Hunt CINI Clearing Bath	Reversal Processor	187
72	50	D-95 Developer	Reversal Processor	187
73	50	D-19 or D-76 B/W Developer	Houston B/W Processor Neg/Pos	187
74	50	LPD B/W Developer	Tray/Sink Process	177
75	30	C-22 Color Fixer	Reversal Processor	187
			Versamat 1411	108-R
76	30	C-22 Color Bleach	Versamat 1411	108-R
77	30	C-22 Color Stop	Versamat 1411	108-R
78	30	C-22 Color Developer	Versamat 1411	108-R
79	30	C-22 Color Stop	Versamat 1411	108-R
80	30	C-22 Color Developer	Versamat 1411	108-R
81	30	C-22 Color Neutralizer	Versamat 1411	108-R
82	30	C-22 Color Prehardener	Versamat 1411	108-R
83	30	MX-641 B/W Developer	Versamat 11C-M	108-R
				172-L
84	5	PHILCO		
35	5	PHILCO		
86	5	PHILCO		

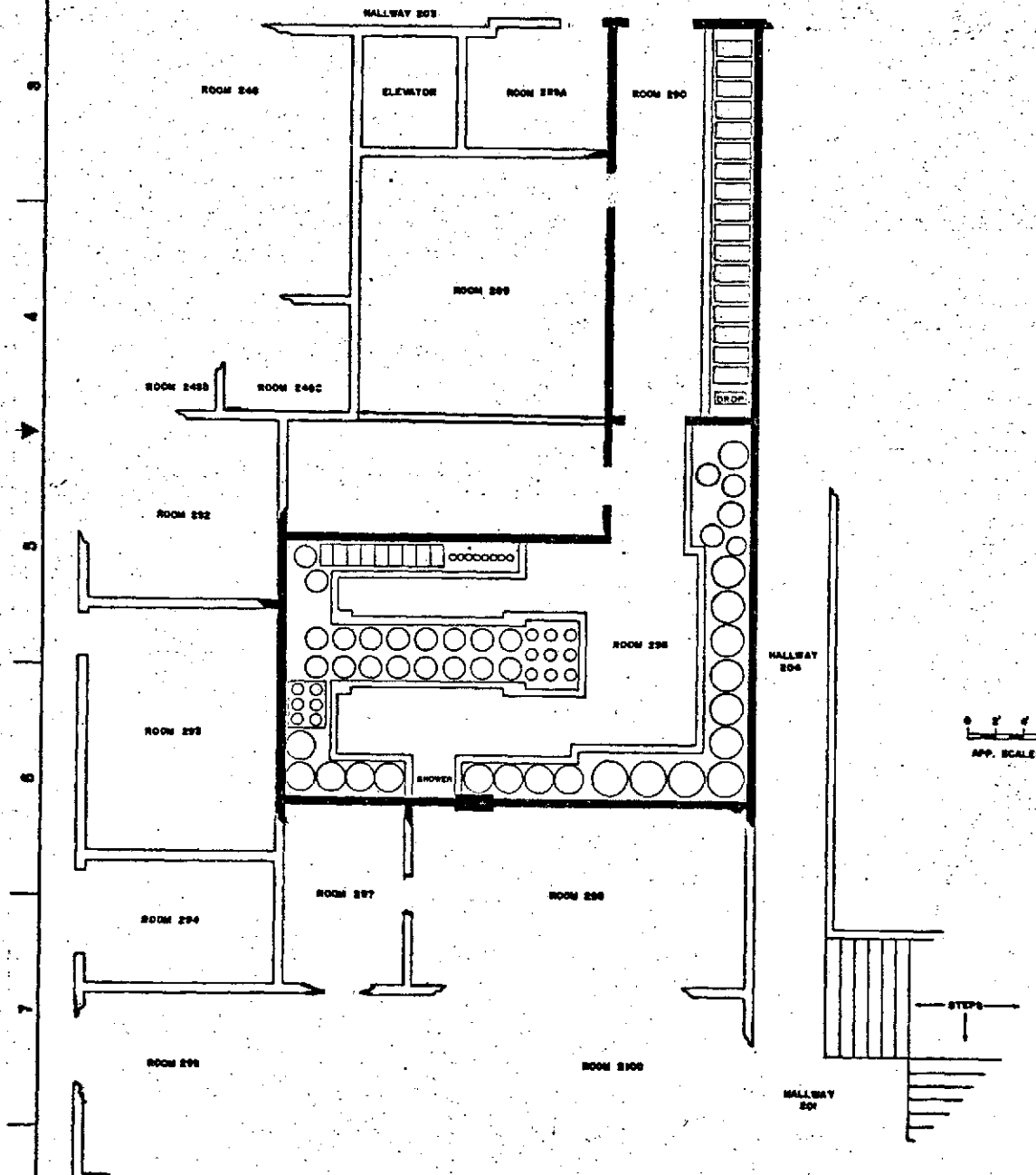
Tank Number	Gallons Tank Capacity	Type Solution	Receiving Unit	Room No.
87	5	PHILCO		
88	5	PHILCO		
89	5	PHILCO		
90	5	PHILCO		
91	5	PHILCO		

Photographic Technology Division

(Chemical Storage/Delivery, Chemical Mixing, Chemical Analysis and Supply)

-EXISTING-

BLDG. 8-2nd Floor



PRESENT AND ESTIMATED CHEMICAL CONSUMPTION REQUIREMENTS

Delivery Tank #	Capacity Gallons	Mixer Number	Mixer Capacity	Total Capacity	Chemical Requirements	Type Chemical Solution	Additional Requirements
4C Color Processor (SL) Pako Processor (PL)							
(24 hour period)							
50	50				50	Stabilizer	
91	100				50	Form Fix	
						Supplies, 4C,	
						Pako, &	
						Simplex	
52	50	50	100		35	Bleach	
55	50					Stop/Fixer	Manifold to tank 54
56	50				35	Developer	
54	50				35	Stop/Fix	Manifold to tank 55
MX 641 Developer (BW) 3 each BW Versamats (PL)							
80	30	B	120		75	MX 641 Devel-	
						oper	
D-19 Developer (BW) *Install quick fill valves on 16mm and 35mm Hi-							
Speed processor							
49	50				50		Manifold tanks together
							and common valve to
							line 49 and 73
73	50						

Delivery Tank #	Capacity Gallons	Mixer Number	Mixer Capacity	Total Capacity	Chemical Requirements	Type Chemical Solution	Additional Requirements
ME2A process - Hi-Speed processor (MPL)							
(24 hour period)							
31	250	66*	150		250	1st Developer Starter	Mixed approx. ea. 3 months
36	100	66	150		40	1st Developer Repl.	Convert delivery line 35 to tank 36
42	100	66	150		40	Hardener	
41	100	66	150		40	Acid Rinse	
30	250	66	150		250	Color Developer Starter	Mixed approx. each 3 months
37	100	66	150		40	Color Developer Repl.	
40	150	SEE	ME4		40	Bleach	ME-4 Chemistry
39	100	SEE	ME4		40	Fixer	ME-4 Chemistry
38	100	SEE	ME4		40	Stabilizer	Convert delivery line 35 to tank 38
*Used for all ME2 solutions except Bleach, Fixer, Stabilizer							
ME4 Process - RAM processor (MPL)							
(24 hour period)							
24	150	1	150	300	150	Prehardener	Use mixers as extra solution capacity

Delivery Tank #	Capacity Gallons	Mixer Number	Mixer Capacity	Total Capacity	Chemical Requirements	Type Chemical Solution	Additional Requirements
23	79.5	67	150	229.5	200	Neutralizer	Use mixers as extra solution capacity
26	150	3	150	300	300	1st Developer Repl.	Use mixers as extra solution capacity
19	110	65	150	260	110	EC03 1st Developer Repl.	Use mixers as extra solution capacity
20	150	66	150	300	300	Acid Rinse	Use mixers as extra solution capacity
18	150	64	150	300	300	Color Developer Repl.	Use mixers as extra solution capacity
40	100	15	250	350	300	Bleach	Usage - RAM, 70mm, Hi-Speed
39	100	13	150	250	250	Fixer	Usage - RAM, 70mm, Hi-Speed
38	100	12	150	250	200	Stabilizer	
22						EC03 1st Developer	

Mixers plumbed direct to tank, transfer panel system

EA-5 Process - 1811 Color Versamats (PPL)

(12 hour peak)

1	110	90	250	580	400	Prehardener	3 ea. 110 gallon tank -
2	110					Prehardener	manifold common tanks
3	110					Prehardener	1, 2, & 3 to delivery line

Delivery Tank #	Capacity Gallons	Mixer Number	Mixer Capacity	Total Capacity	Chemical Requirements	Type Chemical Solution	Additional Requirements
4	110					Neutralizer	3 100 gallon tanks -
5	110						manifold common tank 4,
6	110	90	250	580	400		5, & 6 delivery line.
7	110	89	250	860	842	1st Developer	Bypass manifold to 7A
7A	500	89				1st Developer	to delivery line
8	110	--	--	--	--	Bleach Reserve	No action
9	110	87	500	1,100	2,000	1st & 2nd Stop	Bypass manifold to 9A
9A	500	--	--			1st & 2nd Stop	to delivery line
13	110	86	250	1,080	1,100	Color Devel-	Common manifold 13, 11,
11	110					oper Repl.	10 and bypass to 10A to
10	110	86					common delivery line
10A	500						
12	110	84	250		390	Bleach	Bypass manifold to tank
12A	250	84				Bleach	12A to delivery line
14	110	82	250	360	390	Fixer	Bypass manifold to tank
14A	250	82				Fixer	14A
15	110	81	250	580	576	Stabilizer	Common manifold 17, 16,
16	110	81					15 to delivery line
17	110	81					
ANSCO Color Process - Sinks (SL) (24 hour period)							
62	15	(30 gallon portable mixer)			3	ANSCO 1st Developer	None
58	15				2	ANSCO Bleach	None

Delivery Tank #	Capacity Gallons	Mixer Number	Mixer Capacity	Total Capacity	Chemical Requirements	Type Chemical Solution	Additional Requirements
60	15	(30 gallon portable mixer)			4	ANSCO Developer	None
45	15				2	ANSCO Hardener/Stop	None
58	15				2	ANSCO Fixer	None
Internegative Replenisher (C-22) (24 hour period)							
43	15	(30 gallon portable mixer)			4	Interneg-C-22	None
Black and White Reversal Process - BW Reversal Processor (MPL)							
69	50	B	120	50	50	1st Developer - D49	None
72	50	B	120	50	50	2nd Developer - D-95	None
70	50	50	100	50	35	Bleach	None
71	50	B	120	50	35	Cine Clearing Bath	None
Developer Starter Solution Delivered from Chem Mix (Bulk Mix Starter Solution)							

Delivery Tank #	Capacity Gallons	Mixer Number	Mixer Capacity	Total Capacity	Chemical Requirements	Type Chemical Solution	Additional Requirements
Black and White Developer - Sink/Trays (PPL, SL, MPL)							
(24 hour period)							
74	50	B	120		50 peak 100	LPD Developer	None
Log E Processor - (SL)							
44	15	(30 gallon			15	Litho A Developer	No Change
48	15	portable mixer)			15	Litho B Developer	No Change
Starfix (Fixer)							
(24 hour period)							
25	150	2	150	300	present 300	Fixer Equipment req. Versamat (BW) Select Print BW Sinks HF 16mm Proc. HF 35mm Proc. Log E Proc. BW Rev. Proc. Versamat Proc. (Still Lab)	Gal. Req. 40 40 8

Delivery Tank #	Capacity Gallons	Mixer Number	Mixer Capacity	Total Capacity	Chemical Requirements	Type Chemical Solution	Additional Requirements
C-22 Ektacolor (Negative) - Pako Processor (SL)							
(24 hour period)							
65	50	53	80	50	50	Developer	Storage tank in place No Change
53	50	53	80	50	20	Stop	Storage tank in place No Change
66	50	53	80	50	15	Fixer	Storage tank in place No Change
67	50	50	100	50	15	Bleach	Storage tank in place No Change
68	50	53	80	50	15	Hardener	Storage tank in place No Change
C-22 Ekacolor (Negative) - Color Versamat Model 1411 (PL)							
NOTE: Modifications and formulation changes are presently being implemented. EA-5 color chemistries will be used for all solutions except Color Developer. Tasks and solution volume requirements are not complete at this time.							
81		53	80		?	EA-5	
82		53	80				
83	30	53	80		?		
79	30	53	80			EA-5	
78		30	53		?	EA-5	

Delivery Tank #	Capacity Gallons	Mixer Number	Mixer Capacity	Total Capacity	Chemical Requirements	Type Chemical Solution	Additional Requirements
77	30	53	80				
76	30	50	100		?		
75	30	53	80		?		
84	100	53	80	100			
85	100	50	100	100			

Ektaprint R (Paper Positive) Simplex Processor - (PL) - 50% Increase (24 hour period)

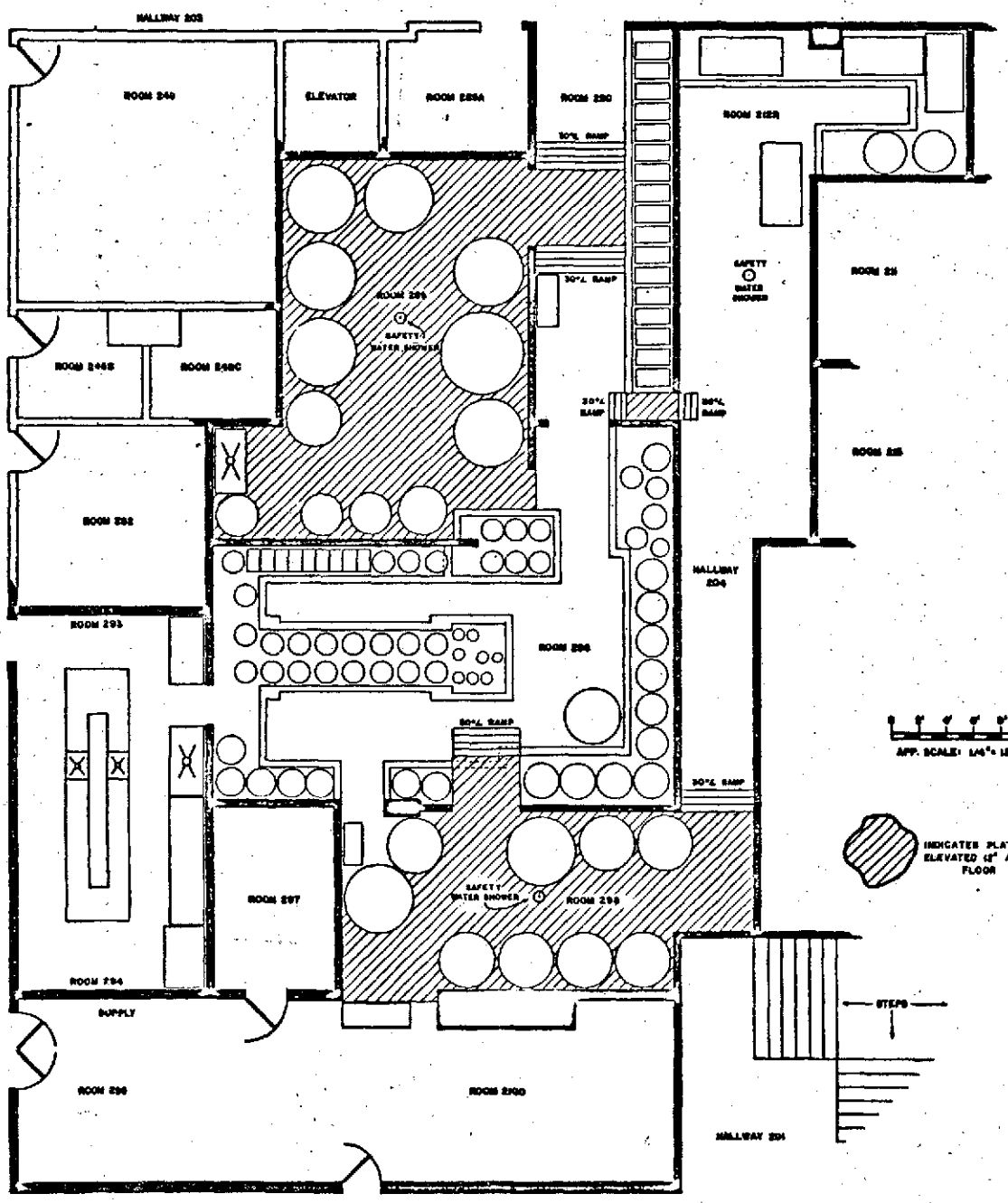
86	100	C	80		30	1st Developer	New tank & line required
87	100	C	80		30	Stop	New tank & line required
88	100	C	80		30	Color Developer	New tank & line required
89	100	C	80		30	Hard Stop	New tank & line required
90	100	50	100		30	Bleach	New tank & line required

Delivery Tank #	Capacity Gallons	Mixer Number	Mixer Capacity	Total Capacity	Chemical Requirements	Type Chemical Solution	Additional Requirements
91	100	C	80		90	Form Fix	Use tank 35 excess (chem to simplex and 4C)
92	100	C	80		30	Stabilizer	New tank required
Versaflow - BW Developer - BW Versamat (SL)							
57	15	(30 gallon portable mixer)			5	Versaflow Developer	No change
4A Processor BW Paper (SL)							
28	150	B	120			Himatic Stop	No change
29	150	B	120			Himatic Fixer	No change
27	150	B	120		75	Duomat Developer	Easy mix approx. 15 minutes - mostly Apollo
Use for Blix system when conversion is implemented							

Photographic Technology Division

(Chemical Storage/Delivery, Chemical Mixing, Chemical Analysis and Supply)

BLDG. 8 - 2nd Floor



NATIONAL AERONAUTICS & SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER - HOUSTON, TEXAS

Photographic Technology Division
Chemical Storage/Delivery, Chemical Mixing, Chemical Analysis and Supply

CODE IDENT NO. | SIZE: D | DWG. NO. | SHEET

SCALE (APP.): 1/4"=1'-0" | DATE: 8/20/72

SIGNATURES: DR. D.C.H. | CHG. | CH. | APP. | AUTH.

REVISION | LTR | ZONE | DATE

PROPOSED CHEMICAL MIXING, STORAGE/DELIVERY TANK
NUMERICAL KEY

Tank Number	Type Solution	Capacity
1	EA-5 Prehardener	110
2	EA-5 Prehardener	110
3	EA-5 Prehardener	110
4	EA-5 Neutralizer	110
5	EA-5 Neutralizer	110
6	EA-5 Neutralizer	110
7	EA-5 1st Developer	100
7A	EA-5 1st Developer	500
8	EA-5 Bleach Reserve	110
9	EA-5 1st and 2nd Stop	110
9A	EA-5 1st and 2nd Stop	500
10	EA-5 Color Developer	110
10A	EA-5 Color Developer (250)	250
11	EA-5 Color Developer	110
12	EA-5 Bleach	110
12A	EA-5 Bleach	250
13	EA-5 Color Developer	110
14	EA-5 Fixer	110
14A	EA-5 Fixer	250
15	EA-5 Stabilizer	110
17	EA-5 Stabilizer	110

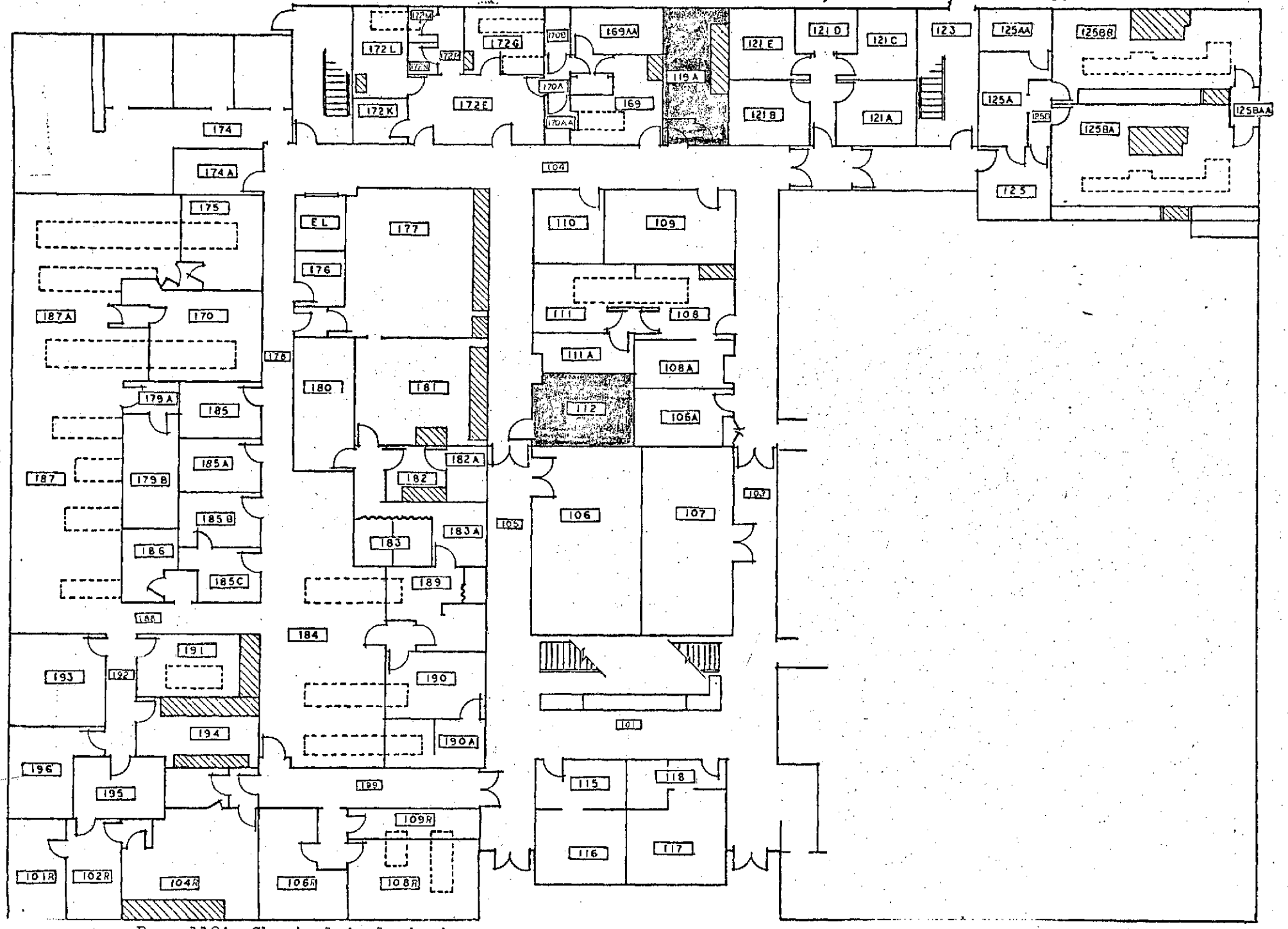
Tank Number	Type Solution	Capacity
18	ME4 Color Developer Replenisher	150
19	ME4 1st Developer Replenisher (ECO 3)	110
20	ME4 Acid Rinse	150
21	Backing Remover Solution	100
22	ECO-3 1st Developer	100
23	ME4 Neutralizer	79.5
24	ME4 Prehardener	150
25	Starfix Fixer (BW)	150
26	ME4 1st Developer	150
27	Duomat BW Developer	150
28	Himatic Stop (4A Processor)	150
29	Himatic Fixer (4A Processor)	150
30	ME2A - Color Developer Starter Processor	250
31	ME2A - 1st Developer Starter Processor	250
32	Empty Bleach Lines (Hi-Speed Processor)	250
33	D-19/C76 (Hi-Speed Processor)	250
34	Empty Remove (old ME4 stab remove and install into tank 92 position)	100
35	Empty Remove (old ME4 1st developer remove and install into tank 84 position)	100
36	ME2A 1st Developer Replenisher	100
37	ME2A Color Developer Replenisher	100
38	ME2A & ME4 Stabilizer	120
39	ME2A & ME4 Fixer	100
40	ME2A & ME4 Bleach	100

Tank Number	Type Solution	Capacity
41	ME2A Acid Rinse	100
42	ME2A Hardener	100
43	Internegative Replenisher (C-22) Relocate chemistry to tank 64	15
44	Litho A Developer Loge Relocate chemistry to tank 59, disconnect line	15
45	Ansco Hardener/Stop	15
46	Empty (old Starfix) Remove	15
47	Empty (old E3 cleaning tank) Remove	15
48	Litho B Developer Loge Relocate chemistry to tank 63	15
49	D-19 - Valved with 73	50
50	Ektaprint C Stabilizer	50
51	Empty (old form fix tank for 4C processor manifold line 51 to 50 mfld)	50
		50
52	Ektaprint C Bleach	50
53	C-22 Stop	50
54	Ektaprint C Stop/Fixer (4C processor)	50
55	Ektaprint C Stop/Fixer	50
56	Ektaprint C Developer	50
57	Versaflow BW Versamat Developer empty	15
58	Ansco Fixer	15
59	Empty, connect line 59 to tank 44	15
60	Ansco Color Developer	15

Tank Number	Type Solution	Capacity
61	Ansco Bleach	15
62	Ansco 1st Developer	15
63	Empth (old E3 color chemistry) connect to line 43	15
64	Empty (old E3 1st developer) connect to line 48	15
65	C-22 Developer (Pako) (SL)	50
66	C-22 Fixer (Pako) (SL)	50
67	C-22 Bleach (Pako) (SL)	50
68	C-22 Hardener (Pako) (SL)	50
69	1st Developer D-94 (BW Reversal)	50
70	Bleach (BW) (BW Reversal) A	50
71	Cine Clearing Bath (BW Reversal)	50
72	2nd Developer D-95 (BW Reversal)	50
73	D-19 - Valved with 49	50
74	LPD Developer (BW)	50
75	C-22 Fixer (1411 PL)	30
76	C-22 Bleach (1411 PL)	30
77	C-22 Fixer (1411 PL)	30
78	C-22 Stop (1411 PL)	30
79	C-22 Stop (1411 PL)	30
80	MX 641 Developer (BW)	30
81	C-22 Hardener (1411 PL)	30

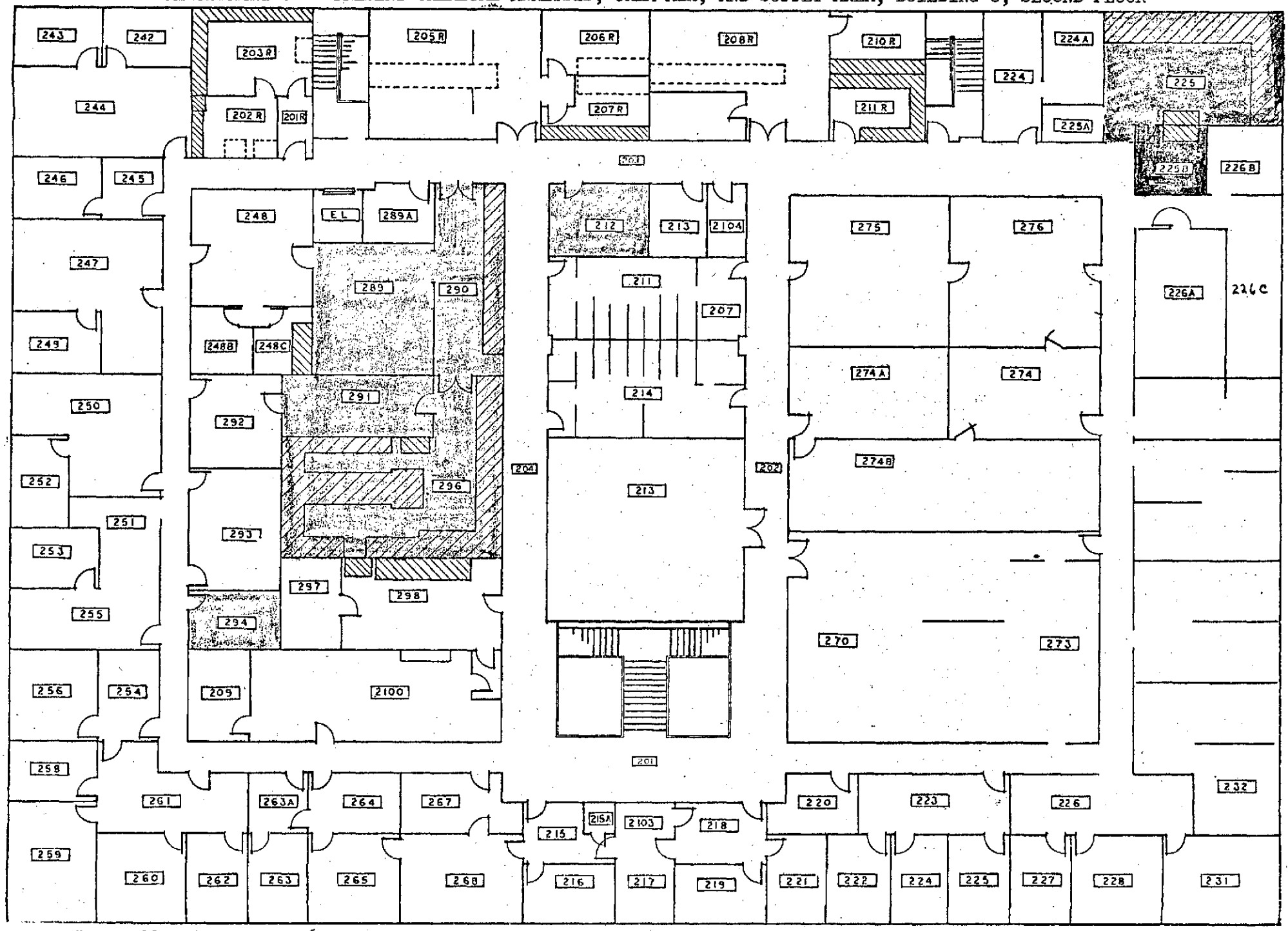
Tank Number	Type Solution	Capacity
82	C-22 Developer (1411 PL)	30
83	C-22 Developer (1411,PL)	30
84	C-22 Hardener (1411 PL) Substitute tank 35 in place 84	100
85	C-22 Bleach (1411 PL) New tank requirement	100
86	Ektaprint R 1st Developer	100
87	Ektaprint R 1st Stop	100
88	Ektaprint R Color Developer	100
89	Ektaprint R Hard Stop	100
90	Ektaprint R Bleach	100
91	Ektaprint R Form Fix (use tank 34 after removal)	100
92	Ektaprint R Stabilizer (relocate and use tank 35 after removal)	100
93	General Purpose Holding Tank and Transfer pump (purpose hold chemistry while (on hand) fixing tanks, space general purpose mixer, etc.)	

ATTACHMENT 6-1 PRESENT CHEMICAL ANALYSIS AND SUPPLY AREA, BUILDING 8, FIRST FLOOR



Room 119A Chemical Analysis Area
Room 112 Supply Cold Storage

ATTACHMENT 6-2 PRESENT CHEMICAL ANALYSIS, CHEM MIX, AND SUPPLY AREA, BUILDING 8, SECOND FLOOR



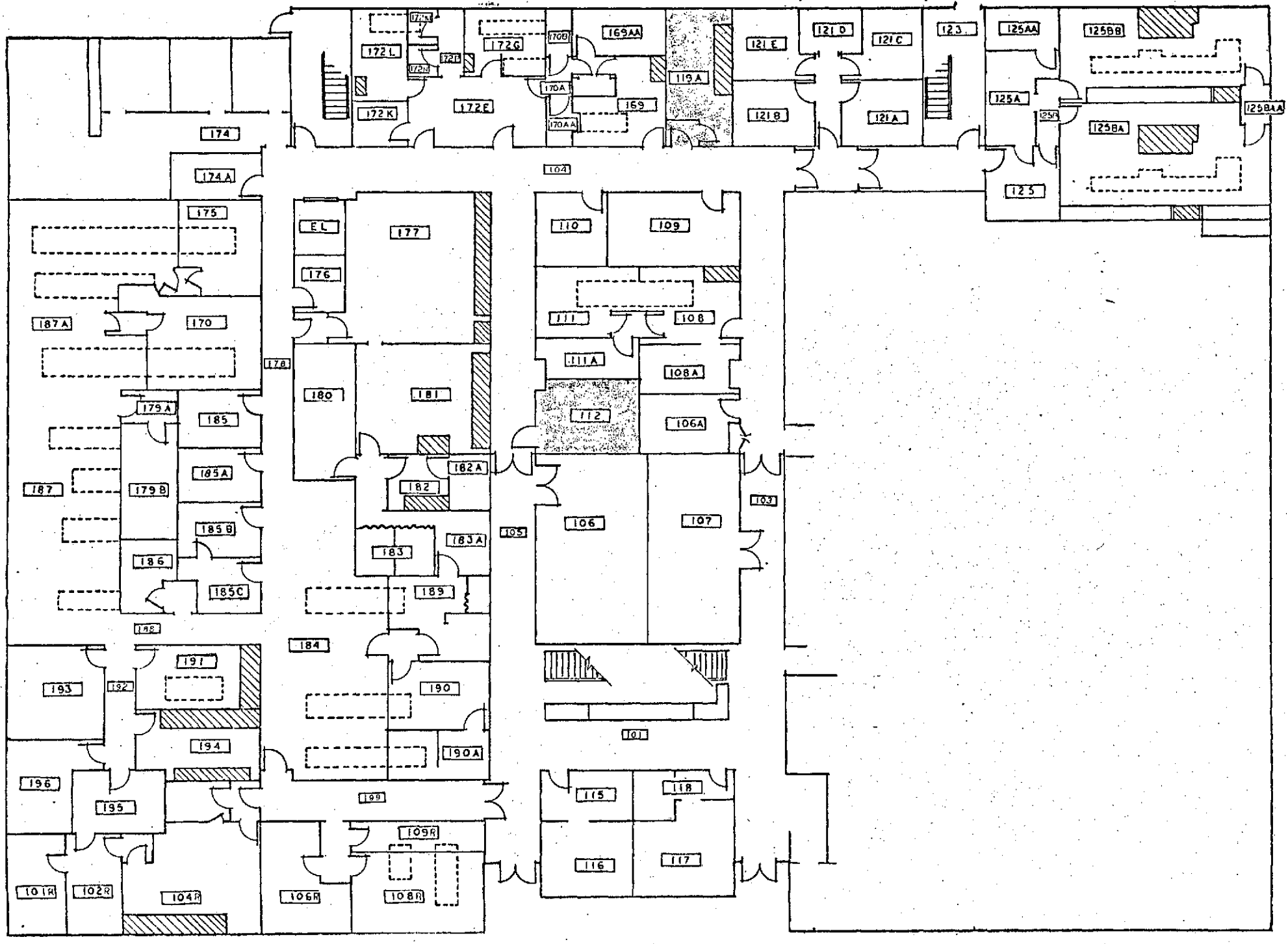
Rooms 225, 290, and 296 — Chemical Mixing Area
Rooms 212, 225B, and 294 — Supply Area
Rooms 225B and 291 — Chemical Analysis Area

PRESENT AND RECOMMENDED FUNCTION BY ROOM NUMBER

Room Number	Present Use	Recommended Use
119A	Chemical Analysis	Photo Science Division
112	Supply Cold Storage	No change
205R	Copy Camera Room	Supply Storage
225	Fultron Delivery/Mix Tanks	No change
225B	Chemical Analysis	Supply Storage
226B	Retouching Functions	Supply Storage
226	Miscellaneous Equipment Storage	Supply Storage
226A	NASA Supply Cold Storage (25% use)	Consolidate with Technicolor Supply Storage
212R	Supply Storage	Solution Delivery/Store Tanks
204	Hallway	Solution Delivery/Store Tanks
289	Supply Storage	Chemical Mixing Units
291	Chemical Analysis	Chemical Mixing Units
290	Solution Delivery/Storage Tanks	No change
296	Solution Delivery/Storage	No change
293	Quality Control	Chemical Analysis
294	Supply Office	Chemical Analysis
209	Precision Laboratory Office	Supply

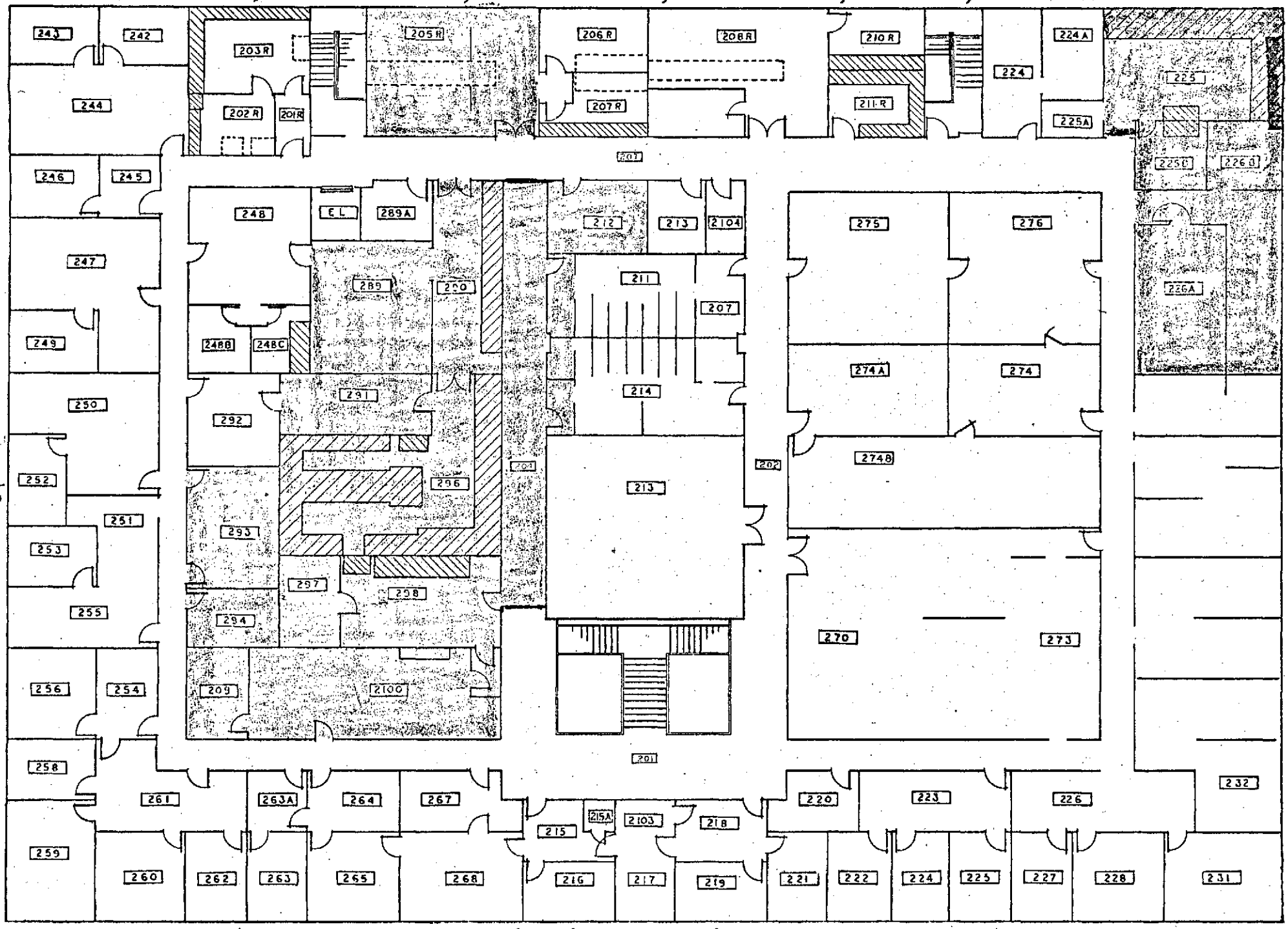
Room Number	Present Use	Recommended Use
2100	Precision Laboratory Final Inspection	Supply
298	Precision Laboratory Titling	Chemical Mixing
297	Cold Room Vault, Processed Film Storage	Supply Cold Storage
225A	Maintenance	Remove wall open to maintenance seal off to chem mix room 225

ATTACHMENT 6-4 PROPOSED PHOTOGRAPHIC SCIENCE AND SUPPLY AREA, BUILDING 8, FIRST FLOOR



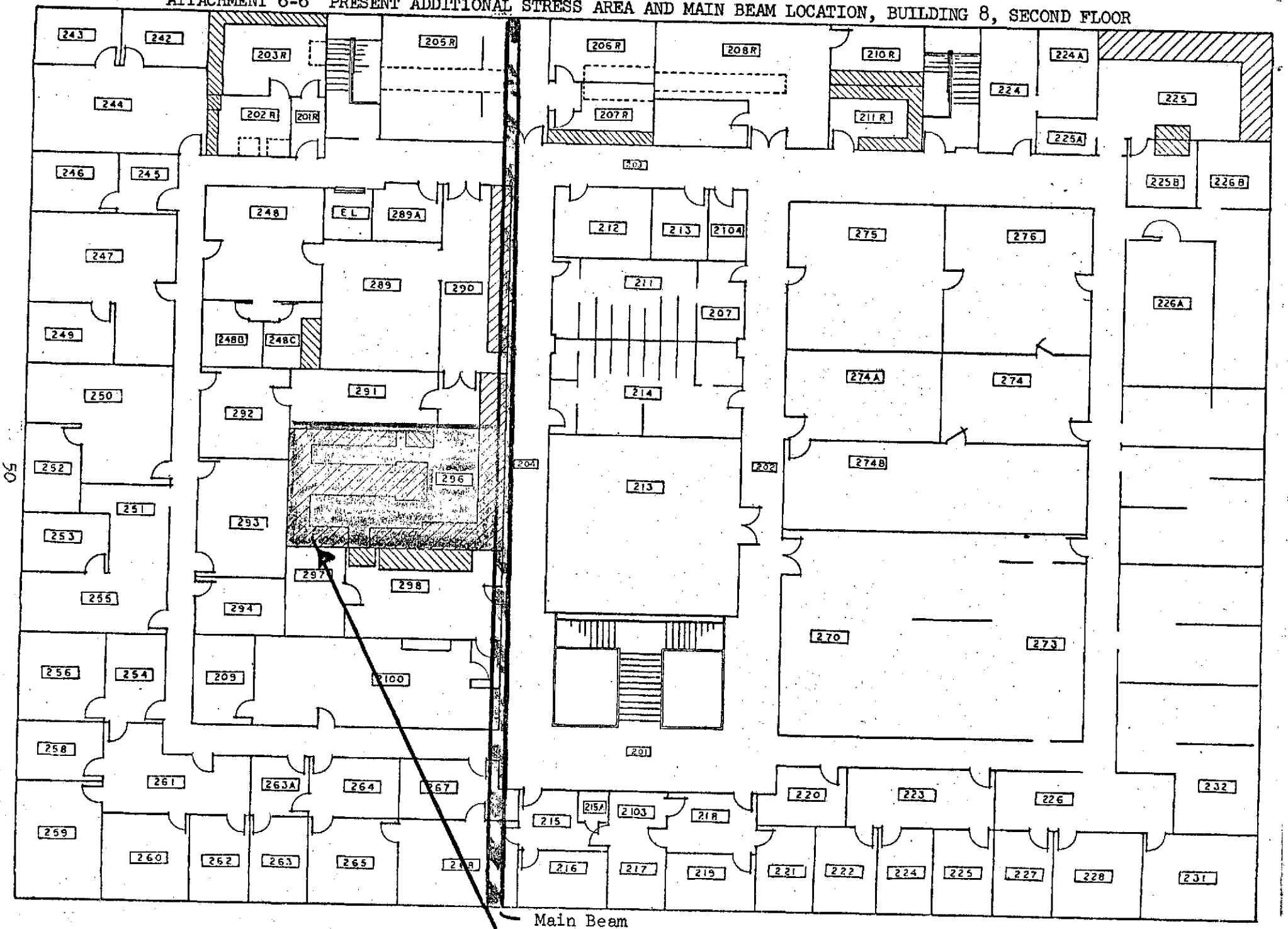
Room 119A Photographic Science Area
Room 112 Supply Cold Storage Area (No Change)

ATTACHMENT 6-5 PROPOSED CHEM MIX, CHEMICAL ANALYSIS, AND SUPPLY AREA, BUILDING 8, SECOND FLOOR

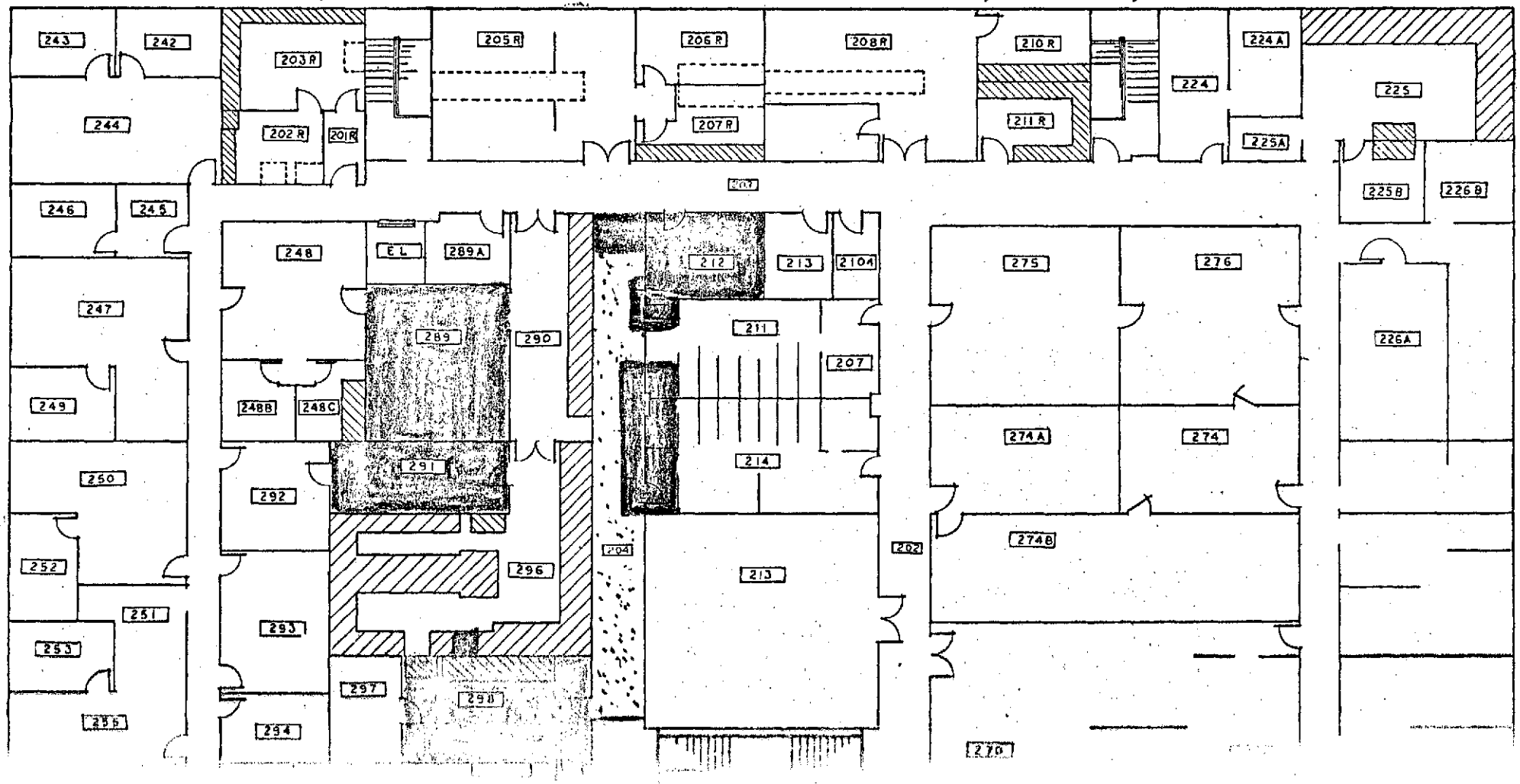


Chemical Mixing/Delivery Area	Rooms 298, 296, 291, 290, 289, 225, 212 and Hallway 204
Chemical Analysis Area	Rooms 293 and 294
Supply Area	Rooms 209, 2100, 205R, 225B, 226, 226D, and 226B

ATTACHMENT 6-6 PRESENT ADDITIONAL STRESS AREA AND MAIN BEAM LOCATION, BUILDING 8, SECOND FLOOR



ATTACHMENT 6-7 PROPOSED RESERVED AREA FOR NEAR FUTURE REQUIREMENTS, BUILDING 8, SECOND FLOOR



- Silver Recovery Unit Area — Hallway 204
- BLIX System Area — Hallway 204
- Chemical Mixing Area — Rooms 212, 289, 291, and 298

EQUIPMENT MODIFICATIONS

Chem Mix

Remove tank connections and relocate chemistry and delivery lines to the appropriate delivery tanks.

Type Chemical Solution
Ektaprint R Color Stabilizer
Ektaprint R Color Bleach
Ektaprint R Color Hard/Stop
Ektaprint R Color Developer
Starfix BW Fixer
Starfix BW Fixer
MX641 BW Developer
MX819 BW Developer
EA-5 Stabilizer
EA-5 Pre Hardener
EA-5 Neutralizer
EA-5 1st Developer
EA-5 1st and 2nd Stop
EA-5 Color Developer
EA-5 Bleach
EA-5 Fixer
EA-5 Stabilizer
C-22 Internegative Replenisher

Type Chemical Solution
ANSCO Hard Stop
Cronolith B Developer
Cronolith A Developer

IMMEDIATE EQUIPMENT PURCHASE AND INSTALLATION DATA

1. Purchase 4 chemical mixers w/o internal transfer pumps.
   a. 150 gallon mixing capacity
   b. plumb to transfer pumps
   c. 1" PVC lines
   d. temporary installation in room 289/291

2. Purchase and install 7 chemical solution delivery/storage tanks, 100 gallon capacity.

3. Purchase 4 stainless steel centrifugal pumps capable of pumping corrosive chemical liquids at a rate of 33 gallons per minute.

IMMEDIATE EQUIPMENT RELOCATION AND INSTALLATION REQUIREMENTS

1. Relocate in house chemical mixers to room 289/291.

   a. 1 general purpose mixer, 120 gallon capacity.

   b. 3 chemical mixers, 30 gallon capacity.

   c. 2 chemical mixers, 80 gallon capacity.

2. Remove sink from room 296 and install in room 291 as per floor plan location attachment 6-2 and 6-5.

   a. install plumbing, hot and cold water with temperature control unit

   b. install drain

3. Remove excess Philco chemistry tanks and seal "stub ups". Tanks number 84 - 91.

IMMEDIATE CONSTRUCTION REQUIREMENTS

1. Remove wall between room 289 and 291.

2. Remove portion of wall between room 291 and room 296. See attachment 6-12 for location.

3. Install dutch-type door with shelf on bottom portion of door. Room 293 to 296. See attachment 6-12 for location.

4. Remove solution delivery/storage tanks, number 43, 44, 45, 46, 47, and 48 with stand. Deliver to Building 17, room 203B.

5. Remove wall between room 293 and 294. See attachment 6-12 for location.

6. Remove wall between room 225A and 224. See attachment 6-12 for location.

CHEMICAL MIXING AND DELIVERY SYSTEM RECOMMENDATIONS

1. Number mixer and delivery/storage tanks

   two mixing areas be alloted; room 289/291 (presently used for chemical storage and analysis), and room 298 (presently used for titling of film).

2. Plumbing, flooring, water showers, transfer pumps, mixers, and mixing tanks be purchased and installed including construction in room 298 as follows:

   a. Seven (7) 150 gallon mix tanks (4 temporarily installed in room 289).
   b. One (1) 150 gallon mix tank (bleach lined).
   c. One (1) 250 gallon mix tank.
   d. One (1) 250 gallon mix tank (bleach - ME4), lined.
   e. Floor platform 12" above floor level.
   f. Install safety emergency water shower in center of room.
   g. 1" PVC plumbing to provide direct transfer to delivery panel, pumps, and transfer system to storage/delivery tanks.
   h. Hot and chill water delivery lines direct to individual mix tanks.
   i. Remove wall (except pillar post) between room 296 and 298.
   j. Remove wall between room 298 and hallway 204.

k. Remove wall between room 298 and 2100 except pillar post.

l. Remove vault door and relocate and install to room 2100 side of vault.

m. Seal previous vault door opening.

3. Mixers, transfer pumps, PVC transfer lines, transfer pump panel system. Purchase and installation including construction.

a. Five (5) 250 gallon mixer tanks.

b. One (1) 250 gallon bleach lined tank.

c. One (1) 500 gallon mixer tank.

d. One (1) 150 gallon mixer tank.

e. One (1) 100 gallon bleach line mixer tank.

f. Two (2) (on hand) 80 mixer tanks.

g. One (1) 120 gallon mixer tank (on hand).

h. One (1) sink 2.5' x 5' (on hand). Relocate from room 296 to room 291. See attachment 6-12.

i. 1" PVC lines connecting mixer tanks to transfer pumps, panel, and matching storage/delivery tanks or flexible chemical transfer lines.

j. Floor platform (12" above floor level).

k. Chemical exhaust vents above mixers.

l. Hot and chill water delivery lines to each mixer.

m. Safety emergency water shower in central delivery room 289.

n. Remove 2.5 foot portion of wall between room 291 and 290, 4 ft. portion of wall between room 291 and 296. See attachment 6-14 for location.

4. Additional solution storage/delivery tank requirements

a. C-22 eight (8) 100 gallon tanks.

b. C-22 one (1) 100 gallon bleach lined tank.

c. EA-5 three (3) 500 gallon tanks (rectangular).

c. EA-5 one (1) 250 gallon bleach lined tank.

e. EA-5 one (1) 250 gallon tank.

f. Room 212R be used to house the above EA-5 delivery/ storage tanks.

EQUIPMENT, PURCHASE, AND INSTALLATION REQUIREMENTS

1. On Hand Chemical Mixers:

Number	gl Cap	Solution	Comments
	120		
	120		
	79.5		
	79.5		
	30		
	30		
	30		

2. Mixers on order by NASA:

   2 chemical mixers - 120 gallon mix capacity each.

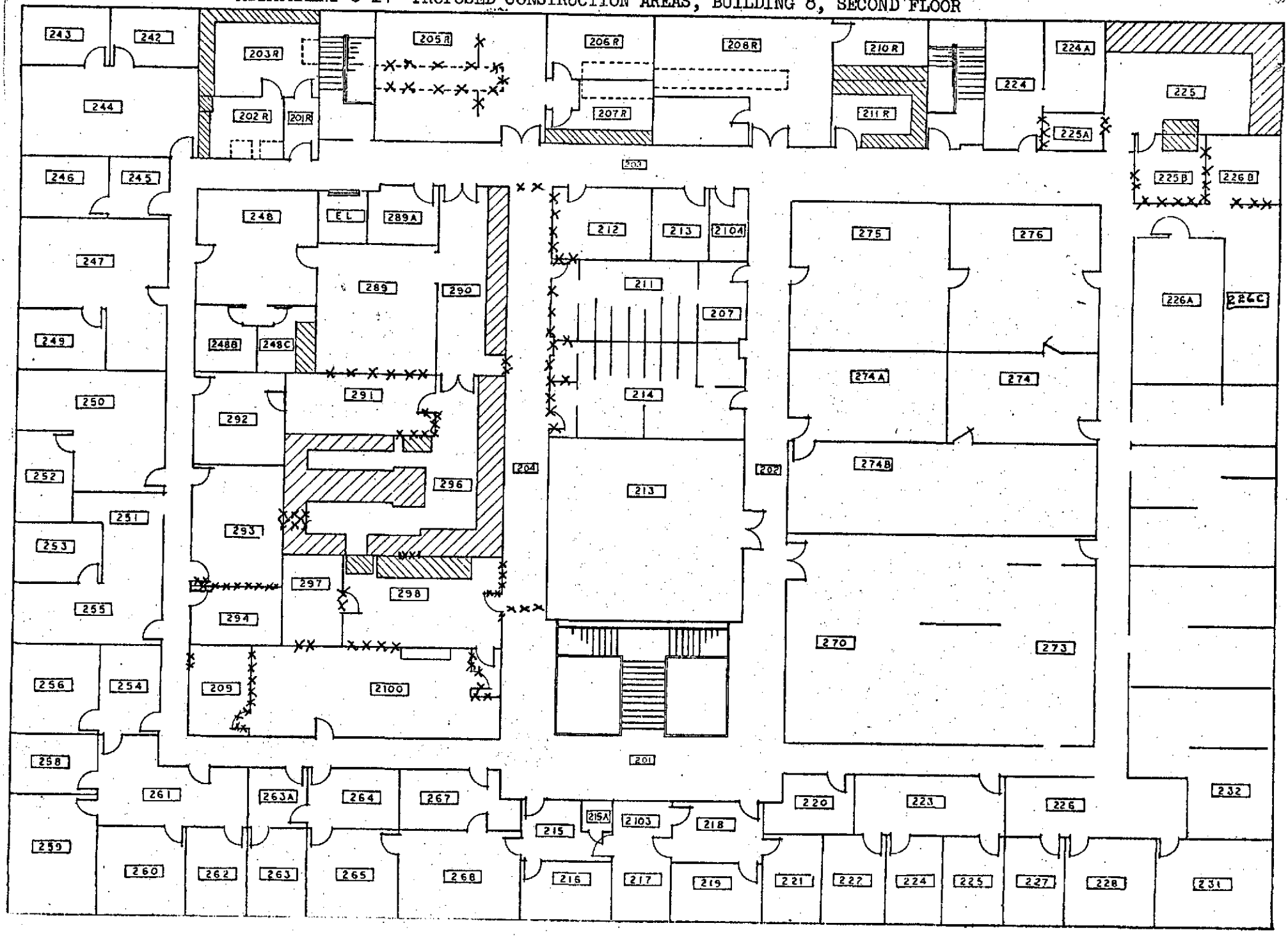
3. Projected Chemical Mixer Requirements:

Mix Capacity	Mix Solution Requirements	Comments
150	ME2A & ME-4 Acid Rinse	Valve to transfer panel to direct to delivery tank
150	ME4 Neutralizer	Valve direct to tank 3 way
150	ME4 Prehardener	Direct to tank manf valve
150	ME4 1st Developer	Direct to transfer panel 1 to delivery tank
150	ME4 Stabilizer	Direct to transfer panel 1 to delivery tank

Mix Capacity	Mix Solution Requirements	Comments
150	ME4 Fixer	Direct to transfer panel 1 to delivery tank
250	ME4 Bleach	Direct to transfer panel 1 to delivery tank
150	ME4 - EC03 - 1st Developer and 1st Developer Replenisher	Services 2 tanks and direct and valve for switch over
150	Starfix (Fixer)	Valve direct to panel and direct to delivery tank
100	C-22, Bleach	Transfer pump-valve to transfer panel 2
80	C-22 Color Chemistry	Transfer pump-valve to transfer panel 2
80	Ektaprint R Chemistry	Transfer pump-valve to transfer panel 2
250	EA5 Stabilizer	Transfer pump, valve to transfer panel 3 and delivery tank
250	EA5 Fixer	Transfer pump, valve to transfer panel 3 and delivery tank
250	EA5 Bleach	Transfer pump, valve to transfer panel 3 and delivery tank
250	EA5 Color Developer	Transfer pump, valve to transfer panel 3 and delivery tank

Mix Capacity	Mix Solution Requirements	Comments
500	EA5 Stop	Transfer pump, valve to transfer panel 3 and delivery tank
250	EA5 1st Developer	Transfer pump, valve to transfer panel 3 and delivery tank
250	EA5 Prehardener/Neutralizer	Transfer pump, valve to transfer panel 3 and delivery tank
120	General Mix & Holding	Semi Portable
30	General Mixing	Portable
30	General Mixing	Portable
30	General Mixing	Portable
120	Developed General Chemistry	Pump to panel 2

ATTACHMENT 6-14 PROPOSED CONSTRUCTION AREAS, BUILDING 8, SECOND FLOOR



X - Construction

PROJECTED CONSTRUCTION RECOMMENDATIONS

1. Remove wall between room 293 and 294.

2. Remove wall between room 225A and 224.

3. Remove wall between room 225B and 226B.

4. Remove wall between room 225B, 226B, and 226C.

5. Remove portion of wall between 298 and Hallway 204.

6. Remove wall except pillar post between room 298 and 2100.

7. Remove wall and light trap except pillar post between room 209 and 2100.

8. Install double door in wall of room 209 and Hallway 203.

9. Remove wall between room 212R and Hallway 204.

10. Construct raised floor 12" above floor line in room 289, room 291, and room 298.

11. Install water showers in center of rooms 289, 291, 298, and Hallway 204.

12. Install and connect all chemical transfer pannels, lines, and mixers delivery/storage tanks.

13. Remove vault door, room 297, and cut opening and relocate door to room 2100 side of vault. Seal old vault door opening.

14. Install chemical exhaust vents above all chemical mixers.

15. Install double door in the wall between Room 225B and Hallway 203.